

SECTION 055000 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Supports for existing guardrail sections height modification.
 - 2. Ductwork supports.
 - 3. Existing rooftop metal stair support modification.

- B. Related Sections:

- 1. Section 055213 "Pipe and Tube Railings".

1.3 SUBMITTALS

- A. Shop drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 QUALITY ASSURANCE

- A. Welding qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding – Steel".

1.5 PROJECT CONDITIONS

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

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
- B. Steel Tubing: ASTM A500, cold formed steel tubing.
- C. Steel Pipe: ASTM A53 Grade B, standard weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

- A. General: Unless otherwise indicate, provide Type 304 stainless steel fasteners for exterior use. Select fasteners for type, grade, and class required.
- B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and where indicated, flat washers; Alloy Group 1.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it..
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to the greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base materials
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds adhere possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicate to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needd to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes and profiles indicated and as necessary to receive adjacent construction.
- C. Galvanize miscellaneous framing and shapes where indicated.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.8 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel

and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

PART 3 - EXECUTION

3.1 INSTALLTION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb and true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

Expansion and Epoxy Anchors in Concrete: Refer to construction drawings for size, manufacturer, type, and embedment requirements. Refer to anchor manufacturer for installation instructions.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including written instructions and requirements indicated on shop drawings..

3.3 ADJUSTING AND CLEANING

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

END OF SECTION 055000

SECTION 055213 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel Pipe Railings

1.3 ACTION SUBMITTALS

- A. Shop drawings: Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code – Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code – Aluminum."
 - 3. AWS D1.6, "Structural Welding Code – Stainless Steel."

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

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

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.2 STEEL AND IRON

- A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.

2.3 FASTENERS

- A. General: Provide the following
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25
- C. Shop Primers: Provide primers that comply with Section 099000 "Exterior Painting".

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railing with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for that purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Close exposed ends of railing members with prefabricated end fittings.
- J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors, to interconnect railing members to other work unless otherwise indicated.
- K. Provide inserts and other anchorage devices for connecting railings to concrete and masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.6 FINISHES, GENERAL

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

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 4. Fill vent and drain holes that will be exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth. Where vent holes are required in pipe supports, position hole near top, to be covered with stainless steel storm collar.

- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
- E. Shop-Painted Finish: Comply with Section 099000 "Exterior Painting."
 - 1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting and fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting".
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 PROTECTION

- A. Protect finished of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 061053 – MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rooftop equipment bases and support curbs.
 - 2. Wood blocking and nailers.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. WCLIB: West Coast Lumber Inspection Bureau.
 - 2. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative-treated wood.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual size required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b for exterior construction not in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Fire Retardant Treatment: Shall comply with the formulation FR-1, current edition of AWPA P49.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- E. Application: Treat all miscellaneous carpentry unless otherwise indicated.
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 LUMBER MATERIALS

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

2. Nailers
 3. Rooftop equipment bases and support curbs.
- B. For items of dimension lumber size, provide No. 2 or better grade lumber of the following species:
1. Douglas fir larch; WCLIB or WWPA
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachments of other work.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood-Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports unless otherwise indicated.

- D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- G. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surface unless otherwise indicated.

END OF SECTION 061053

SECTION 070150 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Roof tear-off.
- 2. Removal of base flashings.

- B. Related Sections:

- 1. Section 015000 "Temporary Facilities and Controls."
- 2. Section 076200 "Flashing and Sheet Metal."
- 3. Section 075216 "SBS-Modified Bitumen Roofing."

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Existing Membrane Roofing System: Built-up asphalt roofing membrane, roof insulation, surfacing, and components and accessories between deck and roofing membrane.
- C. Roof Tear-Off: Removal of existing membrane roofing system from deck.
- D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- E. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 ACTION SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

- A. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by re-roofing operations. Submit before Work begins.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of new membrane roofing system approved by warrantor of existing roofing system to work on existing roofing.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Re-roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner; Consultant; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects re-roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:
 - a. Re-roofing preparation, including membrane roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing roofing system that is to remain during and after installation.
 - c. Existing roof drains and roof drainage during each stage of re-roofing, and roof drain plugging and plug removal requirements.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - e. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
 - f. Structural loading limitations of deck during re-roofing.
 - g. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect re-roofing.
 - h. HVAC shutdown and sealing of air intakes.
 - i. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
 - j. Discovery of asbestos-containing materials.
 - k. Governing regulations and requirements for insurance and certificates if applicable.
 - l. Existing conditions that may require notification of Owner and Consultant before proceeding.

- A. Owner will occupy portions of building immediately below re-roofing area. Conduct re-roofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
 - 1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.
 - 2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- B. Protect building to be re-roofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roof removal and re-roofing operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- D. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
 - 1. The results of an analysis of test cores from existing membrane roofing system are available for Contractor's reference.
 - 2. Construction Drawings for existing roofing system are provided for Contractor's reference. Contractor is responsible for conclusions derived from existing documents.
- E. Limit construction loads on roof to rooftop equipment wheel loads and for uniformly distributed loads.
- F. Weather Limitations: Proceed with re-roofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
- G. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work. Existing roof will be left no less watertight than before removal.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Consultant and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with re-roofing work that could affect indoor air quality or

activate smoke detectors in the ductwork.

- B. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- C. Verify that all roof drains are free flowing. Immediately report any existing stoppage to the Owner and Consultant. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- D. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.
 - 1. Remove roof insulation.
 - 2. Remove bitumen and felts and wet felts.
 - 3. Remove asphalt from concrete substrate.
 - 4. Remove fasteners from deck.
 - 5. Use mechanical means as necessary to remove asphalt and other materials from surface of roof deck – as required to adhere new materials to.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of membrane roofing system.
- B. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if moisture condenses under the plastic sheet.
- C. If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Owner. Do not proceed with installation until directed by Owner.
- D. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Owner. Do not proceed with installation until directed by Owner.
- E. Provide additional deck securement as directed by Owner.

3.4 EXISTING BASE FLASHINGS

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
 - 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.
- C. Inspect parapet sheathing for deterioration and damage. If parapet sheathing has deteriorated, immediately notify Owner.
- D. Plywood parapet sheathing is specified in Section 061053 "Rough Carpentry."

3.5 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 - 1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

SECTION 075216 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE
ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. 2-ply Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.
 - 2. Roof level insulation, tapered insulation and tapered edges strips.
 - 3. Overlay board.
- B. Related Sections:
 - 1. pSection 061053 "Rough Carpentry"
 - 2. Section 055000 "Metal Fabrications"
 - 3. Section 055213 "Pipe and Tube Railings".
 - 4. Section 079200 "Joint Sealants."
 - 5. Section 070150 "Preparation for Re-Roofing."
 - 6. Section 076200 "Sheet Metal Flashing & Trim."

1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 ABBREVIATIONS

- A. ASTM International (formerly American Society for Testing and Materials) www.astm.org.
- B. FM Global Factory Mutual Global (FM Global) www.fmglobal.com.
- C. NRCA National Roofing Contractors Association www.nrca.net.
- D. UL Underwriters Laboratories www.ul.com.
- E. TIMA Thermal Insulation Manufacturers Association.
- F. LTTR Long Term Thermal Resistance.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - 1. Corner Uplift Pressure: 165 lbf/sq. ft.
 - 2. Perimeter Uplift Pressure: 120 lbf/sq. ft.
 - 3. Field-of-Roof Uplift Pressure: 75 lbf/sq. ft.
- D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
- E. UL Listing:
 - 1. Provide modified bituminous roofing systems and components that have been tested for application and slopes indicated, and are listed by Underwriter's Laboratories (UL) for Class A external fire exposure.
 - 2. Provide modified bituminous roofing system materials bearing UL Classification marking on bundle, package, or container, indicating that materials have been produced under UL's Classification and follow-up service.
 - 3. Provide modified bituminous roofing systems that can be installed to comply with UL requirements for Fire Classified and Class 1-90 wind-uplift requirements.
- F. Rigid Insulation Fire Performance Characteristics:
 - 1. Provide rigid insulation materials that are identical to those whose fire performance characteristics, as listed for each material or assembly of which rigid insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Surface Burning Characteristics: ASTM E84.
 - 3. Fire Resistance Ratings: ASTM E119.
- G. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
- H. Energy Performance: Provide roofing system that is listed on DOE's ENERGY STAR "Roof

Products Qualified Product List" for low-slope roof products.

- I. Energy Performance: Provide roofing system with initial Solar Reflectance not less than 0.70 and Thermal Emittance not less than 0.75 when tested according to Cool Roof Rating Council's CRRC-1.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
 1. Base flashings and membrane terminations.
 2. Tapered insulation, including slopes.
 3. Crickets, saddles, and tapered edge strips, including slopes.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Samples for Verification: For the following products:
 1. 12-by-12-inches square samples of modified bituminous reflective surfaced top ply sheet to be exposed as the finish surface.
 2. 12-by-12-inches square of base ply sheet, reinforcing sheet, and flashing sheet.
 3. 12-by-12-inches square of roof level rigid insulation and overlay board

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 1. Submit evidence of meeting performance requirements.
- C. Installer Certification: Submit written certification from manufacturer of modified bituminous roofing systems certifying that installer is approved by manufacturer to install the specified roofing systems.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
- E. Research/Evaluation Reports: For components of roofing system.
- F. Manufacturer's published specifications for the proposed materials and systems.
- G. Evidence of UL and FM Approvals.
- H. Warranty: Submit sample copy of proposed warranties stating obligations, remedies, limitations, and exclusions of warranties.

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications and Requirements:
 - 1. A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
 - 2. In continuous business under same name for past five (5) years.
 - 3. Completed at least three (3) successful installations of specified materials and systems on projects of similar scope.
 - 4. Contractor shall provide all personnel trained in application of materials and systems and shall maintain supervision as specified elsewhere.
 - 5. Installer Field Supervision: Require Installer to maintain a full-time supervisor / foreman on the job site during times that modified bituminous roofing systems installation is in progress, and who is experienced in installation of the specified roofing systems.
- B. Manufacturer's Qualifications and Requirements:
 - 1. A qualified manufacturer that has UL listing and FM Approval for roofing system identical to that used for this Project.
 - 2. A technical representative of materials manufacturer shall periodically observe work in progress.
 - 3. Technical representative, as a minimum, shall be present to observe deck preparation, general installation procedures, and final completion; submit documentation of manufacturer's final acceptance.
 - 4. Work shall not proceed until such observations have been made and conditions have been approved in writing by the manufacturer.
 - 5. Technical representative shall perform a punch list inspection upon substantial completion of the project indicating all items in need of attention, including conformance to manufacturer's published installation instructions and these contract documents; provide documentation.
- C. Source Limitations: Obtain primary products, including each type of roofing ply sheet, bitumen, and adhesive, membrane flashings from a single manufacturer, or with primary manufacturer's endorsement. Provide secondary products as recommended and approved by the primary manufacturer for the specified roof systems.
- D. Fire-Test-Response Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
- E. Pre-installation Roofing Conference: Conduct conference at Project site.

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1. Meet with Owner, Consultant, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's representative and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review project access, crane staging, trash removal and current conditions of ground level surfaces and landscaping.
3. Review methods and procedures related to roofing installation, including manufacturer's most recent written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Loading and Unloading:

1. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
2. Remove and properly dispose of damaged, rejected and removed existing materials on a daily basis. Do not store trash on the roof area.

B. Storage and Protection:

1. Store roll goods on ends only; do not lay flat. Flattened rolls shall be rejected, and shall not be used in the construction of the roof system.
2. Store and handle roofing sheets in a dry, well-ventilated, weathertight place to ensure no possibility of significant moisture pickup.
3. Do not leave unused rigid insulation, felts, and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from wind, weather, or other moisture sources.
4. Control temperature of storage areas in accordance with the manufacturer's instructions.
5. Store materials on pallets, blocking, or other means to keep materials from coming into contact with moisture, dirt, debris, and other contaminants.
6. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - a. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
7. Protect roof level rigid insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with

rigid insulation manufacturer's written instructions for handling, storing, and protecting during installation.

8. Handle and store materials and equipment in a manner to avoid significant or permanent damage and deflection of the roof deck.

1.11 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Provide tarps or plastic sheeting readily available in case of emergency to protect opened roofs and flashings and to prevent the entrance of moisture or rain water into the existing structure until new materials have been applied and roof is in a watertight condition. The Contractor will be held liable for any damage to building interior due to Contractor's negligence.
- C. Roofing materials shall not be applied when water in any form (i.e., rain, dew, ice, frost, snow, etc.) is present on the deck.
- D. Adhesive applied roofing materials shall not be applied when dirt, dust, debris, oil, etc. is present on the deck or any subsequent substrate.

1.12 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof level rigid insulation, overlay boards, walkway products, and other components of roofing system.
 2. Warranty Period: 20 years from date of Substantial Completion.
 3. The warranty shall be written to allow for minor roofing repairs by the Owner and shall contain no disclaimer for ponded water conditions.
- B. Special Installer's Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section.
 1. Include all components of roofing system such as roofing membrane, base flashing, fasteners, overlay boards, walkway products, and other components of the roofing systems.
 2. Warranty Period: Two (2) years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. SBS-Modified Bituminous Membrane Roofing: 2-ply system with self-adhering base ply and torch-applied top ply sheet.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Siplast (Icopal).
 - 2. Soprema.
 - 3. Or approved.

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

2.3 ROOF MEMBRANE MATERIALS

- A. Base Ply Sheet: ASTM D 6163, Grade S, Type I or II, SBS-modified asphalt self-adhering sheet (reinforced with glass fibers) smooth surfaced; suitable for application method specified.
 - 1. Minimum thickness 87-mils, minimum weight 62 pounds per 100 square feet.
 - 2. Tested utilizing ASTM D 5147.

- B. Top Ply: ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt torch applied sheet (reinforced with glass fibers) granular surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White
 - 2. Tested utilizing ASTM D 5147.
 - 3. Minimum thickness 94-mils at selvage edge, minimum weight 75 pounds per 100 square feet.

- C. Flashing Sheet: Metal-foil surfaced, ASTM D 6298, glass-fiber-reinforced, SBS-modified asphalt sheet; suitable for application method specified, and as follows:
 - 1. Foil Surfacing: Aluminum.
 - 2. Minimum Thickness: 134-mils (0.134-inch), minimum weight 90 pounds per 100 square feet.

2.4 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

- B. Asphalt Primer: ASTM D 41.
- C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
- D. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- F. Metallic Powder: Aluminum.
- G. Roofing Granules: White synthetic chips, color to match color of top ply sheet.
- H. Cleaning solution: Non-phosphate cleaning solution.
- I. Pipe Flashings: 4 pound desilverized lead.
- J. Cant strips: Rigid perlite board of same composition as overlay board, 3-inch vertical (with 3-7/8-inch face) minimum, and as shown on the drawings.
- K. Tapered Edge Strip: Rigid polyisocyanurate board of same composition as overlay board, 12-inches wide, 4-foot long, tapering from 0-inch to 2-inch in thickness. Stack units to achieve required thickness where indicated on Drawings.
- L. Reinforced PMMA Flashing Membrane: Liquid applied, layered membrane, fully reinforced and seamless flashing system.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Siplast Parapro 123 Flashing System.
 - b. Or Approved.
- M. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.5 OVERLAY BOARD

- A. General: Provide preformed roof insulation overlay boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Overlay Board Products:
 - 1. ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch, factory primed.
 - a. Products: Subject to compliance requirements, provide the following;
 - 1) [Georgia-Pacific Corporation](#); Dens Deck Prime.

2. ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch thick.
 - a. Products: Subject to compliance with requirements, provide the following;
 - 1) [USG Corporation; Securock](#).

C. Overlay Board Adhesive:

1. One part moisture curing, urethane foam adhesive.
 - a. Adhesive material shall meet FM I-90 (Class 4450) with approved insulation boards.
 - b. Approved Manufacturers:
 - 1) Insta-Stik™, as manufactured by Dow.
 - 2) OlyBond 500, as manufactured by OMG.
 - 3) Or approved equal.

2.6 TAPERED ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
1. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2; Rigid closed-cell polyisocyanurate foam board, felt or glass-fiber mat facer on both major surfaces.
 2. Produced using HC blowing agents in lieu of HCFC's, in accordance with standards mandated by the Environmental Protection Agency.
 3. Thermal Resistance: Tested for Long Term Thermal Resistance (LTTR) in accordance with CAN/ULC-S770.
 4. Compressive Strength: Nominal 20 psi per ASTM D 1621.
 5. Flame Spread: 35 or less per ASTM E.
 6. Unit size shall be 4-foot by 8-foot, except where 4-foot by 4-foot is required by FMG approval.
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to provide a finish slope of 1/4 inch per 12 inches unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners (at metal decks): Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one-component or multicomponent urethane adhesive formulated to attach roof insulation

- D. Insulation Cant Strips: ASTM C 728, perlite insulation board.
- E. Wood Nailer Strips: Comply with requirements in Section 061000 "Rough Carpentry."
- F. Tapered Edge Strips: ASTM C 728, perlite insulation board.

2.8 WALKWAYS

- A. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 3/8-inch thick, minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that all curbs, wall surfaces, equipment supports, and other roof penetrations that will receive roofing materials will allow the installation of full-height flashings.
 - 4. Verify heights of all penetrations which are located within crickets and slope upgrades; extend penetrations where necessary.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Substrates shall be smooth, free of fins, raised edges, sharp edges, protruding or loose nails, and free of foreign material.
- B. Verify that the existing drainage system is free flowing prior to beginning work. Report any drainage blockage immediately upon identification.
- C. Inspect all substrates for irregularities and defects that prohibit the proper installation of new roofing materials. Notify the Owner of all defects for proper correction, prior to installation of new materials.
- D. Prepare all surfaces and details in accordance with manufacturer's printed instructions and these contract documents. Refer to Specification Section 070150.19

- E. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOF INSULATION ASSEMBLY INSTALLATION - GENERAL

- A. Coordinate installing membrane roofing system components so roof level insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and rigid insulation manufacturer's written instructions for installing roof level insulation, and these contract documents.
- C. Roof level insulation assembly units that become wet or damaged after installation must be removed and replaced.
- D. Provide treated wood stops at flanged penetrations and edges and as otherwise shown on the drawings. Provide additional stops as recommended by the manufacturer of the roofing materials.

3.4 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Install tapered insulation under area of roofing to conform to slopes indicated.
- C. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within ¼-inch of nailers, projections, and penetrations.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7-inches or more, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6-inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- G. Adhered Insulation (concrete decks): Install each layer of insulation and adhere to substrate as follows:
 - 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 2. Use temporary ballast to weight down individual boards of insulation until adhesive has cured.
- H. Mechanically Fastened and Adhered Insulation (metal decks): Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation according to requirements in FMG Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
3. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
4. Use temporary ballast to weight down individual boards of insulation until adhesive has cured.

3.1 OVERLAY BOARD INSTALLATION

- A. Where indicated on the Drawings, apply overlay board over rigid insulation units using insulation adhesive.
1. Adhere according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
 2. Adhere to resist uplift pressure at corners, perimeter, and field of roof.
 3. Offset the joints of the overlay board a minimum of 1-foot from the joints of the underlying rigid insulation units.
 4. Joints of overlay board shall be butted tight; leave no more than 1/8-inch gap between abutting boards, maximum. Joints exceeding 1/8-inch shall be in filled with overlay board insulation.
 5. Cut and fit overlay board within 1/4-inch of nailers, projections, and penetrations.
 6. Use temporary ballast to weight down individual overlay boards until adhesive has cured.
- B. Install cricket materials behind curbed penetrations exceeding 2 feet in width to aid in roof drainage.
1. Install crickets formed out of tapered edge strips.
 2. Cricket materials shall be adhered to underlying rigid insulation assemblies.
 3. Joints shall be butted tight; leave no more than 1/8-inch gap between abutting boards, maximum. Joints exceeding 1/8-inch shall be in filled with overlay board insulation.
 4. Cricket materials shall be installed to result in no less than 1/4-inch per foot finish slope.
- C. Form drain sumps as shown on the Drawings; cut overlay board to form rectangular sump, and install tapered edge strips at perimeter of sump, stacked to achieve insulation thickness.
- D. Cant Strips: Bridge junctures of vertical and horizontal surfaces with preformed 45-degree insulation cant strips.
1. Install cant strips in adhesive.

3.2 ROOFING MEMBRANE INSTALLATION - GENERAL

- A. Install modified bituminous membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
1. Install roofing system according to specification-plate classifications in NRCA's "The NRCA Roofing and Waterproofing Manual" and requirements in this Section.
 2. Start installation at low point of roofing systems.

- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- D. Coordinate installing roofing system so insulation assembly and other components of the roofing membrane system are not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation assembly with a course of coated felt set in plastic cement with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- E. Install primed lead flashing at all pipe penetrations. Set flange in plastic cement on top of base ply sheet. Provide reinforcing sheet over flange, set in adhesive, prior to installation of top ply sheet.
- F. Install primed flange type vents in plastic cement on top of base ply sheet. Secure flange prior to application of reinforcing ply sheet.
- G. Roof Drains:
 - 1. Set 30-by-30-inch primed lead flashing in plastic cement over base ply sheet at each drain/overflow drain location.
 - 2. Install reinforcing sheets over lead flashing, and extend onto base ply sheet as shown on the drawings.
 - 3. Install flashing sheets within drain sumps as shown on Drawings.
 - 4. Clamp roofing membrane, metal flashing, reinforcing sheets, and flashing sheet into roof-drain clamping ring unless otherwise noted elsewhere.

3.3 BASE PLY SHEET INSTALLATION

- A. Install the top ply according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 - 1. Unroll, loosely lay and align the length of the self-adhered base ply sheet at the lowest point of the roof with the release poly covered selvage edge at the up-slope.
 - 2. Install lapped base ply-sheet course, extending sheet over and terminating beyond cants.
 - 3. After the membrane is placed in its final position, re-roll so that one-half of the sheet is rolled up. Using a straight blade utility knife, carefully score the release poly across the width of the roll.
 - 4. Roll the self-adhered base membrane in to its final position as the release poly is being removed. Re-roll the remaining section of the self-adhered base membrane and repeat the process.
 - 5. Immediately apply a firm and deliberate pressure by slowly rolling a minimum thirty (30) pounds roller over the entire surface of the installed membrane to ensure a complete bond to the substrate.
 - 6. Side laps are sealed by removing the release film and applying firm and deliberate

pressure to the lap with a hand roller, ensuring a complete bond to the substrate, without air pockets, wrinkles, fishmouths or tears. Pay close attention to T-joints.

7. End laps are sealed using hot air.
8. Shingle side laps of base-ply sheets uniformly to ensure that required number of base-ply sheets covers substrate at any point, aligning successive sheets with 3-inch wide side laps and 6-inch wide end laps. Shingle in direction to shed water.
9. Once installed, check all seam laps using the edge of a trowel and correct any defects.

3.4 TOP PLY SHEET INSTALLATION

- A. Install the top ply according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
 2. Cut the top ply into manageable lengths between 12-feet and 16-feet long. Lay cut sections flat and allow to relax and flatten per manufacturer's recommendations.
 3. Torch apply to the base ply sheet.
 4. Top ply shall be fully bonded to the base ply sheet and each other.
- B. Laps: Accurately align top ply, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 1. Install top ply so side and end laps shed water. Laps shall not buck water and shall be totally sealed.
 2. Laps shall be a minimum of 3-inch side and 6-inch end lap.
 3. Lap seams of the layers shall not be stacked: stacked laps shall be sufficient cause for rejection of the installation.
 4. Repair tears and voids in laps and lapped seams not completely sealed.
 5. Apply roofing granules to cover exuded bead at laps while bead is hot.
- C. Step in all T-joints. T-joints shall be fully sealed and without voids.

3.5 FLASHING AND STRIPPING INSTALLATION

- A. Install reinforcing sheets at horizontal to vertical transitions, including curbed penetrations and flange type penetrations, and adhered over cant strips.
- B. Install flashing sheets over reinforcing sheets and top ply at horizontal to vertical transitions. Extend flashing sheets to the top edge of all vertical surfaces, and a minimum of 8-inches above the roof membrane and 6-inches onto the roof membrane.
- C. Secure top edge of flashing sheets at vertical surfaces at 8-inches on center using fasteners appropriate to the substrate.
- D. Provide corner patches or folded corners at base flashing corners. Blind cut corners are not acceptable. Folded corner tabs shall be cut so that tabs do not exceed 4-inches.
- E. Flashing Sheet Application: Torch apply flashing sheet to substrate.

- A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports.
- B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
 - 1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.
 - 2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
 - 3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Notify Owner 48 hours in advance of date and time of inspection.
- D. Roofing system will be considered defective if it does not pass tests and inspections.
 - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.8 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove trash, nails, debris, and equipment from site and leave the site clean.

END OF SECTION 075216

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manufactured Products:
 - a. Manufactured reglets and counterflashing.
 - 2. Formed Products:
 - a. Formed low-slope roof flashing and trim including copings, wall panels, counter flashings, and cap flashings.
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry." for wood nailers, curbs, and blocking.
 - 2. Section 075216 "SBS Modified Bituminous Membrane Roofing."

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft.: 120-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 90-lbf/sq. ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120° F, ambient; 180° F, material surfaces.
 - 2. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 6. Details of special conditions.
 - 7. Details of connections to adjoining work.
 - 8. Detail formed flashing and trim at a scale of not less than 3-inches per 12-inches.
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Flashing: 12-inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12-inches long and in required profile. Include fasteners and other exposed accessories.
 - 3. Accessories and Miscellaneous Materials: Full-size Sample.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Pre-installation Conference: Conduct conference at Project site.

1. Meet with Owner, Consultant, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 1. Finish: 2B (bright, cold rolled).
 2. Surface: Smooth, flat.
- C. Zinc-Tin Alloy-Coated Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead-soft, fully annealed stainless-steel sheet of minimum uncoated thickness indicated; coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin), with factory-applied gray preweathering.
- D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Color: As selected by Owner from manufacturer's full range.
 - c. 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.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils 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.
 1. Thermal Stability: ASTM D 1970; stable after testing at 240° F.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20° F.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Henry Company; Blueskin PE200 HT.
- C. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners:
 - 1) Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - 2) Galvanized steel with EPDM washers.
 - b. Blind Fasteners: High-strength or stainless-steel rivets suitable for metal being fastened.
 - c. Concrete screw anchors with EPDM washers at masonry/concrete substrates.

Manufacturers:

- 1) Buildex Tapcon Concrete Anchor.
- 2) Or Approved Equal.
2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
5. Form all flashings with hemmed edges (min. ½"), with hem formed outward at 30° to 45° angle to form drip.
6. Hemmed drips shall be fabricated and formed so that adjacent sections of flashings interlock; lapped hems will not be considered acceptable.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of ¼-inch in 20-foot and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than 22 gauge galvanized steel sheet.
 - 1. Exposed cleats shall be fabricated from the same material as flashing.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Coping: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate with profiles as shown on the Drawings.
 - 1. Joint Style: Standing seam, sealed; ends of seams folded and sealed.
 - 2. Sheet Metal: Pre-painted, metallic-coated sheet; 24 gauge
- B. Wall Panels: Fabricate with profiles as shown on the Drawings.
 - 1. Joint Style: S-locks at 30-inches on center.
 - 2. Sheet Metal: Pre-painted, metallic-coated sheet, 24 gauge.
 - 3. Cross-break panels, in multiple horizontal lines, for rigidity.
- C. Counter Flashings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate with profiles as shown on the Drawings.
 - 1. Joint Style: Lapped a minimum of 4" with sealant within the seam.
 - 2. Sheet Metal: Pre-painted, metallic-coated sheet, 24 gauge.
 - 3. 0.029 Stainless steel with riveted and soldered seams.
- D. Penetration/Curb Flashing: Fabricate with profiles as shown on the Drawings.
 - 1. Joint Style: Seamed and Soldered.
 - 2. Sheet Metal: 0.029 Stainless steel.
- E. Scupper Liners: Fabricate with profiles as shown on the Drawings.
 - 1. Joint Style: Seamed and soldered.
 - 2. Sheet Metal: 0.029 Stainless steel.
- F. Post Flashing / Storm Collars: Fabricate with vertical section as shown on drawings, for clamped and sealed securement to substrate. Set in sealant..
 - 1. Coping Profile: As shown on Drawings.
 - 2. Joint Style: Lapped and riveted.
 - 3. Sheet Metal: 0.029 Stainless steel.
 - 4. Contractors option:
 - a. Cinnabar Equipment Co.; Z-vent stainless steel storm collar; size to fit roof top equipment.
 - b. Or Approved Equal.

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.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2-inches.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6-inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2-inches. Roll laps with roller. Cover underlayment within 14 days.
 - 1. Install self-adhering sheet underlayment where indicated on the drawings and at all horizontal to vertical transitions. Install corner patches where relief cuts are required to form to substrate.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Utilize continuous cleats and anchors per FMG requirements; no less than 6" on center.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - 5. Install sealant tape where indicated.

6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate not less than 1-1/4-inches for nails and not less than 3/4-inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- F. Complete standing seam joints as required for watertight construction.
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2-inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder pre-coated galvanized sheet.
 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints where indicated and where necessary for strength.
- 3.4 ROOF FLASHING INSTALLATION
- A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible,

set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate.
 - 2. Anchor interior leg of coping with screw fasteners and washers at 16-inch centers, unless otherwise indicated.
- C. Pipe or Post Counterflashing: Install stainless steel counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4-inches over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4-inches over base flashing. Lap counterflashing joints a minimum of 2-inches and bed with sealant. Secure in a waterproof manner by means of blind rivets and sealant.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of ¼-inch in 20-feet and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

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

END OF SECTION 076200

SECTION 110114 – SUSPENDED ACCESS SUPPORT EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rooftop Anchors
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications".
 - 2. Section 075216 "Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing

1.3 REFERENCES

- A. 29 CFR 1910.23-Occupational Health and Safety Standards for General Industry.
- B. 29 CFR 1910.28 - Walking/Working Surfaces, Subpart D.
- C. 29 CFR 1926.500 - Safety and Health Regulations for Construction, Subpart M-Fall Protection.
- D. AISC S342L-1993
- E. AISI SG-971-1996
- F. ANSI/IWCA I 14.1 - Window Cleaning Standard; Rooftop Safety Anchors.
- G. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.
- H. ASME A120.1-2001
- I. ASTM A 36 - Standard Specification for Carbon Structural Steel.
- J. ATM A 182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
- K. ASTM A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.

- L. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- M. ASTM F 593C - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- N. AWS D1.1/D1 - American Welding Society, Structural Welding Code.
- O. OSHA (29 CFR 1920.66 App C to 1910 Subpart F (Personal Fall Arrest Systems)).

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Provide all Fall Protection System in compliance with OSHA, ANSI, and all applicable state and federal regulatory requirements.
- B. Travel/Fall Restraint systems shall be designed to a safety factor of 2 and shall ensure proper fall clearance is accounted for.
- C. Fall Arrest System shall provide independent fall arrest in addition to suspension line anchorages for descent location.
- D. Design of fall arrest safety systems, and equipment shall meet or exceed the following:
 - 1. Fall Arrest Rooftop Anchors: designed to a maximum fall arresting force of typically 1800 lbs (8.0 k) when wearing a body harness with a safety factor of 2 without any permanent deformation; and to 5000 lbs (22.24 k) against fracture or detachment.
 - 2. Ensure design of primary support equipment is capable of sustaining without failure at least four times the maximum static working load applied or transmitted to the components.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Plans and details of entire fall protection layout, showing member sizes and part identification, fasteners, anchors, fittings, reaction loads and evidence of compliance with structural performance requirements.
 - 1. Include system layout, design analysis, and calculations prepared and sealed by a Registered Professional Engineer licensed in the State of Oregon.
 - 2. Provide manufacturer's certifications that the ultimate strength of the fall protection system is equal to or greater than those specified.
 - 3. Include data regarding installation and rigging as well as all necessary Restrictive and Non-Restrictive General Safety and Usage Notes.
- C. Operation and Maintenance Data:
 - 1. Include technical information for servicing equipment.

2. Include detailed operating procedures indicating proper use of equipment for safe operation of the system.

- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for pre-use inspections, annual inspection, re-certifications.

1.6 QUALITY ASSURANCE

- A. Fall Protection System Provider Qualifications: Work of this Section to be executed by a firm whose primary business is the design, engineering, manufacturing, installation and testing of fall protection systems. This firm must carry specific product liability insurance for the equipment being installed on this project as well as a general liability policy that covers the workmanship associated with the installation of equipment on this project. The entire policy must have liability limits of at least \$10,000,000.00. Companies, such as miscellaneous metal fabricators, who do not typically engage in the design, manufacturing, installation and testing of fall protection systems, are not permitted to bid.
- B. Professional Engineer: A professional engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services of the kind required.
- C. Welding to be executed by certified welders in accordance with AWS requirements.
- D. Installer Qualifications: Specializing in the Work of this section and trained and certified by the fall protection system manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

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

- A. Furnish service and maintenance for fall protection system and components for a period of one year from Date of Substantial Completion with an option for extending maintenance service on an annual basis thereafter.

1.11 WARRANTY

- A. Rooftop Anchor: Provide with manufacturer's 25 year limited warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Rooftop Anchors Inc., 844 South 430 West, Suite 200, Heber City, UT 84032. Tel. Toll Free: (800) 411-3914, Tel: (801) 839-2900. Fax: (800) 839-2929. Web Site: www.RooftopAnchor.com. E-mail: sales@RooftopAnchor.com
- B. Substitutions: Equal as prior approved by Architect.

2.2 MATERIAL

- A. Exposed Structural Components Finish: Hot Dip Galvanized Steel
 - 1. Steel: ASTM A 500, Grade B
 - 2. Steel: ASTM A 36
 - 3. Stainless Steel: 304 ASTM A 182
- B. Exposed Structural Components Finish: Stainless Steel
 - 1. Stainless Steel: 304 ASTM A 182
- C. Exposed Structural Components:
 - 1. Aluminum; 6061-T6 Alloy
- D. Alternative Exposed Structural Components Finish: Polyurathane
 - 1. Polyurathane: LINE-X Protective Coatings
- E. Non-Structural Components:
 - 1. Sheet and Plate: ASTM A 36
 - 2. Extruded Bars, Rods, Shapes, and Tubes

F. Nuts, Bolts, Davit Pins, and Washers:

1. Stainless Steel: 304 ASTM A 193 Grade B8 or ASTM F 593C
2. Galvanized Steel: ASTM A 500, Grade B
3. Galvanize Steel: ASTM A 36

G. Anchor Bolts for securing base plates:

1. Metal: Stainless Steel, 304 Stainless Steel; ASTM A 193 Grade 8, B8 2. Size: 5/8 inch diameter minimum.
2. Galvanized Steel: ASTM A 500, Grade B
3. Galvanize Steel: ASTM A 36

2.3 ROOFTOP ANCHOR

A. Retro-fit Construction

1. Rooftop Anchor- 8 Bolt Epoxy Adhesive: Capable of withstanding 5000 lbs. in any direction without fracture or detachment. Capable of withstanding 2500 lbs. in any direction without permanent deflection. Rooftop Anchor- 8 Bolt Epoxy Adhesive consists of six major components:
 - a. Cap is 1/4 inch ASTM A 36, structural quality carbon steel plate.
 - b. Base plate is 10" x 10" x 5/8" ASTM A 36, structural quality carbon steel.
 - c. Upright hollow structural section is 3-1/2 to 4-1/2 inches Schedule 40 carbon steel, ASTM A 500, Grade B.
 - d. Loop is 3/4 inch 304 stainless round bar, ASTM A 182.
 - e. Stainless steel type 304 1/2" threaded rod, washer and nut.
 - f. Hilti HIT-GY 150 Max-SD Injectable Adhesive.
 - g. Carbon steel components hot dip galvanized after fabrication or coated with LINE-X Protective Coatings, XS-100 or XS-350.
 - h. Flashing compatible with roof membrane.
- B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and where indicated, flat washers; Alloy Group 1.

2.4 FABRICATION

- A. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.
- B. Grind off surplus welding material to ensure exposed surfaces are smooth so as not to abrade workers' ropes.
- C. Coordinate this section's system with supporting structure.
- D. Welding shall be in accordance with the AWS Structural Welding Code D1.1/D1. AWS-D1.2/D1.2M:2003

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examine project prior to installation and report in writing any defects or other site conditions that would cause problematic installation of anchor products or possible deficiency.
- C. Confirm site dimensions.
- D. If substrate preparation is the responsibility of another installer, notify client of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with Roof Fall Protection manufacturer's instructions and approved shop drawings.
- B. Roof Fall Protection manufacturer shall supervise, inspect, and test installation of fall protection system.
- C. Assure that all anchors are level, tightly fitted and flush with adjoining surfaces as required.
- D. To prevent accidental removal, deform minimum of two threads of tail end of anchor studs after nuts have been tightened.
- E. Isolate dissimilar materials as required to prevent electrolytic corrosion.
- F. Coordinate with roofing specified in Section 07500 for the installation of flashings to assure a watertight finish.
- G. Adhesive Anchoring System:
 - 1. Install using manufacture accredited installers using manufacture installation instructions.
 - 2. Load test each installed anchor stud to 50 percent of its rated capacity. Test results shall be certified by a certified installer with experience in suspended access equipment.
- H. Adjust and leave properly functioning equipment.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Testing and certification shall be provided under supervision of the fall protection manufacturer or original installer.
- B. Annual inspection of anchors and suspension equipment, plus 5 and 10 year recertification provided by the manufacturer or their authorized representatives.
- C. Repair or replace parts whenever required. Use parts produced by manufacturer of original equipment.
- D. Provide emergency call back service at all hours for this maintenance period.
- E. Perform maintenance work using competent and qualified personnel under supervision of the fall protection manufacturer or original installer.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 110114