PART 3 - EXECUTION

INSTALLATION, GENERAL 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.

END OF SECTION 061053

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Adhered TPO membrane roofing system.

Product Data: For each type of product indicated. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and

attachments to other work.

- Samples for Verification: For the following products: Sheet roofing, of color specified.
- Research/evaluation reports.
- Field quality-control reports.

SUBMITTALS

Maintenance data.

QUALITY ASSURANCE

membrane roofing system manufacturer to install manufacturer's product. Source Limitations: Obtain components including roof insulation, fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

Installer Qualifications: A qualified firm that is approved, authorized, or licensed by

PERFORMANCE REQUIREMENTS

Exterior Fire-Test Exposure: ASTM E 108, Class C; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

- Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
- Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- Energy Performance: Three-year, aged, solar reflectance not less than 0.55 and emissivity not less than 0.75 or aged, Solar Reflectance Index of not less than 64. G. Exterior Fire-Text Exposure: ASTM E 108, minimum Class C

1.5 WARRANTY

Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

TPO MEMBRANE ROOFING A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or

Warranty Period: 15 years from date of Substantial Completion.

- scrim reinforced, uniform, flexible fabric backed TPO sheet. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Sure-Weld Fully Adhered TPO (Basis of Design). Thickness: 45 mils, nominal,
- Exposed Face Color: White

AUXILIARY MEMBRANE ROOFING MATERIALS

- General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing
- Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
- Bonding Adhesive: Manufacturer's standard. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or
- aluminum bars, approximately 1 by 1/8 inch thick; with anchors. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening
- membrane to substrate, and acceptable to membrane roofing system manufacturer. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sneet 2.4 flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap A. sealants, termination reglets, and other accessories.

WALKWAYS

Walkway Roof Pavers: Heavyweight, hydraulically pressed, concrete units, square edged with top edges beveled 3/16 inch, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows: 1. Size: 24 by 24 inches. Manufacture pavers to dimensional tolerances of plus or

minus 1/16 inch in length, height, and thickness.

PART 3 - EXECUTION ADHERED MEMBRANE ROOFING INSTALLATION

Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

- Accurately align membrane roofing and maintain uniform side and end laps of minimum
- dimensions required by manufacturer. Stagger end laps. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- D. In addition to adhering, mechanically fasten membrane roofing securely at terminations,
- penetrations, and perimeter of roofing. Spread sealant bed over deck drain flange at roof drains, and securely seal membrane
- roofing in place with clamping ring. Apply membrane roofing with side laps shingled with slope of roof deck where possible. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
- Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
- Verify field strength of seams a minimum of twice daily and repair seam sample
- Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

BASE FLASHING INSTALLATION

- Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation. Terminate and seal top of sheet flashings and mechanically anchor to substrate through

WALKWAY INSTALLATION

Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

FIELD QUALITY CONTROL

Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion. Repair or remove and replace components of membrane roofing system where

inspections indicate that they do not comply with specified requirements.

END OF SECTION 075423

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

- SUMMARY

 - This Section includes the following: Roof-edge drainage systems Reglets and counterflashings.

- SUBMITTALS Product Data: For each type of product.
- Shop Drawings: Include plans, elevations, expansion-joint locations, keyed details, and
- attachments to other work. Distinguish between plant- and field-assembled work. Samples: For each type of roof specialty and for each color and texture specified.
- Sample warranty.

Product Test Reports: For tests performed by a qualified testing agency.

Maintenance Data: For roofing specialties to include in maintenance manuals. 1.3

- QUALITY ASSURANCE Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.
- 1.4 WARRANTY Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within
 - specified warranty period. 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - Color fading more than 5 Hunter units when tested per ASTM D 2244. Chalking more than a No. 8 rating when tested per ASTM D 4214.

Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion. PART 2 - PRODUCTS

- PERFORMANCE REQUIREMENTS
- FM Approvals' Listing: Manufacture and install copings and roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested per SPRI ES-1 and capable of resisting the following design pressures: Design Pressure: As indicated on Drawings
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections and other detrimental effects. Provide clips that resist rotation and avoid shear stress because of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material

- ROOF-EDGE DRAINAGE SYSTEMS
- Downspouts: Plain rectangular to match existing profile, complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
- Formed Aluminum: 0.040 inch thick. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of
- Formed Aluminum: 0.032 inch thick. Conductor Heads: Manufactured conductor heads, each with flanged back and 2.4 stiffened top edge, and of dimensions and shape indicated, complete with outlet tube

that nests into upper end of downspout, exterior flange trim, and built-in overflow.

- Formed Aluminum: 0.032 inch thick. D. Aluminum Finish: Three-coat fluoropolymer.
- Color: As selected by Architect from manufacturer's full range.
- REGLETS AND COUNTERFLASHINGS
- Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
- Formed Aluminum: 0.050 inch thick.
- Corners: Factory mitered and continuously welded. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with 2.7 channel for sealant at top edge.
- Multiuse Type, Embedded: For multiuse embedment in masonry mortar joints. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal: 1. Formed Aluminum: 0.032 inch thick.
- Counterflashing Wind-Restraint Clips: Provide clips to be installed before
- counterflashing to prevent wind uplift of counterflashing lower edge. Aluminum Finish: Three-coat fluoropolymer.

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

- MISCELLANEOUS MATERIALS Fasteners: Manufacturer's recommended fasteners, suitable for application and 3.1 designed to meet performance requirements. Furnish the following unless otherwise
- 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant: polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

Coil-Coated Aluminum Sheet Finishes:

- High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear

PART 3 - EXECUTION

- INSTALLATION, GENERAL General: Install roof specialties per manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oilcanning and without warping, jogs in alignment, buckling, or tool marks. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture. Torch cutting of roof specialties is not permitted.
- Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by

Do not use graphite pencils to mark metal surfaces.

- manufacturer. 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal or cementitious construction.
- Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
- 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings. When ambient temperature at time of installation is between 40 and 70 degrees F, set joint members for 50 percent movement each way. Adjust setting
- proportionately for installation at higher ambient temperatures. D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer. Seal joints as required for weathertight construction. Place sealant to be completely
- concealed in joint. Do not install sealants at temperatures below 40 degrees F. COPING INSTALLATION
- Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

Interlock face and back leg drip edges of snap-on coping cap into cleated anchor

- plates anchored to substrate at manufacturer's required spacing that meets performance requirements.
- ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION General: Install components to produce a complete roof-edge drainage system per manufacturer's written instructions. Coordinate installation of roof perimeter flashing
- with installation of roof-edge drainage system Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. 1. Connect downspouts to underground drainage system indicated.

- C. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over
- cants or tapered edge strips and under roofing membrane. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.
- REGLET AND COUNTERFLASHING INSTALLATION
- Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.
- CLEANING AND PROTECTION
 - Clean exposed metal surfaces of substances that interfere with uniform oxidation and
 - weathering. Clean and neutralize flux materials. Clean off excess solder and sealants.
- Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION 077100

SECTION 079200 - JOINT SEALANTS

- PART 1 GENERAL
- 1.1 SUMMARY
- A. Section Includes:
 - Silicone joint sealants
 - Urethane joint sealants
 - Latex joint sealants. Polysulfide joint sealants
- PART 2 PRODUCTS
- JOINT SEALANT COMPATIBLILITY Provide joint sealants, joint fillers, and other related materials that are compatible with

Acoustical joint sealants.

- one another and with joint substrates under service and application conditions. SILICONE JOINT SEALANTS
- Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
- URETHANE JOINT SEALANTS
- For Extterior Traffic-Bearing Joints, Where Slope Allows Use of Pourable Sealant: Single-Component, Pourable Ureethane Sealant: ASTM C 920, Type S, Grade P; Class 25, for Use T.
- Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS,

Class 25, for Use T. LATEX JOINT SEALANTS

- For Perimeter of Door and Window Frames: Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
- POLYSULFIDE JOINT SEALANTS Single-Component, Nonsag, Polysulfide Joint Sealant: ASTM C 920, Type S,
- Grade NS, Class 25, for Use NT.
- ACOUSTICAL JOINT SEALANTS Nonsag, paintable, non-staining latex sealant complying with ASTM C 834 that effectively reduced airborne sound transmission as demonstrated by testing according
- to ASTM E 90.
- MISCELANEOUS MATERIALS Joint Sealant Backing: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are
- approved for applications indicated. Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant
- depth and otherwise contribute to producing optimum sealant performance. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials
- or joint surfaces at back of joint. Provide self-adhesive tape where applicable. D. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction

ioint-sealant-substrate tests and field tests. PART 3 - EXECUTION

- INSTALLATION OF JOINT SEALANTS
- General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use
- of joint sealants as applicable to materials, applications, and conditions indicated. Install sealant backings to support sealants during application and to produce crosssectional shapes and depths of installed sealants that allow optimum sealant movement
- Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal perimeters, control joints, openings, and penetrations with a continuous bead of
- ASTM C919. CLEANING Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint

acoustical sealant. Install acoustical sealant at both faces of partitions. Comply with

sealants and of products in which joints occur. END OF SECTION 079200

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