

SECTION 061000  
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preserved-treated lumber.
3. Dimension lumber framing, blocking, and nailers.
4. Plywood sheathing.

B. Related Requirements:

1. Section 070150.19 "Preparation for Re-Roofing" for methods of existing roof tear-off procedures and requirements.
2. Section 075216 "SBS Modified Bituminous Membrane Roofing" for installation of 2-ply built-up roof systems.
3. Section 076200 "Sheet Metal Flashing and Trim" for installation of sheet metal flashing and trim systems.
4. Section 077200 "Roof Accessories".

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. Lumber grading agencies, and abbreviations used to reference them, include the following:
  1. NLGA: National Lumber Grades Authority.
  2. WCLIB: West Coast Lumber Inspection Bureau.
  3. WWPA: Western Wood Products Association.

1.3 ACTION 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-preserved 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. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

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

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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 sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
  3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
  1. 19 percent unless otherwise indicated.

#### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1, Use Category UC2.
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 DIMENSION LUMBER FRAMING

A. Provide dimension 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. Dimension Lumber Items: Construction or No. 2 or better grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Spruce-pine-fir; NLGA.
3. Hem-fir; WCLIB or WWP.
4. Northern species; NLGA.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWP.
2. Northern species; No. 2 Common grade; NLGA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work

2.4 PLYWOOD SHEATHING

A. Plywood Wall / Curb Sheathing: CDX plywood sheathing, exterior 5-ply laminated wood panels, 1/2-inch-thick x 4-foot x 8-foot panels unless otherwise noted on the Drawings.

2.5 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate for solid wood and completely through plywood sheathing.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329.

- B. Nails, Brads, and Staples: ASTM F1667.
- C. Wood Screws: ASME B18.6.1.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 (for mechanical anchors in masonry), ICC-ES AC58 (for adhesive anchors in masonry), ICC-ES AC193 (for mechanical anchors in concrete, or ICC-ES AC308 (for adhesive anchors in concrete) as appropriate for the substrate.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Provide framing, blocking, and nailers as indicated.
- E. Sort and select lumber so that natural characteristics do 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.
- F. Comply with AWPAC 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.
- G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 3. ICC-ES evaluation report for fastener.
- I. 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 PROTECTION

- A. Verify that all substrates are in sound condition and ready to receive Work.

- B. Verify that related Work of other trades has been properly completed prior to starting Work. Beginning of installation means acceptance of existing conditions.

### 3.3 INSPECTION

- A. Existing Structural Wood Decking: Verify that surfaces are in sound condition and ready to receive Work. Notify Owner if any portion of decking is found to be deteriorated or damaged.

### 3.4 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. Unless otherwise indicated, align tops of blocking/nailers at roof penetrations with top of adjacent roof system cover board; rip as necessary and follow slope of finished plane of adjacent roof for full perimeter of roof penetration.
- C. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- D. Provide solid wood blocking between framing members where required to support edges of curbs or other load-bearing items.

### 3.5 CLEANING

- A. Clean up Work and leave site in clean, finished condition.

END OF SECTION 061000

SECTION 070150.19

PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes:

1. Full roof tear-off.
2. Base flashing removal.
3. Disposal.

B. Related Requirements:

1. Section 011000 "Summary" for use of premises, temporary construction, and environmental protection measures for reroofing preparation.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 FIELD CONDITIONS

A. Existing Roofing System: As indicated on the Drawings.

B. Owner will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so Owner's operations are not disrupted.
2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.

- a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to prevent excessive deflection and/or damage to the structure.

- F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
  - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- G. Hazardous Materials:
  - 1. It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
    - a. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Consultant and Owner.
    - b. Hazardous materials will be removed by Owner under separate contract.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Protect existing roofing system that is not to be reroofed.
  - 2. Limit traffic and material storage to areas of existing roofing that have been protected.
  - 3. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
  - 4. Comply with requirements of existing roof system manufacturer's warranty requirements.
- B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- C. Shut off rooftop utilities and service piping before beginning the Work.
- D. Test existing roof drains to verify that they are not blocked or restricted.
  - 1. Immediately notify Consultant of any blockages or restrictions.
- E. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
  - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
  - 1. Prevent debris from entering or blocking roof drains and conductors.
    - a. Use roof-drain plugs specifically designed for this purpose.

- b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
- 2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
  - a. Do not permit water to enter into or under existing roofing system components that are to remain.

### 3.2 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Full Roof Tear-off: Where indicated on Drawings, remove existing roof system in its entirety down to the existing roof deck.
  - 1. Remove existing penetration flashings, accessory roof system components, and other impediments to installation of replacement system, including but not limited to fasteners and other attachment devices / remnants.

### 3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. 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 Consultant.
  - 1. Do not proceed with installation until directed by Consultant.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Consultant.
  - 1. Do not proceed with installation until directed by Consultant.

### 3.4 BASE FLASHING REMOVAL

- A. Remove existing base flashings.
  - 1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Remove existing wood cants where present at all roof area perimeters.
- C. Remove existing wood blocking / sleepers where applicable at existing mechanical equipment.
- D. Where damaged, replace wood blocking, curbs, nailers, and sheathing to comply with Section 061000 "Rough Carpentry."

### 3.5 DISPOSAL

- A. Collect demolished materials and place in containers.
  - 1. Promptly dispose of demolished materials.
  - 2. Do not allow demolished materials to accumulate on-site.



3. 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

### SBS MODIFIED BITUMINOUS MEMBRANE ROOFING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. 2-ply SBS modified bituminous membrane roof system complete with all preparation and accessories.
2. Roof insulation.
3. Tapered roof insulation.
4. Cover board.
5. Walkways.

###### B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood framing, nailers, curbs, blocking, and plywood sheathing.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counter flashings.
3. Section 077200 "Roof Accessories" for roof hatch safety railing system and ladder assist post (Alternate Bid No. 2) and other miscellaneous manufactured products indicated for rooftop installation.

##### 1.2 DEFINITIONS

- ###### A. Roofing Terminology:
- Definitions in ASTM D1079 and glossary of NRCA's "Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

##### 1.3 ACTION SUBMITTALS

- ###### A. Roof System Assembly Letter:
- On roof system manufacturer's letter head, identifying the following:

1. Roof system including fire class, wind uplift rating, and warranty eligibility.
  - a. Cite project performance requirements for fire class and wind uplift resistance, as defined by the Contract Documents.
2. Membrane materials and application methods, including flashing systems.
3. Cover board materials including method and rate of securement.
4. Insulation materials including method and rate of securement.
5. Vapor retarder materials and application methods.
6. Substrate board materials including method and rate of securement.

7. Substrate preparation requirements including primers and surface conditioners.
- B. Product Data: For each product used, including but not limited to the following:
  1. Roof membrane materials including flashing systems.
  2. Roof membrane primers, adhesives, sealants, and mechanical fasteners.
  3. Roof insulation materials and securement products, including tapered insulation.
  4. Cover board materials and securement products, including cants and tapered edge strips.
  5. Roof membrane accessories.
- C. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:
  1. Layout and thickness of insulation.
  2. Base flashings and roofing terminations.
  3. Flashing details at penetrations.
  4. Tapered insulation, including slopes.
  5. Roof plan showing orientation of existing steel roof deck and fastener / adhesive pattern extents for board securement required to resist defined wind uplift pressures.
  6. Crickets, saddles, and tapered edge strips, including slopes.
  7. Tie-in with adjoining construction.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates:
  1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
    - a. Submit evidence of compliance with performance requirements.
    - b. This certificate may be combined with the Roof System Assembly Letter.
  2. Submit certification that installer is an approved applicator with the membrane manufacturer.
  3. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- C. Product Test Reports: For roof insulation, tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Field Test Reports:

1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

E. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications:

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 special warranty.
2. In continuous business under same name and license for past two (2) years.
3. Completed at least three (3) successful installations of specified materials and systems on projects of similar scope, in the same geographic region as the Project, within the last five (5) years.
4. Contractor shall provide all personnel trained in application of the materials and systems specified and shall maintain supervision as specified.
5. Installer Field Supervision: Maintain a full-time supervisor / foreman, who is experienced in installation of the specified systems, on the job site during all times that roof system installation is in progress.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. 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.

- B. Store materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer.

1. Protect stored material from direct sunlight.
2. Discard and legally dispose of material that cannot be applied within its stated shelf life.

- C. Protect board materials, including but not limited to insulation and cover board, from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.

1. Store in a dry location raised on open supports (sacrificial dunnage) set on even ground or elevated surface. Maintain unobstructed airspace all around each stack, 3 inches minimum. Cover stacks with a breathable tarpaulin secured to resist displacement from wind before leaving the work area at the end of each workday and when inclement weather is expected.

2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

#### 1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be installed in accordance with manufacturer's written instructions and warranty requirements.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period with no dollar limit (NDL).

1. Special warranty includes roofing membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, walkway products, and other components of roofing system.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

- B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering the Work of this Section, including all components of roofing system, such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, vapor retarders, substrate boards, and walkway products, for the following warranty period:

1. Warranty Period: Two (2) years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 SOURCE LIMITATIONS

- A. Obtain components for roofing system from roofing membrane manufacturer or manufacturer approved by roofing membrane manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing system and flashings to remain watertight.

1. Accelerated Weathering: Roofing membrane to withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.

2. Impact Resistance: Roofing membrane to resist impact damage when tested in accordance with ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" section in FM Approvals 4470.

- B. Material Compatibility: Roofing system materials to be compatible with one another and adjacent materials under conditions of service and installation required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

- C. Wind-Uplift Resistance: Provide roofing system to resist the design uplift pressures indicated on the Drawings when tested in accordance with FM Approvals 4474, UL 580, or UL 1897.

- D. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.

- 1. Identify products with appropriate markings of applicable testing agency.

## 2.3 SBS MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM

- A. Acceptable Manufacturers: Subject to the Project requirements, provide roofing systems from one of the following:

- 1. Siplast (Basis of Design).
  - 2. Soprema.
  - 3. Or pre-bid approved.

- B. Base Ply Sheet:

- 1. Provide products that comply with one of the following standard material specifications, suitable for torch application:
    - a. ASTM D6163/D6163M, Type I, Grade S, reinforced with glass fibers, smooth surfaced.
  - 2. Products:
    - a. Siplast Paradiene 20 TG.
    - b. Soprema Sopralene Flam 180.
    - c. Or approved.

- C. Top Ply Sheet:

- 1. Provide products that comply with one of the following standard material specifications, suitable for torch application:
    - a. ASTM D6163/D6163M, Type I, Grade G, SBS-modified asphalt sheet, reinforced with glass fibers.
      - 1) Granule Color: White.
  - 2. Products:
    - a. Siplast Paradiene 30 FR TG.
    - b. Soperma Sopralene Flam 180 FR GR.
    - c. Or approved.

- D. Reinforcing Sheet:

- 1. Provide products that comply with one of the following standard material specifications, self-adhered:
    - a. ASTM D6163/D6163M, Type I, Grade S, reinforced with glass fibers, smooth surfaced.

2. Products:
  - a. Siplast Paradiene 20 SA.
  - b. Soprema Sopralene Stick.
  - c. Or approved.

E. Flashing Sheet (Granule-Surfaced):

1. Provide products that comply with one of the following standard material specifications, suitable for torch application:
  - a. ASTM D6162/D6162M, Type II, Grade G, reinforced with a combination of polyester fabric and glass fibers.
    - 1) Granule Color: Match top ply sheet.
2. Products:
  - a. Siplast Parafor 30 TG.
  - b. Soprema Sopralene Flam 250 FR GR.
  - c. Or approved.

F. Cold Fluid-Applied Flashing System: Roof membrane manufacturer's standard reinforced two-part catalyzed liquid flashing system, polymethyl methacrylate (PMMA) composition, complete with primers, joint fillers, and reinforcing fabric.

2.4 ACCESSORY ROOFING SYSTEM MATERIALS

- A. General: Accessory materials as recommended in writing by roofing membrane manufacturer for intended use, compatible with other roofing components, and suitable for installation method specified.
  1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent retained on No. 40 sieve, color to match roofing.
- C. Cleaning Solution: Non-phosphate cleaning solution.
- D. Pipe Flashings: 4 pound desilverized lead.
- E. Lead Flashings for Drains: 30-inches by 30-inches, 4 pound lead.
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- G. Asphalt Primer: ASTM D41/D41M.
- H. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required by roofing membrane manufacturer.
- I. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.

- J. Self-Adhered Primer: Roofing membrane manufacturer's standard primer to enhance the adhesion of membrane to substrate.
- K. Membrane Termination Sealant: Elastomeric moisture-curing sealant specially formulated for compatibility and use with roof membrane sheet metal flashing materials; non-sagging at vertical terminations; UV stable, non-staining, non-migrating.
- L. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested for required pullout strength, and acceptable to roofing membrane manufacturer.
- M. Safety Accessories: Roofing membrane manufacturer's standard yellow seaming tape for designating safety perimeters and rooftop hazards.
- N. Miscellaneous Accessories: As recommended in writing by roofing membrane manufacturer.

## 2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roof membrane manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, coated glass facer on both major surfaces.
  - 1. Compressive Strength: 20 psi
  - 2. Size: 48 by 48 inches for adhered applications. 48 by 96 inches for mechanically fastened applications.
  - 3. Thickness: As indicated on the Drawings.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
  - 1. Material: Rigid polyisocyanurate (match roof insulation).
  - 2. Minimum Thickness: 1/2 inch.
  - 3. Slope: As indicated on the Drawings.
- D. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to structural deck and acceptable to roof system manufacturer.
- E. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
  - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

## 2.6 COVER BOARD, CANTS, AND TAPERED EDGE STRIPS

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with other roofing system components.
- B. Cover Board (Gypsum): ASTM C1177/C1177M, water-resistant gypsum board.
  - 1. Thickness: 1/2 inch.
  - 2. Surface Finish: Factory primed.



3. Size: 48 by 48 inches for adhered applications.
  4. Products:
    - a. Georgia Pacific DensDeck Prime
    - b. United States Gypsum Company Securock UltraLight.
    - c. Or approved.
  - C. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
  - D. Perlite Tapered Edge Strips: ASTM C728, perlite insulation board measuring 6 inches wide and tapering in thickness from 0.0 inches to 0.5 inches across the width.
  - E. Polyisocyanurate Tapered Edge Strips: Rigid polyisocyanurate (match roof insulation) board measuring 24 inches wide by 48 inches long, tapering in thickness from 0.0 inches to 2.0 inches across the width.
    1. Products: Atlas | ACFoam SureSlope TES.
  - F. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening cover board to structural deck and acceptable to roof system manufacturer.
  - G. Adhesive: Roof insulation manufacturer's recommended adhesive formulated to attach cover board to insulation as follows:
    1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
- 2.7 WALKWAYS
- A. Walkway Pads: Modified bitumen sheet material, manufactured as a traffic pad for foot traffic and acceptable to roofing membrane manufacturer; 197 mils thick, minimum; 30 inches wide, minimum.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  1. Verify that roof openings and penetrations are in place and securely anchored to roof deck, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations. Verify that tops of nailers are set to align with the top of adjacent cover board, following the slope of the roof surface around the full perimeter.
- 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 in accordance with roofing system manufacturer's written instructions.
  1. Remove sharp projections.

- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
  - 1. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests in accordance with roof system manufacturer's written instructions.
  - 1. Submit test result within 24 hours of performing tests.
    - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

### 3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system materials and components in accordance with roofing system manufacturer's written installation instructions and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings. Provide temporary seals to prevent water from entering completed sections of roofing system at the end of workday or when rain is forecast.
  - 1. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Nailer Strips: At roof decks with slopes greater than 1 inch per 12 inches, provide 4-inch nominal-width wood nailer strips ripped to align with top of cover board, oriented perpendicular to slope of roof deck, at spacing as required by roof system manufacturer for the slopes indicated on the Drawings. Mechanically fasten to roof deck.
- D. Install base layer of insulation with continuous joints run perpendicular to span of steel deck. Stagger end joints 24 inches minimum between adjacent rows.
  - 1. Locate end joints over high-flutes of decking.
  - 2. Mechanically attach base layer of insulation to roof deck through high flutes only.
- E. Install upper layers of insulation and tapered insulation adhered, with joints of each layer offset not less than 12 inches in each direction from joints of underlying layer of insulation.
- F. Mechanically attached insulation shall be installed as necessary to resist design uplift pressures, using mechanical fasteners specifically designed and sized for fastening roof insulation to roof deck substrate. Fastener pattern required to resist design uplift pressures shall be determined by roof system manufacturer.
- G. Adhered insulation shall be installed using adhesive in accordance with roof system manufacturer's written instructions.
  - 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive as necessary to resist design uplift pressures, firmly pressing and maintaining insulation in place. Adhesive ribbon pattern required to resist design uplift pressures shall be determined by roof system manufacturer.

- H. Butt insulation boards tightly together. Trim insulation neatly to fit within 1/4 inch of penetrations and projections, and to fit tight to intersecting sloping roof decks. Fill gaps greater than 1/4 inch in width with insulation material.
- I. At internal roof drains, install tapered edge strip assembly to result in configuration shown on the Drawings. Trim/ease edges of insulation as necessary to form a smooth transition for cover board.

### 3.5 INSTALLATION OF COVER BOARD, CANTS, AND TAPERED EDGE STRIPS

- A. Install cover board over insulation with long joints in continuous straight lines, with end joints staggered 24 inches minimum between rows. Offset joints of cover board from joints of insulation below a minimum of 6 inches in each direction.
- B. Adhere cover board to insulation in ribbons of bead-applied insulation adhesive as necessary to resist design uplift pressures, firmly pressing and maintaining cover board in place. Adhesive ribbon pattern required to resist design uplift pressures shall be determined by roof system manufacturer.
- C. Butt cover boards tightly together. Trim insulation neatly to fit within 1/4 inch of nailers, projections, and penetrations, and to fit tight to intersecting sloping roof planes. Fill gaps greater than 1/4 inch with cover board material.
- D. At internal roof drains, conform to slope of drain sump. Trim/ease edges of cover board as necessary to form a smooth transition for the roof membrane.
- E. Cant Strips: Install preformed cant strips at junctures of roofing membrane with vertical surfaces or angle changes greater than 45 degrees. Adhere to interfacing horizontal/sloping and vertical substrates.
- F. Tapered Edge Strips: Install at toes of tapered insulation crickets and where indicated on the Drawings. Adhere to underlying substrate.

### 3.6 INSTALLATION OF ROOFING MEMBRANE, GENERAL

- A. Install roofing system in accordance with roofing system manufacturer's written installation instructions and applicable recommendations in NRCA's "Quality-Control Guidelines for the Application of Polymer-Modified Bitumen Roofing."
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Coordinate installation of roofing system so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at end of workday or when rain is forecast.
  - 1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in adhesive, 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.

### 3.7 INSTALLATION OF BASE PLY SHEET

- A. Prime surface of substrate with primer if required by roofing membrane manufacturer in accordance with roofing membrane manufacturer's written installation instructions, and allow primer to dry.

- B. Before installing, unroll base ply sheet, cut into workable lengths, and allow to lie flat for a time period recommended by roofing membrane manufacturer for the ambient temperature at which base ply sheet will be installed.
- C. Installation of Base Ply Sheet:
  - 1. Install base ply sheet in accordance with roofing membrane manufacturer's written installation instructions, starting at low point of roof.
  - 2. Extend base ply sheet over and terminate above cants.
  - 3. Install base ply sheet in a shingle fashion.
  - 4. Install base ply sheet without wrinkles or rears, and free from air pockets, to result in one-ply construction.
  - 5. Sheet shall be fully bonded to the prepared substrate and each other.
  - 6. Laps: Accurately align base ply sheet, without stretching, and maintain uniform side and end laps.
    - a. Lap side laps as recommended by roofing membrane manufacturer but not less than 3 inches.
    - b. Lap end laps as recommended by roofing membrane manufacturer but not less than 6 inches, staggered 36 inches minimum between rows.
    - c. Cut corner of sheet at a 45-degree angle (dog-ear) on overlapping selvage edges.
    - d. Using a clean trowel, apply top pressure to seal T-laps immediately following sheet placement.
    - e. Completely bond and seal laps, leaving no voids.
  - 7. Repair tears and voids in laps and lapped seams not completely sealed.
  - 8. Apply pressure to body of base ply sheet in accordance with roofing membrane manufacturer's written installation instructions, to remove air pockets and to result in complete adhesion of base ply sheet to substrate.

### 3.8 INSTALLATION OF TOP PLY SHEET

- A. Before installing, unroll top ply sheet, cut into workable lengths, and allow to lie flat for a time period recommended by roofing membrane manufacturer for the ambient temperature at which Top Ply Sheet will be installed.
- B. Install top ply sheet in accordance with roofing membrane manufacturer's written installation instructions, starting at low point of roof.
  - 1. Extend top ply sheet over and terminate above cants.
  - 2. Install top ply sheet in a shingle fashion with side laps oriented to shed water.
  - 3. Heat-weld (torch-apply) top ply sheet to bottom layer.
    - a. Perform heat-welded installation in accordance with NFPA 241, including two-hour fire watch after torches have been extinguished.

- b. Sheets shall be laid behind the torch applicator.
- 4. Install top ply sheet without wrinkles or tears, and free from air pockets.
- 5. Sheets shall be fully bonded to base ply and to each other.
- C. Laps: Accurately align roof sheets, without stretching, and maintain uniform side and end laps.
  - 1. Lap side laps as recommended by roofing membrane manufacturer but not less than 3 inches, staggered 12 inches minimum from side laps in underlying base ply.
  - 2. Lap end laps as recommended by roofing membrane manufacturer but not less than 6 inches, staggered 36 inches minimum between rows. Stagger top ply end laps from end laps in underlying base ply.
  - 3. Cut corner of sheet at a 45-degree angle (dog-ear) on overlapping selvage edges.
  - 4. Using a clean trowel, apply top pressure to seal T-laps immediately following sheet placement.
  - 5. Completely bond and seal laps, leaving no voids.
  - 6. Repair tears and voids in laps and lapped seams not completely sealed.
- D. Apply pressure to body of top ply sheet in accordance with roofing membrane manufacturer's written installation instructions, to remove air pockets and result in complete adhesion of top ply sheet to substrate.
- E. Apply roofing granules of same color as top ply sheet to cover exuded bead at laps while bead is hot, to provide a continuous color appearance.

### 3.9 INSTALLATION OF MEMBRANE FLASHING

- A. Walls, Parapets, and Curbed Penetrations:
  - 1. Prime substrates where required by manufacturer.
  - 2. Extend base ply up to top of cant.
  - 3. Self-adhere reinforcing sheet over base ply at cant strips extending 3 inches minimum onto vertical surfaces above top of cant and 3 inches minimum onto field of base ply beyond toe of cant.
  - 4. Extend top ply sheet over reinforcing sheet and up to top of cant. Prime to receive flashing sheet application if required by manufacturer.
  - 5. Torch-apply flashing sheet over reinforcing sheet and cap sheet extending onto vertical surfaces to a height 8 inches minimum above roof surface at toe of cant and 6 inches minimum onto field of cap sheet beyond toe of cant.
  - 6. Mechanically fasten top edge of flashing sheet at 8 inches on center at vertical terminations. Seal top edge of flashing sheet with elastomeric sealant and tool to drain.
    - a. At masonry and/or concrete substrates, provide termination bar and secure with masonry anchors at 12 inches on center.
  - 7. 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.

B. Embedded Flange Flashings:

1. Set primed sheet metal flashing flanges over completed base ply in a continuous bed of roofing cement and fasten to nailer / blocking as shown in the Drawings.
2. Self-adhere reinforcing sheet over entire flange and extending onto base ply 3 inches minimum beyond edge of flange on all sides.
3. Extend top ply sheet over reinforcing sheet and terminate edge on flashing.
4. Apply membrane termination sealant continuously along top ply sheet edge and tool to drain.

C. Install reinforced cold fluid-applied flashing system (PMMA) where indicated on the Drawings. Prepare and prime surfaces and apply in accordance with manufacturer's written instructions.

D. Roof Drains:

1. Set primed 30-by-30-inch 4-pound lead flashing centered on drain over completed base ply in bed of roof system manufacturer's standard solvent-free adhesive.
2. Self-adhere reinforcing sheet target centered on drain over primed lead flashing, extending 3 inches minimum beyond each edge of lead flashing.
3. Set top ply sheet target centered on drain over reinforcing sheet in hot asphalt, extending 3 inches minimum beyond each edge of reinforcing sheet.
4. Extend field top ply sheet to lap over top ply sheet target, 3 inches minimum on each edge of top ply sheet target.
5. Apply reinforced cold fluid-applied flashing (PMMA) extending from the inside perimeter of drain clamping ring to the leading edge of the field cap sheet lap edge.
6. Install drain clamping ring ensuring complete compression of all membrane / flashing layers around the full perimeter of the drain.

3.10 FINISH INSTALLATION

- A. The finished roof application shall result in a neat, clean, orderly, and aesthetically pleasing appearance.
- B. Apply radiant barrier coating / granules at all laps to cover and protect all exposed bitumen.
- C. Make necessary preparations, utilize recommended application techniques, apply specified materials, and exercise care to ensure that the finished application is acceptable to Owner.

3.11 INSTALLATION OF WALKWAYS

- A. Walkway Pads: Install walkway pads, using units of size indicated or, if not indicated, of manufacturer's standard size, in accordance with walkway pad manufacturer's written instructions.
  1. Install walkways at following locations:
    - a. Access points and access transitions (e.g.: at bottom and top of ladders connecting lower to higher roof areas, step-up locations, step-down locations, and step-over locations).

- b. On service sides of equipment.
  - c. Between each access point and each equipment location or path connecting equipment locations.
  - d. Locations indicated on Drawings. Layout subject to Owner refinement.
  - e. As required by roof membrane manufacturer's warranty requirements.
2. Provide 3-inch minimum clearance between adjoining pads.
  3. Set walkway pads in cold-applied adhesive after sweeping away loose aggregate surfacing.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to inspect substrate conditions, surface preparation, roofing membrane installation, flashings, protection, and drainage components. Inspection reports will be furnished to Owner and Contractor.
- B. Test Cuts: Remove test specimens to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
  1. Determine approximate quantities of components within roofing membrane in accordance with ASTM D3617/D3617M.
  2. Examine test specimens for voids between plies in accordance with ASTM D3617/D3617M and to comply with criteria established in Appendix 3 of NRCA's "Quality-Control Guidelines for the Application of Polymer-Modified Bitumen Roofing."
  3. Repair areas where test cuts were made in accordance with roofing system manufacturer's written installation instructions.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Consultant, and to prepare inspection report.
  1. Notify Consultant and Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. 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.

### 3.13 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
  1. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Consultant and 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 in accordance with warranty requirements.

- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove waste (including but not limited to packaging, stray fasteners, and spent cartridges/tubes), debris (including but not limited to tree debris), and applicator equipment. Leave the site clean.

END OF SECTION 075216



## SECTION 075323 - EPDM MEMBRANE JOINT LINER

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. EPDM Membrane Joint Liner, complete with all preparation and accessories, for use in expansion joints to provide continuity and secondary moisture protection.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For joint liner system. Include plans, elevations, sections, details, and attachments to other work.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Company authorized and trained by the EPDM membrane manufacturer. The applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least 5 years' successful experience installing systems similar to the specified system.
1. Crew Experience and Supervision: Provide adequate number of experienced workers regularly engaged in this type of work who are skilled in the application techniques of the materials specified.
- B. Perform Work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's written instructions.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver 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.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Store roll goods on ends only; do not lay flat. Flattened rolls shall not be used in the construction of membrane system.
- D. Store and handle materials in accordance with the manufacturer's instructions.

## 1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with joint liner work only when existing and forecasted weather conditions permit membrane to be installed according to manufacturer's written instructions and recommendations.
- B. Have necessary waterproof canvas tarpaulins or plastic sheeting readily available in case of emergency.
- C. Protect open roofs and flashings to prevent the entrance of moisture or rain water into the structure until joint is in a watertight condition.
- D. Membrane materials shall not be applied when water in any form (i.e., rain, dew, ice, frost, snow, etc.) is present on the substrate.
- E. Adhesive applied membrane materials shall not be applied when dirt, dust, debris, oil, etc. is present on the substrate.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components for joint liner membrane system from a single manufacturer.

### 2.2 EPDM MEMBRANE

- A. EPDM: ASTM D 4637, Type I, nonreinforced, uniform, flexible EPDM sheet.
  - 1. Thickness: 60 mils, nominal.
  - 2. Exposed Face Color: Black.
  - 3. Product: Johns Manville JM EPDM NR60 mil or approved equivalent.

### 2.3 AUXILIARY 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. Adhesives, Cleaners, and Primers: As recommended by membrane manufacturer for environmental and substrate conditions encountered.
- C. Accessories: Uncured EPDM sheets with release liner and factory applied pressure-sensitive tape for flashing, corner, and T-joint conditions as necessary to provide a complete watertight system.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to membrane installation according to membrane manufacturer's written instructions. Substrates shall be smooth, without raised edges, sharp edges, protruding or loose nails, and free of foreign materials.
- B. Inspect all substrates for irregularities and defects that prohibit the proper installation of joint liner membrane materials. Notify the Owner Representative and Consultant of all defects for proper correction prior to continuation of Work.
- C. Prepare all surfaces and details in accordance with manufacturer's printed instructions and the Contract Documents.

### 3.2 ADHERED EPDM MEMBRANE JOINT LINER INSTALLATION

- A. Adhere EPDM membrane over curb substrates according to membrane system manufacturer's written instructions. Unroll membrane sheets and allow to relax before installing.
- B. Install membrane sheets in maximum lengths practicable. Accurately align membrane sheets to result in liner configuration indicated in the Drawings. Where laps are necessary, maintain uniform side and end laps of minimum dimensions required by the membrane manufacturer.
- C. Bonding Adhesive: Apply to substrate and underside of membrane sheets at rate required by manufacturer, and allow to partially dry before installing membrane sheets. Do not apply to splice area of membrane.
- D. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane sheets according to membrane manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane terminations.
  - 1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane system manufacturer.
- E. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane terminations.
- F. Repair tears, voids, and lapped seams in membrane that do not comply with requirements.

### 3.3 PROTECTING AND CLEANING

- A. Protect membrane liner system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger membrane liner, inspect membrane liner for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.
- B. Correct deficiencies in or remove membrane system that does not comply with requirements, repair substrates, and repair or reinstall membrane 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, stray fasteners, debris, and installation equipment from site and leave the site clean.

END OF SECTION 075323

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Sheet metal fabrications.

###### B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 075216 "SBS Modified Bituminous Membrane Roofing" for 2-ply SBS modified bituminous roof membrane system and accessories.
3. Section 077200 "Roof Accessories" for manufactured roof accessory units.

##### 1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each sheet metal, underlayment, and accessory product.

- B. Shop Drawings: For sheet metal flashing and trim complete with underlayment and accessories.

1. Include plans, elevations, sections, and attachment details as necessary to clearly illustrate fabrications and installations.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, flashings, and counter flashings.

10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

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

#### 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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. Mockups: Build mockups as directed by Consultant to verify selections, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation. Provide mockup of saddle condition and expansion joint condition
  1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
  2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 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.
  1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

#### 1.8 WARRANTY

- A. Special Warranty on Finishes: 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. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
  - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
  - c. 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

### 2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to 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 are not to rattle, leak, or loosen, and are to remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
  1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
  1. Finish: ASTM A480/A480M, No. 2B (bright, cold rolled).
    - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- C. Copper Sheet: ASTM B370, cold-rolled temper, 20 OZ.
- D. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated (i.e., Galvalume) steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40 or zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation.

- E. Prefinished Steel Sheet: Provide aluminum-zinc alloy-coated (i.e., Galvalume) steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40 ; prepainted by coil-coating process to comply with ASTM A755/A755M.
  - 1. Surface: Smooth, flat.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
  - 3. Color: As selected by Owner from manufacturer's full range.
  - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant top surface (polyethylene film, foil-facer factory laminated to cross-laminated polyethylene film, or polypropylene film) laminated to a layer of butyl adhesive, butyl-modified asphalt adhesive, or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high temperatures beneath metal copings and other similar applications. Provide primer in accordance with underlayment manufacturer's written instructions.
  - 1. Source Limitations: Obtain underlayment from single source from single manufacturer.
  - 2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.
  - 3. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
  - 4. Products: GCP Applied Technologies Perm-A-Barrier Ultra or approved.
- B. Water Resistive Barrier: Minimum 20-mil-thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side.
  - 1. Source Limitations: Obtain underlayment from single source from single manufacturer.
  - 2. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lb/sq. ft. pressure difference when tested in accordance with ASTM E2178.
  - 3. Puncture Resistance: Minimum 40 lbf when tested in accordance with ASTM E154.
  - 4. Vapor Permeance: Minimum 15 perms when tested in accordance with ASTM E96, Desiccant Method, Procedure A.
  - 5. UV Resistance: Can be exposed to sunlight for 90 days in accordance with manufacturer's written instructions.
  - 6. Products: Henry VP160 or approved.

## 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as



recommended by manufacturer of primary sheet metal or manufactured item 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. As applicable for the conditions encountered, provide screw fasteners in lengths sufficient to penetrate solid wood by 1 1/4 inch minimum, completely through plywood sheathing, and cold-formed steel by 1/4 inch minimum as measured from the thread nearest the tip.

1. General:

- a. Exposed Fasteners: Hex-washer heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM sealing washers under heads of exposed fasteners bearing on weather side of metal.
- b. Concealed Fasteners: Pancake heads.
- c. Rivets: Pop rivets with stainless steel mandrels of size and length suitable for metal being fastened and bodies prefinished to match metal being fastened.
- d. Fasteners for masonry, concrete, and other cementitious non-nailable substrates shall be threaded. Expanding drive-anchors are not permitted.

2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

3. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.

C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

- E. Elastomeric Sealant: ASTM C920, elastomeric silicone or silyl-terminated polyether (STPe) polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement; non-skinning, non-hardening type.

- G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

## 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  2. 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.
  3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
  4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
1. Fabricate nonmoving seams in stainless steel with flat-lock seams. Tin edges to be seamed, form seams, rivet, and solder.
    - a. Provide tabs of appropriate width on sections to be overlapped.
    - b. Rivet seams at maximum 3-inches on center, unless otherwise indicated.
    - c. Solder seams watertight, filling the entire width of overlap.
  2. Fabricate nonmoving seams in prefinished steel with flat-lock seams. Form seams, blind seal, and rivet. Orient horizontal and sloping seams to result in a weatherlapped configuration.
    - a. Provide tabs of appropriate width on sections to be overlapped.
    - b. Blind seal seam tabs continuously with butyl sealant.

- c. Rivet seams at maximum 3-inches on center through sealant, unless otherwise indicated.
    - d. Back-seal pin holes at corners.
  - H. Do not use graphite pencils to mark metal surfaces.
- 2.6 SHEET METAL FABRICATIONS
  - A. Gutter Expansion Joints: Fabricate to match existing gutter profile, complete with end pieces and other accessories as required.
    - 1. Material: 20 OZ Copper Sheet.
  - B. Gutter Hangers and Reinforcement Angle: Furnish and fabricate to dimensions shown in drawings.
    - 1. Material: 1/8" thick Stainless-steel plate.
    - 2. Joint Style: Butted.
  - C. Splash Pans:
    - 1. Material: 22 gage stainless steel
    - 2. Profile: Configuration shown on the Drawings.
    - 3. Joint Style: Tabbed, riveted, and soldered watertight.
  - D. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Shop fabricate and miter inside and outside corners.
    - 1. Material: 24 gage prefinished steel.
    - 2. Profile: Configurations shown on the Drawings.
    - 3. Joint Style:
      - a. Sloping Surfaces: 1-inch-high standing seams, with nesting seam leg corners trimmed and overlapping seam leg corners folded and sealed; do not trim overlapping seam leg corners.
      - b. Vertical Surfaces: Overlapped 4 inches wide, hems nested.
  - E. Continuous Cleats and Joggle Cleats:
    - 1. Material: 22 gage metallic-coated steel.
    - 2. Profile: Configurations shown on the Drawings.
    - 3. Joint Style: Butted.
  - F. Expansion Joint Covers: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Shop fabricate and miter inside and outside corners.
    - 1. Material: 24 gage prefinished steel.
    - 2. Profile: Configurations shown on the Drawings.

3. Joint Style: Butted with expansion space and 6-inch-wide concealed backup plate overlapping seam leg corners folded and sealed; do not trim overlapping seam leg corners.
- G. Counter Flashings:
  1. Material: 24 gage prefinished steel.
  2. Profile: Configurations shown on the Drawings.
  3. Joint Style: Overlapped, 4 inches wide set in two rows of butyl sealant, hems nested.
- H. Flashing Panels, Coping Concealer Panels, and Flashing Caps:
  1. Material: 24 gage prefinished steel.
  2. Profile: Configurations shown on the Drawings.
  3. Joint Style: Tabbed, blind sealed, and riveted.
- I. Roof-Penetration Flashings, Flanged Base: Fabricate to result in configuration shown on the Drawings.
  1. Material: 24 gage stainless steel.
  2. Joint Style: Tabbed, riveted, and soldered watertight.
- J. Saddle Flashings: Fabricate to result in configuration shown on the Drawings.
  1. Material: 24 gage stainless steel.
  2. Joint Style: Tabbed, riveted, and soldered watertight.
- K. Roof Penetration Storm Collars: Fabricate to result in configuration shown on the Drawings.
  1. Material: 26 gage stainless steel.
  2. Joint Style: Tabbed, blind sealed, and riveted.
- L. Other Sheet Metal Flashings and Trim:
  1. Provide materials, configurations, and joint styles as indicated on the Drawings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, 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.
  3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF UNDERLAYMENT

#### A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free and accurately aligned.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

#### B. Water Resistive Barrier:

1. Install water resistive barrier wrinkle free and accurately aligned in horizontal orientation.
2. Prime substrate if recommended by water resistive barrier manufacturer.
3. Comply with temperature restrictions of water resistive barrier manufacturer for installation; use manufacturer's recommended primer for installing water resistive barrier at low temperatures.
4. Apply in shingle fashion to shed water, with end and side laps of not less than 3 inches. Offset end laps 12 inches between lifts. Roll laps and edges with roller.
5. Cover underlayment within 14 days.

### 3.3 INSTALLATION, GENERAL

#### A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced as indicated on the Drawings.
6. Where provided, space individual clips not more than 12 inches apart. Attach each clip with at least two fasteners. Bend tabs over fasteners.

7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
  8. Do not field cut sheet metal flashing and trim by torch.
  9. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Provide underlayment on cementitious and/or wood substrates.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
  2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
    - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
    - b. Form joints to completely conceal sealant.
    - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
    - d. Adjust setting proportionately for installation at higher ambient temperatures.
      - 1) Do not install sealant-type joints at temperatures below 40 deg F.
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
  2. Do not solder prefinished steel and metallic-coated sheet.
  3. Do not use torches for soldering.
  4. Heat surfaces to receive solder, and flow solder into joint.
    - a. Fill joint completely.

- b. Completely remove flux and spatter from exposed surfaces.
- 5. Stainless Steel Soldering:
  - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
  - b. Promptly remove acid-flux residue from metal after tinning and soldering.
  - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

### 3.4 INSTALLATION, SHEET METAL FABRICATIONS

- A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.
  - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
  - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- C. Copings:
  - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
  - 2. Install continuous cleat, set to correct elevation, and secure to parapet nailer as indicated on the Drawings.
  - 3. Interlock outboard (fascia) edge with continuous cleat as indicated on the Drawings.
  - 4. Continuously support coping and secure to inboard side of parapet as indicated on the Drawings.
- D. Storm Collars: Install with vertical leg set in continuous butyl sealant. Set to correct elevation with bottom edge overlapping top edge of penetration flashing by 2 inches minimum. Install stainless steel draw band and tighten. Install elastomeric sealant in trough at top edge and tool to drain.
- E. Counter Flashing: Coordinate installation of counter flashing with installation of base flashing.
  - 1. Lap counter flashing joints minimum of 4 inches.
- F. Roof-Penetration Flashing: Prepare / prime flange and set in appropriate adhesive according to roof system application requirements. Install in sequence with roof membrane system components as necessary to result in configuration indicated on the Drawings.
  - 1. Secure flanges to solid wood nailer as indicated on the Drawings.

### 3.5 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.7 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. 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, as determined by Consultant.

END OF SECTION 076200



## SECTION 077200

### ROOF ACCESSORIES (Alternate Bid No. 2)

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Roof hatch safety rail with ladder-assist post.

###### B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 075216 "SBS Modified Bituminous Membrane Roofing" for 2-ply SBS modified bituminous roof membrane system and accessories.

##### 1.2 COORDINATION

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

##### 1.3 ACTION SUBMITTALS

###### A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

###### B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

##### 2.2 ROOF HATCH SAFETY RAIL

- A. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation;

attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Basis of Design: Bilco RL2-S Roof Hatch Safety Rail.
2. Height: 42 inches above finished roof surface.
3. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
4. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
5. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: Manufacturer's standard.
  - a. Color: As selected by Owner from manufacturer's full range.

B. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Basis of Design: Bilco LadderUP Safety Post, LU1.
2. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
3. Height: 42 inches above finished roof surface.
4. Material: Steel tube.
5. Post: 1-5/8-inch-diameter pipe.
6. Finish: Manufacturer's standard baked enamel or powder coat.
  - a. Color: As selected by Owner from manufacturer's full range.

## 2.3 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened.

Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
  2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- C. Gaskets: Manufacturer's standard tubular or fingered design of EPDM or silicone or a flat design of foam rubber.
- D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

## 2.4 GENERAL FINISH REQUIREMENTS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Install roof accessories according to manufacturer's written instructions.
1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
  2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.
- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 077253

SNOW GUARDS (Alternate Bid No. 3)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rail-type, seam-mounted snow guards.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Rail-type, seam-mounted snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

C. Samples:

1. Rail-Type Snow Guards: Bracket, 12-inch-long rail, and installation hardware.

D. Delegated Design Submittals: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculation of number and location of snow guards.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the state in which the Project is located.

B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, licensed in the state of Oregon, to design snow guards, including attachment to roofing material and roof deck, as applicable for attachment method, based on the following:

1. Roof snow load.

2. Snow drifting.
  3. Roof slope.
  4. Roof type.
  5. Roof dimensions.
  6. Roofing substrate type and thickness.
  7. Snow guard type.
  8. Snow guard fastening method and strength.
  9. Snow guard spacing.
  10. Coefficient of Friction Between Snow and Roof Surface: 0.
  11. Factor of Safety: 2.
- B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- C. Structural Performance: Snow guards to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Snow Loads: As indicated on Drawings.
- 2.2 RAIL-TYPE SNOW GUARDS
- A. Rail-Type, Seam-Mounted Snow Guards:
1. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail with integral track to accept color-matching inserts of material and finish used for metal roof.
  2. Brackets and Baseplate: ASTM B209 aluminum; color anodic finish.
  3. Bars: ASTM B221 aluminum; color anodic finish.
    - a. Profile: Round with integral track to accept color-matching inserts of material and finish used for metal roof.
  4. Seam Clamps: ASTM B221 aluminum extrusion or ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.
    - a. ASTM B221 aluminum; color anodic finish.
- B. Products: S-5! ColorGard.
1. Color anodic finish to match color of existing copper roof panels.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
  - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
  - 1. Space rows as indicated on Shop Drawings.
- B. Attachment for Standing-Seam Metal Roofing:
  - 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
  - 2. Rail-Type, Seam-Mounted Snow Guards:
    - a. Install brackets to vertical ribs in straight rows.
    - b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
    - c. Torque set screw in accordance with manufacturer's written instructions.
    - d. Install cross members to brackets.

END OF SECTION 077253