

DIVISION 01 - GENERAL REQUIREMENTS

011000 Summary

012200 Unit Prices

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

070150.19 Preparation for Re-Roofing

075113.11 Built-Up Asphalt Roofing, Hot-Applied

075416 Ketone Ethylene Ester (KEE) Roofing

076200.02 Sheet Metal Flashing and Trim (Short Form)

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## SECTION 011000 - SUMMARY

### GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

Project information.

2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

#### 1.2 PROJECT INFORMATION

##### A. Facility Owner Information:

Owner Name: Mason Consolidated Schools.

Roofing Advisor:

Roofing System Manufacturer's Representative: Luke Idoni; Field Advisor;;(810) 280-5194;  
Lidoni@tremcoinc.com.

Direct technical questions to Roofing Advisor.

- a. Where individual specification sections refer to Owner, Owner may elect to delegate submittal and response responsibilities to Roofing Advisor.

##### B. Facility Information:

1. Building Name: Mason High School.
2. Building Location: 2400 Mason Eagle Drive, Erie, MI 48133.

##### C. Project Information:

Project Name: Mason High School THERMastic 80 and KEE Roofing Replacements.

### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

The Work of Project is defined by the Contract Documents and consists of the following:

1. Roof Area(s) / Section(s): 1, 7, 8, 10, 11, 12, and 13.

Total Area of Roof(s): 73,445 sq. ft.

Slope of Existing Roof: 1/8 inch per 12 inches.

The Work of the Project includes:

- 1) Re-roofing preparation specified in Division 07 Section "Preparation for Re-Roofing."
- 2) Replacement roofing specified in Division 07 Section 075113.11 - Built-Up Asphalt Roofing, Hot-Applied.

2. Roof Area(s) / Section(s): 14 and 15.

Area of Roof(s): 14,100 sq. ft.

Slope of Existing Roof: 2 inches per ft.

The Work of the Project includes:

- 1) Re-roofing preparation specified in Division 07 Section "Preparation for Re-Roofing."
- 2) Replacement roofing specified in Division 07 Section 075416 - Ketone Ethylene Ester (KEE) Roofing.

#### B. Type of Contract:

1. Project will be constructed under a single prime contract.

### 1.4 ACCESS TO SITE

#### A. Use of Site, Limited: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

1. Use of Site: Limit use of Project site to work in areas indicated and as directed by Owner. Do not disturb portions of Project site beyond areas in which the Work is indicated, including designated lay-down areas.
2. Driveways, Walkways and Entrances: Keep driveways, facility loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

- a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

#### 1.5 COORDINATION WITH OCCUPANTS

- A. Owner Occupancy: Owner will occupy site including existing and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
  1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
  2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

#### 1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated or approved by Owner.

Weekend Hours: As authorized by Owner.

2. Early Morning Hours: As authorized by Owner.
3. Hours for Utility or Services Shutdowns: As authorized by Owner.
4. Hours for noisy or disruptive activity: As authorized by Owner.

Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

Nonsmoking Project: Use of tobacco products on the Project site is not permitted.

F. Controlled Substances: Use of other controlled substances on the Project site is not permitted.

Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

## 1.7 SPECIFICATION AND DRAWING CONVENTIONS

Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012200 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:

#### 1.2 DEFINITIONS

Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### 1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 SCHEDULE OF UNIT PRICES

Unit Price No. 1: Deck material replacement:

- 1. Description: Remove existing deck material and replace with new material according to Division 07 Section "Preparation for Re-roofing".
  - 2. Unit of Measurement: 1 sq. ft.
- B. Unit Price No. 5: Existing wood nailer replacement

1. Description: Provide new pressure-treated wood nailers according to Division 06 Section "Miscellaneous Rough Carpentry."
2. Unit of Measurement: 1 lineal ft of 2x4-inch lumber.

END OF SECTION 012200

## SECTION 070150.19 - PREPARATION FOR RE-ROOFING

### GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

Roof replacement preparation consisting of full roof tear-off of roof system at designated roof areas.

2. Removal of flashings and counterflashings.
3. Temporary roofing.
4. Temporary roof drainage.
5. Removal and reinstallation of indicated components, accessories, and equipment.

##### Related Information:

1. Division 01 Section "Summary" for use of the premises and phasing requirements, and for restrictions on use of the premises due to Owner or tenant occupancy.
2. Division 07 Section "Sheet Metal Flashing and Trim" for formed metal roof flashings and counterflashings.

#### 1.2 DESCRIPTION OF WORK

Re-roofing preparation Work consists of the following:

1. Preparation for Roof replacement:
  - a. Roof Area(s): 1, 7, 8, 10, 11, 12, and 13.
  - b. Existing Roof Type: Aggregate surfaced BUR.
  - c. Existing Deck Type: Metal deck.
  - d. Roof tear-off.
  - e. Salvaging of non-hazardous demolition and construction waste.
  - f. Roof ply reinforcement.
  - g. Uplift securement.
  - h. Removal of base flashings.

- i. Temporary roof membrane.
2. Preparation for Roof replacement:
  - a. Roof Area(s): 14 and 15.
  - b. Existing Roof Type: Granular surfaced modified bituminous.
  - c. Existing Deck Type: Concrete deck.
  - d. Roof tear-off.
  - e. Salvaging of non-hazardous demolition and construction waste.
  - f. Roof ply reinforcement.
  - g. Uplift securement.
  - h. Removal of base flashings.
  - i. Temporary roof membrane.

### 1.3 MATERIALS OWNERSHIP

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

### 1.4 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" and NRCA's Glossary for definition of terms related to roofing work in this Section.

Existing Roofing System: Roofing system identified above, including roof covering/membrane, roof insulation, surfacing, and components and accessories between deck and roof covering/membrane.

- C. Full Roof Tear-Off: Removal of existing membrane roofing system from deck.
- D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- E. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- F. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- G. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

## 1.5 PREINSTALLATION MEETINGS

Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1. Coordinate with roofing preinstallation meetings specified in Division 07 roofing section(s).
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:

Reroofing preparation, including roofing system manufacturer's written instructions.

- b. Temporary protection requirements for existing roofing system components that are to remain.
- c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
- d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
- e. Existing roof deck conditions and other conditions requiring Owner notification.
- f. Existing roof deck removal procedures and Owner notifications.
- g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
- h. Structural loading limitations of roof deck during reroofing.
- i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
- j. HVAC shutdown and sealing of air intakes.
- k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- l. Governing regulations and requirements for insurance and certificates if applicable.

## 1.6 ACTION SUBMITTALS

Product Data: For each type of product indicated.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Digital Images or Videos: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, which might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

Schedule of Re-Roofing Preparation Activities: Indicate the following:

1. Detailed sequence of re-roofing preparation work, with starting and ending dates for each activity. Ensure occupants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building.

Landfill Records: Indicate receipt and acceptance of hazardous wastes, such as asbestos-containing material, by a landfill facility licensed to accept hazardous wastes.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of new membrane roofing system.
- B. Regulatory Requirements:
  1. Comply with governing EPA notification regulations before beginning membrane roofing removal.
  2. Comply with hauling and disposal regulations of authorities having jurisdiction.

#### 1.9 PROJECT / FIELD CONDITIONS

Owner will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so Owner's operations will not be 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 can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.

Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area.

- a. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

Limit construction loads on roof to rooftop equipment wheel loads and uniformly distributed loads not exceeding recommendations of Contractor's professional engineer based upon site inspection and analysis.

- 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. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.

If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner.

Hazardous materials will be removed by Owner under a separate contract.

- b. Obtain direction from Owner before proceeding with work in the affected area.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY PROTECTION MATERIALS

EPS Insulation: Molded (expanded) polystyrene, ASTM C578.

- B. Plywood: NIST DOC PS 1, Grade CD, Exposure 1.
- C. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.

### DECK REPAIR/REPLACEMENT MATERIALS

- A. Metal Deck Repair Materials:
  - 1. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
    - a. Gage, rib depth, rib configuration to match existing; three span; lapped and stitched joints.
    - b. Sheet Steel: ASTM A653/A653M, Grade A structural quality; with G90 coating (galvanized).
  - 2. Fasteners:

- a. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- b. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8 mm) minimum diameter.
3. Accessories: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Concrete Deck Repair Materials:

1. Bonding Agent: Epoxy-modified, cementitious bonding and anticorrosion agent consisting of water-insensitive epoxy adhesive, Portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.
2. Patching Mortar: Trowelable cementitious repair mortar for vertical and overhead, repairs up to 2 inches (50 mm) per lift, one component, fiber reinforced, polymer modified repair mortar containing corrosion inhibitor.
  - a. Compressive Strength: Not less than 6,000 psi (41,400 kPa) at 28 days when tested according to ASTM C 109/C 109M, modified 2-inch (50-mm) cubes.

2.3 ROOFING INFILL, PATCHING AND REPLACEMENT MATERIALS

- A. General: Use roofing infill materials matching existing membrane roofing system materials unless otherwise indicated.

Use materials specified in Division 07 roofing, unless otherwise indicated.

Wood Blocking, Curbs, Cants and Nailers:

1. Reuse existing wood components that exhibit no signs of deterioration or other conditions detrimental to securement of new roofing system in conformance with specified requirements.

2.4 TEMPORARY ROOFING MATERIALS

- A. Design and selection of materials for temporary roofing are responsibilities of Contractor.

2.5 TEMPORARY ROOF DRAINAGE

- A. Design and selection of materials for temporary roof drainage are responsibilities of the Contractor.

2.6 AUXILIARY RE-ROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new membrane roofing system.

- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

## PART 3 - EXECUTION

### 3.1 PREPARATION, GENERAL

Protection of In-Place Conditions: Protect existing roofing system that is indicated not to be reroofed.

Protect existing roofing system that is indicated not to be reroofed.

Loosely lay 1 inch (25 mm) minimum thick, molded expanded polystyrene (EPS) insulation over the roofing membrane in areas indicated.

- a. Loosely lay 15/32-inch (12-mm) plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch (25 mm).
- 3. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
- 4. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

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.

Test existing roof drains to verify that they are not blocked or restricted.

- 1. Immediately notify Owner of any blockages or restrictions.

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. Pollution Control: Comply with environmental regulations of authorities having jurisdiction. Limit spread of dust and debris.
  - 1. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 2. Remove debris from building roof by chute, hoist, or other device that will convey debris to grade level.

- G. Temporary Weather Protection: During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- H. Roof Drainage Protection: Maintain roof drainage in functioning condition to ensure roof drainage at end of each workday.
  - 1. Prevent debris from entering or blocking roof drainage and conductors.
    - a. Use plugs specifically designed for this purpose.
    - b. Remove plugs at end of each workday, when no work is taking place, or when rain is forecast.
  - 2. If roof drainage components are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding.
    - a. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

### 3.2 ROOF TEAR-OFF

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.

Remove loose aggregate from aggregate-surfaced built-up bituminous roofing using a dry vacuum.

- D. Remove walkways, pavers and accessories from roofing membrane.
- E. Roof Drainage: Remove roof drainage items indicated for removal.
- F. Remove Flashings: Remove roof flashings indicated for removal.

Remove base flashings and counter flashings.

- 2. Remove perimeter edge flashings and gravel stops.
- 3. Remove copings.
- 4. Remove expansion-joint covers.
- 5. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
- G. Full Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.
  - 1. Remove cover boards and roof insulation.

Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry. Remove unadhered bitumen and felts and wet felts.

3. Remove excess asphalt from steel deck. A maximum of 15 lb/100 sq. ft. (0.72 kg/m<sup>2</sup>) of asphalt is permitted to remain on steel decks.
4. Remove fasteners from deck.

Roof Edge Specialties: Replace existing perimeter metal systems with new perimeter metal systems.

1. New perimeter metal systems (fascia and coping) are specified in Division 07 Section "Sheet Metal Flashing and Trim."
- I. Inspect wood blocking, curbs, and nailers for deterioration and damage.
1. Remove deteriorated or unsuitable wood blocking, curbs, and nailers.
  2. Replace existing wood components that exhibit signs of deterioration or other conditions detrimental to securement of roofing system components, including roof edge flashings.
  3. Reuse of Existing Wood Nailers: Permitted where type, size and securement are in accordance with ANSI/SPRI/FM 4435 ES-1; and existing wood nailers exhibit no signs of deterioration or other conditions detrimental to securement of new roofing system in conformance with specified requirements.

### 3.3 DECK PREPARATION

Inspect deck after tear-off of membrane roofing system.

- B. Verify that deck is sound and dry.
- C. If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Owner. Do not proceed with installation until directed by Owner.
- D. Unsuitable Deck: If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Owner.
1. Do not proceed with installation until directed by Owner.

### DECK REPAIR/REPLACEMENT

- A. Repair existing deck to provide smooth working surface for installation of roof system.
1. Replace deck that cannot be repaired to sound condition.
- B. Metal Deck Reattachment:

1. Mechanically reattach loose sections of deck to steel support members 12 inches (300 mm) on center (at every other rib) and 6 inches (150 mm) on center (at every rib) in roof corner and roof perimeter areas.
2. Side Laps: Mechanically fasten 18 inches (450 mm) on center.
3. Mechanically fasten steel deck to supporting member at each deck side lap, regardless of spacing.
4. Overlap steel deck end laps minimum 2 inches (50 mm); mechanically attach at the above listed factors.

C. Metal Deck Replacement:

1. Remove defective metal decking and examine supports; if supports are unsound, notify Owner and obtain direction before proceeding with deck replacement.
2. Install new metal decking in accordance with SDI, Design Manual for Composite Decks, Form Decks, Roof Decks

D. Concrete Deck Repair:

1. Remove spalled or deteriorated deck areas until sound base is reached.
2. Apply bonding agent and install patching mortar in accordance with manufacturer's instructions.
3. Allow patching mortar to fully set.

### 3.5 EQUIPMENT REMOVAL AND REINSTALLATION

A. General: Remove, store, protect and reinstall rooftop equipment as required to accommodate roof tear-off and subsequent roofing work.

1. Raise roof curbs, equipment mountings and other roof penetration flashings as required to accommodate additional insulation thickness and maintain base flashing height of not less than 8 inches (200 mm), unless otherwise indicated.
  - a. Provide wood assemblies and additional support with miscellaneous galvanized steel angles, as required to rebuild or raise existing roof curbs.
  - b. Extend vent and soil stacks and other roof penetrations, using matching materials, as required to accommodate additional insulation thickness.
2. Extend existing ductwork inside existing roof curbs to accommodate extension of curb.
  - a. Use materials matching existing ductwork; minimum of 20 ga. (0.9 mm) galvanized duct with Pittsburgh folded seam slip joints-typical.

- B. Rooftop Equipment, Electrical: Engage a qualified electrician to perform electrical disconnection and reconnection.
  - 1. Disconnect, reroute, extend and reconnect existing power feeders and control circuits (conduit and wiring) feeding the existing roof mounted equipment which is indicated to be raised and/or relocated to a new elevation/location and as required by the Contract.
  - 2. Provide weatherproof exterior junction boxes, when required.
  - 3. Make connections to mechanical equipment by using a maximum 18-inch (450 mm) length of liquid-tight flexible steel conduit.
    - a. Rigid connections to mechanical equipment are not permitted.
  - 4. Relocate and reconnect existing disconnect switches presently installed on existing roof mounted equipment indicated to be raised and/or relocated.
- C. Reinstall designated equipment.
  - 1. Make electrical reconnections in accordance with applicable code and authorities having jurisdiction.
  - 2. Recharge HVAC equipment with refrigerant required by equipment manufacturer.
  - 3. Coordinate with Owner to test equipment and verify proper operation.

### 3.6 TEMPORARY ROOFING MEMBRANE

Install approved temporary roofing membrane over area to be reroofed.

- B. Remove temporary roofing membrane before installing new roofing membrane.

### 3.7 BASE FLASHING REMOVAL

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
  - 1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain.
  - 1. Replace metal counterflashings damaged during removal with counterflashings specified in Division 07 Section "Sheet Metal Flashing and Trim."

### 3.8 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
  - 1. Storage or sale of demolished items or materials on-site is not permitted.

- B. Transport and legally dispose of demolished materials off Owner's property.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by preparation for re-roofing operations. Return adjacent areas to condition existing before operations began.

END OF SECTION 070150.19

## SECTION 075113.11 - BUILT-UP ASPHALT ROOFING, HOT-APPLIED

### GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

Hot-applied three-ply built-up asphalt roofing system on metal deck, including but not limited to:

- a. Roof insulation.
- b. Roof insulation cover board.

Roof membrane base-ply sheet.

- d. Roof membrane ply sheet(s).
- e. Roofing membrane cap sheet.
- f. Base flashings.

Roof surfacing consisting of stone aggregate.

- h. Walkway material.

##### Related Sections:

- 1. Division 07 Section "Preparation for Re-Roofing" for removal of existing roofing; inspection, repair and replacement of existing deck/substrate, if required to receive new roofing.
- 2. Division 07 Section "Sheet Metal Flashing and Trim" for shop- formed sheet metal items including roof drainage system items, roof penetration flashings, roof drainage systems, counterflashings and reglets.

#### 1.2 DEFINITIONS

- ##### A. Roofing Terminology:
- Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and NRCA's Glossary for definition of terms related to roofing work in this Section.

**Hot Roofing Asphalt:** Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg. F (14 deg. C), measured at the mop cart or mechanical spreader immediately before application.

### 1.3 PREINSTALLATION MEETINGS

Preinstallation Roofing Conference: Conduct conference at Project site.

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

### 1.4 ACTION SUBMITTALS

Product Data: For each type of product indicated.

- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastening spacings and patterns for mechanically fastened components.
  2. Base flashings and membrane terminations.
    - a. Indicate that details meet requirements of NRCA and FM required by this Section.

Layout and thickness of insulation.

4. Tapered insulation layout, including slopes.
5. Crickets, saddles, and tapered edge strips, including slopes.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

7. Membrane securement, fastening or adhesion requirements.

#### 1.5 INFORMATIONAL SUBMITTALS

Qualification Statements: For Installer.

1. Include letter from Manufacturer written for this Project indicating approval of Installer.
- B. Contractor's Product Certificate: Submit signed certification, on company letterhead, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

Manufacturer's Instructions: Submit copy of manufacturer's written installation instructions for specified roofing system.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.
- B. Warranties: Executed copies of warranties.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor,, and employees, and qualified by the roofing system manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. Manufacturer Qualifications: Approved manufacturer with roofing systems comparable to those specified for this Project, with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.
2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

#### 1.8 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 liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer.
  - 1. Protect stored liquid material from direct sunlight.
  - 2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
  - 1. Store in a dry location.
  - 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.

#### 1.9 PROJECT / FIELD CONDITIONS

Protect building, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.

- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- D. Daily Protection: In accordance with "Hot-Applied Roofing Membrane Installation, General" Article.

Owner will occupy portions of building immediately below roofing area. Conduct roofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

#### 1.10 WARRANTY

- A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.
  - 1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.
  3. Warranty Period: 20 years from date of completion.
- B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.
1. Inspections to occur in following years: 2, 5, 10 and 15 following completion.
- C. Installer Warranty: Installer's warranty signed by Installer, as follows.
1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.
  2. Scope of Warranty: Work of this Section.
  3. Warranty Period: 2 years from date of completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, [www.tremcoroofing.com](http://www.tremcoroofing.com) that are named in other Part 2 articles. Provide specified products.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
  2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" 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. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. Roofing system manufacturer's details and recommendations.
2. NRCA Roofing Manual for construction details and recommendations.
3. SMACNA Architectural Sheet Metal Manual for construction details.

Comply with requirements of Division 07 Section "Sheet Metal Flashing and Trim".

Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

## 2.3 MATERIALS, GENERAL

- A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

## 2.4 ROOF MEMBRANE MATERIALS

Base-Ply Sheet:

1. SBS-modified asphalt coated composite polyester/fiberglass/fiberglass mat reinforced high tensile strength base sheet, ASTM D4601 Type II.
  - a. Basis of design product: Tremco, BURmastic Composite Ply HT.
  - b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 165 lbf/in (725 N); Cross machine direction, 150 lbf/in (660 N).
  - c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 260 lbf (1150 N); Cross machine direction, 230 lbf (1120 N).
  - d. Thickness, minimum, ASTM D5147: 0.060 inch (1.5 mm).

Ply Sheet:

1. Asphalt and glass-fiber roofing ply sheet for hot-applied built-up roofing systems, ASTM D2178 Type IV.
  - a. Basis of design product: Tremco, THERMglass Type IV.
  - b. Net Dry Mass of asphalt impregnated glass felt, ASTM D146: 7.5 lb/100 sq ft (360 g/ sq m).
  - c. Breaking Strength, ASTM D146: 44 lbf/in (7.70 kN/m).
  - d. Pliability, 1/2 inch (13 mm), ASTM D146: Pass.

## 2.5 BASE FLASHING MATERIALS

### A. Elastomeric Flashing Sheet:

1. Flashing Sheet, Thermoset: Elastomeric polyester reinforced sheet with EPDM and SBR elastomers.
  - a. Basis of design product: Tremco, TRA Elastomeric Sheeting.
  - b. Breaking Strength, minimum, ASTM D751: Machine direction 350 lbf (1550 N); Cross machine direction 300 lbf (1330 N).
  - c. Tear Strength, minimum, ASTM D751: Machine direction 77 lbf (342 N); Cross machine direction 77 lbf (342 N).
  - d. Elongation at Failure, minimum, ASTM D751: Machine direction 30 percent; Cross-machine direction 35 percent.
  - e. Low Temperature Flexibility, minimum, ASTM D2136: -40 deg. F (-40 deg. C).
  - f. Thickness, minimum, ASTM D751: 0.045 inch (1.1 mm).
  - g. Color: Black.

## 2.6 HOT-APPLIED ADHESIVE MATERIALS

### A. Asphalt Primer:

1. Asphalt primer, low-odor, solvent-based.
  - a. Basis of design product: Tremco, TREMprime QD Low Odor.
  - b. Flash Point, minimum, ASTM D3278: 100 deg. F (38 deg. C).
  - c. Non-Volatile Content, ASTM D1644: 52 percent.

### Hot Roofing Asphalt:

1. Hot-melt asphalt adhesive, ASTM D312 Type III.
  - a. Basis of design product: Tremco, Premium III Adhesive.
  - b. Softening Point, min/max, ASTM D36: 195 – 205 deg. F (90 – 96 deg. C).
  - c. Ductility at 77 deg. F (25 deg. C), minimum, ASTM D113: 2.5 cm.
  - d. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D5: 15–30 dmm.
2. Hot-melt asphalt adhesive, SEBS-modified elastomeric, ASTM D6152.

- a. Basis of design product: Tremco, THERMastic 80 Adhesive.
- b. Softening Point, min/max, ASTM D36: 195-205 deg. F (90-95 deg. C).
- c. Flash point, minimum, ASTM D92: 525 deg. F (274 deg. C).
- d. Low Temperature Flexibility, maximum, ASTM D3111: 18 deg. F (-8 deg. C).
- e. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D412: 800 percent.
- f. Elastic Recovery, minimum, ASTM D412: 95 percent.

## 2.7 COLD-APPLIED ADHESIVE MATERIALS

General: Adhesive and sealant materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.

Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

Base Flashing Sheet Adhesive:

1. Bonding and Flashing Adhesive, SEBS/SIS modified asphalt, for elastomeric flashing membranes.
  - a. Basis of design product: Tremco, Sheeting Bond.
  - b. VOC, maximum, ASTM D3960: 250 g/L.
  - c. Adhesion in peel, minimum, ASTM D1876: 3 lbf/in (0.5 N/mm).
  - d. Lap shear adhesion, minimum, ASTM D816: 18 psi (124 kPa).
  - e. Color: White.

## 2.8 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
- B. Detailing Fabric:
  1. Woven Glass Fiber Mesh, Vinyl-Coated: Non-shrinking, non-rotting, vinyl-coated woven glass mesh for reinforcing flashing seams, membrane laps, and other roof system detailing.
    - a. Basis of design product: Tremco, BURmesh.
    - b. Tensile strength, 70 deg. F, min ASTM D146: Warp, 65 lbf/in (285 N); fill, 75 lbf/in (310 N).
    - c. Color: Aqua green.

Asphalt Roofing Cement:

1. Roof Cement, Asphalt-Based: ASTM D4586, Type II, Class I, fibrated roof cement formulated for use in installation and repair of asphalt ply and modified bitumen roofing plies and flashings; UL-classified for fire resistance.
  - a. Basis of design product: Tremco, ELS.
  - b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 190 g/L.
  - c. Non-Volatile Matter, ASTM D4586: 85 percent.
  - d. Resistance to sag ASTM D4586: 1/8 in. (3 mm).
2. Flashing Adhesive, Solvent-free: Single component, multipurpose elastomeric flashing adhesive and multipurpose roof mastic, specially formulated for use with specified roofing membranes and flashings, moisture curing, low odor.
  - a. Basis of design product: Tremco, Burmastic Flashing Adhesive MC.
  - b. Viscosity at 77 deg. F (25 deg. C), ASTM D2916: 260,000 cP (260 Pa\*s).
  - c. Density at 77 deg. F (25 deg. C), ASTM D1475: 8.2 lb/gal (982 kg/m<sup>3</sup>).
  - d. Lap Shear Adhesion at 77 deg. F (25 deg. C), minimum, ASTM D146: 77 lbf (104.4 Nm).
  - e. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 222 g/L.

D. Pitch Pocket Sealer:

1. Pitch Pocket Sealer: Urethane two-component, ASTM C920, Type M, Grade P, Class 12.5, Use O, fast setting, solvent-free, low-odor, formulated for compatibility and use with specified roofing membranes and flashings.
  - a. Basis of design product: Tremco, TremSEAL Pitch Pocket Sealer.
  - b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.
  - c. Hardness, Shore A, minimum ASTM C661: 40.

E. Stripping Reinforcing Fabric:

Same product as Detailing Fabric.

- F. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.
  - a. Basis of design product: Tremco, TremSEAL Pro.
  - b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.
  - c. Hardness, Shore A, ASTM C661: 40.
  - d. Adhesion to Concrete, ASTM C794: 35 pli.
  - e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).
  - f. Color: Aluminum Stone.

Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening built up roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.

1. Use fasteners of type listed in manufacturer's tested assembly for required wind uplift resistance.

Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

- I. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1- by 1/8- inch (25 by 3 mm) thick; with anchors.
- J. Roofing Granules: Roofing membrane manufacturer's standard ceramic-coated mineral roofing granules, No. 11 screen size with 100 percent passing.

Miscellaneous Accessories: Provide miscellaneous accessories recommended by built-up roofing manufacturer.

## 2.9 ROOF INSULATION AND INSULATION ACCESSORIES

- A. Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/8 inch per 12 inches (1:96) unless otherwise indicated.

Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.

- B. Roof Insulation:

1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.
  - a. Basis of design product: Tremco, Trisotech Insulation.
  - b. Compressive Strength, ASTM D1621: Grade 3: 25 psi (172 kPa).
  - c. Conditioned Thermal Resistance at 75 deg. F (24 deg. C): 14.4 at 2.5 inches (50.8 mm) thick.

C. Roof Insulation Cover Board:

1. Roof Protection Board: Multi-ply semi-rigid asphaltic protection board composed of a mineral-fortified asphaltic core molded between two asphalt-saturated fiberglass reinforcement mats; designed to be used as a protection layer between the insulation and membrane.
  - a. Basis of design product: Tremco, Tremboard AC.
  - b. Size: 4 by 5 ft (1200 by 1500 mm), 1/4 inch (6 mm) thick.
  - c. Puncture Strength: ASTM D6506; Not less than 97 lbf/ft (131.5 Nm).
  - d. Compression Strength: ASTM D6506; Not less than 3,500 psi (24,130 kPa).

Roof Insulation and Cover Board Adhesive:

1. Hot-melt asphalt adhesive, ASTM D312 Type III.
  - a. Basis of design product: Tremco, Premium III Adhesive.
  - b. Softening Point, min/max, ASTM D36: 195 – 205 deg. F (90 – 96 deg. C).
  - c. Ductility at 77 deg. F (25 deg. C), minimum, ASTM D113: 2.5 cm.
  - d. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D5: 15–30 dmm.

E. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

Wood Cant Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

G. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

H. Substrate Joint Tape: 6- or 8-inch- (150- or 200-mm-) wide, coated, glass-fiber joint tape.

## 2.10 SURFACING AND COATING MATERIALS

Hot-applied Surfacing Adhesive:

1. Hot-melt asphalt adhesive, SEBS-modified elastomeric, ASTM D6152.

- a. Basis of design product: Tremco, THERMastic 80 Adhesive.
- b. Softening Point, min/max, ASTM D36: 195-205 deg. F (90-95 deg. C).
- c. Flash point, minimum, ASTM D92: 525 deg. F (274 deg. C).
- d. Low Temperature Flexibility, maximum, ASTM D3111: 18 deg. F (-8 deg. C).
- e. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D412: 800 percent.
- f. Elastic Recovery, minimum, ASTM D412: 95 percent.

Aggregate Surfacing Material:

1. Aggregate Stone Surfacing: Clean, dry, opaque, water-worn or crushed stone, free of sharp edges.
  - a. Basis of design product: Aggregate Stone Surfacing.
  - b. Size, ASTM D 1863: No. 6 or 67.
  - c. Aggregate application rate, average: 400 lb/100 sq ft (19.5 k/m<sup>2</sup>).

C. Aluminized Flashing Coating Material:

1. Cold-Applied Reflective Aluminum Roof Coating: ASTM D2824 Type III metallic-pigmented, fibrated asphalt-based roof coating.
  - a. Basis of design product: Tremco, Alumanation 301.
  - b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 400 g/L.
  - c. Reflectance, minimum, ASTM C1549: 0.66 initial; 0.49 3-year aged.
  - d. Solids, percent by volume: 47.

2.11 WALKWAYS

A. Walkway Material:

1. Walkway pads, ceramic-granule-surfaced reinforced asphaltic composition slip-resisting pads, manufactured as a traffic pad for foot traffic, 1/2 inch (13 mm) thick minimum.
  - a. Basis of design product: Tremco, Trem-Tred.
  - b. Flexural Strength at max. load, minimum, ASTM C203: 218 psi (1.5 kPa).
  - c. Granule adhesion (weight loss), maximum, ASTM D4977: 1.1 gram.
  - d. Impact Resistance at 77 deg. F (25 deg. C), ASTM D3746: No Damage to Roof.

- e. Pad Size: 36 by 48 inch (914 by 1220 mm).

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
    - a. Verify that perimeter nailers for copings and roof edge flashings are securely fastened according to ANSI/SPRI/FM 4435/ES-1, and applicable code, to resist uplift pressures.

Verify that substrate is sound and dry.

Steel Roof Deck:

- a. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

Remove existing roofing and protect existing building in accordance with requirements of Division 07 Section "Preparation for Re-Roofing."

- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Protect existing roofing system that is indicated to remain, and adjacent portions of building and building equipment.
  - 1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
  - 2. Maintain temporary protection and leave in place until replacement roofing has been completed.

- E. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.
- F. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with roofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

### 3.3 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's written instructions, approved shop drawings, and Contract Documents.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.4 ROOFING INSTALLATION DETAILS

NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations; modify as required to comply with manufacturer's approved details.

### 3.5 INSULATION AND INSULATION ACCESSORIES INSTALLATION

- A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.
- B. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- C. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.

Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.

Where crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope..

- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

- 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inch (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

Flat Insulation System on Sloped Roof Deck: Install insulation at minimum thickness as follows:

- a. Minimum Continuous Insulation R-value: Not less than 20.

2. Tapered Insulation System for Flat Roof Deck: Install insulation as follows:

- a. Average Insulation R-value: Not less than 20.

Insulation Drain Sumps: Tapered insulation sumps, not less than 4 by 4 feet (1,200 by 1,200 mm), sloped to roof drain.

- a. Sump to maximum depth of not more than 1 inch (25 mm) less than the Project-stipulated continuous insulation thickness based upon code requirements.

Where Average Insulation R-value is permitted, maintain minimum 1 inch (25 mm) insulation thickness at low point.

- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

- H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

Insulation Installation Method:

1. Mechanically Fastened and Adhered Insulation Application Method: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

- a. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.

Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg. F (14 deg. C) of equiviscous temperature.

J. Cover Board Installation:

1. Comply with roofing system and cover board manufacturer's written installation instructions.
2. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.

- K. Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.

1. Apply hot roofing asphalt to substrate and immediately bond cover board to substrate.

### 3.6 HOT-APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:

Base-Ply Sheet: One.

- a. Adhering Method: Mopped.
2. Number of Ply Sheets: Three.
  - a. Adhering Method: Mopped.
3. Granular-Surfaced SBS-Modified Asphalt Cap Sheet:
  - a. Adhering Method: Mopped.

Roof Membrane Surfacing:

- a. Hot-applied surfacing adhesive with aggregate.
  - b. Aluminized coating.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in compatible roofing cement/mastic or hot roofing asphalt, with joints and edges sealed, weathertight.
    - a. Comply with roofing membrane manufacturer's instructions and details for waterstop/daily tie-in; utilize staggered layout and unadhered, removable "deadman" insulation boards.
  2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
  3. Remove temporary plugs from roof drains at end of each day.
  4. Remove and discard temporary seals before beginning work on adjoining roofing.

Hot Roofing Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt

within 25 deg. F (14 deg. C) of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.

- E. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

### 3.7 BUILT-UP ROOFING MEMBRANE INSTALLATION

- A. Prime surface of substrate with primer in accordance with roofing membrane manufacturer's written installation instructions and allow primer to dry.
- B. Install lapped modified bituminous roofing membrane [base-ply sheet], [ply sheet(s)], [and] [cap sheet] according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
  - 1. Before installing, unroll sheet materials, cut into workable lengths, and allow to lie flat for time period recommended by roofing membrane manufacturer for the ambient temperature at which sheet material will be installed.
  - 2. Install sheets in a shingle fashion, in direction to shed water.
  - 3. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.
  - 4. Install sheets without wrinkles or rears, and free from air pockets.
- C. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
  - 1. Repair tears and voids in laps and lapped seams not completely sealed.
- D. Apply rolling pressure to sheet materials in accordance with roofing membrane manufacturer's written installation instructions, to remove air pockets and to result in complete adhesion of roofing membrane to substrate.

### 3.8 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to built-up roofing manufacturer's written instructions and as follows:
  - 1. Extend base flashing up walls or parapets a distance of 8 - 12 inches (200 - 300 mm) above built-up roofing and 6 inches (150 mm) onto field of built-up roofing.
    - a. Comply with roofing manufacturer's details.
  - 2. Prime substrates with asphalt primer if required by built-up roofing manufacturer.

Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing manufacturer.

1. Flashing Sheet Top Termination: Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
  - a. Seal top termination of base flashing with a metal termination bar and a continuous bead of joint sealant.

Flashing Sheet Bottom Termination: Adhere flashing sheet to roofing membrane in a solid mopping of hot roofing asphalt.

- a. Bituminous Flashing: Seal bottom termination of base flashing by adhering to roofing membrane and stripping flashing to membrane joint.

Elastomeric Flashing Sheet: Seal vertical flashing joints. Seal bottom termination of base flashing by adhering to roofing membrane with cold-applied adhesive and sealing flashing-to-membrane joint with joint sealant.

- C. Install stripping, according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
- D. Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of compatible mastic/adhesive sealer, as recommended by roofing manufacturer, and extend onto roofing membrane. Apply number of courses recommended by manufacturer.
- E. Roof Drains: Set 30-by-30 inches (760-by-760 mm) metal flashing in bed of compatible mastic/adhesive sealer, as recommended by roofing manufacturer, on completed built-up roofing. Cover metal flashing with built-up roofing membrane cap-sheet stripping and extend a minimum of 6 inches (150 mm) beyond edge of metal flashing onto field of built-up roofing. Clamp built-up roofing, metal flashing, and stripping into roof-drain clamping ring.
  1. Install flashing sheet stripping according to roofing manufacturer's written instructions.

### 3.9 SURFACING AND COATING INSTALLATION

Hot-Applied Flood Coat and Aggregate Surfacing: Promptly after installing and testing roofing membrane, base flashing, and stripping, flood-coat roof surface with 60 lb/100 sq. ft. (3.0 kg/sq. m) of hot roofing asphalt. While flood coat is hot and fluid, cast the following average weight of aggregate in a uniform course:

1. While adhesive coating is fluid, cast aggregate surfacing in a uniform application at the average weight indicated in Part 2 product listing.
2. If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at a rate of 10 lb/100 sq. ft (0.5 kg/m<sup>2</sup>).

Aluminized Coating: Apply coating to base flashings, according to manufacturer's written instructions, with number of coats, thickness of application, and application method as recommended in writing by coating manufacturer.

### 3.10 WALKWAY INSTALLATION

A. Walkways, General: Install walkways according to roofing manufacturer's written instructions.

1. Install walkways at following locations:

Perimeter of each rooftop unit.

- b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
- c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
- d. Top and bottom of each roof access ladder.
- e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.

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

- 1. Sweep away loose aggregate surfacing.
- 2. Set walkway pads in manufacturer's recommended, compatible adhesive.
- 3. Provide 3-inch (75-mm) clearance between adjacent pads.

### 3.11 FIELD QUALITY CONTROL

Roofing Inspector: Contractor shall engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

- 1. Engage a qualified roofing inspector for a minimum of 3 full-time days on site, per 40-hour crew week, to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in NRCA's "Quality Control and Quality-assurance Guidelines for the Application of Membrane Roofing Systems."
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
  - 1. Notify Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

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

END OF SECTION 075113.11

## SECTION 075416 - KETONE ETHYLENE ESTER (KEE) ROOFING

### GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

Adhered thermoplastic KEE roofing system on concrete deck, including:

Base sheet (Anchor sheet).

3. Roof insulation.
4. Roof insulation cover board.

##### Related Sections:

1. Division 07 Section "Preparation for Re-Roofing" for removal of existing roofing; inspection, repair and replacement of existing deck/substrate, if required to receive new roofing.
2. Division 07 Section "Sheet Metal Flashing and Trim" for shop-formed sheet metal items including roof drainage system items, roof penetration flashings, base and counterflashings and reglets, and formed copings and roof edge metal items.

#### 1.2 DEFINITIONS

- ##### A. Roofing Terminology:
- Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" and NRCA's Glossary for definition of terms related to roofing work in this Section.

#### 1.3 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Roofing Conference:
- Conduct conference at Project site.

Meet with Owner, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review drawings and specifications.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.4 ACTION SUBMITTALS

Product Data: For each type of product indicated.

- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
  1. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastener spacings and patterns for mechanically fastened components.
  2. Base flashings and membrane terminations.
    - a. Indicate details meet requirements of NRCA and FM required by this Section.

Layout and thickness of insulation.

4. Tapered insulation layout, including slopes.
5. Crickets, saddles, and tapered edge strips, including slopes.
6. Membrane securement, fastening or adhesion requirements.

#### 1.5 INFORMATIONAL SUBMITTALS

Qualification Statements: For Installer.

1. Letter written for this Project indicating manufacturer approval of Installer.
- B. Warranties: Unexecuted sample copies of special warranties.

Manufacturer's Instructions: Submit copy of manufacturer's written installation instructions for specified roofing system.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.
- B. Executed copies of warranties.

## 1.7 QUALITY ASSURANCE

- A. **Installer Qualifications:** An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. **Manufacturer Qualifications:** Approved manufacturer with roofing systems comparable to that specified for this Project, with minimum five years' experience in manufacture of thermoplastic roof membrane products in successful use in similar applications.

**Roofing Inspector Qualifications:** A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

- 1. An authorized full-time technical employee of the manufacturer.
  - 2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.
- D. **Manufacturer's Installation Instructions:** Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

## 1.8 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 liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
  - 1. Protect stored liquid material from direct sunlight.
  - 2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
  - 1. Store in a dry location.
  - 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.

#### 1.9 PROJECT / FIELD CONDITIONS

Protect building, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.

- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - 1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed, weathertight.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
  - 3. Remove temporary plugs from roof drains at end of each day.
  - 4. Remove and discard temporary seals before beginning work on adjoining roofing.

Owner will occupy portions of building immediately below roofing area. Conduct roofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

#### 1.10 WARRANTY

- A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.
  - 1. Form of Warranty: Manufacturer's standard warranty form.
  - 2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.
  - 3. Warranty Period: 20 years from date of completion.
- B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10 and 15 following completion.
- C. Installer Warranty: Installer's warranty signed by Installer, as follows.
  1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.
  2. Scope of Warranty: Work of this Section.
  3. Warranty Period: 2 years from date of completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, [www.tremcoroofing.com](http://www.tremcoroofing.com) that are named in other Part 2 articles. Provide specified products.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
  1. Accelerated Weathering: Roofing system shall withstand 10,000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
  2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to ANSI/SPRI/FM 4435 ES-1, capable of resisting design pressures calculated in accordance with ASCE-7 and applicable code.

- C. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
  1. Roofing system manufacturer's details and recommendations.
  2. NRCA Roofing Manual for construction details and recommendations.
  3. SMACNA Architectural Sheet Metal Manual for construction details.

Comply with requirements of Division 07 Section "Sheet Metal Flashing and Trim".

Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

## 2.3 MATERIALS, GENERAL

- A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

## 2.4 BASE SHEET (ANCHOR SHEET) MATERIALS

Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft (0.16 kg/m<sup>2</sup>).

### B. Base Sheet (Anchor Sheet):

- 1. SBS-modified asphalt coated composite polyester/fiberglass/fiberglass mat reinforced high tensile strength base sheet, ASTM D4601 Type II.
  - a. Basis of design product: Tremco, BURmastic Composite Ply HT.
  - b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 165 lbf/in (725 N); Cross machine direction, 150 lbf/in (660 N).
  - c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 260 lbf (1150 N); Cross machine direction, 230 lbf (1120 N).
  - d. Thickness, minimum, ASTM D5147: 0.060 inch (1.5 mm).

## 2.5 THERMOPLASTIC MEMBRANE MATERIALS

### A. KEE Roof Membrane:

- 1. Thermoplastic Ketone Ethylene Ester (KEE) coated polyester fabric-reinforced sheet, ASTM D6754.
  - a. Basis of design product: Tremco, TremPly KEE Single Ply Roof Membrane.
  - b. Breaking Strength, minimum, ASTM D751: Machine direction, 500 lbf/in (87 kN/m); Cross machine direction, 400 lbf/in (70 kN/m).
  - c. Tear Strength, minimum, ASTM D751: Machine direction, 120 lbf (162 N/m); Cross machine direction, 140 lbf (190 N/m).
  - d. Elongation at Break, ASTM D751: 20 percent.
  - e. Dynamic Impact/Puncture Resistance, ASTM D5635: 30 J, minimum.
  - f. Minimum Membrane Thickness, nominal, less backing, ASTM D751: 60 mils (1.5 mm).

- g. Thickness over fiber, optical method: 0.016 inches (0.406).
- h. Accelerated Weathering, ASTM G155 and ASTM G154: Not greater than 15,000 hr., no cracking or crazing.
- i. Abrasion Resistance, ASTM D3389: Not greater than 2,000 cycles, H-18 wheel, 1,000 g load.
- j. Color: White.
- k. Solar Reflectance Index (SRI), ASTM E1980: 110 (White, initial), 86 (White, 3-yr aged).

## 2.6 BASE FLASHING MATERIALS

Sheet Flashing: Manufacturer's standard, smooth-backed, sheet flashing of same material, type, reinforcement, thickness and color as KEE roof membrane.

## 2.7 ADHESIVE MATERIALS

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

## 2.8 ASPHALT MATERIALS

- A. Hot-Applied Asphalt Adhesive:

- 1. Hot-melt asphalt adhesive, SEBS-modified elastomeric, ASTM D6152.
  - a. Basis of design product: Tremco, THERMastic 80 Adhesive.
  - b. Softening Point, min/max, ASTM D36: 195-205 deg. F (90-95 deg. C).
  - c. Flash point, minimum, ASTM D92: 525 deg. F (274 deg. C).
  - d. Low Temperature Flexibility, maximum, ASTM D3111: 18 deg. F (-8 deg. C).
  - e. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D412: 800 percent.
  - f. Elastic Recovery, minimum, ASTM D412: 95 percent.

Asphalt Primer:

- 1. [Click here to select asphalt primer.](#)

## 2.9 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

- B. Prefabricated Flashings: As recommended by roof membrane manufacturer, for pipe, penetration and miscellaneous flashings.

Fasteners, General: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FM 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

Metal Stress Plates: Manufacturer's standard AZ50 Galvalume-coated steel formed plates, 0.047 inch (1.19 mm) thick, with radial corners and membrane-engaging barbs engineered to enhance wind resistance for mechanically-attached KEE membrane roofing systems. FM approved.

1. Basis of design product: TremPly KEE Plus Stress Plates.
- E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch (25 mm wide by 1.3 mm) thick, prepunched.
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 mm by 3 mm) thick; with anchors.
- G. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.
  1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.
    - a. Basis of design product: Tremco, TremSEAL Pro.
    - b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.
    - c. Hardness, Shore A, ASTM C661: 40.
    - d. Adhesion to Concrete, ASTM C794: 35 pli.
    - e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).
    - f. Color: White.

- H. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories, as recommended by roofing system manufacturer.

## 2.10 ROOF INSULATION AND INSULATION ACCESSORIES

Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from insulation manufacturer's standard sizes, suitable for application, and of thicknesses indicated. Provide roof insulation accessories recommended by insulation manufacturer for intended use and compatible with roofing.

Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.

B. Roof Insulation:

1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.
  - a. Basis of design product: Tremco, Trisotech Insulation.
  - b. Compressive Strength, ASTM D1621: Grade 3: 25 psi (172 kPa).
  - c. Conditioned Thermal Resistance at 75 deg. F (24 deg. C): 14.4 at 2.5 inches (50.8 mm) thick.

C. Insulation Cover Board:

1. Roof Protection Board: Multi-ply semi-rigid asphaltic protection board composed of a mineral-fortified asphaltic core molded between two asphalt-saturated fiberglass reinforcement mats; designed to be used as a protection layer between the insulation and membrane.
  - a. Basis of design product: Tremco, Tremboard AC.
  - b. Size: 4 by 5 ft (1200 by 1500 mm), 1/4 inch (6 mm) thick.
  - c. Puncture Strength: ASTM D6506; Not less than 97 lbf/ft (131.5 Nm).
  - d. Compression Strength: ASTM D6506; Not less than 3,500 psi (24,130 kPa).

D. Roof Insulation Adhesive:

1. Hot-melt asphalt adhesive, ASTM D312 Type III.
  - a. Basis of design product: Tremco, Premium III Adhesive.
  - b. Softening Point, min/max, ASTM D36: 195 – 205 deg. F (90 – 96 deg. C).
  - c. Ductility at 77 deg. F (25 deg. C), minimum, ASTM D113: 2.5 cm.
  - d. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D5: 15–30 dmm.

E. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

Wood Cant Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

G. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

H. Substrate Joint Tape: 6- or 8-inch- (150- or 200-mm-) wide, coated, glass fiber.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
    - a. Verify that perimeter nailers for copings and roof edge flashings are securely fastened according to ANSI/SPRI/FM 4435 ES-1, and applicable code, to resist uplift pressures.

Verify that substrate is sound and dry.

- 4. Existing Concrete Roof Deck:
  - a. Verify that concrete substrate is visibly dry and free of moisture. Test for moisture according to ASTM F2659 or other recognized test method utilizing non-destructive, electronic moisture meter.

Verify adhesion of new roofing components to concrete.

- 5. Gypsum Roof Deck: Verify that deck is smooth and flush, secure to subpurlins and exhibits no cracks greater than 1/16 inch (1.6 mm), no damage, spalling or other signs of deterioration.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

Remove existing roofing and protect existing building in accordance with requirements of Division 07 Section "Preparation for Re-Roofing."

- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Protect existing roofing system that is indicated to remain, and adjacent portions of building and building equipment.
  - 1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

2. Maintain temporary protection and leave in place until replacement roofing has been completed.

- E. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

### 3.3 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's written instructions and approved details.

### 3.4 ROOFING INSTALLATION DETAILS

NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations; modify as required to comply with manufacturer's approved details and perimeter fastening requirements of FM references if applicable.

### 3.5 BASE SHEET (ANCHOR SHEET) INSTALLATION

Prime surface of substrate with primer in accordance with roofing membrane manufacturer's written installation instructions and allow primer to dry.

- B. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
  1. Adhere to substrate in a uniform solid mopping of hot asphalt.

### 3.6 INSULATION AND INSULATION ACCESSORIES INSTALLATION

- A. Comply with roofing manufacturer's and insulation manufacturer's written instructions for installing roof insulation.
- B. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.

Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.

Where crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope, not less than 1/4 inch in 12 inches (1:48).

- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
  1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

Flat Insulation System on Sloped Roof Deck: Install insulation at minimum thickness as follows:

- a. Minimum Continuous Insulation R-value: Not less than: Not less than 20.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

Insulation Installation Method:

- 1. Adhered Insulation Application Method: Install each layer of insulation and adhere to substrate as follows:
  - a. Prime substrate with primer as recommended by manufacturer and allow to dry.
  - b. Adhere insulation to resist uplift pressure at corners, perimeter, and field of roof.
- J. Cover Board Installation:
  - 1. Comply with roofing system and cover board manufacturer's written installation instructions.
  - 2. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
    - a. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - b. At internal roof drains, conform to slope of drain sump.
    - c. Trim cover board, so that water flow is unrestricted.
    - d. Cut and fit cover board tight to nailers, projections, and penetrations.
  - 3. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.

### 3.7 ADHERED MEMBRANE ROOFING INSTALLATION

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

Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Hot Asphalt Adhesive: Install roofing membrane sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
  - 1. Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg. F (218 deg. C).
- E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- G. Welded Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

### 3.8 BASE FLASHING INSTALLATION

- A. Membrane Flashings: Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
  - 1. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
  - 2. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
  - 3. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
  - 4. Seal top termination of base flashing with a metal termination bar and a continuous bead of joint sealant.
- B. Extend base flashing up walls or parapets a distance of 8-12 inches (200-300 mm) above roofing and 6 inches (150 mm) onto field of roofing, unless otherwise recommended by roofing manufacturer.

1. Comply with roofing manufacturer's details.

### 3.9 FIELD QUALITY CONTROL

Roofing Inspector: Contractor shall engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

1. Engage a qualified roofing inspector for a minimum of 3 full-time days on site, per 40-hour crew week, to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with applicable criteria established in NRCA's "Quality Control and Quality-assurance Guidelines for the Application of Membrane Roofing Systems."
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  1. Notify Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
  1. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.
- B. Correct deficiencies in or remove membrane roofing 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.

END OF SECTION 075416

## SECTION 076200.02 - SHEET METAL FLASHING AND TRIM

### GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Miscellaneous sheet metal flashing and trim.
  - a. Roof drainage sheet metal fabrications.
  - b. Low-slope roof sheet metal fabrications.

Related Requirements:

1. Division 07 roofing section for installing sheet metal flashing and trim integral with roofing and for related warranty requirements.

#### 1.2 ACTION SUBMITTALS

Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Include identification of material, thickness, weight, and finish for each item and location in Project.
3. Indicate details meet requirements of SMACNA and NRCA required by this Section.
4. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

#### 1.3 INFORMATIONAL SUBMITTALS

Contractor's Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435 ES-1 tested.

#### 1.4 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.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435 ES-1 tested; fabrication shop shall be listed as able to fabricate required details as tested and approved.

## 1.5 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Flashings and Fastening: Comply with requirements of Division 07 roofing sections. Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
  1. NRCA: "The NRCA Roofing Manual" for construction details and recommendations.

SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435 ES-1, to resist pressures calculated according to ASCE-7 and applicable code.

Manufacturer and install gutters that are used to secure perimeter edges of roof membrane on low-slope roof (less than 2:12 slope) built-up, modified bitumen, and single ply roofs tested in accordance with ANSI/SPRI GT-1, to resist wind loads.

- E. 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.

### 2.2 SHEET METALS

General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

Aluminum Sheet: ASTM B209/B209M, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

Basis of Design Product: Tremco, TremLock Sheet.

Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); with smooth, flat surface; prefinished by coil-coating process to comply with ASTM A755/A755M.

Basis of Design Product: Tremco, TremLock Sheet.

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Self-adhering, cold-applied, sheet underlayment, consisting of slip-resistant, woven polymer surface laminated to a modified bitumen adhesive compound, with silicon coated split-release film backing. Provide primer when recommended by underlayment manufacturer.

1. Basis of design product: Tremco, SA.
2. Nominal Thickness: 40 mils (1.0 mm).
3. Tensile Strength, ASTM D1970: MD- 80 lbs/in. (14 kN/m); XMD - 30 lbs/in. (10.5 kN/m).
4. Tear Resistance, ASTM D1970: MD - 60 lbf (267 kN/m); XMD - 40 lbf (178 kN/m).
5. Elongation, ASTM D1970: MD - 70 percent; XMD 60 percent.
6. Nail Sealability, ASTM D1970: Pass.
7. Thermal Stability, ASTM D1970: Pass; Stable after testing at 250 deg F (121 deg C).
8. Low Temperature Flexibility, ICC AC 48: Pass.
9. Permeance, maximum, ASTM E96: 0.03 perms; (1.72 ng/Pa x s x sq m).
10. Adhesion to Plywood, ASTM D903: 5 lbf at 40 deg F (0.04 kN/m at 4.4 deg C) , 12 lbf at 75 deg F (0.08 kN/m at 23.9 deg C).

## 2.4 MISCELLANEOUS MATERIALS

- A. General: 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.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
- b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.
- C. Butyl Sealant: Single-component, low VOC, permanently flexible butyl rubber mastic.
1. High-performance, low VOC, permanently flexible, synthetic rubber-based gun-grade mastic.
    - a. Basis of design product: Tremco, Water Block Sealant.
    - b. Basis of design: Tremco, Water Block Sealant.
    - c. VOC Content, maximum: 150 g/L.
    - d. Solids Content, minimum: 85 percent.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  2. Obtain field measurements for accurate fit before shop fabrication.
  3. Form sheet metal flashing and trim 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.
  4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) 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 (25 mm) deep, filled with butyl sealant concealed within joints.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- 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: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
  - 1. Fabricated Hanger Style: As selected from SMACNA Manual styles.
  - 2. Fabricate from the following materials:
    - a. Same material as gutter.
    - b. Aluminum: 0.050 inch (1.27 mm).
    - c. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.
- B. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
  - 1. Aluminum: 0.040 inch (1.02 mm) thick.

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2.4-m-) long, but not exceeding 12-feet- (3.6-m-) long sections. Shop fabricate interior and exterior corners.

- 1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed splice plate.

2. Fabricate from the Following Materials:
  - a. Aluminum: 0.040 inch (1.02 mm) thick.
  - b. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.
- B. Roof Edge Flashing (Drip Edge): Fabricate in minimum 96-inch- (2.4-m-) long, but not exceeding 12-feet- (3.6-m-) long sections. Shop fabricate interior and exterior corners.
  1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed splice plate.
  2. Fabricate from the Following Materials:
    - a. PVC/KEE Coated Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.

Cleats for Roof Edge Flashing and Copings:

1. Aluminum: 0.050 inch (1.27 mm) thick.
  2. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.034 inch/22 ga. (0.85 mm) thick.
- D. Flashing Receivers: Fabricate from the following materials:
  1. Aluminum: 0.040 inch (1.02 mm) thick.
  2. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.
- E. Roof-Penetration Flashing: Fabricate from the following materials:
  1. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: (0.71 mm) 0.028 inch/24 ga. thick.
  2. Copper: 20 oz/sq ft. (6.1 kg/m<sup>2</sup>); 0.027 in. (0.68 mm) thick.
  3. Lead: (19.53 kg/m<sup>2</sup>) 4 lb/sq. ft.; 0.0625 inch (1.6 mm) thick.

### PART 3 - EXECUTION

#### 3.1 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150

mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.2 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. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

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. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- 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. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg. F (4 and 21 deg. C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg. F (4 deg. C).

### 3.3 INSTALLATION OF ROOF-DRAINAGE SHEET METAL FABRICATIONS

General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

- B. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
  - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.

Provide elbows at base of downspout to direct water away from building.

- C. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper or gutter discharge.

### 3.4 INSTALLATION OF LOW-SLOPE ROOF 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. Roof Edge Flashing:
  - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435 ES-1.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

### 3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### 3.6 CLEANING AND PROTECTION

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

- B. Clean off excess sealants.

- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. 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.

END OF SECTION 076200.02