

**SECTION 07 54 19**  
**POLYVINYL-CHLORIDE (PVC) ROOFING**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete or edit text within //\_\_// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
2. Follow the recommendations of the National Roofing Contractors Association "Roofing and Waterproofing Manual" for design criteria.
3. Slopes: Do not use on slopes over 1:12 (one inch per foot) without providing gutters. Provide 1:50 (1/4 inch per foot) minimum slope to drains (no slopes between drains). NO EXCEPTIONS TO MINIMUM SLOPE. Slope crickets double the roof slope or minimum 1/2-inch per foot.
4. Coordinate with plumbing requirements for roof drains and drain locations at low points and mid span where maximum deflection occurs. Do not put drains at columns or on slopes. Coordinate with insulation to provide "dishes" at drains.
5. Coordinate details and systems used to provide for code required fire rated roofing system. Do not use unsurfaced membranes over combustible insulation on decks.
6. Use of adhered system is preferred over mechanically fastened for concrete substrates. Mechanically fastened systems are less expensive and have sustainable advantages by eliminating adhesives. Do not use PVC membrane for ballasted system.
7. Coordinate with Section 07 22 00, ROOF AND DECK INSULATION for roof insulation under the membrane. Increase "R" value 5 percent when mechanical fasteners are used through the insulation to compensate for parallel heat flow.
8. Do not use polystyrene, urethane, or wood fiberboard insulation under the membrane.
9. Do not use over bituminous materials where direct contact occurs, including grease, oil, or other substances not compatible with PVC. Use a thin layer of insulation, slip sheet or separator

- sheet depending upon method of attachment or felt back sheet when minimum amount of asphalt occurs.
10. Terminate base flashings not less than 200 mm (8 inches) above roof surface including curb for building expansion joints.
  11. Do not put expansion joints at roof surface level.
  12. Do not use "pitch pocket" or "sealant pocket" instead of base flashings and cap flashings.
  13. This specification is for use over concrete, cellular insulating concrete decks, or insulation. Insert additional text when installed directly to other decks or insulation systems not specified in Section 07 22 00, ROOF AND DECK INSULATION.

## **PART 1 - GENERAL**

### **1.1 DESCRIPTION**

- A. Polyvinyl Chloride (PVC) sheet roofing //adhered// //mechanically fastened// to roof deck.

### **1.2 RELATED WORK**

#### **SPEC WRITER NOTES:**

1. Edit Related Work to reflect other sections relating directly to this section or referenced in this section.
- A. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY
  - B. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
  - C. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
  - D. Roof hatches, equipment supports, dome type skylights, and gravity ventilators: Section 07 72 00, ROOF ACCESSORIES.
  - E. Miscellaneous items: Section 07 71 00, ROOF SPECIALTIES/ Section 07 72 00, ROOF ACCESSORIES.

### **1.3 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

#### **SPEC WRITER NOTES:**

1. Remove reference citations that do not remain in Part 2 or Part 3 of edited specification.



- G. FM Approvals: RoofNav Approved Roofing Assemblies and Products:
  - 4450-89                      Approved Standard for Class 1 Insulated Steel Deck Roofs
  - 4470-12                      Approved Standard for Class 1 Roof Coverings
  - 1-28-09                      Loss Prevention Data Sheet: Design Wind Loads.
  - 1-29-09                      Loss Prevention Data Sheet: Above-Deck Roof Components
  - 1-49-09                      Loss Prevention Data Sheet: Perimeter Flashing
- H. National Roofing Contractors Association: Roofing and Waterproofing Manual
- I. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, [www.biopreferred.gov](http://www.biopreferred.gov)
- J. U.S. Department of Energy (DoE): Roof Products Qualified Product List, [www.energystar.gov](http://www.energystar.gov)

**1.4 PERFORMANCE REQUIREMENTS**

- A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- B. General Performance: Installed 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. Roof system and flashings shall remain watertight.

1. Requirements in "Accelerated Weathering" and "Impact Resistance" subparagraphs below are required by the IBC for all roof coverings installed on roofs with slopes less than 2:12.

- 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
- 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272/D 4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

SPEC WRITER NOTES:

1. Retain one or more paragraphs below for typical roofing applications based upon current Federal mandates, which may include one or more of the following: 1) Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings incorporated in Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management, dated January 24, 2007; 2) Energy Policy Act of 2005 (EPA 2005); 3) Energy Independence and Security Act of 2007 (EISA 2007); 4) LEED mandate; 5) Conformance with locally-applicable requirements.

C. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that that have been successfully tested by a qualified independent testing and inspecting agency to meet the following requirements:

SPEC WRITER NOTES:

1. Retain paragraph below for roofs that must comply with DOE's ENERGY STAR requirements: [www.energystar.gov](http://www.energystar.gov).

1. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

SPEC WRITER NOTES:

1. Retain paragraph below for LEED project requirements; note that LEED Credit SS 7.2 is not geographic location specific.
2. Use of cool roof systems need to be examined for cold region climates.

2. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.

SPEC WRITER NOTES:

1. Retain paragraph below for roofs that must comply with California Energy Commission CEC-Title 24: [www.coolroofs.com](http://www.coolroofs.com).

3. Energy Performance, CRRC-1: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

SPEC WRITER NOTES:

1. Typically retain below for VA new construction and reroofing projects in ASHRAE Climate Zones 1 through 3 and elsewhere where cool roof technology is indicated as cost-effective. Also refer to Exceptions in ASHRAE 90.1 Appendix f that address ballasted, vegetated, and ventilated roofs.
4. Energy Performance, Aged: Provide roofing system with minimum three-year aged solar reflectance not less than 0.55 when tested in accordance with ASTM C1549 or ASTM E1918, and in addition, a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408.
- a. Where tested aged values are not available for proposed product, submit calculations to adjust initial solar reflectance to demonstrate compliance as indicated in ASHRAE 90.1-2010 Addendum f.
  - b. Alternatively, provide roofing system with minimum three-year aged Solar Reflectance Index of not less than 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft<sup>2</sup> (12 W/m<sup>2</sup>K).

#### **1.5 QUALITY CONTROL**

- A. Installer Qualifications:
1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
  2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.
- B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer 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 must be one of the following:
1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.

2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.

C. Product/Material Requirements:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.

D. Roofing System Design Standard Requirements:

1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
3. Recommendations of ANSI/SPRI ES-1 for roof edge design.

SPEC WRITER NOTES:

1. Retain paragraph below and enter required uplift pressures if roofing system is required to be designed per ASCE/SEI 7 by local building code.
4. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
- a. Corner Uplift Pressure: //\_\_\_ kPa/sq. m (\_\_\_ lbf/sq. ft.)//.
  - b. Perimeter Uplift Pressure: //\_\_\_ kPa/sq. m (\_\_\_ lbf/sq. ft.)//.
  - c. Field-of-Roof Uplift Pressure: //\_\_\_ kPa/sq. m (\_\_\_ lbf/sq. ft.)//.

SPEC WRITER NOTES:

1. Retain and edit FM 1.Approvals Listing requirement for VA facilities.
5. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

SPEC WRITER NOTES:

1. Select one option in first subparagraph below based on windstorm classification of Project. Utilize calculation based upon FM Approvals Loss Prevention Data Sheet 1-28 to

determine the number that establishes the minimum FM Approvals approval rating.

2. Verify availability of roofing systems that meet these classifications. Other options for classifications increase in increments of 15, e.g., Class 1A-135, 1A-150, 1A-165, and higher.
3. "Class 1A" signifies meeting ASTM E108, Class A fire performance for FMG-approved Class 1 roof coverings.
4. For areas having three or more hailstorms annually, FMG recommends roofing systems rated SH (severe hail) instead of MH (moderate hail).

a. Fire/Windstorm Classification: Class 1A-//60// //75// //90//  
//105// //120//; ASTM E108.

b. Hail Resistance: //MH// //SH//.

SPEC WRITER NOTES:

1. Consider retaining requirement below in addition to FM Approval Listing requirement above for high windstorm classification areas (1A-105 or greater) to allow for broader participation in bidding.

6. High Wind Zone Design Requirement: Contractor Option: Instead of FM Approval Listing windstorm classification, provide roofing membrane, base flashing, and component materials that comply with Miami-Dade County requirements.

E. Pre-Roofing Meeting:

1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and RE/COR.
2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
3. Inspect roof deck at this time to:
  - a. Verify that work of other trades which penetrates roof deck is completed.
  - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that

would prevent application of roofing system from commencing or cause a roof failure.

c. Examine samples and installation instructions of manufacturer.

#### **1.6 SUSTAINABILITY REQUIREMENTS**

A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project // local/regional materials, // low-emitting materials, // recycled content, // certified wood // \_\_\_\_\_// requirements.

##### **SPEC WRITER NOTES:**

1. Retain paragraph below when it is appropriate to incorporate Federal Guiding Principles IV from Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings incorporated in Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management, dated January 24, 2007, [www.ofee.gov/eo/eo13423\\_main.asp](http://www.ofee.gov/eo/eo13423_main.asp): Enhance Indoor Environmental Quality: Biobased Content Requirement. Requirement differs from related requirements in LEED definitions.
2. Project's General Requirements should indicate goals for percentages of bio-based, rapidly renewable, and certified sustainable wood products.

B. Biobased Material: For products designated by the USDA's BioPreferred® program, provide products that meet or exceed USDA recommendations for biobased content, subject to the products compliance with performance requirements in this Section. For more information regarding the product categories covered by the BioPreferred® program, visit <http://www.biopreferred.gov>.

C. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

#### **1.7 SUBMITTALS**

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.

B. Product Data:

1. Adhesive materials.
2. Membrane sheet roofing and flashing membrane.

3. Roofing cement.
4. Roof walkway.
5. Fastening requirements.
6. Application instructions.

C. Samples:

1. Nails and fasteners, each type.

D. Shop Drawings: Include plans, sections, details, and attachments.

1. Base flashings and terminations.

E. Certificates:

1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.

SPEC WRITER NOTES:

1. Retain paragraph below when retaining Miami-Dade County requirement under Quality Assurance article above.

2. Indicating compliance with Miami-Dade County requirements.

3. Indicating compliance with energy performance requirement.

F. Warranty: As specified.

G. Documentation of supervisors' and inspectors' qualifications.

H. Field reports of roofing inspector.

SPEC WRITER NOTES:

1. Retain paragraph below for reroofing projects.

I. Temporary protection plan. Include list of proposed temporary materials.

J. Contract Close-out Submittals:

1. Maintenance Manuals.
2. Warranty signed by installer and manufacturer.

**1.8 DELIVERY, STORAGE AND HANDLING**

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to single ply membrane roofing for storage, handling and installation.

**1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

**1.10 WARRANTY**

- A. Roofing work subject to the terms of the Article "Warranty of Construction," FAR clause 52.246-21, except extend the warranty period to //10// years.

**PART 2 - PRODUCTS****2.1 PVC SHEET ROOFING**

## SPEC WRITER NOTES:

1. Use fabric-backed sheet for adhered systems to cellular insulating concrete, structural concrete, or when re-roofing over other incompatible substrates where the manufacturer recommends a fabric backing for separation. Un-oxidized asphalt residue must be primed.
2. Use sheets without fabric backing when adhering to rigid insulation board cover boards.
3. Grey and custom colors are available for special applications but do not meet Federal cool roof mandates.
4. Do not use PVC sheet in ballasted applications. Type II or Type III are acceptable for adhered systems. Use only Type III for mechanically fastened applications.
5. Use adhered systems over cover boards on new VA construction unless other application is specifically approved by VA.

- A. ENERGY STAR Rated PVC Sheet: ASTM D4434, //Type II//Type III// //or// //Type IV//, fabric reinforced, 1.5 mm (60 mils) thick, //with no backing// //with fabric backing//.

1. Color: //White//.

**2.2 ACCESSORIES**

- A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
- B. Bonding Adhesive: Manufacturer's standard, water based.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.
- D. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 25 mm wide by 1.3 mm (1 inch wide by 0.05 inch) thick, pre-punched.

- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.
- F. Miscellaneous Accessories: Provide sealers, preformed flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories acceptable to manufacturer.

### 2.3 ADHESIVE AND SEALANT MATERIALS

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
  - 1. Liquid-type auxiliary materials must comply with VOC limits of authorities having jurisdiction.

#### SPEC WRITER NOTES:

- 1. Retain subparagraph below for low-emitting materials required for LEED-NC Credit EQ 4.1 or for general project sustainable design requirements. Below applies to all materials located to interior of weather-proof barrier.
- 2. Adhesives and sealants that are not on the exterior side of weather barrier must comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - a. Plastic Foam Adhesives: 50 g/L.
  - b. Gypsum Board and Panel Adhesives: 50 g/L.
  - c. Multipurpose Construction Adhesives: 70 g/L.
  - d. Fiberglass Adhesives: 80 g/L.
  - e. Single-Ply Roof Membrane Adhesives: 250 g/L.
  - f. Other Adhesives: 250 g/L.
  - g. PVC Welding Compounds: 510 g/L.
  - h. Adhesive Primer for Plastic: 650 g/L.
  - i. Single-Ply Roof Membrane Sealants: 450 g/L.
  - j. Non-membrane Roof Sealants: 300 g/L.
  - k. Sealant Primers for Nonporous Substrates: 250 g/L.
  - l. Sealant Primers for Porous Substrates: 775 g/L.

#### SPEC WRITER NOTES:

- 1. Use vapor barrier when specifying PVC in climate zones 4-8.
- 2. On non-nailable decks use 40 mil self-adhered vapor barrier; on steel decks

use 1/-inch cover board under the vapor barrier.

#### 2.4 VAPER BARRIER

- A. Self-healing, self-adhering vapor barrier acceptable by roofing manufacturer within roofing warranty.

#### 2.5 PVC WALK TREAD

- A. Scrim reinforced minimum 2.4 mm (0.096 inch) thickness PVC membrane with a textured surface, compatible with and supplied by manufacturer of the PVC roof membrane.

#### 2.6 ROOF PAVERS

##### SPEC WRITER NOTES:

1. Assure pavers are detailed showing size and shape.
2. Do not exceed 600 mm square (24 inches square) for non-interlocking units with approximate weight of 23 kg (50 pounds) each.
3. Interlocking pavers are preferred over non interlocking pavers.
4. Use interlocking type that has been tested in a wind tunnel for wind uplift meeting project requirements.
5. Do not use light weight aggregate pavers.
6. Extensive use of pavers is not appropriate for roof systems with solar reflective design requirements.

- A. Roof Pavers: Hydraulically pressed, concrete units, with top edges beveled, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C67; and as follows:

1. Minimum weight: 73 kg/m<sup>2</sup> (15 pounds per square foot).
2. Manufactured using normal weight aggregate.
3. Units of size, shape, and thickness as shown.
4. Ribbed on bottom surface or provided with legs approximately 6 mm (1/4 inch) high. Legs must distribute weight of paver so bearing does not exceed 69 kPa (10 psi) on the roofing membrane.
5. Configuration: //Non-Interlocking// //Interlocking//.

- B. Protection Mat: Minimum 200 gram/square m (6 ounce/square yard) ultraviolet resistant polypropylene, non-woven, needle punched fabric for use as protection mat under ballast system or as recommended and supplied by the roof membrane manufacturer.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.
- B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

**3.2 PREPARATION**

- A. Complete roof deck construction prior to commencing roofing work:
  - 1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.
  - 2. Complete deck and insulation to provide designed drainage to working roof drains.
  - 3. Document installation of related materials to be concealed prior to installing roofing work.
- B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.
- C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.
- D. Remove projections that might damage materials.
- E. Concrete Decks, except Insulating Concrete:
  - 1. Test concrete decks for moisture prior to application of roofing materials. Test for capillary moisture by plastic sheet method according to ASTM D4263.
  - 2. Prime concrete decks, including precast units, with primer as specified. Keep primer back four inches from joints in precast units.
  - 3. Allow primer to dry before application of bitumen.
- F. Insulating Concrete Decks:
  - 1. Allow to dry out for at least five days after installation before the placement of materials.
  - 2. If rain occurs during or at end of drying period or during installation of roofing, allow additional drying time before the placement of the roofing materials.
- G. Existing Membrane Roofs and Repair Areas:

1. Comply with requirements in Section 07 01 50.19, PREPARATION FOR REROOFING.
2. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur, or repairs are required.
3. Cut and remove existing roof membrane for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.
4. At modified bituminous base flashing to be repaired, bend up cap flashing or temporarily remove cap flashing. Brush and scrape away all deteriorated sheets or surface material of base flashing.

### **3.3 TEMPORARY PROTECTION**

- A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.
- B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.
- C. Provide for removal of water or drainage of water away from the work.
- D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by RE/COR, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

### **3.4 INSTALLATION, GENERAL**

- A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FM 4450 and FM 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

- B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations.
- C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.
- D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.
- E. Installation Conditions:
  - 1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
  - 2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
  - 3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:
    - a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
    - b. Apply materials to substrate having temperature of 4 deg. C (40 deg. F) and rising.

### **3.5 INSTALLATION OF PVC ROOFING**

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with PVC.
- B. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. Commence installation at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet.
- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as being rolled out and remove defective areas.
  - 1. Lap edges and ends of sheets 50 mm (two inches) or more as recommended by the manufacturer.
  - 2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434.
  - 3. Check seams to ensure continuous adhesion and correct defects.

4. Finish edges of laps with a continuous beveled bead of sealant to sheet edges to provide smooth transition, as required by manufacturer.
  5. Finish seams as the membrane is being installed (same day).
  6. Anchor perimeter to deck or wall as specified.
- F. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.
- G. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (four inches) beyond cut.
- H. Membrane Perimeter Anchorage:
1. Install metal fastening strip or screws and plates, at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated and in accordance with membrane manufacturer's instructions on top of roof membrane to deck or wall.
  2. Mechanically Fastened Metal Fastening Strip:
    - a. Set top of mechanical fastener set flush with top surface of the metal fastening strip. Space mechanical fasteners a maximum 300 mm (12 inches) on center starting 25 mm (one inch) from the end of the nailing strip.
    - b. When strips are cut round corners and eliminate sharp corners.
    - c. After mechanically fastening strip cover and seal strip with a six-inch wide roof membrane strip; heat weld to roof membrane; seal edges as required by manufacturer.
    - d. At roof edge metal, turn the membrane down over the front edge of the blocking or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; or, if required by the membrane manufacturer with fasteners spaced not over 300 mm (12 inches) on centers.
    - e. At parapet walls, intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 300 mm (12 inches) on centers or as shown on NRCA manual; make angle change securement within 4 inches of the angle change, on the wall or deck.
- I. Adhered System:
1. Apply adhesive in quantities required by roof membrane manufacturer.
  2. Fold sheet back on itself after rolling out and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.

3. After adhesive has set according to adhesive manufacturer's application instruction, roll the membrane into the adhesive in a manner that minimizes voids and wrinkles.
4. Repeat for another half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

J. Mechanically Attached System:

1. Secure the membrane to the structural deck with fasteners through stress plate or batten strips spaced and patterned in accordance with the membrane manufacturer's instructions to achieve specified wind uplift performance.
2. When fasteners are installed within the laps of adjoining sheets, position the fastener so that the stress plates are a minimum 13 mm (1/2)inch) from the edge of the sheets.
3. Where fasteners are installed over the membrane after the seams have been welded, cover the fasteners with a minimum 175 mm (7 inches) wide round PVC membrane cap centered over the fasteners. If batten strips are used cover the strip with a minimum 175 mm (7 inches) wide PVC strip centered over the batten. Heat weld to the roof membrane; finish edges with sealant as required by manufacturer.
4. Before installing fasteners into cast in place concrete, pre-drill the correct size hole into the deck. Drill the hole 9 mm (3/8 inch) deeper than the fastener penetration.

### 3.6 INSTALLATION OF FLASHING

- A. Install flashings as the membrane is being installed. If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.
- B. Flashing Roof Drains:

SPEC WRITER NOTES:

1. Ensure roof drain flashing details are shown with a sump to depress notched clamping ring below roof surface to minimize ponding water created by clamping ring.
  2. Offset drains in basin or dish to side of steel beams so drain is not above low point when roof slope terminates on top of beam.
1. Install roof drain flashing as recommended by the membrane manufacturer.

2. Turn down the metal drain flashing and PVC roof membrane into the drain body and install clamping ring and strainer; and install water cut-off mastic between the drain body and membrane to create a compression seal.

C. Installing PVC Base Flashing and Pipe Flashing:

SPEC WRITER NOTES:

1. See NRCA manual for PVC base flashing.
  2. Use with metal cap flashing.
  3. Use detail E when joint is 25 mm (1 inch) or less; DO NOT USE as a building expansion joint. Put expansion joint on curb.
  4. Coordinate with sheet metal work to provide metal cap flashing for base flashing on curbs and walls and penetrations.
  5. Use surface mounted type (NRCA manual) on existing walls.
  6. Use manufacturer supplied or approved, pre-manufactured, preformed pipe boots wherever possible.
  7. Do not terminate base flashing or membrane edge exposed on top of parapet walls or in reglets on horizontal or sloped wash surface. Terminate only under cap flashings or coping covers except gravel stops and for draw bands on pipe boots.
  8. Use 200 mm (8 inch) minimum height for base flashing.
1. Install PVC flashing membranes to pipes, wall or curbs to a height not less than eight-inches above roof surfaces and 100 mm (4 inches) on roof membrane.
    - a. Adhere flashing to pipe, wall or curb with adhesive.
    - b. Use manufacturer supplied or approved, pre-manufactured, preformed inside and outside boots wherever possible.
    - c. Lap ends not less than 100 mm (4 inches).
    - d. Heat weld or solvent weld flashing membranes together and flashing membranes to roof membranes; finish exposed edges with sealant as required by manufacturer.
    - e. Install flashing membranes in accordance with NRCA manual.
  2. Anchor top of flashing to walls or curbs with fasteners spaced not over 200 mm (eight inches) on centers. Use fastening strip on ducts. Use pipe clamps on pipes or other round penetrations.
  3. Apply sealant to top edge of flashing.

D. Installing Building Expansion Joints:

## SPEC WRITER NOTES:

1. Do not put expansion joints at roof membrane level.
  2. Design joints to be installed on curbs not less than 200 mm (8 inches) high especially at walls.
  3. Detail expansion joint.
1. Install base flashing on curbs as specified.
  2. Coordinate installation with metal expansion joint cover or roof expansion joint system.
  3. Install flexible tubing 1-1/2 times width of joint over joint. Cover tubing with PVC flashing strip adhered to base flashing and lapping base flashing 100 mm (4 inches). Finish edges of laps with sealants as specified.

## E. Repairs to Membrane and Flashings:

1. Remove sections of PVC sheet roofing or flashing that is creased wrinkled or fishmouthed.
2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Heat weld to roof membrane or flashing; finish edge of lap with sealant as required by manufacturer.

**3.7 FLEXIBLE WALKWAYS**

## SPEC WRITER NOTES:

1. Use manufacturer supplied or approved, pre-manufactured, preformed walk treads for walkways over roof areas which do not have paver walkways between equipment.
  2. Use manufacturer supplied or approved, pre-manufactured, preformed walk treads around equipment requiring servicing or having discharges detrimental to PVC and at doors for roofs.
  3. Clearly indicate on roof plan PVC walkways.
  4. When using concrete pavers for pads require manufacturer approved walk treads as protection under pavers. Indicate protection mat for larger plaza or ballast-type application.
- A. Heat weld walkway sheet to roof sheet at edges. Weld area 50 mm (2 inches) wide by the entire length of the walkway sheet.
  - B. Finish edges of laps with sealants as required by manufacturer.

**3.8 INSTALLATION OF PAVERS**

## SPEC WRITER NOTES:

1. Use pavers in the following locations as a minimum:
  - a. At working and access areas of equipment requiring servicing.
  - b. At equipment having discharges detrimental to roof membrane, under gooseneck discharges from kitchens and chemical exhausts.
  - c. At landing points for hatches, ladders, and doors entering roof level.
2. Show extent of walkways and pavers on roof plan.
3. Specify pavers and anchorage for pavers when weight of pavers does not meet the requirements for the wind velocities per FM TAB 1-29.
4. Pavers without interlocking connectors require strapping together and edge clamps when they do not provide the minimum weight per m<sup>2</sup> (square foot) for wind uplift resistance. See paragraph 3.2, D, 4.
5. Use mechanical strapping to create a perimeter anchor, at penetrations, cuts at valleys, over drains, and where partial or cut units occur.
6. Detail strapping, perimeter restraints, edge clamps and location of strapping. Do not anchor through base flashing.
7. Interlocking connectors:
  - a. Use 400 mm (16 inches) on center minimum spacing of connectors.
  - b. Decrease spacing to 300, 200, or 100 mm (12, 8, or 4 inches) on center for higher wind velocities.

A. Installation of Pavers:

1. Saw cut or core drill pavers for cut units.
2. Provide specified protection between paver and roof membrane.
3. Install pavers with butt joints in running bond with not less than one half-length unit at ends.
  - a. Stagger end joints; generally locate joints near midpoint of adjacent rows, except where end joints occur in valleys. Miter end joints to fit in valleys.
  - b. Cut to fit within 13 mm (1/2 inch) of penetrations.
4. Install interlocking connectors in channel units for complete tie in of units, including cut units. Use corner spacing for a distance of 1200 mm (4 feet) or more around roof drains, penetrations, and other vertical surfaces in the field of the roof area.

- a. Space connectors at \_\_\_\_\_ mm (inches) on center at the corners for 3 m (10 foot) square area.
  - b. Space connectors at \_\_\_\_\_ mm inches on center at the perimeter for 1800 mm (6 foot) wide strip.
  - c. Space connectors at \_\_\_\_\_ mm (inches) on center in the field.
  - d. Install pavers under the perimeter retainer as shown.
5. Install strapping where shown.
- a. Limit strap lengths to a maximum of 9 m (30 feet).
  - b. Install straps at corner connection to the perimeter retainer at approximate 45-degree angle at approximate 3 to 3.6 m (10 to 12 feet) from corner.
  - c. Install straps on each side of the valleys, hips, and ridges, with cross straps spaced not over 1200 mm (4 feet) on center between the end straps.
  - d. Install straps at the perimeter of the penetrations more than two paves in width or length.
  - e. Anchor straps to each paver with two fasteners per unit.
  - f. Pre-drill holes for fasteners in pavers.

### 3.9 PVC WALKWAYS

- A. Use manufacturer's standard walkway.
- B. Heat weld walkway treads to roof membrane as directed by the manufacturer.

### 3.10 FIELD QUALITY CONTROL

#### SPEC WRITER NOTES:

1. Select one or both of following two paragraphs based upon project requirements. VA may elect to perform or hire roofing inspector. VA may also elect to require contractor to retain roofing inspector, either as qualified representative of manufacturer or independent third-party inspector.
- A. Roofing Inspector: //Contractor must// engage a qualified roofing inspector for a minimum of //5// //7// //10// full-time days on site to perform roof tests and inspections and to prepare start up, interim, and final reports.
    1. Examine and probe seams in the membrane and flashing in the presence of RE/COR and Membrane Manufacturer's Inspector.

2. Probe edge of completed welded seams daily with a blunt tipped instrument. Use sufficient hand pressure to detect marginal welds, voids, skips, and fishmouths.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
  1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

**3.11 PROTECTING AND CLEANING**

- A. Protect membrane roofing system from damage and wear during remainder of construction period.
- 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 acceptance by Owner.
- C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

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