

SECTION 07 50 00
ROOFING
Design Standard

PART 1 GENERAL

1.1 LOW-SLOPED ROOF MEMBRANE SYSTEMS – POLYVINYL-CHLORIDE (PVC) ROOFING

- A. Roof membrane shall be Sika Sarnafil G410, ASTM D 4434, Type II, Grade I, glass fiber reinforced, felt backed.
 - 1. Thickness: 60 mils nominal
 - 2. Exposed Face Color: Energy Star white or tan
- B. Related Sections: County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.
- C. Roofing system shall be rated Class A in accordance with Underwriter's Laboratory (UL) 790.
- D. Roof covering shall be designed for wind loads in accordance with the California Building Code and ASCE 07.
- E. Thermoplastic single-ply membrane roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2-percent slope) in accordance with the California Building Code.
 - 1. Crickets and saddles shall be installed on the ridge side of any penetration greater than 24 inches wide.
- F. Roof drainage shall comply with the California Plumbing Code.
- G. Membrane shall have a solar reflective index of 95 in accordance with ASTM E1980, solar reflectance of 0.80 minimum in accordance with ASTM A1918, and solar emittance of 0.87 minimum in accordance with ASTM E408 and shall meet the standards of the State of California, Title 24.
- H. Membrane shall be adhered with manufacturer's standard VOC compliant adhesive.
- I. Thermoplastic membrane flashing shall be manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
 - 1. Design Option: Contrasting color for building identification number.
- J. Integrated Sheet Metal: Manufacturer's G90 hot dip galvanized steel with manufacturer's thermoplastic membrane laminated on one side.
 - 1. Color: To be selected by District from manufacturer's full range of colors.
- K. Walkway pads shall be Sarnatred V.

1. Contrasting color to that of roofing membrane.
 - L. Termination bars shall be manufacturer's standard, predrilled aluminum or stainless steel termination bars, approximately 1 by 1/8 inch thick; with anchors. Formed steel shall be pre-punched with holes every 1 inch on center to allow various fastener spacing options.
 - M. Penetration flashing shall be field fabricated boots fabricated tight to penetration.
 - N. Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane
 1. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than No. 24 galvanized sheet (G-90 minimum.)
 - a. Finishes shall be field painted or 2-coat fluoropolymer.
 2. Provide Type 304 stainless steel flashing in corrosive exposures.
 - O. Where wall cladding abuts roof areas provide two-piece reglet in counterflashing systems including wind clips and corner pieces.
 - P. Roof membrane and flashings shall be installed in accordance with manufacturer's recommendations and the recommendations of the National Roofing Contractors Association (NRCA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA.)
 - Q. Insulation: Where required for thermal resistance (R-Value); where roof slope is not provided by the structure; as secondary slope for crickets and saddles.
 1. Rigid insulation, tapered as required, shall be polyisocyanurate insulation with inorganic coated-glass facers, including tapered edge strips; ASTM C 1289, with a core density of 2.0 pcf, per ASTM D 1622.
 2. Pre-primed Cover Board: As top layer of insulation system and substrate for membrane adhesion.
 - a. Densdeck Prime: Glass mat gypsum panel with pre-primed surfaces on front and back; ASTM C 1177, with maximum flame-spread and smoke-developed indexes of 0, per ASTM E 84.
 - b. Thickness: 1/2-inch.
 - R. Rigid/tapered insulation shall be mechanically attached over nailable decks and adhered over non-nailable decks. Pre-primed cover board shall be adhered over rigid/tapered insulation.
 - S. Manufacturer's warranty shall be on manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system including components that fail in materials or workmanship within twenty (20) years.
- 1.2 LOW-SLOPED ROOF MEMBRANE SYSTEMS BELOW GARDEN ROOFS – POLYVINYL CHLORIDE (PVC) ROOFING
- A. Roof membrane shall be Sika Sarnafil G410, ASTM D 4434, Type II, Grade I, glass fiber reinforced, felt backed.

1. Thickness: 60 mils nominal
 2. Exposed Face Color: Energy Star white or tan where exposed beyond garden roof, if required.
- B. Approved Manufacturer Equals:
1. Fibertite
 2. Duro-Last
 - a. Design Note: Provide rolled goods not prefabricated system.
- C. Related Sections: County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.
- D. Include electronic leak detection system consisting of grounding screen below roof membrane for future leak detection. This system is required for manufacturer's 'Single Source' warranty.
- E. Manufacturer's standard drainage panel shall be installed over roofing membrane.
- F. Roofing system shall be rated Class A in accordance with Underwriter's Laboratory (UL) 790.
- G. Roof covering shall be designed for wind loads in accordance with the California Building Code and ASCE 07
- H. Thermoplastic single-ply membrane roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2-percent slope) in accordance with the California Building Code.
1. Crickets and saddles shall be installed on the ridge side of any penetration greater than 24 inches wide.
- I. Roof drainage shall comply with the California Plumbing Code.
- J. Membrane, where exposed beyond garden roof, shall have a solar reflective index of 95 in accordance with ASTM E1980, solar reflectance of 0.80 minimum in accordance with ASTM A1918, and solar emittance of 0.87 minimum in accordance with ASTM E408 and shall meet the standards of the State of California, Title 24.
- K. Membrane shall be adhered with manufacturer's standard VOC compliant adhesive.
- L. Thermoplastic membrane flashing shall be manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
- M. Integrated Sheet Metal: Manufacturer's G90 hot dip galvanized steel with manufacturer's thermoplastic membrane laminated on one side.
1. Color: To be selected by District from manufacturer's full range of colors.

- N. Termination bars shall be manufacturer's standard, predrilled aluminum or stainless steel termination bars, approximately 1 by 1/8 inch thick; with anchors. Formed steel shall be pre-punched with holes every 1 inch on center to allow various fastener spacing options.
- O. Penetration flashing shall be field fabricated boots fabricated tight to penetration.
- P. Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane
 - 1. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than No. 24 Type 304 stainless steel sheet.
- Q. Where wall cladding abuts roof areas provide two-piece reglet in counterflashing systems including wind clips and corner pieces.
- R. Provide PVC protection layer under pedestals where pavers are to be installed at perimeter and other locations around garden roof.
- S. Roof membrane and flashings shall be installed in accordance with manufacturer's recommendations and the recommendations of the National Roofing Contractors Association (NRCA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA.)
- T. Insulation: Where required for thermal resistance (R-Value); where roof slope is not provided by the structure; as secondary slope for crickets and saddles.
 - 1. Rigid insulation, tapered as required, shall be polyisocyanurate insulation with inorganic coated-glass facers, including tapered edge strips; ASTM C 1289, with a core density of 2.0 pcf, per ASTM D 1622.
 - 2. Pre-primed Cover Board: As top layer of insulation system and substrate for membrane adhesion.
 - a. Densdeck Prime: Glass mat gypsum panel with pre-primed surfaces on front and back; ASTM C 1177, with maximum flame-spread and smoke-developed indexes of 0, per ASTM E 84.
 - b. Thickness: 1/2-inch.
- U. Rigid/tapered insulation shall be mechanically attached over nailable decks and adhered over non-nailable decks. Pre-primed cover board shall be adhered over rigid/tapered insulation.
- V. Manufacturer's warranty shall be on manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system including components that fail in materials or workmanship within twenty (20) years. Warranty shall include removal and reinstallation of overburden and replacement of damaged overburden.

1.3 LOW-SLOPED ROOF MEMBRANE SYSTEMS – BUILT-UP ROOFING

- A. Manufacturer Basis of Design: Johns-Manville.
 - 1. Approved Equals:
 - a. GAF

b. Malarkey Roofing Products

- B. Related Sections: County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.
- C. Wind Uplift Performance: Provide assembly, including insulation and components, meeting wind uplift resistance for field, perimeter and corners in accordance with California Building Code and ASCE 07
- D. Roofing system shall be rated Class A in accordance with Underwriter's Laboratory (UL) 790.
- E. Built-up roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2-percent slope) in accordance with the California Building Code.
 - 1. Crickets and saddles shall be installed on the ridge side of any penetration greater than 24 inches wide.
- F. Roof drainage shall comply with the California Plumbing Code.
- G. Solar Reflectance Index (SRI): Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- H. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- I. Sheathing Paper: Red-rosin type, minimum 3 lb./100 sq. Ft.
- J. Base Sheet: permapply 28
- K. Ply Sheet: glaspoly Premier
- L. Cap Sheet: glaskap CR
- M. Walkway pads: AP-5140; APOC, or approved equal
- N. Flashings:
 - 1. Base Ply Sheet (over wood substrates): permapply 28
 - 2. Backer Sheet: glastite Flexible
 - 3. Flashing Surfacing Sheet: glaskap CR
- O. Roofing Asphalt: permamop; Trumbull Asphalt, No known equal.
 - 1. Design Note: Provide Permamop by Trumbull Asphalt regardless of manufacturer chosen.
- P. Ceramic Granules: #11 ceramic granules by 3M of color selected by Owner
- Q. Fasteners: Hot dipped galvanized by Maze Nails or equal.

- R. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, glass-fiber reinforced facer on both major surfaces.
- S. Cover Board: ASTM C 728, perlite board, 3/4 inch thick, seal coated.
 - 1. Fesco Board; Johns-Manville
- T. Nail base sheet and install insulation and cover board in hot asphalt.
- U. Ply Felts: Apply three plies of felts in a continuous operation in shingle fashion over the cover board with hot-moppings of bitumen. Maintain the specified number of plies of felt throughout the roofing.
- V. At slopes over 2:12 all sheets are to be strapped. Back nailing is to be in accordance with manufacturer's recommendations.
- W. Asphalt Mopping: Apply nominal 30 lb. Of asphalt per 100 square feet of ply – no more or less than 25 – 40 lb. Per square. Note: this requirement supersedes manufacturer's acceptable requirements. On slopes exceeding 1/2" x 12", apply nominal 22 lbs. Asphalt, no more than 28 lbs. Per square.
- X. Install two plies membrane and bitumen glaze coat for cut-off at end of each day's operation. Remove cut-off before resuming roofing.

If walls are taller than 24 inches, an independent wall covering system shall be installed. Wall covering shall consist of one base sheet, one reinforcing ply and one cap sheet ply. Lap wall covering system 4 inches over base flashing.
- Y. Manufacturer's warranty shall be on manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system including components that fail in materials or workmanship within twenty (20) years.
- Z. Design Option: Paint building identification number on cap sheet.

1.4 STEEP-SLOPED ROOF MEMBRANE SYSTEMS – METAL ROOFING

- A. Standing seam metal roof panels shall be spanseam by AEP span, vertical-rib, seamed-joint, zinc-coated (galvanized) steel sheet in compliance with ASTM E 1514.
 - 1. Thickness: 24 gauge nominal thickness
 - a. Designer Note: Verify with manufacturer that gauge is adequate for project spans
 - 2. Color: Owner selected.
 - 3. Exterior Finish: 2-coat fluoropolymer.
 - 4. Joint Type: Double folded.
 - 5. Panel Coverage: 16 inches, with ribs and striations.
- B. Related Sections: County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the

specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.

- C. Delegated Design: Require manufacturer to provide drawings stamped by California licensed Engineer.
- D. Panel clips shall be floating to accommodate thermal movement.
- E. Metal roofing shall not allow water penetration when tested according to ASTM E 2140.
- F. Metal roof panel assembly shall comply with UL 580 for wind-uplift-resistance class UL 90.
- G. Metal roofing shall have a solar reflectance index not less than 29 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency and shall meet the standards of the State of California, Title 24.
 - 1. Metal roof panels shall be listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for steep-slope roof products.
- H. Concealed panel sealants shall be butyl. Use butyl tape and gunnable butyl as recommended by the manufacturer.
- I. Exposed sealants shall be silicone as manufactured by Dow Corning or Momentive Performance Materials, Inc. Complying with ASTM C920.
- J. Metal roof panels shall be fastened to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
 - 1. Clips shall be installed to supports with self-tapping fasteners.
 - 2. Pressure plates shall be installed at locations indicated in manufacturer's written installation instructions.
 - 3. Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
- K. Underlayment shall be two layers of Grace Ultra high temperature self-adhering underlayment, polyethylene faced in compliance with ASTM D 1970.
 - 1. Primer shall be manufacturer's recommended primer for improved adhesion to substrates.
 - 2. Slip sheet shall be manufacturer's recommended slip sheet, of type required for application.
- L. Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, fillers, closure strips, and similar items. Match material and finish of metal roof panels.
- M. Insulated roof curbs shall be fabricated from same material as roof panels, minimum 24 gauge thick; with bottom of skirt profiled to match roof panel profiles, and welded top box and integral full-length cricket. Fabricate curb and sub-framing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.
- N. Flashing and trim shall be formed from same material as roof panels, prepainted with coil coating, minimum 24 gauge. Provide flashing and trim as required to seal against weather

and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Flashing and trim shall be finished to match adjacent metal roof panels.

- O. Manufacturer's warranty shall be on manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within twenty (20) years.
 - P. Manufacturer's special warranty on panel finishes shall be on manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within twenty (20) years.
- 1.5 STEEP-SLOPED ROOF MEMBRANCE SYSTEMS – POLYVINYL CHLORIDE (PVC) ROOFING WITH DECORATIVE RIBS SIMULATING STANDING SEAM METAL ROOFING
- A. Roof membrane shall be Sika Sarnafil G410, ASTM D 4434, Type II, Grade I, glass fiber reinforced, felt backed.
 - 1. Thickness: 60 mils nominal
 - 2. Exposed Face Color: As selected by the architect.
 - B. Related Sections: County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.
 - C. Roofing system shall be rated Class A in accordance with Underwriter's Laboratory (UL) 790.
 - D. Roof covering shall be designed for wind loads in accordance with the California Building Code and ASCE 07.
 - E. The use of decorative ribs is intended for steep-slope aesthetic, however it can be used on slopes down to and including of one-fourth unit vertical in 12 units horizontal (2-percent slope) in accordance with the California Building Code.
 - 1. Crickets and saddles shall be installed on the ridge side of any penetration greater than 24 inches wide.
 - F. Roof drainage shall comply with the California Plumbing Code.
 - G. Architect shall select color that conforms with Title 24 Energy Code requirements for steep sloped roofing as required.
 - H. Membrane shall be adhered with manufacturer's standard VOC compliant adhesive.
 - I. Thermoplastic membrane flashing shall be manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
 - J. Integrated Sheet Metal: Manufacturer's G90 hot dip galvanized steel with manufacturer's thermoplastic membrane laminated on one side.
 - 1. Color: To be selected by District from manufacturer's full range of colors.

- K. Termination bars shall be manufacturer's standard, predrilled aluminum or stainless steel termination bars, approximately 1 by 1/8 inch thick; with anchors. Formed steel shall be pre-punched with holes every 1 inch on center to allow various fastener spacing options.
- L. Penetration flashing shall be field fabricated boots fabricated tight to penetration.
- M. Manufacturer's warranty shall be on manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system including components that fail in materials or workmanship within twenty (20) years.
- N. Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane
 - 1. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than No. 24 galvanized sheet (G-90 minimum.)
 - a. Finishes shall be field painted or 2-coat fluoropolymer.
 - 2. Provide Type 304 stainless steel flashing in corrosive exposures.
- O. Where wall cladding abuts roof areas provide two-piece reglet in counterflashing systems including wind clips and corner pieces.
- P. Roof membrane and flashings shall be installed in accordance with manufacturer's recommendations and the recommendations of the National Roofing Contractors Association (NRCA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA.)
- Q. Insulation: Where required for thermal resistance (R-Value); where roof slope is not provided by the structure; as secondary slope for crickets and saddles.
 - 1. Rigid insulation, tapered as required, shall be polyisocyanurate insulation with inorganic coated-glass facers, including tapered edge strips; ASTM C 1289, with a core density of 2.0 pcf, per ASTM D 1622.
 - 2. Pre-primed Cover Board: As top layer of insulation system and substrate for membrane adhesion.
 - a. Densdeck Prime: Glass mat gypsum panel with pre-primed surfaces on front and back; ASTM C 1177, with maximum flame-spread and smoke-developed indexes of 0, per ASTM E 84.
 - b. Thickness: 1/2-inch
- R. Rigid/tapered insulation shall be mechanically attached over nailable decks and adhered over non-nailable decks. Pre-primed cover board shall be adhered over rigid/tapered insulation.

PART 2 PRODUCTS

2.1 Approved Manufacturer Equals:

- A. Fibertite
- B. Duro-Last

1. Design Note: Provide rolled goods not prefabricated system.

END OF SECTION