

# THERMOPLASTIC ROOFING

## SECTION 6 - PRIMARY MEMBRANE

### 6.1 GENERAL

- .1 Thermoplastic membrane designs can be categorized as a fully adhered, mechanically fastened, loose-laid ballasted and protected membrane.
- .2 For all designs the thermoplastic membrane shall be uniformly supported by an accepted substrate. The thermoplastic primary membrane shall be joined and sealed to the vapour retarder membrane extension at perimeters and penetrations.
- .3 Applications of fully adhered thermoplastic roofing systems must not be undertaken when the air temperature at roof level is colder than -18°C (0°F), with a wind velocity more than 14.5 km/h (9 mph) or equivalent wind chill of 1300. For cold weather applications, follow the thermoplastic membrane manufacturer's cold weather membrane seaming and application requirements.
- .4 Roofing systems components shall not be applied during periods of rain, snow or similar moisture conditions.
- .5 Remove or cover all bitumen based materials with an acceptable underlayment as thermoplastic membrane is not compatible with bitumen.
- .6 Membranes should be applied so the flow of water will not be against the laps.

### 6.2 DESIGN CONSIDERATIONS

- .1 When developing a thermoplastic membrane system design, the design authority shall take the following items into consideration.

#### 6.2.1 Drainage Provision

- .1 The Warranty Certificate does not warrant the roof drainage system.
- .2 The Warranty Certificate covers the watertight integrity of the primary membrane and the seal of the roof flashing components, e.g. to sheet metal flashing, drain or scupper flange. The design authority shall ensure that the drainage system is designed in accordance with the governing Plumbing and Building Code to provide positive drainage and accommodate a minimum roof drainage slope of 1:100 (1/8"/ft.).
- .3 Some isolated ponding water can be anticipated when drainage slope is provided.
- .4 ARCA Warranty Ltd. recommends that emergency or overflow drainage be incorporated into the roof drainage systems. The Warranty Certificate requires that emergency drainage be provided for designs using "flow control" type roof drains.
- .5 Splash pads shall be installed beneath drain outlets discharging water onto lower roofs.

## **6.2.2 Roof Slope**

- .1 For a loose-laid ballasted design, maximum roof slope shall not exceed 1:6 (2"/ft.)
- .2 For mechanically fastened designs, maximum roof slope shall not exceed 1:1.5 (18"/ft.)
- .3 For fully adhered designs, there are no roof slope restrictions.
- .4 For protected membrane and combination designs the minimum drainage slope is 1:50 (1/4"/ft.)
- .5 Installation of nailers may be required for insulated mechanically fastened designs. Please refer to the membrane manufacturer's recommendations for spacing and installation of nailers, when required.

## **6.2.3 Temporary Roofing**

- .1 When used for temporary roofs, thermoplastic membranes shall not be reused. Remove and dispose of the temporary membrane prior to the application of the permanent thermoplastic membrane.

## **6.3 THERMOPLASTIC ROOFING SYSTEMS COMPONENTS**

### **6.3.1 General**

- .1 To prevent moisture infiltration, membrane rolls shall be covered during shipment and storage out of doors.
- .2 Store membrane rolls so they are elevated and lying on their side, do not store rolls on end.
- .3 For Warranty Certificate issuance select the appropriate membrane system from the list of Accepted Thermoplastic Membrane Systems.

### **6.3.2 Polyvinyl Chloride (P.V.C.) Membrane**

- .1 P.V.C. membranes shall be reinforced and have a minimum nominal thickness of 1.2 mm (48 mil) and shall comply with the requirements of CGSB 37-GP-54M. All membrane components shall be from the same manufacturer.

### **6.3.3 Thermoplastic Olefin (T.P.O.) Membrane**

- .1 T.P.O. membranes shall be reinforced and shall have a minimum nominal thickness of 1.1 mm (45 mil). and shall comply with the requirements of ASTM D-6878. All membrane components shall be from the same membrane manufacturer.

### **6.3.4 Cleaners, Primers, Adhesives and Sealants**

- a) Membrane/Seam Cleaner
  - .1 The splice cleaners shall be a solvent-based cleaner as required by the membrane manufacturer to remove dust, dirt and other membrane contaminants prior to hot-air welding.

b) Perimeter Membrane Securement Strip

.1 The perimeter membrane securement shall be by continuous bars or screws and plates mechanically fastened to the vertical or horizontal substrate as approved by the membrane manufacturer.

c) Bonding Adhesive

.1 The bonding adhesive to adhere thermoplastic membranes to accepted substrates shall be approved by the membrane manufacturer.

.2 The bonding adhesive may be a water or solvent based adhesive.

### 6.3.5 Accessories

.1 Accessories used in the application of thermoplastic membranes shall be approved by the membrane manufacturer.

.2 Accessories include flashing materials, termination bars, pourable sealers, sheet metal edgings and walkways.

### 6.3.6 Ballast

.1 For loose-laid and protected membrane designs, the minimum ballast mass shall be 50 kg/m<sup>2</sup> (10 P.S.F.) evenly distributed over the field of the primary membrane.

.2 The ballast may be comprised of crushed or river rounded gravel or concrete pavers.

.3 Gravel ballast must be relatively free of dust and other foreign matter and of a size recommended by the membrane manufacturer.

.4 When the ballast is comprised of crushed gravel, a protective fabric approved by the membrane manufacturer shall completely cover the primary membrane prior to ballast placement.

.5 Concrete paver ballast shall be installed in accordance with the membrane manufacturer's application requirements and must not be placed directly on the surface of the unprotected primary membrane.

.6 **Cautionary Note:**

When designing ballast requirements, interior building air pressure and external environmental conditions can cause excess forces on loose-laid designs.

ARCA Warranty Ltd. recommends that the design incorporate the standards identified in "Wind Design Guide Ballasted Single-Ply Roofing Systems" produced by the Rubber Manufacturer's Association and the Single Ply Roofing Institute (SPRI) and "A Guide for the Wind Design of Mechanically Attached Flexible Membrane Roofs" published by the Institute for Research in Construction, National Research Council of Canada.

## 6.4 INSTALLATION

### 6.4.1 Loose-laid Ballasted P.V.C. Membrane Design

- .1 Loose-laid designs shall be comprised of minimum 1.5 mm (60 mil) thick fiberglass reinforced P.V.C. membrane loose-laid over a supporting substrate and retained in place with ballast.
- .2 For insulated systems, an ARCA Warranty Ltd. approved insulation may be loose-laid over the vapour retarder.
- .3 A separator is required between polystyrene insulation and the P.V.C. membrane.
- .4 Membrane rolls shall be positioned over the substrate and aligned before seaming. Adjoining sheets shall be overlapped a minimum distance of 75 mm (3") to facilitate seaming. Allow membrane to relax for a minimum of thirty (30) minutes before seaming.
- .5 Continuous perimeter membrane securement shall be installed along roof perimeter and roof penetrations mechanically fastened to the vertical or horizontal substrate as recommended by the membrane manufacturer.
- .6 Field membrane seams must be completed as the work progresses (daily).
- .7 Ballast shall be applied at a minimum rate of 50 kg/m<sup>2</sup> (10 P.S.F.) over the field of the membrane as the application progresses.

**NOTE:** *The Design Authority shall ensure sufficient ballast mass is selected to prevent blow-off of the loose-laid roofing system or collapse of the structure.*

### 6.4.2 Fully Adhered P.V.C. Membrane Design

- .1 Adhered designs may be comprised of minimum 1.2 mm (48 mil) thick fiberglass reinforced P.V.C. membrane uniformly adhered to a supporting substrate with bonding adhesive and mechanically fastened along perimeter and penetrations. Consult with the membrane manufacturer for specific requirements for adhesive type and application rates for each accepted substrate or deck type.
- .2 For insulated systems, an ARCA Warranty Ltd. approved insulation shall be mechanically fastened to the decking or adhered to a vapour retarder bonded to the roof deck.
- .3 Maximum 3000 mm (10 ft.) wide P.V.C. membrane rolls shall be positioned over the substrate, aligned and the exposed field membrane allowed to relax for a minimum of thirty (30) minutes prior to seaming. To permit seaming adjoining sheets must be overlapped a minimum distance of 75 mm (3").
- .4 The membrane sheet shall be pulled back on itself to expose approximately one half of its underside.
- .5 The back surface of the membrane and the top surface of the substrate must be cleaned to remove any accumulated dirt and debris.

- .6 Bonding adhesive shall be applied to the back of the P.V.C. membrane and to the top surface of the exposed substrate taking care not to coat the seam mating surfaces. Bonding adhesive must be allowed to flash off for proper adhesion.
- .7 When the bonding adhesive has flashed off, the coated membrane shall be rolled into the adhesive coated substrate, taking care to minimize membrane wrinkling and ridging.
- .8 The balance of the P.V.C. membrane sheet shall be bonded using a similar process.
- .9 The bonded membrane shall be rolled with a weighted roller to ensure adhesion with its supporting substrate.
- .10 After bonding, the primary membrane shall be mechanically fastened along the perimeter, at roof penetrations and at roof slope elevation changes exceeding 1:6 (2"/ft.).
- .11 Membrane field seams shall be completed as the work progresses.

#### **6.4.3 Fully Adhered T.P.O. Membrane Design**

- .1 Adhered designs may be comprised of minimum 1.2 mm (48 mil) thick reinforced T.P.O. membrane uniformly adhered to a supporting substrate with bonding adhesive and mechanically fastened along perimeter and penetrations. Consult with the membrane manufacturer for specific requirements for adhesive type and application rates for each accepted substrate or deck type.
- .2 For insulated systems, an ARCA Warranty Ltd. approved insulation shall be mechanically fastened to the decking or adhered to a vapour retarder bonded to the roof deck.
- .3 Maximum 3.66 meter (12 ft.) wide T.P.O. membrane rolls shall be positioned over the substrate and aligned parallel with roof perimeter. Seaming adjoining sheets must be overlapped a minimum distance of 50 mm (2") to provide for a minimum 38 mm (1.5") heat weld.
- .4 The membrane sheet shall be pulled back on itself to expose approximately one half of its underside.
- .5 The back surface of the membrane and the top surface of the substrate must be cleaned to remove any accumulated dirt and debris.
- .6 Bonding adhesive shall be applied to the back of the T.P.O. membrane and to the top surface of the exposed substrate taking care not to coat the seam mating surfaces. Bonding adhesive must be allowed to flash off until it is tacky but not stringy to a dry finger touch for proper adhesion.
- .7 When the bonding adhesive has flashed off, the coated membrane shall be rolled into the adhesive coated substrate, taking care to minimize membrane wrinkling and ridging.
- .8 The balance of the T.P.O. membrane sheet shall be bonded using a similar process.
- .9 The bonded membrane shall be brushed down with a soft bristle push broom to ensure adhesion with its supporting substrate.

<p>Added December 1, 2011</p>
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- .10 After bonding, the primary membrane shall be mechanically fastened along the perimeter, at roof penetrations and at roof slope elevation changes exceeding 1:6 (2"/ft.).
- .11 Membrane field seams shall be completed as the work progresses

#### **6.4.4 Mechanically Fastened P.V.C. and T.P.O. Membrane Design**

- .1 Mechanically fastened designs shall be comprised of minimum 1.2 mm (48 mil) thick polyester reinforced P.V.C. or 1.1 mm (45 mil) thick T.P.O. membrane mechanically fastened in the lap with fasteners approved by the membrane manufacturer. Consult with the membrane manufacturer for the specific membrane securement configuration options.
- .2 For insulated systems, an ARCA Warranty Ltd. approved insulation shall be mechanically fastened over the vapour retarder.
- .3 A separator sheet is required between polystyrene insulation and a P.V.C. membrane.
- .4 A separator sheet is not required between polystyrene insulation and a T.P.O. membrane.
- .5 Maximum 3000 mm (10 ft.) wide P.V.C. or 3650 mm (12 ft.) wide T.P.O. membrane rolls shall be positioned over the substrate, aligned and the exposed field membrane allowed to relax for a minimum of thirty (30) minutes prior to fastening and seaming. Adjoining sheets shall be overlapped a minimum distance of 150 mm (6") to facilitate mechanical fastening and seaming.
- .6 The bottom primary membrane sheet shall be mechanically fastened along the centre of the membrane splice, using fasteners and fastener plates approved by the membrane manufacturer. Fastener types and spacing shall be determined by the design authority for site conditions, such as deck type, building height and wind load.
- .7 Membrane field seams must be completed as the work progresses (daily).

Added April 4, 2007

### **6.5 SEAMING**

#### **6.5.1 General**

- .1 Membrane field seams may be welded with an approved hand held or a self propelled hot air electric welder. Maintain a minimum 38 mm (1.5") continuous weld width unless otherwise approved by the membrane manufacturer.
- .2 During membrane seaming, conduct periodic membrane weld tests to ensure automatic hot air welding equipment is properly adjusted for the weather conditions.
- .3 Welding and testing of field membrane seams must be completed on a daily basis.
- .4 The membrane mating surface shall be cleaned with a damp cloth to remove accumulated dust or dirt and allowed to dry.
- .5 Heavily contaminated membrane mating surfaces shall be cleaned with the appropriate cleaner. Ensure mating surfaces are free of any adhesive prior to welding.
- .6 Completed seams shall be checked for voids and lack of seal by running a rounded screw driver (probe) along the exposed edge of the seam. Any voids or gaps shall be re-welded.

- .7 The cut edge of reinforced membrane seams and flashings shall be continuously sealed with an approved lap sealant, if required by the membrane manufacturer.

#### **6.5.2 Hand Held Welding Method**

- .1 Membranes shall be aligned to form a minimum 75 mm (3") wide overlap, free from folds and wrinkles.
- .2 The seam mating surfaces shall be bonded together with a continuous primary weld, completed with a hand held heat gun, along the back edge of the seam.
- .3 The remaining seam shall be sealed with the heat gun and hand roller ensuring a small bead of molten material flows along the outer edge of the secondary weld.

#### **6.5.3 Machine Welding Method**

- .1 Membrane sheets shall be aligned to form a minimum 75 mm (3") wide lap free from folds and wrinkles.
- .2 The automated welder shall be aligned with the lap edge to continuously weld membrane mating surfaces ensuring that a small bleed out of molten material is observed along the exposed edge of the completed seam.

#### **6.5.4 Membrane Overlaps and "T" Joints Junctions**

- .1 Membrane splice overlaps and membrane "T" joint junctions shall be covered with a minimum 150 x 150 mm (6" x 6") square of heat welded thermoplastic membrane as required by the membrane manufacturer.

### **6.6 MEMBRANE LOAD PROTECTION**

- .1 Under no circumstance shall any equipment load be supported directly on the surface of an unprotected primary membrane.
- .2 For roof mounted equipment exceeding 91 kg (200 lbs.) in mass or when roof loads exceed 5 kPa (105 P.S.F.) they shall be supported on minimum 200 mm (8") high curbs, sleepers or pedestals attached to the structure or decking. Roof mounted equipment includes antennae, signs, service lines, skylights, hatches and walkways. For new construction where H.V.A.C. equipment is supported by pedestals, a minimum clearance of 762 mm (30") shall be provided beneath the equipment to permit installation of the roofing system. Equipment supports shall be designed by a structural engineer and shall conform to the Alberta Building Code.
- .3 Equipment loads 91 kg (200 lbs.) or less in mass may be supported by free floating sleepers or support pads, loose laid over the roofing system. Free floating sleepers shall be pressure preservative treated wood, precast concrete, metal or specialty product. Free floating sleepers or pads shall be placed on a minimum 25 mm (1") thick layer of Type 4 insulation attached to the base of the supports without the use of mechanical fasteners. A ply of thermoplastic membrane applied to the primary membrane may be substituted for the Type 4 insulation protection layer.

- .4 When guy wires are used to anchor roof mounted equipment their anchorage points shall be waterproofed with 200 mm (8") high curbs or with gum boxes.
- .5 H.V.A.C. units, skylights and hatches shall be supported by insulated metal or wooden curbs supported by and fastened to the structural deck, extending a minimum distance of 200 mm (8") above the surface of the roofing system measured at the highest point.
- .6 To protect the primary membrane from concrete paver and/or walkway damage, a minimum 25 mm (1") thick layer of Type 4 insulation shall be placed between the walkway/pavers and the thermoplastic membrane surface. Place the Type 4 insulation so that the roof drainage is free to flow under the pavers/walkway.

## **ACCEPTED THERMOPLASTIC MEMBRANE SYSTEMS**

### **6.7.1 Polyvinyl Chloride (P.V.C.) Membrane**

- .1 Sika Sarnafil Inc.**
  - a) Fully Adhered
  - b) Loose-laid Ballasted
  - c) Mechanically Fastened
  - d) Protected Membrane
- .2 Carlisle SynTec Canada**  
Sure-Flex Polyester Reinforced PVC Membrane
  - a) Fully Adhered
  - b) Mechanically Fastened

Added  
March  
2011

### **6.7.2 Thermoplastic Olefin (T.P.O.) Membrane**

- .1 Carlisle SynTec Canada**
  - a) Fully Adhered
  - b) Mechanically Fastened
- .2 GenFlex Roofing Systems, L.L.C.**
  - a) Fully Adhered
  - b) Mechanically Fastened
- .3 Firestone Building Products Canada**
  - a) Fully Adhered
  - b) Mechanically Fastened

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2010