

# BUILT-UP ROOFING

## SECTION 9 - PROTECTED MEMBRANE & COMBINATION DESIGNS

### 9.1 GENERAL

- .1 A protected membrane roofing design is an insulated and ballasted roofing system in which the primary insulation is applied above the membrane and retained in place by ballast.
- .2 A combination roofing assembly is comprised of a conventional insulated membrane system where the primary membrane is covered with insulation held in place with ballast.
- .3 Protected membrane and combination designs do not require back nailing of the primary membrane plies for roof slopes 1:8 (1 1/2"/ft.) and greater.

### 9.2 DRAINAGE

- .1 For protected membrane and combination designs the drainage slope shall be a minimum 1:50 (1/4"/ft.).
- .2 The maximum roof slope is restricted to 1:6 (2"/ft.).
- .3 When flow control drains are incorporated into the roof drainage system, membrane level scuppers shall be provided at the roof perimeter as emergency drainage. Roof drains and scuppers must have gravel screens installed when gravel ballast is specified. Drainage openings are not permitted through expansion joints.

### 9.3 PENETRATIONS AND PERIMETER HEIGHTS

- .1 Except for roof drain and pedestal fall protection roof anchors, all membrane penetrations shall be contained within or supported by a curb secured to the structure or decking
- .2 Roof parapets, roof/wall junctions and membrane penetrations including curbs, area dividers, equipment supports and pedestal fall protection anchors shall extend a minimum distance of 200mm (8") above the surface of the insulation when using gravel ballast or above the surface of concrete pavers and concrete topped insulation when they form the ballast.
- .3 Deck level pedestal fall protection roof anchors may be waterproofed with an ARCA Warranty Ltd. approved one-piece manufactured metal specialty flashings. The one-piece metal specialty flashing shall incorporate a minimum 75mm (3") wide integral flange. The flashing flange shall be mechanically fastened to the structure or decking over the primary membrane prior to the application of the membrane flashing.
- .4 Roof area dividers are not required for protected membrane designs.

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### 9.4 MEMBRANE FLASHING

- .1 A minimum of three (3) plies of organic felt membrane flashing, adhered in applications of hot bitumen, and shall be installed at internal roof drains, parapet, curb and wall junctions. For alternate membrane flashing types refer to Section 7, Built - Up Roofing Membrane Flashings.

- .2 When gravel ballast is specified, the vertical extension of the membrane flashing shall terminate a minimum vertical distance of 200mm (8") above the surface of the primary insulation.
- .3 For concrete pavers or concrete topped insulation systems, the vertical extension of the membrane flashing shall terminate a minimum distance of 200mm (8") above the top of the concrete surface.

#### **9.5 Bitumen Flood coat**

- .1 A bitumen flood coat shall serve as a barrier against moisture infiltration and shall completely cover the field of finished primary membrane.
- .2 The bitumen flood coat shall be applied in two (2) separate applications for a minimum combined bitumen mass of 3 kg/m<sup>2</sup> (0.6 lb/ft<sup>2</sup>).

#### **9.6 SEPARATOR SHEETS**

- .1 When set, the bitumen floodcoat shall be completely covered with a minimum of two (2) mil thick loose-laid polyethylene separator prior to application of the Type 4 primary insulation. The polyethylene separator prevents the insulation from bonding to the bitumen floodcoat.
- .2 Separator sheets, including filter fabric, shall have minimum 300mm (12") wide side and end laps.
- .3 At perimeters, curbs and wall junctions the separator sheet shall extend to the surface of the primary insulation.
- .4 When gravel ballast is specified, a loose-laid filter fabric shall completely cover the surface of the Type 4 primary insulation.
- .5 When concrete paver ballast is specified, the use of a filter fabric is optional.

#### **9.7 INSULATION**

- .1 The roof insulation shall be Type 4 extruded polystyrene insulation loose-laid over a polyethylene separator sheet. The insulation provides ultraviolet light protection for the bitumen, as well as the thermal resistance for the roofing system.
- .2 Roof insulation 100mm (4") thick and less shall be installed in a single layer.
- .3 For multi-layer insulation applications, the base layer of insulation boards shall not be less than 100mm (4") thick.. When using more than one insulation layer, the board joints shall be offset a minimum distance of 300mm (12") from the joints of the previous insulation layer.

#### **9.8 BALLAST**

- .1 Poured-in-place concrete topping ballast is not accepted for Warranty Certificate issuance.
- .2 The ballast may be comprised of rock, concrete pavers or a concrete topped Type 4 insulation system.

- .3 Gravel (rock) ballast must be relatively free of fines and other foreign matter and shall contain gravel sizes between 19mm (3/4") and 37.5mm (1 1/2") in diameter.
- .4 A minimum ballast mass of 50 kg/m<sup>2</sup> (10 lbs/ft.<sup>2</sup>) is recommended over the field of the filter fabric and loose-laid insulation system. With the minimum gravel ballast mass, the filter fabric may be visible. For thick insulation layers, consult with the insulation manufacturer for ballasting requirements.
- .5 For concrete paver ballast, the weight of individual pavers shall not exceed 45 kg (100 lbs.) in mass. When using a paver ballast system, the pavers shall be elevated above the insulation to provide an air space between the paver and the primary insulation. Pedestals or insulation strips shall be employed to elevate the concrete pavers above the surface of the Type 4 insulation boards. Paver ballast shall not be placed on a bedding medium.
- .6 An interlocking concrete topped insulation system may be substituted for concrete paver or gravel ballast. A perimeter securement system, designed by the insulation manufacturer, is critical to the successful performance of the roofing system. The system shall be designed to ensure insulation boards are not displaced during anticipated wind loads. The building owner is responsible for the periodic inspection and maintenance of the insulation securement system. Hairline cracks in the bonded concrete topping may not cause premature or delamination of the concrete topping.
- .7 The design parameters of the roof structure itself must include the weight of the newly installed ballasted roofing system. The structure must be capable of supporting the weight of the roofing system plus the specified ballast without encroaching on the necessary live load allowance and without creating or aggravation water ponding problems. A design professional should be consulted to certify that the structural system will support these loads.

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## 9.9 SHEET METAL FLASHINGS

- .1 Gravel stop flashings are not accepted for roof edge terminations.
- .2 For a gravel ballast system, the sheet metal base flashings shall contain a minimum 50mm (2") wide horizontal leg that rests on the top surface of the primary insulation.
- .3 With paver ballast, the 50mm (2") horizontal base flashing leg shall rest on the surface of the paver.
- .4 When using a concrete topped insulation system, the sheet metal base flashings shall be minimum 24 Ga. and a minimum 50mm (2") wide horizontal base flashing leg shall be mechanically fastened to the concrete topping. Follow the manufacturers written application instructions for base flashing securement.