

# **Firestone EPDM Roofing System for Extensive Green Roofs**

The specifications herein described are general guidelines created from information provided to Firestone Building Products by project specifiers and design professionals. Also the system design needs to comply with national regulations and installation specifications. They are intended to facilitate and assist in the selection of roof materials, not as a substitute for the judgment of a design professional. The ultimate selection of a specification for a particular roof remains the responsibility of the building owner and their design professionals.

For the build-up of the green roof layers on top of the EPDM membrane we refer to the green roof designers and/or specialists.

When also a Photovoltaic System will be installed in combination with this green roof, please also consult our specifications for EPDM Enviro-Ready Roofing Systems.

## **1 Preparation of the Roof Substrate**

### **1.1 New Roof**

#### **1.1.1 General**

Roof slope should be a minimum of 2% to allow for adequate drainage of the roof taking into account the deflection of the roof.

The roof surface will be made clean, dry, smooth and free of contaminants such as grease, animal fats, coal tar and oil based products. All sharp edges, fins and rough surfaces that could damage the membrane will be removed or if they can't be removed, isolated from the membrane with a leveling layer.

It is essential that the roof structure is capable of supporting the imposed load of the new roofing system, also taking the saturated condition of the green roof into account. When necessary, the advice of a Structural Engineer should be sought in this respect.

#### **1.1.2 Substrate Type: Metal Decking**

Metal decks require a minimum thickness of 0.75 mm for galvanized steel. Deck should be installed without inducing stresses (over-stretching/compressing) that could cause the flutes to bend. The deck should be fixed to the substrate using sufficient fasteners as per the manufacturer's specifications.

#### **1.1.3 Substrate Type: Wooden Decks**

The deck needs to consist of wooden boards with a minimum thickness of 18 mm. Thickness of the boards depends on the distance between the purlins. Wooden panels should be kept dry before and during the waterproofing works.

#### **1.1.4 Substrate Type: Concrete**

Concrete needs to be structurally sound and dry to the touch. Concrete should have aged for a minimum of 2 weeks before starting any roofing works.

## **1.2 Reroofing**

### **1.2.1 General**

Roof slope should be a minimum of 2% to allow for adequate drainage of the roof taking into account the deflection of the roof.

All outlets must be protected to prevent debris entering and causing blockage of down pipes.

The roof surface will be made clean, dry, smooth and free of contaminants such as grease, animal fats, coal tar and oil based products. All sharp edges, fins and rough surfaces that could damage the membrane will be removed or if they can't be removed, isolated from the membrane with a leveling layer.

It is essential that the roof structure is capable of supporting the imposed load of the new roofing system, also taking the saturated condition of the green roof into account. When necessary, the advice of a Structural Engineer should be sought in this respect.

### **1.2.2 Substrate Type: Metal Decking**

Metal decks require a minimum thickness of 0.75 mm for galvanized steel. Metal decks will be inspected for their deflection and assessed for their pullout resistance when necessary.

### **1.2.3 Substrate Type: Wooden Decks**

The deck needs to consist of wooden boards with a minimum thickness of 18 mm. Thickness of the boards depends on the distance between the purlins. Wooden decks will be fully examined for their quality (dryness) and pullout resistance. Any wet or unsound portions will be replaced with new material prior to the installation of the membrane system.

### **1.2.4 Substrate Type: Concrete**

Concrete needs to be structurally sound and dry.

### **1.2.5 Existing Membrane: Smooth Bitumen**

All debris and non-adherent areas of the existing bitumen roof finish will be removed. Blisters and buckles will be

cut open and sealed, defects will be repaired by gentle warming and redressing.

#### **1.2.6 Existing Membrane: Granule Surfaced Bitumen**

All chippings, debris and non-adherent areas of the existing bitumen roof finish will be removed from the surface. Blisters and buckles will be cut open and sealed, defects will be repaired by gentle warming and redressing.

A separation layer of geotextile (min. 200 gr/m<sup>2</sup>) or an insulation board or a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent will be installed prior to the installation of the roofing membrane.

#### **1.2.7 Existing Membrane: Thermoplastic Membrane**

The existing thermoplastic membrane will be cut at the perimeter and all flashings will be removed from the upstands and penetrations. When necessary, the membrane will be cut at equidistant intervals to release the tension out of the membrane.

A separation layer of geotextile (min. 200 gr/m<sup>2</sup>) or an insulation board or a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent will be installed prior to the installation of the roofing membrane.

#### **1.2.8 Existing Membrane: EPDM Membrane**

All debris will be removed from the existing roof surface. All non-adherent parts of the existing EPDM membrane at upstands and penetrations will be removed.

A separation layer of geotextile (min. 200 gr/m<sup>2</sup>) or an insulation board or a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent will be installed prior to the installation of the roofing membrane.

## **2 Vapour Control Layer**

### **2.1 General**

The necessity, type and thickness of the vapour control layer need to be determined based upon the designation of the building and the regional climatic conditions.

All installations need to be in accordance with the recommendations of the manufacturer and the method of fixation needs to be adapted to both the substrate and the roofing system to be installed.

Dress to provide sufficient edge protection to new thermal insulation at perimeter, abutments and details etc.

## **3 Insulation & Cover Board**

### **3.1 General**

Use insulation boards with a high compressive strength. If necessary a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent will be installed on top of the insulation.

The thermal resistance of the total package of insulation and cover boards requires minimum R-value of ... m<sup>2</sup>K/W (check your local and/or National Standards).

### **3.2 Insulation Type**

#### **3.2.1 Mineral Wool (MW)**

Mineral wool boards have a minimum compressive strength of 40 kPa; UEAtc class C.

In case of a fully adhered membrane application, install a suitable overlayment (e.g. a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent) prior to the installation of the EPDM membranes.

#### **3.2.2 Perlite (EPB)**

Perlite boards have a minimum compressive strength of 200 kPa.

In case of a fully adhered membrane application, install a suitable overlayment (e.g. a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent) prior to the installation of the EPDM membranes.

#### **3.2.3 Polyurethane (PUR)**

Polyurethane boards have a minimum compressive strength of 120 kPa with an acceptable facer with sufficient delamination strength.

#### **3.2.4 Polyisocyanurate (PIR)**

Polyisocyanurate boards have a minimum compressive strength of 120 kPa with an acceptable facer with sufficient delamination strength.

##### **3.2.4.1 Firestone ISO 95+ GL**

Manufacturer needs to be ISO 9001:2008 and ISO 14001:2004 certified. The foam technology does not contribute to the depletion of the earth's ozone layer (zero ODP) and uses a HCFC-free blowing agent.

Firestone polyisocyanurate insulation boards consist of closed-cell polyiso foam core laminated on both sides to a

black glass reinforced mat facer of app. 150 g/m<sup>2</sup>. The boards will comply with the following characteristics when tested in accordance with EN 13165:

- Dimensions: 1.22 m x 2.25 m
- Thickness: from 25.4 mm to 101.6 mm
- Compressive strength:  $\geq 138$  kPa
- Thermal conductivity:  $\leq 0.029$  W/mK

Keep insulation dry at all times. Do not install over wet, damp or uneven substrates.

The insulation boards comply to following certifications, but not limited to: CE marked according to EN 13165, ASTM C1289 Type II Class 1, UL Classified, FM Class 1 Approved.

#### **3.2.4.2 Firestone RESISTA AK**

Manufacturer needs to be ISO 9001:2008 and ISO 14001:2004 certified. The foam technology does not contribute to the depletion of the earth's ozone layer (zero ODP) and uses a HCFC-free blowing agent.

Firestone polyisocyanurate insulation boards consist of closed-cell polyiso foam core laminated on both sides to a gastight multi-layered aluminium complex. The boards will comply with the following characteristics when tested in accordance with EN 13165:

- Dimensions: 1.2 m x 0.6 m,  
1.2 m x 1.2 m,  
1.2 m x 2.4 m
- Thickness: from 30 mm to 140 mm
- Compressive strength:  $\geq 150$  kPa
- Thermal conductivity:  $\leq 0.023$  W/mK

Keep insulation dry at all times. Do not install over wet, damp or uneven substrates.

The insulation boards comply to following certifications, but not limited to: CE marked according to EN 13165, FM Class 1 Approved.

#### **3.2.5 Expanded polystyrene (EPS)**

Expanded polystyrene boards have a minimum compressive strength of 120 kPa.

Direct contact between polystyrene boards and contact adhesives and/or primers must be avoided.

In case of a fully adhered membrane application, install a suitable overlayment (e.g. a half-inch (12.7 mm) thick Firestone ISOGARD™ HD Cover Board or equivalent) prior to the installation of the EPDM membranes.

### **3.2.6 Extruded polystyrene (XPS)**

Extruded polystyrene boards have a minimum compressive strength of 300 kPa.

Polystyrene boards are meant to be used in inverted roof systems and thus can only be installed on top of the EPDM membrane.

## **3.3 Cover Board Types**

### **3.3.1 ISOGARD HD**

Manufacturer needs to be ISO 9001:2008 and ISO 14001:2004 certified. The foam technology does not contribute to the depletion of the earth's ozone layer (zero ODP) and uses a HCFC-free blowing agent.

Firestone ISOGARD HD is a high-density, closed-cell, polyisocyanurate board with a coated fiberglass facer on both sides designed for use as a cover board. The boards will comply with the following characteristics when tested in accordance with EN tests:

- Dimensions: 1.22 m x 2.25 m
- Thickness: 12.7 mm
- Weight: 1.8 kg/m<sup>2</sup>
- Compressive strength: >= 800 kPa

Keep cover board dry at all times. Before board is placed on the roof deck, the surface must be clean, dry, free of debris, water, ice or snow and suitably prepared.

### **3.3.2 DensDeck Roof Board**

DensDeck Roof Board exists of a high-density gypsum core, bonded on front and back with fiberglass mats. The boards provide an excellent fire barrier, wind-uplift properties, flute spanning that stiffens and provides increased foot traffic resistance to the roof deck. The boards will comply with the following characteristics:

- Dimensions: 1.22 m x 2.44 m
- Thickness: 6.4 mm, 12.7 mm, 15.9 mm
- Weight: 5.9 kg/m<sup>2</sup>, 9,8 kg/m<sup>2</sup>, 12.2 kg/m<sup>2</sup>

Keep cover board dry at all times. Before board is placed on the roof deck, the surface must be clean, dry, free of debris, water, ice or snow and suitably prepared.

## **3.4 Attachment of Insulation and/or Cover Boards**

### **3.4.1 Thermal Insulation loose laid (for Ballasted/Inverted System only)**

Install the boards on above underlay, loose laid with end joints staggered. When installing two layers of insulation

boards, ensure that the joints of both layers do not coincide. Install fully in accordance with manufacturers instructions.

Install in any one day only as much boards as can be protected by the completed roofing system that same day.

#### **3.4.2 Thermal Insulation and/or Cover Boards mechanically attached**

Install the boards on above underlay with end joints staggered. When installing two layers of insulation boards, ensure that the joints of both layers do not coincide. Mechanically fix to pattern and frequency advised by manufacturer, all in accordance with national wind uplift standards. Install fully in accordance with manufacturers instructions. Use Firestone insulation plates and fasteners or equivalent.

Install in any one day only as much boards as can be protected by the completed roofing system that same day.

#### **3.4.3 Thermal Insulation and/or Cover Boards adhered**

Install the boards on above underlay with end joints staggered. When installing two layers of insulation boards, ensure that the joints of both layers do not coincide. Adhere the boards using Firestone Twin Pack Insulation Adhesive or an equivalent adhesive system, according a pattern as advised and approved by manufacturer, all in accordance with national wind uplift standards. Firestone insulation boards shall not be larger than 1.2 m x 1.2m. Install fully in accordance with manufacturers instructions. Install in any one day only as much boards as can be protected by the completed roofing system that same day.

#### **3.4.4 Thermal Insulation Boards inverted roof**

Install XPS boards loose laid over membrane with end joints staggered. Install fully in accordance with manufacturers instructions. The installation of a vapour open separation layer (geotextile) between the insulation and the green roof is required. The insulation boards must be immediately (temporarily) ballasted after installation.

## **4 Firestone EPDM Roofing Membrane**

### **4.1 Products**

EPDM Membrane and accessories need to be supplied from the same manufacturer. Manufacturer needs to be ISO 9001:2008 and ISO 14001:2004 certified.

#### **4.1.1 Roofing membrane: Firestone RubberGard™ EPDM low slope fire retardant 1.5 mm (0.060")**

The Firestone RubberGard EPDM low slope fire retardant membrane is a 100% cured unreinforced roofing membrane made of a synthetic rubber Ethylene-, Propylene-, Diene terpolymer. The sheet is made of two plies of low slope fire retardant compound and is factory-assembled into large, fully vulcanized seamless membranes. The membrane can be supplied in the following dimensions:

- Specific weight: 1230 kg/m<sup>3</sup>
- Length: 15.25 m; 30.5 m; 45.75 m; 61.00 m
- Width: 2.28 m; 3.05 m; 5.08 m; 6.10 m;  
7.62 m; 9.15 m; 12.20 m; 15.25 m

Dimension of the membrane will be chosen in view of the complexity of the roof and the application method chosen.

The membrane complies with the following characteristics when tested in accordance with EN 13956:

- Tensile strength:  $\geq 7$  N/mm<sup>2</sup>
- Elongation at break:  $\geq 300\%$
- Tear Resistance:  $\geq 40$  N
- Static loading:  $\geq 20$  kg
- Dynamic indentation:  $\geq 300$  mm (hard support)  
 $\geq 2000$  mm (soft support)
- Joint peel resistance:  $\geq 80$  N/50mm
- Joint shear resistance:  $\geq 200$  N/50mm
- Cold foldability:  $\leq -45^{\circ}\text{C}$
- Durability/UV-exposure: Pass EN 1297 (>7500h)

The membrane has been assessed for its properties according to EN 13956 (CE mark), ASTM D-4637 (Type I), DIN V 20000-201, is FM approved and carries following certificates, but not limited to: BBA, ATG, KOMO, DTA, ETN, Sintef, DIT, AbP.

## **4.2 Roofing System**

Ponding water, snow, frost and/or ice present in more than trace amounts, must be removed from the work surface prior to installing the system.

For larger roof surfaces it is highly recommended to divide the roof in several compartments. The different installed compartments will be indicated on the roof plan.

### **4.2.1 Fully Adhered System (recommended)**

Place the Firestone RubberGard EPDM membranes (without stretching) over the acceptable substrate as close to its final position as possible, and allow to relax a minimum of 30 minutes before attachment or splicing. Install the Firestone RubberGard EPDM single-ply roofing membrane fully bonded to the compatible substrate with solvent or Water



Based Bonding Adhesive. Each panel shall overlap the adjoining one by 100 mm minimum.

The adhesives must be roller applied in a thin even coat on both mating surfaces. Allow sufficient time for the adhesive to flash off before mating the surfaces. All strictly in accordance with Firestone specifications.

Water Based Bonding Adhesive can be applied in a single coat directly onto OSB or plywood after which the EPDM can be mated to the substrate while the adhesive is still wet. Do not use Water Based Bonding Adhesive when there is a possibility of freezing temperatures within 48 hours of application. All strictly in accordance with Firestone specifications.

#### **4.2.2 Ballasted System (only for roof slopes < 5%)**

Install the Firestone RubberGard EPDM single-ply roofing membrane, loose laid on a suitable substrate as close to its final position as possible, and allow to relax a minimum of 30 minutes before attachment or splicing. Each panel shall overlap the adjoining one by 100 mm minimum.

The EPDM membranes must be (temporarily) ballasted immediately after installation.

The EPDM membranes must be sufficiently ballasted, strictly calculated in accordance with local standards for wind uplift, but always with min. 50 kg/m<sup>2</sup>. If the substrate of the green roof is resistant against erosion, the weight of the green roof (in dry condition) may be taken into account. If necessary additional ballast must be installed.

When the green roof is removed, another (temporary) layer of ballast must be installed.

#### **4.2.3 Inverted System (only for roof slopes < 5%)**

Install the Firestone RubberGard EPDM single-ply roofing membrane, loose laid on a suitable substrate as close to its final position as possible, and allow to relax a minimum of 30 minutes before attachment or splicing. Each panel shall overlap the adjoining one by 100 mm minimum.

The EPDM membranes must be (temporarily) ballasted immediately after installation.

The EPDM membranes must be sufficiently ballasted, strictly calculated in accordance with local standards for wind uplift and in accordance with manufacturers' instructions, but always with min. 50 kg/m<sup>2</sup>. If the substrate of the green roof is resistant against erosion, the weight of the green roof (in dry condition) may be taken into account. If necessary additional ballast must be installed.

When the green roof is removed, another (temporary) layer of ballast must be installed.

## **4.3 Roof Details**

### **4.3.1 General**

Vulcanized EPDM will be used wherever possible for the flashing of the details and this always in accordance to the Firestone Technical Guidelines.

Around all perimeters and around each roof detail, a green-free zone of app. 50 cm wide must be foreseen. In these zone(s) the vegetation will be replaced by gravel or a row/rows of tiles.

Use smooth, river-washed ballast with rounded edges and corners preferably between 20 mm - 40 mm nominal diameter. The diameter of the gravel is also depending on the height of the roof.

### **4.3.2 Seaming**

#### **4.3.2.1 Splicing (FLL/EN 13948 approved)**

The membrane is joined with a 75 mm wide, self-adhesive QuickSeam™ Splice Tape and bonded using Firestone QuickPrime Plus. Roll seams with a 50 mm silicone rubber roller or the QuickRoller. Layout the Firestone RubberGard EPDM membranes in a fashion so that field and flashing seams are installed to shed water.

In addition the edge of the horizontal tape seams must be covered with Pourable Sealer (min. 50 mm wide and 5 mm thick) over their entire length. The membrane will be primed with QuickPrime Plus prior to the application of Pourable Sealer.

#### **4.3.2.2 Splicing (alternative)**

The membrane is joined with a 75 mm wide, self-adhesive QuickSeam™ Splice Tape and bonded using Firestone QuickPrime Plus. Roll seams with a 50 mm silicone rubber roller or the QuickRoller. Layout the Firestone RubberGard EPDM membranes in a fashion so that field and flashing seams are installed to shed water.

On top of the EPDM membranes a PE-sheet (LDPE, min. 0.4 mm) will be installed with an overlap of min. 1 meter.

### **4.3.3 Base Tie-in**

At all changes in angles greater than 15%, the membrane must be restrained using one of the approved 'Base Tie-in' methods as per the Firestone specifications.

#### **4.3.3.1 Detail 1: Self-adhesive QuickSeam Reinforced Perimeter Fastening Strip**

Install the self-adhesive QuickSeam RPFS (Reinforced Perimeter Fastening Strip) at the base of the upstand,

mechanically attached to the substrate with an appropriate fastening system as per Firestone specifications.

The strip will be attached to either the deck, or the wall. The selection for vertical or horizontal attachment is related to the ease of application (thickness of insulation and nature of the substrate). The strip will be mechanically attached each 300 mm minimum. The membrane will then be adhered to the strip using QuickPrime Plus.

Alternatively, and only for roofs smaller than 100 m<sup>2</sup>, the mechanical attachment of the EPDM membrane may be replaced by the adherence of the EPDM membrane to the (compatible) horizontal substrate for min. 20 cm, starting at the perimeter. Insulation and/or Recovery boards needs to be fixed here, all in accordance with national wind uplift standards. Install fully in accordance with manufacturers instructions. Use Firestone insulation plates and fasteners, Firestone Twin Pack Insulation Adhesive or equivalent. Solid concrete tiles (no gravel) need to be installed on top of the EPDM membranes over a distance of 50 cm starting from the angle change.

#### **4.3.3.2 Detail 2: Batten bar and separate EPDM, QuickSeam SA Flashing or QuickSeam FormFlash**

The membrane shall be mechanically attached using a metal batten bar and approved fasteners as per Firestone specifications either on the flat roof substrate or onto the wall. The selection for vertical or horizontal attachment is related to the ease of application (thickness of insulation and nature of the substrate). The strip will be mechanically attached each 300 mm minimum.

Alternatively, and only for roofs smaller than 100 m<sup>2</sup>, the mechanical attachment of the EPDM membrane may be replaced by the adherence of the EPDM membrane to the (compatible) horizontal substrate for min. 20 cm, starting at the perimeter. Insulation and/or Recovery boards needs to be fixed here, all in accordance with national wind uplift standards. Install fully in accordance with manufacturers instructions. Use Firestone insulation plates and fasteners, Firestone Twin Pack Insulation Adhesive or equivalent. Solid concrete tiles (no gravel) need to be installed on top of the EPDM membranes over a distance of 50 cm starting from the angle change.

#### **4.3.4 Vertical flashings roof edges and penetrations**

Vertical facings are completed using EPDM, QuickSeam SA Flashing or QuickSeam FormFlash, fully bonded to the vertical face using (Water Based) Bonding Adhesive in case of EPDM membrane or using QuickPrime Plus in case of a QuickSeam product. If needed, install a suitable overlayment (e.g. a PUR/PIR insulation board with an acceptable facer and sufficient delamination strength, a half-inch (12.7 mm)

thick Firestone ISOGARD™ HD Cover Board or equivalent) to ensure the adherence.

Where possible, provide a minimum design height of at least 150 mm for all flashing terminations. Do not flash over existing through-wall flashings, weep holes and overflow scuppers.

#### **4.3.5 Corners**

Internal and external corners are to be flashed using self-adhesive QuickSeam FormFlash with QuickPrime Plus. All in accordance with Firestone specifications.

Preferable inside corners are being executed by folding and restraining the excess of EPDM membrane.

#### **4.3.6 Wall Termination**

##### **4.3.6.1 Termination Bar**

The membrane will be secured with a Firestone termination bar, used in conjunction with Firestone water repellent sealant Water Block between the membrane and the substrate under compression behind the termination bar, mechanically fixed at maximum 200 mm centers using appropriate fasteners. A bead of Firestone Lap Sealant is applied along the top edge of the termination bar.

##### **4.3.6.2 Counterflashing**

The EPDM membrane will be mechanically fastened using an appropriate fastening system. A proprietary flashing is secured to the vertical face above the membrane termination. The counterflashing will cover the top of the fastening system by a minimum of 100 mm.

#### **4.3.7 Roof Edge Termination**

##### **4.3.7.1 Metal Coping Terminations**

The membrane shall be returned over the upstand and fully bonded using (Water Based) Bonding Adhesive and secured to the horizontal face of the parapet. If necessary, a suitable timber plate will be installed, mechanically fixed to the top of the parapet to provide an even substrate. The metal coping will be installed, ensuring full protection of the top of the upstand detail.

##### **4.3.7.2 Concrete Coping Terminations**

The membrane will be returned and fully bonded over the upstand using (Water Based) Bonding Adhesive and secured to the top horizontal surface of the upstand.

Stop the EPDM flashing sufficiently from the wall edge, without putting the water tightness into danger, so as to allow a good adhesion of the mortar to the wall.

The coping stone will be installed, ensuring full protection of the top of the upstand detail.

#### **4.3.7.3 Metal Roof Edge**

Allow the field membrane to pass over the edge by a minimum of 100 mm and fully adhere it to the front of the perimeter edge over the complete length. If necessary, install a wood nailer at the roof edge to provide a suitable edge detail.

Install the appropriate metal edge profile fastened to roof edge at 100 mm centres, using appropriate fasteners. The horizontal flange of the metal profile shall be flashed using 125 mm wide Firestone self-adhesive QuickSeam Flashing. Ensure an adequate overlap of 75 mm beyond the inner edge of the profile.

#### **4.3.8 Pipe Penetrations**

##### **4.3.8.1 Self-adhesive QuickSeam Pipe Flashing**

Pipe penetrations accessible from the top side and with a maximum diameter of 150 mm, can be flashed in using Firestone prefabricated self-adhesive QuickSeam pipe flashing. Install in accordance with Firestone specifications.

##### **4.3.8.2 Self-adhesive QuickSeam FormFlash**

Field fabricated flashing of pipes is to be executed using Firestone QuickSeam FormFlash, bonded using Firestone QuickPrime Plus. Apply a bead of Firestone Lap Sealant at all cut edges of flashing. This method is to be used where the top of the pipe is not accessible and/or the pipes are larger than 150 mm in diameter. All penetrations must allow flashing terminations of a minimum 150 mm above the roof membrane level.

##### **4.3.8.3 Pipe Clusters and Unusual Shaped Penetrations**

Install a QuickSeam Penetration Pocket kit around the penetrations or create pre-fabricated metal penetration pockets flashed in with Firestone QuickSeam FormFlash. Fill penetration pockets with Firestone Pourable Sealant, so as to shed water. The Pourable Sealant shall be a minimum of 50 mm deep, use filler as required. All installed in accordance with the Firestone specifications.

#### **4.3.9 Water Drains**

Number and dimensions of the outlets are in accordance with national regulations.

##### **4.3.9.1 Rainwater Outlets incorporating a Clamping Ring**

Install roof outlets, providing a clean even finish on the mating surfaces between the clamping ring and the drain bowl. Position the membrane, and then cut a hole for the outlet to allow 20 mm of membrane to extend inside the clamping ring past the drain bolts. Install Firestone water repellent sealant Water Block beneath the membrane, where the clamping ring seats. Install the outlet clamping ring and clamping bolts. Tighten the clamping bolts to achieve constant compression and install gravel/leaves guard.

##### **4.3.9.2 Rainwater Outlets incorporating an Insert Piece**

The field EPDM membrane sheet must be in place prior to installation of the drain insert.

Cut a hole to the size of the insert piece, over the centre of the outlet. Install drain insert piece and apply a layer of Water Block between the flange of the insert piece and the EPDM membrane.

The flange of the insert piece must have a smooth structure and shall be fastened every 100 mm centers using an appropriate fastening system.

Flash over with QuickSeam FormFlash or QuickSeam SA Flashing, extending 75 mm minimum onto the field membrane and 75 mm past the fasteners. Cut a circular hole in the QuickSeam FormFlash or QuickSeam SA Flashing above the drainpipe 20 mm larger than the diameter to allow application of a Lap Sealant.

##### **4.3.9.3 Through wall Scupper Outlets incorporating a "Scupper" Insert Piece**

The field sheet must be in place prior to installation of the scupper insert. Set the welded scupper insert in Firestone water repellent sealant Water Block and secure to the structure with appropriate fasteners.

Flash with QuickSeam FormFlash, overlapping all edges by 75 mm minimum and fastener heads 75 mm minimum. Finish the detail with Lap Sealant.

#### **4.3.10 Roof expansion joints**

##### **4.3.10.1 Roof expansion joints (in case of a Fully Adhered System)**

The membrane is mechanically attached at both sides of the expansion joint using an appropriate fastening system. The

expansion joint is then covered with a second piece of non-reinforced EPDM membrane. A compressible tube is added to allow for excess membrane. Ensure there is enough excess membrane to accommodate building movement.

Flash all seams crossing the expansion joint using a strip of QuickSeam FormFlash as per Firestone specifications.

#### **4.3.10.2 Roof expansion joints (in case of a Ballasted or Inverted System)**

The membrane can be loose-laid over a flat expansion joint in the roof deck. The elasticity of the membrane will accommodate for the movement of the structure.

#### **4.3.11 Walkway Pads**

Walkways shall be installed in specific areas such as access points to the roof (doorways, ladders,...) and on roof parts subjected to traffic more frequent than once per month.

Prepare the mating surface of the EPDM membrane with QuickPrime Plus. Pre-cleaning with Clear Splice wash may be required. Install Firestone QuickSeam Walkway Pads as per Firestone specifications.

For a Ballasted System the QuickSeam Walkway Pads will be substituted by concrete pavers.

For concrete pavers: place a layer of protection mat or an additional layer of EPDM membrane underneath the pavers (min. 50 mm beyond the paver) to isolate them from the roofing membrane.

## **5 Extensive Green Roof**

In order to avoid mechanical damage during the installation of the green roof and/or during maintenance a protection layer must be installed on top of the EPDM membranes.

For the build-up of the green roof layers on top of the EPDM membrane we refer to the green roof designers and/or specialists.

Vegetations used for extensive green roofs are plants like sedums, herbs, prairie flowers, etc. A list of plants that must be avoided (plants that generate rhizomes) can be found on, but not limited to, [www.fbb.de](http://www.fbb.de).

## **6 Notes**

The Firestone Building Products specifications will be strictly followed for all products supplied by the company. Prior to installation, Firestone Building Products must approve any deviation from the specifications. The works shall only be installed by an authorized contractor. A

Firestone approved Contractor Certificate with validity date shall be provided before start of the works.

Installations must comply with all current relevant standards, codes of practice, and the Building Regulations.

A Firestone standard 10 years Membrane Warranty shall be issued to the building owner on completion.

All materials shall be stored clear of ground and moisture with weather protective covering. Keep all adhesives, sealants and primers away from sources of ignition.

Do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application.

At the end of the working day: Temporarily seal the membrane to the deck to prevent any water infiltration.

Temporary closures that ensure that moisture does not damage any completed section of the new roofing system are the responsibility of the roofing contractor. Completion of flashings, terminations and temporary closures shall be completed as required to provide a watertight condition. Ensure protection of warm deck insulation by temporary seal.

Ensure that the sequence of laying enables temporary sealing of loose membrane edges to be down the slope and not against the flow of water. On resumption of work cut away the tail of the membrane from completed area and remove from roof.

Safety scaffolding, rubbish skips, access ladders etc. should be agreed with the client and in accordance with the current Health and Safety regulations.

To avoid discussions because of any mechanical damage inflicted after the EPDM was installed, we strongly recommend testing the water tightness of the EPDM system immediately after installation and before the installation of the green roof.

Adequate temporary protection must be provided over the installed membrane during the works program, particularly at temporary walkways, access points to the roof, roofing material stockpiles etc. in order to prevent damage.

The main contractor shall ensure that all areas of the finished roofing system shall be protected from roofing related work traffic and other trades until completion of all works.