

# 3 Installation

The information provided within this chapter may assist the contractor to install the Firestone UltraPly TPO Systems in accordance with Firestone's requirements. It may also help him and the designer to inspect the completed installation. For a more practical use, we collected the information in a chronological order. The reader may consult the illustrations at the end of this document when additional information is required.

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## 3.1 Membrane Installation

### 3.1.1 Membrane Installation - General

Firestone recommends for each system the following panel widths.

System	Panel width (m)
Ballasted-Inverted	up to 3.05
M.A.S.	up to 2.00
Fully adhered	up to 3.05

Prior to the installation of the roofing membrane, the contractor must check if the roof substrate complies with Firestone's design instructions.

Any defects in the substrate need to be corrected and the final surface has to be prepared to meet the requirements previously outlined.

It is important that the substrate is free of any sharp objects and/or products that may damage the membrane. Wipe the substrate or install a geotextile when required.

Place the TPO roll as close as possible to its final position. Inspect the wrapper and TPO roll for damage before and during the installation. Unroll the TPO membrane and prior to any attachment, cutting or welding, allow each panel to relax a minimum of 30 minutes. Cut a cross-shaped opening above every drain to evacuate excess ponding water, in case of sudden rainfall.

The TPO panels shall be installed in a fashion so that field and flashing splices are installed to shed water. Straight cuts are very important for a neat and easy application.

Allow ample material for splicing determined by the type of seam and tie-ins.

Temporary ballasting during installation may be required to keep the membrane in place until it is secured to the substrate. Suggested temporary ballasting includes sand bags and other non-abrasive materials such as rubber tires, etc. Never leave the project without temporary ballasting loose laid sheets.



### 3.1.2 Membrane Installation - Mechanically Attached (M.A.S.)

#### ■ Applicability

This technique is applicable for the mechanically attached system M.A.S..

#### ■ Installation Instructions

Consult the wind design calculation for information about the density and position of the plates and fasteners and the size of local wind zones (zones of high wind pressure, such as perimeter, ridge, base of roof step, base of penthouse, etc.).

Select the size of the panels in function of the wind uplift requirements. Consult the table below to identify the most appropriate panel width.

Spacing between fastener rows (m)	Panel width (m)
1.35	1.50
1.85	2.00

Position adjoining sheets with a side overlap of 150 mm in case of a mechanical anchoring in the seam and a minimum of 75 mm for seams with no mechanical anchoring. Allow the membranes to relax a minimum of 30 minutes.

Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with Firestone Cut Edge Sealant or TPO General Purpose Sealant.

The inside edge of the membranes are mechanically attached to the substrate with approved plates and fasteners. The plates need to be positioned at least 20 mm in from the edge of the membrane.

In the central zone of the roof, the membrane shall be mechanically attached with approved plates and fasteners in the side laps of the membrane. On metal decks it is important that the membranes run as much as possible perpendicular to the direction of the flutes of the deck, to avoid overloading of the structure.

At perimeters and in zones of higher wind pressure, the TPO membrane may be either fully adhered to the substrate following the technique described hereafter or mechanically attached in the overlap. When wind calculations require an even smaller spacing between fastener rows than mentioned in the table above, a 2.00 m wide membrane may be cut in half on site to produce a panel width of 1.00 m providing spacing between fastener rows of 0.85 m.

A row of fasteners and plates shall be installed along the inside edge of the perimeter sheets, to separate the perimeter zones from the central zone of the roof. In the case of a fully adhered perimeter zone, care must be taken not to apply Bonding Adhesive onto the inside portion of the perimeter sheets located beyond the fastening plates.

When working onto a continuous support (concrete, wood, ...), an alternative layout for TPO sheets may be used for practical reasons. In this layout, perimeter zone panels are laid parallel to the parapet. Field zone panels can be laid in the most practical direction.

The fasteners must be properly engaged in the deck. Use caution not to overdrive fasteners, as this will reduce the pull-out value of the fastener. An electric screw gun with an automatic clutch control or an automatic installation tool may be used. Once the tools have been set, all fastener installation will be consistent.

The end and side laps of adjoining sheets shall be spliced as outlined in the following section.



### 3.1.3 Membrane Installation with Bonding Adhesive

#### ■ Applicability

This technique is applicable for fully adhered systems and as an alternative to mechanical attachment in the perimeter zones of the mechanically attached system.

#### ■ Installation Instructions

Position adjoining sheets with a minimum overlap of 75 mm and allow to relax a minimum of 30 minutes.

Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with Firestone Cut Edge Sealant or TPO General Purpose Sealant.

Fold the first membrane back, evenly onto itself so as to expose the underside and the substrate. The sheet fold should lay smooth so as to minimize the formation of wrinkles during and after installation.

Before bonding, remove excess dust or other contaminants. Wipe the substrate and the mating surface of the sheet with a stiff broom.

The TPO-sheets are to be fully adhered with TPO Bonding Adhesive. Stir the Bonding Adhesive before and during application to achieve a uniform mix with no sediment on the bottom. Properly mixed adhesive is critical for desired performance and uniformity of the bond.

The Bonding Adhesive must be roller applied in a thin even coat on both mating surfaces. Firestone recommends a two-man operation to facilitate equal drying times. Apply Bonding Adhesive to lighter coloured surface and/or shady surfaces first to aid in drying. Avoid globs or puddles of adhesive during application. An excess of adhesive will prolong the drying time and reduce production. Use large solvent resistant rollers with short hairs to apply the adhesive evenly. Care must be taken not to apply Bonding Adhesive over an area that is to be welded to another sheet. Use a chalkline to mark the splicing area that has to remain clean.

Let the solvents evaporate naturally until the adhesive is tacky. Drying time will differ with various climatic conditions and coverage rate. Never use a hot air dryer to accelerate this process. Solvent-based adhesives tend to surface-flash during cold weather, forming an outer skin on the surface before the entire adhesive has had sufficient time to flash off.

Touch the surface with a clean, dry finger to check the adhesive for dryness. As you are touching the adhesive, push straight down to check the mass of adhesive under its surface for stringing. Push forward on the adhesive at an angle to ensure that it is dry throughout its thickness. If either motion exposes wet or stringy adhesive when the finger is lifted then it is not ready for mating. Allow extra time for the adhesive film to properly flash off before retesting. Adhering two surfaces that have not completely flashed off will result in blisters and bubbles in the membrane, caused by the trapped solvents.

As the first sheet is flashing off, lay out the adjoining sheets and allow them to relax.

Bond the membrane, starting at the fold. Roll the previously coated portion of the sheet into the coated substrate, slowly and evenly to minimize wrinkles.

Compress the bonded half to the substrate with a stiff brush to ensure proper contact. Extra compression will strengthen the bond. Repeat the bonding procedure to complete the bonding of the sheet.

Take special precautions when the outside temperature is below 10°C, when the dew point is near the ambient outside temperature. Certain combinations of temperature and humidity may cause condensation on the surface of the Bonding Adhesive. This is referred to as "blushing". If this condition occurs, do not mate the surfaces. Wait until the ambient air conditions no longer cause condensation, dry the surface with clean, dry rags, apply a thin additional layer of adhesive and proceed.



### 3.1.4 Membrane Installation with Ballast

#### ■ Applicability

This technique is applicable for ballasted and inverted systems.

#### ■ Installation Instructions

Position adjoining sheets with a minimum overlap of 75 mm and allow to relax a minimum of 30 minutes. Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with Firestone Cut Edge Sealant or TPO General Purpose Sealant.

Cover loosely laid roofing sections as soon as possible with:

- Gravel, in the form of round, smooth, river washed aggregate without broken pieces of adequate size (nominal 16-32 mm). Make sure that the roofing membrane is completely covered. A ballast of minimum 50 kg/m<sup>2</sup> is required. However this may not always provide complete membrane coverage or meet local requirements.
- Graduated, crushed gravel. This type of ballast contains broken pieces and may damage the TPO membrane during installation. Firestone therefore recommends installing a geotextile (min. 200 gr/m<sup>2</sup>) between ballast and membrane.
- Concrete pavers, with smooth trowel finish. Install a geotextile directly beneath the concrete pavers.
- Other types of ballast may be used (earth, poured concrete, etc.) for other types of applications (parking decks, green roofs, etc.) but require a specific study. Consult local standards for type, adequate size, and minimum weight of ballast and consult Firestone's Technical Department for appropriate detailing.
- In case of re-roofing, existing gravel may be re-used on the new roofing system provided it is of adequate size and weight. It is recommended to install a geotextile (min. 200 gr/m<sup>2</sup>) between the TPO membrane and the recovered gravel.

Do not stock pile ballast on the roof deck. Spread the ballast over the TPO membrane as specified, using soft tools (rubber-tyre buggies, squeegees, etc.), avoid direct contact with the membrane when projected. Spread the ballast around details by hand/foot so as not to damage the freshly installed detail. Any ballast that is displaced by a walkway pad, should be distributed around the pad so as to maintain the specified average coverage rate.

On roofs with a flat edge, the installation of TPO walkway pads within 3 m of the roof edge is not allowed. Use concrete pavers.

For Inverted Systems, install the extruded polystyrene insulation directly over the TPO membrane. The insulation boards shall be installed within 6 mm of all projections. Do not bond the insulation boards to the membrane or to each other.

Unroll a protection mat over the insulation overlapping at side laps a minimum of 100 mm and at end laps a minimum of 150 mm. The mat shall extend up at all vertical penetrations 10 mm above the ballast.



## 3.2 Membrane Welding

### ■ General Requirements

All lap splices need to be hot air welded. Wherever possible, all field splices on the horizontal surface (including flashing) should be completed using an automatic heat welder that has been designed for hot air welding of thermoplastic membranes. Handheld welders should only be used on vertical welds or where an automatic is not practical or can not be used.

Set-up of the welding equipment is the responsibility of the installer. The air intake, temperature and speed of the machine must be adjusted to provide proper seam strength. Practice welds should be made and tested to insure proper set-up of the automatic welder.

Typical welding conditions on a 10°C day in the sun are as follows: 565 - 621°C at 3.7 m/min. with 2 weights added at 80 - 100% air flow. For these typical equipment settings the ambient temperature should be from -6°C to 33°C.

When weather conditions vary, adjustments to the welding machine must be made. It is recommended that this be done using spare material. In addition, there must be destructive tests performed at the beginning of each working day and every time there is an interruption in the welding process (i.e. power failure, welder shut down, job site conditions change and after lunch). There should be periodic checks to verify good peel strength. A proper weld will always delaminate at the scrim when peeled open.

An ample power supply must be provided to all heat welding equipment. A generator, which is dedicated to the heat welding equipment, is recommended on all installations. Using generator equipment eliminates power surges or lapses that would occur if the particular building electrical services were used. Minimum power requirements are 220 volts, 30 amp, 7500 watts or greater if the equipment manufacturer recommends so. It is recommended that each piece of automatic welding equipment has its own generator. More than one piece of welding equipment can be run of a generator providing the proper increase in generator output is provided. In most cases an increase from 7500 watts to 10000 watts is sufficient.

### ■ Installation Instructions

Position the sheets at the splice area with an overlap as described in table hereafter.

System	Min. membrane overlap
Ballasted, Inverted, Adhered	75 mm
M.A.S	up to 150 mm (laps with mechanical anchoring) 75 mm (laps without mechanical anchoring)

Use a clean white cotton rag dampened with Firestone Splice Wash (Acetone or Xylene may be used alternatively) to thoroughly clean an area on both sheets at least 150 mm wide if the seam area has become heavily contaminated with dirt, debris, mud, etc..

Set up the welding equipment as per the general instructions above. When welding, if the material becomes liquid, the welder is too hot. When making an automatic weld, very slight amount of the dark gray material will be visible at the seam edge.

Seams made with an automatic welder must be a minimum of 38 mm wide. Seams made with hand welders must be a minimum of 50 mm wide.

Probe all completed welds using a slotted screwdriver or dull cotter pin puller type tool to verify seam integrity daily. Do not probe welds until they have had time to cool. Any welds found to be insufficiently welded need to be repaired.



### ■ **Special Considerations**

T-joint patches are recommended if probing reveals the presence of voids or cold welds and are required at all intersections of field seams if a membrane thicker than 1.2 mm is used. T-joint patches can be cut from unsupported TPO Flashing.

Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with Firestone Cut Edge Sealant or TPO General Purpose Sealant.

In case of a mechanically attached system, the inside edges of the membranes are mechanically attached to the substrate with approved plates and fasteners. The plates need to be positioned at least 20 mm in from the edge of the membrane. Spacing between fasteners should not exceed 250 mm.





## 3.3 Base Tie-in

### 3.3.1 Base Tie-in General

In order to account for structural movement of the substrate, stresses inherent in the handling and production of TPO sheets and thermal variations, the TPO membrane should be mechanically attached at all locations where the membrane ends or passes through an angle change greater than 15%, such as roof edges, curbs, interior walls, around roof penetrations, etc. If the securement is inadequate to resist these stresses, the membrane may tear or pull away from the termination and allow water to enter the building. For situations where the installation of a base tie-in detail is required but not feasible, consult Firestone's Technical Department for advice.

### 3.3.2 Base Tie-in with Plates

#### ■ Installation Instructions

Plates and fasteners are either installed on the flat roof substrate or on the wall. The selection for vertical or horizontal attachment is related to the ease of application (nature of substrate, thickness of insulation).

#### ■ Horizontal Installation

Install the plates as close as possible to the angle change but no closer than 15 mm from the membrane edge. The TPO membrane must extend 15 mm beyond the edge of the plates. The plates should be fastened at max. 300 mm centres with appropriate fasteners. Plates should be positioned as close as possible to the inside and outside corners and no more than 150 mm out from the corner.

#### ■ Vertical Installation

The TPO field membrane should be positioned against the upstand, extending 15 mm above the top edge of the plates. For curved curbs, the membrane should be cut to the shape of the curve to avoid wrinkles in the field membrane.

Install the plates on the vertical within 15 mm of the angle change but with the fastener no more than 150 mm out from the angle change. No bridging of the membrane at the angle change is allowed. The plates should be fastened at max. 300 mm centres with appropriate fasteners.

Use a vacuum machine to pick up all dust, when holes are pre-drilled, prior to starting wall flashing.

### 3.3.3 Base Tie-in with Coated Metal

#### ■ Installation Instructions

Mechanically fasten Firestone UltraPly Coated Metal to supporting structure using appropriate fasteners. Install the fasteners so as to avoid buckling of the coated metal. Plates can be used to provide a better clamping of the coated metal and to allow a bigger spacing between fasteners (max. 300 mm). Position the fasteners no closer than 15 mm from the metal edge. Plates and fasteners should be positioned as close as possible to the inside and outside corners.

Install the pieces of Coated Metal with 3 to 6 mm between adjoining sections.

Use a vacuum machine to pick up all dust, when holes are pre-drilled, prior to starting wall flashing.

Install a 50 mm wide duct tape over joints in UltraPly TPO Coated Metal to act as a separator to prevent normal thermal movement from affecting the watertight hot air weld to the coated metal. Heat weld the field TPO membrane to the coated metal flashing. Heat weld a 150 mm wide piece of UltraPly TPO membrane or Unsupported Flashing over the joint as per Firestone specifications. Seams must meet requirements mentioned in § 3.2.



## 3.4 Wall Flashing

The Wall Flashing details are in line with the two methods of base tie-in, previously described. Either the field membrane has to be welded onto Firestone UltraPly Coated Metal flashing (see § 3.3), or the upstand can be flashed with separate strips of TPO membrane. The wall flashing should always be terminated with one of the details illustrated at the end of this document.

### 3.4.1 Flashing using TPO Membrane

#### ■ General Installation Instructions

Evaluate the substrate and the quality of all existing flashings. The substrate must be secure and allow for adequate adhesion. Textured masonry, corrugated metal panels, uneven substrates and some insulation materials may require an overlayment in accordance with the requirements previously mentioned. If adhesion is not sufficient, remove loose, unsecured, mineral surfaced or coated flashings to provide a smooth and sound substrate.

Intermediate attachment of the TPO wall flashing is required regardless of wall height when TPO membrane is not adhered to the wall or curb, under the conditions mentioned in the table below.

Wall Height	Intermediate attachment requirements
up to 0.45 m	None
> 0.45 m	Every 0.6 m, using approved fasteners and plates 300 mm o.c. max.

When the TPO membrane is adhered to the wall or curb, intermediate attachment is required under the conditions mentioned in the table below.

Wall Height	Intermediate attachment requirements
up to 1.0 m	None
From 1.0 to 2.0 m	One attachment at ½ wall height, using approved fasteners and plates 300 mm o.c. max.
Above 2.0 m	One attachment every 1 m, using approved fasteners and plates 300 mm o.c. max.

All seams must meet requirements mentioned in § 3.2.

When measuring the width of the TPO material, allow the TPO strip to cover the wall to the height required, plus min. 150 mm for the seam onto the horizontal TPO sheet and an additional 150 mm for every intermediate attachment required as per indications above. The longest pieces practical can be used to flash high walls to the specified height. Selecting the correct cut for TPO strips is a time saver.

#### ■ Adhering TPO membrane to the wall/curb

Position the TPO strip 150 mm from the angle break along the wall to be flashed. Apply Firestone UltraPly TPO Bonding Adhesive at about the same time to both the membrane flashing and the surface to which it is being bonded so as to allow approximately the same drying time. Apply the adhesive by rolling it onto the mating surfaces evenly, avoiding globs or puddles. Make sure not to apply any adhesive to any area to be welded.

Allow the TPO Bonding Adhesive to flash off until tacky. Touch the Bonding Adhesive with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, push straight down to check for stringing, also push forward on the adhesive at an angle to ensure the adhesive is ready throughout its thickness. If either motion expresses wet or stringy adhesive when the finger is lifted, then it is not ready for mating. Flash off time will vary depending on the ambient air conditions. When flashing to metal work, the metal will act as a barrier to the solvents. The solvents can only dry through one surface (the adhesive), this will make the drying process slower than onto the membrane.

Roll the TPO flashing into the wall, keeping a rounded leading edge. Mate the flashing by hand and broom with a stiff brush.

Complete the splice between membrane flashing and the main roof sheet by hot air welding. Please refer to §3.2 for further details about lap splicing.

#### ■ Special Considerations

Adjoining wall flashings are overlapped using standard seaming techniques. The installation of a joint cover piece at the base is required.



## 3.5 Corners

This section provides information with regard to detailing in and around corners.

All corners should be flashed using one of the following techniques:

- Pre-Molded Corner (inside & outside).
- Field fabricated corner flashing.

### ■ Installation Instructions

TPO corners come in groups of 1 inside/outside corner piece which must be cut individually for specific application. Cut the corner out of the pre-molded piece and round off all corners prior to heat welding into place.

Care should be given during the heat welding process in order to prevent heat build-up that could damage the TPO pre-molded corner or field fabricated corner flashing.

Please refer to the drawings in chapter 5 of these guidelines for further details about inside and outside corners using pre-molded corners or unsupported flashing.



## 3.6 Pipe Penetrations

### 3.6.1 Penetrations General

This section provides information with regard to detailing around circular and odd shaped roof penetrations.

All penetrations passing through the membrane should be flashed using one of the following techniques:

- Pre-Molded Pipe Flashing.
- Field fabricated pipe flashing.
- Penetration pocket.

For re-roofing applications, all existing flashings should be stripped off (i.e. lead, existing roofing membranes, mastic, etc.) prior to installation of the new detail. The flashing seal must be made directly to the penetration.

All pipes must be anchored to the deck, as loose pipes move and may damage the flashing.

All TPO components should be protected from direct contact with steam or heat sources when the in-service temperature of the penetration is in excess of 60°C. In such cases the flashing can be installed directly to an intermediate insulated cool sleeve.

All metal edges used at pipe penetrations must have rounded corners.

### 3.6.2 Pre-molded Pipe Flashing

#### ■ Applicability

Firestone UltraPly™ TPO Pipe Flashings are specifically designed to be used in roofing applications for flashing of round penetrations.

The Universal Pre-molded Pipe Flashing is designed for circular pipes from 25 to 152 mm in diameter where the top of the pipe is accessible. The Large Pre-Molded Pipe Flashing is designed for circular pipes from 106 to 203 mm in diameter where the top of the pipe is accessible.

This technique is not applicable for the following situations: structural steel tubing, multiple penetrations close to one another, when the pipe is too close to the wall, flexible penetrations such as cables, on uneven surfaces, for thin metal stacks or hot pipes.

#### ■ Installation Instructions

Clean the pipe and the field membrane around the pipe (approximately 150 mm) with Splice Wash if the seam area has become heavily contaminated with dirt, debris, mud, etc.. If the pipe is rusted or cannot be cleaned with Splice Wash, clean it with a steel brush, then when possible with Splice Wash.

Each pipe boot will fit various penetrations and shall be cut at the correct place to insure a tight fit before installation. Select the pipe boot size that corresponds to the outside diameter of the penetration to be flashed. Cut out a circle on the outside of a level ring of the pipe boot that is smaller than the penetration.

Cut the extra material from the pipe boot base around the indented circle. Heat weld the boot into place and install the clamp and sealant per current UltraPly TPO specifications.

Install the stainless steel clamping ring and tighten the locking screw. It is important that the clamping ring seats onto a flattened surface of the boot. Finish by applying a bead of General Purpose Sealant around the entire circumference of the pipe.



### 3.6.3 Field Fabricated Pipe Flashing

#### ■ Applicability

This technique applies to circular pipes or supports where the top is not accessible and for accessible pipes larger than 203 mm in diameter. This technique cannot be used for multiple penetrations, flexible conduits, cables, small pipes less than 25 mm in diameter and hot pipes.

In many cases, the field membrane should be cut to work around the penetration. The cut must be repaired prior to installation pipe flashing. The covering piece must lap a minimum of 75 mm beyond the cut in all directions.

#### ■ Installation Instructions

Refer to the illustrations at the end of this document for additional information.

### 3.6.4 Penetration Pocket

#### ■ Applicability

Penetration Pockets are designed as a last resort for flashing penetrations that cannot be flashed in any other way. This technique applies to clusters of pipes, odd shaped roof penetrations, I-beams, small pipes less than 25 mm in diameter. Up to a pipe diameter or cluster of 90 mm a pre-molded TPO Penetration Pocket can be used, for larger openings a pocket can be made out of TPO coated metal.

#### ■ Installation Instructions

Seal around the penetration prior to installation to prevent Pourable Sealer from flowing into the roof system and possibly into the building.

In many cases, the field membrane should be cut to work around the penetration. The cut must be repaired prior to installation of the penetration pocket. The covering piece must lap a minimum of 75 mm beyond the cut in all directions.

#### Option A: Pre-molded TPO Penetration Pocket

Open the PVC ring and place it around the penetration. If required, cut the TPO Penetration Pocket through the flange and side in one place and install it over the PVC ring so that the ring fits completely inside the top overhang of the pocket. Then cut a piece of TPO flashing long enough to cover the cut in the pocket and the membrane. Heat weld the flashing on the vertical cut in the pocket and to the lip in the cavity. Center the pocket around the penetration and weld the flange to the membrane. Next, weld the flashing onto the flange and cut membrane. Weld and roll the flange step-off thoroughly.



### **Option B: Penetration pocket using TPO Coated Metal**

The flange corners of the penetration pocket must be rounded prior to installation. There must be 25 mm spacing between all penetrations and between each penetration and the side of the penetration pocket. The minimum height of the penetration pocket is 50 mm being the minimum acceptable thickness of Pourable Sealer. Secure penetration pocket as per base tie-in detail and flash per Firestone details. Refer to the illustrations at the end of this document for additional information.

Apply the TPO QuickPrime with the dauber to all areas of the penetration and all surfaces that the pourable sealer will contact within the cavity. Make sure that the top of the pocket is primed also. Allow the primer to dry and add pourable sealer, being careful to mound it from the penetration to the top of the pocket to shed water away from the penetration. Refer to the product information sheet for information with regard to storage, mixing, preparation and application of the Pourable Sealant material. Use a stick to force the sealant between all penetrations while pouring it into the penetration pocket. Make sure that the sealant is worked between the pipes. Crown the penetration pocket by cresting the sealant in the centre and tapering it to the sides.

Refer to the illustrations at the end of this document for additional information.



## 3.7 Drains and Scuppers

### 3.7.1 Drain with Clamping Ring

#### ■ Applicability

Roof drains with clamping ring are designed for vertical drainage of new roofs.

#### ■ Installation Instructions

When re-roofing, existing flashing, roofing materials must be removed down to the metal sump. Broken clamping rings must be repaired or replaced. Broken drain bolts must be drilled, tapped and replaced.

Provide a clean even finish on the mating surfaces between the clamping ring and the drain bowl.

Taper insulation around the drain to provide a smooth transition from the roof surface to the drain. Use tapered insulation with suitable bonding surface to create a slope. The slope shall not exceed 1:12.

Position the TPO membrane, then cut a hole for the roof drain. Cut a circular drainpipe, but allow 10 to 20 mm of membrane extending inside the clamping ring past the drain bolts.

Make round clean holes in the TPO membrane to align with clamping bolts. Use a paper punch or a hammer. Do not cut the membrane back to the bolt holes.

Place Water Block on top of the drain bowl below the membrane where the clamping ring will sit. Use a minimum of one half tube per drain.

Place the clamping ring over the TPO membrane and install the clamping bolts. Tighten the clamping bolts to achieve a constant compression.

Install the drain basket and twist-lock if the drain has a twist-lock system.

### 3.7.2 Roof Drain Insert

#### ■ Applicability

Drain inserts are typically used on drains with little or no sump and for re-roofing applications.

#### ■ Installation Instructions

Remove the existing drain inserts on re-roofing projects.

The field sheet must be in place prior to installation of the drain insert. Cut a circular hole over the centre of the drain. The hole should be as large as the drainpipe.

Install the drain insert in the hole. Apply a layer of Water Block sealant between the flange of the drain insert piece and the TPO membrane around the drainpipe. Use a minimum of one quarter of a tube per drain. Drain insert flanges may be fastened using plates and fasteners.

Heat weld a piece of TPO membrane or TPO Unsupported Flashing to the flange and onto the field membrane. Please refer to the § 3.2 for overlap and welding requirements.

All cut edges with scrim exposed must be sealed with Firestone UltraPly TPO Cut Edge Sealant or TPO General Purpose Sealant.

Refer to the illustrations at the end of this document for additional information.





### 3.7.3 Scupper

#### ■ Applicability

Scuppers are used for roofs with a horizontal drainage system in vertical walls.

#### ■ Installation Instructions

The scupper insert piece usually consists of a welded metal sleeve fabricated using TPO Coated metal or of a pre-molded TPO scupper insert piece.

The entire interior of the flange needs to be flashed if the scupper insert is not welded watertight. All corners of the flanges need to be rounded. Remove existing scuppers and provide new watertight ones on re-roofing projects.

The TPO wall flashing membrane must be in place prior to installation of the scupper insert. Cut a hole over the centre of the drain. The hole should be as large as the drainpipe.

Install the drain insert in the hole. Apply a layer of Water Block sealant between the flange of the scupper insert piece and the TPO membrane around the drainpipe. Use a minimum of one quarter of a tube per drain. Scupper insert flanges may be fastened using plates and fasteners.

Heat weld a piece of TPO membrane or TPO Unsupported Flashing to the flange and onto the field membrane. Please refer to the § 3.2 for overlap and welding requirements.

All cut edges with scrim exposed must be sealed with Firestone UltraPly TPO Cut Edge Sealant or TPO General Purpose Sealant.

Refer to the illustrations at the end of this document for additional information.



## 3.8 Expansion Joints

### ■ Applicability

Expansion joints should be installed at all locations as specified by the designer.

Expansion joints have an extreme durability due to the high resistance to tear and long life performance of the TPO membrane when exposed to intense sunlight and external weather conditions, provided the detail is installed in accordance with the following instructions.

### ■ Installation Instructions

The TPO membrane should be mechanically attached at both sides of the expansion joint using approved plates and appropriate fasteners, 300 mm on centre.

Install a compressible tube over the expansion joint. The diameter of the insulation tube must exceed the deck or insulation opening by minimum 25 mm. Weld a TPO cover piece onto the field membrane using standard welding techniques.

Refer to the detail drawings at the end of this document for additional information with regards to other types of expansion joints.



## 3.9 Roof Edges

### ■ Applicability

A roof edge detail should be installed as specified by the designer at all flat edges of the roof where the field membrane ends and at internal and external gutters. The standard roof edge details in this section are generally applicable. Consult Firestone's Technical Department for assistance when designing an alternative detail that is more suitable for specific roof conditions.

### ■ Installation Instructions

Allow the TPO field membrane to pass over the edge by minimum 100 mm and fully adhere it to the front of the wall over its full length. Use stainless steel screws to fasten the metal edge profile at 100 mm on centre. Whenever possible, fasten as close as possible to the edge of the flange. Make sure that the front part of the profile extends a minimum of 25 mm over the edge of the TPO membrane. Flash the horizontal flange of the metal profile with TPO QuickSeam Flashing using TPO QuickPrime Plus. Ensure adequate overlap. Special considerations should be made at the end of a roll, at field splices, corners and where adjoining pieces of metal edge profile overlap.

Metal external gutters require the installation of an appropriate metal edge profile, which is adjusted to the shape of the gutter. Install the profile as previously explained and use TPO QuickSeam Flashing to flash in the flange of the profile. Alternatively the profile can be fabricated using TPO Coated Metal and the membrane can then be welded onto the profile.

Concrete external gutters should be flashed with separate strips of TPO membrane. The flashing membrane should be fully adhered onto the substrate over the full extent of the gutter.

Make sure that the flashing strips for the gutter extend a minimum of 150 mm at the internal edge of the gutter, so as to provide sufficient overlap for a welded seam detail including a mechanical anchoring. The external edge of the gutter must be terminated with a wall termination detail.

Internal gutters are to be flashed with separate strips of TPO membrane. The flashing membrane needs to be fully adhered onto the substrate over the full extent of the gutter. Where possible avoid seams in the gutter, by using long pieces of membrane.

Make sure that the flashing strips extend a minimum of 150 mm at both edges of the gutter, so as to provide sufficient overlap for a welded seam detail including a mechanical anchoring.



## 3.10 Wall Terminations

### ■ Applicability

A wall termination detail should be installed as specified by the designer and is applicable at all locations where the TPO flashing ends at wall or curb upstand. The standard termination details in this section are applicable for each Firestone TPO system. Consult Firestone's Technical Department for assistance when specific roof conditions require the design of an alternative detail. Coping stones, metal copings and metal edge profile details are used for upstands to be completely covered with TPO flashing. Counterflashing and termination details can be used at upstands that are not flashed over their entire height.

### ■ Installation Instructions

#### Coping stone

Stop the TPO flashings at a sufficient distance of the wall edge so as to allow a good adhesion of the mortar to the wall without compromising the watertightness of the detail. The TPO flashing should be fully adhered to the substrate over its entire length.

#### Metal Coping

Install a wood nailer on top of the wall. Allow the TPO flashing to extend beyond the wall edge by minimum 50 mm and fully adhere it to the wood nailer over its full length. Use galvanised nails with large head ( $\varnothing$  10 mm) to nail the TPO flashing 150 mm on centre at the vertical face of the wood nailer. Ensure that the front part of the metal coping extends beyond the underside of the wood nailer by a minimum of 25 mm.

#### Metal edge profile

Fasten the metal edge profile fabricated from TPO Coated Metal at 100 mm centres with appropriate fasteners. Fasten the flange as close as possible to its edge to ensure sufficient overlap of the flashing material at both sides of the fastener. When necessary, clean the membrane and metal edge flange with Splice Wash, following the previously described procedure. Weld the TPO membrane wall flashing onto the TPO Coated Metal using standard welding techniques as per §3.2.

#### Termination Bar

The required height for the TPO flashing should be determined by local regulations. For situations where this condition cannot be satisfied, Firestone requires that the flashing height exceeds the potential water level of a blocked drain. Suitable substrates for a Termination Bar are concrete, smooth bricks, blocks or masonry. A termination bar may never be mounted to a wooden substrate. The termination bar must be installed directly to the wall surface, not to existing flashings, sheet metal, etc. Pre-drill holes into the brick, masonry or concrete and not into the soft mortar joint.

Keep a minimum space of 5 mm between two adjoining bars. A Termination Bar must be cut at inside and outside corners. Do not bend the bar around the corners.

Prior to installation of the Termination Bar, pull back the topside of the membrane flashing 20 mm and apply a bead of Water Block between the membrane and the wall.

Install the Termination Bar with an acceptable fastening system at max. 200 mm on centers. A continuous compression is required and may need additional fastening. Each Termination Bar must be fastened a maximum of 25 mm from the end. Apply a bead of General Purpose Sealant on the topside of the bar.

At all locations where base flashings end, install the Termination Bar vertically. Apply General Purpose Sealant to both sides of the bar.

#### Counterflashing

The TPO membrane flashing shall be mechanically attached at the top with a metal batten strip. Apply a bead of General Purpose Sealant on the topside of the metal bar.

Allow the counterflashing to cover the top of the metal strip by minimum 100 mm.



## 3.11 Membrane Repair

### ■ Applicability

Repair of cuts and punctures in the TPO membrane or Unsupported Flashing, contamination of the membrane with hazardous products, voids in heat welded seams.

### ■ Installation Instructions

#### **Reinforced Membrane**

Patches must be at least 150 mm x 150 mm in size and made to be a minimum of 75 mm longer on all sides than the repair area. The patch must consist of a solid weld. These patches are used for deck sheet repairs only.

Strips of reinforced membrane can be used in long areas such as seams or cuts. Strips must be 150 mm wide minimum and 75 mm longer on each end than the repair area. A 38 mm wide seam is required on all sides of this repair.

*NOTE: Pay particular attention when welding in step-down areas to roll into these areas while welding. Also, use a pre-weld to hold strip in place while welding.*

#### **Unsupported Membrane**

Unsupported membrane is to be used when repairing any detail areas with angle changes, such as pipe wraps, wall seams, corner patches and pitch pans. All unsupported patches must be fully welded and be 50 mm or larger on all sides of the repair area. Minimum patch must be no less than 100 mm x 100 mm.

#### **Voids**

Voids can be cleaned and re-welded after probing. Use your probe to hold the fold open, insert heat gun nozzle and weld. If the void is in a difficult area, use a patch over the void using the patch specification.

*NOTE: Be careful when welding repairs. You can cause more damage by overheating these smaller areas. Turn the heat down to avoid burning and scorching. Use a smaller nozzle with repairing voids in seams. Always clean before repairing.*



## 3.12 Miscellaneous

### Roof Walkways

Prior to heat welding the Walkway Pad to the TPO Roofing System, the membrane needs to be clean and free of dirt, dust or debris. Allow it to relax sufficiently. For best results, installation of the pad should occur during the warmest part of the day. Installing the walkway in colder temperatures can cause the sheet to expand later and cause buckling. Cut the material into manageable lengths (maximum 3 m) and place the TPO Eco Walkway Pad over the TPO Roofing System with the textured side up.

Heat weld the perimeters of each Walkway Pad section to the UltraPly TPO roof membrane using techniques similar to splicing of the UltraPly TPO Roofing System membrane panels. Different welding settings might be required because of the thickness of the Walkway Pad. Special attention must be given when welding occurs over roof membrane seams, to assure that a proper weld is achieved, and no damage to the membrane seams occurs. The perimeter should be heat welded in 600 mm long sections, allowing for a 200 mm space between sections.

### Temporary closure

Temporary closures can prevent moisture from damaging the completed section of the new installation but are the responsibility of the roofing contractor. Flashings, Terminations and temporary closures must be completed to provide a watertight condition at the end of each working day.

Mark the free edge of the uncompleted section on the substrate. Fold the membrane back a minimum of 200 mm. Use a chalkline to mark a straight line on the substrate 100 mm within the first marks. Apply a bead of WaterBlock over the chalkline at a rate of 3 lin.m./tube. Let the membrane fall freely into the WaterBlock and install some temporary ballast to put the seam under continuous compression. The next working day, use a chalkline to trim a portion of 200 mm at the end of the membrane.

