

Firestone

Firestone Building Products

FIRESTONE ULTRAPLY™ TPO ROOFING SYSTEMS APPLICATION GUIDE

October 2021

Contents

1.01	GENERAL.....	3
1.02	JOB SITE CONSIDERATIONS	3
1.03	ROOF SUBSTRATE PREPARATION.....	4
1.04	WOOD NAILER LOCATION AND INSTALLATION	4
1.05	AIR OR VAPOR BARRIER INSTALLATION	5
1.06	V-FORCE VAPOR BARRIER INSTALLATION	6
1.07	BASE SHEET INSTALLATION.....	6
1.08	INSULATION INSTALLATION.....	7
1.09	MEMBRANE INSTALLATION	8
1.10	MEMBRANE SEAMING	13
1.11	ADDITIONAL MEMBRANE SECUREMENT AND BASE TIE-IN FLASHING	14
1.12	FLASHING- PENETRATIONS.....	15
1.13	FLASHING – WALLS, PARAPETS, MECHANICAL EQUIPMENT CURBS, ETC.....	16
1.14	SHEET METAL WORK.....	17
1.15	FLASHING GRAVEL STOPS OR ROOF EDGE METALS	18
1.16	ROOF WALKWAYS.....	19
1.17	TEMPORARY CLOSURE AND TIE-INS	22
1.18	FINISHED ROOF PROTECTION	22
1.19	MEMBRANE REPAIR.....	22
1.20	CLEAN UP	23
1.21	WELD WINDOWS	24

1.01 GENERAL

This Firestone Technical Manual provides instructions for the basic installation of Firestone's UltraPly TPO Roofing System. Reference to the UltraPly TPO Design Guide, technical Information sheets (TIS), and other published information is necessary to ensure that the finished roof system is installed in compliance with Firestone requirements.

Extended warranties, 15, 20, 25, and 30 year, and wind warranties in excess of 55 mph may require special considerations regarding fasteners, insulation, membrane gauge and securement. Refer to the system design guide or Firestone website (<http://firestonebpc.com/>) for specific requirements and information for other TPO systems: UltraPly Platinum, UltraPly TPO XR, UltraPly TPO SA, UltraPly TPO Flex Adhered, UltraBlend and InvisiWeld.

The Firestone Platinum System and Warranty requires special considerations with regards to fasteners, insulations, membrane gauge and attachment requirements. These requirements are provided as a part of this application guide.

NOTE: If a proposed application falls outside of the specification, contact a Firestone Building Systems Advisor for additional information.

1.02 JOB SITE CONSIDERATIONS

A. Safety

1. Comply with all applicable regulatory safety and health regulations.
2. Consult container labels, Safety Data Sheets (SDS) and Technical Information Sheets (TIS) for specific safety instructions for all products used on the project.
3. Keep all adhesives, sealants and cleaning materials away from ALL ignition sources (i.e., flames, fire, sparks, etc.). Do not smoke while using these materials.
4. Care must be used when installing fasteners or other required roof related items to avoid possible conduits and other piping in or under the deck.
5. Fumes from adhesive solvents may be drawn into the building during installation through rooftop intakes. Take suitable precautions when using such products on an occupied building.
6. Do not use heat guns or open flames to dry adhesives and primers.

B. Cautions

1. Store Firestone UltraPly TPO membranes in the original undisturbed plastic wrap in a manner to protect it from becoming damaged. Insulation must be properly stored and protected from ignition sources, moisture and damage. Consult container labels, Safety Data Sheets and Technical Information Sheets for specific safety, use and storage instructions for all products used on the project.
2. Do not use oil-base or bituminous-base roof cement with any Firestone TPO products.
3. Store Firestone Insulations properly protected from ignition sources, moisture and damage.

C. Cold Weather

1. When the outside temperature is below 40 °F (4 °C), certain combinations of temperature and humidity may cause condensation on the surface of solvent-based adhesives and primers. If this condition occurs, discontinue the application. When the ambient air conditions no longer cause condensation on adhesive surfaces and the membrane is clean and dry then proceed with application of adhesive or primer.
2. The consistency of sealants, adhesives and primers will begin to thicken as the temperature drops. To minimize this consequence:
 - a) Start work with sealants, adhesives and primers that have been stored between 60 °F to 80 °F (16 °C to 27 °C).
 - b) Complete test areas to determine if conditions will cause problems such as condensation with the application of the materials.
 - c) Stop the operation or change to another warm container when material becomes too thick to properly apply.
3. When the outside temperature is below 40 °F (4 °C), installation of the Firestone TPO System requires additional precautionary measures:
 - a) Ensure that the roof surface is dry. Even trace amounts of moisture may cause poor adhesion and lead to moisture entrapment within the roofing system.
 - b) Use of temporary roofs should be considered when roof applications must occur in cold or potentially wet weather to permit continued interior construction or roof-top work.
 - c) Refer to the product Technical Information Sheets for individual product temperature restrictions / limitations if applicable.
4. If using Water-Based Bonding Adhesive (WBBA), ambient and substrate temperatures must be at least

40 °F (4 °C) and rising, during and 48 hours after application, for the material to be applied and perform as designed. Expect longer drying times during lower temperatures or higher humidity. Plan for material staging.

1.03 ROOF SUBSTRATE PREPARATION

It is the roofing contractor's responsibility for ensuring that the substrate is acceptable for the Firestone roof system. **Firestone Platinum System** warranties require either new construction or a complete removal of the existing systems down to the deck.

A. Correct Substrate Defects

1. Defects that need to be corrected before work can commence should be brought to the attention of the General Contractor or Owner in writing and addressed by them.
2. For re-roofing applications, remove existing roof system components as specified by the project designer. If components are discovered during installation that could be detrimental to the performance of the new roof system, they should be brought to the attention of the project designer for corrective action.
3. Recovering an existing roof system is an alternative to removing existing roof components. However, if soundness and integrity of the existing roof system cannot be verified, good roofing practice requires a complete tear-off to the structural deck. Non-destructive testing, in conjunction with core cuts, must be completed to determine the condition of the existing roof system and decking.
4. The building owner or project designer is responsible for assuring that all wet insulation and/or wet substrate materials are removed in a re-roofing application. The best diagnostic technique is taking and evaluating a series of roof cuts. There are three other techniques that are currently available to make this determination by indirect means. These are:
 - Nuclear moisture detection
 - Infrared thermography
 - Electric capacitance

These techniques provide measurement of factors that can be associated with the presence of moisture, which can then be verified with the use of roof core cuts to confirm the results of the non-destructive testing.

5. In the absence of a design professional, the roofer should coordinate with the building owner to assure conditions are satisfactory to commence with the project as designed.

B. Remove Moisture

Ponded water, snow, frost and/or ice, present in more than trace amounts must be removed from the work surface(s) prior to installing the Firestone TPO Roofing System.

C. Prepare Surface

Acceptable substrates to which the Firestone TPO Roofing System is installed must be properly prepared prior to roof system installation. The surface must be relatively even, clean, dry, smooth, free of sharp edges, fins, loose or foreign materials, oil, grease and other materials that may damage the roof system. Rough surfaces that could cause damage to the membrane must be overlaid with insulation or cover boards as determined by the design professional.

D. Fill Voids

All surface voids of the immediate membrane substrate greater than ¼" (6.35 mm) wide must be filled with insulation.

- #### E. Concrete Additives can have a negative impact on the adhesion of asphaltic membranes and insulation products. The concrete supplier/installer should verify that any additives in the mix will not render the deck unsuitable for roofing application. Firestone does not accept surface-applied curing compounds for warranted systems.

- #### F. Firestone does not accept for warranty any concrete substrates that have been sealed with chemical sealers or silicon surface treatments.

1.04 WOOD NAILER LOCATION AND INSTALLATION

Firestone Building Products no longer requires the use of treated wood nailers. This is due to the new EPA requirements that have caused treated lumber to have more corrosive properties than the previous generation of wood treatments.

If architectural specifications require the use of treated wood nailers, the following Firestone requirements apply:

- Refer to the Firestone Design Guide for the appropriate Firestone fastener to be used for securing membrane into wood nailers.
- Nails penetrating treated wood nailers must be hot-dipped galvanized, meeting ASTM A653, Class G185 or as currently recommended by industry associations.
- Aluminum fasteners, flashings and accessory products must not make direct contact with treated wood nailers.

- Uncoated metal and painted metal flashing and accessories, except for 300-series stainless steel, must not make direct contact with treated wood nailers.
- When in doubt of the type of treatment of the wood nailer or its compatibility with a metal component, use UltraPly TPO membrane as a separator.

Because of recent EPA regulations regarding treated wood, new treatments for lumber may be highly corrosive to fasteners. Contact the fastener manufacturer for their recommendations on fasteners if attaching nailers that have been treated with corrosive materials.

Wood nailers must be installed as specified by the project designer or as noted in Firestone Details and the TPO System Design Guide. Install wood nailers as follows:

A. Wood Nailer Grade

1. When wood nailers are used, Firestone specifications require the use of wood that is kiln-dried (Southern Pine, Douglas Fir) structural grade #2 or better, unless otherwise noted.
2. While being stored on the roof, properly elevate and cover non-treated wood to protect from the weather and keep dry.
3. Nailers must be properly anchored to provide secure attachment through the warranty term.
4. Nailers are not covered by the Firestone warranty.

B. Size of Nailer

Nailers shall be a min. thickness of 2" x 4" (51 mm x 102 mm) nominal 1½" x 3½" (38 mm x 89 mm) and exceed the width of any metal flange attached to it by a min. of ½" (13 mm).

C. Position of Nailer

1. Total wood nailer height must match the total thickness of insulation being used and should be installed with a ⅛" (3.2 mm) gap between each length and each change of direction.
2. When nailers are stacked, end joints should be staggered a min. of 12" (305 mm) from the prior layer in straight runs.

D. Secure Wood Nailer

1. Wood nailers must be firmly fastened to the deck or building.
2. Mechanically fasten wood nailers to resist a min. force of 200 lb/f (890 N) in any direction.
3. Refer to attachment requirements of the roofing system as specified by the project designer if greater than 200 lb/f (890 N).

E. Taper Wood Nailer

The wood nailer must be tapered (if applicable) so that it will always be flush at the point of contact with the insulation (refer to Firestone Details).

F. Poured-In-Place Decks

For new construction over poured-in-place decks or fill, and all recover projects, a waterproof separator membrane shall be placed between the non-treated lumber and the deck.

G. Installation of Wood Nailers by Others

1. Make these specifications and details available when nailers are to be installed by others.
2. Work that compromises the integrity of the roof system may jeopardize the roof warranty.

H. For Additional Information

Please consult the NRCA Special Report, "Use of Treated Wood in Roof Assemblies."

1.05 AIR OR VAPOR BARRIER INSTALLATION

A. Install Vapor Retarder (when specified):

Install a vapor retarder as specified by the project designer or as required by Firestone Building Products.

B. Install Air Barrier (when specified):

Install an air barrier as specified by the project designer or as required by Firestone Building Products.

1.06 V-FORCE VAPOR BARRIER INSTALLATION

Firestone V-Force Membrane is intended for use in applications where a vapor barrier is specified.

General

1. All substrates except metal decks must be primed with either Firestone SA Water Based or SA Solvent Based Primer.
2. Position V-Force Membrane with min. 3" (76 mm) side laps and 6" (152 mm) end laps.
3. Shingle side laps up the roof slope wherever possible and stagger end laps min. 12" (305 mm).
4. Peel back approximately 5' (1.5 m) of release liner from the end of the roll and adhere it to the substrate.
5. Keeping the V-Force flat and properly positioned, remove the remaining release liner on a 45° angle.
6. Roll the V-Force with a 75 lb (34 kg) roller to fully mate the product to the substrate.
7. Refer to the Firestone website for details and additional product and installation information.

1.07 BASE SHEET INSTALLATION

This section is intended for applications where it has been determined that a base sheet is required for roof system installation. Refer to the design section of the Firestone database for suitable substrates, and the Technical Information Sheets for additional product and installation information.

A. General

1. Starting at the low point of the roof, align the base sheet, unroll and allow the sheet to relax prior to attaching. After allowing the base sheet to relax, adhere or attach to the substrate with appropriate materials as indicated below.
2. Roofing base ply shall never touch roofing single ply, even at roof edges, laps, tapered edge strips, and cants. Cut out fishmouths/side laps, which are not completely sealed; and repair accordingly. Fully adhered base sheets which are not fully and continuously bonded shall be replaced.

B. Hot Asphalt Attachment

1. The base sheet may be attached using a solid mopping of Firestone SEBS mopping asphalt or ASTM D 312 Type III or IV hot steep asphalt.
2. The substrate must be suitable for asphalt attachment (structural concrete, base sheet, coverboard, etc.). Refer to the Design section of this manual for suitable substrates and the Technical Information Sheets for additional information on specific base sheets.
3. The asphalt shall be at the manufacturer's stated EVT at point of installation.
4. Align subsequent rolls, shingling the laps, maintaining a min. 3" (51 mm) side lap and min. 6" (152 mm) end lap and repeat the application.
5. Firestone recommends that a half sheet be used as the first roll to ensure that the base sheet laps and the cap sheet laps are not aligned. Half sheets may be required, depending on the roof slope.
6. Refer to the Design section for slope limitations.
7. Do not install any base or ply sheets in solid mopping of asphalt directly to polyisocyanurate insulation. The base sheet must be mechanically attached, or spot attached using ASTM D312 Type III or IV asphalt or Firestone SEBS Mopping Asphalt. An overlayment of Structodek HD Fiberboard, SECUROCK or DensDeck may be installed over the Firestone ISO 95+ GL / ISOGARD™ GL polyisocyanurate insulation before the base sheet is installed.
8. Solid Mopping
 - a) Starting at the low point of the roof, align the base sheet and unroll into a solid mopping of hot asphalt.
 - b) With a stiff push broom, immediately broom the base sheet ensuring full contact.

C. Mechanical Attachment

Starting at the low point of the roof, align the base sheet, unroll and allow the sheet to relax prior to attaching. After allowing to relax, begin attachment at one end and work towards the other end, keeping the roll tight and wrinkle free. Align subsequent rolls, shingling the laps, maintaining a min. 3" (76 mm) side lap and min. (152 mm) end lap and repeat the application. Stagger all end laps.

1. Fasten Base Sheet Using Firestone Insulation Plates and Fasteners
 - a) Using Firestone Insulation Plates and Fasteners, base sheets may be attached through insulation into the deck, or directly to poured in place concrete, wood, gypsum, cementitious wood fiber, lightweight concrete decks, or through a smooth surfaced built-up or modified bitumen roof system. Refer to the TPO Design Guide for information on fasteners for specific deck types.
 - b) 39" (1 m) Firestone compatible base sheets and cap sheets used as base sheets. The Base sheet must be mechanically attached 12" (305 mm) o.c. in the side laps and 18" (457 mm) o.c. in two staggered rows in the field of the sheet. Each row shall be 13" (330 mm) approximately in from the sides of the base sheet.

2. Fasten Base Sheet Using Cap Nails
 - a) Using cap nails with 1" (25 mm) diameter steel heads, base sheets may be attached to plywood, wood plank, and oriented strand board decks.
 - b) Mechanically attach with cap nails specified by the project designer at 9" (229 mm) o.c. in the side laps and 18" (457 mm) o.c. in two staggered rows in the field of the sheet. Each row shall be 12" (305 mm) approximately in from the sides of the base sheet.
 - c) Cap nails cannot be used to attach insulation, attach a base sheet through an existing insulated roof, attach a base sheet over a gravel surfaced built-up roof, or through a smooth surfaced un-insulated built up roof over ½" (13 mm) thick.
 - d) Fasteners used to attach base sheet must be manufactured for the deck type and be Factory Mutual Approved. This attachment pattern applies to all Firestone compatible base sheets and cap sheets used as base sheets.

3. Fasten Base Sheet Using Specialty Fasteners
 - a) Using nail-in type fasteners and plates, base sheets may be attached to gypsum, cementitious wood fiber or lightweight insulating concrete decks. The base sheet must be mechanically attached with fasteners as acceptable to the substrate.
 - b) Nail-in fasteners cannot be used to:
 - Attach insulation
 - Attach a base sheet through an existing insulated roof
 - Attach a base sheet over a gravel surfaced built-up roof
 - Attach a base sheet through a smooth surfaced built-up roof.

D. Base Sheet Laps

1. Hot steep asphalt applied Base sheets must be lapped a min. of 3" (50.8 mm) in the side laps.
2. Mechanically attached torch applied, or automatic heat welded base sheets must be lapped a min. of 3" (76 mm) in side laps.
3. End laps must be min. 6" (152 mm).
4. In all cases, an offset of 12" (305 mm) min. must be maintained between the side and end laps of the base sheet and the cap sheet.

1.08 INSULATION INSTALLATION

InvisiWeld Systems require a min. 1½" (38 mm) of insulation over the metal deck for operation of induction welding equipment. Firestone UltraPly Platinum TPO Roofing System warranties require a new approved substrate board.

Ballast systems are not permitted when the membrane is installed directly over any mechanically attached insulation or over a hard surface such as HailGard / ISOGARD HG, ISOGARD HD, DensDeck, SECUROCK, OSB or concrete. Ballast systems are not approved for use when **Firestone Platinum System** warranties are desired.

A. Install Insulation

1. Install only as much insulation as can be covered with roofing membrane and completed before the end of the day's work or before the onset of inclement weather.
2. Form continuous insulation joints over deck flange. Do not cantilever insulation edges over deck ribs. Min. bearing surface: 1" (25 mm).

B. When installing multiple layers of insulation, all joints between layers shall be staggered 6" (152 mm) min. Fit Insulation

1. Neatly fit insulation to all penetrations, projections, and nailers. Insulation should be loosely fitted, with no gaps greater than ¼" (6 mm) filled with acceptable insulation. The membrane shall not be left unsupported over a space greater than ¼" (6 mm).
2. On metal decks, the edge of the board parallel with the roof deck flutes should be completely supported by the flange.
3. Tapered insulation with acceptable facers for bonding must be installed around roof drains to provide proper slope for drainage as shown in Firestone Details.

C. Attach Insulation

1. Mechanical Attachment:

- a) Insulation must be attached using Firestone Insulation Plates and Fasteners. HailGard fasteners may be used to attach HailGard / ISOGARD HG insulation without the use of insulation plates.
- b) If installing on a metal deck (where allowed by specification), the edge of the board parallel with the roof deck should be completely supported and fasteners must penetrate the top flange of the deck.
- c) When installing fasteners, care should be taken to avoid penetration of conduits and other piping below or encased in the deck.
- d) For insulation attachment please refer to the Technical Information Sheets that reference the specific insulation being used. Use appropriate attachment patterns and fastening rates of that specific insulation and desired warranty term. **Firestone Platinum Warranties** requires increased fastening.
- e) For specific deck penetration requirements refer to the Technical Information Sheet that references the specific fastener being used.
- f) When installing a multi-layer insulation assembly, the fastening pattern is determined by the type and thickness of the top layer of insulation and the performance criteria of the system. MAS systems with a fully adhered perimeter shall require the perimeter insulation to use fastening pattern used in a fully adhered system as determined by the top layer of insulation.
- g) Multiple layers of insulation may be installed using a common fastener.
- h) Ensure that the fasteners are fully seated, but not overdriven. Use a properly adjusted clutch or depth sensing type of drill. Do not use a standard single speed drill. If a fastener must be removed after installation, do not reinstall fastener into same hole.
- i) Fastener pull tests should be conducted on existing decks or decks with conditions that are not "like new". Pull values below Firestone requirements may require increased fastening, alternate system requirements or refusal of warranty coverage.

2. Asphalt Attachment

- a) The substrate may require priming or a base sheet prior to installing the insulation. Refer to the Design Guide for specific information.
- b) The insulation shall be no larger than 4' X 4' (1.2 m X 1.2 m) panels.
- c) Insulation may be attached using a solid mopping of Firestone SEBS Asphalt (as required by warranty terms) or ASTM D 312 Type III or Type IV asphalt. Resista™ / ISOGARD CG and ISOGARD HD may not be asphalt attached.
- d) The asphalt shall be at the manufacturer's stated EVT less ~ 25 °F (-4 °C) at the point of installation. Install enough asphalt to achieve complete adhesion, approximately 25-30 lb per 100 ft² (1.2-1.4 k/m²), depending on substrate.
- e) It is necessary to "walk" boards in to ensure complete adhesion to the substrate.
- f) Additional layers of insulation should be installed in the same fashion.

3. Adhesive Attachment

- a) Insulation may be attached using I.S.O. Twin Pack™, I.S.O. Stick™ I.S.O. Fix™, I.S.O. SPRAY™ R or Twin Jet.
- b) Apply the adhesive in strict accordance with the instructions provided with the product and the Technical Information Sheets that are a part of this Technical Database.
- c) It may be necessary to prime the substrate prior to installing the insulation adhesive with a prescribed primer.
- d) If installing on a metal deck (where allowed by specification), the edge of the board parallel with the roof deck flutes must be completely supported.
- e) The insulation or coverboard shall be no larger than 4' x 4' (1.2 m x 1.2 m).
- f) It is necessary to weight each board, using full pails of bonding adhesive or other available source of weight that will not damage the insulation board, at each corner, to ensure complete adhesion to the foam and substrate. Refer to the specific product Technical Information Sheet for min. weight times.

1.09 MEMBRANE INSTALLATION

A. General

1. This section contains information for standard Firestone UltraPly TPO membrane systems. Read all the information to ensure that it is the correct system and application. **Firestone Platinum Warranties** require the use of our UltraPly TPO 80 mil membrane or UltraPly TPO XR 135 membrane.

2. Additional securement details for the membrane (base tie-in) will occur at all locations where the membrane goes through an angle change greater than 1" (25 mm) in 12" (305 mm) (i.e. roof edges, curbs, interior walls, etc.) and other areas as details indicate. See Firestone details for more information.
3. TPO Membrane installations may require the use of a TPO QuickSeam Reinforced Perimeter Fastening Strip, requiring coordination with the many substrates at perimeters and layout and installation of the membrane system in a logical sequence. These steps should be addressed early in the roofing process.

Note: It is important to verify that welds completed at any transition from machine to hand application is completed properly. Validate weld transition is fully bonded and no gaps, fish mouths, pin holes or cold welds exist. Probe all welds to verify weld is completed properly.

B. Fully Adhered System

1. Position Membrane
 - a) Place membrane panel, starting at the low side of the roof and unroll over the acceptable substrate. Allow the panel to relax for 30 minutes before attaching or splicing.
 - b) The Firestone TPO Adhered System shall be installed so that the seams shed or run parallel to the flow of water wherever possible.
 - c) Placement of additional rolls of membrane shall provide for overlapping the sides of adjoining sheets 3½" (90 mm) as marked on the top side of the membrane and overlapping the ends of adjoining sheets a min. of 3" (76 mm). For sufficient membrane overlap distance, see standard lap splice details for robotic and hand welding.
 - d) If possible, sheets cut along one side shall have the cut edge installed as the underside of the seam. If cut edges are exposed on the weather side, they are to be sealed to specification with Firestone UltraPly TPO Clear Cut Edge Sealant.
2. Fold the Membrane Back
After making sure the sheet is placed in its final position allowing for the proper lap width per Firestone details and specifications, fold it back evenly onto itself without wrinkles to expose the underside bonding surface of the sheet and substrate.
3. Remove any Debris or Dirt
Sweep the mating surfaces with a stiff broom to remove any debris or dirt that may have accumulated. If required, wash membrane with Splice Wash SW-100 and allow to dry.
4. Apply the Bonding Adhesive
Always stop bonding adhesive short of membrane seam area.
Care must be taken not to apply bonding adhesive over an area that is to be later hot air welded to another sheet or flashing. All bonding adhesive must be completely removed from the seam area.
 - a) Apply bonding adhesive with either a 9" (228 mm) wide solvent-resistant paint roller or a commercial-grade adhesive sprayer.
 - Adhesive must be applied in a relatively uniform thickness to both surfaces at approximately the same time.
 - If adhesive is spray-applied, it must be back-rolled with a solvent-resistant paint roller to assure proper contact and uniform coverage. Refer to Firestone Technical Information Sheets and container labels for specific application instructions.
 - b) Apply bonding adhesive at specified coverage rate. Refer to the container label and Technical Information Sheet for specific application requirements and coverage rates.
5. Test Bonding Adhesive for Readiness (Touch-Push Test)
Allow the bonding adhesive to flash-off. Touch the adhesive surface in several places with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If motion exposes wet or stringy adhesive when the finger is lifted, the adhesive is not ready for mating. Flash-off time will vary depending on ambient conditions of temperature, wind and humidity.
6. Bond the Membrane to the Substrate
Starting at the fold, roll the previously coated portion of the membrane into the coated substrate slowly and evenly to prevent wrinkles.
7. Broom the Membrane
To assure proper contact, compress the bonded half of the membrane to the substrate with a stiff push broom.
8. Repeat Procedure to Complete the Membrane Installation
Fold the unadhered half of the membrane back onto itself and repeat the procedure.
9. Weld the Lap

- a) If membrane has been open for more than 12 hours or become contaminated with dirt, debris or moisture, wash mating surfaces with Splice Wash SW-100 and allow to dry.
- b) Complete the laps with hot air welds as specified and refer to UT-LS details.

C. Mechanically Attached System

Firestone suggests that when installing mechanically fastened membranes over steel decks, the field attachment should run perpendicular to the deck panels. If a project is Factory Mutual insured or specified, per FM 1-29 Loss Prevention Data Sheet, attachment must run perpendicular to the deck panels.

The perimeter of the Firestone UltraPly TPO mechanically attached roofing system may be adhered or mechanically attached. When mechanically attaching a perimeter, the fastener layout must be as specified in the Firestone Membrane Layout and Attachment Guide at a min., or as required by the owner's design professional or local building code. Should a fully adhered perimeter be selected, the perimeter area is the same as for mechanically attached.

NOTE: UltraPly TPO Flex Adhered is an adhered membrane only. It is not approved for mechanical attachment. Firestone Platinum Membrane when used in Platinum Warranties allows for up to 8'-0" (2.44 m) maximum row spacing and fastened at a maximum of 6" (152.4 mm) o.c.. Specific project conditions may alter this allowance.

1. Securing with Plates and Fasteners

a) Position Perimeter Panels

- i. Firestone UltraPly TPO Mechanically Attached Roofing Systems are installed starting at the low point of the roof using up to four sheets, determined by job requirements, that are half the width of the field panels. Place membrane panel, unroll over the acceptable substrate and allow panel to relax for a min. of 30 minutes before attaching or splicing. Ensure proper sheet overlap allowances for roof edge details and flashing seams. (Consult Firestone UltraPly TPO Lap, edge and base tie-in details.)
- ii. The Firestone TPO Adhered System should be installed so that the seams shed or run parallel to the flow of water wherever possible.
- iii. Placement of additional rolls of membrane shall provide for overlapping the sides of adjoining sheets 6" (152 mm) as marked on the top side of the membrane and overlapping the ends of adjoining sheets a min. of 3" (76 mm). For sufficient membrane overlap distance, see standard lap splice details for robotic and hand welding.

NOTE: If possible, sheets cut along one side shall have the cut edge installed as the underside of the seam. If cut edges are exposed on the weather side, they are to be sealed to specification with Firestone UltraPly TPO Clear Cut Edge Sealant.

b) Secure the Panel

- i. The inside edge of the half sheet lap is fastened to the deck using approved Firestone UltraPly TPO Seam Plates and fasteners as required by specification.
- ii. Position each fastener 2" (51 mm) inside the membrane edge and 1" (26 mm) from the area to be heat welded, per lap splice details.
- iii. Install each fastener so that it is properly engaged in the deck and the head is flush within the countersunk portion of the seam plate.

c) Position Second Perimeter Panel

Roll out the second perimeter panel and position along the lap line of the first.

d) Fold the Membrane Back at the Lap

After confirming the sheet is positioned allowing for the proper lap width, fold it back evenly onto itself without wrinkles or creases to expose the underside mating surface of the lap.

e) Remove Dirt or Debris

Sweep surfaces with a stiff broom to remove any debris or dirt that may have accumulated.

f) Weld the Lap

Fold the membrane back into position, heat weld the side lap per section 2.09 (Membrane Seaming) of this specification, then fasten along the opposite edge of the panel.

g) Install Subsequent Perimeter Panels

Continue this procedure of lay-out, fastening and welding for perimeter sheets.

h) Position First Field Panel

- i. Roll out the first field panel and position along the lap line of the last perimeter panel allowing for 6" (152 mm) side lap and 3" (76 mm) end laps.
- ii. Follow procedure outlined above to secure the last perimeter panel and heat weld the first field lap.

i) Position and Secure Subsequent Field Panels

- i. Roll out, position, secure and complete adjoining field panels as above.

- ii. Install each fastener so that it is properly engaged in the deck and the head is flush within the countersunk portion of the Seam Plate.
 - iii. If the slope changes direction, begin working at the lower edge of the adjoining side of the roof up the slope with perimeter and field panels until reaching previous work. A half sheet is installed over a ridgeline, secured and welded to the two panels.
2. Securing Membrane with Batten Strips (WIDE WELD SYSTEMS ONLY)
- a) Position Perimeter and Field Panels
Position perimeter and field panels according to the design layout, and as described in section 2.08.2.a, above.
 - b) Position Batten strips
 - i. The inside edge of the half sheet lap is fastened to the deck using appropriate Firestone Batten Strip and Fasteners as required by the project design layout. To appropriately position the batten strip for the Wide Weld seam, center the batten 3 9/16" (90.5 mm) from membrane edge.
 - ii. When batten strips must be field cut, round the cut end. Assure that all burrs created by cutting are removed.
 - iii. Where field drilling of metal battens is necessary, use a 1/4" (6.4 mm) diameter drill bit.
 - iv. Install 2" (50 mm) field cut membrane circle patches centered under the ends of metal batten strips and end fasteners.
 - c) Fasten Batten Strips (WIDE WELD SYSTEM ONLY)
 - i. Place the Firestone fastener starting 1" (25 mm) in from the end of the Firestone Batten Strip, then every 12" (305 mm) o.c. (unless a more frequent fastener spacing is required per wind/application design guide) using the pre-punched holes in the battens.
 - ii. Fasten batten strips working from one end only. Install each fastener so that it is properly engaged in the deck and the head is flush with the batten strip surface. Use caution not to overdrive the fastener as this will cause the batten strip to buckle between the fasteners and interfere with the Wide Weld nozzle.
 - iii. Lap Field Runs of Firestone Batten Strips
 - iv. Use a common fastener to anchor overlapping Firestone Batten Strips using a common hole.
 - d) Complete the Lap
Fold the membrane back into position, heat weld the side lap using the Wide Weld Nozzle, per the section on membrane seaming in this specification, then fasten along the opposite edge of the panel.
3. Adhered Perimeter
- a) Position Perimeter Panel
 - i. Place membrane panel, starting at the low side of the roof and unroll over the acceptable substrate. Allow the panel to relax for 30 minutes before attaching or welding.
 - ii. Membrane panels shall be installed so that the seams shed or run parallel to the flow of water wherever possible.
 - iii. Placement of additional rolls of membrane shall provide for overlapping the sides of adjoining sheets 3 1/2" (90 mm) as marked on the top side of the membrane and overlapping the ends of adjoining sheets a min. of 3" (76 mm). For sufficient membrane overlap distance, see standard lap splice details for robotic and hand welding.
 - iv. If possible, sheets cut along one side shall have the cut edge installed as the underside of the seam.
 - b) Fold the Membrane Back
After making sure the sheet is placed in its final position allowing for the proper lap width per Firestone details and specifications, fold it back evenly onto itself without wrinkles to expose the underside bonding surface of the sheet and substrate.
 - c) Remove any Debris or Dirt
Sweep the mating surfaces with a stiff broom to remove any debris or dirt that may have accumulated. If required, wash membrane with Splice Wash SW-100 and allow to dry.
 - d) Apply the Bonding Adhesive
 - i. Always stop bonding adhesive short of membrane seam area.
 - ii. Care must be taken not to apply bonding adhesive over an area that is to be hot air welded to another sheet or flashing. All bonding adhesive must be completely removed from the seam area before welding.
 - iii. Apply bonding adhesive with either a 9" (228 mm) wide solvent-resistant paint roller or a commercial-grade adhesive sprayer.

- iv. Adhesive must be applied in a relatively uniform thickness to both surfaces at approximately the same time.
 - v. If adhesive is spray-applied, it must be back-rolled with a solvent-resistant paint roller to assure proper contact and uniform coverage. Refer to Firestone Technical Information Sheets and container labels for specific application instructions.
 - vi. Apply bonding adhesive at specified coverage rate
 - vii. Refer to the container label and Technical Information Sheet for specific application requirements and coverage rates.
- e) Test Bonding Adhesive for Readiness (Touch-Push Test)
Allow the bonding adhesive to flash-off. Touch the adhesive surface in several places with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If motion exposes wet or stringy adhesive when the finger is lifted, the adhesive is not ready for mating. Flash-off time will vary depending on ambient conditions of temperature, wind and humidity.
- f) Bond the Membrane to the Substrate
Starting at the fold, roll the previously coated portion of the membrane into the coated substrate slowly and evenly to prevent wrinkles.
- g) Broom the Membrane
To assure proper contact, compress the bonded half of the membrane to the substrate with a stiff push broom.

NOTE: If possible, sheets cut along one side shall have the cut edge installed as the underside of the seam. If cut edges are exposed on the weather side, they are to be sealed to specification with Firestone UltraPly TPO Clear Cut Edge Sealant.

- h) Repeat Procedure to Complete the Membrane Panel Installation
Fold the un-adhered half of the membrane back onto itself and repeat the procedure.
- i) Terminate the Membrane at the Perimeter
After the perimeter sheets are adhered to the substrate, they must be terminated along the outside edge using appropriate Firestone roof edge or base tie-in detail.
- j) Install Perimeter Isolation
Install Firestone fasteners and TPO seam plates continuously along the inside edge of the adhered perimeter area per Firestone details.
- k) Position First Field Panel
 - i. Roll out the first field panel and position along the lap line of the adhered perimeter panel allowing for 6" (152 mm) side lap and 3" (76 mm) end laps.
 - ii. Heat weld the first field lap.
- l) Position and Secure Subsequent Field Panels
 - i. Roll out, position, secure and splice adjoining field panels as above.
 - ii. Install each fastener so that it is properly engaged in the deck and the head is flush within the countersunk portion of the Seam Plate.
 - iii. If the slope changes direction, begin working at the lower edge of the adjoining side of the roof up the slope with perimeter and field panels until reaching previous work. A half sheet is installed over a ridgeline, secured and welded to the two panels.

D. Ballasted System

Ballasted systems are not permitted when the membrane is installed directly over or onto a hard surface, such as HailGard / ISOGARD HG, DensDeck, SECUROCK, OSB, ISOGARD HD, ISOGARD HD Composite, or concrete. Ballasted systems are not allowed when the membrane is installed directly to a layer of insulation, which has been mechanically attached.

Adhesive attachment of insulation is acceptable for Ballasted systems, if required.

NOTE: UltraPly TPO Flex Adhered is an adhered membrane only. It is not approved for ballast attachment.

1. Position Membrane

- a) Position membrane panel, without stretching, over the acceptable substrate and allow to relax for 30 minutes.
- b) Good roofing practice dictates that seams shed or run parallel to the flow of water wherever possible.
- c) Move Membrane to its Final Position.
Shift the membrane panel to its final position allowing for a min. 4" (102 mm) field seam onto adjacent panels and sufficient membrane for proper flashing and termination.

2. Complete the lap
Heat weld the side lap per section 2.09 (Membrane Seaming) of this specification, then fasten along the opposite edge of the panel.
3. Ballast Information
 - a) Firestone Ballast Paver System
 - i. Install Firestone Ballast Paver System and Accessories as required in proper sequence for membrane protection and paver system performance, according to the Firestone SkyScape™ Ballast Paver Technical Information Sheet and as determined by the design professional.
 - ii. Stone Ballast
 - Spread stone ballast over the TPO membrane at the rate specified by the project designer but never less than 10 lb/ft² (4.5 kg/ft²) using ASTM #4 stone. Refer to the System Design Guide of this manual for additional ballast type and size requirements. Ballast must be spread over the membrane using soft rubber-tired ballast buggies. Spread ballast around penetrations by hand. Take special care not to damage TPO membrane when distributing ballast.
 - Protect membrane and underlying insulation at staging areas where ballast is loaded, by layering additional insulation and/or plywood over a sacrificial layer of Firestone membrane. Remove and replace all roofing components damaged from ballasting operation.
 - Distribute ballast around Walkway Pads: Any ballast displaced by a walkway should be distributed around the pad to maintain the specified average ballast rate. (Do not position walkway within 10' (3.04 m) of a roof edge.) Use appropriate ballast pavers around mechanical equipment.

1.10 MEMBRANE SEAMING

A. General

The following information provides for typical set up and heat welding of Firestone UltraPly TPO membrane. For information beyond the scope of this document, we encourage installers to contact a Firestone Building Services Advisor or local Firestone Field Technical Representative.

B. Equipment and Test Splice Requirements

1. The air intake, temperature and speed of the welder shall be adjusted to provide proper seam strength.
2. An ample power source shall be provided for all heat welding equipment. A dedicated generator must be provided for each robotic welder. For specifics on welding equipment and generator, consult the welder manufacturer's data sheets.
3. Adjust the welding equipment according to membrane thickness and varying weather conditions. It is recommended that this be completed using spare material before starting welding of the finished roofing material. In addition, destructive tests shall be completed at the beginning of each day of welding and every time there is an interruption in the welding process (i.e. power failure, welder shut down, change in job site conditions, after lunch, etc.) to verify adequate seam strength.
4. Automatic Welder Settings – See additional weld window tables at the end of this document.
Firestone UltraPly TPO allows for successful welding through a wide range of automatic welder settings for temperature and momentum. Typical settings near the center of this welding range are as follows (ambient temperatures between 20 °F to 90 °F and -6.7 °C to 32.2 °C):
 - a) Leister Varimat - Temperature: 1000 °F Air Flow: 80%, Speed: 11.5' min.
 - b) Leister Varimat V2 - Temperature: 1100 °F Air Flow: 70%, Speed: 12.5' min.
 - c) Contact your local Firestone Technical Representative for additional information.

C. Clean the Lap Splice Area

If membrane has been exposed for more than 12 hours or becomes contaminated with dirt, debris or moisture, it must be cleaned. Wearing chemical resistant gloves and using a clean white cotton rag dampened with Firestone SW-100 Splice Wash, thoroughly clean the involved area on both sheets at least 6" (15.24 cm) wide prior to any welding activity. For aged membrane, or when additional cleaning is desired, a Firestone QuickScrubber Plus pad moistened with Splice Wash may be used to clean the weld area, followed by wiping with a clean white cotton rag dampened with Splice Wash. Allow cleaner to flash off completely, as residual cleaner can contaminate the membrane bond.

D. Hot Air Weld Lap Splices

1. Horizontal field welds should be completed first. Wherever possible, field splices on the horizontal surface (including flashings) are to be completed using an automatic heat welder that has been designed for hot air welding of thermoplastic membranes. For specifics on welding equipment and generator, consult the equipment manufacturer's data sheet.
2. Seam width requirements
 - a) Seams made with the automatic welder must be a min. of 1½" (38 mm) wide.
 - b) Seams made with a hand welder must be a min. of 2" (50 mm) wide. Use silicone hand rollers to assure proper compression of the heated surfaces as hand welding proceeds.
 - c) Wide Weld seams require the Firestone Wide Weld kit for the Varimat welder. The kit system includes all hardware to adapt the existing welder to the special 4½" (114 mm) wide nozzle and guides.

Note: It is important to verify that welds completed at any transition from machine to hand application is completed properly. Validate weld transition is fully bonded and no gaps, fish mouths, pin holes or cold welds exist. Probe all welds to verify weld is completed properly.

3. Vertical splices

Hand held welders are to be used on vertical welds or where an automatic welder is not practical or cannot be used.

- a) T-Joint and Membrane Transition Patches:
 - i. Install T-joint patches at reinforced membrane seam intersections when membrane thicker than .045" (1.14 mm) is used.
 - ii. Install T-Joint patches wherever TPO reinforced membrane seams extend through angle changes 1:12 or greater.
 - iii. Membrane to receive T-joint cover shall have the edge chamfered by heating and rolling to minimize any step-down. Refer to Lap Splice and T-Joint Detail Section of Firestone's Technical Manual.

E. Seam Inspection

Probe all completed welds with a dull cotter pin puller type tool to verify seam integrity, paying special attention to hand welded areas (i.e. corners, t-joints, angle changes, etc.). Do not probe welds until they have cooled. Any welds found to be insufficiently fused need to be repaired daily. Avoid damaging membrane when checking welds.

F. Seal Cut Edges

1. Ensure that all cut edge areas are clean and dry. Clean with Splice Wash SW-100 to remove any contamination.
2. All edges of TPO reinforced membrane with scrim exposed are to be sealed daily with Firestone UltraPly TPO Clear Cut Edge Sealant.

NOTE: Solvent welding is NOT acceptable.

1.11 ADDITIONAL MEMBRANE SECUREMENT AND BASE TIE-IN FLASHING

A. Secure the membrane at all locations where the membrane goes through an angle change greater than 1" (25 mm) in 12" (305 mm). i.e.: roof edges, curbs, interior walls, etc.

1. Using Screws and Plates
 - a) Mechanically fasten Firestone HD Seam Plates for TPO membrane with Firestone Fasteners either horizontally into the deck or vertically into the wall in accordance with Firestone Base Tie-In Details (typically 12" (305 mm) o.c. for standard applications).
 - b) Refer to the Firestone System Design Guide or Firestone Technical Information Sheets of this manual to determine the applicable fastener and the associated penetration requirements for the specific substrate conditions.
2. Using Coated Metal
 - a) Fasten Firestone UltraPly TPO Coated Metal into Wood Nailers as shown in Firestone Details.
 - b) The Firestone coated metal must be completely supported by wood nailers in accordance with Firestone Details.
 - c) Heat weld membrane to Firestone UltraPly TPO Coated Metal flashing.
 - d) Seams made with an automatic welder must be a min. of 1½" (38 mm) wide. Seams made with hand welders must be a min. of 2" (51 mm) wide.
3. Using UltraPly TPO QuickSeam Reinforced Perimeter Fastening Strip (RPFS)
 - a) Attach the RPFS to the parapet wall or deck using Firestone Heavy Duty Seam Plates fastened a max. of 12" (305 mm) o.c. Roll the membrane into place and then fold back, exposing the underside of the membrane and the QSRPF Strip.

- b) Apply the appropriate Firestone Primer to the membrane where it will mate with the QuickSeam Splice Tape on the RPFS and allow to dry completely. Apply Firestone Bonding Adhesive to the membrane that is to be bonded to the penetration or wall, and to the penetration or wall itself.
- c) After the primer has dried completely and the adhesive has flashed off properly as determined by using the Touch-Push Test, remove the release paper from the RPFS and roll the membrane into place, assuring a tight fit into the transition between the horizontal and vertical surfaces. Continue to roll the membrane up the wall and broom in place with a stiff push broom. Roll the membrane over the QuickSeam Tape portion with a 1½" to 2" (38 mm to 51 mm) wide silicone roller across the tape and then along its length.

NOTE: QuickSeam RPFS is not acceptable for 25 and 30 year warranties on TPO installations.

1.12 FLASHING- PENETRATIONS

A. General

1. Remove all loose existing flashing (i.e. metal, bituminous materials, mastic, etc.).
2. Flash all penetrations passing through the membrane.
3. The flashing seal must be made directly to the penetration.

B. Pipes, Round Supports, Structural Steel Tubing, Etc.

1. Flash penetrations with Firestone TPO Pre-Molded Pipe Flashings wherever possible. Do not cut or patch TPO Pre-Molded Pipe Flashings vertically to assist in their installation.
2. Flash penetrations using Firestone UltraPly TPO Unsupported Flashing when the use of Pre-Molded or Custom TPO Pipe Flashings is not feasible.
3. Refer to Firestone's Technical Information Sheet for min. and max. pipe diameters that can be successfully flashed with Pre-Molded TPO Pipe Flashings.
4. Structural Steel Tubing: Use a field-fabricated pipe flashing detail when the corner radius is greater than ¼" (6.4 mm) and the longest side of the tube does not exceed 4" (102 mm). When the tube exceeds 4" (102 mm), use a standard curb detail including base-tie in and suitable termination.
5. Firestone manufactures Custom pipe flashings round, square or conical, with or without a split. Contact your Firestone Sales Representative for additional information.

C. Roof Drains

The following applies to new or reused cast iron drains. For all other drain types contact a Firestone Building Services Advisor.

1. Remove existing clamping ring. Remove any broken clamping hardware and replace.
2. Remove all existing flashing (including lead flashing), roofing materials and cement from the existing drain in preparation for membrane and Water Block Seal.
3. Provide a clean even finish on the mating surfaces between the clamping ring and the drain bowl.
4. Install tapered insulation with suitable bonding surfaces around the drain to provide a smooth transition from the roof surface to the drain. Slope into drain cannot be greater than 1" in 12" (25 mm in 305 mm).
5. Position the membrane and cut a hole for the roof drain allowing ½" (13 mm) to ¾" (19 mm) of membrane inside the clamping ring. Make round holes in the membrane to align with clamping bolts (a paper punch may be used). Do not cut the membrane back to the bolt holes.
6. Install Firestone Water Block Seal on the clamping ring seat flange below the membrane. Use a min. of one half of a 10 oz (295 cc) tube for a 10" (254 mm) drain.
7. Install the roof drain clamping ring and all clamping bolts. Tighten the clamping bolts to achieve constant compression.

D. Insert Drains

Firestone 3" & 4" Insert Drains are intended for installation when existing drains are deteriorated and not suitable for reuse or for re-roofing situations where existing drain sumps exceed Firestone's min. requirements. For conditions outside of these, contact a Firestone Building Services Advisor.

1. Remove existing clamping ring. Remove any broken clamping hardware and debris.
2. Remove all existing flashing (including lead flashing), roofing materials and cement from the existing drain.
3. Install wood blocking as required to support, level and square drain insert with new insulation sump.
4. Install insulation, flat and tapered, with suitable bonding surfaces around the drain to provide a smooth transition from the roof surface to the drain. Slope into drain cannot be greater than 1" in 12" for reinforced membrane.
5. Install Firestone Insert Drain, securing to a solid substrate in accordance with instructions, in preparation to receive the roof membrane.

6. Install Firestone Water Block Seal in a continuous bead on the clamping ring seat flange below the membrane. Use a min. of one half of a 10 oz (295 cc) tube for a 10" (254 mm) strainer basket/clamping ring.
 7. Install Firestone roof membrane as prescribed and secure with strainer basket and bolt assembly.
- E. Rigid Pipe Clusters and Unusual Shaped Penetrations
1. Install Firestone UltraPly TPO molded penetration pockets per instructions. Allow a min. clearance of 1" (25 mm) between the penetration(s) and from all sides of the penetration pocket.
 2. Flash detail with shop fabricated penetration pockets per Firestone Details.
 3. Fill penetration pockets with Firestone Pourable Sealer or FillGard M and mound to shed water. Pourable Sealer must be a min. of 2" (51 mm) deep and 1" (25 mm) thick around all penetrations. Be sure to prime penetration and inside of pocket before installing sealer.
- F. Hot Pipes
- Protect the UltraPly TPO components from direct contact with steam or heat sources when the in-service temperature is more than 160 °F (71 °C). In all such cases flash to an intermediate "cool" sleeve per Firestone Details.
- G. Flexible Penetrations
1. Provide a weathertight gooseneck set in Water Block Seal and secured to the deck.
 2. Flash in accordance with current Firestone Details.
- H. Scuppers
- Scuppers shall refer to all primary and overflow devices for roof drainage.
1. Install welded watertight sleeve and flashing assembly.
 2. Set sleeve in Water Block Seal.
 3. Round all corners of metal flange.
 4. Fasten flange 4" (102 mm) o.c.
 5. Flash in accordance with current Firestone Details.
- I. Expansion Joints
1. Install where specified by the project designer in accordance with Firestone details.
 2. Expansion Joint assemblies shall be sized as needed to provide for all anticipated movement and make logical transition to other materials at perimeters.

1.13 FLASHING – WALLS, PARAPETS, MECHANICAL EQUIPMENT CURBS, ETC.

A. General

Using the largest pieces of UltraPly TPO membrane, UltraPly TPO Flex Adhered, TPO Custom Curb Flashing or TPO 18" Curb Flashing practical, flash all walls, parapets, curbs, etc., to a min. height of 8" or as specified by the project designer.

1. Evaluate Substrate:

The following substrates require an overlay of 5/8" (16 mm) exterior grade or "Wolmanized" plywood, mechanically fastened in accordance with project designer's requirements:

- Interior Gypsum board
- Stucco
- Cobblestone
- Textured masonry
- Corrugated metal panels
- Other uneven substrates

NOTE: All loose existing flashing must be removed.

2. Install Additional Membrane Securement at Curbs, Penetrations, Walls, etc.: Refer to 1.11 of this specification.
 3. Provide Termination in accordance with Firestone specifications and details.
 4. Provide Intermediate Attachment
- Intermediate attachment of membrane is required at 36" (914 mm) intervals in accordance with Firestone details unless:
- a) The wall surface is smooth, without noticeable high spots or depressions (i.e., plywood, poured or precast concrete, or hollow core block or masonry walls where joints are flush with masonry surface)
 - b) The termination is either a Termination Bar or the flashing membrane extends underneath a metal coping, over the outside edge of the wall.

1.14 SHEET METAL WORK

A. General

1. Sheet metal work is not waterproofing. The installed membrane roofing system must be made watertight before metal application.
2. No roof system is complete until all the edges are terminated in such a way as to prevent water infiltration into the roofed structure. This typically involves the use of manufactured or shop fabricated metal detailing, such as coping caps, gravel stops, roof edging, flashing and counter-flashing components.
3. All sheet metal work should be fabricated and installed according to SMACNA and National Roofing Contractors Association (NRCA) guidelines. Unless specifically agreed to in writing by Firestone Quality Building Services Group prior to installation, sheet metal work manufactured by others is not included in the Firestone warranty coverage.

B. Codes and Standards

1. The designer and roofing contractor should be aware that many municipalities and states are beginning to enforce metal codes that, until recently, were merely used as guidelines. These metal codes relate to min. standards on material, fabrication, and testing of roof related sheet metal work. It is the contractor's responsibility to review and know the building codes relating to their roofing projects to avoid costly remedial work to bring a project into compliance.
2. If the sheet metal work on a project is specified by the designer to be included in a full system warranty, use Firestone brand edge metal and coping products and install per Firestone published details and specifications. Contact your Firestone Sales Representative for additional information.
3. If a metal flashing product by others is submitted via a deviation request for inclusion in the warranty coverage, the following are min. requirements for consideration:
 - a) The sheet metal work must be shop or factory formed or extruded.
 - b) The sheet metal work must be configured and installed in accordance with SMACNA guidelines and NRCA installation instructions.
 - c) Min. requirements regarding sheet metal work material are 24 ga (0.61 mm) G-90 Kynar pre-finished steel or 0.040" (1.02 mm) aluminum (mill finished, pre-finished or anodized).
 - d) A deviation request for inclusion of sheet metal work in warranty coverage must accompany the PIN form submitted by the installing contractor.
 - e) The deviation request must include shop drawings of the sheet metal work to be included and a roof plan showing the installed location and linear dimension for each profile.
 - f) Should the deviation request be granted, the installing contractor will be responsible to Firestone Building Products for a period of two-years from the date of Firestone's inspection and acceptance under their installer's agreement.

C. Application

1. Sheet metal work installation, regardless of material source, must be according to the sheet metal manufacturer's instructions available from the manufacturer or supplier.
2. Sheet metal work formed by roofing contractors must be fabricated and installed in accordance with SMACNA and NRCA recommendations.
3. All flange-mounted sheet metal work must be flashed per the appropriate Firestone material type's standard details.
4. Sheet metal work formed by contractors is not eligible for warranty coverage unless the conditions listed above are met and Firestone accepts the sheet metal work for warranty coverage in writing.
5. Sheet metal work by roofing contractors must have metal joints stripped-in to the uppermost edge of the metal dam on the roof side.
6. Projects utilizing UltraPly TPO QuickSeam Flashing to strip-in sheet metal work with a gravel dam (or a formed configuration that can hold water on the edge of the installed cover tape) must have UltraPly TPO General-purpose Sealant applied on both sides of the cover tape, and the vertical metal joints are to be covered with a section of TPO QuickSeam Flashing.
7. Gravel stop type sheet metal work on UltraPly TPO roof systems may be fabricated from UltraPly TPO Coated Metal to provide a suitable welding surface to seal the roof system to the sheet metal work.
8. As an alternative on some UltraPly TPO applications, it may be appropriate and permissible to use a two-piece snap on fascia assembly instead of UltraPly TPO Coated metal.

9. The approval of sheet metal work for inclusion in warranty coverage is conditional upon acceptance by Firestone Building Products, and, if approved, is subject to the “terms, conditions and limitations” of the requested warranty. Under no circumstance will any warranty coverage for sheet metal work exceed the wind speed limitation of the warranty issued for the roof system. Aesthetic appearance is expressly excluded from warranty coverage.
10. Sheet metal work by others is not permitted on projects requiring full system warranties and wind speed coverage equal to, or greater than, 90 mph.

1.15 FLASHING GRAVEL STOPS OR ROOF EDGE METALS

USING FIRESTONE ULTRAPLY TPO QUICKSEAM FLASHING (warrantable to 20 years):

- A. Install Edge Metals (fascia, coping, gutter, accessories)
 1. Prepare substrate and roofing membrane as required by product installation details and instructions.
 2. Install metals and accessories in longest sections possible in accordance with Firestone details.
- B. Flash Edge Metal with UltraPly TPO QuickSeam Flashing
 1. Prime area to receive flashing
 - a) Clean the application surfaces to remove heavy debris or contaminants with a rag or broom.
 - b) Stir the approved Firestone Primer thoroughly before and during use.
 - c) Dip the Firestone QuickScrubber or QuickScrubber Plus into the bucket of primer, keeping the scrubber flat.
 - d) Apply the primer to the TPO membrane and metal edging to receive UltraPly TPO QuickSeam Flashing using long back and forth type strokes with heavy pressure along the length of the splicing area.
 - e) Additional scrubbing is required at areas of heavy contamination.
 - f) Change the scrub pad every 200' (61 m) or when the pad will no longer hold the proper amount of primer.
 - g) Allow the primer to dry completely before installing flashing.
 2. Install Firestone UltraPly TPO QuickSeam Flashing
 - a) Place the roll of Firestone UltraPly TPO QuickSeam Flashing on the roof a few feet prior to the application starting point, positioned so that it unrolls from the top of the roll (release liner will be on top).
 - b) Remove approximately 2' to 3' (.6 m to .9 m) of release liner and apply flashing to the metal flange and UltraPly TPO membrane.
 - c) Lap adjacent rolls of flashing a min. of 1" (25 mm).
 - d) Roll the QuickSeam Flashing with a 2" (51 mm) wide silicone hand roller to assure proper adhesion.
 - e) Apply heat while rolling to form UltraPly TPO QuickSeam Flashing at steps, laps and angle changes.
 - f) Refer to published Firestone details and specifications for additional information.
 3. Special Considerations (End Laps, T-Joints, etc.)
 - a) Apply a 6" (152 mm) length of UltraPly TPO QuickSeam Flashing or an UltraPly QuickSeam T-Joint Patch to the inside edge of the UltraPly TPO QuickSeam Flashing at all overlaps and intersections. Refer to roof edge details for additional information.

Note: UltraPly TPO QuickSeam products must be heat-formed to conform to seam step-offs, metal laps, angle changes, etc.

- b) Optimal Application:
 - i. The optimal application of UltraPly TPO QuickSeam Flashing is where a 3" (76 mm) edge metal flange is used. This will provide the min. 2" (51 mm) bonded area to the UltraPly TPO roofing membrane, with the remaining 3" (76 mm) of the flashing material covering the metal flange.
 - ii. If more than ½" (13 mm) of metal flange is exposed at the sheet metal laps, the laps of the metal flange must be stripped in using additional QuickSeam Flashing set in an appropriate TPO primer, after the primary flashing is complete (see Firestone roof edge details).
 - iii. It is recommended that 3" (76 mm) QuickSeam Splice Tape be placed in the sheet metal lap to help seal the metal edge.
- c) Special Considerations for Copper Edging:
 - i. Copper may be weathered or coated with an anti-tarnish lacquer which makes adhesion difficult. Therefore, Firestone requires that special cleaning techniques be used to prepare the copper surface to receive the TPO QuickSeam Flashing.
 - ii. Scrub the copper with acetone or lacquer thinner, using clean cotton cloths. Cleaning before installation is recommended but can take place after metal is attached if care is taken not to allow the solvents to encounter the membrane.

- iii. After the cleaner dries, apply the appropriate Firestone primer and flashing per Firestone Specifications.

1.16 ROOF WALKWAYS

A. General

1. Firestone UltraPly TPO Walkway Pads or acceptable pavers are required at all access points to the roof system and recommended anywhere routine traffic on the membrane surface is anticipated. Walkway pads are used to protect the weatherproofing membrane from damage or excessive wear and tear.
2. Traffic-related roof damage is not covered by the Firestone Warranty. In areas of extreme traffic, contact Firestone for options to enhance the roof system to prevent or mitigate damage to roofing components.
3. Install walkway pads in locations as specified by the project designer and in accordance with published Firestone specifications.
4. Walkway maintenance is the responsibility of the building owner and not part of the warranted waterproofing assembly.
5. Flex Adhered TPO systems require the use of the application method found in 1.16 B Walkway Pad Applications Instructions – Adhered UltraPly TPO walkway Pads.

B. Walkway Pad Application Instructions – Adhered UltraPly TPO Walkway Pads

1. Ensure the existing area to which new UltraPly TPO Walkway Pads are to be mated is clean, smooth and free of all contaminants. If the membrane has been installed more than thirty (30) days, thoroughly clean the work area with detergent and water. It is recommended that a water-soluble granular cleaner be used such as T-M-T brand, which is manufactured by the U.S. Borax Company. Liquid cleaners can leave a film residue that can interfere with adhesion quality.
 - a. It is recommended that a polypropylene scouring pad be used for maximum cleaning. This is the type manufactured by 3M. Coupled with the granular detergent it allows for enough abrasive action to thoroughly clean the sheet without causing damage.
 - b. **DO NOT** use steel wire brushes under any circumstances.
 - c. Thoroughly rinse the area several times to remove all detergent and contaminants.
 - d. The areas cleaned must be allowed to dry completely before continuing.
2. Unroll each roll of UltraPly™ TPO Walkway Pad and allow it to relax for a minimum of 30 minutes **PRIOR TO** cutting and installing the Walkway Pad. Once the Walkway Pad is sufficiently relaxed, measure and cut the Walkway Pad into maximum 10' (3 m) long sections. Plan to position each section with a minimum 4" gap to allow for positive drainage and at least 4" from any system seam or penetration. Allow a minimum of 18" (0.45 m) between Walkway Pad and any roof drainage device. Walkway Pad may be cut length-wise or width-wise to ensure minimum spacing requirements. To achieve the best aesthetic quality, install when ambient temperature is between 60 and 80 °F (16 and 27 °C). Chalk lines may be used but excessive chalk should be shaken off the line to avoid contaminating the cleaned area.
3. Place each cut section of Walkway Pad with the textured side down. For each section, measure and cut to length strips of Firestone 3" EcoWhite™ QuickSeam™ Splice Tape that will be applied around the entire perimeter of the Walkway Pad and length-wise down the middle of the Walk Pad. *NOTE: For this application, DO NOT use black QuickSeam Splice Tape. Only use EcoWhite QuickSeam Splice Tape.*
4. Apply Firestone Single-Ply QuickPrime™ Primer using a QuickPrime scrub pad and handle, according to the instructions on the Technical Information Sheet. Apply primer in 4" wide strips around the entire perimeter of the Walkway Pad and down the center of the Walkway Pad. Once the primer is tacky but firm to the touch, carefully lay the EcoWhite QuickSeam Splice Tape into the primer with the removeable paper backing facing up. Lay the Splice Tape into the primer gradually, starting at one end and apply consistent pressure as the Tape makes contact with the primer. *Do not lay the Splice Tape over the primer all at once.* With the paper backing still in place, smooth the seam tape into place using your hand then roll the Splice Tape with a 1½" to 2" (38 mm to 51 mm) wide silicone roller or a Firestone QuickRoller™ to ensure good adhesion of the EcoWhite QuickSeam Splice Tape to the Walkway Pad. NOTE: Shelf life of EcoWhite QuickSeam Splice Tape will be shortened if exposed to elevated temperatures.
 - a. Every five (5) Lf, leave a 1" gap in the Splice Tape running down the middle of the Walkway Pad **and** the low side of the WalkWay Pad (based on the flow of water). This will allow any accumulated moisture to drain

5. Ensure the UltraPly TPO roof surface is clean, completely dry, and free of debris. For existing roofs and new roofs that have been in service, it is necessary to remove accumulated dirt. Proper membrane preparation is made by scrubbing the membrane with a scrub brush and warm soapy water, rinsing with clear water, and drying with clean cotton cloths. After this initial cleaning, clean the area again using clean cotton cloths and Firestone SW100 Splice Wash. Additional cleaning using Firestone Splice Wash is often necessary. The entire area must be cleaned and cleaning must extend a minimum of 6" past the edges of the Walkway Pad's final position.
6. Once the TPO membrane is completely clean and dry, position each section of Walkway Pad over the membrane. *Do not remove the paper backing from the Splice Tape at this time.* Simply position each section of Walkway Pad where it will be installed. Using a chalk-line, mark the areas of the membrane to be primed. Then, remove the Walkway Pad from the area until it is ready to install.
7. Prime the TPO membrane with Single-Ply QuickPrime Primer in 4" wide strips to align with the QuickSeam Splice Tape applied to the Walkway Pad. Allow the primer to set up.
8. Install each section of Walkway Pad over the properly cleaned and primed TPO membrane:
 - a. First, set each section of Walkway Pad into position. NOTE: Do not remove the paper backing from the EcoWhite QuickSeam Splice Tape and do not apply downward pressure to the Walkway Pad at this time. Simply lay the Walkway Pad in place over the TPO membrane and ensure the primed areas align with the QuickSeam Splice Tape.
 - b. Fold back each section of Walkway Pad length-wise, making sure to keep the Walkway Pad, QuickSeam Tape, and primed membrane aligned. Only fold back the Walkway Pad approximately 10" initially to make it easier to keep the entire section in place. With the Walkway Pad folded back, remove the exposed portions of paper backing from the Splice Tape, then return the Walkway Pad to its original flat position.
 - c. Repeat this process, but fold the Walkway Pad back farther this time to fully expose the QuickSeam Tape running down the center of the Walkway Pad. Ensure all paper backing has been removed before returning the Walkway Pad to its original flat position.
 - d. Roll the Walkway Pad with a 1½" to 2" (38 mm to 51 mm) wide silicone roller or a Firestone QuickRoller™ to ensure good adhesion of all mated surfaces.

Note: To achieve the best quality of the application, follow these guidelines:

- When possible, apply the Walk Pad when ambient temperature is between 60 and 80 °F (16 and 27 °C).
- Cut Walk Pad as required to avoid applying directly over a welded seam in the roofing membrane or any other flashing application (Walk Pad should be bonded directly to the field sheet – not flashings).
- Round corners on cut Walk Pad.
- Apply EcoWhite™ QuickSeam™ Splice Tape along perimeter of Walk Pad extending 1/8" to 1/4" beyond edge of Walk Pad so tape is slightly exposed upon completion of the application.
- Be sure to leave a 2" gap in the middle and lower side seam tape in the center of the Walk Pad run to allow for drainage of any water that should get below the Walk Pad during the service life of the roof. When in doubt about the direction of slope, leave a 1" wide gap in the center of all three long runs of seam tape.

C. Walkway Pad Application Instructions – Welded UltraPly TPO Walkway Pads

1. Ensure the existing area to which new UltraPly TPO Walkway Pads are to be mated is clean, smooth and free of all contaminants. If the membrane has been installed more than thirty (30) days, thoroughly clean the work area with detergent and water. It is recommended that a water-soluble granular cleaner be used such as T-M-T brand, which is manufactured by the U.S. Borax Company. Liquid cleaners can leave a film residue that can interfere with adhesion quality.
 - a. It is recommended that a polypropylene scouring pad be used for maximum cleaning. This is the type manufactured by 3M. Coupled with the granular detergent it allows for enough abrasive action to thoroughly clean the sheet without causing damage.
 - b. **DO NOT** use steel wire brushes under any circumstances.
 - c. Thoroughly rinse the area several times to remove all detergent and contaminants.
 - d. The areas cleaned must be allowed to dry completely before continuing.
2. Unroll each roll of UltraPly™ TPO Walkway Pad and allow it to relax for a minimum of 30 minutes **PRIOR TO** cutting and installing the Walkway Pad. Once the Walkway Pad is sufficiently relaxed, measure and cut the

Walkway Pad into maximum 10' (3 m) long sections. Plan to position each section with a minimum 4" gap to allow for positive drainage and at least 4" from any system seam or penetration. Allow a minimum of 18" (0.45 m) between Walkway Pad and any roof drainage device. Walkway Pad may be cut length-wise or width-wise to ensure minimum spacing requirements. To achieve the best aesthetic quality, install when ambient temperature is between 60 and 80 °F (16 and 27 °C). Chalk lines may be used but excessive chalk should be shaken off the line to avoid contaminating the cleaned area.

3. Fully heat weld the perimeter of each section of the UltraPly TPO Walkway Pad to the UltraPly TPO roof membrane, leaving one or two 1" gaps in the weld at the low side of the pad to allow for the escape of inadvertent moisture.

D. Walkway Pad Application Instructions – X-Tred – Membrane Strip Securement

1. Ensure the existing area to which new UltraPly TPO Walkway Pads are to be mated is clean, smooth and free of all contaminants. If the membrane has been installed more than thirty (30) days, thoroughly clean the work area with detergent and water. It is recommended that a water-soluble granular cleaner be used such as T-M-T brand, which is manufactured by the U.S. Borax Company. Liquid cleaners can leave a film residue that can interfere with adhesion quality.
 - a. It is recommended that a polypropylene scouring pad be used for maximum cleaning. This is the type manufactured by 3M. Coupled with the granular detergent it allows for enough abrasive action to thoroughly clean the sheet without causing damage.
 - b. **DO NOT** use steel wire brushes under any circumstances.
 - c. Thoroughly rinse the area several times to remove all detergent and contaminants.
 - d. The areas cleaned must be allowed to dry completely before continuing.
2. Unroll each roll of X-Tred Walkway Pad and allow it to relax for a minimum of 30 minutes **PRIOR TO** cutting and installing the Walkway Pad. Once the Walkway Pad is sufficiently relaxed, measure and cut the Walkway Pad into appropriate lengths. Plan to position each section with a minimum 4" gap to allow for positive drainage and at least 4" from any system seam or penetration. Allow a minimum of 18" (0.45 m) between Walkway Pad and any roof drainage device. Walkway Pad may be cut length-wise or width-wise to ensure minimum spacing requirements. To achieve the best aesthetic quality, install when ambient temperature is between 60 and 80 °F (16 and 27 °C). Chalk lines may be used but excessive chalk should be shaken off the line to avoid contaminating the cleaned area.
3. Install Side A as the top surface on Firestone UltraPly TPO systems.
4. Cut strips of UltraPly TPO membrane to ¾" (19 mm) wide x 10" (254 mm) long.
5. Thread the TPO strips through the X-Tred pad at the first loop using two 90-degree folds. **DO NOT** attach strips over seams or flashing locations.
6. Using a hot air welding tool, weld the ends of the UltraPly TPO strip (weathering side up) onto the fled membrane.
7. Space the strips approximately 36" (914 mm) apart on both sides of the walkway pad and at the roll ends.
8. For the full 30" (762 mm) x 30' (9 m) roll, there should be 20 attachment strips installed, i.e. 10 strips per side (Refer to Detail Drawing UT-M-7).

E. Walkway Pad Application Instructions – X-Tred – All Purpose Sealant Securement

1. Ensure the existing area to which new UltraPly TPO Walkway Pads are to be mated is clean, smooth and free of all contaminants. If the membrane has been installed more than thirty (30) days, thoroughly clean the work area with detergent and water. It is recommended that a water-soluble granular cleaner be used such as T-M-T brand, which is manufactured by the U.S. Borax Company. Liquid cleaners can leave a film residue that can interfere with adhesion quality.
 - a. It is recommended that a polypropylene scouring pad be used for maximum cleaning. This is the type manufactured by 3M. Coupled with the granular detergent it allows for enough abrasive action to thoroughly clean the sheet without causing damage.
 - b. **DO NOT** use steel wire brushes under any circumstances.
 - c. Thoroughly rinse the area several times to remove all detergent and contaminants.
 - d. The areas cleaned must be allowed to dry completely before continuing.

2. Unroll each roll of X-Tred Walkway Pad and allow it to relax for a minimum of 30 minutes **PRIOR TO** cutting and installing the Walkway Pad. Once the Walkway Pad is sufficiently relaxed, measure and cut the Walkway Pad into appropriate lengths. Plan to position each section with a minimum 4" gap to allow for positive drainage and at least 4" from any system seam or penetration. Allow a minimum of 18" (0.45 m) between Walkway Pad and any roof drainage device. Walkway Pad may be cut length-wise or width-wise to ensure minimum spacing requirements. To achieve the best aesthetic quality, install when ambient temperature is between 60 and 80 °F (16 and 27 °C). Chalk lines may be used but excessive chalk should be shaken off the line to avoid contaminating the cleaned area.
3. Install Side A as the top surface on Firestone UltraPly TPO systems.
4. Layout X-Tred Walkway Pad in the desired locations.
5. Prime membrane areas below each side of the walkway pad every 5' along both sides of the X-Tred Walkway Pad with Single-Ply QuickSeam Primer.
6. Place X-Tred Walkway Pad over primed areas then apply a generous dab of AP sealant over a rib of the X-Tred flowing onto the primed membrane below. DO NOT attach X-Tred over seams or flashing locations.

1.17 TEMPORARY CLOSURE AND TIE-INS

A. General

1. At the completion of each day's work or before the onset of inclement weather, a watertight temporary seal must be established by the roofing applicator at any loose edge of membrane.
2. Install temporary seal or flashing strip to ensure that moisture does not flow beneath or damage any completed section of the new roofing system.
3. Membrane contaminated with the sealant or flashing used as a night seal must be cut away and discarded prior to resumption of work.

1.18 FINISHED ROOF PROTECTION

A. General

1. When it becomes necessary for other trades to work over a completed area of new roof, the roofing membrane and flashing must be protected from physical damage.
2. Proper and adequate protection includes installation of a slip-sheet in the work area overlaid with plywood or OSB, to minimize damage to the finished roof surface due to construction equipment and activities that encounter the membrane.
3. If damage does occur to the roof system, it should be repaired immediately to preserve the integrity of the roofing components.

1.19 MEMBRANE REPAIR

A. Clean the Membrane

When repairing "in-service" Firestone UltraPly TPO Membrane it is necessary to remove accumulated field dirt. The membrane is properly prepared by scrubbing with a scrub brush and warm soapy water, rinsing with clear water, drying with clean cloths, then wiping with a clean cotton cloth dipped in Firestone SW-100 Splice Wash.

B. Install Repair Patch

1. Repair damaged Firestone UltraPly TPO Membrane with like material.
2. The repair material must extend a min. of 2" (51 mm) beyond the boundary of the affected area in all directions. Example: A pinhole will require a min. 4" x 4" (102 mm x 102 mm) patch.
3. Round all corners of the repair piece.

C. Multiple Repairs

1. If the membrane is damaged in more than six (6) locations within a 100 ft² (9.3 m²) area, new membrane extending 6" (152 mm) beyond the border of the damaged area must be installed over existing membrane in accordance with published Firestone specifications.
2. Secure the replacement membrane in the same manner as the existing membrane.
3. Contact a Firestone Technical Representative with questions on how to address comprehensive damage.

1.20 CLEAN UP

A. General

If required by the specifier to ensure the aesthetics of the Firestone UltraPly membrane, (i.e., hand prints, footprints, general traffic grime, industrial pollutants and environmental dirt), the membrane may be cleaned by scrubbing with non-abrasive soapy water and rinsing the area completely with clean water. Firestone SW-100 Splice Wash can be used sparingly to clean small areas of membrane.

B. Cleaning Procedure for In-Service Thermoplastic Membrane

1. Ensure that the existing area to which new thermoplastic membrane is to be mated is clean, smooth, and free of all contaminants.
2. Thoroughly clean this area with detergent and water. It is recommended that a water-soluble granular cleaner be used such as T-M-T brand, which is manufactured by the U.S. Borax Company. Liquid cleaners tend to leave a film residue that can interfere with heat-weld quality. The cleaner must be completely rinsed/removed from areas where welding may occur and allowed to completely dry before any welding is performed.
3. It is recommended that a polypropylene scouring pad be used for maximum cleaning. This is the type manufactured by 3M. Coupled with the granular detergent it allows for enough abrasive action to thoroughly clean the sheet without causing damage to it.

Note: DO NOT USE STEEL WIRE BRUSHES UNDER ANY CIRCUMSTANCES.

4. It is imperative that the area be thoroughly rinsed several times to remove all cleaner and contaminants before heat welding. Further, the area must be allowed to dry completely before continuing. If blisters form upon heat welding, the area has not been allowed to dry sufficiently and heat welding should discontinue.
5. After allowing to dry sufficiently, the heat-welding areas on the existing membrane shall be cleaned a second time with denatured alcohol and wiped clean with a clean cotton rag to remove all surface impediments and eliminate any surface curing which may have occurred.

Again: THOROUGH CLEANING WITH DENATURED ALCOHOL IS THE MOST CRITICAL PROCEDURE TO ENSURE THE PERFORMANCE OF THE NEW TO EXISTING MEMBRANE HEAT-WELD.

6. All heat welding shall be in accordance with Firestone thermoplastic details and specifications as published. Keep in mind that the existing sheet is aged, which may call for more allowance. Care should be taken not to overheat and scorch either membrane.
7. Upon completion, allow newly welded seams to cool.

IMPORTANT: ALL WELDS MUST BE THOROUGHLY PROBED AND CHECKED FOR COMPLETE INTEGRITY AND REWELDED OR STRIPPED IN AS REQUIRED.

1.21 WELD WINDOWS

Firestone UltraPly TPO & TPO XR Membrane Weld Windows

Leister Varimat V Robot Welder (15 lb weight)	
Speed (ft/min)	Temp (°F)
2.2	789
3.2	813
4.2	836
5.2	860
6.2	883
7.2	907
8.2	930
9.1	951
10.2	977
11.2	998
12.1	1022
13.1	1045
14.1	1069
15	1090
16	1113

Leister Varimat V2 Robot Welder (15 lb weight)	
Speed (ft/min)	Temp (°F)
2.2	858
3.2	884
4.2	911
5.2	937
6.2	963
7.2	990
8.2	1016
9.1	1039
10.1	1066
11.1	1092
12.1	1118
13.1	1145

Note:

1. Leister Varimat V Robot Welder set at 80% air flow, and 2 additional weight plates (15 lbs).
2. Leister Varimat V2 Robot Welder set at 70% air flow, and 2 additional weight plates (15 lbs).
3. Validate temperature settings and weld quality at the various times throughout the day including start/stop times and change in weather.
4. Visual observation should occur during welding to avoid scorching/burning of membrane. Adjust temperature as needed to avoid membrane damage.

Firestone UltraPly TPO Flex Adhered Membrane Weld Windows

Leister Varimat V Robot Welder (15 lb weight)	
Speed (ft/min)	Temp (°F)
3.9	803
4.9	870
5.9	938
6.9	1006
7.9	1074
8.9	1141

Leister Varimat V2 Robot Welder (15 lb weight)	
Speed (ft/min)	Temp (°F)
1.5	347
2.2	392
3.2	437
4.2	482
5.2	527
6.2	572
7.2	617
8.2	657.5
9.1	702.5
10.1	747.5
11.1	792.5
12.1	837.5
13.1	882.5
14.1	923
15	968
16	1013
17	1058
18	1103
19	1148
20	1193

Note:

5. Leister Varimat V Robot Welder set at 80% air flow, and 2 additional weight plates (15 lbs).
6. Leister Varimat V2 Robot Welder set at 70% air flow, and 2 additional weight plates (15 lbs).
7. Validate temperature settings and weld quality at the various times throughout the day including start/stop times and change in weather.
8. Visual observation should occur during welding to avoid scorching/burning of membrane. Adjust temperature as needed to avoid membrane damage.