

Roofing Products International Re-Flex TPO Mechanically Attached Specification

Part 1 – General

1.01 System Description

A. Mechanically attached thermoplastic sheet membrane using Re-Flex Seam Tapes or heat weld.

1.02 Specification Designations

A. See Plates.

1.03 Regulatory Requirements

A. Conform to all applicable building and jurisdictional codes, including roof assembly wind uplift and fire resistance requirements and slope.

B. Follow local jurisdiction requirements for disposing of used membranes, and expired adhesives and sealants.

1.04 Delivery, Storage and Protection

A. Delivery products to site in original containers with seals unbroken and labeled with manufacturers' name, product brand name and type.

B. Store materials in weather protected environment, clear of ground and moisture, in accordance with RPI instructions.

C. All materials stored outside shall be raised above ground or roof level on pallets, and covered with a tarpaulin or other waterproof material. Factory-installed plastic wrapping is not an adequate covering. Extreme heat conditions may require special storage requirements.

Reference data sheets for product storage requirements.

D. Follow RPI directions and requirements for protection of materials prior to and during installation.

E. Materials that are wet or damaged to the extent that product and system performance are compromised should not be used. All roof insulation that has been wet is considered damaged, even if dried out. Remove all damaged materials from job site.

1.05 Environmental Requirements & Restrictions

A. Do not apply roofing materials during inclement or threatening weather.

B. Do not expose materials vulnerable to damage from water or sun in quantities greater than can be covered and weatherproofed the same day.

C. High or gusting winds make the installation and rooftop stocking of materials difficult. Keep all vulnerable materials covered and secured.

D. Material installation during periods of high ambient temperatures, typically above 90°F, can result in poor installation quality, due to condensation on the membrane surface, and excessively fast adhesive drying rates.

E. Material installation during periods of low ambient temperatures, typically below 30°F, can result in poor installation quality due to increased material stiffness and vulnerability to damage and excessively slow adhesive drying rates.

Cool Temperature Recommendations:

1. Store accessory materials in a warming box.
2. Use as soon as possible.
3. Allow adhesives to properly cure.
4. Constantly check and adjust welder settings to insure proper welds for applicable ambient conditions.

1.06 Working Environment

A. Provide a safe working environment, including but not limited to, adequate fall protection, restriction of unauthorized access to the work area, and protection of the building and its occupants.

B. Safe work practices should be followed, including but not limited to, keeping tools properly stored and in good operating condition, providing adequate ventilation for adhesives, and removal and disposal of debris and other jobsite hazards.

Part 2 – Products

2.01 Membrane

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- A. RPI Re-Flex TPO (smooth reinforced) thermoplastic polyolefin membrane.
- B. RPI Re-Flex TPO fleece-Back thermoplastic polyolefin membrane

2.02 Flashings

A. Heat Weld System

1. RPI Re-Flex membrane flashings to be of same type, thickness and color as roofing membrane.
2. RPI Re-Flex TPO Fleece Back membranes are optional flashing membranes for all RPI Re-Flex TPO roofing systems RPI Re-Flex TPO Fleece Back membranes may be a solution when a contaminated substrate is encountered.

B. Seam Tape System

1. RPI Re-Flex Uncured EPDM flashings and RPI Re-Flex TPO tape backed flashing accessories.

2.03 Flashing Accessories

A. Heat Weld System

1. RPI Re-Flex TPO preformed flashing accessories to be of same type as roofing membrane.
2. RPI Re-Flex TPO laminated metal flashings to be a minimum of 25 mils of non-reinforced thermoplastic membrane of same type as roofing membrane, laminated to 25 ga. Galvanized steel sheet metal.
3. Pre-formed Vent Boots with stainless steel clamping bands.
4. Pre-formed Universal Corners for reinforcement of inside and outside corners.
5. Pre-formed Expansion Joint Covers for roof-roof and roof-wall expansion joints.
6. Membrane Flashing Strips for miscellaneous applications.
7. Un-reinforced Detailing Membrane for flashing of miscellaneous penetrations in lieu of preformed accessories.
8. RPI Re-Flex TPO Cover Strip for stripping in of flat metal edges.

B. Seam Tape System

1. Pre-formed RPI Re-Flex TPO Pipe Boots with tape.
2. RPI Re-Flex 3 inch Seam Tape
3. Pre-formed RPI Re-Flex TPO Outside Corners with tape.
4. RPI Re-Flex 6 inch Cover Tape.
5. RPI Re-Flex Uncured EPDM Flashing Membrane (for outside corners, pipes, and other details requiring a moldable flashing membrane).

2.04 Fasteners

- A. DRILL-TEC membrane fasteners and plates, insulation fasteners and plates, and flashing fasteners and termination bars. Refer to the Insulation Attachment Table and the appropriate Membrane Attachment Table at the end of this section for the correct type, length and diameter.

2.05 Adhesives and Sealants

- A. Royal Edge bonding adhesives, sealants and caulking.
 1. RPI Re-Flex TPO Bonding Adhesive (solvent-based).
 2. RPI Re-Flex H2O Bonding Adhesive (low VOC).
 3. Royal Edge 2-Part Pourable Sealant for use in sealant pans.
 4. RPI Re-Flex Caulking for use in sealing termination bars and penetration clamping bands.
 5. RPI Re-Flex TPO Cut Edge Sealant.
 7. RPI Re-Flex Primer.

2.06 Traffic Protection

- A. RPI Re-Flex TPO walkway rolls.

2.07 Insulation

- A. Foam insulation of the following types and sizes. Minimum 1" thickness. Board size to be 4' x 4' for adhered attachment and tapered systems.
 1. EnergyGuard and EnergyGuard Ultra polyisocyanurate insulation with glass-based facer meeting or exceeding the requirements for

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ASTM C-1289 (min. 16 psi compressive strength)

2. Extruded polystyrene insulation meeting or exceeding the requirements for ASTM C-578, Type II nominal 1.5 pound density.
3. Expanded polystyrene insulation with plastic facer meeting or exceeding the requirements for ASTM C-578, Type II nominal 1.5 pound density.

2.08 Insulation – High Traffic Applications

A. Foam insulation of the following types. Minimum 1" thickness. Board size to be 4' x 8' panels for mechanical attachment, and 4' x 4' for adhered attachment and tapered systems.

1. EnergyGuard and EnergyGuard Ultra polyisocyanurate insulation with glass-based facer meeting or exceeding the requirements for ASTM C-1289, (min. 25 psi compressive strength).
2. EnergyGuard extruded polystyrene insulation meeting or exceeding the requirements for ASTM D-578, Type IV (min. 25 psi compressive strength).
3. EnergyGuard expanded polystyrene insulation meeting or exceeding the requirements for ASTM D-578, Type IX (min. 25 psi compressive strength).

2.09 Recover Board

- A. EnergyGuard Perlite insulation, minimum ½", ASTM C-728
- B. High density wood fiber insulation, minimum ½", ASTM C-208, Class E
- C. EnergyGuard foam recover board of the following types. Board size to be 4' x 8' panels for mechanical attachment, and 4' x 4' for adhered attachment and tapered systems, except for fan-fold recover board, which comes in 2' x 4' sections with a 50" total length.

1. EnergyGuard and EnergyGuard Ultra ½" polyisocyanurate recover board insulation with glass-based facer meeting or exceeding the requirements for ASTM C-1289 (min. 16 psi compressive strength).

2. EnergyGuard 3/8" extruded polystyrene fan-fold recover board with plastic facer meeting or exceeding the requirements for ASTM D-578, Type IV (min. 25 psi compressive strength).
3. EnergyGuard ½" extruded polystyrene recover board meeting or exceeding the requirements for ASTM D-578, Type IV (min. 25 psi compressive strength).
4. EnergyGuard ½" expanded polystyrene recover board with plastic facer meeting or exceeding the requirements for ASTM D-578, Type II (min. 15 psi compressive strength).

2.10 Base Sheets

- A. GAFGLAS Stratavent Eliminator Nailable Base Sheet
- B. GAFGLAS #80 Ultima Base Sheet
- C. GAFGLAS #75 Base Sheet

2.11 Protection Layer

- A. GAF Polymat slipsheet, 3.0 oz/sq.yd.
- B. GAF Polymat cushioning slipsheet, 6.0 oz/sq.yd.
- C. GAF Firesheet.50 fiberglass slipsheet.

2.12 Other Accessories

- A. Subject to compliance with requirements, provide the following products not available from RPI:
1. Wood Nailers: New wood nailers shall be pressure treated for rot resistance, #2 or better lumber. Asphaltic or creosote-treated lumber is not acceptable.
 2. Roofing Nails: Galvanized for non-ferrous type and size as required to suit application.
 3. Temporary Sealant: Royal Edge Water Cut-Off Mastic sealant to provide temporary/overnight watertight sealing of roofing.
 4. Air/Vapor Barrier: Polyethylene sheeting, min. 6 mil. for TPO only.
 5. Fire Barrier: Silicone-treated fiberglass-faced gypsum panels, min. ¼" thick (Dens-Deck, by Georgia-Pacific).

Part 3 – Execution

3.01 Site Conditions

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A. Obtain verification that the building structure can accommodate the added weight of the new roofing system. Take test cuts of existing roof system to determine the types and condition of existing assemblies.

B. Confirm the adequacy of the new roofing system to provide positive slope to drain. Eliminate ponding areas by the addition of drainage locations or by providing additional pitch to the roof surface. Check for proper slope in drain sump areas.

C. All defects in the roof deck or substrate shall be corrected by the responsible parties before new roofing work commences. Verify that the deck surface is dry, sound, clean and smooth, free of depressions, deflections, or projections.

D. Protect building surfaces against damage and contamination from roofing work.

E. Where work by other trades must continue over completed roof areas, it is the general contractors responsibility to protect the finished roofing surfaces from damage.

F. Deck preparation is the sole responsibility of the building owner or roofing contractor. All defects in the roof deck or substrate shall be corrected before roofing work commences.

G. Prepare substrate surfaces thoroughly prior to application of new roofing materials. Preparation includes, but is not limited to, removal of existing flashings, replacements of we/damaged existing roofing material, removal of loose aggregate, abandoned equipment, supports and penetrations, and repair or replacement of damaged decking, etc., to ensure that underlying deficiencies will not compromise the performance of the new roofing system.

H. Raise equipment supports to allow the installation of full-height flashings.

3.02 Preparation of Roofing Area – New and Tear-off Applications

A. Remove all existing roofing materials to the roof decking including flashings, metal edgings, drain leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants.

B. Confirm quality and condition of roof decking by visual inspection and by fastener pull-out testing.

C. Secure all loose decking. Remove and replace all deteriorated decking.

D. Remove abandoned equipment and equipment supports.

E. Confirm that height of equipment supports will allow the installation of full-height flashings.

3.03 Preparation of Roofing Area – Recover Applications

A. Remove all stone ballast, loose gravel, and debris from the roof surface.

B. Remove blisters and ridges from the roof membrane.

C. Cut membrane away from all perimeter and penetration securements.

D. Remove all existing flashings. Including metal edgings, drains leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants. If the wall/curb flashings are in good condition and tightly adhered to the substrate, new TPO flashing materials may be installed over these to a height of 18".

E. It is strongly recommended that the building owner have a moisture survey performed to ascertain the condition and suitability of the existing roofing materials to receive a recover system. A survey is required if perlite or wood fiber insulation is used in a recover system. RPI will not be responsible for damage to the roofing system if it results from moisture in the existing roofing system. Remove and replace all existing roofing materials that contain moisture.

F. If possible, confirm quality and condition of roof decking by visual inspection and by fastener pullout testing. Remove and replace all deteriorated decking.

G. Remove abandoned equipment and supports.

H. Raise equipment supports to allow the installation of full height flashings.

I. Recover installation over coal tar pitch roofs require that the existing loose gravel be broomed (do not spud). If high spots remain, use a thicker insulation board to provide a smooth substrate for RPI Re-Flex membrane. Recover with RPI Re-Flex TPO membranes over coal tar pitch roofs require the installation of recover boards. Do not use EPS/XEPS over coal tar pitch roofs.

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3.04 Wood Nailer Installation

A. Acceptable Material

1. Solid Blocking:
Wood, #2 Grade or better, nominal 5/4" x 4" minimum; stagger multiple layers.
2. Shim Material: Pressure treated plywood, 1/2"x width to match solid blocking.

B. Existing Nailers

Anchor to resist 250 lb. per ft. load applied in any direction.

1. DRILL-TEC HD screws 18" on center attachment to structural wood, steel decks. Min. 1"thread embedment.
2. DRILL-TEC spikes 18" on center attachment to concrete decks. Min. 1" shank penetration.
3. Polymer screws 12" on center attachment to gypsum concrete cellular concrete, cementitious wood fiber decks. Min. 1-1/2"thread embedment.
4. Three anchors per length of wood nailer minimum.

C. New Nailers Anchors to resist 250 lb. per ft. load applied in any direction.

1. DRILL-TEC HD screws 18" on center attachment to structural wood, steel decks. Min. 1" thread embedment.
2. DRILL-TEC spikes 18" on center attachment to concrete decks. Min. 1"shank penetration.
3. Polymer screws 12" on center attachment to gypsum concrete, cellular concrete, cementitious wood fiber decks. Min. 1-1/2" thread embedment.
4. Three anchors per length of wood nailer minimum.

D. Shim Material

Secure simultaneously with overlying solid wood nailer.

1. Shim material must be continuous; spaced shims are not acceptable
 - a. Use ASTM D-312, Type III or Type IV asphalt.
 - b. Apply asphalt at the rate of 25 lbs. per 100 sq. ft.

over the entire surface to which the board is to be adhered.

- c. Asphalt application rates of up to 60 lbs. per 100 sq. ft. may be required if the substrate surface is rough or porous, such as an existing flood coat and gravel surfacing.

3.04 Gypsum Board Installation

A. General

1. Gypsum fire barrier board shall typically be installed when required by design professional or code authority to address code or approval requirements.

B. Placement

1. Butt gypsum boards together with a 1/4" maximum space between adjoining boards. Fit gypsum boards around penetrations and perimeter with a 1/4" maximum space between board and penetrations.
2. Install gypsum boards in pieces a minimum of 2' x 2' in size.
3. Gypsum boards installed over steel decking shall have boards placed perpendicular to deck flutes with edges over flute surface for bearing support.
4. Gypsum boards that are wet, warped or buckled shall not be installed and must be discarded. Insulation boards that are broken, cracked, or crushed shall not be installed unless the damaged area is first removed and discarded.
5. Gypsum boards that become wet or damaged after installation must be removed and replaced.
6. Install no more gypsum board than can be properly covered by the end of each day with roofing membrane.

C. Securement

1. Mechanical Attachment

- a. Use appropriate type and length of DRILL-TEC fastener for structural deck type. See Insulation Attachment Table.
- b. Install required number of fastener per board size, and type of roofing system installed.
- c. Pre-drilling is required for concrete decks,

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and may be required for gypsum concrete and cementitious wood fiber decks.

d. Install fasteners such that the fastener plate is pulled slightly

below the insulation board surface.

e. Use ASTM D-312, Type III or Type IV asphalt.

f. Apply asphalt at the rate of 25 lbs. per 100 sq. ft. over the entire surface to which the board is to be adhered.

g. Asphalt application rates of up to 60 lbs. per 100 sq. ft. may be required if the substrate surface is rough or porous, such as an existing flood coat and gravel surfacing.

2. Hot Asphalt

a. Apply asphalt at its EVT temperature to obtain a proper bond, typically within the range of 425-475°F degrees.

b. Walk in the boards after installation to ensure a proper bond.

c. Maximum board size: 4' x 4'.

d. Hot asphalt application requires priming of concrete and gypsum decks and existing asphaltic roofing systems.

3. Foam Adhesive

a. Depending on foam adhesive type, apply adhesive in full ¼" – ½" thick coverage or in ¾"-1" continuous beads according to the manufacturer's instructions.

b. Adhesive beads shall be evenly spaced at the rate required for the board size and type of roofing system being installed.

c. Apply the proper grade adhesive based on current air and surface temperatures.

d. Walk in the boards after installation to ensure a proper bond.

e. Maximum board size: 4' x 4'.

3.06 Air/Vapor Barrier Installation

A. General

1. Air/vapor barrier sheet shall typically be installed when required by design professional to address internal building air pressure or humidity conditions.

2. Insulation must be installed over the air/vapor barrier sheet and mechanically attached to the deck.

B. Application

1. Install air/vapor barrier sheet loose-applied to the deck or fire barrier board so that wrinkles and buckles are not formed.

2. Overlap air/vapor barrier sheet a minimum of 6" for side and end laps. Tape laps together with duct tape or double sided tape.

3. Seal perimeter and penetration areas with foam sealant.

3.07 Protection Layer Installation – Polyester

A. General

1. Polymat protection layer shall be installed between the roofing membrane and the substrate, in accordance with the Design Table.

B. Application

1. Install polymat protection layer loose-applied over substrate surface so that wrinkles and buckles are not formed.

2. Overlap polymat protection layer a minimum of 6" for side and end laps.

3.08 Protection Layer Installation – Fiberglass

A. General

1. Fire Sheet 50 or 10 fiberglass sheet protection layer shall typically be installed when required by design professional or code authority to address code or approval requirements, or as a separator layer in accordance with the Design Table.

B. Application

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1. Install fiberglass sheet protection layer loose-applied over substrate surface so that wrinkles and buckles are not formed.
2. Overlap fiberglass sheet protection layer a minimum of 6" for side and end laps.

3.09 Base Sheet Installation

A. General

1. Fiberglass base sheet shall typically be installed over all nailable substrates other than gravel-surfaced built-up roofing whenever insulation, recover board, or fire barrier board is installed in hot asphalt or adhesive.
2. Nailable base sheet shall be applied over substrates that are not suitable for asphalt adhesion. Requires installation of insulation in hot asphalt or adhesive.
3. Install base sheet so that wrinkles and buckles are not formed.
4. Overlap base sheet a minimum of 2" for side laps and 6" for end laps.

B. Mechanical Securement-Nailable Base Sheet

1. Secure venting nailable base sheet through existing substrate to the deck. Use appropriate type and length of approved fastener for structural deck type, and install required number of fasteners.
2. Pre-drilling is required for concrete decks, and may be required for gypsum concrete and cementitious wood fiber decks.
3. Install fasteners such that the fastener plate is pulled flush with the venting base sheet surface and lies flat on the deck.

3.10 Recover Board/Insulation Installation

A. General

1. Insulation board and recover board shall be installed in accordance with FM Design Requirements.
2. The use of extruded and expanded polystyrene insulations is limited to a maximum roof membrane temperature of 165°F. Use under colored membranes

requires special approval from RPI Technical Services.

B. Placement

1. Butt insulation boards together with a ¼" maximum space between adjoining boards. Fit insulation boards around penetrations and perimeter with a ¼" maximum space between boards and penetrations. Gaps wider than ¼" should be filled.
2. Install insulation boards in pieces a minimum of 2' x 2' in size. Every piece shall be properly secured to the substrate.
3. Insulation boards installed in multiple layers shall have the joints between boards staggered a minimum of 6" between layers.
4. Insulation boards installed over steel decking shall have boards placed perpendicular to deck flutes with edges over flute surface for bearing support.
5. Insulation shall be tapered to provide a sump area a minimum of 36" x 36" at all drains with a maximum slope of 4:12.
6. Insulation boards that are wet, warped or buckled shall not be installed and must be discarded. Insulation boards that are broken, cracked, or crushed shall not be installed unless the damaged area is first removed and discarded.
7. Insulation boards that become wet or damaged after installation must be removed and replaced.
8. Install no more insulation than can be properly covered and made watertight by the end of each day with roofing membrane.

C. Securement

1. Mechanical Attachment

- a. Use appropriate type and length of DRILL-TEC fastener for structural deck type. See Insulation Attachment Table.
- b. Install required number of fasteners per insulation type, board size, and type of roofing system installed.
- c. Pre-drilling is required for concrete decks, and may be required

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for gypsum concrete and cementitious wood fiber decks.

- d. Install fasteners such that the fastener plate is pulled slightly below the insulation board surface.
- e. Use fastener of correct length as required by the Insulation Attachment Table. The use of any fastener greater than 8" in length must be pre-approved by RPI Contractor Services.

2. Hot Asphalt

- a. Use ASTM D-312, Type III or Type IV asphalt.
- b. Apply asphalt at the rate of 25 lbs. per 100 sq. ft. over the entire surface to which the insulation is to be adhered.
- c. Asphalt application rates of up to 60 lbs. per 100 sq. ft. may be required if the substrate surface rough or porous, such as an existing flood coat and gravel surfacing.
- d. Apply asphalt at its EVT temperature to obtain a proper bond, typically within the range of 425-475°F.
- e. Walk in the insulation boards after installation to ensure a proper bond.
- f. Maximum board size: 4' x 4'.
- g. Hot asphalt application requires priming of concrete and gypsum decks and existing asphaltic roofing systems.

3. Foam Adhesive

- a. Depending on foam adhesive type, apply adhesive in full ¼" – ½"
- b. thick coverage or in ¾"-1" continuous beads according to the manufacturer's instructions.
- c. Adhesive beads shall be evenly spaced at the rate required for the insulation board size and type of roofing system being installed.
- d. Apply the proper grade adhesive based on current air and surface temperatures. Walk in the insulation boards after installation to ensure a proper bond.
- e. Maximum board size: 4' x 4'.

3.11 Membrane Installation

A. Placement

1. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement. Roof membrane shall be mechanically fastened after it is rolled out, followed by welding to adjacent sheets.
2. Full-width rolls shall be installed in the field of the roof.
3. Half-width rolls shall be installed in the perimeter region of the roof. Width of the roof perimeter region shall be determined in accordance with the Perimeter Half Sheet Table.
4. Overlap roof membrane a minimum of 5" for side laps of mechanically attached systems, and a minimum of 3" for end laps. Membranes are provided with a lap line along the side laps, the inside line is for mechanically attached system overlaps (6" for TPO) and the other line is for adhered and ballasted systems overlap.
5. Install membrane so that the laps run across the roof slope lapped toward drainage points. On metal deck, install sheets perpendicular to deck direction so that fasteners will penetrate the top flanges and not the flutes, however, there will be limited areas of the roof (i.e. perimeter areas) where this is not practical.
6. All exposed sheet corners shall be rounded a minimum of 1".
7. Overlap roof membrane a minimum of 3" for end laps of RPI Re-Flex TPO membrane. End laps for Royal Edge fleece-back membranes are made by butting adjacent sheets and heat welding an 8" wide RPI Re-Flex TPO reinforced membrane flashing strap over the joints, or installing a 6" wide RPI TPO Cover Tape over the joint.

B. Securement

1. Roof membrane shall be mechanically fastened in the side lap area to the roof deck with fasteners and plates of a type and spacing appropriate to the deck type and as required by the Membrane Attachment Table.

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2. The metal plates must be placed within ¼" – ¾" of the membrane edge. Plates must not be placed closer than ¼" to the membrane edge.
3. Fasteners must be installed to achieve the proper embedment depth. Install fasteners vertical to the deck, without lean or tilt.
4. In the corner regions, additional fasteners will also be installed through the perimeter half-width membrane rolls to form a grid pattern, with an 8" wide reinforced membrane flashing strip heat-welded over the additional fasteners, or, a 6" wide RPI Re-Flex TPO Cover Tape centered over the fasteners. "Corners" include both outside and inside corners that measure 75-105 angle degrees. Perimeter cap sheets may overlap one another in the corner areas.
5. Mechanically attach membrane with screws and plates to the roof deck at locations of deck angle changes in excess of 5 angle degrees (1" in 12").
6. Membrane may be heat welded to coated metal flanges. Membrane must be secured to the roof deck within 6" of the base of walls and curbs. At the perimeter, and all penetrations with DRILL-TEC Fasteners and Plates of a type and spacing in accordance with in-lap attachment requirements, with a 12" on center maximum spacing. Alternatively, membrane may be extended vertically 3" up walls and curbs and secured to the wall/curb substrate within 2" of the plane of the roof with DRILL-TEC Fasteners and inverted Termination Bar of type and spacing in accordance with in-lap attachment requirements, with a 12" on center maximum spacing. This detail is required to be used for pressurized buildings.
7. Install fasteners so that the plate is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the plate/termination bar to move (underdriving), but will not cause wrinkling of the membrane (underdriving).

C. Field Seaming

1. Fabricate field seams using a current-generation automatic hot air welding machine and a 10,000 watt voltage-controlled generator minimum. In addition, fabricate detail seams with automated hot air welders where possible. Outdated welding equipment and inadequate

/fluctuating electrical power are the most common causes of poor seam welds.

2. Equipment Settings: The correct speed and temperature settings for automatic welders are determined by preparing test welds at various settings. The welds are tested by application of pressure, causing the seam to peel apart. A satisfactory weld will fail by exposing the scrim reinforcement called a "film tearing bond." A deficient weld fails by separating between the two layers of the membrane.

3. Adjustments to Equipment Settings- Many factors will influence the welder settings: thicker membranes, lower air temperatures, and overcast skies will generally require a slower speed than would be required with thinner membranes, higher air temperatures, and sunny skies. The slower speed provides additional heat energy to compensate for heat-draining conditions. The test weld procedure should be conducted at the beginning of every work period (i.e., morning and afternoon) and following a significant change in weather (i.e., air temperature, wind speed, cloud cover.)

4. Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.

5. Weld width shall be a minimum 1-1/2" in width for automatic machine welding. Weld width shall be a minimum 2" in width for hand welding.

6. All cut edges of TPO reinforced membrane must be sealed with RPI Re-Flex Cut Edge Sealant.

D. Substrate Surface Preparation

1. Prepare substrate surfaces thoroughly prior to application of new roofing materials. This is particularly important for recover and reproofing applications.

2. Preparation includes, but is not limited to, removal of existing flashings, replacement of wet/damaged existing roofing materials, removal of loose aggregate, removal of abandoned equipment, supports and penetrations, replacement of damaged decking, etc.

3. Providing a smooth, even, sound, clean and dry substrate minimizes the likelihood that underlying deficiencies will cause premature

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deterioration or even failure of the new roofing system.

E. Membrane Surface Preparation

1. Membrane must be clean of dirt, dust, and contaminants; and free from dew, rain, and other sources of moisture. Factory-fresh membrane typically will not require cleaning prior to automatic welding, provided that welding is preformed immediately after placement and securement of the membrane.
2. Membrane that has been exposed for over 12 hours or has become contaminated will require additional cleaning methods.
3. Light Contamination – Membrane that has been exposed overnight up to a few days to air-borne debris, foot traffic, or dew or light precipitation can usually be cleaned with a white cloth moistened with RPI Re-Flex TPO Cleaner. Be sure to wait for solvent to flash off prior to welding.
4. Dirt-Based Contamination – Membrane that is dirt-encrusted will require the use of a low-residue cleaner such as Formula 409 and a mildly abrasive scrubbing pad to remove the dirt. This must be followed by cleaning with a white cloth moistened with RPI Re-Flex TPO cleaner. Be sure to wait for solvent to flash off prior to welding.
5. Exposure-Based Contamination – Membrane that is weathered/oxidized will require the use of RPI Re-Flex TPO Cleaner and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer. This must be followed by cleaning with a white cloth moistened with RPI Re-Flex TPO cleaner. Unexposed membrane left in inventory for a year or more may need to be cleaned as instructed above. Be sure to wait for solvent to flash off completely before beginning the welding process.
6. Chemical-Based Contamination – Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminant usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. The membrane should be removed and replaced.

3.12 Flashing Installation

A. General

1. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
2. All coated metal and membrane flashing corners shall be reinforced with pre-formed corners or un-reinforced membrane.
3. Heat weld all flashing membranes, accessories, and coated metal together to achieve a minimum 2" wide (hand welder) weld. A minimum 1.5" will be acceptable when using robotic welders.
4. All cut edges of reinforced TPO membrane must be sealed with RPI Re-Flex TPO Cut Edge Sealant.
5. When using bonding adhesive, be sure to use adhesive specific to membrane type.
6. Minimum flashing height is 8"

B. Coated Metal Flashings

1. Coated metal flashing allows much of the metal-work used in typical roofing applications to benefit from the security of heat-welded membrane seaming, with a corresponding reduction in required metalwork maintenance during the life of the roofing system.
2. Coated metal shall be formed in accordance with construction details and SMACNA guidelines.
3. Coated metal sections used for roof edging, base flashing, and coping shall be butted together with a ¼" gap to allow for expansion and contraction. Heat weld a 6"wide unreinforced membrane strip to both sides of the joint, with approximately 1" on either side of the joint left unwelded to allow for expansion and contraction. 2" wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
4. Coated metal used for sealant pans and scupper inserts, and corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Heat weld a 6"wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.

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5. Coated metal base flashing must be provided with min. 4" wide flanges nailed to wood nailers. Coated metal base flashings must be formed with a 1" cant.
6. Provide a ½" hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
7. In addition, provide a ½" hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.
8. Coated metal flashings are nailed to treated wood nailers or otherwise mechanically attached to the roof deck, or to the wall or curb substrate, in accordance with construction detail requirements.
9. When installing coated metal on walls or curbs that completely cover the existing flashing, the flashing does not need to be removed provided that it is in good condition and tightly adhered.

C. Adhered Reinforced Membrane Flashings – Smooth Surface

1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.
2. When using RPI Re-Flex TPO adhesives, use any one of the following substrates: polyisocyanurate insulation (w/o foil facer), high density wood fiber board, Den Deck, Dens Deck Prime, Dens Guard cured structural concrete absent of curing and sealing compound, untreated OSB, untreated CDX plywood, Type X gypsum board, and dry, sound masonry absent of curing or sealing compounds.
3. Apply bonding adhesive to both the substrate surface and the underside of the flashing membrane, at the rate of 120 sq. ft./gal. which covers both surfaces yielding 45-60 square feet of finished, mated surface per gallon for solvent-based bonding adhesives, and at the rate of 150-200 sq. ft./gal. covering both surfaces yielding 100 square feet of finished, mated surface area per gallon for water-based bonding adhesive. Solvent-based adhesive must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to dry completely to the touch; install the flashing within one hour of

drying. The rate of coverage may vary depending upon the porosity of the substrate.

4. Apply the adhesive only when the outside temperature is above 40°F and rising. Recommended minimum application temperature is 50°F to allow easier adhesive application.
5. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
6. When installing fleece-back membranes to a vertical surface, the material should be secured at the top of the sheet upon placement to avoid slippage. Top attachment should be installed immediately after the flashing installation to prevent slippage.
7. All laps in RPI Re-Flex smooth-reinforced flashing membrane shall be heat welded in accordance with heat welding guidelines.
8. Porous substrates may require double application of adhesive.
9. For extended guarantee lengths, separate counter-flashing or cap flashing is required; exposed termination bars are not acceptable.
10. Alternatively, the Freedom System can be used for flashings. Consult the Freedom section for installation instructions.

D. Adhered Reinforced Membrane Flashings– Fleece Back

1. Apply bonding adhesive to the substrate at the rate of 45-60 sq. ft./gal for solvent-based adhesive and at a rate of 100 sq. ft./gal for water-based adhesive.
2. The bonding adhesive must remain wet to the touch for one surface applications.
3. Apply the adhesive only when the outside temperature is above 40°F and rising. Recommended minimum application temperature is 50°F to allow easier adhesive application.
4. All selvage edge laps in RPI Re-Flex Fleece-Back flashing membrane shall be heat welded in accordance with heat welding guidelines. Lap width is 3".
5. Non-selvage edge laps in RPI Re-Flex Fleece-Back flashing membrane are made by butting adjacent sheets and heat welding an 8" wide strip of RPI Re-Flex TPO Flashing membrane over joint.

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6. For extended guarantee lengths. Separate counter-flashing or cap flashing is required; exposed termination bars are not acceptable.

E. Loose Reinforced Membrane Flashing

1. For extended guarantee lengths, separate counter-flashing or cap flashing is required; exposed termination bars are not acceptable.
2. Carefully position the RPI Re-Flex smooth reinforced flashing membrane prior to application to avoid wrinkles and buckles.
3. All laps in RPI Re-Flex smooth reinforced flashing membrane shall be heat welded in accordance with heat welding guidelines.
4. Maximum flashing height is 18" unless incremental attachment is used.

F. Unreinforced Membrane Flashings

1. Unreinforced membrane is used as a field-fabricated penetration/reinforcement flashing only where pre-formed corners and pipe boots cannot be properly installed.
2. Penetration flashings constructed of unreinforced membrane is typically installed in two sections, a vertical piece that extends up the penetration, and a horizontal piece that extends onto the roofing membrane. The two pieces are overlapped and heat-welded together.
3. The unreinforced vertical membrane flashing may be adhered to the penetration surface. Apply bonding adhesive to both the penetration surface and the underside of the flashing membrane, at the rate of 120 sq. ft./gal. which covers both surfaces yielding 60 square feet of finished, mated surface area per gallon for solvent-based bonding adhesives, and at the rate of 200 sq. ft./gal. covering both surfaces yielding 100 square feet of finished, mated surface area per gallon for water-based bonding adhesive. Coverage rates will vary depending on substrate. Solvent-based adhesive must be allowed to dry until tacky to the touch before flashing membrane application. Water-based adhesive must be allowed to dry completely to the touch; install the flashing within one hour of drying.
4. The penetration is finished with Water Cut-Off Mastic between the pipe and the membrane, install clamping band, and caulk.

G. Roof Edging

1. Roof edge flashing is applicable for both gravel and gravel stop/drip edge details as well as exterior edges of parapet walls.
2. Flash roof edges with membrane-coated metal flanged edging with minimum 3" wide flange nailed 4" on center to wood nailers, and heat weld roof membrane to metal flanges.
3. Coated metal roof edging must be provided with a continuous metal hook strip to secure the lower fascia edge if the fascia width is 4" or greater. The continuous hook strip must be secured to the building a minimum of 12" on center.
4. Alternatively, flash roof edges with a 2-piece snap-on fascia system, adhering roof membrane to metal cant with bonding adhesive and face nailing the membrane 8" on center prior to installing the snap-on fascia.
5. Galvanized metal edging may be flashed using RPI Re-Flex TPO Cover Strip after priming both the metal and the TPO field membrane for warranty lengths up to 15 years. Allow approximately 2" of tape to cover the metal edge with the remaining 3" of tape onto the TPO membrane. All T-joints and tape overlaps shall be covered with T-joint covers. Caulk all corners, tape overlaps and T-joints per published standard Re-Flex details. Caulk the back edge of the tape with Re-Flex Caulking when slope exceeds 1" in 12".
6. Flash roof edge scuppers with a scupper insert of coated metal that is mechanically attached to the roof edge and integrated as part of the metal edging.

H. Parapet and Building Walls

1. Flash walls with loose-applied membrane flashing, membrane flashing applied to the wall substrate with bonding adhesive, or with coated metal flashing fastened with DRILL-TEC fasteners 12" on center to wood nailers.
2. Secure membrane flashing at the top edge with a termination bar. Royal Edge Water Cut-Off Mastic shall be applied between the wall surface and membrane flashing underneath all termination bars. Exposed termination bars shall be mechanically fastened 6" O.C.

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termination bars that are counter-flashed shall be fastened 12" O.C.

3. Roof membrane must be mechanically attached along the base of walls that are flashed with membrane flashing with screws and plates/termination bar at a fastener spacing in accordance with in-lap attachment requirements, with a 12" O.C. maximum spacing.

4. Metal counter-flashings may be optional with fully adhered membrane wall flashings depending on guarantee duration. All termination bars must be sealed with RPI Re-Flex Lap Caulking.

5. Flash wall scuppers with a scupper insert of coated metal that is mechanically attached to the wall and integrated as part of the wall flashing. Refer to scupper section for other detail options.

6. Maximum flashing height without intermediate fastening:

- 18"– Loose-Applied Flashing
- 54"– Adhered Flashing

7. Metal cap flashings shall be provided with a continuous clip fastened 12"O.C.

I. Round and Square Tube Penetrations

1. Flash penetrations with pre-formed vent boots provided that the penetrations are accessible from the top. Otherwise, field-fabricate flashing with two-piece field fabricated flashings of unreinforced membrane.

2. All flashings require the installation of a stainless steel draw band around the top of the flashing. Seal the top edge with Royal Edge Water Cut-Off Mastic and add draw band with RPI Re-Flex Lap Caulking.

3. Roof membrane must be mechanically attached at the base of each penetration with screws and plates a maximum of 12"O.C. with a minimum of four fasteners per penetration.

J. Irregularly-Shaped Penetrations

1. Flash irregularly shaped penetrations with flanged sealant pans formed of coated metal, secured to the deck through the roof membrane with screws 6" O.C., a minimum of two per side.

2. Strip in metal flanges and the vertical pop riveted seam with 8"wide membrane flashing

strips heat welded to both the roof membrane and the metal flanges.

3. Fill sealant pans with Royal Edge 2-part Pourable Sealant. Fill sealant pans with non-shrink quick-set grout, and top off sealant pans with a 2"minimum thickness of Royal Edge 2-part Pourable Sealant.

K. Curbs and Ducts

1. Flash curbs and ducts with loose-applied membrane flashing, membrane flashing applied to the curb substrate with bonding adhesive or with coated metal flashing fastened 4" on center to wood nailers.

2. Secure membrane flashing at the top edge with a termination bar. Royal Edge Water Cut-Off Mastic shall be applied between the curb/duct surface and membrane flashing underneath all termination bars. Exposed Termination bars shall be mechanically fastened 6" on center; termination bars that are counter-flashed shall be fastened 12" O.C. If wood is present at the top of the curb, install ring shanks 12" on center. This can be used in lieu of the bar if nailed on the top or preferably the back side of the wood.

3. Roof membrane must be mechanically attached along the base of curbs and ducts that are flashed with membrane flashing with screws and plates/termination bar at 12" on center.

4. All coated metal curb flashings and loose membrane flashings must be provided with separate metal counter-flashings, metal copings, or flashed with equipment flanges.

5. Metal counter-flashings may be optional with fully adhered membrane curb and duct flashings depending on guarantee duration. All termination bars must be sealed with caulking.

L. Expansion Joints

1. Install prefabricated expansion joint covers at all flat type and raised cant/curb type expansion joint conditions.

All metal nailing strips must either be nailed to wood nailers, cants or curbs, or secured to walls with screws or expansion anchors appropriate to substrate type.

2. Roof membrane must be mechanically attached along the base of raised cant/curb

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expansion joints with screws and plates a minimum of 12" O.C.

3. Expansion joint bellows must be twice the width of the expansion joint opening to allow for proper expansion/contraction.

4. Metal nailing strip must be set in Water Cut Off and secured with fasteners and neoprene washers fastened 6" O.C.

5. Expansion joints may be also be field fabricated.

M. Roof Drains

1. Roof drains must be fitted with compression clamping rings and strainer baskets. Original-type cast iron and aluminum drains, as well as retrofit-type cast aluminum and molded plastic drains, are acceptable.

2. Roof drains must be provided with a min. 36"x 36" sumped area. Slope of tapered insulation within the sumped area shall not exceed 4" in 12"

3. Extend the roofing membrane over the drain opening. Locate the drain and cut a hole in the roofing membrane directly over the drain opening. Provide a ½" of membrane flap extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.

4. For cast iron and aluminum drains, the roofing membrane must be set in a full bed of Water Cut-Off Mastic on the drain flange prior to securement with the compression clamping ring. Typical Water Cut Off application rate is one 10.5oz. cartridge per drain.

5. For fleece-backed roof membrane applications, the fleece-backed membrane is cut just short of the drain flange. A separate smooth reinforced membrane drain flashing sheet is heat welded to the roofing membrane and set into the drain above in a full bed of Water Cut-Off Mastic and mechanically secured.

6. Lap seams shall not be located within the sump area. Where lap seams will be located within the sump area, a separate smooth reinforced membrane drain flashing a minimum of 12" larger than the sump area must be installed. The membrane flashing shall be heat welded to the roof membrane. Alternately, if the seam does not run under the clamping ring, it

can be covered with a 6" wide reinforced membrane strip heat welded to the membrane.

7. Tighten the drain compression clamping ring in place.

N. Scuppers

1. Coated metal roof edge scuppers must be provided with a min. 4" wide flange nailed to wood nailers with hemmed edges and secured with continuous clips in accordance with the gravel stop assembly.

2. Coated metal wall scuppers must be provided with 4" wide flanges, with additional corner pieces pop-riveted to the flanges to create a continuous flange. All flange corners must be rounded.

3. Install wall scuppers over the roof and flashing membrane and secure to the roof deck/wall with DRILL-TEC fasteners 6" O.C., a minimum of 2 fasteners per side.

4. All corners must be reinforced with RPI Re-Flex TPO Universal Corners or field fabricated from Royal Edge unreinforced materials.

5. Strip in scupper with flashing membrane target sheet.

6. Alternately, a wall scupper box may be field flashed using unreinforced flashing membrane heat welded to membrane on the wall face and roof deck and terminated on the outside wall face and roof deck with a termination bar, Water Cut-Off Mastic and Lap Caulk.

O. Heater Stacks

1. Field-fabricated two-piece membrane flashings of RPI Re-Flex Unreinforced Flashing Membrane are typically installed at heater stacks.

2. Heat stacks must be equipped with either cone-shaped or vertical roof jack flashing sleeves so that the membrane flashing is not adhered directly to the heater stack. Do not allow RPI Re-Flex Membranes to contact any type of heat stack.

3. Mechanically attach the roof membrane to the structural deck with DRILL-TEC screws and plates around the penetration base prior to flashing installation. Fastener shall be installed 12" O.C. or a minimum of 4 per penetration.

4. All stack flashings must be secured at their top edge by a stainless steel clamping band

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over Water Cut-Off Mastic and sealed with RPI Re-Flex Caulking.

5. Field-fabricated membrane flashings may be adhered to the flashing sleeve with RPI Re-Flex TPO Adhesive.

P. Wood Support Blocking

1. Wood support blocking, typically 4"x 4", is installed under light-duty or temporary roof-mounted equipment, such as electrical conduit, gas lines, condensation and drain lines.
2. Install wood support blocking over a protective layer of RPI Re-Flex TPO membrane or RPI Re-Flex Walkway pad.

Q. Satellite Dish Support Bases

1. Install satellite dish support bases over a protective layer of RPI Re-Flex Walkway Pad.

R. Lightning Suppression Clips

1. Alternatively, secure lightning suppression clips to the roof surface by means of 2" wide RPI Re-Flex TPO Flashing membrane strips heat welded to the roof membrane.

3.13 Traffic Protection

- A. Walkway rolls must be installed at all roof access locations including ladders, hatchways, stairs and doors. Install walkway rolls at other designated locations including roof-mounted equipment work locations and areas of defined or repeated rooftop traffic.
- B. Walkway rolls must be spaced 2" to allow for drainage between the pads.
- C. Heat weld walkway rolls to the roof membrane surface continuously around the walkway pad perimeter.
- D. TPO walkway rolls may also be installed with TPO primer on the back of the TPO pad along the edges and down the middle of length of the pad. Clean and prime the roof membrane where the pad will be installed. Install tape to the back of the pad where cleaned (edges and middle) and roll in with a silicone hand roller. Remove

the release paper and install and taped pads directly onto the roof membrane. Secure the pads by rolling into place.

3.14 Temporary Closures

- A. The roofing installation must be made watertight at the end of each day's activity to prevent water infiltration into the completed roofing system installation.
- B. Complete all flashings and terminations as the roofing installation progresses.
- C. At the edge of the completed roofing system installation, extend the roofing membrane a minimum of 6" beyond the edge. Seal the roofing membrane to the surrounding deck or substrate surface with hot asphalt or foam sealant.
- D. Remove all temporary night seal materials prior to continuing with the roof installation and dispose of properly.

3.15 Field Quality Control

- A. Inspect completed roof sections on a daily basis. It is the contractor's responsibility to probe all heat-welded seams and perform an adequate number of seam cuts to ascertain seam quality and consistency.
- B. Immediately correct all defects, irregularities, and deficiencies identified during inspections.
- C. Remedial work shall be performed with like materials and in a manner consistent with the balance of the roofing installation so as to minimize the number of repair patches.
- D. Excessive patchwork will require replacement of the entire affected membrane section, from lap to lap.

3.16 Cleaning

- A. Remove bonding adhesive, bituminous markings and other contaminants from finished surfaces. In areas where finished surfaces are soiled by asphalt or any other source of contamination caused by work of this or other

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sections, consult manufacturer of surfaces for cleaning advice and conform to those instructions.

B. Cut out and remove any sheet membrane contaminated with solvent-based adhesive, bituminous markings, and other contaminants from finished surface. Repair sheet damage by first cleaning the area with an all-purpose cleaner, then rinse off soapy residue. Reactivate membrane using the appropriate Royal Edge cleaner, wiping with a damp (not saturated) rag. Complete repair by installing a patch of like material to specific system requirements. Repairs can be made using Re-Flex Cover Tape and Re-Flex Primer/Activator, or Heat welding.

3.17 Maintenance

A. Upon completion of the roofing system, provisions should be made to establish a semi-yearly inspection and maintenance program in accordance with standard good roofing practice guarantee requirements.

B. Repair cuts, punctures and other damaged membrane by cleaning the membrane (see section 3.11E), followed by heat welding a membrane repair patch to sufficient size to extend a minimum of 2" beyond the damaged area, or, using Re-Flex TPO Cover Tape and Re-Flex Primer/Activator. The Re-Flex TPO Cover Tape patch must extend a minimum of 3 inches beyond the damaged area in every direction. If heat welding to the top surface of the existing membrane is ineffective, the patch must be heat welded to the underside, which may be clean, of the existing sheet after proper preparation.

C. Any damage to adhered membrane areas or locations of mechanical attachment shall be repaired so that the repaired area remains fully adhered or mechanically attached.