

## TRI-PLY® GENERAL INSTRUCTIONS

### ROOFING DESIGN CONCERNS

This list represents the most commonly encountered roofing situations that can influence the performance of a roofing system. It is not all-inclusive, and should not be looked upon as representing all situations that may be encountered or considered.

#### 1. Drains

- a) The use of plastic drains is not recommended and is not acceptable for installations.
- b) A minimum of 2.5 lb (1.13 kg) lead sheeting must be incorporated in the drain flashing design.
- c) Drains must have properly installed clamping rings.

#### 2. Pitch Pans

- a) The use of pitch pans is not recommended. Pitch pans are maintenance items that can become nuisances if ignored or improperly used or installed.
- b) Pitch pans are not covered by GAF guarantees.

#### 3. Metal Flanged Skylights and Other Rooftop Equipment

- a) Due to the differential expansion between metal and asphalt, large metal flanges are undesirable surfaces to flash to with BUR and modified bitumen materials.
- b) Flashing to these metal flanges is not covered by GAF guarantees.
- c) Such units should be mounted on canted wood curbs at least 8" (203 mm) above the level of the roof.

#### 4. Plumbing Vents

- a) The use of primed lead flashing sleeves is required due to better compatibility between lead and asphalt roofing systems as compared to sheet metal flashing.
- b) Lead sleeves on plumbing vents are required.

#### 5. Gravel Stops

- a) All gravel stops should be raised to push water to proper draining locations.
- b) The membrane should be nailed to raised perimeter nailers and counterflashed with metal counterflashing where at all possible.
- c) Where metal gravel stop flanges are flashed to the roof membrane, leaks caused by metal movement are not covered by GAF guarantees.

#### 6. Air Conditioning Units

- a) Where at all possible, install such units at ground level.
- b) If such units are to be installed on the roof, they must be mounted on at least 8" (203 mm) high canted wood curbs or platforms secured to the structural members of the roof. The curbs or platforms must be properly flashed and counterflashed.
- c) Do not use wood sleepers for supporting these units directly on the roof membrane. GAF guarantees do not cover leaks caused by units mounted on sleepers laid directly on the roof membrane.

#### 7. Piping and Conduit on Rooftop

- a) Piping and conduit should not be run across a roof.
- b) Where no alternative exists, the piping/conduit should be elevated at least 8" (203 mm) above the surface of the roof on supports that are secured to the structural roof members or the deck if light pipes. These supports must allow for the movement of the pipes and must be flashed with Tri-Ply® materials.
- c) Leaks resulting from improper supports are not covered by GAF guarantees.
- d) Where continuing piping and conduit penetrate the roof, a two-piece, soldered, noncorroding sheet metal sleeve should be installed in conjunction with a metal umbrella.

#### 8. General Flashing Considerations

- a) All flashing must be installed at least 8" (203 mm) above the immediate roof membrane level.
- b) All flashing must be mechanically attached at its top.

- c) Counterflashing is required and must extend at least 4' (1.22 m) below the top nailing.
- d) Counterflashing is not covered by GAF guarantees.
- e) Termination bars may only be used in conjunction with an appropriate counterflashing extending a minimum of 4" (102 mm) below the termination bar. Fastener spacing must be 4" (102 mm) or 8" (203 mm) as determined by flashing height as listed in the individual flashing specifications.

#### 9. Coatings

- a) Asphalt solvent-based coating must not be used on new granular-surfaced rolls.
- b) Reapplication of coating must be employed as a part of periodic maintenance program. The frequency will vary depending on climatic conditions.

### STORAGE AND INSPECTION OF ROOFING MATERIALS

Tri-Ply® roofing materials leave the factory dry and must be maintained in storage to prevent the materials from getting wet. Provisions must also be made for storing in a well-ventilated, ambient temperature environment out of the weather. Water-based coatings must be protected from freezing.

At the job site, no more material should be stored than will be used within two weeks; it should be stored on pallets, roll goods on end, in a well-ventilated area. Where dry inside storage is not possible (such as where new concrete floors or extensive plastering results in a high humidity), storage under secured canvas tarpaulins in a well-ventilated area is acceptable for periods up to two weeks. For periods longer than two weeks, the materials should be properly warehoused, i.e., dry, ventilated, on pallets, etc. Polyethylene covers are unacceptable field covers. Rooftop storage of roofing should be on pallets, rolls on end, and protected with properly secured vapor permeable covers such as canvas tarpaulins. No more material should be stored on the roof than can be used within five days. When prolonged inclement weather threatens, i.e., rainy seasons, no more roofing materials should be supplied to the rooftop than can be used within two days.

In the unlikely event that obviously defective or damaged material reaches the job site or damage to the material occurs from improper storage on the job site, it is the responsibility of the roofing contractor not to install this material. In the case of material that has obvious manufacturing defects, GAF should be notified immediately so replacement material can be supplied if the complaint is justified. Installation of defective material can result in additional costs above the cost of supplying replacement material. If the roofing contractor chooses to install material with obvious defects, this added cost is not the responsibility of GAF.

### CONDITION AND PREPARATION OF ROOF DECK SURFACE

All open edges must have wood nailers. On steel or concrete roof decks of any kind, use treated wood nailers along all open or flush eaves so that gravel-stops or edging strips may be securely nailed. Wood nailers may also be needed at other projections through the roof.

Prime masonry and metal surfaces to receive a mopping of roofing asphalt with asphalt/concrete primer and allow to dry thoroughly.

The surface of a roof deck should be dry, firm, smooth, and free of dirt and loose material. It is the responsibility of the roofing contractor, deck contractor, and owner's representative to determine the suitability of the roof deck surface to receive the roof assembly.

Electrical conduits, bolts, and other similar small items must be removed from the surface of the roof deck; such surface irregularities cannot be properly insulated and roofed.

None of the foregoing factors is the responsibility of GAF, which under no circumstances will assume such responsibility.

If the roof is sloped ½:12 or more, see “Installation on Steep Slopes.”

## Non-Nailable Decks (Steel Decks)

Any of the Tri-Ply® specifications for use over insulation may be applied over a steel deck. A steel deck must be covered with rigid insulation that is firm, capable of withstanding traffic, and is thick enough to span the rib opening of the deck. The insulation must be mechanically attached using Tri-Ply® Screws and Plates to meet at least FM I-60 uplift resistance.

When two layers of insulation are to be installed, solidly mop the second layer of insulation to the first layer.

A steel deck must be no lighter than 22 gauge and conform to the recommendations of the latest Factory Mutual Bulletin I-28.

## Nailable Decks (Wood Decks—Plywood Decks)

Wood boards must be at least 1" (25 mm) nominal thickness and have a nominal width of 4" to 6" (102 to 152 mm). All boards must have a bearing on rafters at each end and be securely nailed.

Plywood sheathing shall be exterior grade, minimum 4 ply, not less than 15/32" (11.9 mm) thick. Plywood decks must be designed and fabricated in accordance with the recommendations of the American Plywood Association. All four sides of each plywood panel shall bear on and be securely nailed to joists and cross blocking between joists. “H” clips are not acceptable. Plywood decks must be installed with a 1/8" – 1/4" (3 – 6 mm) gap between sheets and must match vertically at joints to within 1/8" (3 mm).

Wood and plywood decks must be dry prior to roofing. Cover cracks wider than 1/4" (6 mm) and knot holes larger than 1" (25 mm) with securely nailed sheet metal. When light metal wall ties or other structural metal are exposed on top of the wood deck, cover them with a heavy ply of roofing membrane, such as inverted Tri-Ply® BUR Granule Cap Sheet, extending 2"– 6" (51 – 152 mm) beyond the metal in all directions. Nail in place before applying the base ply.

If Tri-Ply® Ply 4 or Tri-Ply® FlexPly™ 6 is used as a base sheet over a wood deck, a sheathing paper is required.

Nail the base sheet through flat metal caps or use nails with attached 1" (25 mm) square or round metal caps that have a minimum withdrawal resistance of 40 lb (18 kg) each.

Tape-and-staple fastening systems may be used on wood decks when they comply with local building codes and agencies such as FM and UL.

## ROOF DRAINAGE

Proper and adequate drainage of the roof surface is required, and is the responsibility of those involved in the design and construction of the roof substrate and supporting structure. GAF recommends at least ¼:12 slope with proper grading to and placement of outlets. Guarantees will not be valid for areas of a roof that pond water. Ponding water is defined as water that does not drain or dissipate from the roof surface within 48 hours after precipitation. Ponding can also result from other water sources, including improperly piped air conditioning condensate and steam condensate lines.

Perlite tapered insulation may be used to create proper drainage. For recommendations on tapered insulations or fills to provide slope for drainage, contact the GAF Tapered Design Group at 1-800-766-3411.

## EXPANSION JOINTS

Separate building units from adjacent units by expansion joints to allow for structural expansion and contraction. Although requirements may vary depending on structural and climatic conditions, expansion joints are strongly recommended. The exact location and number of expansion joints are the responsibility of the building designer.

## VAPOR RETARDERS

A vapor retarder installed to the deck beneath the pre-formed roof insulation is not a part of the roofing specification; its use must be determined by the architect, design engineer, or building owner.

## ASPHALT

### Heating of Asphalts

ASTM D312 Type III Steep or Type IV High Temperature Steep Asphalts should be used to install mop-applied Tri-Ply® BUR Cap and Ply Sheets and Tri-Ply® SBS Membranes.

Field experience has demonstrated that proper temperatures in the kettle and at the point of application are essential to obtain a satisfactory roof. Kettle temperatures in excess of those indicated below may result in changing of the asphalt while temperatures below specified minimums can result in lack of adhesion. Every effort should be made to maintain the temperature limitations indicated below. It is essential that the foreman of the roofing crew be provided with an accurate thermometer to check temperatures at the kettle and at the point of application. Prolonged heating, at 500 °F (260 °C) or more, of roofing asphalts may cause changes in their physical properties that can affect roof membrane performance and must be avoided. Unless roofing asphalt is being continuously used, the temperature of the kettle should be reduced to below 500 °F (260 °C).

Recommended kettle and asphalt application temperatures:

Steep Asphalt	ASTM D312 Type III
Kettle	—Not over 500 °F (260 °C)
Time of Application	—EVT, but not less than 400 °F (204 °C)
HT Steep Asphalt	ASTM D312 Type IV (High Temp.)
Kettle	—Not over 500 °F (260 °C)
Time of Application	—EVT, but not less than 400 °F (204 °C)

**Safety Note:** Asphalt should be heated to provide the EVT at the time of application, but should not be heated above the final blowing temperature or the flash point of the asphalt.

GAF supports NRCA's position of two EVTs, one for mop application and one for mechanically applied asphalt. For mop applications, the optimum asphalt viscosity of 125 centipoise has been established. The optimum asphalt viscosity of 75 centipoise has been established for mechanical applications.

The same asphalt will need to be heated to a higher temperature to achieve the lower optimum viscosity when it is applied with a mechanical spreader.

## Application of Asphalt

Low-density roof decks and insulation material tend to absorb the bitumen. It is important, therefore, that the layer of bitumen used to secure either the insulation material to the roof deck or the first ply of felt in the roof system be applied in sufficient quantity to ensure adequate adhesion.

Interply moppings of asphalt must be applied in a continuous film and consist of approximately 25 lb (11.3 kg) per 100 square feet (9.2 sq. m) of roof area, with a tolerance not to exceed 20% plus or minus.

## TEMPORARY WATER CUTOFFS AND PHASED CONSTRUCTION

All Tri-Ply® roofing systems must be made watertight at the end of each workday. Ideally, an entire roof area will receive the installation of the complete new roof system, including all board insulation, membrane plies, and flashings, in one day. When this is not possible, the exposed edges of the new roof system must be sealed so as to prevent water penetration and wind infiltration into the new roof assembly. Any such water cutoffs must be completely removed before resuming work.

The installation of the Tri-Ply® roofing system shall progress in such a manner so that proper drainage of both the existing roof area and the new roof installation is maintained.

## RECOMMENDED PROCEDURES FOR APPLYING INSULATION

### General

Do not apply roof insulation and roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment.

It is recommended that insulation be applied in more than one layer, if feasible, with joints staggered between layers. The roof insulation must be firmly attached to the deck. Whenever possible, the first layer should be mechanically fastened while the second layer is applied in a continuous mopping of hot steep asphalt at the rate of 25 lb (11.3 kg) (plus or minus 20%) per 100 square feet (9.2 sq. m) and joints staggered in parallel courses as well as between layers. If roof tape is specified, top layer joints of insulation may be continuous in both directions.

Cut all insulation to fit where it meets vertical surfaces. Cut ¼" (6 mm) short where insulation meets vertical flashings. Miter edges of insulation panels at ridges and elsewhere to prevent irregular surfaces and open joints. Butt edges moderately as to not deform them.

Decks must be designed to drain freely with sufficient outlets placed and installed to promptly and thoroughly remove water from roof.

If additional taper is required, perlite tapered roof insulation can be utilized. All hip and valley panels should be mitered. Laced valleys are not acceptable.

Roofing should not be applied over wet insulation. Any insulation that has become wet or damp must be removed and replaced.

### Drill-Tec™ Mechanical Fasteners

Mechanical attachment of insulation to the roof deck is the preferred method of installation whenever practical and is required by GAF and FM on steel decks. Tri-Ply® Fasteners may be used to fasten EnergyGuard™ Polyiso Insulation to most roof decks including steel, wood, and concrete. Where Drill-Tec™ Fasteners are employed, they must be used at the minimum rate to achieve FM I-60 uplift resistance.

### Application Over Steel Decks

The steel deck installation should conform with FM's recommendations. Consult the current Factory Mutual Loss Prevention Data Sheet 1-28 and Approval Guide for details on the roof system being installed and for the recommended number of fasteners per insulation board.

Apply panels of insulation with long sides continuous, either parallel or at right angles to steel deck ribs. The opposite edges of panel must rest firmly on the bearing surface of the steel deck. Joints of parallel courses of insulation should be staggered.

The insulation panels are placed in position immediately ahead of the fastening crew. Sight along the top flanges of the metal deck section or snap a chalkline. Place Drill-Tec™ Fastener plates in a pattern that will enable the screws to contact and penetrate the top flange of the metal deck a

minimum of ¾" (19 mm). Drive screws through the holes in the plates, insulation, and into the metal deck using an electric screw gun. Repeat across the entire area to be fastened.

If additional layers of insulation are used, secure in a continuous mopping of hot steep asphalt applied at the rate of 25 lb (11.3 kg) (plus or minus 20%) per 100 square feet (9.2 sq. m) and stagger joints in parallel courses as well as between layers. If joint tape is specified, the top layer of insulation joints may be continuous in both directions. As an alternate to asphalt, both layers of insulation can be mechanically fastened simultaneously.

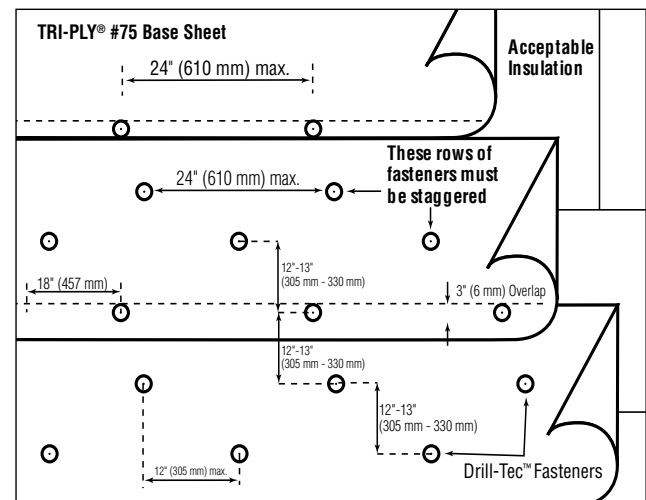
### Application Over Wood, Precast, or Preformed Nailable Decks

This recommendation is for use when installing insulation over decks capable of adequately holding fasteners that are recommended by GAF or the deck manufacturer. The condition of the deck must be carefully examined to determine the capacity of the deck to hold the fasteners.

### Application of Insulation Without Underlayment

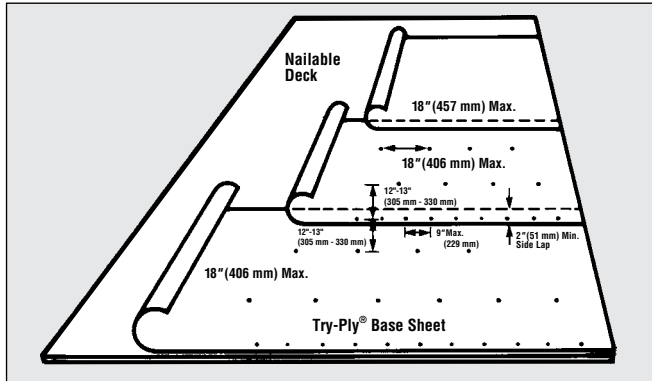
Panels of EnergyGuard™ Polyiso Insulation should be applied with long joints running continuously and short joints staggered. The insulation should be mechanically attached using the appropriate approved fastener or fastener recommended by the deck manufacturer. Nails are not to be used to fasten insulation to decks. When additional layers of insulation are used, the second and succeeding layers should be applied in a continuous mopping of hot steep asphalt at the rate of 25 lb (11.3 kg) (plus or minus 20%) per 100 square feet (9.2 sq. m) and joints staggered in parallel courses as well as between layers. As an alternate to asphalt, both layers of insulation may be mechanically fastened simultaneously.

## MECHANICALLY ATTACHED BASE SHEET AND ENERGYGUARD™ POLYISO INSULATION ASSEMBLIES



Where permitted in the specification, a mechanically attached system can be used over steel, concrete, and wood decks as an alternative to steep asphalt attachment of the base sheet. Attachment of both insulation and a #75 Base Sheet can be accomplished simultaneously employing the Drill-Tec™ Fastener System as shown above. This fastener placement is applicable only for the Drill-Tec™ 3" (76 mm) diameter metal fastener. The use of other fasteners is not recommended. This specification can be used with insulation boards with a minimum compressive strength of 16 pounds per square inch (110 kpa) (Test Method ASTM D1621 or C165) and includes isocyanurates and perlite products.

## Nailing of Base Sheet Directly to Deck



All nailing must be done through flat metal caps or acceptable nails with 1" (25 mm) square or round metal caps. The proper nail or fastener must be selected in accordance with the recommendations of the deck manufacturer or as recommended for specific type decks in this catalog. The fastener used must have a minimum withdrawal strength of 40 lb (18 kg).

Some buckling of the base sheet may occur during its installation if it is not permitted to relax sufficiently. The base sheet must be unrolled and allowed to relax before fastening. It is suggested that the base sheet be stretched just prior to nailing. This is usually accomplished by a shuffling motion of the feet of the mechanic installing the sheet just ahead of nailing.

Nail along the side lap of the base ply at intervals not to exceed 9" (229 mm) and stagger-nail down the center of sheet in two rows with nails spaced at intervals not to exceed 18" (457 mm) in each row, with each row 12" – 13" (305 – 330 mm) in from the edges of the sheet.

### Installation on Steep Slopes

Slippage of mop-applied or torch-applied roof systems may occur on slopes of ½:12 or more unless supplemental nailing is used. If the roof slope is less than ½:12, nailing is not required.

If the slope is greater than ½:12 but less than 2:12, use wood nailers at the eave, at the ridge, and at intermediate spacing of no more than 16' (4.8 m). If the slope is 2:12 to 3:12, use wood nailers at the eave, at the ridge, and at intermediate spacing of no more than 8' (2.4 m). All dimensions are from inside face to inside face of the wood nailers. Ensure a snug fit with the courses of insulation, but avoid cutting the insulation. For non-insulated wood decks, back-nail the plies directly to the deck at the intervals listed above.

If insulation is to be installed, mechanically attach insulation or mop between wood nailers with the long dimension in the same direction as the roof slope. Use wood nailers treated with water-based preservative to hold the insulation in place. Use wood nailers at least 2" (51 mm) wide and the same thickness as the insulation. Install on top of the vapor retarder (if used) at right angles to the direction of slope. Mechanically attach wood nailers to the deck with nails, screws, or bolts.

Install all plies of Tri-Ply® Base and Ply Sheets vertically on slopes ½:12 or more and back-nail them into wood nailers or nailable decks approximately 4" (102 mm) from the back edge of the sheet. All end laps must be at wood nailers, and the top edge must be at wood nailers, and the top edge must be nailed into the wood nailer on 6" (152 mm) centers. Use nails with integral metal heads at least 1" (25 mm) round or square.

Install Tri-Ply® Membranes vertically on slopes ½:12 or more. Terminate at wood nailer and fasten the top edge of each sheet with Tri-Ply® Screws and Plates, placing 4 fasteners evenly spaced across the top of the sheet.

The overlapping sheet must extend at least 9" (229 mm) past the top of the underlying sheet. All end laps must be staggered to the closest wood nailer, spaced a minimum of 4' (1.22 m). On slopes of 2:12 to 3:12, the Tri-Ply® Sheets must be cut into lengths not to exceed 17' (5.2 m). For non-insulated wood decks, terminate and fasten the end of the Tri-Ply® Sheets to the deck with the same fasteners, on the same spacing indicated above.

ASTM D312, Type IV, HT Steep Asphalt must be used to install all base sheets, ply sheets, and Tri-Ply® Mop Membranes on slopes of ½:12 or above.

For cold-applied specifications starting at ½:12 or greater, the above referenced fastening requirements must be followed, except wood nailers must be used at intermediate spacing of no more than 8' (2.4 m).

For roofs with slopes greater than 3:12, contact GAF Technical Services.

### FLASHING

The juncture of the roof deck and a vertical surface is probably the most vulnerable moisture infiltration point on any roof. Before selecting a flashing type, examine the many factors that may affect the optimum trouble-free joining between the roof deck and vertical surface. The potential for differential movement between deck and vertical surfaces must be addressed in the flashing design.

### RE-COVER

For reroofing projects, it is always best to remove the old roof system. This will show the deck condition, allow for upgrading roof insulation, eliminate moisture entrapment, allow proper addition of new units and curbs, and give greater confidence in the new roofing system.

Follow the recommendations below when re-covering an existing BUR or any modified bitumen roof. Any deviations must be addressed in writing from GAF Technical Services.

Re-covering single-ply membranes present unique problems; contact GAF Technical Services for guidance.

### Preparation

A proper analysis of the old system, including determining the cause of its failure, must be made. A proper preparation of the old system and the roof insulation (if any) must be done.

It is the responsibility of the building owner or its agent, roof designer, or roofing contractor to determine if the old system is suitable to be re-covered with a new roofing membrane. GAF assumes no responsibility for determining the suitability for re-covering or the composition of the existing roof system. GAF's responsibility under the term of the guarantee does not include problems with the new system caused by the substrate, in this case, the old roof system. These problems include, but are not limited to, problems in the new roof system that result from roofing over wet materials in the old roof.

The preparation for re-covering the old roof should include:

1. Establishing the history of the old roof system.
2. Determining and correcting the cause of any premature roof failures.
3. Determining that the deck is structurally sound to receive the new system.
4. Taking test cuts to verify the old roof construction and condition. Three test cuts should be made for roofs under 100 squares (929 sq. m) and one test cut per 100 squares (929 sq. m) above the minimum amount.

**Note:** Roof systems having existing vapor retarders must be addressed with GAF Technical Services.

5. Confirming that the old system is securely fastened to the roof deck.



6. Removing all wet roof insulation and old, wet membrane. Replacing with dry materials. The existing roof membrane must be in a condition suitable to receive the new roof assembly.

**Note:** It is highly recommended that a moisture survey be made to determine the extent of wet insulation and moisture entrapment.

7. Providing for proper drainage of the new roof system to eliminate ponding. Provisions must be made to ensure the new roof system has proper drainage, i.e., placement of additional roof drains, use of tapered insulation, use of crickets, etc., as appropriate.
8. Complying with all code requirements.
9. GAF recommends re-covering over only one existing roof system. GAF will not issue a guarantee for a new GAF roof membrane installed over more than one pre-existing roof system.

## Re-cover Specifications

GAF requires that the new roof membrane be separated from the old roof system by the installation of a layer of EnergyGuard™ Polyiso Roof Insulation. The maximum insulation board size is to be 4' x 4' (1.22 m x 1.22 m).

## Specific Deck Requirements: Steel, Gypsum, Wood, Tectum

1. Any gravel surfacing must be removed to provide a smooth surface.
2. On smooth-surface roofs, the old roof surface should be level and clean.
3. Remove all wet or damaged roof insulation and old, wet membrane. Replace with new insulation of the same type and cover with new membrane to complete the repair.
4. Old membrane must be cut on 3' (914 mm) centers to allow for the release of any trapped vapor pressure.
5. Re-covering over existing modified bitumen smooth and granule-surfaced roof systems requires the use of a mechanically attached insulation.
6. When insulation is used, it must be mechanically fastened with Drill-Tec™ Fasteners to steel decks. On tectum and gypsum decks, after removing any gravel, new insulation can be mopped to achieve a minimum of 70% attachment. The surface of the old BUR roof surface must be primed before mopping in the insulation. Install new roof specification to insulation as outlined in this manual.
7. Top side venting is required. Use vent stacks installed at the rate of one per 1,000 square feet (92.9 m) or use perimeter venting.
8. All specification requirements and recommendations listed in this manual must be followed, i.e., slope, nailing, etc.
9. If the old roof is a coal tar BUR, a mechanically fastened insulation must be used. Proper precautions must be taken to ensure that coal tar drippage into the building does not occur.

## COLD WEATHER APPLICATIONS

Special care is necessary in applying Tri-Ply® Membranes at temperatures below 45 °F (7.2 °C). The roof surface must be ice-free and dry.

Tri-Ply® Membranes must be stored for at least overnight at a minimum of 55 °F (12.8 °C) prior to their application. For mop-applied Tri-Ply® Membranes, asphalt must be at least 425 °F (218 °C) (with a target temperature of 425 °F [218 °C]) or ±25 °F (±13.9 °C) above the EVT, whichever is higher, at the point of application. Mopping must not precede the roll by more than 5' (1.52 m).

For both mop-applied and torch-applied Tri-Ply® Membranes, the rolls must be at least 45 °F (7.2 °C) at the time of application.

## TRI-PLY® BUR INSTALLATION INSTRUCTIONS

Tri-Ply® BUR Granule Cap Sheet is considered part of the membrane system as well as surfacing. The application of Tri-Ply® BUR Cap Sheet shall commence at low points of the roof so that at no place is the flow of water against the laps. Parallel lap lines of cap sheet should not coincide with the lap lines of the underlying piles wherever possible. Application must be over and parallel to the underlying roofing membrane.

All sheets must be precut into 10' to 12' lengths (3.05 – 3.66 m) and stacked prior to application. Sheets may be cut in 15' to 18' (4.57 – 5.45 m) lengths if the temperature is 65 °F (18 °C) or above. Embed cap sheet in steep asphalt applied at the nominal rate of 25 lb (11.3 kg) per 100 square feet (9.2 sq. m). Side laps must be a minimum of 2" (51 mm) and end laps 6" (152 mm). End laps shall not occur in a continuous line and should be broken by a minimum of 3' (0.9 m). Uniformity of the separation of side laps is desirable for best appearance. All sheets must be firmly embedded in the hot asphalt and be free of wrinkles, buckles, blisters, fishmouths, or voids.

End laps must be nailed on all slopes exceeding 1:12.

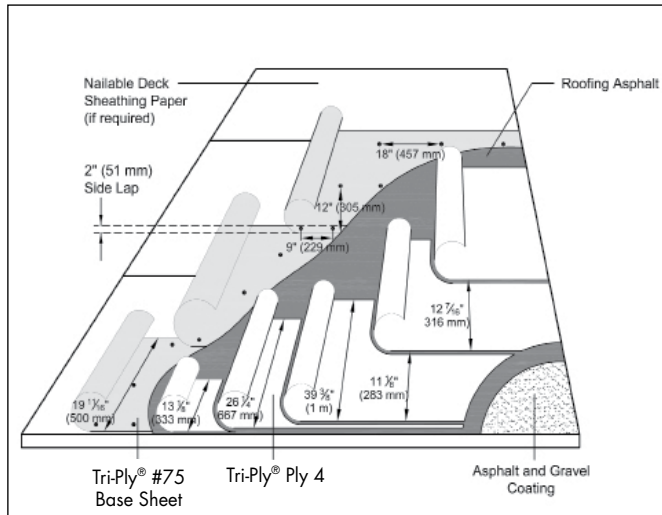
There are three acceptable methods of application:

1. The “flop in” method involves setting the precut sheet with mineral-surfaced side down adjacent to the area where it is to be applied with the lap of the previous course exposed. Solidly mop with roofing asphalt the full sheet width to be covered including the lap. The Tri-Ply® BUR Cap Sheet should be picked up at each end and at the outside edge, turned over, and set immediately into the hot mopping.
2. The “fly in” method involves mopping the full width of the area to be covered and then picking up a precut sheet and setting it immediately into the hot mopping.
3. The “reroll” method involves setting the precut sheets so it is in its exact final position, rerolling it, and then mopping immediately ahead of the roll as it is rolled in place.

**Note:** Brooming of the Tri-Ply® BUR Cap Sheet is desirable in all cases to ensure completed adhesion. Also, in the “flop in” and “fly in” methods, tension should be placed on the precut sheet as it is being set to avoid wrinkles or buckles in the sheet.

Application of the Tri-Ply® BUR Cap Sheet at temperatures below 50 °F (10 °C) is not recommended. At temperatures near 50 °F (10 °C), the reroll method with complete brooming will provide the best results. Wind conditions, which may chill the asphalt more quickly, must be considered.

## FOUR (4) PLY BUILT-UP ROOFING SYSTEM AVAILABLE DECK



## BASE SHEET & PLY FELT APPLICATION CHART

	Recommended Starter Rolls	2 <sup>nd</sup> Full-Width Sheet Side Lap/Exposure	Following Courses Lap/Exposure	End Laps <sup>1</sup>
Tri-Ply® #75 Base Sheets*	39 3/8" (1 m)	Lap 2" (51 mm) Exp 37 3/8" (949 mm)	Same	4" (102 mm)
One Ply Tri-Ply® Ply 4	39 3/8" (1 m)	Lap 2" (51 mm) Exp 37 3/8" (949 mm)	Same	6" (152 mm)
Two Ply Tri-Ply® Ply 4	39 3/8" (1 m)	Lap 21 1/8" (551 mm) Exp 17 1/8" (449 mm)	Lap 20 1/8" (525 mm) Exp 18 1/8" (475 mm)	6" (152 mm)
Three Ply Tri-Ply® Ply 4	13 1/8" (348 mm) 26 1/4" (667 mm) 39 3/8" (1 m)	Lap 21 1/8" (551 mm) Exp 17 1/8" (449 mm)	Lap 26 1/8" (684 mm) Exp 12 1/8" (316 mm)	6" (152 mm)
Four Ply Tri-Ply® Ply 4	9 1/2" (251 mm) 19 1/8" (500 mm) 29 1/2" (749 mm) 39 3/8" (1 m)	Lap 31 1/2" (800 mm) Exp 7 1/8" (200 mm)	Lap 30 1/8" (763 mm) Exp 9 1/8" (236 mm)	6" (152 mm)

\*Where necessary to maintain offset between all plies, base sheet and one-ply starter rolls may be cut to narrower widths to maintain a suitable offset from succeeding courses. Refer to individual specification installation drawings.

<sup>1</sup> All end laps must be staggered a minimum of 18" (457 mm) from adjacent or underlying courses.

## BASE/INTERPLY SHEETS – HOT ASPHALT APPLICATION

### General

The following applies to all Tri-Ply® Sheets that may be used as ply sheets or base sheets:

1. Foot and machine traffic on freshly applied membranes with asphalt must be kept to a minimum to reduce the possibility of asphalt displacement due to "point applied" pressure. The potential result is the creation of an area where the asphalt quantity may be too light to perform the required waterproofing or bonding function.

Workers must stand on the insulation or deck side of the system and avoid traffic on the freshly laid membrane system for a long-enough time to allow the asphalt to set up. Do allow the equipment over, or store materials on, the freshly laid membrane. Asphalt-dispensing equipment must have balloon tires.

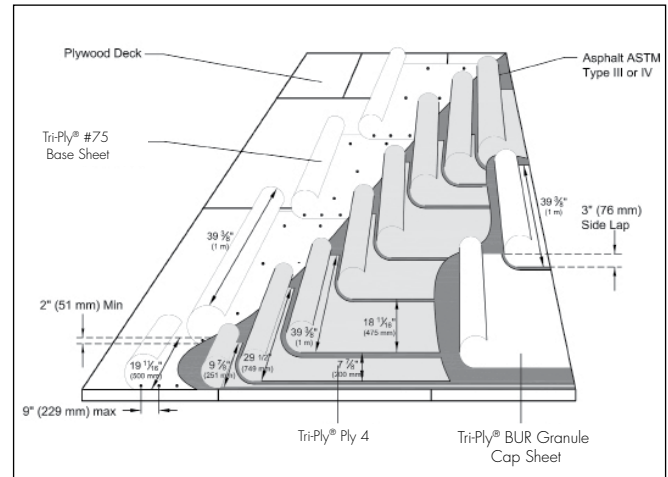
2. For slopes under 1:12, Type III or IV asphalt can be used. Type IV must be used on all slopes 1:12 and greater. On slopes up to 1/2:12, Type II asphalt may be used except in Florida, Texas, New Mexico, Arizona, and California.
3. Asphalt shall be applied in a uniform layer, without voids, at a rate of 25 lb/square (1.2 kg/m<sup>2</sup>) ± 20%.
4. Apply asphalt so that a visible, uniform bleed-out of asphalt shows at the edge of the membrane. Do not allow heavy flows of asphalt to extend beyond the membrane edge. Heavy, irregular surface flows of asphalt will make proper application of cap membranes and surface coatings difficult.
5. In the vent a wrinkle or a fishmouth forms during the application of the membrane, do not "walk it down" as the memory of the sheet or felt may cause it to reappear. Fishmouths or wrinkles shall be sliced open and patched with hot asphalt and additional membranes. Avoid cutting into the plies below the fishmouth or wrinkle by angling the knife blade to the side.
6. Base plies must be installed with all side and end laps staggered and offset from previous plies with adjacent end laps a minimum of 18" (457 mm) apart.

## TRI-PLY® SBS INSTALLATION INSTRUCTIONS

### TRI-PLY® SBS MEMBRANE INSTALLATION

- For slopes less than ½:12, Type III or IV asphalt can be used. Type IV must be used on all slopes ½:12 and over.
- Asphalt shall be applied at its EVT temperature or 425 °F (218 °C), whichever is greater, in a uniform layer, without voids, at a rate of 25 lb/square (1.2 kg/m<sup>2</sup>) ± 20%.
- For mop applications of Tri-Ply® SBS Membranes, the mopping stroke will be such that the side lap is covered with asphalt last. A rolling bank (puddle) of mopping asphalt must be maintained across the full width of the roll.
- Cap sheet application: Install full-width cap sheets, lapping 3" (76 mm) on the sides and 6" (152 mm) on ends. Stagger adjacent end laps a minimum of 18" (457 mm) apart. All side and end laps must be staggered from underlying plies.
- All laps must be parallel or perpendicular to the slope of the roof such that the flow of water is never against the lap.
- Tri-Ply® SBS Membranes must not be applied during adverse weather or without precautionary measures in temperatures below 45 °F (7.2 °C).
- Coiled rolls should be unrolled, placed upside down, and allowed to "relax" prior to installation. Then reroll to apply. Care should be taken to ensure that the cap sheet lies flat in the asphalt. There must be complete adhesion between the cap sheet and the mopping asphalt. Brooming-in may be necessary under certain conditions to ensure that the cap sheet adheres solidly to the asphalt. Apply extra pressure to avoid creating open channels where three or more membranes are lapped.
- A minimum 3/8" (10 mm) asphalt flow-out must be obtained at all laps. Dry laps are not acceptable. Check all seams for full and uniform adhesion.
- All end laps must be staggered a minimum of 18" (457 mm) so that no adjacent end laps coincide. If end laps fall in line or are not staggered the proper distance, a full width of Tri-Ply® SBS Membrane must be installed over the end laps.
- For additional information and requirements, contact GAF Technical Services at 1-800-766-3411.

### FOUR (4) PLY SBS HOT-MOPPED SYSTEM AVAILABLE DECK



### BASE/INTERPLY SHEETS – MECHANICALLY FASTENED

After allowing the base sheet to relax, keep sheet taut, fastening at center of sheet and working in opposite directions. Push all wrinkles and buckles ahead as fastening proceeds.

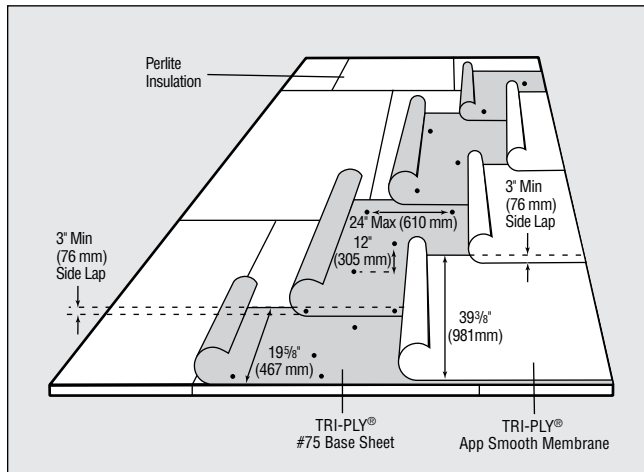
The following are minimum fastening patterns that may be used when fastening the base ply:

- Base sheet (no insulation) on decks of wood, plywood, OSB, light-weight concrete, gypsum, or cementitious wood fiber.
  - Lap the base sheet 2" (51 mm), and mechanically fasten with three rows of fasteners. The first row (on the seam) will be 1" (25 mm) from the leading edge and on 9" (229 mm) centers. Locate the second row of fasteners 14" (356 mm) from the leading edge and on 18" (457 mm) centers. The third row of fasteners shall be 26" (660 mm) from the leading edge on 18" (457 mm) centers. The centers for the second and third rows should be staggered.
  - Plywood or OSB decks only. Lap the base sheet 2" (51 mm) and mechanically fasten with four equally spaced rows of Senco Tape and N12 BAB or N12 FAB Staples spaced at 9" (229 mm) o.c. centered over the 2" (51 mm) wide laps and at 9" (229 mm) o.c. in three rows equally spaced in the field of the sheet.
- Simultaneous fastening base sheets with insulation, with the fasteners having a 3" (76 mm) plate.
  - Lap the base sheet 2" (51 mm). Screws and plates are then installed in 3 staggered, equally spaced rows on 24" (610 mm) maximum centers in each row. One row is in the 2" (51 mm) side lap, the other rows are located equidistant from the lap rows approximately 12" - 13" (305 - 330 mm) from the lap rows. This pattern results in approximately one fastener per 2.1 square feet (0.20 m<sup>2</sup>). Along building perimeters (minimum 4-foot [1.22 m] wide) fastening pattern must be increased to one fastener per 1.2 square feet (0.11 m<sup>2</sup>), in 4 staggered, equally spaced rows of fasteners on 18" (457 mm) centers.

**Note:** When fastening base sheets using screws and plates without insulation or over DensDeck®, the plate must be of a design that allows it to lie flat on the deck.

## TRI-PLY® APP INSTALLATION INSTRUCTIONS

### TRI-PLY® APP SMOOTH MEMBRANE INSTALLATION



**Substrate**—Insulated decks

**Slope**—Up to 3:12

#### Materials

Perlite Insulation  
 Drill-Tec™ Insulation Fastening System  
 Tri-Ply® #75 Base Sheet  
 Tri-Ply® APP Smooth Membrane

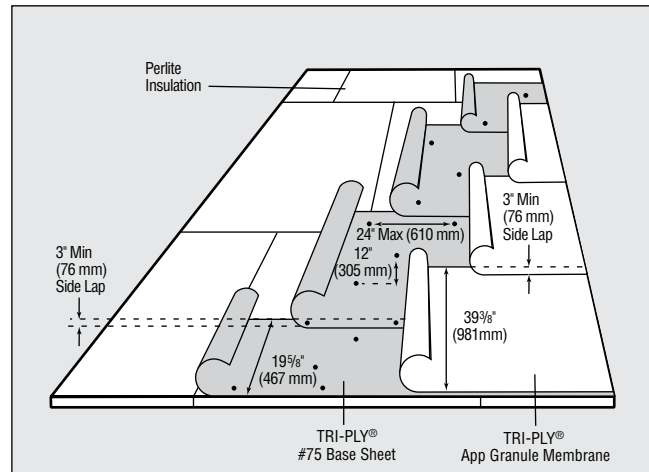
#### General

Design and application instructions shall apply in addition to the following recommendations and specifications. For additional information, call 1-800-766-3411.

#### Application Recommendations

1. Install one ply of Tri-Ply® #75 Base Sheet over the perlite simultaneously attaching the base sheet and insulation to the deck using Drill-Tec™ Screws and Plates. The side laps must be a minimum of 3" (76 mm). The end laps must be a minimum of 4" (102 mm).
2. Starting at the low point of the roof surface, set the Tri-Ply® APP Smooth Membrane in the course to be followed and unroll half the roll where practical. Position the membrane to provide a minimum of 3" (76 mm) side laps and a 6" (152 mm) end lap. Using the propane torch, apply the flame to the surface of the coiled portion of the roll until the surface reaches the proper application temperature, approximately 350 °F (177 °C). The side lap and the end lap areas of the previously applied sheet must also be heated to provide proper adhesion. The flame should be moved from side to side and up the side lap area of the previously applied sheet. Unroll the membrane while pressing onto the underlying surface. Be sure that the surface of the roll is heated sufficiently so that the texture-backed products lose their sharp definition. The generation of heavy smoke is an indication that the surface is being overheated. When this half of the roll is secure, reroll the other half of the roll and torch in place in the same manner. A minimum of 1/4" (6 mm) flow out of modified bitumen compound is required at all seams. Field seams should not be troweled.
3. For smooth-surface installation, a coating is required. Between 1 and 4 weeks after the installation, apply a premium aluminum roof coating per the manufacturer's instructions. The Tri-Ply® Membrane surface must be clean, dry, and free of all loose dirt and dust at the time of coating.

### TRI-PLY® APP GRANULE MEMBRANE INSTALLATION



**Substrate**—Insulated decks

**Slope**—Up to 3:12

#### Materials

Perlite Insulation  
 Drill-Tec™ Insulation Fastening System  
 Tri-Ply® #75 Base Sheet  
 Tri-Ply® APP Granule Membrane

#### General

Design and application instructions shall apply in addition to the following recommendations and specifications. For additional information, call 1-800-766-3411.

#### Application Recommendations

1. Install one ply of Tri-Ply® #75 Base Sheet over the perlite simultaneously attaching the base sheet and insulation to the deck using Drill-Tec™ Screws and Plates. The side laps must be a minimum of 3" (76 mm). The end laps must be a minimum of 4" (102 mm).
2. Starting at the low point of the roof surface, set the Tri-Ply® APP Granule Membrane in the course to be followed and unroll half the roll where practical. Position the membrane to provide a minimum of 3" (76 mm) side laps and a 6" (152 mm) end lap. Using the propane torch, apply the flame to the surface of the coiled portion of the roll until the surface reaches the proper application temperature, approximately 350 °F (177 °C). The side lap and the end lap areas of the previously applied sheet must also be heated to provide proper adhesion. The plastic film must be melted off the selvage edge of granule-faced products. The flame should be moved from side to side and up the side lap area of the previously applied sheet. Unroll the membrane while pressing onto the underlying surface. Be sure that the surface of the roll is heated sufficiently so that it develops a sheen. The generation of heavy smoke is an indication that the surface is being overheated. When this half of the roll is secure, reroll the other half of the roll and torch in place in the same manner. A minimum of 1/4" (6 mm) flow out of modified bitumen compound is required at all seams. Field seams should not be troweled.
3. At the 6" (152 mm) minimum end laps, sufficient heat must be applied to the granule-surfaced Tri-Ply® Membranes to cause the granules to sink into the top surface coating to ensure a receptive surface for bonding to the overlapping next roll of Tri-Ply® Membrane.



## TRI-PLY® SAFETY PRECAUTIONS

### SAFETY PRECAUTIONS/CONSIDERATIONS

Roofing is a hazardous activity. Workers must be properly trained to work in a manner to avoid falls, burns, back injuries, heat-related afflictions, etc.

It is the sole responsibility of the roofing applicator to enforce fire safety precautions and to ensure safety at all times. All appropriate OSHA and local codes should be followed in the application of roofing. All personnel involved in roofing should be properly trained in safety and fire procedures. Proper clothing and equipment should be worn at all times on the job site.

We refer you to the National Roofing Contractors Association's "Passport to Safety" booklet, which addresses numerous safety concerns. Visit [nrca.net](http://nrca.net) for more information.

### TORCH SAFETY INFORMATION

Installation of torch-applied products creates the risk of fire, including smoldering fires.

Torch-applied products must be applied only by professional roofing applicators trained in proper torch application and safety procedures.

Roofing applicators must follow GAF's current roofing safety requirements, procedures, and specifications, which are available from GAF Technical Services by calling toll-free: 1-800-ROOF-411.

Procedures and equipment that will be used must comply with all applicable code requirements.

Knowledge of the building construction and HVAC systems must be obtained prior to installation of torch-applied products.

All potentially combustible and flammable aspects of the building's use and design that increase the risk of fire must be identified, including:

- Deck and under deck composition (materials and accessories);
- Insulation types;
- Cants and tapered edge strips;
- Parapet wall and curb composition;
- Perimeter details;
- Adjoining building materials;
- Expansion joints;
- Wires and electrical conduit pipes;
- Natural gas lines;
- Chemicals, grease, oil or other condensates/exhausts/spills.

A base sheet must be used between the roofing membrane and any combustible materials, such as wood.

Never apply flame directly to combustible materials or allow the flame to enter into hidden or protected areas that may contain combustible materials, such as:

- Air intakes or exhaust openings;
- Air coolers;
- Lead flashings;
- Drains;
- Counterflashings and coping covers;
- Collars;
- Flashings.

The installation equipment must be designed for the specific use, and must be in proper working order.

Ventilation must always meet or exceed OSHA or NIOSH requirements.

A supervisor trained in torch safety must conduct external and internal fire watches during application and after the torches are shut down. The watches shall never be less than one hour and may need to be longer.

The watches shall be of sufficient frequency and duration based on:

- Weather;
- Building and roof design and composition;
- Penetration types and design.

Infrared scanning equipment must be used in the fire watch.

One Class ABC fire extinguisher must be kept within 10' (3.05 m) of every torch operator.

The above list is not a complete set of necessary safety requirements, procedures, and specifications. Call GAF Technical Services for the most current GAF technical literature. In addition, the following steps must be taken by the applicator to prevent fires, since only the applicator is in a position to prevent fires. These steps include, but are not limited to:

- Do not leave propane torches lighted and unattended. Do not place a lighted torch on the deck surface, insulation, membrane, or any other surface or object other than an acceptable torch stand. Extinguish the torch when not in use.
- Avoid holding the flame on any one area of the membrane or substrate long enough for heavy smoke to be generated.
- Train all personnel in GAF's recommended application techniques.
- Train all personnel in fire prevention and extinguishing methods. Take precautions when working around combustible materials, such as gas lines for HVAC units, and in the presence of solvent-based products. Use caution to prevent burns and train personnel in first-aid procedures.
- Comply with all applicable fire regulations regarding the storage and use of propane.

**Note:** For more information on safety measures, we recommend you refer to the Asphalt Roofing Manufacturers Association booklet titled "Torch Applied Roofing Dos and Don'ts" and their video, "A Guide to Safety Torch-On Modified Bitumen." Visit [asphaltroofing.org](http://asphaltroofing.org) for more information.

### SPECIFIC RECOMMENDATIONS FOR TORCH APPLICATIONS

#### Membrane Installation

Only torches designed for installing modified bitumen roofing sheets should be used for installing Tri-Ply® Sheets in both field and flashing constructions.

Starting at the low point of the roof surface, set the roll in the course to be followed and unroll half the roll where practical. Position the membrane to provide a minimum of 3" (76 mm) side laps and a 6" (152 mm) end lap. End laps shall not occur in a continuous line and should be offset by a minimum of 3' (914 mm). Using the torch, apply the flame to the surface of the coiled portion of the roll until the surface reaches the proper application temperature (approximately 350 °F [177 °C]). The side lap and end lap areas of the previously applied sheet must also be heated to provide proper adhesion. The plastic film must be melted off the selvage edge of granule-surfaced products. The flame should be moved from side to side and up the side lap area of the previously applied sheet. Unroll the membrane while pressing onto the underlying surface. BE SURE that the surface of the roll is heated sufficiently so that it develops a sheen and the texture-backed products lose their sharp definition. The generation of heavy smoke is an indication that the surface is being overheated. When this half of the roll is secure, reroll the other half of the roll and heat-weld in place in the same manner. A minimum of ¼" (6 mm) flow out of modified bitumen compound is required at all seams. More than 1" (25 mm) flow out of modified bitumen compound may indicate excess heating of the sheet. Field seams should not be troweled. Vertical flashing seams may be troweled when desired for appearance.

At the 6" (152 mm) minimum end laps, sufficient heat must be applied to the granule-surfaced Tri-Ply® Membranes to cause the granules to sink into the top surface coating to ensure a receptive surface for bonding to the overlapping next roll of Tri-Ply® Membrane.



Occasionally, a roll of Tri-Ply® Membrane will contain a splice that was fabricated as part of the manufacturing process. These splices are marked. Cut out all splices, and treat as an end lap area.

**Note:** Torch-applied Tri-Ply® Membranes must not be installed with asphalt nor should they be used in conjunction with roofing cements.

## **Surfacing**

Coatings or gravel surfacing are required for smooth-surface torch-applied Tri-Ply® Membrane installations to be guaranteed for 12 years. Apply a premium aluminum roof coating per the manufacturer's instructions within 1 – 4 weeks.

Reapplication of surfacing should be employed as part of a periodic maintenance program. The frequency may vary depending on climatic conditions.