

TEXAS DEPARTMENT OF INSURANCE

Engineering Services / MC 103-3A 333 Guadalupe Street P.O. Box 149104 Austin, Texas 78714-9104
Phone No. (512) 322-2212 Fax No. (512) 463-6693

PRODUCT EVALUATION RC-22

Effective April 1, 2008

*The following product has been evaluated for compliance with the wind loads specified in the **International Residential Code (IRC)** and the **International Building Code (IBC)**. This product shall be subject to reevaluation 3 years after the effective date.*

This product evaluation is not an endorsement of this product or a recommendation that this product be used. The Texas Department of Insurance has not authorized the use of any information contained in the product evaluation for advertising, or other commercial or promotional purpose.

This product evaluation is intended for use by those individuals who are following the design wind load criteria in Chapter 3 of the IRC and Section 1609 of the IBC. The design loads determined for the building or structure shall not exceed the design load rating specified for the products shown in the limitations section of this product evaluation. This product evaluation does not relieve a Texas licensed engineer of his responsibilities as outlined in the Texas Insurance Code, the Texas Administrative Code, and the Texas Engineering Practice Act.

Polypro AH-160 Roof Tile Adhesive manufactured by

Polyfoam Products, Inc.
11715 Boudreaux Road
Tomball, Texas 77375
Telephone: (800) 774-3626

will be acceptable as an adhesive for adhering concrete and clay roofing tiles to roof decks of structures located in designated catastrophe areas along the Texas Gulf Coast when installed in accordance with the roofing tile manufacturer's installation instructions, the Polypro AH-160 Roof Tile Adhesive Installation Instructions published by Polyfoam Products, Inc., dated April 10, 2007, and this product evaluation report.

PRODUCT DESCRIPTION

Polypro AH-160 roof adhesive is a two component polyurethane adhesive for adhering concrete and clay roofing tiles to hot mopped 30/90 roof underlayment systems. The two components of the adhesive system are referred to as chemical or component "A" and chemical or component "B" in Polyfoam's product literature. The two components are provided in color coded refillable tanks that are available in 17, 60, 120, and 350 gallon capacities or in disposable units called ProPack 30 and ProPack 100. Equipment for dispensing the Polypro AH160 adhesive is color coded for ease of use with the Polyfoam Foampro® RTF1000 dispensing system.

GENERAL REQUIREMENTS

Roofing tiles: Concrete and clay roofing tiles shall be installed in accordance with this product evaluation report and in accordance with the Polypro AH-160 Roof Tile Adhesive Installation Instructions published by Polyfoam Products, Inc., dated April 10, 2007. General installation requirements for the roofing tiles shall be as specified in the roofing tile manufacturer's installation instructions.

Licensed applicators: Installation of the Polypro AH-160 roof adhesive shall be by qualified applicators approved and licensed by Polyfoam Products, Inc.

Tile dimension limitations: The Flat/Low profile, Medium profile, and High profile roofing tiles shall be between 12 and 21 inches in length. The exposed width of the roofing tiles shall be between 8 and 15 inches. The maximum thickness of the tail of the roofing tiles shall not exceed $1\frac{3}{8}$ inch. Each roofing tile shall have at least $\frac{2}{3}$ of the tile's area free of adhesive contact.

GENERAL REQUIREMENTS (cont.)

Roof tile profile classifications: Roofing tile profiles shall be classified as one of the following:

Flat/Low profile: Flat/Low profile tiles are defined as tiles having a rise equal to or less than $\frac{1}{2}$ inch and a rise-to-width ratio of less than or equal to 1.5.

Medium profile: Medium profile tiles are defined as tiles having a rise greater than $\frac{1}{2}$ inch and a rise-to-width ratio of less than or equal to 1:5.

High profile: High/Barrel profile tiles are defined as those tiles having a rise to width ratio greater than 1.5.

Roof height limitations: Roofing tiles adhered with the Polypro AH160 roof adhesive shall only be installed on buildings with mean roof heights that do not exceed the limitations specified in Table 1 and Table 4 of this product evaluation report. For buildings with a mean roof height greater than 60 feet, the roof tiles and their adhesive attachment method shall be designed to withstand the aerodynamic wind uplift moment determined in accordance with Section 1609.7.3 of the IBC and the attachment of the underlayment system to the roof deck shall be designed to resist the wind loads determined from the IBC.

Roof slope limitations: The minimum roof slope shall be $2\frac{1}{2}$:12.

INSTALLATION INSTRUCTIONS

Roof Framing and Roof Deck: Roof framing members shall be in accordance with either the International Residential Code or the International Building Code. The roof framing members shall not be spaced greater than 24 inches on center. The roof deck shall be solidly sheathed with minimum $\frac{15}{32}$ " wood structural panels. The minimum thickness and application of the roof sheathing to the roof framing members shall be in accordance with either the International Residential Code or the International Building Code to resist the required wind loads.

If the existing roof deck is a spaced board roof deck, then the spaced boards shall either be removed or covered with minimum $\frac{15}{32}$ " wood structural panels. The wood structural panels shall be installed over the spaced boards in accordance with either the International Residential Code or the International Building Code to resist the required wind loads.

Metal drip edge: A metal drip edge shall be installed as specified in the roofing tile manufacturer's installation instructions.

Underlayment:

Hot mop 30/90 underlayment: The underlayment shall consist of a two-ply 30/90 hot mop underlayment system.

The base ply of the underlayment system shall be an ASTM D 226 Type II (No. 30) asphalt-saturated organic felt. The base ply shall be fastened to the wood roof deck with minimum 11 gauge (minimum 0.120 inch shank diameter) corrosion resistant roofing nails (smooth, ring, or screw shank) with a minimum 1 inch diameter flat head or with minimum 1 inch diameter tin caps. The fasteners shall be long enough to penetrate a minimum of $\frac{1}{4}$ " through the bottom of the wood deck.

The top ply of the underlayment system shall consist of one layer of No. 90 ASTM D249 mineral surfaced roll roofing. The top ply shall be applied over the base ply by first adhering the top ply to the base ply with a full mopping of ASTM D 312 Type IV asphalt. Next, the top ply shall be backnailed to the base ply with minimum 11 gauge (minimum 0.120 inch shank diameter) corrosion resistant nails (smooth, ring, or screw shank) with a minimum 1 inch diameter flat head or with minimum 1 inch diameter tin caps. The fasteners shall be long enough to penetrate a minimum of $\frac{1}{4}$ " through the bottom of the wood deck.

INSTALLATION INSTRUCTIONS (cont.)

Underlayment (continued):

Attachment of underlayment to roof deck: The required underlayment design pressure is determined using Table 1 for Exposure B conditions based on the mean roof height of the structure, the location of the structure, and the roof slope of the structure. If the structure is located in an Exposure C condition, then the required underlayment design pressure determined from Table 1 shall be multiplied by the appropriate Exposure C coefficient from Table 2.

The allowable uplift resistance for the underlayment attachment is specified in Table 3. Either Attachment Method A, B, or C from Table 3 may be used as long as the allowable uplift resistance of the underlayment attachment is greater than the required underlayment design pressure determined from Tables 1 and 2.

Battens: Battens shall be installed as required by the roofing tile manufacturer. If battens are installed, they shall be installed over the underlayment. If battens are used, then the Polypro AH160 roof adhesive shall not be applied to the battens.

Polypro AH160 roof adhesive: The Polypro AH-160 roof adhesive is dispensed using a Polyfoam Foampro® RTF1000 dispensing system. The dispensing system shall be operated in accordance with the *Foampro® RTF1000 Installation and Operating Manual*. Calibration of the Polyfoam Foampro® RTF1000 dispensing system equipment is required before the application of the Polypro AH160 roofing adhesive. The mix ratio between chemical "A" and chemical "B" shall be within the range of 1.0A:B to 1.15A:B. The adhesive is dispensed in the form of paddies. The quantity of adhesive dispensed will depend on the size of paddy required and the type of paddy application.

Roofing tile installation: The roofing tiles and the underlayment system shall be clean and dry at the time of application.

The roofing tiles shall be adhered to the two-ply 30/90 hot mop underlayment system using the Polypro AH-160 roofing adhesive in accordance with the Polypro AH-160 Roof Tile Adhesive Installation Instructions published by Polyfoam Products, Inc. and the paddy application methods provided in this product evaluation report. A brief overview of the installation instructions is presented in this section.

The roofing tiles shall be adhered directly to the underlayment system. Battens are permitted but are not required. If battens are used, then the roofing tiles shall not be adhered to the battens. Roofing tiles shall be adhered directly to freshly applied adhesive. The roofing tile must be set within 2 to 3 minutes after the adhesive has been dispensed.

The adhesive is dispensed in the form of paddies. The following two paddy application methods are acceptable:

- (1) Medium paddy placement
- (2) Large paddy placement

The medium and large paddy placement application methods are acceptable for flat/low profile, medium profile, and high profile roofing tiles. The large paddy placement application method is also acceptable for two-piece barrel roofing tiles.

Table 4 specifies the limitations on allowable mean roof heights for each of the paddy placement application methods for flat/low profile, medium profile, high profile, and two-piece barrel profile roofing tiles.

Table 1
Required Underlayment Design Pressure (psf) ¹
Exposure B ²

Gable/Hip Roofs			
Roof Slope: $\geq 2\frac{1}{2}$:12 and ≤ 6:12			
Mean Roof Height	Inland II	Inland I	Seaward
0-30	48.0	57.1	67.0
40	52.1	62.0	72.7
50	55.5	66.0	77.5
60	58.5	69.6	81.7
Gable Roofs			
Roof Slope: > 6:12			
Mean Roof Height	Inland II	Inland I	Seaward
0-30	22.1	26.3	30.9
40	24.0	28.6	33.6
50	25.6	30.5	35.8
60	27.0	32.1	37.7
Monoslope Roofs			
Roof Slope: $\geq 2\frac{1}{2}$:12 and < 7:12			
Mean Roof Height	Inland II	Inland I	Seaward
0-30	53.5	63.7	74.7
40	58.1	69.1	81.1
50	61.9	73.7	86.5
60	65.2	77.6	91.1

Note: ¹ Table is based on an Importance factor of 1.0.

² The Exposure category for the structure location shall be as defined in either the International Residential Code or the International Building Code.

Table 2
Mean Roof Height and Building Exposure Coefficients ¹

Mean Roof Height (ft)	Exposure C ²
0-15	1.21
20	1.29
25	1.35
30	1.40
40	1.49
50	1.56
60	1.62

Note: ¹ The appropriate Exposure C coefficient shall be multiplied by the required underlayment design pressure determined from Table 2.

² The Exposure category for the structure location shall be as defined in either the International Residential Code or the International Building Code.

Table 3
Allowable Uplift Resistance for Two-Ply Underlayment Attachment (psf)

Attachment Method (See Below)	Field (Inches o.c.)	Lap (Inches o.c.)	Backnail Cap Sheet (Inches o.c.)	Allowable Uplift Resistance (psf)			
				15/32"		19/32"	
				Smooth	Deformed ¹	Smooth	Deformed ¹
	12	6	12	23.3	94.2	29.4	119.3
	9	6	12	26.3	106.4	33.2	134.8
A	6	6	12	32.3	130.3	40.7	165.1
	4	6	12	41.1	165.9	51.8	210.3
	3	6	12	50.0	202.1	63.1	256.1
	12	6	12	27.8	112.5	35.1	142.5
	9	6	12	32.3	130.3	40.7	165.1
B	6	6	12	41.1	165.9	51.8	210.3
	4	6	12	54.4	219.9	68.7	278.6
	3	6	12	67.8	273.8	85.5	347.0
	12	6	12	32.8	132.3	41.3	167.7
	9	6	12	38.7	156.3	48.8	198.0
C	6	6	12	50.5	204.1	63.8	258.6
	4	6	12	68.4	276.4	86.3	350.2
	3	6	12	86.2	348.2	108.8	441.2

Note: ¹ Deformed shank includes either ring shank nails or screw shank nails.

Attachment Method A: Two rows of fasteners staggered in the field; one row of fasteners at the lap; and one row of fasteners at the top edge of the 90 lb cap sheet.

Attachment Method B: Three rows of fasteners staggered in the field; one row of fasteners at the lap; and one row of fasteners at the top edge of the 90 lb cap sheet.

Attachment Method C: Four rows of fasteners staggered in the field; one row of fasteners at the lap; and one row of fasteners at the top edge of the 90 lb cap sheet.

Table 4
Mean Roof Height Limitations for Paddy Placement Applications
Flat/Low Profile Tiles, Medium Profile Tiles, High Profile Tiles, Two-Piece Barrel Tiles

Gable Roofs						
Roof Slope: $\geq 2 \frac{1}{2} :12$ and $\leq 6:12$						
Paddy Types	Mean Roof Height Limitation ²					
	Inland II		Inland I		Seaward	
	Exposure B ¹	Exposure C ¹	Exposure B ¹	Exposure C ¹	Exposure B ¹	Exposure C ¹
Medium, Paddy	60 ft	60 ft	60 ft	60 ft	60 ft	60 ft
Large Paddy	60 ft	60 ft	60 ft	60 ft	60 ft	60 ft
Gable Roofs						
Roof Slope: $> 6:12$						
Paddy Types	Mean Roof Height Limitation ²					
	Inland II		Inland I		Seaward	
	Exposure B ¹	Exposure C ¹	Exposure B ¹	Exposure C ¹	Exposure B ¹	Exposure C ¹
Medium Paddy	60 ft	60 ft	60 ft	60 ft	60 ft	60 ft
Large Paddy	60 ft	60 ft	60 ft	60 ft	60 ft	60 ft
Monoslope Roofs						
Roof Slope: $\geq 2 \frac{1}{2} :12$ and $< 7:12$						
Paddy Types	Mean Roof Height Limitation ²					
	Inland II		Inland I		Seaward	
	Exposure B ¹	Exposure C ¹	Exposure B ¹	Exposure C ¹	Exposure B ¹	Exposure C ¹
Medium Paddy	60 ft	60 ft	60 ft	60 ft	60 ft	60 ft
Large Paddy	60 ft	60 ft	60 ft	60 ft	60 ft	60 ft

Note: ¹ The Exposure category for the structure location shall be as defined in either the International Residential Code or the International Building Code.

² Table is based on an Importance factor of 1.0

Presented below are brief overviews of the installation instructions for flat/low profile, medium profile, high profile, and two-piece barrel profile roofing tiles.

Flat/Low profile, Medium profile, and High profile roofing tiles:

General installation requirements: Apply a paddy of Polyfoam adhesive vertically under the tile at the starting side of the roof. Install the first course of the tile over the paddy of Polyfoam adhesive. Make certain that the tiles overhang the eave drip edge evenly along the entire first course. Apply a paddy of Polyfoam adhesive vertically under the pan closest to the underlock of the previously installed tile. For flat tiles, place adhesive under the strengthening rib closest to the overlock of the tile being set.

Paddy placement application: Refer to either the medium or large paddy placement applications shown in Figures 1 thru 6 at the end of this product evaluation report for proper placement and sizes of adhesive paddies. Fasteners shall be installed in addition to the adhesive as required based on roof slope.

Two-piece barrel roofing tiles:

General installation requirements: Apply a paddy of foam adhesive vertically under the pan tile at the starting side of the roof. Install the first course of tile over the paddy of Polyfoam adhesive. Make certain that the tiles overhang the eave drip edge evenly along the entire first course. Turn the cover tile over on its back to allow for the application of Polyfoam adhesive. Apply a bead of Polyfoam adhesive directly onto the inner edge of each side of the cover tile. The cover tile is then turned over and placed onto previously installed pan tiles such that the adhesive is in contact with barrel edges of the pan tiles.

Paddy placement application: Refer to the large paddy application for two-piece barrel tiles shown in Figure 7 at the end of this product evaluation report for proper placement and size of adhesive paddies. Fasteners shall be installed in addition to the adhesive as required based on roof slope. A 2"x4" nailer, placed on edge, straw nail or a wire and nailing system, may be required for fastening two-piece barrel tiles on steeper pitches.

Additional attachment requirements for roofing tiles:

- For roof slopes above 6:12, the eave course shall be fastened with a single corrosion resistant fastener in addition to the adhesive. The fasteners shall be as specified in the International Residential Code or the International Building Code. Flashing cement shall be applied to seal all fastener penetrations.
- For roof slopes above 6:12 up to and including 7:12, every third tile in every fifth course shall be fastened with a single corrosion resistant fastener in addition to the adhesive. Flashing cement shall be applied to seal all fastener penetrations.
- For roof slopes greater than 7:12, every tile shall be fastened with a single corrosion resistant fastener in addition to the adhesive. The fasteners shall be as specified in the International Residential Code or the International Building Code. Flashing cement shall be applied to seal all fastener penetrations.
- For roof slopes > 24:12, the nose end of all tiles shall be fastened to the roof deck with a nose clip. The fasteners used to secure the nose clip to the roof deck shall be as specified in the International Residential Code or the International Building Code. Flashing cement shall be applied to seal all fastener penetrations.

Note: The Polypro AH-160 Roof Tile Adhesive Installation Instructions published by Polyfoam Products, Inc., dated April 10, 2007, shall be available on the job site during installation. All fasteners used shall be corrosion resistant as specified in the International Residential Code (IRC), the International Building Code (IBC), and the Texas Revisions.

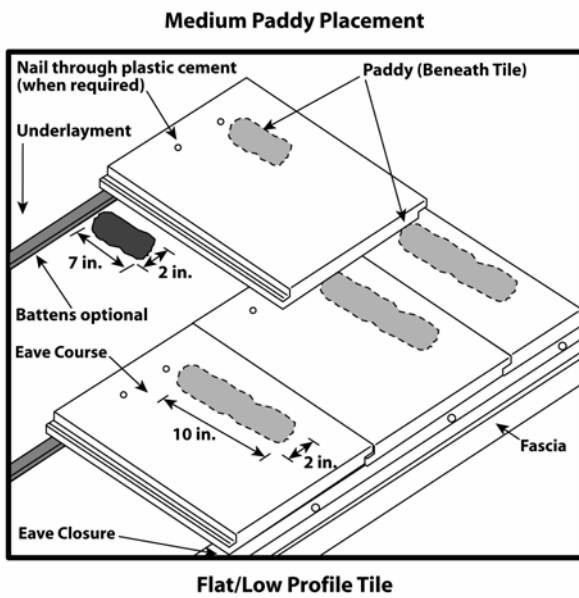


Figure 1.

Medium Paddy Placement – Flat/Low Profile Tile

Medium Paddy Placement Flat/Low Profile Tile

1. Starting at the eave course, apply a minimum 2" x 7" x 1" foam paddy onto the underlayment positioned under the strengthening rib closest to the overlock of the tile being set. Refer to Figure 1.
2. Continue in the same manner with the remaining tiles. Insure approximately 10 to 12 square inches of adhesive contact with the underside of the tile.

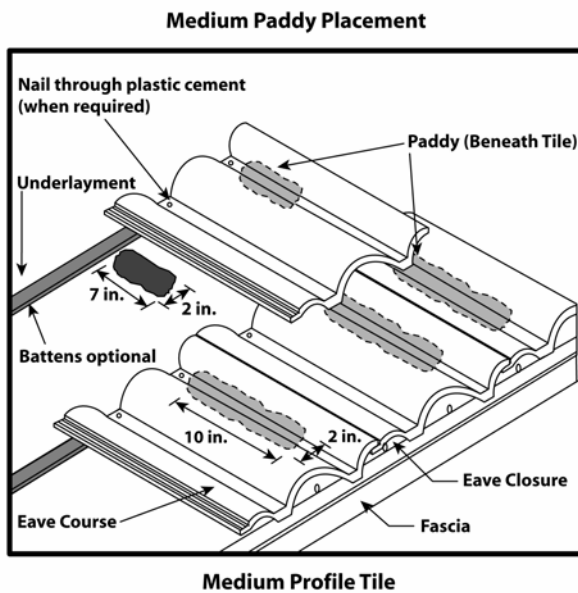


Figure 2.

Medium Paddy Placement – Medium Profile Tile

Medium Paddy Placement Medium Profile Tile

1. Starting at the eave course, apply a minimum 2" x 7" x 1" foam paddy onto the underlayment positioned under the pan portion of the tile closest to the overlock of the tile being set. Refer to Figure 2.
2. Continue in the same manner with the remaining tiles. Insure approximately 12 to 14 square inches of adhesive contact with the underside of the tile.

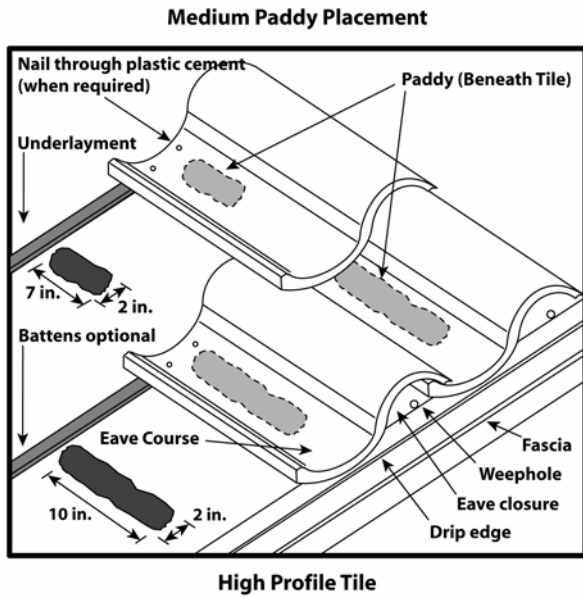


Figure 3.
Medium Paddy Placement - High Profile Tile

Medium Paddy Placement High Profile Tile

1. Starting at the eave course, apply a minimum 2" x 7" x 1" foam paddy onto the underlayment positioned under the pan portion of the tile closest to the overlock of the tile being set. Refer to Figure 3.
2. Continue in the same manner with the remaining tiles. Insure approximately 17 to 19 square inches of adhesive contact with the underside of the tile.

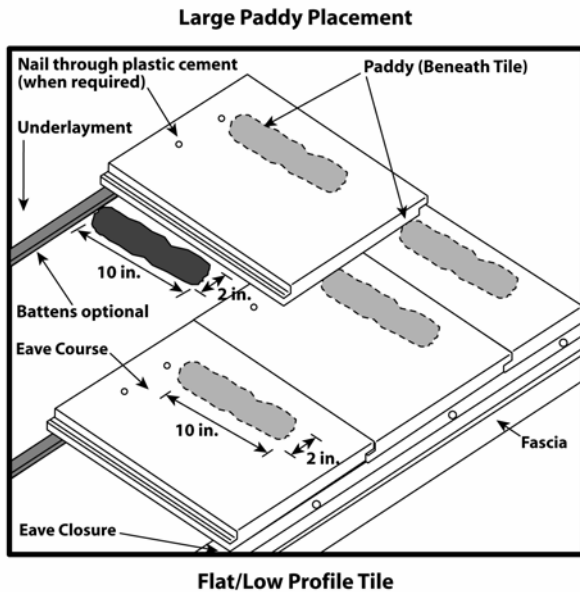


Figure 4.

Large Paddy Placement – Flat/Low Profile Tile

Large Paddy Placement Flat/Low Profile Tile

1. Starting at the eave course, apply a minimum 2" x 10" x 1" foam paddy onto the underlayment positioned under the strengthening rib closest to the overlock of the tile being set. Refer to Figure 4.
2. Continue in the same manner with the remaining tiles. Insure approximately 17 to 23 square inches of adhesive contact with the underside of the tile.

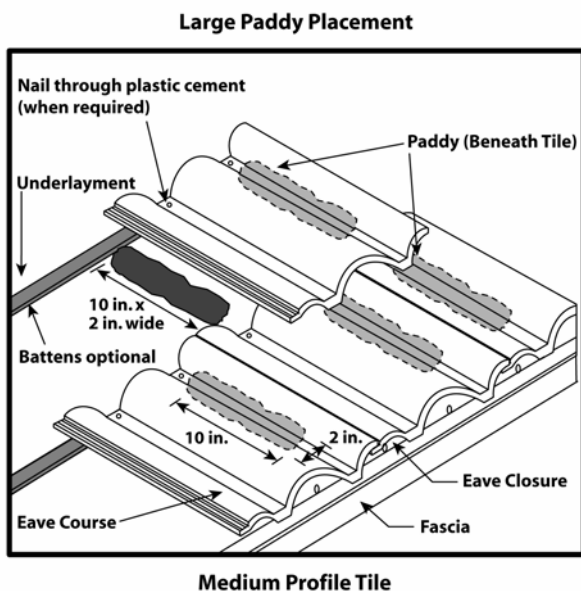
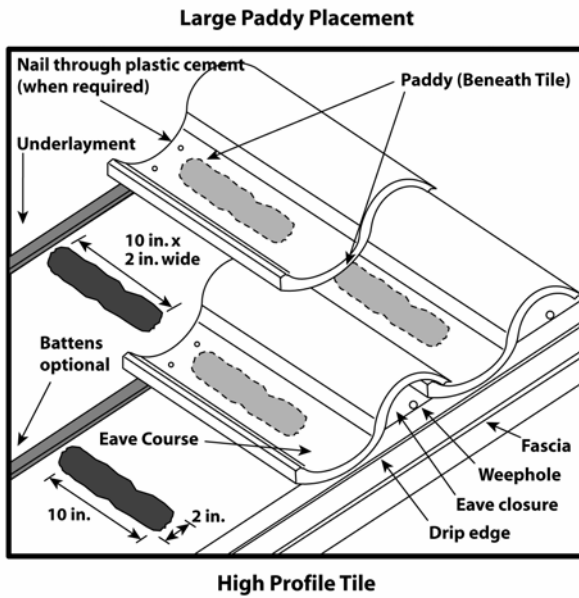


Figure 5.

Large Paddy Placement – Medium Profile Tile

Large Paddy Placement Medium Profile Tile

1. Starting at the eave course, apply a minimum 2" x 10" x 1" foam paddy onto the underlayment positioned under the pan portion of the tile closest to the overlock of the tile being set. Refer to Figure 5.
2. Continue in the same manner with the remaining tiles. Insure approximately 17 to 23 square inches of adhesive contact with the underside of the tile.

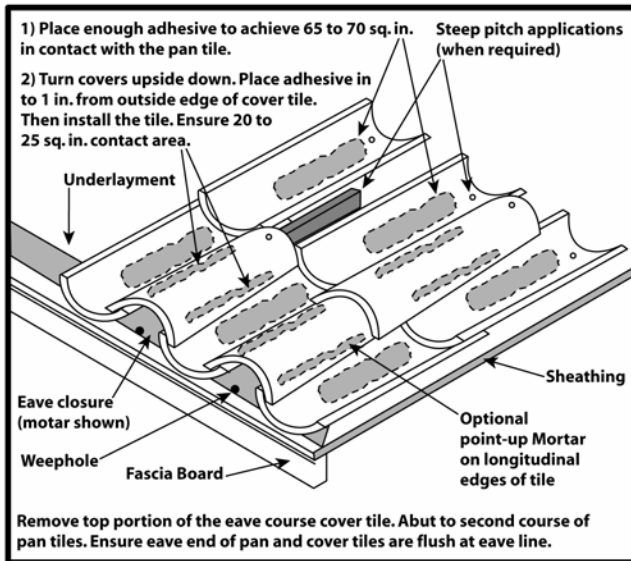


Large Paddy Placement High Profile Tile

1. Starting at the eave course, apply a minimum 2" x 10" x 1" foam paddy onto the underlayment positioned under the pan portion of the tile closest to the overlock of the tile being set. Refer to Figure 6.
2. Continue in the same manner with the remaining tiles. Insure approximately 17 to 23 square inches of adhesive contact with the underside of the tile.

Figure 6.
Large Paddy Placement - High Profile Tile

Large Paddy Placement Two-Piece Barrel Tile



Two Piece Barrel - High Profile Tile

Figure 7.
Large Paddy Placement - Two-Piece Barrel Tile

1. Starting at the eave course, apply a minimum 2" x 10" x 1" foam paddy onto the underlayment positioned under two adjacent pan tiles. Refer to Figure 7. Support the eave tiles from rocking until the adhesive has had a chance to cure.
2. Continue in the same manner bringing two pan courses up toward the ridge. Insure approximately 65 to 70 square inches of adhesive contact with the underside of the pan tile.
3. Turn covers upside down exposing the underside of the tile. Apply a minimum 1" x 10" bead of adhesive directly over the inner edge of each side of the cover tile. Leave approximately $\frac{3}{4}$ " to 1" from the outer edge of the tile, inward, free of foam to allow for expansion.
4. Turn cover tile over after foam is applied and place onto pan tile course. Insure a minimum of 20 to 25 square inches of contact area on each side of the cover tile to the pan tile. Continue in the same manner. Trim away any cured exposed foam adhesive.
5. Pointing of longitudinal edges of the cover tile is optional.
6. When additional nailing is required for steep roofs, either a 2x4 nailer, placed on edge, straw nail, or a wire and nailing system may be used.