



Product Evaluation

RC434 | 0218

Engineering Services Program

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 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.

For more information, contact TDI Engineering Services Program at (800) 248-6032.

Evaluation ID: RC-434

Effective Date: February 1, 2018

Re-evaluation Date: February 2022

Product Name: Extruded Interlocking Concrete Roof Tiles

Manufacturer: Crown Building Products, LLC
2155 FM 1187
Mansfield, TX 76063
(817) 225-6112

General Description:

This evaluation report covers extruded concrete Iberia, Mediterranean, Tuscany, and Windsor roof tile that are interlocking. The interlocking tiles have interlocking ribs on the longitudinal edges of the tiles. The interlocking ribs restrict lateral movement and provide a water stop. The tiles are available in a variety of colors.

Mechanical Attachment: Install the Crown roof tiles specified in this evaluation report mechanically with fasteners using one of the following attachment systems.

1. Installation using a 1 x 2 wood batten with one corrosion resistant No. 8 x 2-1/2" wood screw in the center nail hole on the tile. The No. 8 wood screw must be long enough to penetrate completely through the batten and completely through the roof sheathing.
2. Installation using a 1 x 2 wood batten with two corrosion resistant No. 8 x 2-1/2" wood screws in the left two nail holes on the tile. The No. 8 wood screw must be long enough to penetrate completely through the batten and completely through the roof sheathing.
3. Installation using a 1 x 2 wood batten with two 10d ring shank nails in the left two nail holes on the tile. The 10d ring shank nail must be long enough to penetrate completely through the batten and completely through the roof sheathing.

Adhesive Attachment: Crown roof tiles installed with adhesive is outside the scope of this evaluation report. Adhesive fastening systems must comply with ICC-ES AC152, **Acceptance Criteria for Adhesive Fastening of Concrete or Clay Roof Tiles**. Refer to the adhesive fastening system manufacturer product evaluation for the allowable aerodynamic uplift moment and the installation method to develop a resistance equal to or greater than the code required aerodynamic uplift moment. Installation of roof tiles using an adhesive fastening system must be done by technicians trained and having a current certification by the adhesive fastening system manufacturer.

Roof Tile Profile Classifications: Classify roof tile profiles as one of the following:

- **Flat/Low profile:** Flat/Low profile tiles are tiles with a rise equal to or less than 1/2".
- **Medium profile:** Medium profile tiles are tiles with a rise greater than 1/2" and a rise to width ratio of less than or equal to 1.5.
- **High/Barrel profile:** High profile tiles are tiles having a rise to width ratio greater than 1-1/2.

Tile Weight: This evaluation report covers standard weight tiles. Lightweight tiles are outside of the scope of this evaluation report.

Roof Tile Designations, Profile Classifications, and Dimensions: Table 1 specifies the roof tile designations, profile classifications, and dimensions for the Crown roof tiles that apply to this product evaluation report. A picture of each roof tile is shown in Figures 1, 2, 3, 4, 5 and 6.

Table 1: Roof Tile Designations, Profile Classifications, and Dimensions

Tile Designation	Profile Classification	Tile		
		Length (in.)	Width (in.)	Exposed (in.)
Iberia	Medium	17.25	13	12.125
Mediterranean	High	17.25	11.75	10.875
Tuscany	Flat/Low	17.25	13	11.75
Windsor Slate	Flat/Low	17.25	13	12.125
Windsor Shake				
Windsor Split Shake				

Installation and Limitations:

Roof Framing and Roof Deck: Roof framing members must comply with either the IRC or the IBC. Do not space the roof-framing members greater than 24" on center. A minimum 15/32" plywood or 5/8" OSB should solidly sheath the roof deck. Fasten the roof deck to the roof-framing members in compliance with either the IRC or the IBC to resist the required wind loads.

If the existing roof deck is a spaced board roof deck, then either remove the spaced boards or cover with minimum 15/32" plywood or 5/8 OSB. Install the plywood or OSB sheathing over the spaced boards in compliance with either the IRC or the IBC to resist the required wind loads.

Metal drip edge: Install a metal drip edge as specified in the manufacturer's installation instructions as referenced in the TRI/WSRCA Installation Manual.

Roof underlayment:

- **2.5:12 roof slope to under 4:12 roof slope:** Single-ply or multi-ply sealed underlayment system with sealed head laps and side laps. Install the underlayment as specified in either the IRC or the IBC and in the manufacturer's installation instructions as referenced in the TRI/WSRCA Installation.
- **4:12 roof slope and greater:** Minimum one layer of underlayment complying with ASTM D 226, Type II (No. 30 asphalt felt) or equivalent. Lap the underlayment a minimum of 2" at the head laps and a minimum of 6" at the side laps. Install the underlayment as specified in either the IRC or the IBC and in the manufacturer's installation instructions as referenced in the TRI/WSRCA Installation Manual.

Battens: Install the Crown roof tiles over battens. Solidly sheath the roof deck minimum 15/32" plywood or 5/8" OSB. As a minimum, use a nominal 1x2 wood members for the battens. Space the battens to allow for a 3" or 4" headlap for the Iberia and Mediterranean depending on the installation and a 3" headlap for the Tuscany and Windsor. Fasten the battens to the roof deck with minimum 8d corrosion resistant common wire or box nails or equivalent size nail. Space the nails a maximum of 24" on center. As an alternative, fasten battens to the roof deck with No. 16-gauge by 7/16" crown by 1.5" long staples. Space the staples a maximum of 12" on center. Batten fasteners must be long enough to penetrate a minimum of 3/4" into or through the roof deck whichever is less. Separate batten ends a minimum of 1/2" every 4' to allow for drainage.

Roof Tile Installation: The limitations on mean roof height and roof slope for installing the Crown roof tiles must comply with the following guidelines:

- **Roof Slope Limitations:** Only install the Crown roof tiles on buildings with a roof slope of 2-1/2:12 or greater. Tables 3 through 8 specify roof slope limitations. Note: Battens are required when the roof slope exceeds 7:12. At a roof slope greater than 24:12 from the horizontal, fasten the nose end of all tiles to the roof deck with a nose clip.
- **Mean Roof Height Limitations:** Table 4 specifies the mean roof height limitations for installing the Crown roof tiles in for buildings with a mean roof height of 60' or less. For buildings with a mean roof height greater than 60', design the Crown roof tiles and their fastening systems to withstand the aerodynamic wind uplift moment determined in accordance with Section 1609.7.3 of the IBC.
- **General:** The Crown roof tiles and the underlayment system must be clean and dry at the time of their application.
- **Installation:** Install the Crown roof tiles in compliance with this product evaluation report and the manufacturer's installation instructions as referenced in the "Concrete and Clay Roof Tile Design Installation Manual," July 2015, published by the Tile Roofing Institute (TRI) and the Western States Contractors Association (WSRCA).

Lay out the Crown roof tiles from the right to the left, starting at the right rake. Install the Crown roof tiles with a 3" inch or 4" headlap for the Iberia and Mediterranean depending on the installation and a 3" headlap for the Tuscany and Windsor.

Roof Tile Fasteners: Mechanically fasten the Crown roof tiles to the roof deck. The following fasteners are acceptable:

1. No. 8 course-threaded screw(s). Use a minimum 2-1/2" long, bugle head screws conforming to ANSI/ASME 8.18.6.1, having a nominal diameter of 0.335", a shank diameter of 0.131", and a screw thread diameter of 0.175". The screws must be long enough to penetrate completely through the roof sheathing.
2. 10d ring shank nails: The 10d ring shank nails had a shaft diameter of 0.139", a head diameter of 0.311", and a length of 3". The nails must be long enough to penetrate completely through the roof sheathing.

Roof Tile Fastener Locations: Figures 1, 2, 3, 4, 5 and 6 show the fastener hole locations for each roof tile.

Rake Tiles: Secure rake tiles to Southern Pine, Douglas Fir or Spruce-Pine-Fir lumber framing with either two minimum No. 8 screws or two minimum 10d ring shank nails. Use corrosion resistant fasteners long enough to penetrate the wood framing a minimum 3/4".

Hip and Ridge Tiles: Fasten the hip and ridge tiles to hip and ridge boards (Dimension lumber of sufficient height to support the hip and ridge tiles) in accordance with one of the following options:

1. Drill a 3/16" hole in the lower 1/3 of the starter tile. Use a fastener as specified in Table 2 and secure the starter tile at both the drilled hole in the lower 1/3 and at the head of the tile. Seal the head of the fastener with a UV resistant sealant.
2. Prior to installing the starter tile, apply a roof tile adhesive along the entire length of the starter tile. Secure the head of the starter tile with a fastener as specified in Table 2.

Install the remaining hip and ridge tiles with a minimum 3" headlap. Place the nose of the tile into a 4" to 5" bead of roof tile adhesive along the head of the lower tile to insure proper contact with the two tiles. Secure the head of the hip or ridge tile using a fastener as specified in Table 2.

Note: Keep the manufacturer’s installation instructions as referenced in the “Concrete and Clay Roof Tile Design Installation Manual,” July 2015, published by the Tile Roofing Institute (TRI) and the Western States Roofing Contractors Association WSRCA at the job site. Use corrosion resistant fasteners as specified in the IRC, the IBC, and the Texas Revisions.

Table 2: Hip and Ridge Tile Fastener Requirements

Dimension lumber	Fasteners per Tile
Spruce-Pine-Fir	One (1) No. 8 wood screw
Southern Yellow Pine	One (1) No. 8 screw or One (1) 10d box nail

Table 3 – Iberia

Iberia Allowable Attachment Moment (ft-lbf)				
Attachment System	Roof Slope			
	25°	27°	30°	45°
1-#8	30.50	30.39	30.21	29.04
2-#8	43.77	43.66	43.48	42.31
2-10d ring shank	29.08	28.97	28.79	27.62

Table 3 – Mediterranean

Mediterranean Allowable Attachment Moment (ft-lbf)				
Attachment System	Roof Slope			
	25°	27°	30°	45°
1-#8	42.67	42.56	42.37	41.11
2-#8	67.21	67.10	66.91	65.65
2-10d ring shank	36.80	36.69	36.50	35.24

Table 3 – Tuscany

Tuscany Allowable Attachment Moment (ft-lbf)				
Attachment System	Roof Slope			
	25°	27°	30°	45°
1-#8	32.40	32.28	32.10	30.88
2-#8	45.20	45.08	44.90	43.68
2-10d ring shank	18.82	18.70	18.52	17.30

Table 3 – Windsor

Windsor Allowable Attachment Moment (ft-lbf)				
Attachment System	Roof Slope			
	25°	27°	30°	45°
1-#8	28.27	28.14	27.92	26.51
2-#8	36.18	36.05	35.83	34.42
2-10d ring shank	16.00	15.87	15.65	14.24

Table 4

Allowable Mean Roof Height For 1-#8 Exposure B (ft)												
Roof Tile	Roof											
	Gable/Hip Roof 7° < θ ≤ 27°			Hip Roof 7° < θ ≤ 25°			Gable Roof 27° < θ ≤ 45°			Monoslope Roof 10° 10 < θ ≤ 30°		
	Inland		Seaward	Inland		Seaward	Inland		Seaward	Inland		Seaward
	II	I		II	I		II	I		II	I	
Importance Factor = 1.00												
Iberia	60	60	30	60	60	60	60	60	60	60	40	NA
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	60	60	40	60	60	60	60	60	60	60	60	30
Windsor	60	40	NA	60	60	60	60	60	60	60	30	NA
Importance Factor = 1.15												
Iberia	60	30	NA	60	60	50	60	60	60	30	NA	NA
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	60	50	NA	60	60	60	60	60	60	60	30	NA
Windsor	50	NA	NA	60	60	40	60	60	60	30	NA	NA

Table 4 (Continued)

Allowable Mean Roof Height For 1-#8 Exposure C (ft)												
Roof Tile	Roof											
	Gable/Hip Roof 7° < θ ≤ 27°			Hip Roof 7° < θ ≤ 25°			Gable Roof 27° < θ ≤ 45°			Monoslope Roof 10° 10 < θ ≤ 30°		
	Inland		Seaward	Inland		Seaward	Inland		Seaward	Inland		Seaward
	II	I		II	I		II	I		II	I	
Importance Factor = 1.00												
Iberia	30	NA	NA	60	60	25	60	60	60	20	NA	NA
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	30
Tuscany	50	20	NA	60	60	40	60	60	60	30	15	NA
Windsor	20	NA	NA	60	40	15	60	60	30	15	NA	NA
Importance Factor = 1.15												
Iberia	15	NA	NA	60	30	NA	60	60	30	NA	NA	NA
Mediterranean	60	60	30	60	60	60	60	60	60	60	40	20
Tuscany	25	NA	NA	60	40	20	60	60	40	15	NA	NA
Windsor	NA	NA	NA	40	20	NA	60	40	15	NA	NA	NA

Table 4 (continued)

Allowable Mean Roof Height For 2-#8 Exposure B (ft)												
Roof Tile	Roof											
	Gable/Hip Roof 7° < θ ≤ 27°			Hip Roof 7° < θ ≤ 25°			Gable Roof 27° < θ ≤ 45°			Monoslope Roof 10° < θ ≤ 30°		
	Inland		Seaward	Inland		Seaward	Inland		Seaward	Inland		Seaward
	II	I		II	I		II	I		II	I	
Importance Factor = 1.00												
Iberia	60	60	60	60	60	60	60	60	60	60	60	60
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	60	60	60	60	60	60	60	60	60	60	60	60
Windsor	60	60	60	60	60	60	60	60	60	60	60	40
Importance Factor = 1.15												
Iberia	60	60	60	60	60	60	60	60	60	60	60	60
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	60	60	60	60	60	60	60	60	60	60	60	60
Windsor	60	60	60	60	60	60	60	60	60	60	60	40

Table 4 (continued)

Allowable Mean Roof Height For 2-#8 Exposure C (ft)												
Roof Tile	Roof											
	Gable/Hip Roof 7° < θ ≤ 27°			Hip Roof 7° < θ ≤ 25°			Gable Roof 27° < θ ≤ 45°			Monoslope Roof 10° < θ ≤ 30°		
	Inland		Seaward	Inland		Seaward	Inland		Seaward	Inland		Seaward
	II	I		II	I		II	I		II	I	
Importance Factor = 1.00												
Iberia	60	60	40	60	60	60	60	60	60	60	50	25
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	60	60	50	60	60	60	60	60	60	60	60	30
Windsor	60	30	15	60	60	30	60	60	60	50	20	NA
Importance Factor = 1.15												
Iberia	60	40	20	60	60	60	60	30	60	25	NA	NA
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	60	60	25	60	60	60	60	60	60	60	30	15
Windsor	40	15	NA	60	60	30	60	60	60	25	NA	NA

Table 4 (continued)

Allowable Mean Roof Height For 2-10d Ring Shank Exposure B (ft)												
Roof Tile	Roof											
	Gable/Hip Roof 7° < θ ≤ 27°			Hip Roof 7° < θ ≤ 25°			Gable Roof 27° < θ ≤ 45°			Monoslope Roof 10° < θ ≤ 30°		
	Inland		Seaward	Inland		Seaward	Inland		Seaward	Inland		Seaward
	II	I		II	I		II	I		II	I	
Importance Factor = 1.00												
Iberia	60	50	NA	60	60	60	60	60	60	60	30	NA
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	60
Tuscany	NA	NA	NA	60	30	NA	60	50	NA	NA	NA	NA
Windsor	NA	NA	NA	30	NA	NA	60	30	NA	NA	NA	NA
Importance Factor = 1.15												
Iberia	50	30	NA	60	60	40	60	60	60	30	NA	NA
Mediterranean	60	60	60	60	60	60	60	60	60	60	60	40
Tuscany	NA	NA	NA	30	NA	NA	50	30	NA	NA	NA	NA
Windsor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4 (continued)

Allowable Mean Roof Height For 2-10d Ring Shank Exposure C (ft)												
Roof Tile	Roof											
	Gable/Hip Roof 7° < θ ≤ 27°			Hip Roof 7° < θ ≤ 25°			Gable Roof 27° < θ ≤ 45°			Monoslope Roof 10° < θ ≤ 30°		
	Inland		Seaward	Inland		Seaward	Inland		Seaward	Inland		Seaward
	II	I		II	I		II	I		II	I	
Importance Factor = 1.00												
Iberia	25	NA	NA	60	40	20	60	60	20	NA	NA	NA
Mediterranean	60	60	25	60	60	60	60	60	60	60	40	NA
Tuscany	NA	NA	NA	15	NA	NA	25	NA	NA	NA	NA	NA
Windsor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Importance Factor = 1.15												
Iberia	NA	NA	NA	50	25	NA	60	50	20	NA	NA	NA
Mediterranean	60	30	25	60	60	60	60	60	60	60	40	15
Tuscany	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Windsor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4 - Notes:

1. TDI defines the Designated Catastrophe Areas.
2. The IRC or IBC define the Exposure category for the structure location.

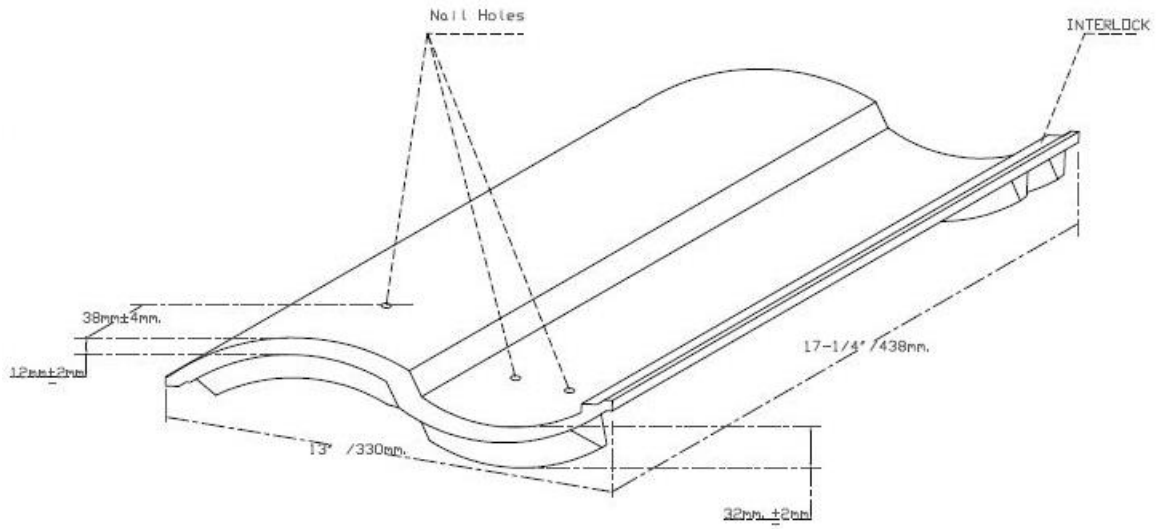


Figure 1
Iberia

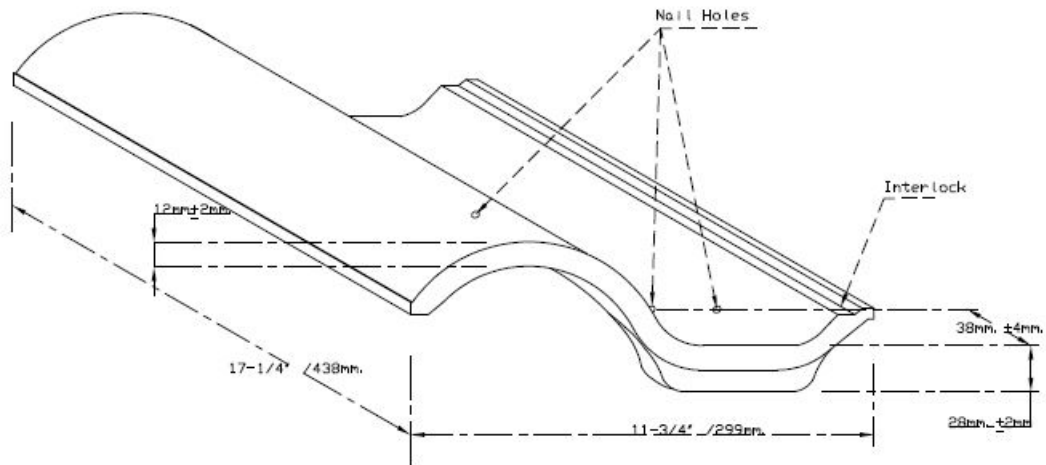


Figure 2
Mediterranean

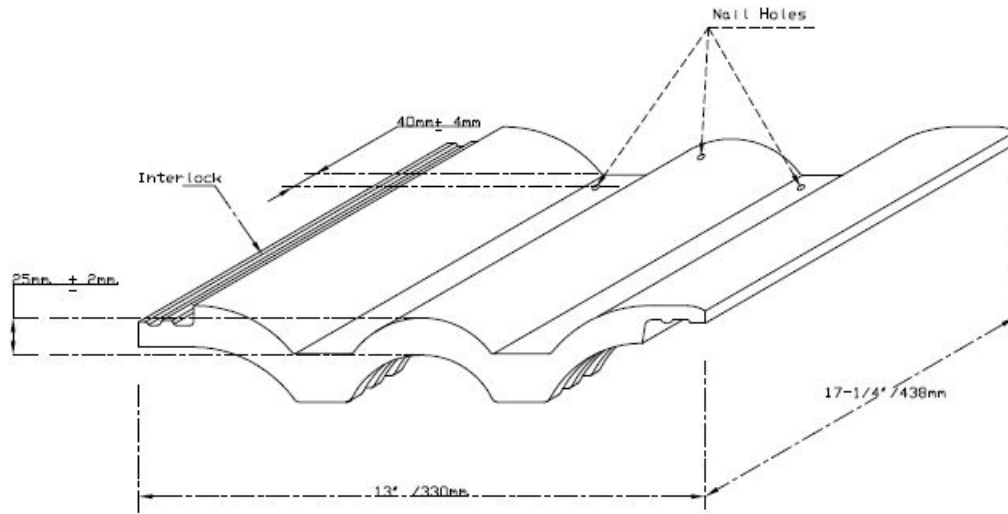


Figure 3
Tuscany

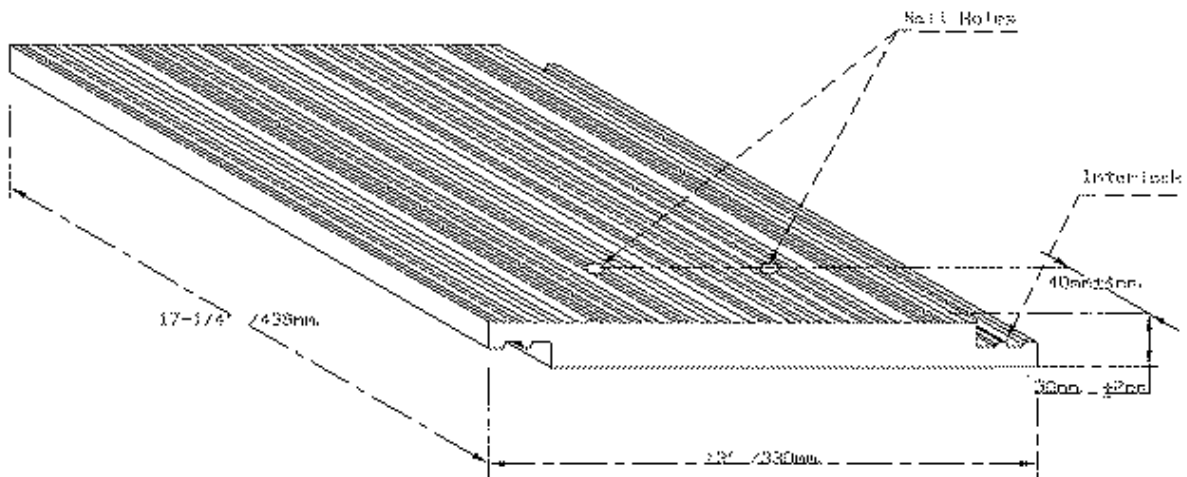


Figure 4
Windsor Shake

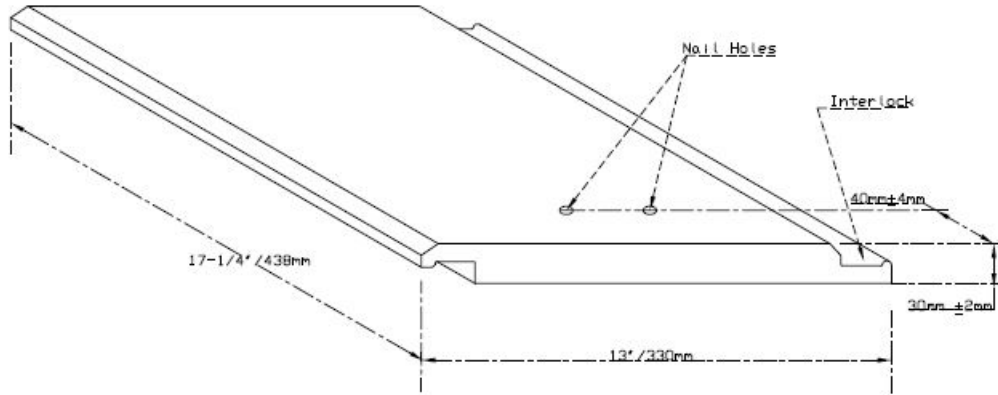


Figure 5
Windsor Slate

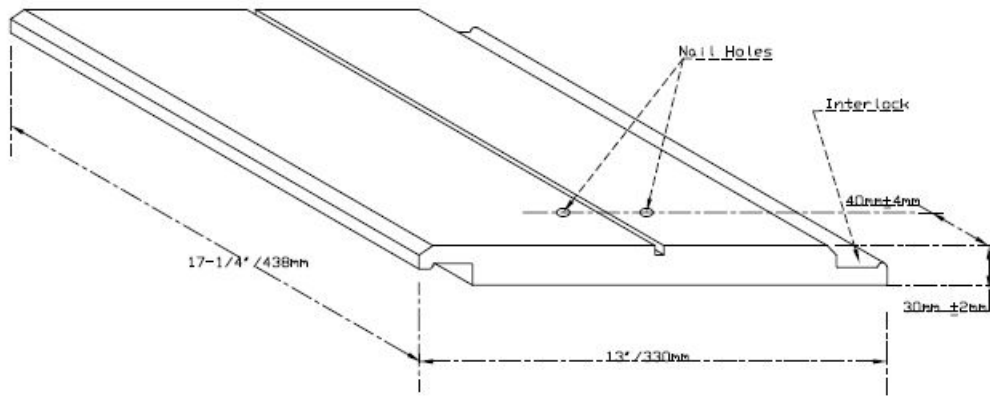


Figure 6
Windsor Split Shake