

Product Evaluation

RC309 | 0221

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-309

Effective Date: February 1, 2021

Re-evaluation Date: February 2025

Product Name: Clay Roof Tiles

Manufacturer: Ludowici Roof Tile
P.O. Box 69
4757 Tile Plant Road
New Lexington, OH 43764
(800) 945-8453

General Description:

Ludowici clay roofing tiles are acceptable for use in designated catastrophe areas along the Texas Gulf Coast when installed in accordance with this product evaluation report, the building specifications adopted by the TDI, and the manufacturer's installation instructions as referenced in the document entitled "*Florida High Wind Concrete and Clay Roof Tile Installation Manual*," 6th Edition (FSRA-TRI Manual) except for the application methods specified in this evaluation report.

Product Description:

Ludowici clay roof tiles are tiles that are manufactured from Southeastern Ohio shale and fire clay. The tiles are available in a variety of colors.

Attachment: Install the Ludowici clay roof tiles specified in this report using either a mechanical fastening system or an adhesive fastening system. Secure the roof tiles either directly to the roof deck or over battens.

Roof Tile Profile Classifications: Roof tile profiles are classified as one of the following:

- **Flat/Low profile:** Flat/Low profile tiles are tiles having a rise equal to or less than 1/2".
- **Medium profile:** Medium profile tiles are defined as tiles having a rise greater than 1/2" and a rise to width ratio of less than or equal to 1.5.
- **High/Barrel profile:** High/Barrel profile tiles are those tiles having a rise to width ratio greater than 1.5.
- **Roof Tile Designations, Profile Classifications, and Dimensions:** Table 1 specifies the roof tile designations, profile classifications, and dimensions for the clay roof tiles that apply to this product evaluation report.

Table 1
Roof Tile Designations, Profile Classifications, and Dimensions

Tile Name	Alternate Name	Tile Profile	Tile		
			Length (in.)	Width	
				Total (in.)	Exposed (in)
Large Interlocking Tiles					
Americana 16"	Americana XL	Flat/Low	16	10-3/4	10-1/8
Classic 16"	Classic XL	Flat/Low	16	10-3/4	10-1/8
Lanai 16"	Lanai XL	Flat/Low	16	10-3/4	10-1/8
Ludo Shake	-	Flat/Low	16	10-3/4	10-1/8
Ludo Slate	Celedon Ceramic Slate	Flat/Low	16	10-3/4	10-1/8
Williamsburg 16"	Williamsburg XL	Flat/Low	16	10-3/4	10-1/8
Small Interlocking Tiles					
Americana 14"	Americana	Flat/Low	14	9	8-1/4
Classic 14"	Classic	Flat/Low	14	9	8-1/4
Lanai 14"	Lanai	Flat/Low	14	9	8-1/4
Williamsburg 14"	Williamsburg	Flat/Low	14	9	8-1/4
Spanish Tiles					
13-1/4" Spanish	-	High/Barrel	13-1/4	9-3/4	8-1/4
18-3/8" Spanish	-	High/Barrel	18-3/8	9-3/4	8-1/4
Mission Tiles					
14-1/4" Mission	14-1/4" Straight Barrel Mission	High/Barrel	14-1/4	8	8
16" Mission	16" Straight Barrel Mission	High/Barrel	16	8	8
18" Mission	18 ³ / ₈ Straight Barrel Mission	High/Barrel	18-3/8	8	8
Palm Beach Mission	18 ³ / ₈ Palm Beach Mission	High/Barrel	18-3/8	8	8

Installation and Limitations:

Roof Framing and Roof Deck: Install roof framing members in accordance with either the IRC or the IBC. Do not space the roof framing members greater than 24" on center. The roof deck must be solidly sheathed with minimum 15/32" plywood. Fasten the roof deck to the roof framing members in accordance with either the IRC or the IBC.

If the existing roof deck is a spaced board roof deck, then either remove or cover the spaced boards with minimum 15/32" plywood. Install the plywood sheathing over the spaced boards in accordance with either the IRC or the IBC.

Metal Drip Edge: Install a metal drip edge as specified in the manufacturer's installation instructions as referenced in the FRSA-TRI Manual.

Roof underlayment:

3:12 roof slope to under 4:12 roof slope: Two layers of underlayment complying with ASTM D 226, Type II (No. 30 asphalt felt) or equivalent. Install the underlayment as specified in either the IRC or the IBC and in the manufacturer's installation instructions as referenced in the document entitled FRSA-TRI Manual.

4:12 roof slope and greater: One layer of underlayment complying with ASTM D 226, Type I (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 document entitled FRSA-TRI Manual.

Self-Adhering Underlayment: Self-adhering underlayment must comply with ASTM D 1970 and ICC-ES acceptance criteria AC152 Section 3.4 Alternate Underlayments. Install the self-adhering underlayment in accordance with the self-adhering underlayment product evaluation report and the self-adhering underlayment manufacturer's installation instructions.

Battens: The roofing tiles may be installed over battens. For roof slopes greater than 7:12, battens are required. The roof deck must be solidly sheathed with minimum 15/32" plywood. As a minimum, the battens must be minimum 1x2 wood members. The battens must be spaced to allow for a minimum 3" headlap. The battens must be fastened to the roof deck with minimum 8d common wire or box nails or equivalent size nail. The fasteners must be spaced a maximum of 24" on center. Batten ends must be separated a minimum of 1/2" every 4' to allow for drainage.

Roof Tile Installation:

Roof Slope Limitations: The roofing tiles must only be installed on buildings with a roof slope greater than or equal to 3:12 but not exceeding 12:12. Note: Battens are required when the roof slope exceeds 7:12.

Moment of Resistance: The overturning resistance (moment of resistance) due to wind of the roof tiles based on the installation method for the roof tiles is shown in Table 2.

Table 2: Moment of Resistance Based on Roof Tile Installation Method

Tile Name	Alternate Name	Tile Profile	Moment of Resistance (ft-lbs)	
			Two No. 8 x 2" SS screws	Two Copper Ring Shank Nails
Large Interlocking Tiles				
Americana 16"	Americana XL	Flat/Low	14.3	8.2
Classic 16"	Classic XL	Flat/Low	14.3	8.2
Lanai 16"	Lanai XL	Flat/Low	14.3	8.2
Ludo Shake	-	Flat/Low	13.5	7.1
Ludo Slate	Celedon Ceramic Slate	Flat/Low	13.5	7.1
Williamsburg 16"	Williamsburg XL	Flat/Low	14.3	8.2
Small Interlocking Tiles				
Americana 14"	Americana	Flat/Low	30.7	30.4
Classic 14"	Classic	Flat/Low	30.7	30.4
Lanai 14"	Lanai	Flat/Low	30.7	30.4
Williamsburg 14"	Williamsburg	Flat/Low	30.7	30.4
Spanish Tiles				
13-1/4" Spanish	-	High/Barrel	35.6	13.1
18-3/8" Spanish	-	High/Barrel	28.9	15.6
Mission Tiles				
14-1/4" Mission	14-1/4" Straight Barrel Mission	High/Barrel	26.0	20.5
16" Mission	16" Straight Barrel Mission	High/Barrel	37.4	29.3
18" Mission	18 ^{3/8} " Straight Barrel Mission	High/Barrel	28.7	23.9
Palm Beach Mission	18 ^{3/8} " Palm Beach Mission	High/Barrel	34.2	14.6

Aerodynamic Uplift Moment: The aerodynamic uplift moment for the roof tile is calculated using Equation 16-34 from the 2018 IBC. The aerodynamic uplift moment is calculated based on the mean roof height for the installation and the required wind speed and Exposure condition for the installation location using ASCE 7-16.

Permissible Tile Installation: The roof tiles may be installed if the Moment of Resistance for the roof tile specified in this evaluation report is greater than the Aerodynamic Uplift Moment for the roof tile calculated for the structure location.

General: Install the roof tiles in accordance with this product evaluation report and the manufacturer's installation instructions. The roof tiles and the underlayment system must be clean and dry at the time of their application.

The roofing tiles must be laid out from the right to the left, starting at the right rake. All roofing tiles must be installed with a minimum 3" headlap.

If battens are used, then the fasteners for the roofing tiles must penetrate through the battens and into the roof deck.

Mechanical Fastening Systems:

Fasteners: Use fasteners for direct deck installations long enough to penetrate a minimum of 3/4" into or through the roof deck. Use fasteners for batten installations (when used) long enough to penetrate through the batten entirely and a minimum of 3/4" into or through the roof deck. The following types of fasteners may be required, depending on the installation method used as specified in FRSA-TRI Manual:

Screws: No. 8 stainless steel wood screws.

Nails: 10d copper ring shank nails (shank diameter of 0.121").

Rake Tiles: Rake tiles must be secured to minimum Spruce-Pine-Fir lumber framing with minimum two 10d box nails (3" long, 0.128" shank diameter).

Hip and Ridge Tiles: The hip and ridge tiles must be fastened to hip and ridge boards (dimensional 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 3 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 3.

The remaining hip and ridge tiles are to be installed with a minimum 1" headlap. Place the toe of the tile into a 4" to 5" bead of roof tile adhesive along the head of the lower tile. The head of the hip or ridge tile is to be secured using a fastener as specified in Table 3.

Table 3
Hip and Ridge Tile Fastener Requirements

Lumber Species	Fasteners per Tile
Spruce-Pine-Fir	One No. 8 wood screw
Southern Pine	One No. 8 wood screw or One 10d box nail

Adhesive Fastening Systems:

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.

Adhesive fastening systems must not be used with polyethylene or silicon surfaced underlayments.

Notes: A copy of the "*Florida High Wind Concrete and Clay Roof Tile Installation Manual*," 6th Edition (FSRA-TRI Manual) must be available at the job site. When a self-adhering underlayment is used, the self-adhering underlayment product evaluation and the self-adhering underlayment manufacturer's installation instructions must be available at the job site. When an adhesive fastening system is used, the adhesive fastening system product evaluation and the adhesive fastening system manufacturer's installation instructions must be available at the job site. Use corrosion resistant fasteners as specified in the IRC and the IBC.