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ESR-1017

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
SECTION: 07 32 13—CLAY ROOF TILES

REPORT HOLDER:

BORAL ROOFING LLC

**7575 IRVINE CENTER DRIVE, SUITE 100
IRVINE, CALIFORNIA 92618**

EVALUATION SUBJECT:

**ONE-PIECE “S,” TAPERED TWO-PIECE MISSION, MONARCH TWO-PIECE MISSION,
ROMANO® PAN, CLAYLITE®, AND CLAYMAX® CLAY ROOF TILES**



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ICC-ES Evaluation Report

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1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code*® (IBC)
- 2015, 2012 and 2009 *International Residential Code*® (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties Evaluated:

- Weather resistance
- Fire classification
- Wind uplift resistance

1.2 Evaluation to the following green code:

- 2013 California Green Building Standards Code (CALGreen), Title 24, Part 11

Attributes verified:

- See Section 3.0

2.0 USES

The clay roof tiles described in this report are used as roof coverings on new roofs and over existing roofs, when installed in accordance with this report.

3.0 DESCRIPTION

General:

The tiles are vitrified clay products, and are machine-formed and fired to various degrees and have a selection of burned-on colors. The various colors are obtained by

controlled firing of the kilns. The tiles conform to the physical requirements of ASTM C1167.

See Table 1 for product designations, dimensions, installed dry weights and manufacturing facilities. Roof tile profiles and dimensions are illustrated in Figure 1. See Table 1A for other dimensions, tile factor and tile factor ratio.

The attributes of the roof tiles have been verified as conforming to the requirements of 2013 CALGreen Section A5.406.1.2 for reduced maintenance. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

4.0 INSTALLATION

4.1 General:

Except as otherwise noted in this report, installation must be in accordance with the Concrete and Clay Roof Tile Installation Manual for Moderate Climate Regions, dated March 2010 and published by the Tile Roofing Institute and the Western States Roofing Contractors Association (hereinafter referred to as the TRI/WSRCA installation manual). This report and the TRI/WSRCA installation manual must be available at the jobsite at all times during installation.

4.1.1 Claylite Tiles: Claylite tiles must be fastened to the sheathing with two nails per tile. As an alternative, a single nail, using the fastener hole located in the pan side $1\frac{3}{4}$ inches (44.3 mm) from the head end of the tile, may be used with the maximum allowable wind speed and roof height as shown in Table 3, for the zone and exposure as noted. Nails must be in accordance with IBC Table 1507.3.7 or IRC Section R905.3.6, as applicable. Solid sheathing must be not less than $\frac{7}{16}$ -inch (11.1 mm) oriented strand board or $\frac{15}{32}$ -inch (11.9 mm) wood structural panels. Nails must be minimum No. 11 gage [0.1196 inch (3.03 mm)] and have minimum $\frac{7}{16}$ -inch-diameter (11.1 mm) heads.

4.1.2 Claymax Tiles: ClayMax tiles must be fastened to the sheathing with two nails per tile. As an alternative, a single nail, using the fastener hole located in the center, $1\frac{3}{4}$ inches (44.3 mm) from the head end of the tile, may be used with the maximum allowable wind speed and roof height as shown in Table 4, for the zone and exposure as noted. Nails must be in accordance with IBC Table 1507.3.7 or IRC Section R905.3.6, as applicable. Solid sheathing must be not less than $\frac{7}{16}$ -inch (11.1 mm)

oriented strand board or ¹⁵/₃₂-inch (11.9 mm) wood structural panels. Nails must be minimum No. 11 gage [0.1196 inch (3.03 mm)] and have minimum ⁷/₁₆-inch-diameter (11.1 mm) heads.

4.2 Adhesively Attached Systems:

The clay roof tiles may be installed with roof tile adhesives that are recognized in a current ICC-ES evaluation report for use in clay roofing tile applications. Installation of tiles using these adhesive set systems must be in accordance with the adhesive manufacturer’s ICC-ES evaluation report.

4.3 Roof Slope Limitation:

The roof tiles must be installed on a minimum roof slope of 2¹/₂:12 (20.83 percent).

4.4 Roofing Classification:

4.4.1 The fire classifications are as noted in Table 2.

4.4.2 Adhesively Attached Systems: When roof tiles are installed with a roof tile adhesive, installation must be in accordance with [ESR-1709](#).

4.5 Wind Resistance:

4.5.1 General: When installation is on roof slopes greater than 21:12 (175 percent), the noses of all tiles must be securely fastened.

4.5.2 Claylite and ClayMax: See Section 4.1.1 and Table 3 for one-fastener installation of the Claylite tiles and Section 4.1.2 and Table 4 for one-fastener installation of the ClayMax tiles.

4.5.3 High Wind Applications (2009 IBC and 2009 IRC Only): With the exception of the Claylite and ClayMax tiles, for applications beyond the prescriptive parameters of IBC Section 1507.3.7 and IRC Section R905.3.7, the fastening systems must be determined to withstand the aerodynamic uplift moment in accordance with the Design Considerations for High Wind Applications in Appendix B of the TRI/WSRCA installation manual, dated March 2010. The generic required aerodynamic uplift moment, determined in accordance with Tables 5A through 6D of the TRI/WSRCA installation manual, must be multiplied by the tile factor ratio in Table 1A to obtain the required aerodynamic uplift moment for the specific roof tile being installed. The allowable aerodynamic uplift moment for the roof tile fastening system selected from Table 7A of the TRI/WSRCA installation manual, must be equal to or

greater than the required aerodynamic uplift moment for the specific roof tile being installed.

Note: The above determination is not applicable for high wind applications of the Claylite and ClayMax tiles.

4.6 Reroofing Applications:

The tiles may be installed over existing roofs, provided the requirements of 2015 IBC Section 1511, 2012 and 2009 IBC Section 1510 and 2015 IRC Section R908. 2012 and 2009 IRC Section R907, as applicable, are met. The roof classification is as noted in Table 2.

5.0 CONDITIONS OF USE

The clay roof tiles described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The roof tiles are manufactured, identified and installed in accordance with this report, the TRI/WSRCA installation manual, dated March 2010 and the applicable code. If there is a conflict between this report and the installation manual, this report governs.

5.2 The roof sheathing and roof framing system must be designed for the appropriate loads determined in accordance with the applicable code, subject to the approval of the code official.

5.3 The roof tiles are produced in Corona, California, under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES Acceptance Criteria for Clay and Concrete Roof Tiles (AC180), dated February 2012 (editorially revised April 2015).

7.0 IDENTIFICATION

The name “U.S.T.”, Boral or Boral Roofing LLC are embossed on the underside of each tile near the nail hole. Additionally, a tag must be attached to each shipping pallet that bears the report holder’s name (United States Tile Company or Boral Roofing LLC) and address, the product name, the evaluation report number (ESR-1017) and the installed weight.

TABLE 1—TILE DIMENSIONS, WEIGHTS AND MANUFACTURING FACILITIES

TILE DESIGNATION	GRADE	INSTALLED DRY WEIGHT (psf)	DIMENSIONS (inches)			MINIMUM HEAD LAP (inches)	CENTER-TO-CENTER SPACING (inches)
			LENGTH	BUTT WIDTH	SMALL WIDTH		
One-Piece “S” Tile	1	8	18	13	13	3	11
Tapered 2-Piece Mission Tile	1	9.6	18	8.5	7	3	11
Monarch 2-Piece Mission Tile	3	10.7	18	6.75	5.25	3	9
Romano Pan	1	9.9	18	11	11	3	13
Claylite	1	5.9	18	13	13	3	11
ClayMax	1	5.8	18	13	13	3	11

For **SI**: 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

TABLE 1A—TILE DIMENSIONS, TILE FACTOR AND TILE FACTOR RATIO

PROFILE	LENGTH ² (inches)	WIDTH ² (inches)	SIDE LAP ² (inches)	EXPOSED WIDTH ² (inches)	TILE FACTOR (ft ³)	TILE FACTOR RATIO ¹
One-Piece S Tile	18	13	2	11	1.568	1.114
Romano Pan	18	11	3	8	1.140	0.810
Claylite	18	13	2	11	1.568	1.114
ClayMax	18	13	2	11	1.568	1.114

For SI: 1 inch = 25.4 mm

¹ Tile factor ratio = Tile factor / 1.407 ft³. See Section 4.5.3 of this report and Appendix B of the TRI/WSRCA installation manual for additional details.

² All dimensions are nominal.

TABLE 2—FIRE CLASSIFICATION ASSEMBLIES

SYSTEM NO.	ROOF CLASS	SUBSTRATE	MAX. ROOF SLOPE	COVER BOARD	UNDERLAYMENT	BATTENS	ROOF TILE
1	A	Wood structural panel ¹	Unlimited	None	ASTM D226, Type II (No. 30)	---	One-piece S, Tapered and Monarch Two-Piece Mission, Romano Pan, Claylite and ClayMax

For SI: 1 inch = 25.4 mm.

¹ Wood structural panel must be minimum 15/32-inch-thick plywood or 7/16-inch-thick OSB.

TABLE 3—MAXIMUM WIND SPEEDS (mph) FOR CLAYLITE TILES—ONE-FASTENER INSTALLATION^{1,2,3,4,5}

BUILDING HEIGHT (feet)	7° ≤ Ω ≤ 27°	7° ≤ Ω ≤ 27°	27° ≤ Ω ≤ 45°	27° ≤ Ω ≤ 45°
	ZONE 3 EXPOSURE B	ZONE 2 EXPOSURE B	ZONE 3 EXPOSURE B	ZONE 2 EXPOSURE B
20	91	124	137	137
40	87	119	132	132
60	N/A	112	124	124
	ZONE 3 EXPOSURE C	ZONE 2 EXPOSURE C	ZONE 3 EXPOSURE C	ZONE 2 EXPOSURE C
20	N/A	109	121	121
40	N/A	102	112	112
60	N/A	97	109	109

For SI: 1 foot = 304.8 mm; 1 mph = 1.61 km/h.

¹ Ω - Roof angle.

² See Figure 6-3, ASCE 7-05 and Figures 30.4.2B, 2C and 5B of ASCE 7-10.

³ Calculations are based on an Importance Factor of 1.0 for ASCE 7-05.

⁴ Calculations are based on a Risk Factor of II for ASCE 7-10.

⁵ For applications under the 2015 and 2012 IBC, multiply table wind speed by 1.29.

TABLE 4—MAXIMUM WIND SPEEDS (mph) FOR CLAYMAX TILES—ONE-FASTENER INSTALLATION^{1,2,3,4,5}

BUILDING HEIGHT (feet)	7° ≤ Ω ≤ 27°	7° ≤ Ω ≤ 27°	27° ≤ Ω ≤ 45°	27° ≤ Ω ≤ 45°
	ZONE 3 EXPOSURE B	ZONE 2 EXPOSURE B	ZONE 3 EXPOSURE B	ZONE 2 EXPOSURE B
20	105	142	157	157
40	100	136	151	151
60	95	129	142	142
	ZONE 3 EXPOSURE C	ZONE 2 EXPOSURE C	ZONE 3 EXPOSURE C	ZONE 2 EXPOSURE C
20	92	125	139	139
40	86	117	129	129
60	N/A	112	124	124

For SI: 1 foot = 304.8 mm; 1 mph = 1.61 km/h.

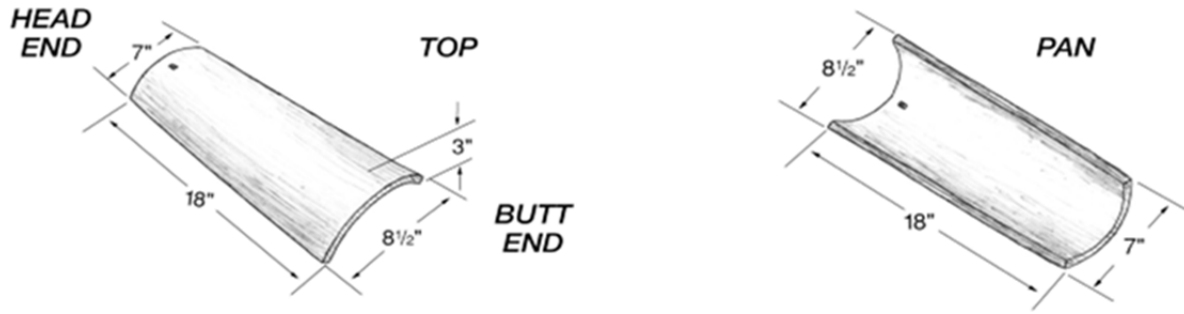
¹ Ω - Roof angle.

² See Figure 6-3, ASCE 7-05 and Figures 30.4.2B, 2C and 5B of ASCE 7-10.

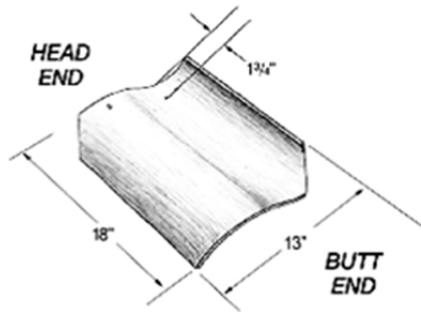
³ Calculations are based on an Importance Factor of 1.0 for ASCE 7-05.

⁴ Calculations are based on a Risk Factor of II for ASCE 7-10.

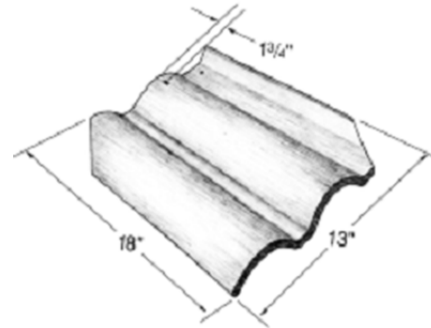
⁵ For applications under the 2015 and 2012 IBC, multiply table wind speed by 1.29.



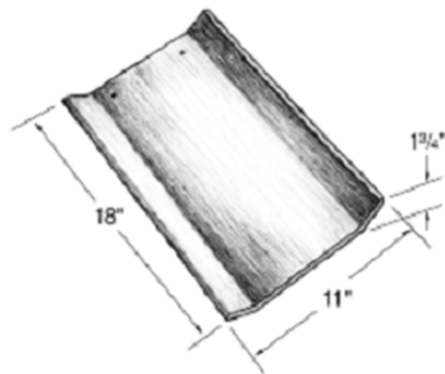
TAPERED TWO-PIECE MISSION ROOF TILE



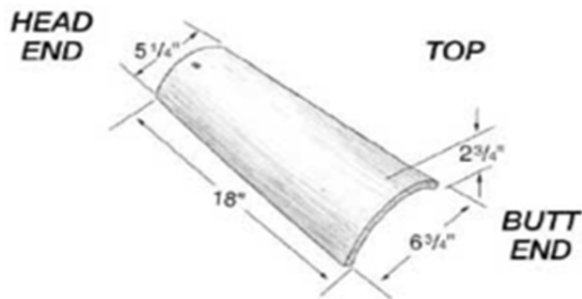
ONE-PIECE "S" AND CLAYLITE® ROOF TILE



CLAYMAX® ROOF TILE



ROMANO® PAN



MONARCH TWO-PIECE MISSION ROOF TILE

For SI: 1 inch = 25.4 mm.

FIGURE 1—TILE PROFILES

ICC-ES Evaluation Report

ESR-1017 CBC and CRC Supplement

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1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Boral Roofing clay roof tiles, recognized in ICC-ES master evaluation report ESR-1017, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2010 *California Building Code* (CBC)
- 2010 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Boral Roofing clay roof tiles described in the master report ESR-1017 may be used where a Class A roof covering complying with CBC Section 1505.1.1, a Class B roof covering complying with CBC Section 1505.1.2, or a Class C roof covering complying with CBC Section 1505.1.3 is required, provided installation is in accordance with the master report and the additional requirements of CBC Sections 1507.3.10 and 1511.

The roof tiles may be used in the construction of new buildings located in a Fire Hazard Severity Zone within State Responsibility Areas or any Wildland–Urban Interface Fire Area, provided installation is also in accordance with the master report and the additional requirements of Sections 701A.3 and 705A of the CBC.

2.2 CRC:

The Boral Roofing clay roof tiles described in the master report ESR-1017 may be used where a Class A roof covering complying with CRC Section R902.1.1, a Class B roof covering complying with CRC Section R902.1.2, or a Class C roof covering complying with CRC Section R902.1.3 is required, provided installation is in accordance with the master report and the additional requirements of CRC Section R905.3.

The roof tiles may be used in the construction of new buildings located in any Wildland–Urban Interface Fire Area, provided installation is also in accordance with the master report and the additional requirements of Sections R327.1.3.1 and R327.5 of the CRC.

The products recognized in this supplement have not been evaluated for compliance with the *International Wildland–Urban Interface Code*®.

This supplement expires concurrently with the master report, reissued January 2017.

ICC-ES Evaluation Report

ESR-1017 FBC Supplement

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1.0 EVALUATION SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Boral Roofing clay roof tiles, recognized in ICC-ES master report ESR-1017, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2010 *Florida Building Code—Building*
- 2010 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The clay roof tiles, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1017, comply with the 2010 *Florida Building Code—Building* and the 2010 *Florida Building Code—Residential*, provided the design and installation are in accordance with the *International Building Code*® (IBC) provisions noted in the master report, with this additional condition: The roof tiles must be installed in accordance with Section 1609 of the 2010 *Florida Building Code—Building* or with FRSA/TRI 07320, where the nominal design wind speed, V_{asd} , is determined in accordance with Section 1609.3 of the 2010 *Florida Building Code—Building*.

Use of the clay roof tiles described in the master evaluation report for compliance with the High-Velocity Hurricane Zone provisions of the 2010 *Florida Building Code—Building* and the 2010 *Florida Building Code—Residential* has not been evaluated, and is outside the scope of this evaluation report.

For products falling under Florida Rule 9N-3, verification that the report holder's quality-assurance program is audited by a quality-assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the master report, reissued January 2017.