EVALUATION SUBJECT:
TILE FLASHING SYSTEM

REPORT HOLDER:
EcoFasten Solar®
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CSI DIVISION: 06—WOOD AND PLASTICS
CSI Section: 06 25 23—Wood, Plastic, and Composite Fastenings

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2015, 2012 and 2009 International Building Code® (IBC)
- 2015, 2012 and 2009 International Residential Code® (IRC)

1.2 Evaluated in accordance with:

- IAPMO UES Evaluation Criteria for Joist Hangers and Miscellaneous Connectors, EC002, adopted January 2016
- Acceptance Criteria for Roof Flashing for Pipe Penetrations (ICC-ES AC286), approved April 2010

1.3 Properties assessed:

- Structural
- Water Penetration

2.0 PRODUCT USE

EcoFasten Solar's Tile Flashing System are mounting assemblies used to attach solar panels and other types of equipment to the rafters of roofs with low-profile barrel shaped tile or flat tile roof coverings in accordance with IBC Sections 1509 and 1511.

3.0 PRODUCT DESCRIPTION

3.1 Product information

3.1.1 Tile Flashing System: The Tile Flashing System has six basic components: an aluminum tile base factory-attached to an aluminum pedestal; tile flashing (in Flat, 'S', or 'W' profile); slotted aluminum plate; aluminum attachment bracket; and cap screw. EcoFasten Solar's published installation instructions provide more detailed dimensional information.

3.2 Description

The Tile Flashing System's roof mount component material standards are specified in Table 2 of this report. Tile Flashing System-Flat roof mounts include a painted flat profile aluminum flashing panel nominally 15.51 by 16.97 inch (394 x 431 mm). When installed the Flat flashing has a mounting distance of 4.05 inches (103 mm) from the top of the roof sheathing to the bottom of the support bracket. Figure 1 of this report illustrates the flat roof mounts.

Tile Flashing System-S roof mounts include a painted low-profile barrel-shaped aluminum flashing panel nominally 13.84 by 17.78 inch (351 x 452 mm). When installed the 'S' flashing has a mounting distance of 5.4 inches (137 mm) from the top of the roof sheathing to the bottom of the support bracket. Figure 2 of this report illustrates the S roof mounts.

Tile Flashing System-W roof mounts include a painted low-profile barrel-shaped aluminum flashing panel nominally 15.00 by 19.36 inch (381 x 492 mm). When installed the 'W' flashing has a mounting distance of 4.4 inches (112 m) from the top of the roof sheathing to the bottom of the support bracket. Figure 3 of this report illustrates the W roof mounts.

Fasteners used to secure the flashing to the wood roof rafter shall be $^{5}/_{16}$-inch-diameter (7.9 mm) lag screws complying with ANSI/ASME B18.2.1-B1. The lag screw shall be long enough to penetrate the rafter a minimum of $2^{1}/_{2}$ inches (64 mm). Lag screws shall be corrosion-resistant. Table 1 of this report provides allowable pull-out capacities and allowable lateral loads for typical roof lumber. Aluminum attachment brackets are shown in Figure 5 of this report.

4.0 DESIGN AND INSTALLATION

4.1 Design: Compliance to the following shall be provided by the Designer/Engineer if requested by the jurisdiction having authority: The tabulated allowable loads shown in this report are based on allowable stress design (ASD) and include the load duration factor, C_D, corresponding with the applicable loads in accordance with ANSI/AWC National Design Specification (NDS).

Where the roof mounts are exposed to temperatures exceeding 100°F (37.8°C), uplift allowable loads shall be adjusted by the temperature factor, C_t, in accordance with Section 10.3.4 of the NDS temperature factor, C_t, which applies to the roof mount connected to supporting wood members where sustained temperatures are greater than 150°F (65.6°C). When products are attached to wood framing having a moisture content greater than 19 percent (16 percent for engineered wood products), or where wet

service is expected, the allowable loads shall be adjusted by the wet service factor, C_M, specified in Section 10.3.3 of the NDS. Connected wood members shall be analyzed for load-carrying capacity at the connection in accordance with the NDS.

4.2 Installation: The Tile Flashing System shall be installed in accordance with this evaluation report, published manufacture's installation instructions, and the applicable code. Where conflicts occur, the more restrictive shall govern. The Tile Flashing System roof mounts shall be installed using two $^5/_{16}$ inch (7.9 mm) diameter lag screws to connect the preassembled base and pedestal to the rafter. The minimum specific gravity of the wood member shall be 0.42. The Flat, 'S', or 'W' shaped tile flashing shall be placed over the base-pedestal and fastened to the pedestal using a $^5/_{16}$ inch (7.9 mm) diameter cap screw.

Butyl strips shall be applied under lag screw hole locations to provide waterproofing protection.. Installation of the Tile Flashing System roof mounts are limited to roofs having minimum and maximum slopes of 3:12 (14 percent) and 12:12 (45 percent), respectively, as shown in Figure 6.

RainBuster adhesive/sealant shall be applied to the leading upslope edge of the tile base and to the predrilled lag holes through the base and backfill hole to provide waterproofing protection. Installation of the Tile Flashing System roof mounts are limited to roofs having minimum and maximum slopes of 3:12 (14 percent) and 12:12 (45 percent), respectively as shown in Figure 7.

5.0 LIMITATIONS

The Tile Flashing System roof mounts described in this report comply with the codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The Tile Flashing System roof mounts shall be installed in accordance with this report, the manufacturer's published installation instructions, and the codes listed in Section 1.1 of this report. Where conflicts occur, the more restrictive shall govern.

5.2 Calculations showing compliance with this report shall be submitted to the code official for approval. The calculations shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Fasteners used in contact with fire-retardant-treated or preservative-treated lumber shall comply with the 2015 IBC Section 2304.10.5 (2012 and 2009 IBC Section 2304.9.5) or the 2015, 2012 and 2009 IRC Section R317.3, as applicable. The report holder or lumber treater should be contacted for recommendations on minimum corrosion resistance and connection capacities of fasteners used with the specific proprietary preservative-treated or fire-retardant treated lumber.

5.4 Calculations to verify that imposed loads on the assembly do not exceed the allowable loads contained in Table 1 of this report shall be submitted to the code official for approval.

5.5 Calculations for the assembly support framing conforming to IBC Section 1510.2 shall be submitted to the code official for approval.

6.0 SUBSTANTIATING DATA

Testing and analysis data submitted is in conformance with IAPMO ES Evaluation Criteria for Joist Hangers and Miscellaneous Connectors, (EC002, approved January 2016). Rain test data is in conformance ICC-ES AC286 and with the Underwriters Laboratory Standard for Gas Vents, (UL 441-10 Section 27). Test results are from laboratories in compliance with ISO/IEC 17025.

7.0 IDENTIFICATION

EcoFasten Solar's Tile Flashing System roof mounts are identified with a label bearing the Manufacturers name and address, product designation, IAPMO Uniform ES Marks of Conformity, this evaluation report number (ER-369), compliance code, and inspection agency.

IAPMO ES ® or UES ™

IAPMO ER #369

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For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

Table 1: Tile Flashing System Allowable Loads (pounds)			
Load Direction	**Specific Gravity of Lumber**	**Allowable Load**	**Load at 1/8" Deflection**
Uplift	0.55	264	42
Uplift	0.42	259	40
Lateral	0.55	556	93
Lateral	0.42	480	81

For SI: 1inch = 25.4 mm

Table 2: Material Properties		
Tile Base		6000 Series Aluminum complying with ASTM B209
Pedestal		
Tile Flashing -Flat		3106 Aluminum (painted)
Tile Flashing – S		
Tile Flashing – W		
Aluminum Brackets:		
Top Slide: 7.4-inch-long L-shaped slotted connector plate as shown in Figure 4 of this report		6061 T-6 Aluminum complying with ASTM B209
L-102-3: L-shaped with two slotted holes		
CP-SQ-Slotted: grooved flat plate		
SCL-101-3: L-shaped with single slot		
Fasteners:		
Hex Head Lag Screw	5/16" x 4" or 4.5" long	18.8 SS, ANSI/ASME B18.2.1-B1 see table 12 QSM for pull out capacities for typical roof lumber (NDS),
Hex Head Cap Screw	5/16"-18 x 1-1/2" long	18.8 SS
EPDM bonded metal roof bushing (washer)	5/16" diameter	EPDM rubber and 18.8 SS, Type 304 stainless steel complying with ASTM A 240

For SI: 1inch = 25.4 mm

EcoFasten Solar Components

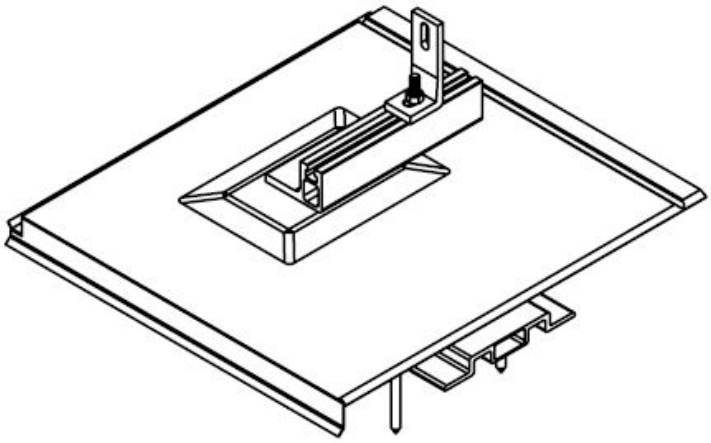


Figure 1: Tile Flashing System - Flat

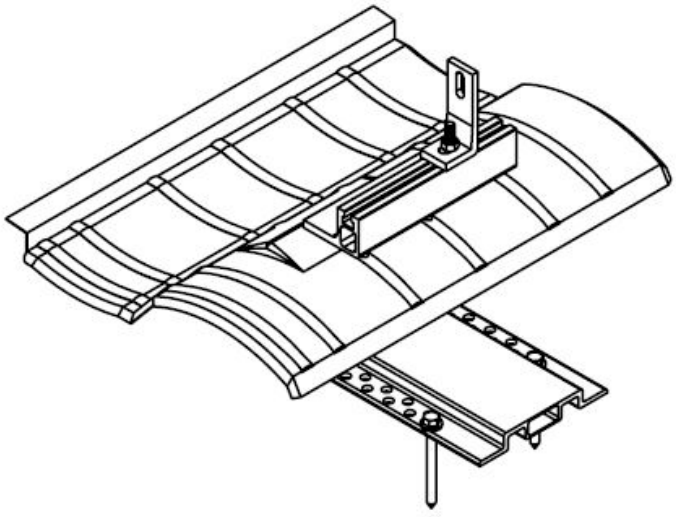


Figure 2: Tile Flashing System - S

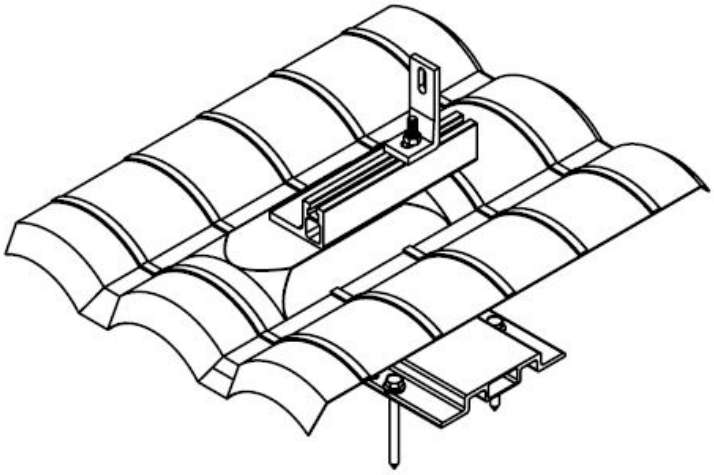


Figure 3: Tile Flashing System - W

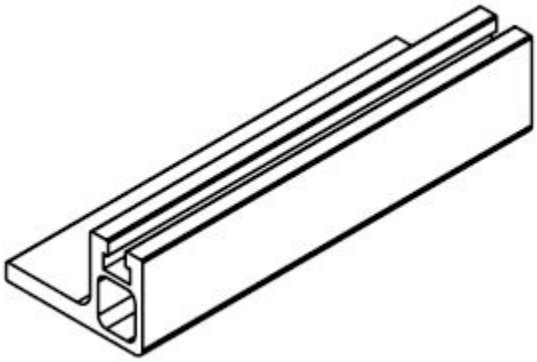
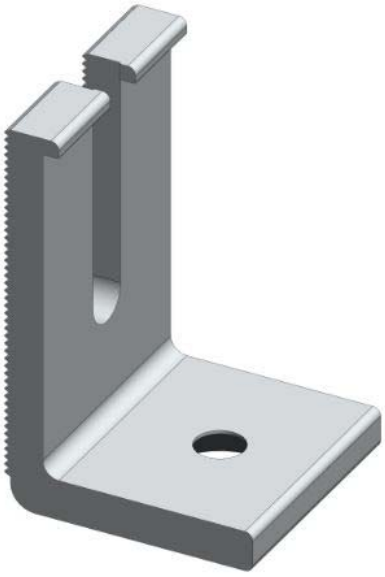
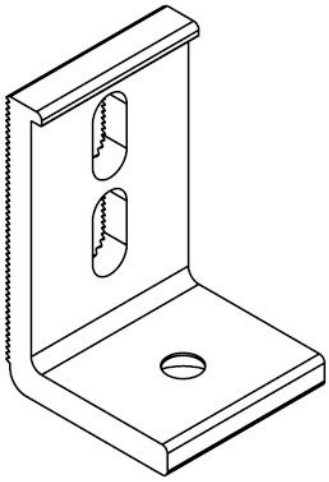


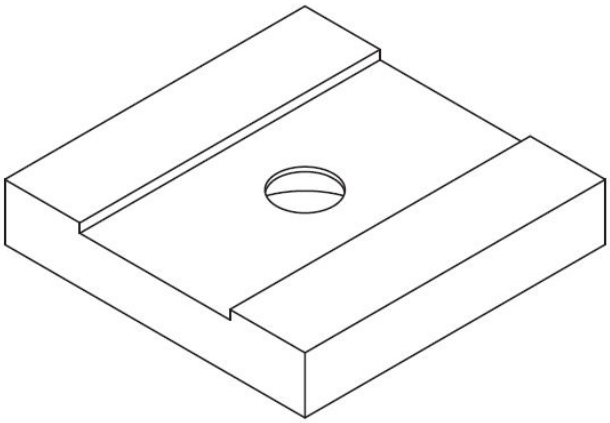
Figure 4: Top Slide



SCL-101-3 Bracket

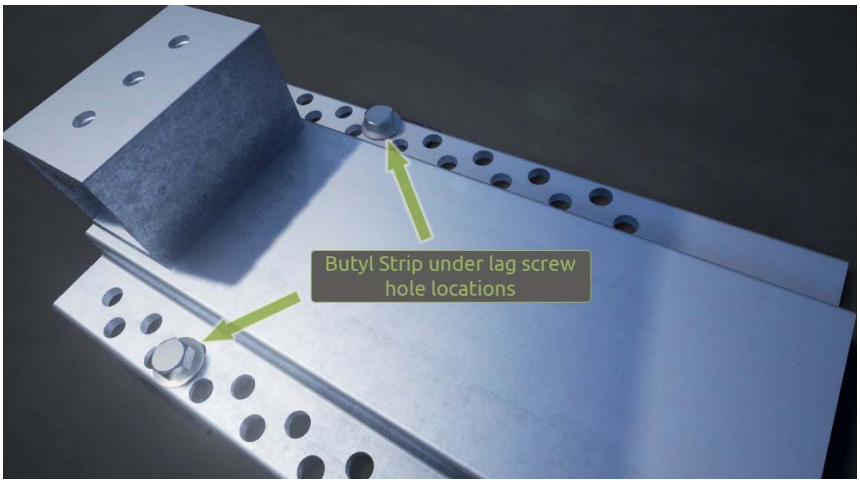


L-102-3 Bracket



CP-SQ Slotted

Figure 5: Brackets



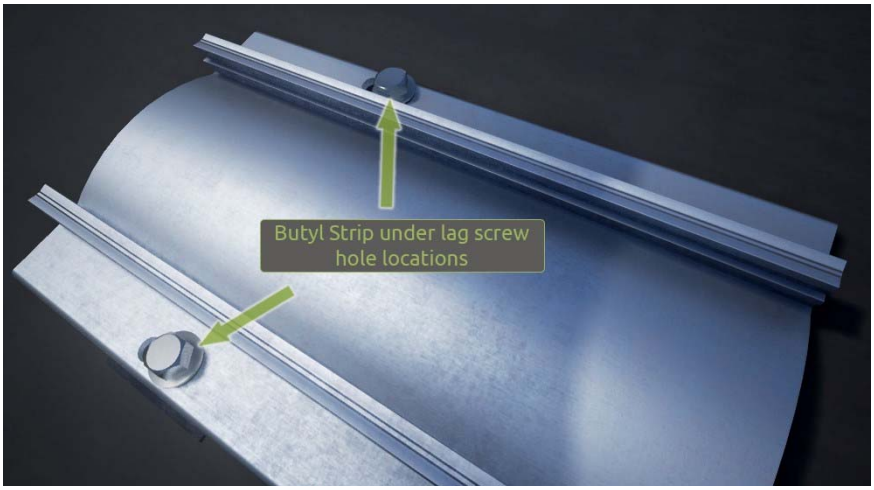


Figure 6: Butyl Strips

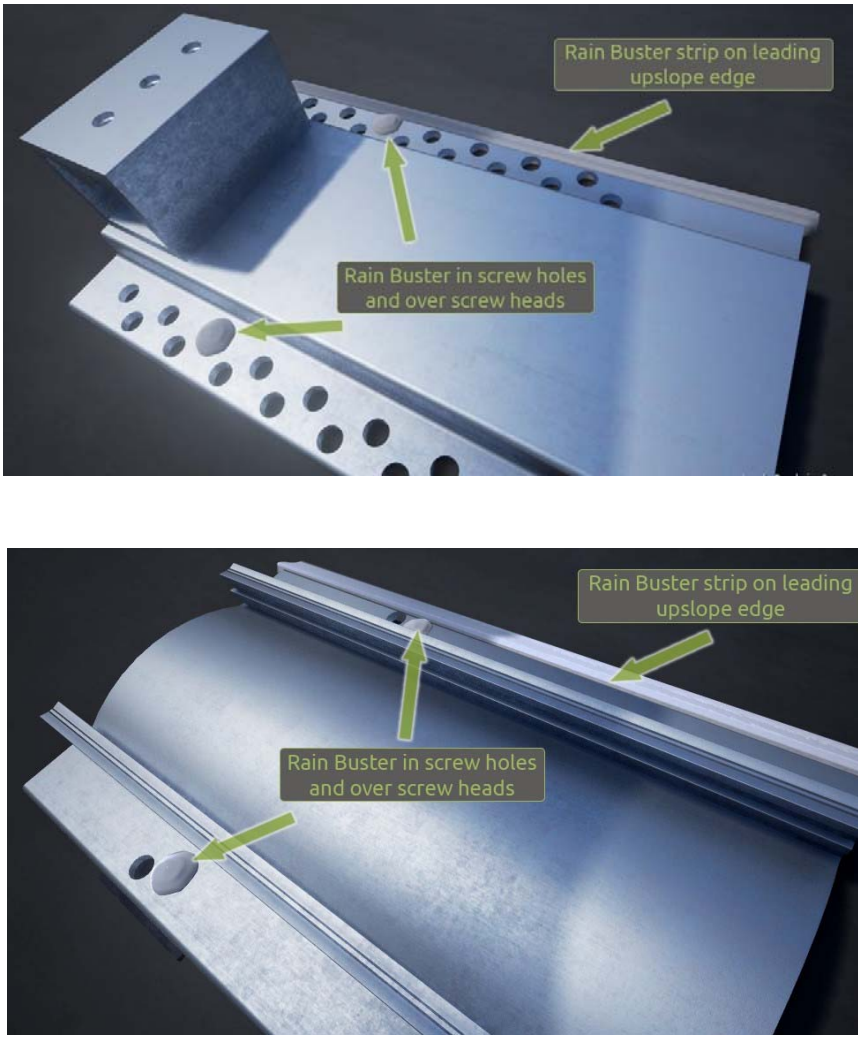


Figure 7: RainBuster