

Seismic Anchor

2013 Edition v1.3

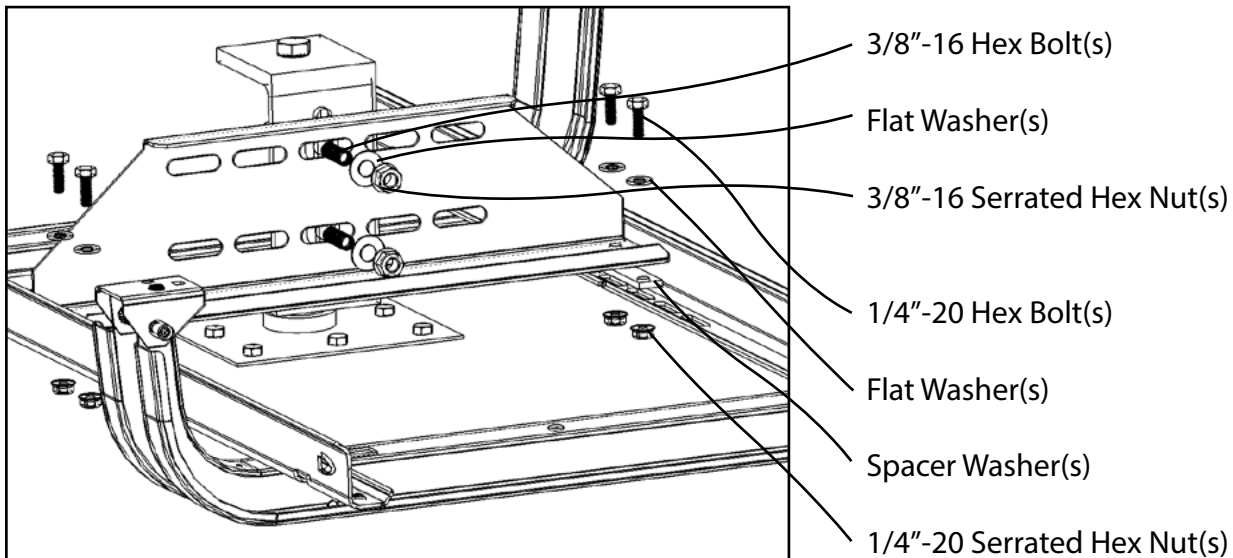
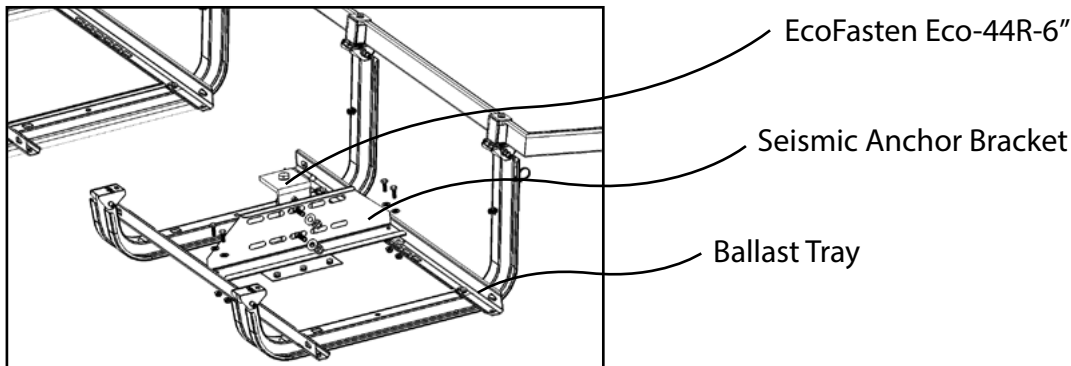
A complete guide to attaching and installing the seismic anchor to the ballasted roof mounting system.

Seismic Anchor Bracket Installation

Important: It is the sole responsibility of the installer to verify roofing warranty status, and if under warranty comply with roofing manufacturer's warranty terms and conditions. Most roofing manufacturers require that certified installers perform all roof penetrations and some require pre-approval and/or post-installation inspections.

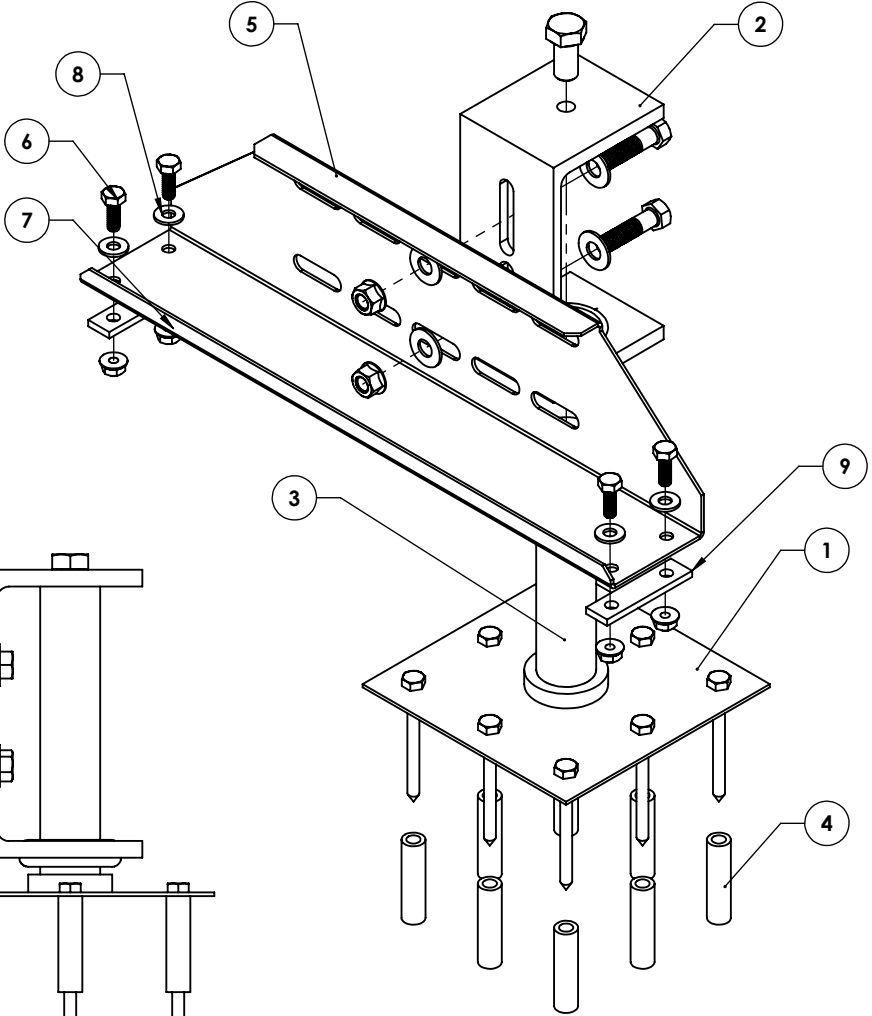
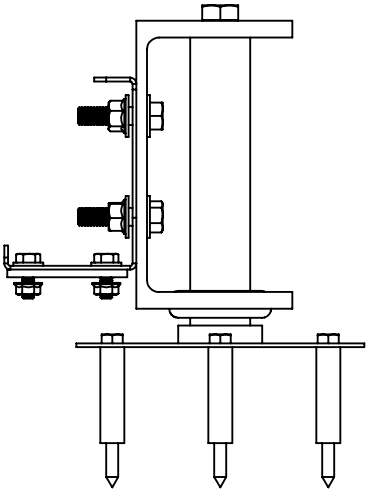
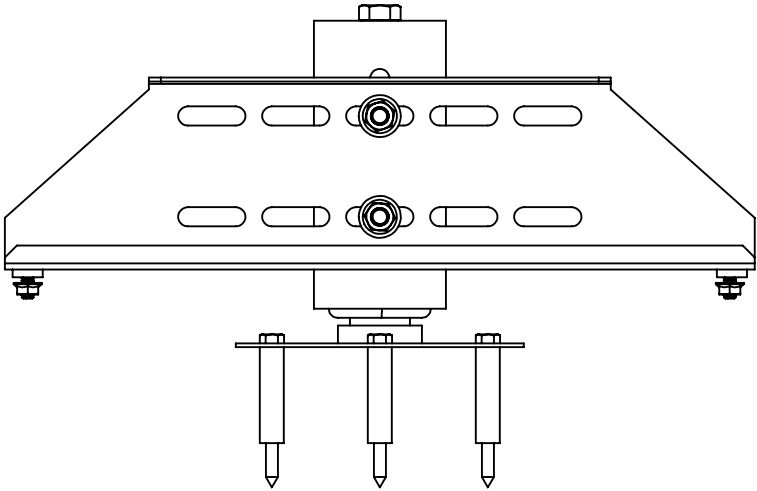
To install the Seismic Anchor Bracket, first install the BRM racking system and modules. Then determine the Seismic Anchor position and mark the location. Make sure to line up Seismic Anchor Bracket holes with Ballast Tray slots, as shown below. Refer to the project stamped engineering drawings for specific Seismic Anchor location(s). Next, install the EcoFasten Eco-44R-6" using the Eco-Fasten detailed installation instructions provided on the following pages. This document also contains test data, certifications and part details for reference.


Once the EcoFasten Eco-44R-6" has been installed, connect the Seismic Anchor Bracket to the C-Bracket (#C-102-6) with two (2) 3/8" Hex bolts and torque to 17 ft-lbs. Then attached the Seismic Anchor Bracket to the Ballast Tray with four (4) 1/4" Hex Bolts and torque to 10 ft-lbs. See illustrations below.



		MATERIAL	FINISH	DIMENSIONS ARE IN INCHES. TOLERANCES: .XX: +/- .030, XXX: +/- .015 ANGLES: +/- 1.5°	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF IRONRIDGE INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF IRONRIDGE INC. IS PROHIBITED.	ZONE	REV.	REVISIONS	DESCRIPTION	DATE	APPROVED

ITEM NO.	P/N	DESCRIPTION	QTY
1	EF-44R-SS	Eco-44R w/ C-102-6	1
2	C-102-6	C-102-6 Assembly	1
3	P-6-CSK	P-6-CSK	1
4	Ferrule-6"	Ferrule	8
5	52-0000-008	Support, Anchor 6"	1
6	23-2520-050	Bolt, 1/4-20 x 0.75 Hex CS SS	4
7	24-3118-440	Nut, 0.25-20 Flanged Hex SS	4
8	25-2502-000	Washer, Flat 1/4" SS	4
9	52-0000-012	Washer, Seismic Anchor	2



DRAWN			
CHECKED			
ENG APPR.			
MFG APPR.			
Q.A.		Assy, Seismic Anchor 6"	
COMMENTS: DO NOT SCALE DRAWING		SIZE A	DWG. NO. BRM-ANC-06
		SCALE:1:4	WEIGHT:
		SHEET 1 OF 1	

Eco-44R-6" PRODUCT GUIDE – FERRULES

Eco-44R-6" Ferrules Contents

Exploded Product View with Installation Instructions – Sec. 1

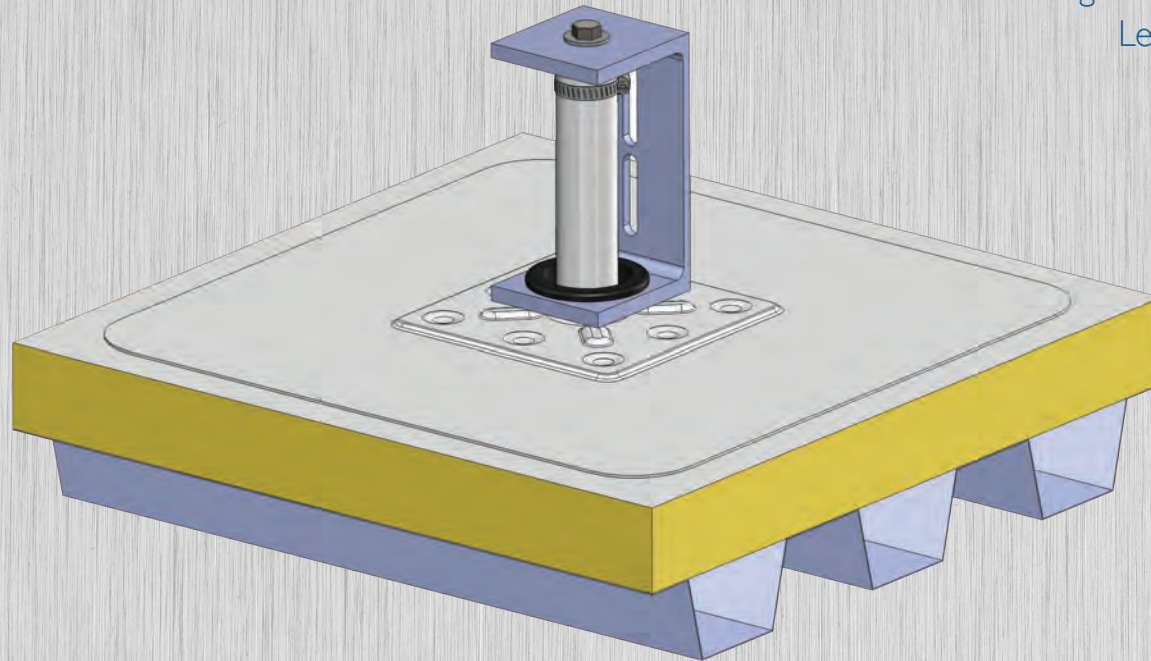
Bill of Materials – Sec. 2

Cutsheets – Sec. 3

Specifications – Sec. 4

Engineer's Test Report – Sec. 5

Leak Test Report – Sec. 6



EcoFasten Solar®

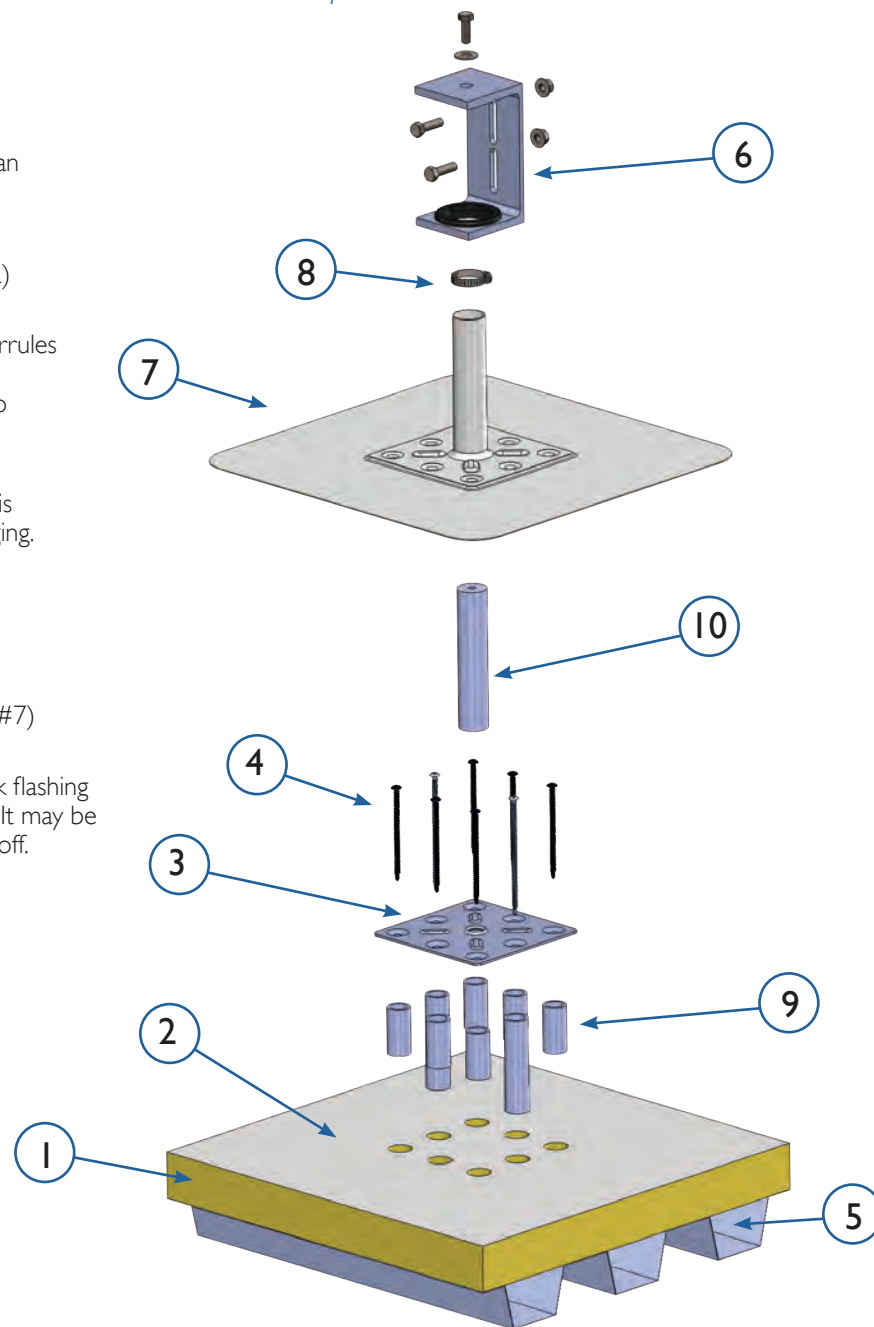
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ECO-44R-6" PRODUCT GUIDE – FERRULES

Exploded Product View with Installation Instructions

1. Determine the locations needed for the Eco-44R-6" brackets.
2. Place base plate (#3) on finished roof deck material.
3. Trace around the plate (#3) and mark the fastener hole locations using an appropriate marking tool.
4. Set base plate (#3) aside.
5. Using a 1" spade bit, drill eight, 1" holes through the roof membrane (#2) and insulation (#1) down to the steel deck (#5).
6. Insert ferrule material (#9) into the holes drilled in the previous step. Ferrules should rest on steel deck and be flush with top of roof membrane (#2). Mark for length (or simply measure with a tape measure). Cut ferrules to proper length for all eight holes. These should be field cut to account for variations in the insulation and steel deck.
7. Fill any voids in and around ferrules (#9) in an appropriate manner that is approved by the roof membrane manufacturer to prevent thermal bridging.
8. Replace base plate (#3) and secure it to the roof using 8 fasteners (#4) of an appropriate length.
9. Install standoff (#10) by threading the post onto portion of the stud.
10. Install acceptable roof membrane manufacturer's plumbing / vent stack (#7) over standoff (#10).
11. Secure stainless steel pipe clamp (#8) around top of plumbing vent stack flashing (#7) with roof membrane manufacturer's acceptable sealant, if required. It may be necessary to trim the flashing so that it is flush with the top of the standoff.





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Materials Needed for Assembly (see figure 1, Sec 1-1)

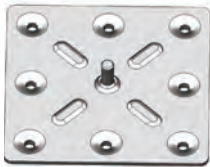
Item No.	Description of Material/Part	Quantity
1	Insulation	By Others
2	Membrane	By Others
3	Eco-44R-6" Baseplate	1
4	Fastener (Length to be determined)	8
5	Structural Steel Roof Deck	By Others
6	C-102-6	1
7	Pipe Flashing with 1-1/4" Boot (May be provided by others, but must match roof material)	By Others
8	Stainless Steel Hose Clamp	By Others
9	Ferrules (Must be cut to length)	8
10	P6-CSK (1-1/4" OD)	1

Required Tools

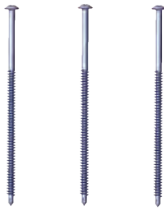


Base Components Needed

#3



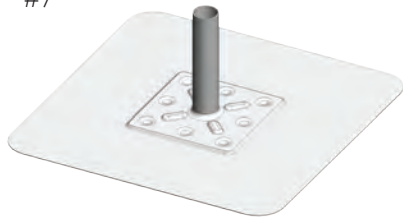
#4



#6



#7



#8



#9



#10

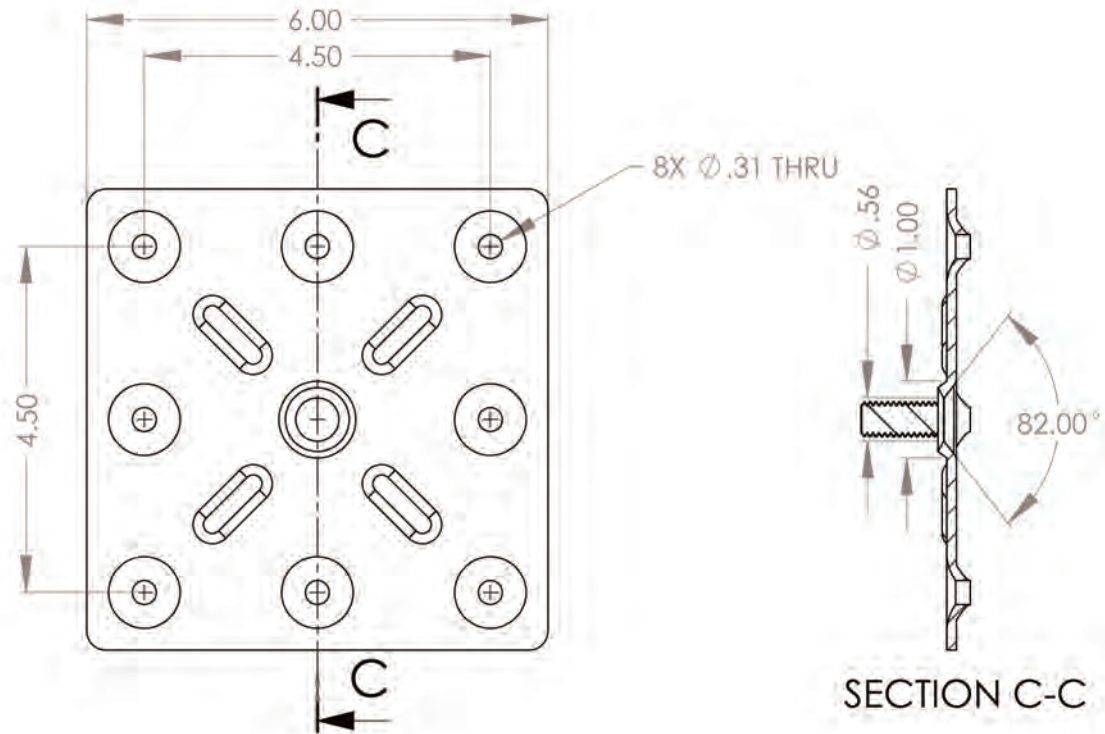


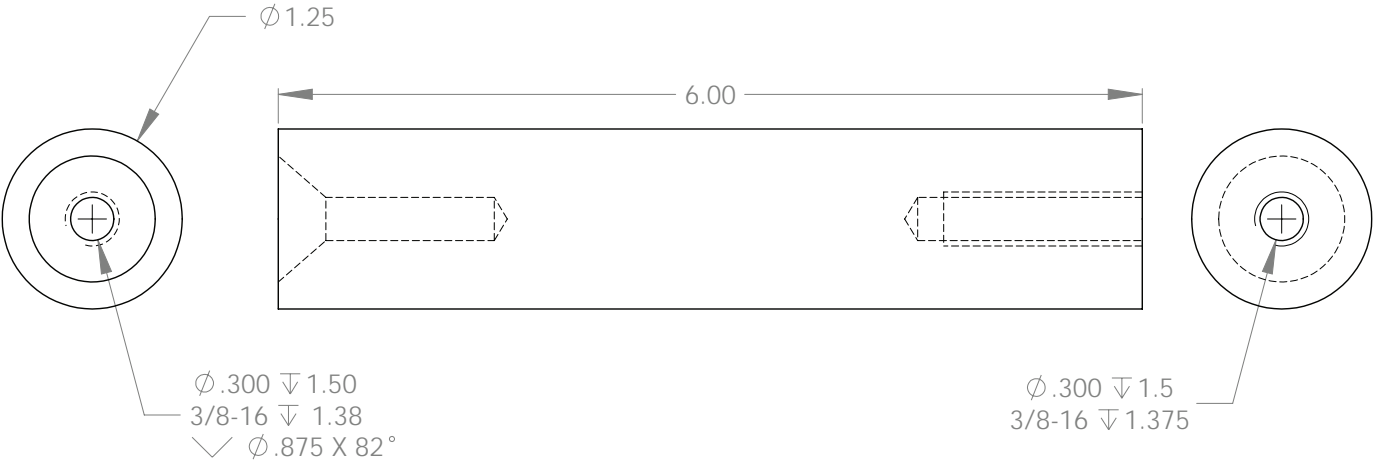


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Notes:

1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings
3. Contact manufactureres for dailed layout

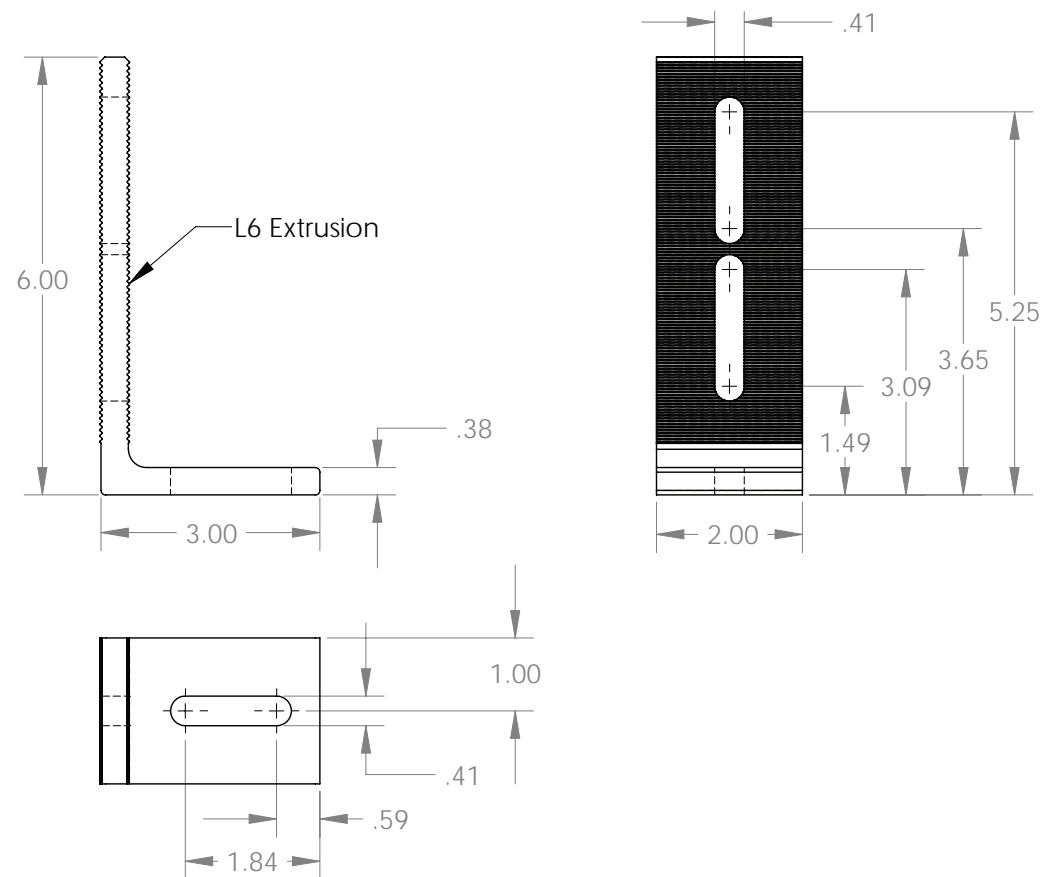




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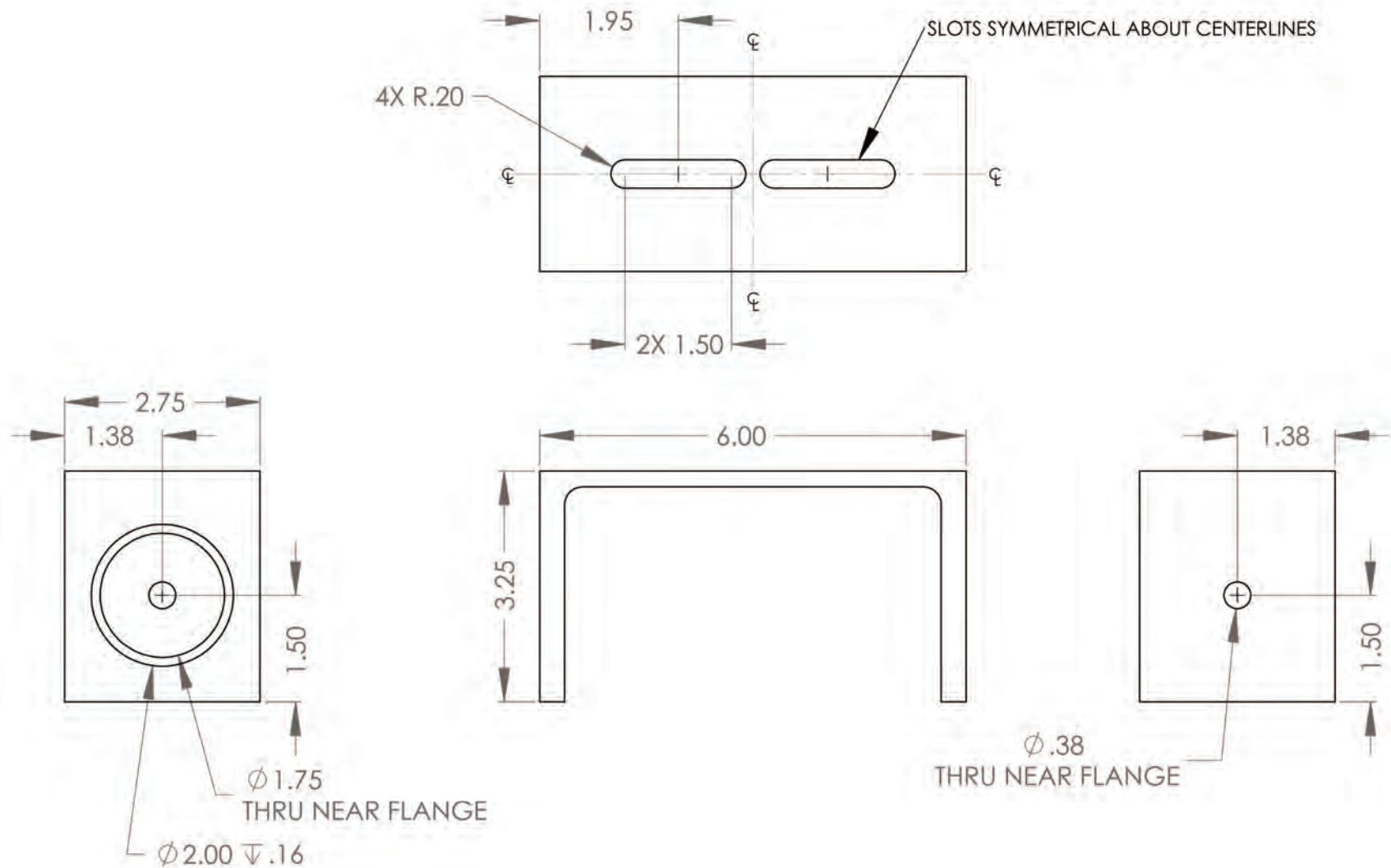


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PART 1 – GENERAL

1.1 SUMMARY

A. WORK INCLUDES:

1. Eco-44R-6" Solar attachment bracket that attaches directly to the roof deck.
2. Provide appropriate bracket and fasteners for the roof system.

B. RELATED SECTIONS:

1. Section 07600: Flashing and Sheet Metal
2. Section 07500: Membrane Roofing
3. Division 1: Administrative and procedural requirements
4. Division 7: Thermal and Moisture Protection

1.2 SYSTEM DESCRIPTION

A. COMPONENTS:

1. Eco-44R system consists of post and base plate
2. Fasteners
 - A. To be of metal compatible with base plate.
 - B. Fasteners should be selected for compatibility with the roof deck
 - C. Fastener strength should exceed or be equal to that of the allowable load of the system. See test data at www.ecofastensolar.com
3. Standoff Post
4. Plumbing Boot
5. Pipe Clamp
6. Sealant (if required by roof manufacturer): to be membrane roof manufacturer approved.

B. DESIGN REQUIREMENTS:

1. Bracket spacing to be recommended by project engineer.
2. Install a minimum of eight fasteners per base plate.
3. It is important to design new structures or assess existing structures to make sure that they can withstand retained loads.

1.3 SUBMITTAL

- A. Submit manufacturer's written specifications.
- B. Submit standard product cut sheets.
- C. Submit installation instructions.
- D. Submit product specific load test data, showing ultimate and allowable load values.

1.4 QUALITY ASSURANCE

Installer to be experienced in the installation of specified roofing material for not less than 5 years in the area of the project.

1.5 DELIVERY / STORAGE / HANDLING

Inspect material upon delivery. Notify manufacturer within 24 hours of any missing or defective items. Keep material dry, covered and off the ground until installed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

EcoFasten Solar, 289 Harrel Street
Morrisville, VT. 05661 (877) 859-3947
www.ecofastensolar.com

2.2- MATERIALS

- A. Attachment Bracket
 - 6000 Series Aluminum (choose one)
 1. SL-102-6
 2. C-102-6
 3. P-6-CSK
 4. Custom
- B. Base Plate is 11 gauge material thickness. (Choose material)
 1. 304 Stainless Steel with one 1/2" 304 stainless steel machine screws welded into embossed countersink.
 2. 1018 hot rolled and pickled steel with one 1/2" 304 stainless steel machine screw welded into embossed countersink.

- C. Fasteners (can be purchased from others) to be compatible with chosen roof application and meet specified pull out values as shown in load test data.
- D. Base Plate Support Mechanism: Aluminum Ferrules 6000 series aluminum, 1" O.D. 1/8" wall thickness.
- E. Plumbing boot, (may be supplied by others) to be compatible with roofing material, roofing material manufacturer's acceptable installation technique, and of an acceptable size to meet roof manufacturer's specifications.
- F. 1-1/4" I.D. Aluminum Post-Series 6000 aluminum with 3/8-16" threaded hole in one end, countersink in opposite end.
- G. Stainless steel pipe clamp 1 1/4" adjustable.

2.3 FINISH – Mill Finish

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Substrate: Inspect structure on which brackets are to be installed and verify that it will withstand any additional loading that it may incur. Notify General Contractor of any deficiencies before installing EcoFasten Solar's Eco-44R brackets.
- B. Verify that roofing material has been installed correctly prior to installing solar attachment brackets.

3.2 INSTALLATION

Comply with architectural drawings and project engineer's recommendations for location of system. Comply with Manufacturer's written installation instructions for installation.

Engineer's Test Report - EF-SS-44R Base Plate

Page 1



ABEngineering LLC
Design, Controls, Engineering Services
117 Hanon Drive, Williston, VT 05495-8851

At the request of Alpine SnowGuards we tested the EF-SS-44R roof mount base plate using the apparatus and methods described in ASTM D1761-06. The ASTM test was modified as required to accommodate multiple fasteners.

These tests measured the maximum pullout or lateral force the roof mount base plate would sustain in a given material. The actual performance of the roof mount base plate in a given installation may be different.

The roof mount base plate (Figure 1) as tested was made of an unpainted 304 stainless steel with a countersunk boss for a stainless steel 3/8" flathead socket cap screw. The screw was welded on the backside to prevent rotation in an installed roof mount base plate. There are eight 5/16" diameter countersunk holes for attaching the base plate to the roof.

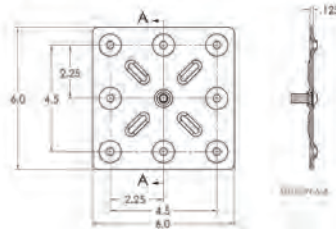


Figure 1 - Roof Mount Base Plate

The roof mount base plate was fastened to 18 Gauge HSB 36 metal roof decking using eight appropriate length XHD Fastener Company. The base plate was offset from the nearest deck surface by 2" using ~1" diameter aluminum tubes similar to what would be used when installing a deck plate on top of insulation (Figure 2, 3). An aluminum sealing washer was installed on the 3/8" stud to provide a flat attachment surface for the load fixture.

Several samples were tested for pullout (perpendicular to decking) and lateral strength (parallel to decking). Lateral loads are applied at level of the deck plate. Figure 4 shows the lateral load fixture and figure 5 shows the pullout test fixture.

Engineer's Test Report - EF-SS-44R Base Plate

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Mount Base Plate Testing

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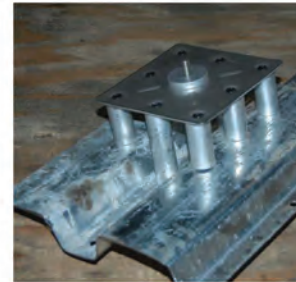


Figure 2 - Base plate mounted on 18ga decking

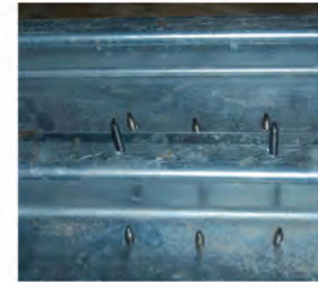


Figure 3 - Back side of decking



Figure 4 - Lateral test fixture



Figure 5 - Pullout test fixture

Engineer's Test Report - EF-SS-44R Base Plate

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Mount Base Plate TestingPage: 3 of 4
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Loads were applied slowly, a typical test pullout test would take 5 minutes from first load to failure. Tests were performed using a recently calibrated load cell. The table below lists the resulting maximum loads.

Condition	Direction	Maximum Load lb (kN)
Lateral	Along	2179 (9.69)
Lateral	Corrugations	2884 (12.83)
Lateral/ Transverse	90° to Corrugations	1642 (7.30)
Pullout	Perpendicular to deck	4347 (19.34)
Pullout		2708 (12.05)

The typical pullout failure mode was either the head popping off one or more fasteners or the fastener pulling out of the decking material (Figure 6).



Figure 6 - Pullout test result

The typical lateral failure was a combination of spacer tube rotation, screw head failure and screw pullout from the roof deck (Figure 7). There was considerable deformation prior to failure. The decking was permanently deformed due to the moment imposed on the decking by the standoffs.



Figure 7 - Lateral load test result

Engineer's Test Report - EF-SS-44R Base Plate

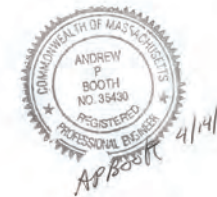
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The last test condition was applying a lateral load 90° to the decking corrugations as shown in figure 8. The decking was badly deformed which contributed to the relatively low failure load.



Figure 8 - 90° Lateral load test results.



Engineer's Test Report - C-102-6 Bracket

Engineer's Test Report - C-102-6 Bracket



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ABEngineering LLC
Design, Controls, Engineering Services
117 Hanon Drive, Williston, VT 05495-8851

At the request of Alpine SnowGuards we tested the C-102-6 roof mount bracket using the apparatus and methods described in ASTM D1761-06. The ASTM test was modified as required to accommodate multiple fasteners and for use with metal roof decking.

These tests measured the maximum pullout or lateral force the roof mount bracket would sustain for a given roof deck material. The actual performance of the roof mount bracket in a given installation may be different due to factors beyond the scope of this report.

The roof mount bracket (Figure 1) as tested was made of an unpainted 304 stainless steel with a countersunk boss for a stainless steel 3/8" flathead socket cap screw. The screw was welded on the backside to prevent rotation in an installed roof mount bracket.

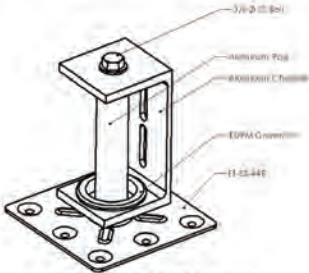


Figure 1 - C-102-6 bracket

There are eight 5/16" diameter countersunk holes for attaching the bracket to the roof. The 1" diameter post and C channel are made of a 6000 series aluminum. The grommet is EDPM. As tested samples were bare aluminum.

The roof mount bracket was fastened to .035" thick "B" style metal roof decking using eight appropriate length XHD Fasteners. The bracket was offset from the nearest deck surface using 1" diameter aluminum tubes similar to what would be used when installing a deck plate on top of insulation (Figure 3).

Alpine SnowGuard
C-102-6 Pullout Testing

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Figure 2 - Test fixture



Figure 3 - Pullout test



Figure 4 - Lateral test

Several samples were tested for pullout (perpendicular to decking) and lateral strength (parallel to decking). Lateral loads are applied at level of the deck plate. Figure 2 shows the load test apparatus. Figure 3 shows a typical pullout test and figure 4 shows a typical lateral test.

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C-102-6 Pullout Testing

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Engineer's Test Report - C-102-6 Bracket

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Figure 5 - Pull test failure- one bolt



Figure 6 - Pull test failure- two bolts



Figure 7- Lateral test failure

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C-102-6 Pullout Testing

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ECO-44R-6" PRODUCT GUIDE – FERRULES

Engineer's Test Report

Engineer's Test Report - C-102-6 Bracket

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Loads were applied slowly, a typical test pullout test would take 3-5 minutes from first load to failure. Tests were performed using a recently calibrated load cell. The table below lists the resulting maximum loads.

Condition	Roof Material	Direction	Maximum Load lb (kN)	Failure Mode
"Pullout	.0035" Steel	Perpendicular to deck	2633 (11.7)	Top bolt broke
Lateral w load point farthest away from deck		Parallel to decking/ Along Corrugations	2318 (10.3)	Mounting screwheads failed
Lateral w load point closest to deck (Fig 7)			3892 (17.3)	
Pullout	3/4" Plywood	Perpendicular to deck	2688 (11.9)	Screws pulled out of plywood
Lateral w load point farthest away from deck		Parallel to decking	2056 (9.1)	

The typical pullout failure mode for pullout testing was severe bending in the C section and failure of the 3/8" top bolt head due to prying action of the C channel (Figure 5). Figure 6 shows pullout using two bolts.

The typical lateral failure was a combination of screw head failure and screw pullout from the roof deck (Figure 7). Note that figure 7 shows the load point positioned at the bottom of the slot closest to the deck. Both top of slot and bottom of slot results are listed in the table above. There was considerable deformation of the decking prior to failure for the lateral load test condition.



Leak Test

EcoFasten Solar® tested the EcoFasten roof mount system so you can be sure your roof penetrations won't leak, even when under standing water.

A paper towel was inserted above and below the base plate in this mock installation to provide a visual indication if any of the green water leaks past the flashing. The membrane is a 45mil reinforced EPDM from Carlisle.



Leak Test

The apparatus is pressurized to 30psi and left to stand for over 10 minutes. This is equivalent to nearly 70ft of standing water. The green water leaks past the flashing. The membrane is a 45mil reinforced EPDM from Carlisle.

The patented compression fitting between the cone shape of the base plate and the countersink in the bracket makes the EcoFasten system water tight. Water finds its way between the bracket and membrane but stops at the base of the compression fitting and can go no further.

Neither of the paper towels shows any indication of leaking. The EcoFasten system is 100% water tight.

