

September 20th, 2021

EcoFasten

4141 West Van Buren St.

Phoenix, AZ 85009

Attn.: John Hudson, Senior Director of Product, EcoFasten

Re: Ecofasten *RockIT Flashless Slide Assembly* Roof Attachment with *Rockit Mount* Allowable Capacities

This letter certifies the structural capacity of the EcoFasten *RockIt Flashless Slide Assembly* for use as a roof attachment, in combination with a *RockIt Mount*, on *RockIt* solar systems. The *RockIt Flashless Slide Assembly* consists of an extruded aluminum slide, that contains 8 punched holes used for roof attachment via #12 wood screws. The *RockIt Mount* includes a pedestal which attaches to the slide and allows for horizontal system adjustment while a leveling bolt provides vertical adjustment of the PV module. The tested *RockIt Flashless Slide Assembly* with *RockIt Mount*, simplified as *RockIt Flashless Assembly* going forward in this letter, details and component dimensions are shown in drawing 850076.

The structural capacities of the *RockIt Flashless Assembly* were determined from mechanical load testing along four respective load directions including uplift, compression, lateral parallel to the rafter, and lateral perpendicular to the rafter. The capacity ratings are based on structural load tests performed using a Universal Instron Test Unit according to ASTM D1761-20 "*Standard Test Methods for Mechanical Fasteners in Wood and Wood Based Materials*". For each load test a *RockIt Flashless Assembly* was installed onto a sample roof deck composed of 7/16" OSB Board over 2x4 rafters as shown in Figure 1. The moisture content and the specific gravity of the rafters were measured per ASTM D2395-17 "*Standard Test Methods for Density and Specific Gravity (Relative Gravity) of Wood and Wood-Based Materials*". The recorded moisture content of the rafters among all sample roof decks is between 12% and 14% and the specific gravity was 0.42. The tested *RockIt Flashless Assembly* was affixed to the roof deck structure via 3" long #12 stainless steel wood screws per the requirements specified by the Ecofasten *RockIt* Installation Guide. For each test a minimum of two screws were placed within the middle third of the rafter and, if required, any remaining screws were installed to the adjacent roof deck. Configurations which reflect the varied positions of the *RockIt Mount* along the slide, as well as position of the leveling bolt for the vertical adjustment of the PV module, from ½" above and ½" below pre-assembly nominal position, were included in the testing. The worst-case failure associated with the lowest test result among the different configurations along the specified load direction tested is reported here and summarized in Table 1.

The failure observed under the uplift load was wood screw withdrawal from the OSB roof deck at the peak load of 1590lbs, which is the average of five (5) tests provided. With a safety factor of 3 applied per ASTM D7147 to the screw withdrawal, **the allowable uplift capacity is 530 lbs.** The above allowable capacity is applicable to roof decks with a rafter specific gravity greater than or equal to 0.42, which was the average wood specific gravity recorded in the uplift load tests.

The failure under the compression load was recorded as crushing of the OSB deck above the rafter in bearing. The average of peak loads from five (5) compressive tests is 2809 lbs. With a safety factor of 2.54 applied per NDS 2018 to the deck bearing failure, **the allowable compression capacity is 1106 lbs.**

For the lateral load tests two load directions, parallel and perpendicular to the rafter, were tested. Under each lateral load, the *RockIt Flashless Assembly* was tested in two load positions, with *RockIt Mount* placed ½" above or below the pre-

assembled nominal position on the leveling bolt. For the lateral load parallel to the rafter, the critical failure mode which results in the lowest allowable capacity was observed to be flexural yielding of the mount leveling bolt. The average of the bending loads from five (5) lateral load tests is 237 lbs and with a safety factor of 1.67 per AISC 360-16 for the bolt yielding, **the allowable capacity for a lateral load parallel to the rafter is 142 lbs.** The critical failure mode for the lateral load perpendicular to the rafter is aluminum fracture of the *RockIt Flashless Assembly* slide foot. The average of the fracture loads from five (5) tests is 201 lbs and with a safety factor of 1.95 per ADM-2015 for the aluminum fracture, **the allowable capacity for a lateral load perpendicular to the rafter is 103 lbs.** For each lateral load direction, the average of the rafter specific gravity was measured to be 0.42. The specified allowable lateral capacities above shall be used when the supporting rafter has a specific gravity 0.42 or greater.

Please note the test investigation and its results described herein were based on the load tests performed on the *RockIt Flashless Assembly* as a stand-alone roof attachment. It is not the intention of the letter to rate or certify *RockIt* system level performance or structural components other than those mentioned in this letter. This evaluation excludes the structural adequacy of the chosen PV modules, or underlying roof supporting members. For those, it shall be the responsibility of the system designer or engineer to verify the structural capacity and adequacy regarding the applied or resultant loads of the chosen array configuration.

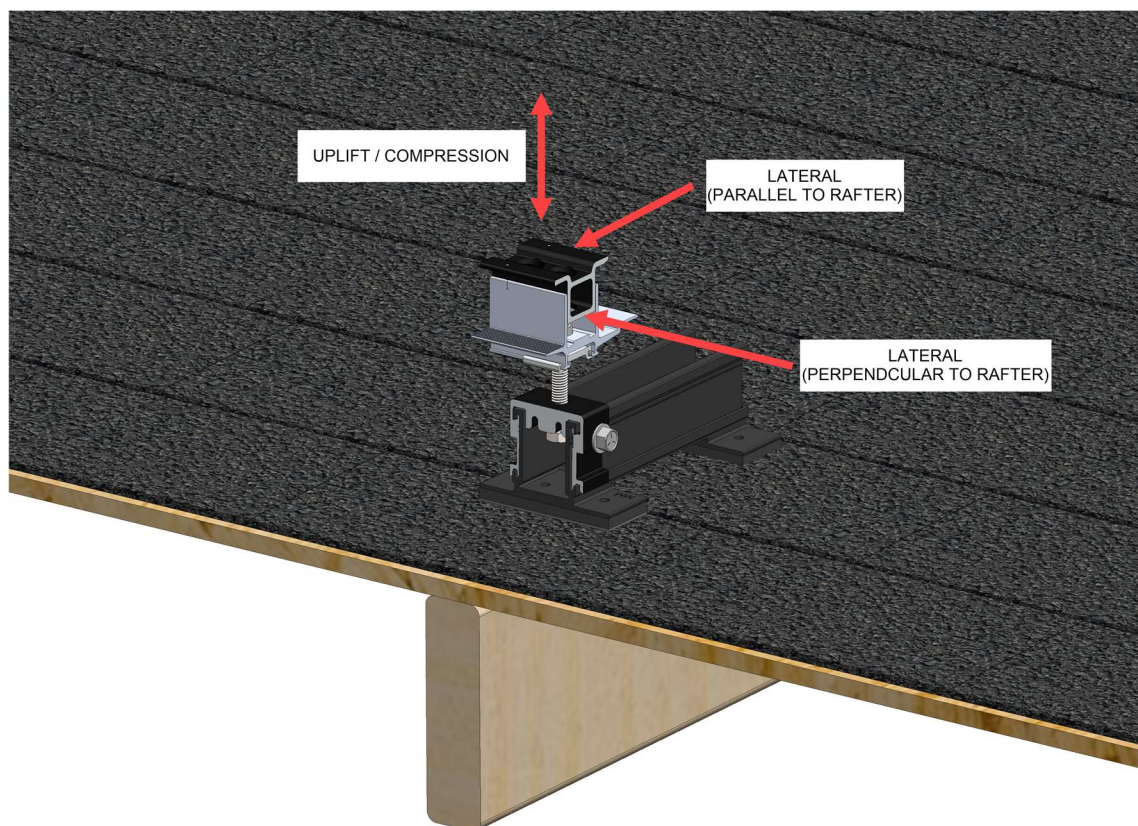


Figure 1: RockIt Flashless Assembly and Applied Loading Directions

Table 1 Ecofasten RockIt Flashless Assembly ⁽¹⁾

Load Direction	Test Quantity	Average Peak Failure Load (lbs)	Deviation of test results ⁽⁴⁾	Critical Failure Mode	Safety Factor ⁽⁵⁾	Allowable Capacity (lbs) ⁽⁶⁾
Uplift ⁽²⁾	5	1590	8.68%	Wood Screw Pullout	3	530
Compression ⁽³⁾	5	2809	3.55%	OSB Deck Bearing Rupture	2.54	1106
Lateral Parallel to Rafter	5	237	4.45%	Leveling Bolt Yielding	1.67	142
Lateral Perpendicular to Rafter	5	201	2.33%	Aluminum Rupture at Slide Foot	1.95	103

(1) Capacities apply to a roof structure with the minimum component size of a 2x4 rafter, and a roof deck thickness of 7/16" and 3" long #12 wood screws installed per the Ecofasten RockIt Flashless Installation Guide. Rafters and roof deck should be in sound structural condition with no sign of rot, decay, previous installation, or pre-existing damages.

(2) The uplift direction is upward perpendicular to the roof surface. The uplift capacity shall be used when the direct supporting rafter has a specific gravity 0.42 or greater.

(3) The compression direction is downward perpendicular to the roof surface.

(4) Deviation reflects the variance of the highest or the lowest test value from the group mean for the respective loading direction.

(5) Safety Factor is associated with respective failure modes recorded and determined per AISC 360-16, ADM-2015, NDS-2018 and ASTM-7147

(6) The Allowable Capacity is equal to the Average Peak Failure Load divided by its safety factor.

(7) The certified capacity in Table 1 shall be used when all Ecofasten provided components are used with no other generic replacement parts.

Sincerely,



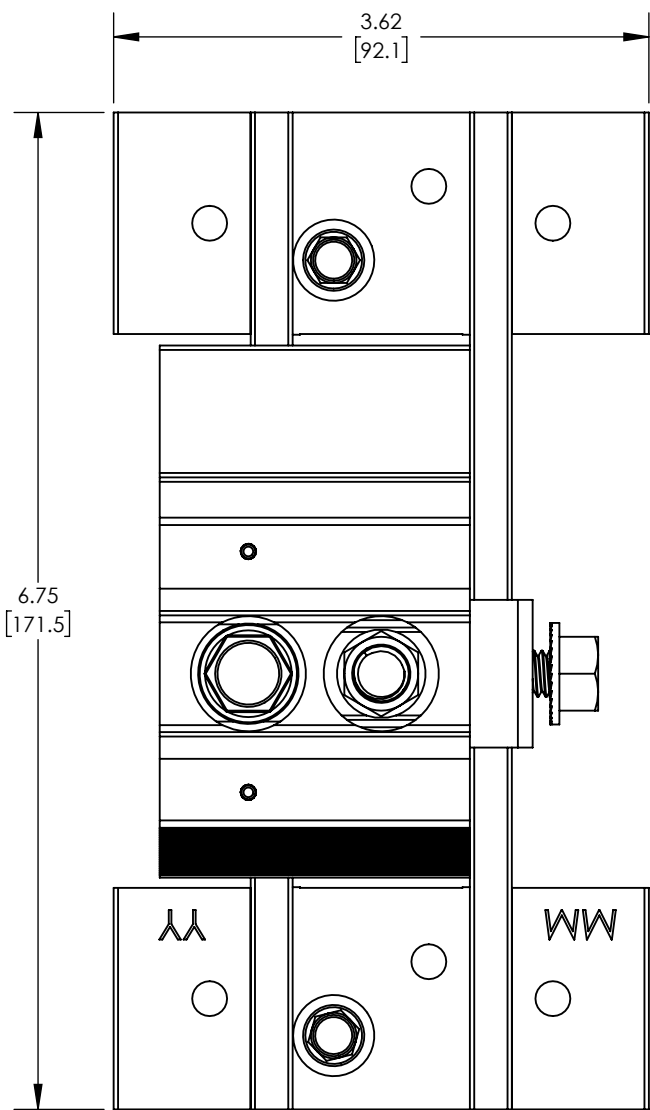
Gang Xuan SE

Senior Structural Engineer

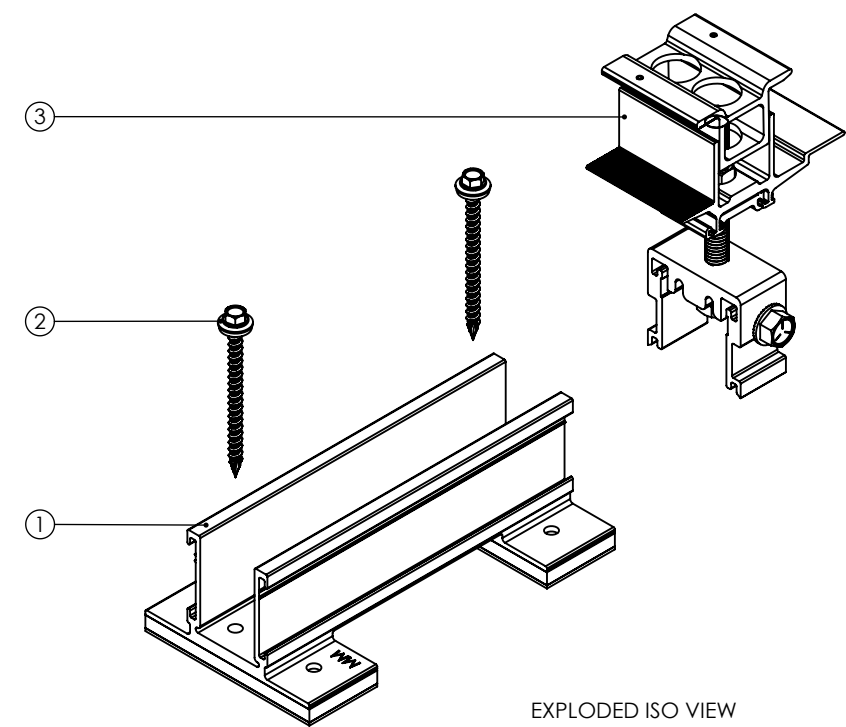
Matthew S Kuzila PE

Structural Engineer

ITEM NO.	PART NUMBER	REV	DESCRIPTION	QTY.
1	70-00041	X04	ROCKIT FLASHLESS SLIDE ASSEMBLY	1
2	70-00053	X02	SELF TAPPING SCREW #12X3" WITH A SEALING WASHER ASSEMBLY	2
3	750101	B	ROCKIT V3 MNT 30 TO 40MM ASSEMBLY	1



TOP VIEW



EXPLODED ISO VIEW

THIRD ANGLE PROJECTION		DRAWN	M. STANCIC	09/16/2021
		CHECKED	-	-
		ENG APPR.	-	-
		MFG APPR.	-	-
		Q.A.	-	-
DO NOT SCALE DRAWING		INTERPRET DIM AND TOLERANCE PER ASME Y14.5[M]-2009		
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ESDC INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ESDC INC. IS PROHIBITED. COPYRIGHT © 2020 ESDC INC.		DIMENSIONS TOLERANCES ARE IN:		
		INCHES. [MILLIMETERS]		
		.XX: +/- .030 .X: +/- .75		
		.XXX: +/- .010 .XX: +/- .25		
ANGLES: +/- 1°		SIZE A DWG. NO. 850076 REV.		
		WEIGHT: 1.14 LBS		SHEET 1 OF 1

ESDEC
INNOVATIVE MOUNTING SYSTEMS
ROCKIT FLASHLESS TEST ASSEMBLY