

# SNR SOLAR LLC. DBA SNAPNRACK MIAMI-DADE TEST REPORT

## SCOPE OF WORK

ASTM D7147 UPLIFT AND SHEAR TESTING ON THE *ULTRAFOOT, RAFTER* MOUNT WITH ONE, 5/16 IN BY 4-1/2 IN LAG SCREW - RAFTER MOUNT

## REPORT NUMBER

S1173.02-119-18 R1

## TEST DATES

12/04/24 - 12/19/24

## ISSUE DATE

01/21/25

## REVISED DATE

02/04/25

## RECORD RETENTION END DATE

12/19/34

## MIAMI-DADE COUNTY NOTIFICATION NO.

ATI24091

## LABORATORY CERTIFICATION NO.

22-0428.14

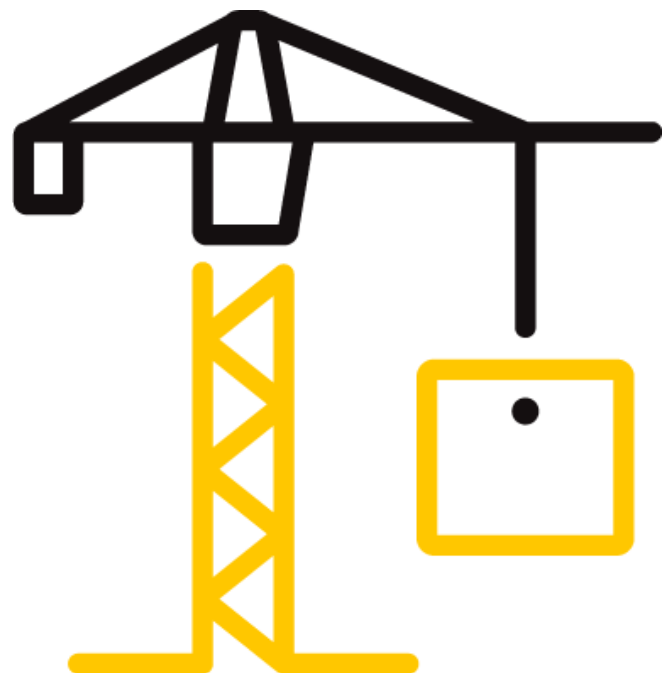
## PAGES

18

## DOCUMENT CONTROL NUMBER

RT-R-AMER-Test-2790 (06/05/24)

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## TEST REPORT FOR SNR SOLAR LLC. DBA SNAPNRACK

Report No.: S1173.02-119-18 R1

Date: 01/21/25

Revised Date: 02/04/25

### REPORT ISSUED TO

#### SNR SOLAR LLC. DBA SNAPNRACK

775 Fiero Lane, Suite 200

San Luis Obispo, CA 93401

### SECTION 1

#### SCOPE

Architectural Testing, Inc. (an Intertek company) dba Intertek Building & Construction (B&C) was contracted by SNR Solar LLC. dba SnapNrack to perform uplift and shear load testing on their *UltraFoot*, *Rafter* mount with one, 5/16 in by 4-1/2 in lag screw - rafter mount. Results obtained are tested values and were secured by using the designated test method. Testing was conducted at the Intertek test facility in York, Pennsylvania.

Intertek B&C in York, Pennsylvania has demonstrated compliance with ISO/IEC International Standard 17025 and is consequently accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc. (IAS).

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. Intertek B&C will service this report for the entire test record retention period. The test record retention period ends ten years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained for the entire test record retention period.

For INTERTEK B&C:

<b>COMPLETED BY:</b>	Adam J. Schrum
<b>TITLE:</b>	Project Manager
<b>SIGNATURE:</b>	
<b>DATE:</b>	02/04/25

<b>REVIEWED BY:</b>	V. Thomas Mickley, Jr., P.E.
<b>TITLE:</b>	Senior Staff Engineer
<b>SIGNATURE:</b>	
<b>DATE:</b>	02/04/25

<b>COMPLETED BY:</b>	Tanya A. Dolby, P.E.
<b>TITLE:</b>	Engineering Manager
<b>SIGNATURE:</b>	
<b>DATE:</b>	02/04/25

AJS:vtm/tad/aas

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### SECTION 2

#### SUMMARY OF TEST RESULTS

##### *UltraFoot, Rafter Mount with One, 5/16 in by 4-1/2 in Lag Screw - Rafter Mount*

<b>UPLIFT RESISTANCE <sup>1</sup></b>	Average Load at 1/8 in Displacement - 474 lbf Average Ultimate Load - 2213 lbf
<b>SHEAR PARALLEL TO THE RAFTER <sup>1, 2</sup></b>	Average Load at 1/8 in Displacement - 571 lbf Average Ultimate Load - 2288 lbf
<b>SHEAR PERPENDICULAR TO THE RAFTER <sup>1, 2</sup></b>	Average Load at 1/8 in Displacement - 777 lbf Average Ultimate Load - 2462 lbf

<sup>1</sup> Test/Ulimate loads should not be used as design loads or safe working loads.

<sup>2</sup> Shear loads represent the capacity of the mount to roof connection only and not the shear capacity of the mount as an assembly.

### SECTION 3

#### TEST METHOD

The specimens were evaluated in general accordance with the following:

**ASTM D7147-11 (Reapproved 2018)**, *Standard Specification for Testing and Establishing Allowable Loads of Joist Hangers*

The uplift and shear load testing reported herein evaluated the connection of the *UltraFoot, Rafter* mount to the mock roof and did not evaluate the *UltraFoot, Rafter* mount with an attached *Ultra Rail* mount or panel.

### SECTION 4

#### MATERIAL SOURCE

Test samples were provided by the client. Representative samples of the test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

Each tested specimen was installed on a mock roof consisting of one 12 in square piece of 15/32 in plywood sheathing, one piece of 30# felt underlayment, and one, three-tab shingle.

### SECTION 5

#### EQUIPMENT

Testing was performed in an Instron Model 5989 Universal Testing Machine. Load and deflection were recorded manually using either the crosshead movement of the test machine, a 2-inch travel Instron<sup>®</sup> Model 3540-200T-ST deflectometer or a dial indicator accurate to 0.001 in.

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### SECTION 6

#### LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Shawn E. Beamer	Intertek B&C
Adam J. Schrum	Intertek B&C

### SECTION 7

#### TEST SPECIMEN DESCRIPTION

The *UltraFoot, Rafter* mount is a 2 in long angle-shaped aluminum extrusion with a 2-3/4 in horizontal leg and a 3 in vertical leg (flange). Each mount was fastened to the joist (rafter) of the mock roof with one, 5/16-9 by 4-1/2 in, stainless steel, hex-head, Type A point lag screw with sealing washer.

Drawings are included in Section 11 to verify the overall dimensions and other pertinent information of the tested product, its components, and any constructed assemblies.

### SECTION 8

#### TEST PROCEDURE

The purpose of this testing was to determine the uplift and shear load capacity of the product in accordance with ASTM D7147.

##### *Uplift Resistance Testing*

The mock roof assemblies were rigidly mounted to the base of an Instron Model 5989 Universal Test Machine. Load was applied in tension to the 3 in leg of the aluminum angle bracket, through a load cell attached to the testing machine crosshead. Test speed was 0.05 in/min. Displacement was taken with the crosshead movement of the test machine, which was zeroed at zero load. Ultimate load was the maximum load the test assembly could carry.

##### *Shear Load Testing*

The mock roof assemblies were rigidly mounted to the base of an Instron Model 5989 Universal Test Machine. Load was applied to the base of the angle bracket in both a parallel and perpendicular orientation to the joist through a load cell attached to the testing machine crosshead. Test speed was 0.10 in/min. Displacement was taken with either a 2-inch travel Instron® Model 3540-200T-ST deflectometer or a dial indicator, accurate to 0.001 in, attached to the base of the test machine, which were zeroed at zero load. Ultimate load was the maximum load the test assembly could carry.

See photographs in Section 10 for typical test set-up.

## TEST REPORT FOR SNR SOLAR LLC. DBA SNAPRACK

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### SECTION 9

#### TEST RESULTS

#### Uplift Resistance Testing

Test/Ulimate loads should not be used as design loads or safe working loads.

#### *UltraFoot, Rafter with One, 5/16 in by 4-1/2 in Lag Screw - Rafter Mount*

Test Date: 12/04/24

BASE DISPLACEMENT RELATIVE TO MOCK ROOF (in)	SPECIMEN NO.		
	1	2	3
	LOAD (lbs)		
0.020	25	95	14
0.040	62	197	34
0.060	114	318	60
0.080	174	453	90
0.100	232	609	145
0.120	301	795	224
0.140	408	994	327
0.160	533	1190	458
0.180	671	1364	591
0.200	834	1533	735
<b>Ultimate Load:</b>	2075	2124	2439

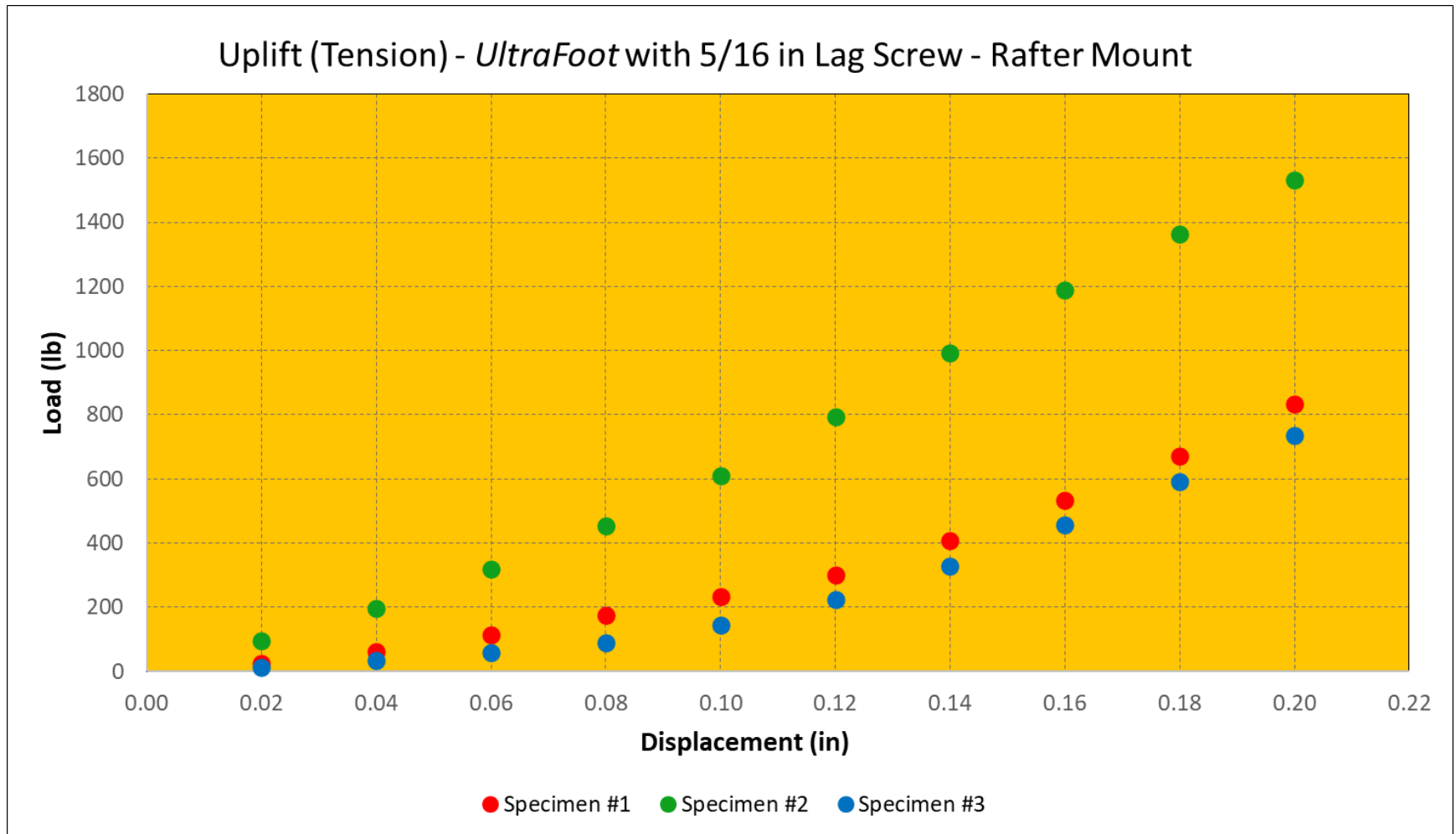
SPECIMEN NO.	ULTIMATE LOAD (lbf)	DEVIATION FROM AVERAGE	LOAD @ 1/8 in DISPLACEMENT (lb)	MODE OF FAILURE
1	2075	-6.2%	328	Lag screw withdrew from mock roof
2	2124	-4.0%	845	
3	2439	+10.2%	250	
<b>Average:</b>	<b>2213</b>	<b>Average:</b>	<b>474</b>	
		<b>Standard Deviation:</b>	323	
		<b>Coefficient of Variation:</b>	68%	

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Date: 01/21/25

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**Shear Load Testing**

Test/Ultimate loads should not be used as design loads or safe working loads.

**UltraFoot, Rafter with One, 5/16 in by 4-1/2 in Lag Screw - Rafter Mount (Shear Parallel to the Rafter)**

Test Date: 12/17/24

BASE DISPLACEMENT RELATIVE TO MOCK ROOF (in)	SPECIMEN NO.		
	1	2	3
	LOAD (lbs)		
0.020	80	60	219
0.040	114	89	356
0.060	257	121	473
0.080	386	170	574
0.100	504	223	657
0.120	617	289	742
0.140	704	375	827
0.160	776	476	905
0.180	855	551	980
0.200	912	603	1050
<b>Ultimate Load:</b>	2338	2336	2191

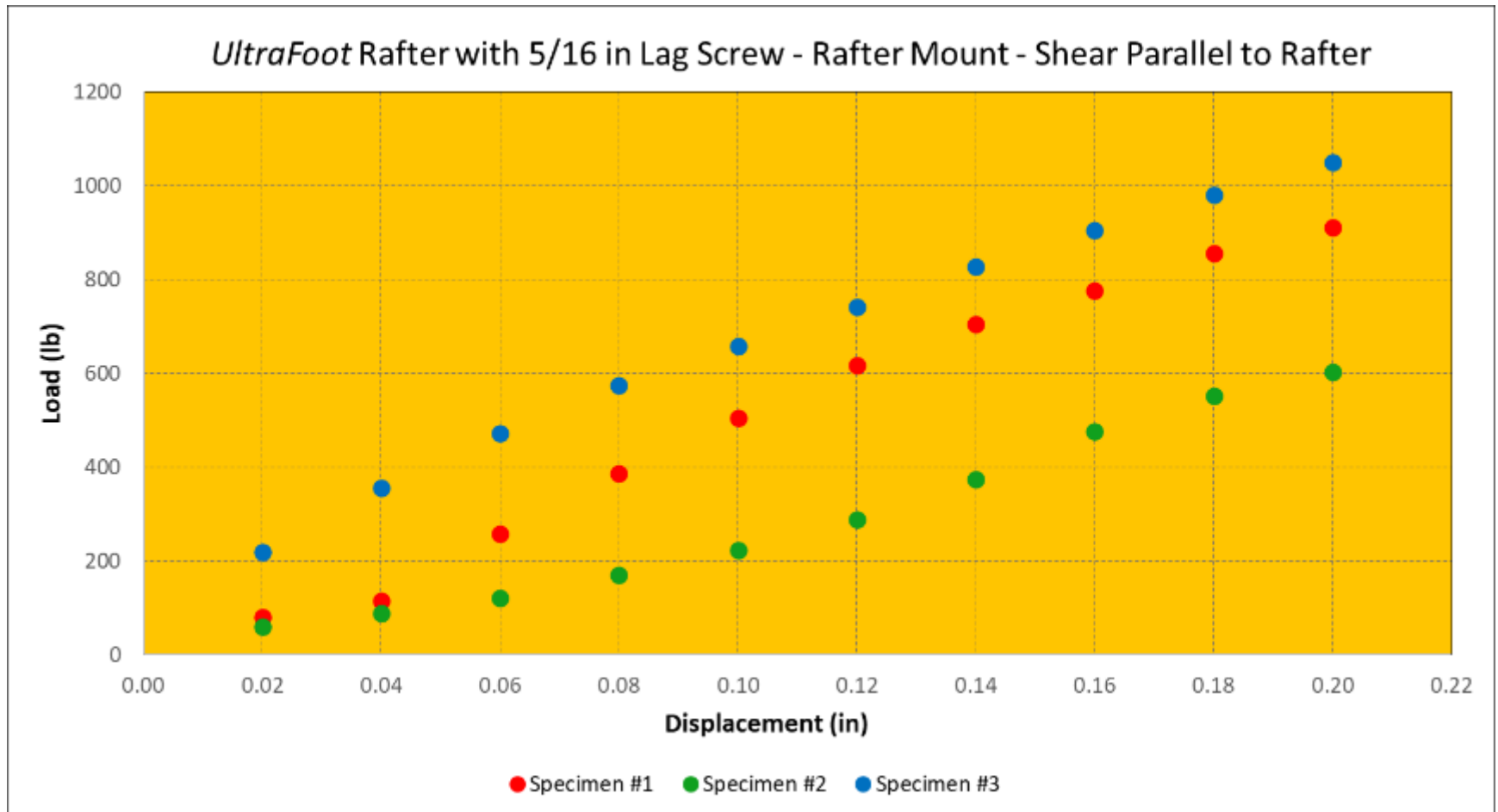
SPECIMEN NO.	ULTIMATE LOAD (lbf)	DEVIATION FROM AVERAGE	LOAD @ 1/8 in DISPLACEMENT (lb)	MODE OF FAILURE
1	2338	+2.2%	639	Lag screw bent and pulled through mock roof
2	2336	+2.1%	311	
3	2191	-4.2%	763	
<b>Average:</b>	<b>2288</b>	<b>Average:</b>	<b>571</b>	
		<b>Standard Deviation:</b>	234	
		<b>Coefficient of Variation:</b>	41%	

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Date: 01/21/25

Revised Date: 02/04/25

**UltraFoot, Rafter with One, 5/16 in by 4-1/2 in Lag Screw - Rafter Mount (Shear Perpendicular to the Rafter)**

Test Date: 12/19/24

BASE DISPLACEMENT RELATIVE TO MOCK ROOF (in)	SPECIMEN NO.		
	1	2	3
	LOAD (lbs)		
0.020	338	89	40
0.040	607	226	95
0.060	788	377	299
0.080	850	516	445
0.100	903	609	544
0.120	946	715	620
0.140	986	790	705
0.160	1036	852	781
0.180	1080	1028	848
0.200	1113	1154	895
<b>Ultimate Load:</b>	<b>2227</b>	<b>2726</b>	<b>2434</b>

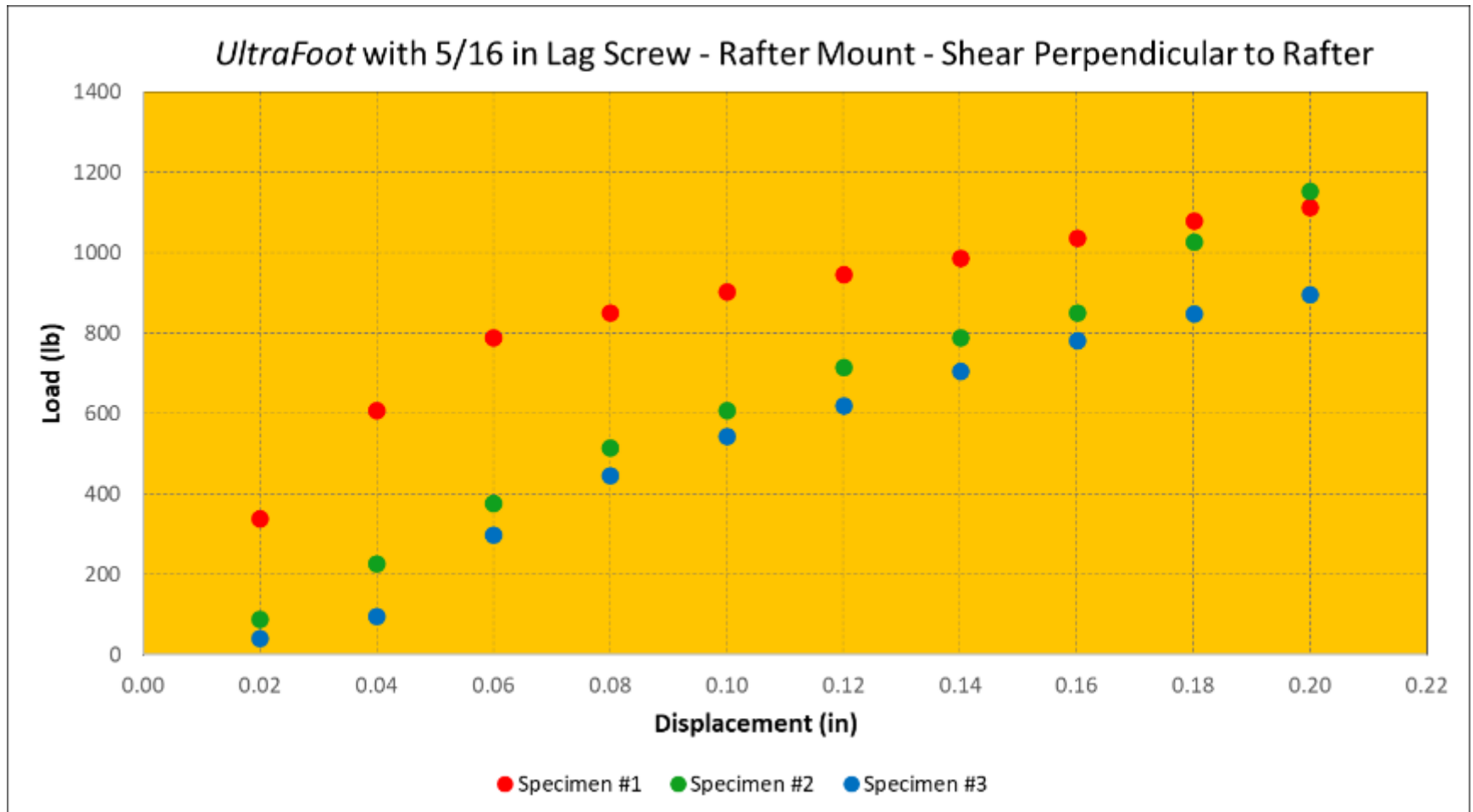
SPECIMEN NO.	ULTIMATE LOAD (lbf)	DEVIATION FROM AVERAGE	LOAD @ 1/8 in DISPLACEMENT (lb)	MODE OF FAILURE
1	2227	-9.6%	956	Lag screw bent and pulled through mock roof
2	2726	+10.7%	734	
3	2434	-1.1%	641	
<b>Average:</b>	<b>2462</b>	<b>Average:</b>	<b>777</b>	
		<b>Standard Deviation:</b>	162	
		<b>Coefficient of Variation:</b>	21%	

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Revised Date: 02/04/25

### SECTION 10

### PHOTOGRAPHS



**Photo No. 1**  
**Uplift Testing**



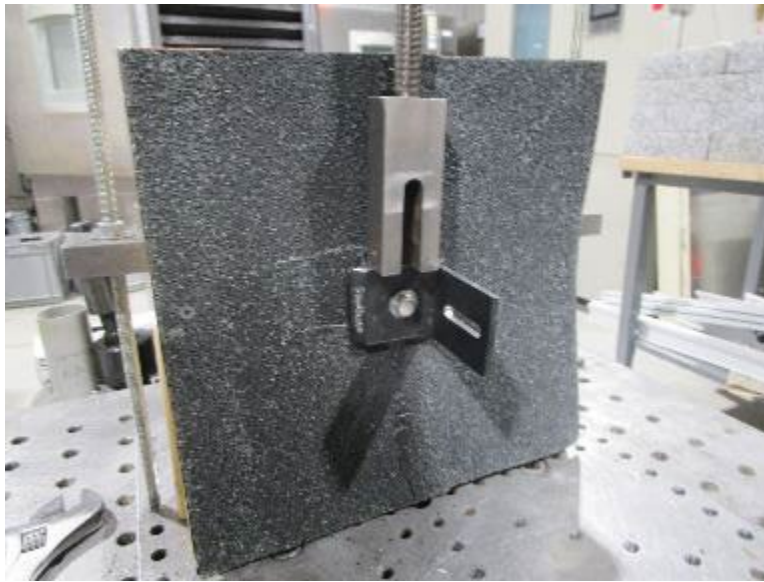
**Photo No. 2**  
**Shear Parallel to the Rafter**

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**Photo No. 3**  
**Shear Perpendicular to the Rafter**

### **SECTION 11** **DRAWINGS**

The "As-Built" drawings for the *UltraFoot, Rafter* mount, which follow, have been reviewed by Intertek B&C and are representative of the project reported herein. Project construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

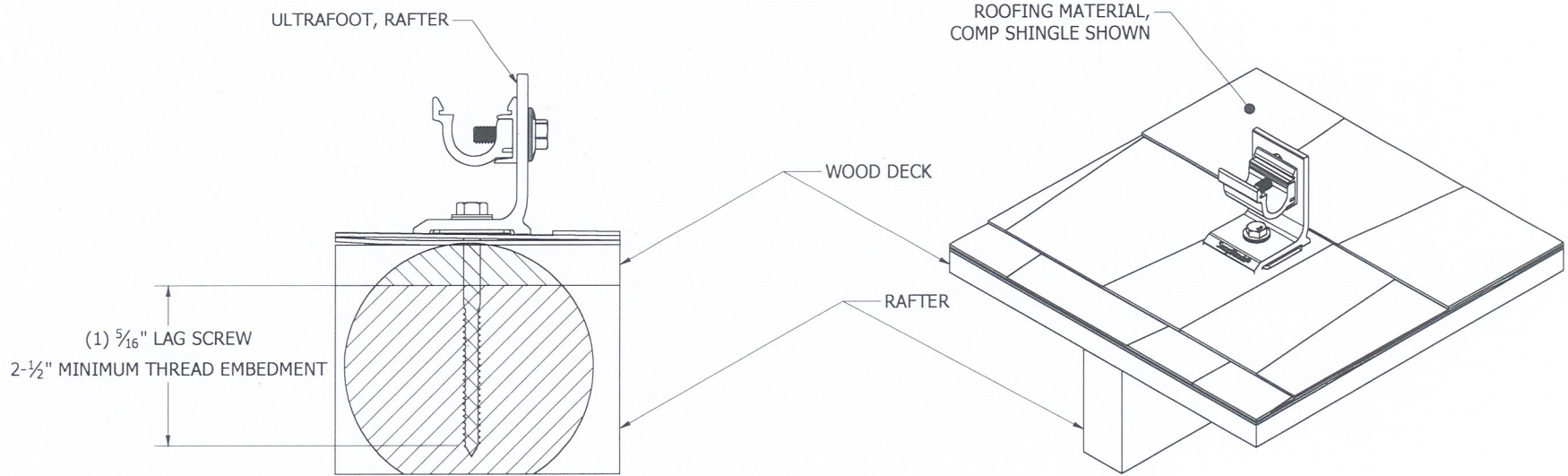


Test sample complies with these details.  
Deviations are noted.

Report # 51173.02-119-18

Date 2/4/25 Tech AJS

REVISION:			
A	2/3/2025	RELEASED	MJA



PE SIGNATURE:	PE DATE:	DESCRIPTION:	DRAWING NUMBER:		REV:
		ULTRA RAIL PV MOUNTING SYSTEM WITH ULTRAFOOT ROOF ATTACHMENTS FAMILY	SNR-DC-00485		A
SNR SOLAR LLC	775 FIERO LANE, SUITE 200 SAN LUIS OBISPO, CA 93401 CONTACT@SNAPNRACK.COM	UNITS: IN, LB, DEG [MM, KG, DEG]	DATE: 2/3/2025	SHEET SIZE: 11 IN X 17 IN	SHEET NUMBER: 3 OF 5

**NOTES:**

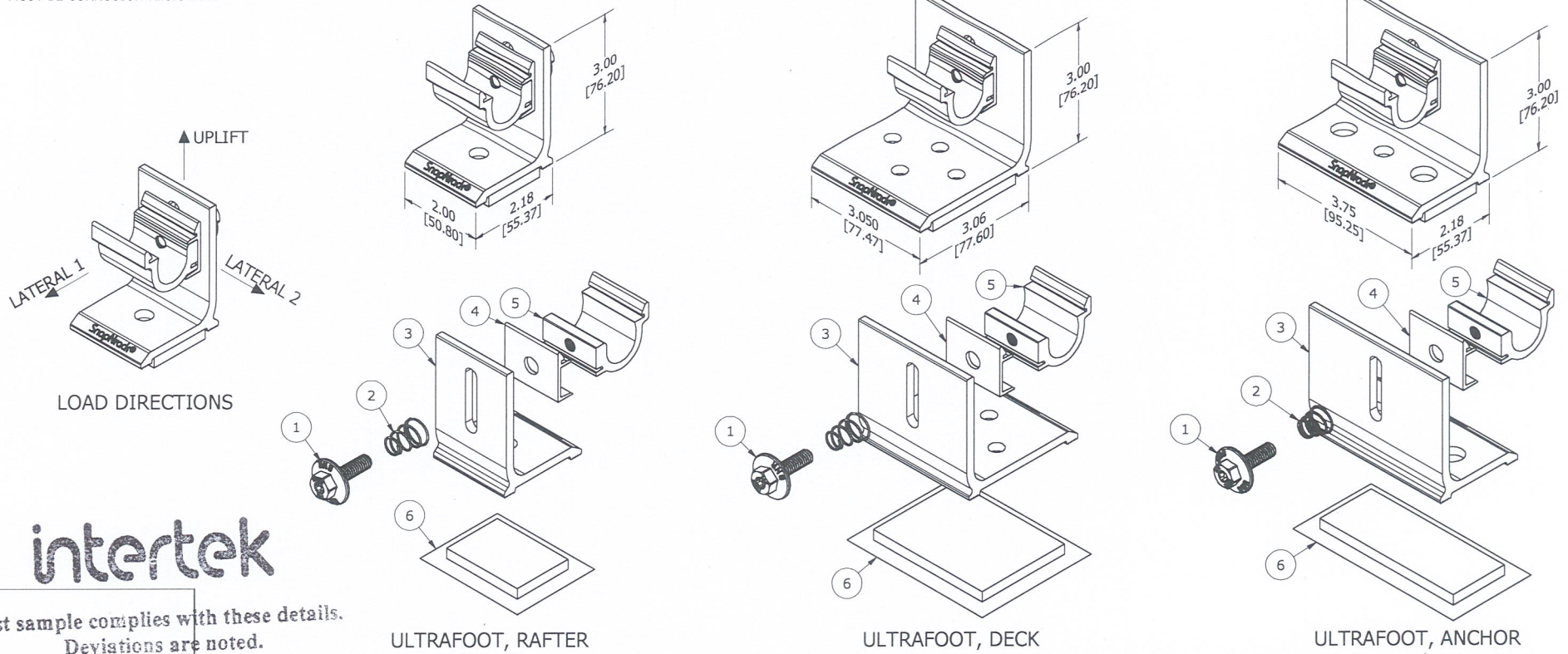
1. THIS SYSTEM COMPLIES WITH THE 8TH EDITION (2023) FLORIDA BUILDING CODE, INCLUDING HVHZ
2. THIS SYSTEM HAS BEEN TESTED TO THE TAS100(A) AND ASTM D7147 STANDARDS. IMPACT RESISTANCE IS NOT REQUIRED, AS IT IS NOT PART OF THE BUILDING ENVELOPE
3. INSTALLATIONS MUST FOLLOW THE SNAPRACK ULTRA RAIL SYSTEM INSTALLATION MANUAL
4. PV PANELS ARE NOT PART OF THIS APPROVAL
5. DESIGN OF THE ROOF SUBSTRATE AND STRUCTURE IS THE RESPONSIBILITY OF THE ENGINEER OF RECORD (EOR) AND IS NOT PART OF THIS APPROVAL
6. ALL ANCHORS FASTENING ATTACHMENTS TO THE ROOF SUBSTRATE MUST BE CORROSION RESISTANT

**BOM: ULTRAFooter PRODUCTS**

ITEM	DESCRIPTION	MATERIAL	MIN YIELD (KSI)	MINIMUM ULTIMATE (KSI)
1	BOLT, WIDE FLANGE, 5/16"-18	STAINLESS STEEL, 300 SERIES	60	95
2	SPRING	STAINLESS STEEL, 300 SERIES	N/A	N/A
3	ULTRAFooter BASE (RAFTER, DECK, OR ANCHOR)	ALUMINUM, 6000 SERIES	34	38
4	UR FLIP CLAMP, THRU	ALUMINUM, 6000 SERIES	34	38
5	UF FLIP CLAMP, TAP	ALUMINUM, 6000 SERIES	34	38
6	SPEEDSEAL+ FLASHING SYSTEM	BUTYL RUBBER	N/A	N/A

REVISION:

REV	DATE	RELEASED	MJA
A	2/3/2025		



**intertek**

Test sample complies with these details.  
Deviations are noted.

Report # 51173.02-119 PE SIGNATURE: \_\_\_\_\_  
Date 2/7/25 Tech AJS

ULTRAFooter, RAFTER

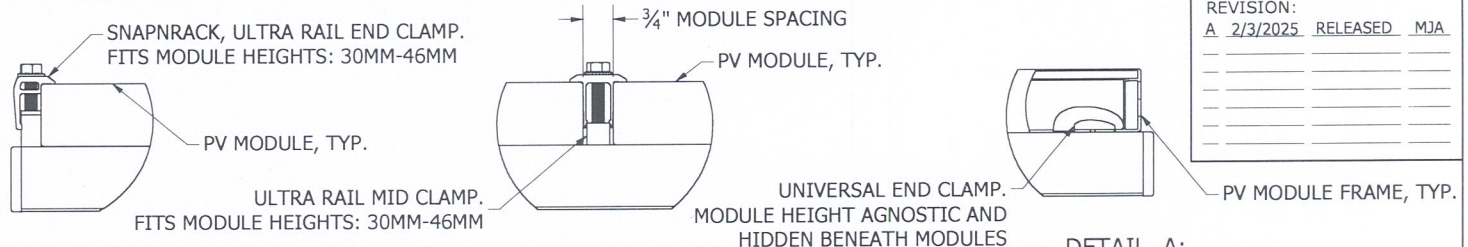
ULTRAFooter, DECK

ULTRAFooter, ANCHOR

PE DATE:		DESCRIPTION: ULTRA RAIL PV MOUNTING SYSTEM WITH ULTRAFooter ROOF ATTACHMENTS FAMILY		DRAWING NUMBER: SNR-DC-00485		REV: <b>A</b>
SNR SOLAR LLC		775 FIERO LANE, SUITE 200 SAN LUIS OBISPO, CA 93401 CONTACT@SNAPRACK.COM		UNITS: IN, LB, DEG [MM, KG, DEG]	DATE: 2/3/2025	SHEET SIZE: 11 IN X 17 IN
				SCALE: NTS	SHEET NUMBER: 1 OF 5	

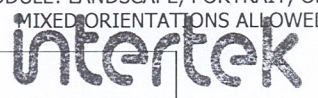
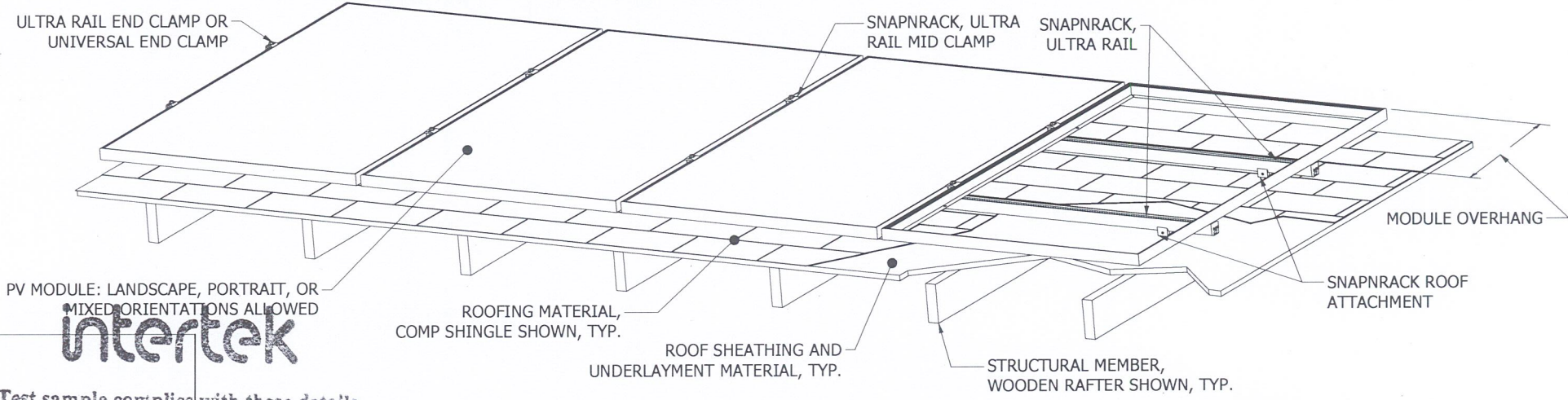
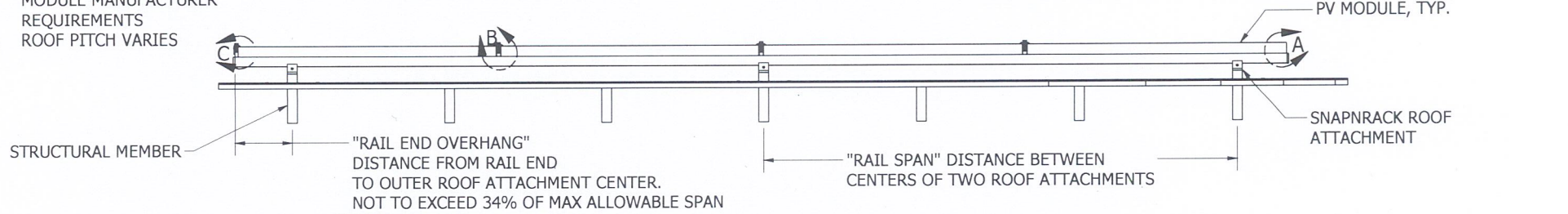
**NOTES:**

1. BOTH THE UNIVERSAL END CLAMP AND ULTRA RAIL END CLAMP MAY BE USED ON END MODULES
2. MODULES MAY BE CLAMPED ON SHORT OR LONG SIDE PER MODULE MANUFACTURER REQUIREMENTS
3. RAILS MAY BE MOUNTED UP/DOWN OR ACROSS THE SLOPE OF THE ROOF
4. A THIRD RAIL MAY BE ADDED IN THE MIDDLE OF THE PANEL FOR INCREASED LOAD CAPACITY, PER MODULE MANUFACTURER REQUIREMENTS
5. ROOF PITCH VARIES



REVISION:	A	2/3/2025	RELEASED	MJA

DETAIL C: SNAPRACK, ULTRA RAIL END CLAMP      DETAIL B: SNAPRACK, ULTRA RAIL MID CLAMP      DETAIL A: SNAPRACK, UNIVERSAL END CLAMP



Test sample complies with these details. Deviations are noted.

PE SIGNATURE:	PE DATE:	DESCRIPTION: ULTRA RAIL PV MOUNTING SYSTEM WITH ULTRAFOOT ROOF ATTACHMENTS FAMILY	DRAWING NUMBER: SNR-DC-00485	REV: A
Report # <u>SM73.02-119-1B</u>		UNITS: IN, LB, DEG [MM, KG, DEG]	SHEET SIZE: 11 IN X 17 IN	SHEET NUMBER: 2 OF 5
Date <u>2/4/25</u>	Tech <u>AJS</u>	775 FIERO LANE, SUITE 200 SAN LUIS OBISPO, CA 93401 CONTACT@SNAPRACK.COM	SCALE: NTS	
SNR SOLAR LLC				

DESCRIPTION:  
**SNAPRACK, ULTRAFOOT, RAFTER**

PART NUMBER(S):  
**242-10056**

DOC NUMBER:  
**SNR-DC-01436**

DRAWN BY:  
**H. WULFEKOETTER**

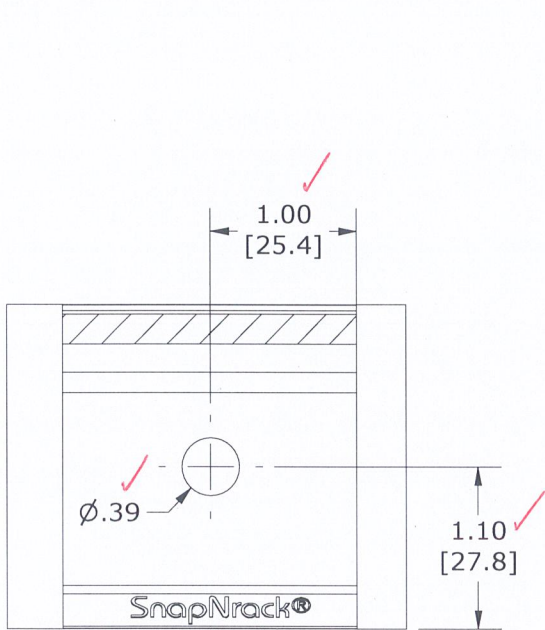
REV: **A**      DATE:  
**8/28/2024**

**SnapNrack®**

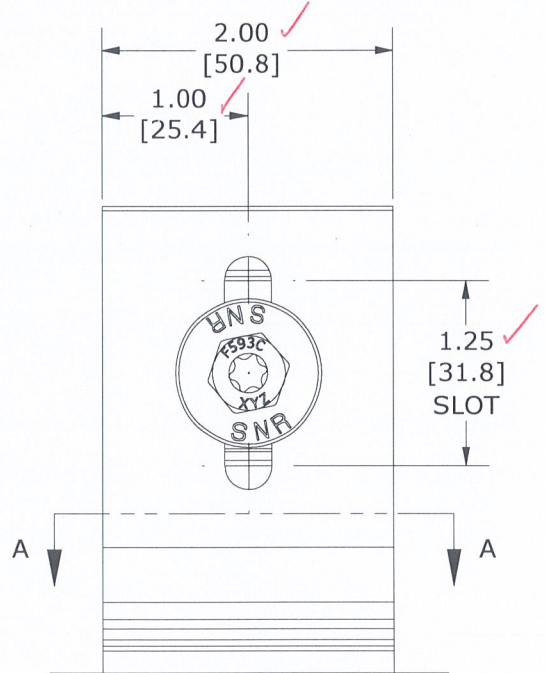
SNR SOLAR LLC  
 775 FIERO LANE, SUITE 200  
 SAN LUIS OBISPO, CA 93401 USA  
 EMAIL: CONTACT@SNAPNRACK.COM

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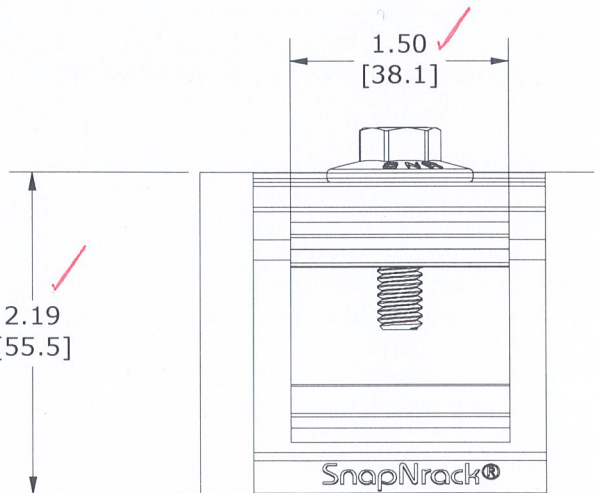
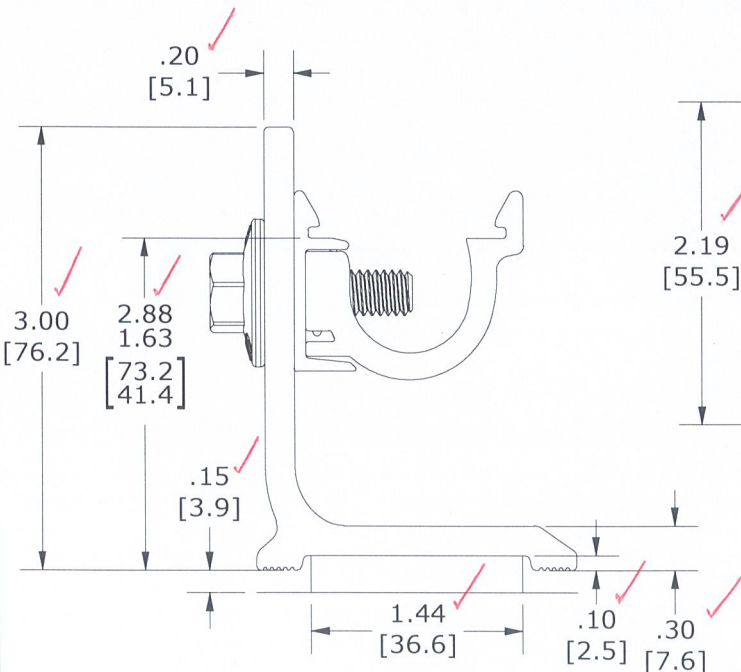
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SECTION A-A



BACK



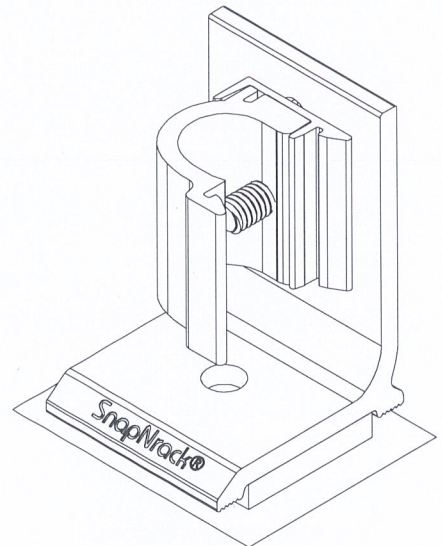
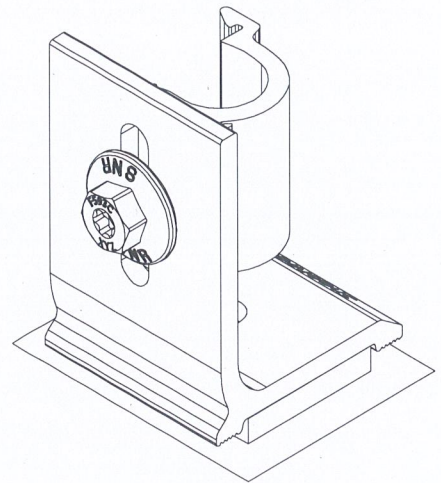
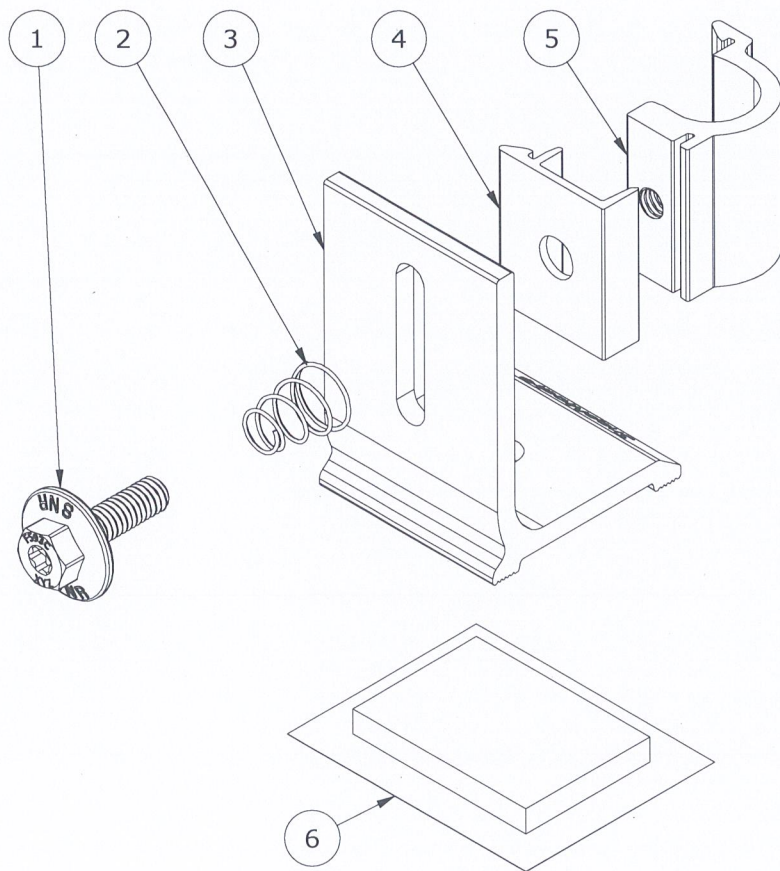
TOP  
**intertek**

Test sample complies with these details.  
 Deviations are noted.

Report # 51173.02-119-18  
 Date 1/15/25 Tech AJS



DESCRIPTION: <b>SNAPNRACK, ULTRAFOOT, RAFTER</b>		DOC NUMBER: SNR-DC-01436		<h1>SnapNrack®</h1>
PART NUMBER(S):  242-10056		DRAWN BY: H.WULFEKOETTER		
UNITS: IN, LB, DEG [MM, KG, DEG]		SHEET: 1:2	REV: <b>A</b>	DATE: 8/28/2024
SNR SOLAR LLC 775 FIERO LANE, SUITE 200 SAN LUIS OBISPO, CA 93401 USA EMAIL: CONTACT@SNAPNRACK.COM THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY. ANY REPRODUCTION, DISCLOSURE OR USE THEREOF IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF SNR SOLAR LLC.				



PARTS LIST		
ITEM	QTY	DESCRIPTION
1	1	BOLT, WIDE FLANGE, RECESSED, 5-16IN-18 X 1IN, SS
2	1	SNAPNRACK, ULTRA RAIL MOUNT SPRING, SS
3	1	SNAPNRACK, ULTRAFOOT BASE, RAFTER, BLACK
4	1	SNAPNRACK, UR FLIP CLAMP, THRU, SILVER
5	1	SNAPNRACK, FLIP CLAMP, TAP, BLACK
6	1	SNAPNRACK, BUTYL PAD, 2IN X 1.5IN X .25IN

**intertek**

Test sample complies with these details.  
Deviations are noted.

Report # 51173.02-119-18  
Date 1/15/25 Tech AJS

MATERIALS:	6000 SERIES ALUMINUM & 300 SERIES STAINLESS STEEL
DESIGN LOAD (LBS):	VARIABLES, REFER TO SNAPNRACK ENGINEERING
ULTIMATE LOAD (LBS):	VARIABLES, REFER TO SNAPNRACK ENGINEERING
TORQUE SPECIFICATION:	16 FT-LBS FT-LBS
CERTIFICATION:	UL 2703, FILE E359313;
WEIGHT (LBS):	.365



Total Quality. Assured.

130 Derry Court  
York, Pennsylvania 17406

Telephone: 717-764-7700  
Facsimile: 717-764-4129  
www.intertek.com/building

**TEST REPORT FOR SNR SOLAR LLC. DBA SNAPRACK**

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Date: 01/21/25

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**SECTION 12**

**REVISION LOG**

REVISION #	DATE	PAGES	REVISION
0	01/21/25	N/A	Original Report Issue
1	02/04/25	13-17	Updated Drawing Package