

Project Number: A0004-0003-171

June 28, 2017

EcoFasten Solar 4741 W. Polk St., Suite 4 Phoenix, AZ 58043

REFERENCE: Simple Block Ultimate Capacity Laboratory Test Results

Per your request we observed the testing of the attachment of the Simple Block to standing metal seam specimens in uplift (perpendicular to the seam) and shear (parallel to the seam). The intent of the testing was to evaluate the ultimate capacity of the Simple Block to metal seam connection itself. The tests were performed on portions of isolated metals seam specimens and therefore does NOT account for the capacity of the supporting roof system or supporting members. The information in this report should only be utilized by design professionals or personnel qualified to assess and apply factors of safety as well as interpret proper applications for the information provided in this report. Please be advised as follows:

Product/Specimen Description

- Simple Block
 - Approximate overall dimensions = 1-11/16" (H) x 2" (L) x 1-5/16" (W)
 - \circ Material = 6000 series aluminum extrusion
 - Two 3/8" Dia. ball nosed set screws spaced at approx. 1 1/4"
 - See attached assembly sheet on page 5 for additional information
- Standing Metal Seam Specimens
 - Material = 26ga ACRYLUME (acrylic coated galvanized steel)
 - Approximate seam height and type = 1" double-lock
 - The seam was isolated by using aluminum plates and screws to fasten the plates and standing seam material to a solid wood base material. Refer to Figure 1.

Test Procedure

The testing was performed under our observation in the EcoFasten Solar facility using a mechanical drive load frame and a 1610AJH-5K load cell calibrated on January 10, 2017 by Interface Inc. (see page 6). The following is a description of each test type performed. A minimum of 3 specimens in each loading direction were tested.

- Simple Block Uplift Test- The Simple Block was fastened to the metal seam with the lip of the Simple Block oriented to be able to engage the underside of the double-lock seam. The set-screws were tightened to 150 in/lbs. using a torque wrench. Then a hex head bolt was inserted into the channel on top of the Simple Block that was then attached to the load cell and loading mechanism which applied load perpendicular to the seam. Refer to Figure 1, Figure 2, and Page 5.
- Simple Block Shear Test- The Simple Block was fastened to the metal seam with the lip of the Simple Block oriented to be able to engage the underside of the double-lock seam. The set-screws were tightened to 150 in/lbs. using a torque wrench. Then a hex head bolt was inserted into the channel on top of the Simple Block. That bolt was attached to a plate that was then connected to the load cell and loading mechanism which applied load parallel to the seam. Refer to Figure 3 and Page 5.

Test Results

- Simple Block Uplift Test (26ga ACRYLUME 1" double-lock standing metal seam)
 - Average Ultimate Load = 1,980 lb. (Static Load) 0
 - Failure Mode = The small lip of the simple block that fits underneath the standing metal seam 0 began to peel off. Refer to Figure 4.
 - Observations = The metal seam deformed during the loading prior to the final failure mode noted 0 above, but the set screws did not tear or puncture the standing metal seam. Refer to Figures 5 & 6.
- Simple Block Shear Test (26ga ACRYLUME 1" double-lock standing metal seam)
 - Average Ultimate Load = 1.030 lb. (Static Load) 0
 - Failure Modes = The metal seam buckled and/or the small lip of the simple block that fits 0 underneath the standing metal seam began to peel off. Refer to Figures 4 & 7.
 - Observations = The metal seam deformed significantly during the loading and in prior to the lip of 0 the simple block beginning to peel off. The set screws did not tear or puncture the standing metal seam. Refer to Figures 4 & 7. Some bending of the bolt and some damage in the Simple Block around the bolt head was also evident in some tests.

Application of Ultimate Loads/Capacities

The capacity of the Simple Block clamp is dependent on the roofing material and type to which it is fastened. The roofing type and material used in these tests is noted earlier in the report. Appropriate factors of safety should be determined and applied by the design professional or qualified personnel to the noted ultimate values based on the specific circumstance and application, but under NO circumstance should the factor of safety be less than 2. The metal roofing must be adequately attached to the supporting roof system/structure to resist loads. The loads applied to the Simple Block clamp will be transferred to the roofing material and supporting members. Said roofing material and supporting members and their attachments must be designed or analyzed accordingly. The Simple Block is NOT approved for use as a fall restraint device.

Limitations

The recommendations above are provided based upon information obtained during our observation of testing and from information provided by the client. The intent of the testing was to evaluate the capacity of the hardware itself in relation to the material it was attached to. The analysis of the new or existing structure, roof, and attachment to the roof must be performed by others on a project specific basis prior to installation. The conclusions and recommendations described above are based on the assumption that the components tested were properly designed and fabricated and are identical to those intended for use. Vector Structural Engineers makes no claim regarding any components or any aspects of the components not specifically mentioned in this report.

We hope this meets your needs. If you have any further questions regarding this matter, please call this office at vour convenience.



Enclosure



Figure 1





Figure 3



Figure 5



Figure 4



Figure 6



Figure 7







LOAD CELL-INDICATOR SYSTEM CALIBRATION CERTIFICATION

P.O. #: 0002209-00

Procedure: C-1761

CUSTOMER : ECOFASTEN SOLAR ADDRESS : PHOENIX, AZ CONDITION: FINAL S.O. #: 162075 Load Cell Model : 1610AJH-5K Capacity : 5 Klbf Indicator Model : 9830-110-1 Excitation/Supply : 10 VDC Sensor Select : Configuration :

Serial :297157 Serial :N1289 Count-By :0.1 Cable :ATTACHED

TEST CONDITIONS

TEMPERATURE: 73 °F HUMIDITY: 34%

TRACEABILITY

FORCE STANDARD:	STD-22	NIST#:	STD-2212315	DUE: 15-SEP-17
STANDARD INDICATOR:	BRD106	NIST#:	050898	

SHUNT CALIBRATION

	Shunt (+/01%)	Reading	Connections
Tension	30.0 KOhm	3570.3	Internal
Compression	30.0 KOhm	3570.9	Internal

PERFORMANCE

TEST LOAD APPLIED (Klbf)	Raw F Tension C	Readings () ompression	Tension	Net Output () Compression
0	0.0	0.0	0.0	0.0
1	999.0	-999.0	999.0	-999.0
2	1999.3	-1999.1	1999.3	-1999.1
3	2999.3	-2999.4	2999.3	-2999.4
4	3999.1	-4000.0	3999.1	-4000.0
5	4999.8	-5001.4	4999.8	-5001.4
2	2000.8	-2001.0	2000.8	-2001.0
õ	0.0	0.0	0.0	0.0

Interface Inc. certifies that force measurements are traceable to primary standards at NIST. Calibration performed per Interface QA program and the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1994 and MIL-STD-45662A. Estimated measurement uncertainty is 0.040% RDG expressed as the expanded uncertainty at 95% confidence level using a coverage factor of k=2. Results relate to load cell serial 297157 only. DO NOT REPRODUCE THIS REPORT except in full or with Interface Inc. written approval.

CALIBRATION DATE : 10-JAN-17 - Thomas Sapien **TECHNICIAN:** Interface Inc. 7401 East Butherus Drive- Scottsdale, Arizona 85260 U.S.A Telephone (480)-948-5555 - FAX (480)-948-1924

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