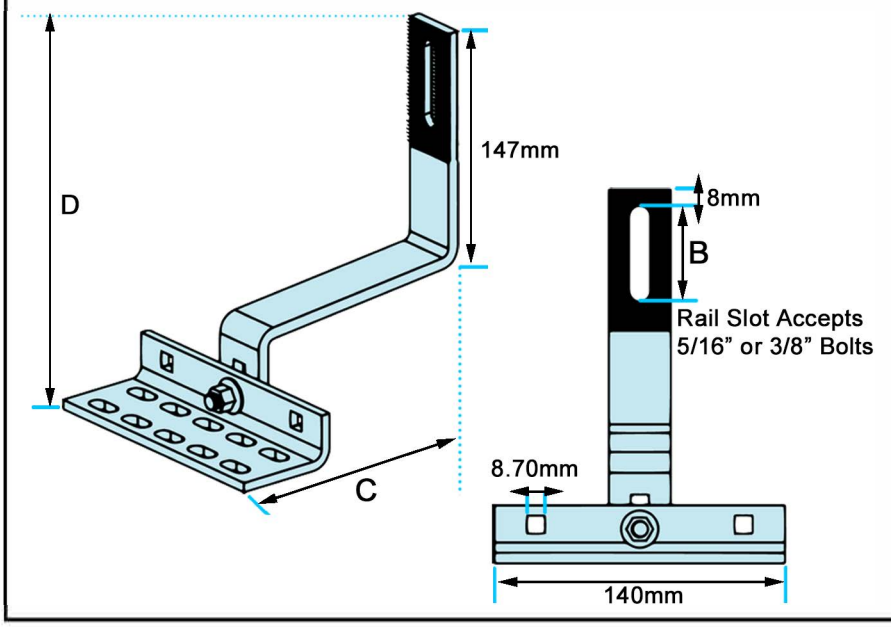
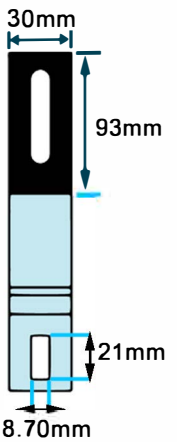
Part #	Box Quantity	Screw Size
17585	10 Hooks	Not Included
17586	1 Hook	Not Included
17587	10 Hooks & 20 Screws	5/16" x 3"
17588	1 Hook & 2 Screws	5/16" x 3"
17589	10 Hooks & 20 Screws	#14 x 3"
17618	1 Hook & 2 Screws	#14 x 3"

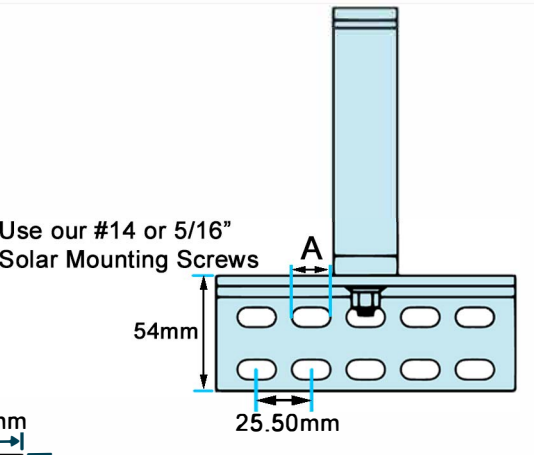
Type 304 Stainless Steel
For Side Mount Rails

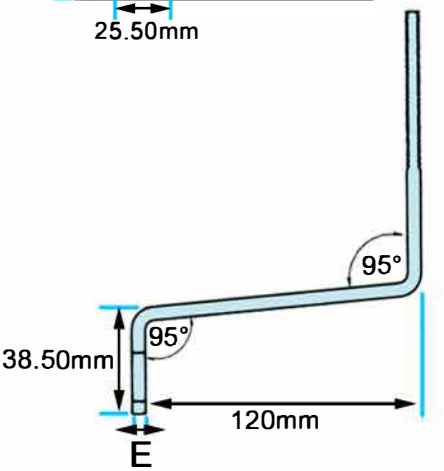
Rev1

Letter	Description	Size/Length
A	Mounting Screw Slots	9mm x 18mm
B	Rail Slot Size	10mm x **71mm**
C	Length of Roof Hook	**176.5mm**
D	Bottom End to Top End	**190.3mm - 198.5mm**
E	Thickness	6mm









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SolarRoofHook is a division of Quickscrews International Corp.

January 23, 2014

To whom this may concern,

SolarRoofHook is committed to excellence. All of our parts were tested by a third party test facility for the following.

1. Uplift test
2. Downward load test
3. Water Proof - QuickBOLT only

AME Research facility had a current engineer license per the State of California in 2012 and 2013. Terrapin Testing had a current engineer license per the State of California in 2011.

The following is an excerpt from:

CALIFORNIA BOARD FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS
guide to Engineering & Land Surveying *for City and County Officials*
Page 12, Line 27

27. If the license has expired between the time the engineering documents were prepared and the time when the local agency's review is performed, do the documents need to be re-sealed by a licensee with a current license? (B&P Code §§ 6733, 6735, 6735.3, 6735.4)

As long as the license was current at the time the engineering documents were prepared, the documents do not need to be re-sealed prior to review by the local agency. However, any changes (updates or modifications) to the documents that are made following the review by the local agency would have to be prepared by a licensed engineer with a current license and those changes would have to be signed and sealed.

We trust the information provided will alleviate any request for the test reports submitted to have a stamp from the current year.

Respectfully,

Rick Gentry

V.P. of Sales & Marketing

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September 17, 2015

Mr. Rick Gentry
QUICKSCREWS INTERNATIONAL
5830 Las Positas Road
Livermore, CA 94551

Project Number 115727C

Subject: QS# 17585 –All Tile Roof Hook 90° Laboratory Load Testing

Dear Mr. Gentry:

As requested, Applied Materials & Engineering, Inc. (AME) has completed load-testing the All Tile Roof Hook 90° (see Appendix A, Figure 1). The purpose of our testing was to evaluate the compressive tensile (uplift) and shear (parallel to rafter) load capacity of the All Tile Roof Hook 90° attached to a 2"x4" Douglas Fir Rafter using two 5/16"Øx3" screws.

SAMPLE DESCRIPTION

Mockup samples were assembled in our laboratory on August 31, 2015. Mockup configuration consisted of three 12" long rafters at 4.5"o.c., screwed to 1/2" Structural I plywood. All Tile Roof Hook 90° is attached through the plywood into a rafter with two fasteners installed at the farthest end.

TEST PROCEDURES & RESULTS

1. Compressive Load Test

A total of three tests were conducted for compressive load capacity on September 11, 2015 using a United Universal testing machine. Samples were rigidly attached to the testing machine and a compressive load was applied to the hook. The samples were loaded in compression at a constant rate of axial deformation of 0.09 in. /min. without shock until the hook was bent and came in contact with the test board; displacement at maximum load was recorded. Based on the above testing, the average maximum compression load of the All Tile Roof Hook 90°attached to a 2"x4" Douglas Fir rafter using two 5/16"Øx3" screws was determined to be 395 lbf. Detailed results are provided in Table I. Test setup and mode of failure are provided in Appendix B, Figure 1.

The specific gravity and moisture content of the rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The specific gravity and moisture content were determined to be 0.379 and 10.0%, respectively.

2. Tensile (Uplift) Load Test

A total of three tests were conducted for compressive load capacity on September 14, 2015 using a United Universal testing machine. Samples were rigidly attached to the testing machine and an uplift load was applied to the hook. The samples were loaded in tension at a constant rate of axial deformation of 0.09 in. /min. without shock until failure occurred; displacement at maximum load was recorded. Based on the above testing, the average maximum uplift load of the All Tile Roof Hook 90° attached to a 2"x4" Douglas Fir rafter using two 5/16"Øx3" screws was determined to be 2091 lbf. Detailed results are provided in Table II. Test setup and mode of failure are provided in Appendix B, Figure 2.

The specific gravity and moisture content of the rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The specific gravity and moisture content were determined to be 0.383 and 11.5%, respectively.

3. Shear (Lateral) Load Test Parallel to Rafter

A total of three tests were conducted for shear load capacity on September 16, 2015 using a United Universal testing machine. Samples were rigidly attached to the testing machine and a shear load (parallel to rafter) was applied to the hook. The samples were loaded in shear at a constant rate of axial deformation of 0.09 in. /min. without shock until failure occurred; displacement at maximum load was recorded. Based on the above testing, the average maximum shear load (parallel to rafter) of the All Tile Roof Hook 90° attached to a 2"x4" Douglas Fir rafter using two 5/16"Øx3" screws was determined to be 487 lbf. Detailed results are provided in Table III. Test setup and mode of failure are provided in Appendix B, Figure 3.

The specific gravity and moisture content of the rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The specific gravity and moisture content were determined to be 0.354 and 10.9%, respectively.

Respectfully Submitted,

APPLIED MATERIALS & ENGINEERING, INC.

Mohammed Faiyaz
Laboratory Manager

Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
ARMEN TAJIRIAN
No. 35535
Exp. 9/30/17
CIVIL
STATE OF CALIFORNIA

Armen Tajirian, Ph.D., P.E.
Principal

TABLE I

COMPRESSIVE LOAD TEST RESULTS

ALL TILE ROOF HOOK 90° (QS# 17585)

PROJECT NUMBER 115727C

SAMPLE ID	MAXIMUM COMPRESSIVE LOAD (lbf)	DISPLACEMENT AT MAXIMUM LOAD (in.)	FAILURE MODE
C-1	375	1.8	Hook contact w/Plywood
C-2	405	1.9	Hook contact w/Plywood
C-3	405	1.9	Hook contact w/Plywood
AVERAGE	**395**	**1.9**	**..**

TABLE II

TENSILE (UPLIFT) LOAD TEST RESULTS

ALL TILE ROOF HOOK 90° (QS# 17585)

PROJECT NUMBER 115727C

SAMPLE ID	MAXIMUM TENSILE LOAD (lbf)	DISPLACEMENT AT MAXIMUM LOAD (in.)	FAILURE MODE
T-1	1982	7.0	Fastener pullout
T-2	2138	6.6	Fastener pullout
T-3	2154	6.8	Fastener pullout
AVERAGE	**2091**	**6.8**	**..**

TABLE III

SHEAR (LATERAL) LOAD TEST RESULTS
PARALLEL TO RAFTER

ALL TILE ROOF HOOK 90° (QS# 17585)

PROJECT NUMBER 115727C

SAMPLE ID	MAXIMUM TENSILE LOAD (lbf)	DISPLACEMENT AT MAXIMUM LOAD (in.)	FAILURE MODE
S-1	474	9.7	Fastener shear
S-2	493	9.5	Fastener shear
S-3	495	9.7	Fastener shear
AVERAGE	**487**	**9.6**	**..**

REFERNCES

AC13-2010, "*Acceptance Criteria for Joist Hangers and Similar Devices*", ICC Evaluation Service.

AC85-2008, "*Acceptance Criteria for Test Reports*", ICC Evaluation Service.

ASTM D1761-2006, "*Standard Test Methods for Mechanical Fasteners in Wood*", ASTM International.

ASTM D2395-2007, *"Standard Test Method for Specific Gravity of Wood and Wood-Based Materials"*, ASTM International.

APPENDIX A

FIGURE 1

ALL TILE ROOF HOOK 90° (QS# 17585)

PROJECT NUMBER 115727C

Part #	Box Quantity	Screw Size
17585	10 Hooks	Not Included
17586	1 Hook	Not Included
17587	10 Hooks & 20 Screws	5/16" x 3"
17588	1 Hook & 2 Screws	5/16" x 3"
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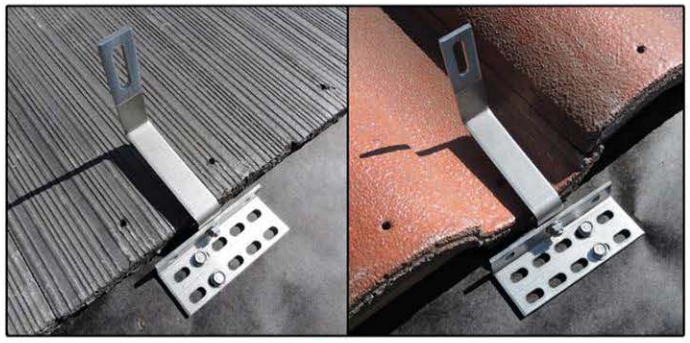
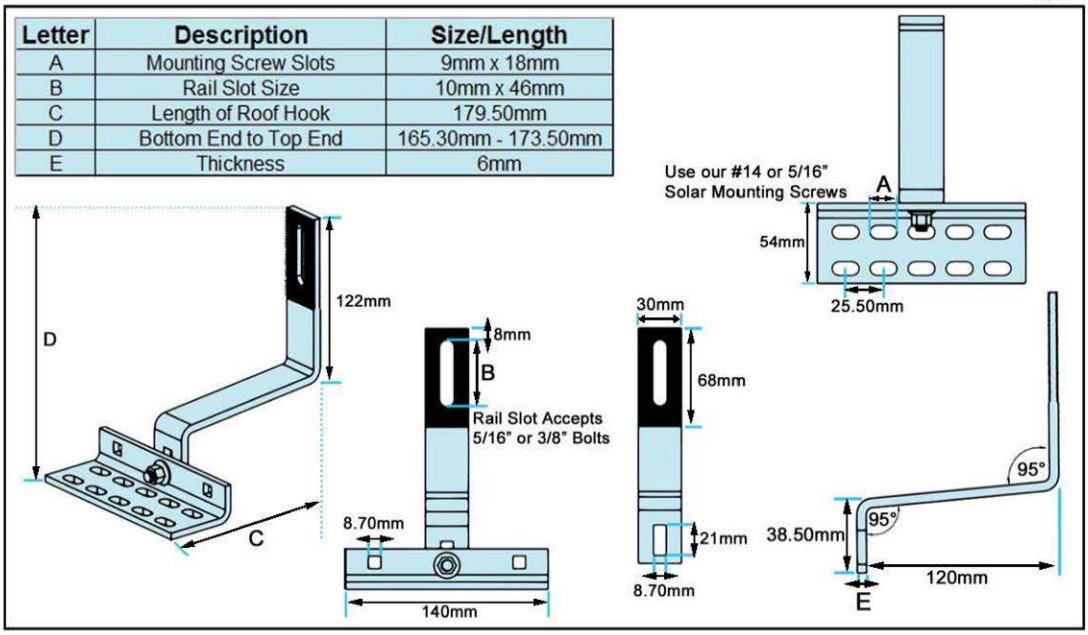
17618	1 Hook & 2 Screws	#14 x 3"

Type 304 Stainless Steel
For Side Mount Rails



Rev1

Letter	Description	Size/Length
A	Mounting Screw Slots	9mm x 18mm
B	Rail Slot Size	10mm x 46mm
C	Length of Roof Hook	179.50mm
D	Bottom End to Top End	165.30mm - 173.50mm
E	Thickness	6mm



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APPENDIX B

FIGURE 1

ALL TILE ROOF HOOK 90° (QS# 17585)

COMPRESSIVE LOAD TEST SETUP

PROJECT NUMBER 115727C

Figure1a. Test Setup Figure 1b.

Typical Failure Mode

FIGURE 2

ALL TILE ROOF HOOK 90° (QS# 17585)

UPLIFT LOAD TEST SETUP

PROJECT NUMBER 115727C

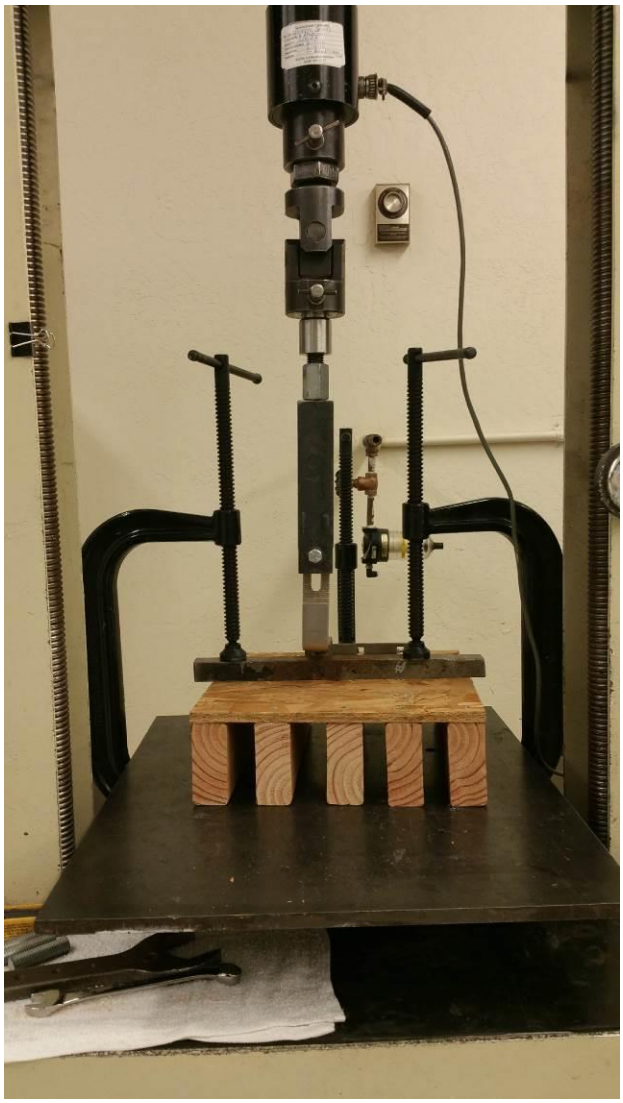

Figure 2a. Test Setup

Figure 2b. Typical Failure Mode

FIGURE 3

ALL TILE ROOF HOOK 90° (QS# 17585)

SHEAR LOAD TEST SETUP
PARALLEL TO RAFTER

PROJECT NUMBER 115727C

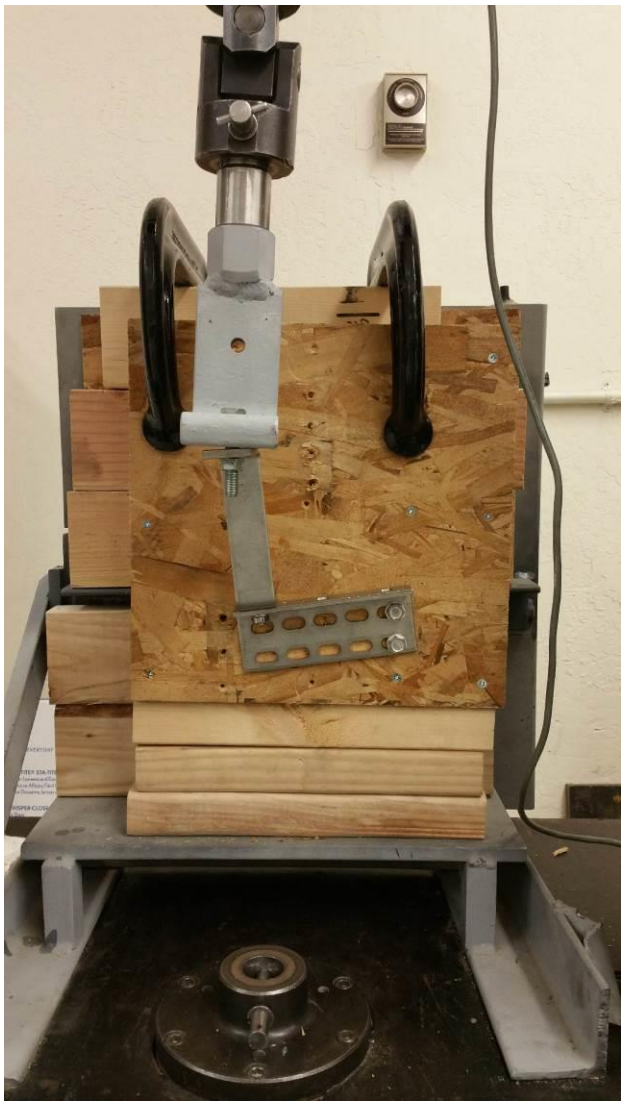

Figure 3a. Test Setup

Figure 3b. Typical Failure Mode