



November 20, 2009

Mr. Stewart Wentworth
QUICK MOUNT PV
936 Detroit Avenue, Suite D
Concord, CA 94518-2539

Project Number 109603C

Subject: Curved Tile Mount Load Testing

Dear Mr. Wentworth:

As requested, Applied Materials & Engineering, Inc. (AME) has completed load-testing Curved Tile Mount for shear and tensile strength. The purpose of our testing was to evaluate the tensile and shear load capacity of Curved Tile Mount Hardware attached to a 2"x4" Douglas Fir rafter.

SAMPLE DESCRIPTION

Six (6) mockup samples were delivered to our laboratory on November 12, 2009. Mockup configuration consisted of three 16" long rafters at 7" o.c., screwed to 1/2" OSB sheathing. The Curved Tile Mount is attached through the OSB into the rafter with two 5/16"x3" lag bolts. Drawing showing the sample makeup is provided in Appendix A.

TEST PROCEDURES & RESULTS

1. Tensile Strength

Three samples were tested for tensile strength on November 17, 2009 using a United Universal testing machine. Samples were rigidly attached to the testing machine and a tensile load was applied to the 5/16"x1" machine bolt connected to the aluminum post. The samples were loaded in tension at a constant rate of axial deformation of 0.05 in./min. without shock until failure. Detailed results are provided in Table I. Test setup and typical failure mode are provided in Appendix B. Based on these results, the average tensile strength of the curved tile mount in Douglas Fir rafter was determined to be 2993 lbf.

2. Shear Strength

Three samples were tested for shear strength on November 18 & 20, 2009 using a United Universal testing machine. Samples were rigidly attached to the testing machine and a shear load was applied to the 5/16"x1" machine bolt connected to the aluminum post. The samples were loaded in shear at a constant rate of axial deformation of 0.30 in./min. Detailed results are provided in Table II. Test setup and typical failure mode are provided in Appendix B. Based on these results, the average shear strength of the curved tile mount in Douglas Fir rafter was determined to be 691 lbf.

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QMTMH Tile Mount Hardware Load Testing
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TORQUE SPECIFICATIONS

1. 5/16"x3" Lag Bolt

We are recommending a torque specification of 20 to 25 ft-lbs on the 5/16"x3" lag bolt. Moisture cycling in wood prevents the torque from being a fixed value. The above torque value was established through trial and error method.

2. 5/16"x1" Grade 2 Machine Bolt

We are recommending a torque specification of 10 ft-lbs on the 5/16"x1" Grade 2 machine bolt. The torque specification is based on proper seating of the 5/16"x1-1/4" sealing washer.


3. 5/16"x3/4" Grade 8 Machine Bolt

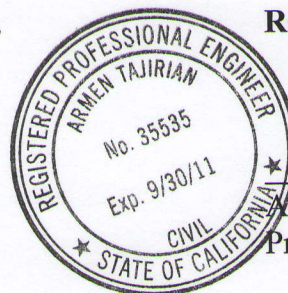
We are recommending a torque specification 25 ft-lbs on the 5/16"x3/4" grade 8 machine bolt. The torque specification is based on commonly accepted SAE J429 grade 8 bolt standards.

If you have any questions regarding the above, please do not hesitate to call the undersigned.

Respectfully Submitted,

APPLIED MATERIALS & ENGINEERING, INC.


Mohammed Faiyaz
Laboratory Manager



Reviewed By:

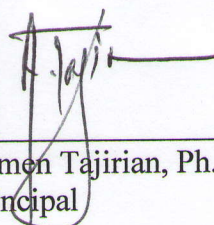

Armen Tajirian, Ph.D., P.E.
Principal

TABLE I
CURVED TILE MOUNT
TENSILE LOAD TEST RESULTS
PROJECT NUMBER 109603C

SAMPLE ID	RAFTER	ULTIMATE TENSILE LOAD (lbf)	FAILURE MODE
T-1	Douglas Fir	2856	5/16"x3" lag bolt in rafter pulled out
T-2	Douglas Fir	2892	5/16"x3" lag bolt in rafter pulled out
T-3	Douglas Fir	3231	5/16"x3" lag bolt in rafter pulled out
AVERAGE	...	2993	...

TABLE II
CURVED TILE MOUNT
SHEAR LOAD TEST RESULTS
PROJECT NUMBER 109603C

SAMPLE ID	RAFTER	ULTIMATE SHEAR LOAD (lbf)	FAILURE MODE
S-1	Douglas Fir	660	5/16"x3/4" machine bolt bent at base plate
S-2	Douglas Fir	689	5/16"x3/4" machine bolt bent at base plate
S-3	Douglas Fir	725	5/16"x3/4" machine bolt bent at base plate
AVERAGE	...	691	...

APPENDIX A

CURVED TILE MOUNT

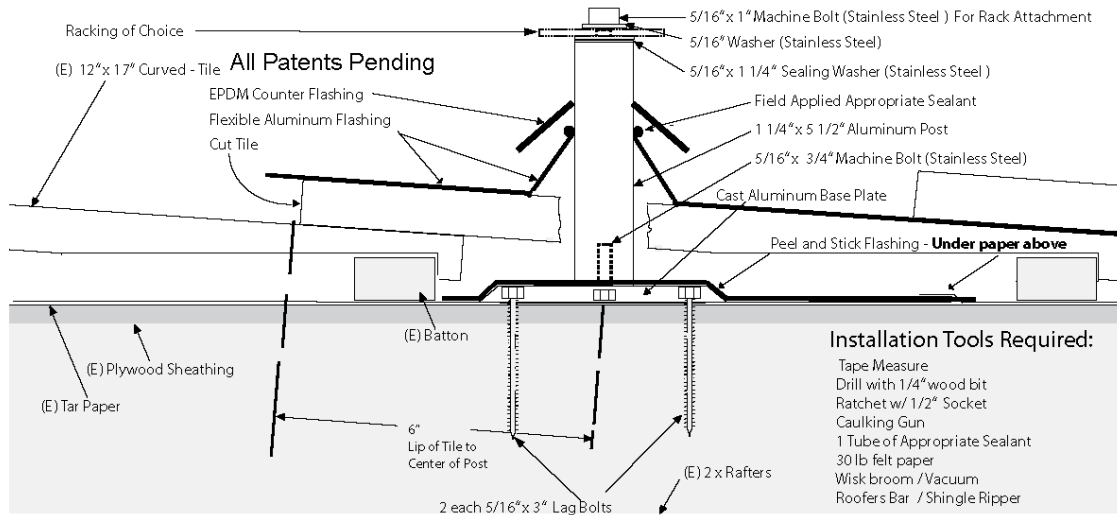
SAMPLE MAKEUP DRAWING

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Quick Mount PV[®]

Your *Solution* in Mounting Products
Solar • H₂O • Conduit • HVAC • Custom

Curved Tile Mount Specifications



Lag Bolt Specifications

	Specific gravity	5/16" shaft 3" thread depth	5/16" shaft 1" thread depth
Douglas Fir, Larch	.50	798	266
Douglas Fir, South	46	705	235
Engelmann Spruce (MSR 1650 f & higher)	46	705	235
Hem, Fir	43	636	212
Hem, Fir. (North)	46	705	235
Southern Pine	55	921	307
Spruce, Pine, Fir	42	615	205
Spruce, Pine, Fir (E of 2 million psi and higher grades of MSR and MEL)	.50	798	266

Sources: Uniform Building Code; American Wood Council
 Notes: 1) Thread must be embedded in a rafter or other structural roof member.
 2) Pull-out values incorporate a 1.6 safety factor recommended by the American Wood Council.
 3) See UBC for required edge distances.

**Note: To maintain waterproofing of substrate it is important to make sure the Peel and Stick Flashing is properly placed over the Mount Base, and under the course of paper above. If the paper above does not reach due to layout, place an additional piece of roofing paper over the Peel and Stick and under the next course of paper above. (See instructions page 4)



APPENDIX B

CURVED TILE MOUNT

TEST SETUP

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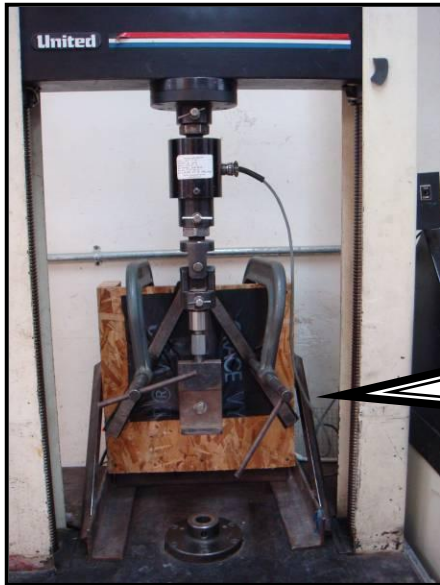


Figure 1. Shear Test

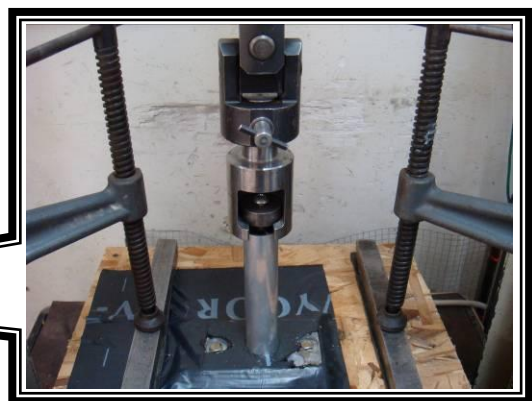
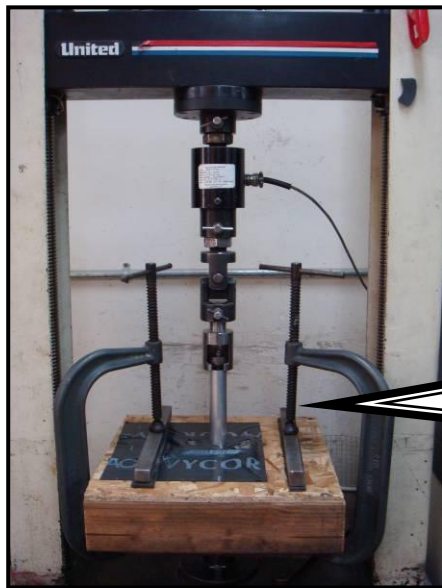


Figure 2. Tensile Test

CURVED TILE MOUNT
TYPICAL FAILURE MODE
PROJECT NUMBER 109603C



Figure 3. Shear Test Typical Failure Mode



Figure 4. Tensile Test Typical Failure Mode