July 5, 2011

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

Subject: Flat Tile Mount Hardware Load Testing

Dear Mr. Wentworth:

As requested, Applied Materials & Engineering, Inc. (AME) has completed load-testing the Flat Tile Mount hardware. The purpose of our testing was to evaluate the tensile and shear load capacity of the Flat Tile Mount hardware attached to a commercially available 2"x6" Douglas Fir rafter.

SAMPLE DESCRIPTION

Six (6) mockup samples were delivered to our laboratory on June 17, 2011. Mockup configuration consisted of one 12" long rafter, screwed to 1/2" Structural 1 plywood. The Flat Tile Mount hardware is attached through the plywood into the rafter with four 1/4"x1-1/2" lag bolts torqued to 7ft-lbs. Product hardware drawings are provided in Appendix A.

TEST PROCEDURES & RESULTS

1. Tensile Strength

Three samples were tested for tensile strength on June 29, 2011 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 occurred. Based on the above testing, the average ultimate tensile load of the Flat Tile Mount hardware in Douglas Fir was determined to be 1090 lbf.

The specific gravity and moisture content of the rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The average specific gravity and moisture content was determined to be 0.429 and 18.9%, respectively. Detailed results are provided in Table I. Test setup is illustrated in Figure 1 of Appendix B.
2. Shear Strength

Three samples were tested for shear strength on June 29, 2011 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 standoff. The samples were loaded perpendicular to rafter at a constant rate of axial deformation of 0.01 in./min. without shock until failure occurred. Based on the above testing, the average ultimate shear load, parallel to rafter, of the Flat Tile Mount hardware in Douglas Fir was determined to be 602 lbf.

The specific gravity and moisture content of the rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The average specific gravity and moisture content was determined to be 0.411 and 18.0%, respectively. Detailed results are provided in Table II. Test setup is illustrated in Figure 2 of Appendix B.

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

Respectfully Submitted,

APPLIED MATERIALS & ENGINEERING, INC.

[Signature]
Mohammed Faraz
Laboratory Manager

Reviewed By:

[Signature]
Armen Tajirian, Ph.D., P.E.
Principal
TABLE I
FLAT TILE MOUNT
TENSILE LOAD TEST RESULTS
PROJECT NUMBER 111317C

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>ULTIMATE TENSILE LOAD (LBF)</th>
<th>RAFTER MOISTURE CONTENT (%)</th>
<th>RAFTER SPECIFIC GRAVITY</th>
<th>FAILURE MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PULL-1</td>
<td>1047</td>
<td>20.7</td>
<td>0.456</td>
<td>Lag bolt pull-out</td>
</tr>
<tr>
<td>PULL -2</td>
<td>1338</td>
<td>16.0</td>
<td>0.402</td>
<td>Lag bolt pull-out</td>
</tr>
<tr>
<td>PULL -3</td>
<td>885</td>
<td>20.1</td>
<td>0.429</td>
<td>Lag bolt pull-out</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>1090</td>
<td>18.9</td>
<td>0.429</td>
<td>..</td>
</tr>
</tbody>
</table>

1. Upper bolt.
<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>ULTIMATE SHEAR LOAD PARALLEL TO RAFTER (LBF)</th>
<th>RAFTER MOISTURE CONTENT (%)</th>
<th>RAFTER SPECIFIC GRAVITY</th>
<th>FAILURE MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEAR-1</td>
<td>696</td>
<td>15.9</td>
<td>0.396</td>
<td>5/16&quot;x3/4&quot; bent bolt</td>
</tr>
<tr>
<td>SHEAR-2</td>
<td>629</td>
<td>17.4</td>
<td>0.434</td>
<td>5/16&quot;x3/4&quot; bent bolt</td>
</tr>
<tr>
<td>SHEAR-3</td>
<td>482</td>
<td>20.5</td>
<td>0.403</td>
<td>5/16&quot;x3/4&quot; bent bolt</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>602</td>
<td>18.0</td>
<td>0.411</td>
<td>..</td>
</tr>
</tbody>
</table>
Flat Tile Mount Specifications

All Patents Pending

**Racking of Choice** (Not Included)

- (E) 12" x 17" Flat Concrete Tile - Monier, Eagle, Life Tile, or Hansen
- EPDM Rubber Counter Flashing
- Monolithic Aluminum Tile Cover (Aluminum Flashing)

**Installation Tools Required:**
- Tape Measure
- Drill with 11/64" wood bit
- Impact Drill with 7/16" Socket
- Caulking Gun
- 1 Tube of Appropriate Sealant
- 30 lb felt paper
- Wisk Broom / Vacuum
- Roofing Bar/Wedge

**Cast Aluminum Base Plate** 5.5" x 3.5" x 0.5"

**Aluminum Primary Flashing - Under paper above**

**Lag pull-out (withdrawal) capacities (lbs) in typical lumber:**

**Lag Bolt Specifications**

<table>
<thead>
<tr>
<th>Specific Gravity</th>
<th>4/ea 1/4&quot; shaft per 1&quot; thread depth</th>
<th>1/4&quot; shaft per 1&quot; thread depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas Fir, Larch</td>
<td>.50</td>
<td>900</td>
</tr>
<tr>
<td>Douglas Fir, South</td>
<td>.46</td>
<td>828</td>
</tr>
<tr>
<td>Engelmann Spruce, Lodgepole Pine (MSR 1650 &amp; higher)</td>
<td>.46</td>
<td>828</td>
</tr>
<tr>
<td>Hem, Fir</td>
<td>.43</td>
<td>716</td>
</tr>
<tr>
<td>Hem, Fir (North)</td>
<td>.46</td>
<td>828</td>
</tr>
<tr>
<td>Southern Pine</td>
<td>.55</td>
<td>1040</td>
</tr>
<tr>
<td>Spruce, Pine, Fir</td>
<td>.42</td>
<td>692</td>
</tr>
<tr>
<td>Spruce, Pine, Fir (E of 2 million psi and higher grades of MSR and MEL)</td>
<td>.50</td>
<td>900</td>
</tr>
</tbody>
</table>

Sources: Uniform Building Code; American Wood Council

Notes:
1) Thread must be embedded in a rafter or other structural roof member.
2) See UBC for required edge distances.

**Note:** To maintain waterproofing of substrate it is important to make sure the Aluminum Primary Flashing is properly placed over the Q 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 Primary Flashing and under the next course of paper above. (See instructions on page 4)
FLAT TILE MOUNT

LOAD TEST SETUP

PROJECT NUMBER 111317C

Figure 1. Tensile Test

Figure 2. Shear Test
Stamped Engineering Test Reports Do Not Expire

To whom it may concern,

Quick Mount PV offers extensive testing for all our products conducted by a third-party licensed professional engineer. All our third-party engineering reports are stamped by a licensed professional engineer at the time the reports were prepared and do not expire. Our engineering reports continue to be valid as long as the professional engineer's license (date within the stamp) was valid when the reports were prepared (the report date). Even if the license has expired between the time the engineering reports were prepared and the time when a local agency reviews them, the reports do NOT need to be re-stamped with a current stamp.

This information is written into California State law under the Professional Engineers Act within the Business and Professions Code (B&P Code §§ 6700-6799). The California Board for Professional Engineers and Land Surveyors (BPELS) provides further clarification of the code in their Guide to Engineering & Land Surveying for City and County Officials, page 12 section 27, which is cited below.

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.

It should also be noted that as of January 1, 2010 professional engineers are not required to include their license expiration date when they sign and stamp engineering documents only the date that they signed the document (B&P Code §§ 6735, 6735.3, 6735.4, 6764, 8750, 8761 & 8764.5). Links to all of the codes and guides referenced in this letter may be found online at quickmountpv.com under FAQ. Please submit any further questions to tech@quickmountpv.com.

Sincerely,

Jennifer D. Alfsen, BSME
R&D Mechanical Engineer
Quick Mount PV