



Starling Madison Lofquist, Inc.

Consulting Structural and Forensic Engineers

5224 South 39th Street, Phoenix, Arizona 85040

tel: (602) 438-2500 fax: (602) 438-2505 www.smleng.com

IronRidge
1435 Baechtel Rd.
Willits, CA 95490

March 12, 2013

Page 1 of 3

Attn: Mr. William Kim, Chief Executive Officer

Subject: IronRidge Roof Flush Mounting System
Quick Hook USA by Quick Mount PV, Walnut Creek, CA

Dear Sir:

This letter is a supplement to the standard letter for the IronRidge Roof Flush Mounting System to address the requirements for use with the QMFTH & QMCTH Curved Tile Roof Mounts.

We have reviewed the Test Reports for the mounts prepared by Applied Materials & Engineering (AME), dated October 17, 2012. We have also reviewed loading and anchorage requirements for the IronRidge Roof Flush Mounting System for both the Standard and Light rails and determined that, subject to the limitations outlined below, the QMFTH & QMCTH mounts are suitable for the IronRidge Roof Flush Mounting System.

The mounting bracket is made up from two basic components; a baseplate that is screwed into the edge of the roof rafters, through the plywood sheathing, with 2 - 5/16" diameter x 3 1/2" long lag screws, and the hook component that connects to the baseplate at one end and provides a connection point for the PV support rail at the other end. The main difference between the two test samples is the width of the baseplate – 4.5" for the QMFTH and 6" for the QMCTH. The testing took into account the four basic failure load patterns associated with this type of connection; Tension (uplift), Compression (gravity forces), Shear parallel to the roof rafters, and Shear perpendicular to the roof rafters. The AME tests simulated these configurations in addition to incorporating worst case installation scenarios by offsetting the location of the hook relative to the lag screws. The AME report indicates the failure mode under tension loading is pullout of the lag screw from the wood framing and the bending of the hook and baseplate under the shear loads. AME's test results are as follows:

Failure Test Load Results

Item Number	Tension (lbs.)	Compression (lbs.)	Shear (Perp.) (lbs.)	Shear (Para) (lbs.)
QMFTH	1084	712	532	1219
QMCTH	1246	692	584	1341
<i>Failure Mode</i>	<i>Lag Bolt Pullout</i>	<i>Bent Hook</i>	<i>Bent Hook & Plate</i>	<i>Bent Hook & Plate</i>

The above listed loads represent the “failure load” and to convert these values into allowable load values they must be multiplied by a Factor of Safety that is based on the material and type of failure. Therefore the factor of safety for Shear will be 1.95 since the failure was in the aluminum bracket and 1.6 for Tension since the failure was in the Lag Bolt pullout. The resulting allowable loads will be as follows:

Allowable Load Values

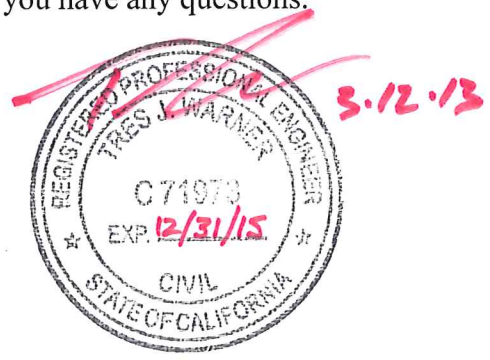
Item Number	Tension (lbs.)	Compression (lbs.)	Shear (Perp.) (lbs.)	Shear (Para) (lbs.)
QMFTH	677.5	365.1	272.8	625.2
QMCTH	778.8	354.9	299.5	687.7

The applied loads are not to exceed the allowable loads. The following tables are derived from our analysis and IronRidge’s Design Assistant data and shows the limiting conditions under which the QMFTH & QMCTH mounts may be used for any roof slope up to 45 deg. The values shown are for the rails installed at their maximum allowable spans per the Design Assistant or the current IronRidge Flush Mounting Standard letter. The values for specific roof slopes and rail spans can be obtained from the online Design Assistant as described above.

Please feel free to contact me at your convenience if you have any questions.

Respectfully yours,

Tres J. Warner, P.E.
 Design Division Manager



Attachments: Table 1: Wind Loads for QMFTH
 Table 2: Wind Loads for QMCTH

IronRidge Roof Flush Mounting System – QMFTH & QMCTH Roof Mounts

Table 1: Wind Loads for QMFTH

Roof Height (ft)	Wind Exposure Category	Roof Wind Zone		
		1 MPH	2 MPH	3 MPH
15	B	140	120	-
15	C	130	110	-
15	D	110	-	-
30	B	140	120	-
30	C	120	90	-
30	D	110	-	-
45	B	130	110	-
45	C	110	-	-
45	D	100	-	-
60	B	130	110	-
60	C	110	-	-
60	D	90	-	-

Table 2: Wind Loads for QMCTH

Roof Height (ft)	Wind Exposure Category	Roof Wind Zone		
		1 MPH	2 MPH	3 MPH
15	B	150	120	90
15	C	140	110	-
15	D	130	90	-
30	B	150	120	90
30	C	130	90	-
30	D	120	85	-
45	B	150	110	85
45	C	130	90	-
45	D	120	85	-
60	B	140	110	-
60	C	120	85	-
60	D	110	-	-

Notes:

1. Tabulated values are subject to the Load/Span requirements of the IronRidge Rails and may be used without any additional restriction on the snow load
2. Values shown are for the IronRidge Standard Rail
3. Wind Loads & Snow Loads per ACSE 7-05
4. Maximum Panel Dimension = 78 in