

Quik Foot Moment Test

For the moment tests, the load was applied parallel to the axis of the 2x4 to the top of the 1" diameter aluminum post. The plywood-2x4 assemblies were fastened to a welded steel structure which was bolted to the base of the testing machine (figure 3 and 4). Five tests were done for both 6" long posts and 3" long posts.

Loads were applied slowly, each test taking 3-5 minutes until failure. The loads were measured by an ASTM E74 calibrated load cell and display. The results were recorded as follows.

Moment, 6" Post

Test	Max Load (lb)	Mode of Failure
1	470.7	Lower Screw Withdrawal
2	676.4	Over 30 Degrees Deformation
3	467.6	Lower Screw Withdrawal
4	550.5	Lower Screw Head Failure
5	370.0	Lower Screw Withdrawal

Average 507.0

Moment, 3" Post

Test	Max Load (lb)	Mode of Failure
1	955.7	Lower Screw Withdrawal
2	1113.9	Lower Screw Withdrawal
3	1003.4	Lower Screw Head Failure
4	856.3	Lower Screw Withdrawal
5	828.3	Lower Screw Withdrawal

Average 951.5

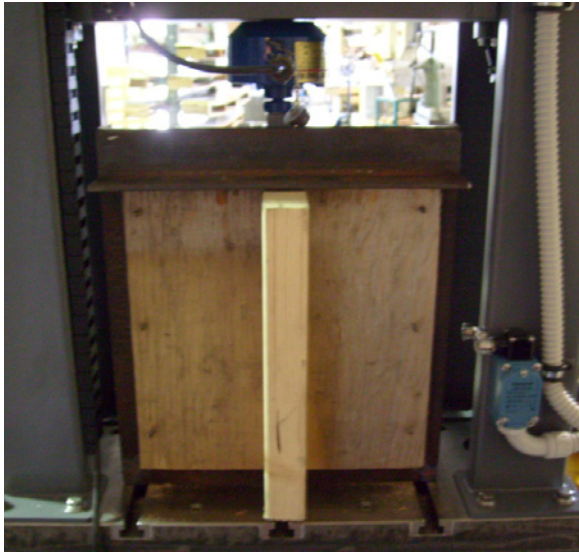
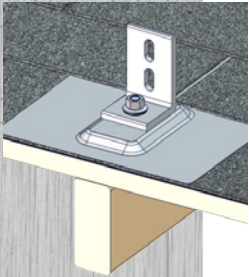


Fig.3



Fig.4



Quik Foot Moment Test Cont.

The most common mode of failure for the moment tests was withdrawal of the lower screw. However there were a few tests where the head of the lower screw had failed. In each test the post would deflect approximately 15-20 degrees from horizontal (Figure 6). Typically the post would start to deflect at a load approximately half the maximum load. In each test the Quik Foot was deformed, as the upper edge of the post dented the top surface of the Quik Foot (Figure 7).

From the average maximum load of each series of moment tests it can be determined that the average maximum moment for the Quik Foot is 2948 in-lb.

$$507.0\text{lb} \times 6'' = 3042\text{in-lb}$$

$$951.5\text{lb} \times 3'' = 2854.5\text{in-lb}$$

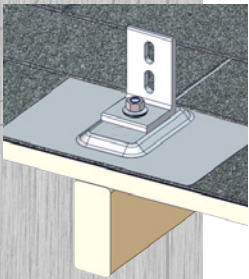
$$\frac{(3042 + 2854.5)}{2} = 2948\text{in-lb}$$



Fig. 6



Fig. 7



Quik Foot Pull-Out Test

These tests determined the maximum pull-out and moment a Quik Foot would sustain before failure. Three series of tests were conducted, a pull-out test where the Quik Foot was pulled directly from the "roof" and two moment tests with different length posts where a side load was applied parallel to the "roof". The average maximum pull out load was determined to be 2312.2lb while the average maximum moment was determined to be 2948in-lb.

For each test, to simulate a typical roof the Quik Foot would be installed on, a 12"x12" square of .5" plywood was screwed to the top edge of a 12" long spruce 2x4 with 1.5" decking screws. The Quik Foot was then fastened through the center of the plywood into the top edge of the 2x4 with two TFC #14 concealer screws (Figure 1). A new Quik Foot and screws were used for each test.

For the pullout tests, the load was applied along the axis of the 1" diameter aluminum post screwed onto the top of the Quik Foot (Figure 2). The plywood-2x4 assembly was clamped to the base of the testing machine through a welded steel frame that surrounded the assembly (figure 2).

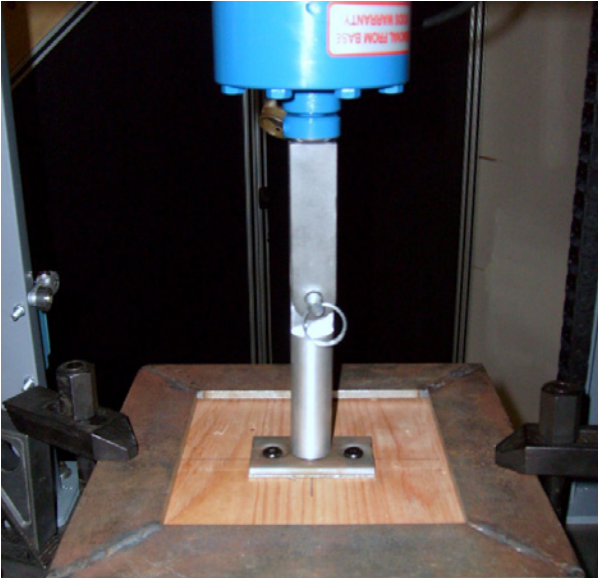
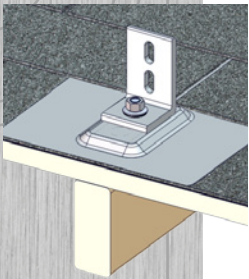


Fig 1



Fig 2



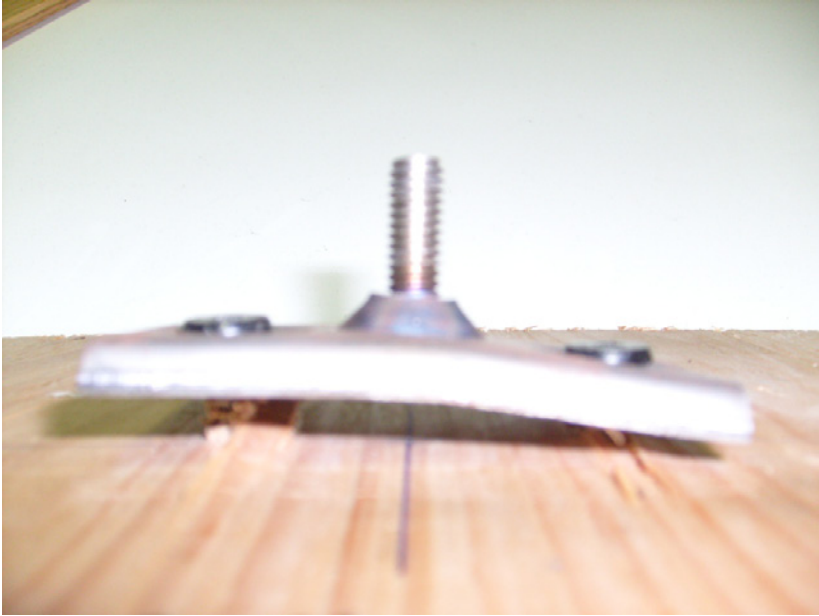
Quik Foot Pull-Out Test Cont.

In each pull out test the mode of failure was withdrawal of the screws at the maximum load. Some deformation of the Quik Foot occurred in each test (figure 5). The Average maximum load was 2312.2lb.

Pull Out

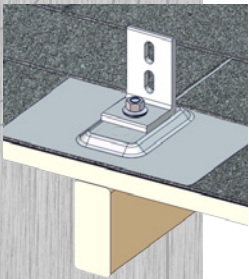
Test	Max Load (lb)	Mode of Failure
1	2463.5	Screw Withdrawal
2	2375.3	Screw Withdrawal
3	2060.8	Screw Withdrawal
4	2301.0	Screw Withdrawal
5	2360.3	Screw Withdrawal

Average 2312.2



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Quik Foot Lateral Load Test

Machine: Universal or tensile testing machine with a capacity of 5,000lbs or more. ASTM E74 certified load cell and display to measure load and a dial or electronic indicator accurate to .001" to measure displacement.

Specimen: One solar bracket fastened according to the manufactures installation instructions to a 12"x12" or larger section of the roof substrate. Sealants, flashings and other roofing materials that have no affect on bracket strength may be omitted from the assembly.

Apparatus: A welded steel structure reinforced as necessary to prevent buckling, warping or twisting while the specimen is under load. The apparatus is securely fastened to the bed of the testing machine.

Setup: Attach the specimen to the apparatus using #12 or #14 self drilling screws in sufficient quantity and spacing so as to prevent failure of the roof substrate prior the failure of the snow guard bracket. Position the apparatus on the test machine bed and connect the load cell to the bracket so that the load is applied as it would be during normal service.

Procedure: Photograph the specimen and apparatus prior to testing. Load the bracket slowly with an upward pull until failure. Photograph the specimen after testing. Do a minimum of three tests using a new specimen for each test. If after three tests the results are inconsistent, conduct two additional tests.

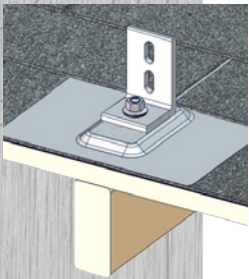
Failure: Any of the following occurrences shall be considered failure.

- A. Fastener failure (fracture or withdrawal).
- B. Structural failure of bracket.

Reporting: On the data sheet, record the ultimate load (in pounds) and mode of failure for each test. Calculate and record the mean load for all tests conducted. Note any unusual observations during testing as well as a description of the specific failure observed for each test. Fill out all requested information on the data sheet.

Test Data			
Product: QKFT-Base		Substrate: 2X4 Spruce Rafter	Fastener: 3" XHD
Failure: Any of the following occurrences shall be considered failure.			
A. Fastener failure (fracture or withdrawal). B. Structural failure of bracket.			
Test #	Ultimate Load (lbs)	Mode of Failure	Description
1	1179.7	B	Bent 30 Degrees
2	1280.3	B	Bent 30 Degrees
3	4304.5	B	Bent 30 Degrees
Mean	1221.3		

Additional Notes: Lateral Test on 3" post



Quik Foot Pull Test Using 3" XHD Fasteners

Machine: Universal or tensile testing machine with a capacity of 5,000lbs or more. ASTM E74 certified load cell and display to measure load and a dial or electronic indicator accurate to .001" to measure displacement.

Specimen: One solar bracket fastened according to the manufactures installation instructions to a 12"x12" or larger section of the roof substrate. Sealants, flashings and other roofing materials that have no affect on bracket strength may be omitted from the assembly.

Apparatus: A welded steel structure reinforced as necessary to prevent buckling, warping or twisting while the specimen is under load. The apparatus is securely fastened to the bed of the testing machine.

Setup: Attach the specimen to the apparatus using #12 or #14 self drilling screws in sufficient quantity and spacing so as to prevent failure of the roof substrate prior the failure of the snow guard bracket. Position the apparatus on the test machine bed and connect the load cell to the bracket so that the load is applied as it would be during normal service.

Procedure: Photograph the specimen and apparatus prior to testing. Load the bracket slowly with an upward pull until failure. Photograph the specimen after testing. Do a minimum of three tests using a new specimen for each test. If after three tests the results are inconsistent, conduct two additional tests.

Failure: Any of the following occurrences shall be considered failure.

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Test Data			
Product: QKFT-Base		Substrate: 2X4 Spruce Rafter	Fastener: 3" XHD
Failure: Any of the following occurrences shall be considered failure.			
A. Fastener failure (fracture or withdrawal). B. Structural failure of bracket.			
Test #	Ultimate Load (lbs)	Mode of Failure	Description
1	3800	A	Screws Pulled
2	3895.4	A	Screws Pulled
3	3517.1	A	Screws Pulled
Mean	3737.5		

Additional Notes: Pull Test