

Attn: Corey Geiger, COO, IronRidge Inc.
Date: September 7th, 2018

Re: Structural Certification and Span Tables for IronRidge Flush Mount System

This letter addresses the structural performance and code compliance of IronRidge's Flush Mount System. The Flush Mount System is a proprietary rooftop mounting system used to support photovoltaic (PV) modules installed in portrait or landscape orientation and set parallel to the underlying roof surface. PV modules are supported by extruded aluminum XR Rails and secured to the rails with IronRidge mounting clamps. The XR Rails are side mounted to a selected roof attachment with 3/8" stainless steel bonding hardware and then attached directly to the roof structure or to a stanchion that is fastened to the underlying roof structure. Assembly details of a typical Flush Mount installation and its core components are shown in Exhibit EX-0015.

The IronRidge Flush Mount System is designed and certified to the structural requirements of the reference standards listed below, for the load conditions and configurations tabulated in the attached span tables.

- ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures (ASCE 7-10)
- 2015 International Building Code (IBC-2015)
- 2015 Michigan Building Code
- 2015 Aluminum Design Manual (ADM-2015)

The tables included in this letter provide the maximum allowable spans of XR Rails in the Flush Mount System for the respective loads and configurations listed, covering wind exposure categories B, C, D, roof zones 1, 2 & 3, and roof slopes from 0° to 45°. The span tables are applicable provided that the following conditions are met:

1. Span is the distance between two adjacent roof attachment points (measured at the center of the attachment fastener)
2. The underlying roof pitch, measured between roof surface and horizontal plans, is 45° or less.
3. The mean roof height, defined as the average of the roof eave height and the roof ridge height measured from grade, does not exceed 30 feet.
4. Module length shall not exceed the listed maximum dimension provided for the respective span table and module width shall not exceed 48".
5. All Flush Mount components shall be installed in a professional workmanlike manner per IronRidge's Flush Mount installation manual and other applicable standards for general roof construction practice.

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The parameters and adjustments allowed in the span tables are defined as follows:

1. The Flush Mount System is designed as a Risk Category II structure as defined by ASCE 7-10 Chart 1.5-1.
2. When designing with a roof slope not listed in the span tables, but no greater than 45°, the lesser of the two span values listed immediately below and above the desired slope shall be used. For instance, if one is designing to a roof slope of 12°, use the lesser of the two span values associated with 10° and 15°.
3. The wind speed selection shall conform to ASCE 7-10 Fig. 26.5-1A (Risk Category II wind) and any state & local county/city amendments to the IBC. No special wind topographic features are included in the span tables and the topographic coefficient (Kzt) is taken as 1.0.
4. The snow load used in the span tables is the ground snow and shall conform to ASCE 7-10 Fig. 7-1. If a more restrictive snow load is imposed by a local building code/amendment to the IBC, such snow load requirement shall also be complied with. If the local jurisdiction specified snow load is in the format of a flat roof snow load, it shall first be converted to a ground snow following the local building code/amendment before the application of the attached span tables. No special snow conditions are considered including unbalanced, drifting, sliding or ponding snow. Snow load conditions presented in the span tables do not include buildings which are intentionally kept below freezing, kept just above freezing, or unheated.
5. The span tables reflect the ASCE 7 prescribed earthquake loads with the maximum magnitudes being:
 - 1) For ground snow no greater than 42psf: $S_s \pm 2.0g$ for Site Class A, B, C, or D.
 - 2) For ground snow greater than 42psf: $S_s \pm 1.0g$ for Site Class A, B, C, or D.
 - 3) For ground snow between 42 and 60psf: $S_s \pm 1.5g$ for Site Class A, B, C, or D.
6. Roof zone size and definition conforms to ASCE 7-10 Fig. 30.4-2A.
7. Allowable span length in the charts may be multiplied by a factor of 1.08 if the rails are continuous over a minimum of three spans.
8. An array to roof clearance of 2" minimum must be provided.
9. The maximum cantilever length measured from the rail end to the nearest attachment point shall not exceed 40% of the allowable span provided for the respective load & configuration condition from the span tables.
10. No rail splices are allowed in the cantilever, outer 2/3 of end spans, or middle 1/3 of interior spans.
11. For shaded cells of the span tables, UFO Mid Clamps shall not be installed closer than 20" to the shaded cell's associated Roof Zone.
12. When a roof attachment listed in IronRidge's Flush Mount installation manual is considered, the span values provided in this letter can be adjusted using IronRidge's online Design Assistant by checking the capacity of the selected roof attachment against the reaction forces provided in Design Assistant.

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