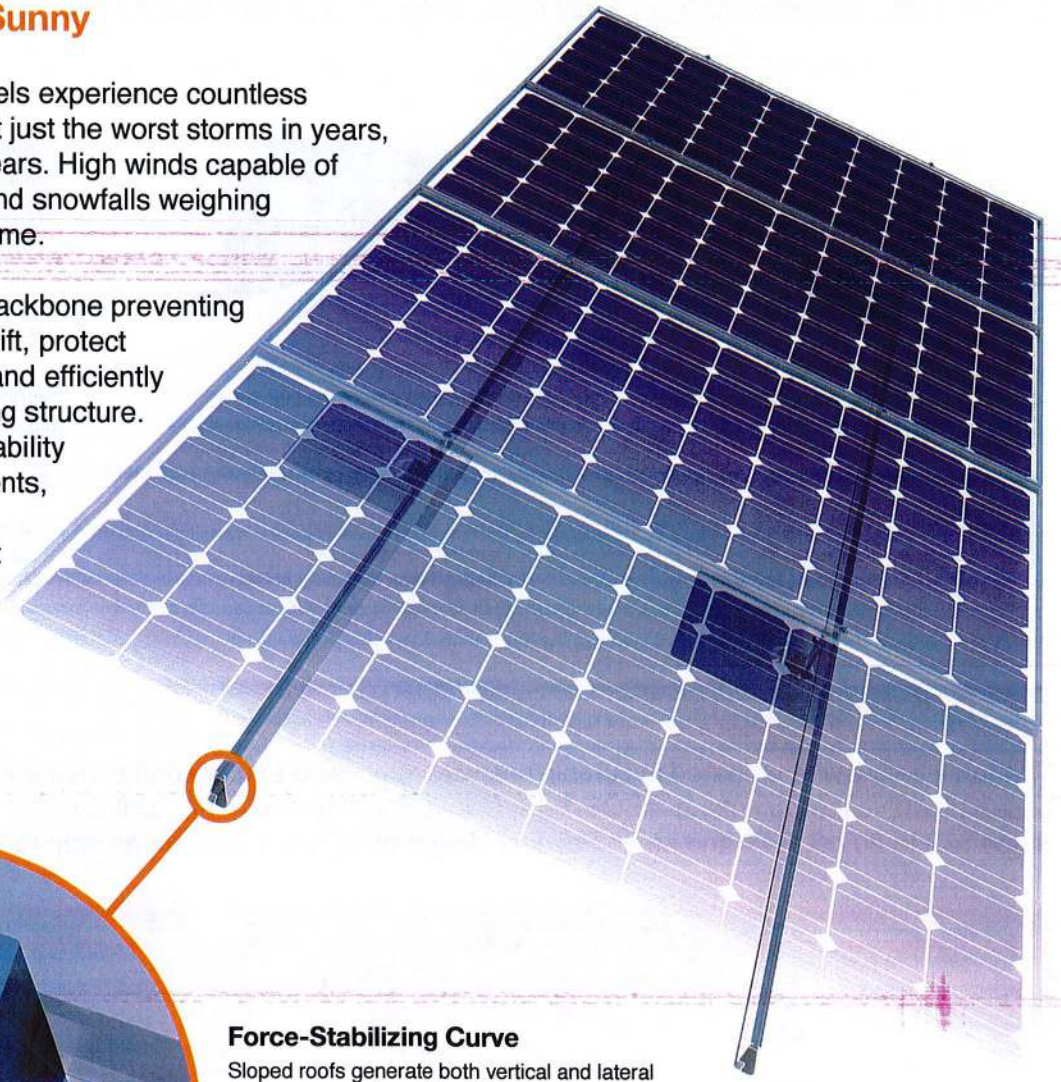
Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails are compatible with FlashFoot and other pitched roof attachments.

IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

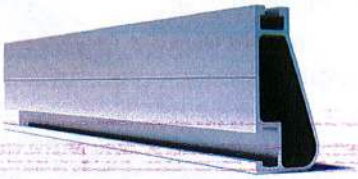
XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves spans up to 6 feet, while remaining light and economical.

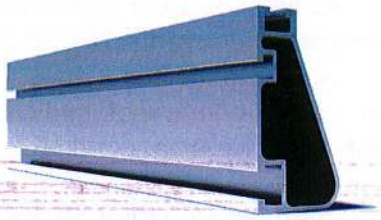
- 6' spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available



XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

- 10' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans up to 12 feet for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	90	XR10		XR100		XR1000	
	120						
	140						
	160						
20	90						
	120						
	140						
	160						
30	90						
	160						
40	90						
	160						
80	160						
120	160						

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

Attn: Corey Geiger, COO, IronRidge Inc.
Date: July 1st, 2021

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

This letter addresses the structural performance and code compliance of IronRidge's Flush Mount System. The contents of the letter shall be read in its entirety before applying to any project design. 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 7-16 Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)
- 2018 International Building Code (IBC-2018)
- 2020 Florida Building Code (FBC-2020)
- 2015 Aluminum Design Manual (ADM-2015)
- Report SEAOC (Structural Engineer Association of California) PV2-2017 Wind Design for Solar Arrays

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 provided in ASCE 7-16 for gable & hip roof profiles, and roof slopes of 8° to 45°. The tabulated spans are applicable when 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. Each module shall be supported by 2 rails (2 rail system) or 3 rails (3 rail system). Spans are calculated based on 2 rail systems, and conservatively deemed acceptable for 3 rail systems.

3. The underlying roof slope, measured between the roof surface and horizontal plane, is 8° to 45°.

4. 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.

5. A clearance from the underside of the array to the roof surface of 2" minimum shall be provided and the height of the array, the distance from the module top surface to the roof surface (defined as h_2), shall not exceed 10".

6. Module length and area shall not exceed the maximum values listed on the respective span tables.

7. All Flush Mount components shall be installed in a professional workmanlike manner per IronRidge's *Flush Mount Installation Manual* and other applicable standards for the general roof construction practice.

28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

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

1. The Flush Mount System is designed as a Risk Category II structure as defined by ASCE 7-16 Table 1.5-1.

2. Wind speed shall conform to ASCE 7-16 Fig. 26.5-1B (for Risk Category II) and applicable state & local county/city amendments to the IBC. No special wind topographic features are included and both topographic coefficient (K_{zt}) and wind ground elevation factor (K_e) are taken as 1.0.

3. Snow load used in the span tables is the *ground snow* and shall conform to ASCE 7-16 Fig. 7.2-1 and applicable state & local county/city amendments to the IBC. If the local jurisdiction specified snow load is in the format of a *flat roof snow*, it shall first be converted to a *ground snow* following the local building code/ amendments before the application of the attached span tables. No special snow conditions are considered including unbalanced, drifting, sliding, retention, or ponding snow. No rain-on-snow surcharge load is considered. The span tables do not apply to buildings which are intentionally kept below freezing, kept just above freezing, or unheated.

4. The span tables reflect the ASCE 7 prescribed earthquake loads with the maximum magnitudes being:

   (a) For ground snow no greater than 42psf: $S_s \leq 2.0g$ for Site Class A, B, C, & D.
   (b) For ground snow greater than 65psf: $S_s \leq 1.0g$ for Site Class A, B, C, & D.
   (c) For ground snow between 42 and 65psf: $S_s \leq 1.5g$ for Site Class A, B, C, & D.

5. Roof zones are defined by ASCE 7-16 Figure 30.3-2A to Figure 30.3-2I and are organized into three *groups* in which the zones share the same External Pressure Coefficients (GC_p). Roof zones comprising each *group* along with each roof zone's size and location are depicted in Figures 2 and 3 below each span table.

6. The maximum rail cantilever length, measured from the rail end to the nearest attachment point, shall be the lesser of the following two conditions: 40% of the allowable span provided for the respective load & configuration condition from the span tables, or 36".

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. No splices are allowed in the rail cantilever. For each XR splice type install per the following requirements:

   a) XR Bonded Splice cannot be installed in the center 1/3 of interior spans, or the outer 2/3 of end spans.
   b) BOSS Splice can be installed at any location within a span.

9. Shaded cells of the span tables indicate conditions in which UFO Mid Clamp connection capacity is exceeded. If such conditions are encountered contact support@ironridge.com.

28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

10. Systems using CAMO module clamps shall be installed with the following guidance:
    a) For single module installations (orphan modules) using modules with a length greater than 67.5", CAMO clamps shall not be installed in regions that experience ground snow loads of 70psf and greater. Such scenarios are shown by asterisks in the applicable span tables.
    b) CAMO will function within a module's design load ratings. Be sure the specific module being used with CAMO meets the dimensional requirements shown in the figure below and that the module selected is suitable for the environmental conditions of a particular project.

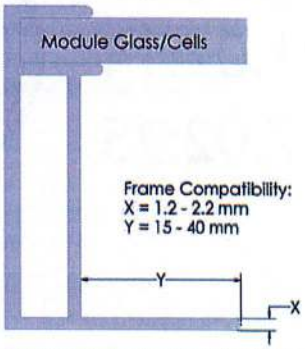


Figure 1: CAMO Module Frame Dimensional Requirements

Span values for *Exposed* and *Edge* module conditions, as defined below, are included in the attached span tables and shall be used when each condition exists. The maximum allowable span for *Exposed* or *Edge* modules shall be the lesser of the following two: (1) The span value for the *Exposed* or *Edge* module condition; (2) The span value determined by site wind speed and ground snow load. Additionally, irrespective of the lesser span, the shaded cells for the *Exposed* and *Edge* module conditions which reflect the UFO clamp usage limitation detailed in note 9 of page 2 shall apply to the respective condition.

1. Exposed Module conditions:

A module is defined as *Exposed* (per Section 29.4.4 of ASCE 7-16) if the distance from any of its free edges (an edge with no connectivity to other modules) to its facing roof edge (such as eave, ridge, rake, or hip) is greater than 0.5*h* (*h* is ASCE defined building height) AND if the distance from its free edge to any other adjacent array or panel is greater than 4 feet.

The allowable spans and cantilever shall only be applied to the portion of rail directly under *Exposed Modules*.

2. Edge Module conditions:

A module is defined as an *Edge Module* when its distance from any side of the module to its facing perimeter roof edge (such as eave, ridge, rake, or hip) is less than 2 times the height of the array ($2h_2$) where h_2 is measured from the roof surface to the top surface of the module.

The allowable spans and cantilever shall only be applied to the portion of rail directly under *Edge Modules*. Additionally, if the roof edge is the eave or ridge, only the rail nearest to that roof edge shall be considered for this span adjustment.

28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

The span tables provided in this letter are certified based on the structural performance of IronRidge XR Rails only with no consideration of the structural adequacy of the chosen roof attachments, PV modules, or the underlying roof supporting members. It is the responsibility of the installer or system designer to verify the structural capacity and adequacy of the aforementioned system components in regards to the applied or resultant loads of any chosen array configuration.

Sincerely,

Gang Xuan
2021.07.14
'00'07- 17:02:25

GANG XUAN LICENSE No 80599 STATE OF FLORIDA PROFESSIONAL ENGINEER

This item has been electronically signed and seal by *Gang Xuan* using a Digital Signature and date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Gang Xuan, PE
Senior Structural Engineer

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 67.5", Max Module SF: 21 SF
Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
95 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
100 mph	8-20	130	130	126	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
105 mph	8-20	130	129	118	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	129	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	126	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
110 mph	8-20	130	124	112	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	129	126	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	124	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
115 mph	8-20	130	118	105	110	110	105	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	127	119	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	115	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
120 mph	8-20	130	111	99	110	110	99	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	121	113	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	126	113	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
130 mph	8-20	125	100	89	110	100	89	92	92	89	91	91	89	82	82	82	74	74	74	68	68	68
	21-27	131	109	101	105	105	101	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	126	116	103	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
140 mph	8-20	111	91	81	110	91	81	92	91	81	91	91	81	82	82	81	74	74	74	68	68	68
	21-27	124	99	92	105	99	92	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	118	107	96	103	103	96	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
150 mph	8-20	99	83	74	99	83	74	92	83	74	91	83	74	82	82	74	74	74	74	68	68	68
	21-27	114	91	84	105	91	84	89	89	84	87	87	84	81	81	81	76	76	76	72	72	72
	28-45	109	99	87	103	99	87	88	88	87	87	87	87	80	80	80	75	75	75	72	72	72
160 mph	8-20	88	76	68	88	76	68	88	76	68	88	76	68	82	76	68	74	73	68	68	68	68
	21-27	105	84	77	105	84	77	89	84	77	87	84	77	81	81	77	76	76	74	72	72	72
	28-45	101	92	81	101	92	81	88	88	81	87	87	81	80	80	80	75	75	75	72	72	72
170 mph	8-20	82	72	64	82	72	64	82	72	64	82	72	64	82	72	64	74	72	64	68	68	64
	21-27	98	78	72	98	78	72	89	78	72	87	78	72	81	78	72	76	76	72	72	72	69
	28-45	96	86	76	96	86	76	88	86	76	87	86	76	80	80	76	75	75	75	72	72	72
175 mph	8-20	80	68	60	80	68	60	80	68	60	80	68	60	80	68	60	74	68	60	68	68	60
	21-27	93	75	68	93	75	68	89	75	68	87	75	68	81	75	68	76	75	68	72	72	68
	28-45	91	83	73	91	83	73	88	83	73	87	83	73	80	80	73	75	75	73	72	72	72
180 mph	8-20	77	65	57	77	65	57	77	65	57	77	65	57	77	65	57	74	65	57	68	65	57
	21-27	90	72	66	90	72	66	89	72	66	87	72	66	81	72	66	76	72	66	72	72	66
	28-45	88	80	72	88	80	72	88	80	72	87	80	72	80	80	72	75	75	72	72	72	72

Wind Speed (mph)	Roof Slope (deg.)	70 psf			80 psf			90 psf			100 psf			110 psf			120 psf			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	130	124	113	112	96	84
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	132	132	126	122	101	96
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	123	118	107	97
95 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	130	117	104	104	88	80
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	132	125	119	116	96	90
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	117	112	102	92
100 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	130	109	97	97	83	75
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	132	119	111	109	90	84
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	123	111	106	97	87
105 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	126	103	91	91	79	72
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	132	112	104	104	86	79
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	118	105	101	92	83
110 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	121	96	86	86	74	67
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	129	105	98	99	81	75
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	123	112	100	96	88	79
115 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	112	91	80	82	72	64
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	124	100	92	96	77	72
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	119	107	96	92	84	75
120 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	104	86	77	79	67	61
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	118	96	87	90	74	69
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	113	102	90	88	80	72
130 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	92	77	69	73	64	52
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	107	85	78	83	67	64
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	103	93	82	80	74	66
140 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	83	72	64	68	54	43
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	97	78	72	77	64	56
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	96	85	75	74	69	61
150 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	77	64	53	64	45	37
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	90	72	65	72	57	48
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	87	79	69	69	64	57
160 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	72	58	42	59	39	32
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	83	65	60	68	48	39
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	80	73	64	64	60	48
170 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	67	48	37	52	35	29
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	78	61	48	64	42	32
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	74	68	60	60	54	41
175 mph	8-20	64	64	60	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	64	42	35	49	33	27
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	75	58	43	64	39	30
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	72	65	57	58	50	39
180 mph	8-20	64	64	57	60	60	57	57	57	56	54	54	54	51	51	51	49	49	49	64	40	33	48	32	25
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	73	53	40	60	37	28
	28-45	68	68	67	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	69	64	52	54	48	36

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

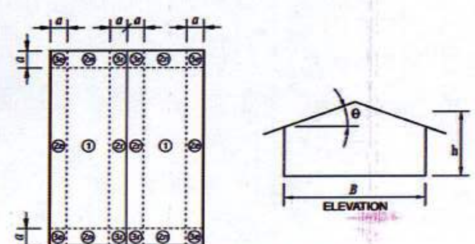


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 67.5", Max Module SF: 21 SF
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf			80 psf			90 psf			100 psf			110 psf			120 psf			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	130	128	118	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	125	100	90	90	77	72
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	132	110	103	103	84	78
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	116	103	99	91	82
95 mph	8-20	130	122	109	110	110	109	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	117	96	83	84	73	66
	21-27	131	131	125	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	128	103	96	97	79	74
	28-45	128	128	122	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	122	109	97	96	86	77
100 mph	8-20	130	114	102	110	110	102	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	107	87	78	80	69	64
	21-27	131	124	117	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	120	96	89	92	75	72
	28-45	128	128	115	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	115	103	92	89	82	73
105 mph	8-20	130	108	96	110	108	96	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	99	82	73	76	65	58
	21-27	131	117	109	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	113	90	83	87	72	66
	28-45	128	122	109	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	109	98	87	84	78	72
110 mph	8-20	125	101	90	110	101	90	92	92	90	91	91	90	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	92	77	69	73	64	52
	21-27	131	110	103	105	105	103	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	107	85	78	83	67	64
	28-45	128	116	104	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	103	93	82	80	74	66
115 mph	8-20	118	96	84	110	96	84	92	92	84	91	91	84	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	86	73	65	72	58	45
	21-27	129	104	96	105	104	96	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	101	80	74	80	64	59
	28-45	124	111	99	103	103	99	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	97	88	78	77	72	64
120 mph	8-20	111	90	80	110	90	80	92	90	80	91	90	80	82	82	80	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	82	69	61	67	52	42
	21-27	123	99	91	105	99	91	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	96	76	72	76	61	53
	28-45	118	106	96	103	103	96	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	92	84	74	73	67	60
130 mph	8-20	97	80	72	97	80	72	92	80	72	91	80	72	82	80	72	74	74	72	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	75	64	48	64	42	35
	21-27	112	89	82	105	89	82	89	89	82	87	87	82	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	87	69	64	72	53	43
	28-45	108	97	86	103	97	86	88	88	86	87	87	86	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	84	77	67	67	64	53
140 mph	8-20	86	73	65	86	73	65	86	73	65	86	73	65	82	73	65	74	73	65	68	68	65	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	69	52	39	55	36	30
	21-27	102	81	74	102	81	74	89	81	74	87	81	74	81	81	74	76	76	74	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	80	64	53	66	44	35
	28-45	99	89	78	99	89	78	88	88	78	87	87	78	80	80	78	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	77	72	61	64	57	44
150 mph	8-20	80	67	60	80	67	60	80	67	60	80	67	60	80	67	60	74	67	60	68	67	60	64	64	60	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	64	41	34	48	32	26
	21-27	96	74	67	96	74	67	89	74	67	87	74	67	81	74	67	76	74	67	72	72	67	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	74	56	41	61	38	30
	28-45	91	82	72	91	82	72	88	82	72	87	82	72	80	80	72	75	75	72	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	72	64	54	57	49	37
160 mph	8-20	74	61	48	74	61	48	74	61	48	74	61	48	74	61	48	74	61	48	68	61	48	64	61	48	60	60	48	57	57	48	54	54	48	51	51	48	49	49	48	59	36	30	42	28	24
	21-27	86	68	64	86	68	64	86	68	64	86	68	64	81	68	64	76	68	64	72	68	64	65	65	64	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	69	44	35	57	33	24
	28-45	83	76	67	83	76	67	83	76	67	83	76	67	80	76	67	75	75	67	72	72	67	67	67	67	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	65	60	44	48	42	32
170 mph	8-20	69	53	40	69	53	40	69	53	40	69	53	40	69	53	40	69	53	40	68	53	40	64	53	40	60	53	40	57	53	40	54	53	40	51	51	40	49	49	40	50	32	26	37	24	20
	21-27	81	64	56	81	64	56	81	64	56	81	64	56	81	64	56	76	64	56	72	64	56	65	64	56	61	61	56	58	58	56	55	55	55	52	52	52	50	50	50	64	38	30	50	29	20
	28-45	78	72	64	78	72	64	78	72	64	78	72	64	78	72	64	73	72	64	69	69	64	66	66	64	64	64	64	60	60	60	58	58	58	55	55	55	53	53	53	60	52	37	41	37	27
175 mph	8-20	67	48	38	67	48	38	67	48	38	67	48	38	67	48	38	67	48	38	67	48	38	64	48	38	60	48	38	57	48	38	54	48	38	51	48	38	49	48	38	48	30	25	35	24	19
	21-27	78	61	49	78	61	49	78	61	49	78	61	49	78	61	49	76	61	49	72	61	49	65	61	49	61	61	49	58	58	49	55	55	49	52	52	49	50	50	49	64	36	27	48	28	19
	28-45	75	68	60	75	68	60	75	68	60	75	68	60	75	68	60	72	68	60	68	68	60	65	65	60	64	64	60	60	60	60	57	57	57	55	55	55	53	53	53	58	48	35	39	35	25
180 mph	8-20	65	43	36	65	43	36	65	43	36	65	43	36	65	43	36	65	43	36	65	43	36	64	43	36	60	43	36	57	43	36	54	43	36	51	43	36	49	43	36	43	28	24	33	22	18
	21-27	76	59	44	76	59	44	76	59	44	76	59	44	76	59	44	75	59	44	72	59	44	65	59	44	61	59	44	58	58	44	55	55	44	52	52	44	50	50	44	60	34	26	44	26	18
	28-45	72	66	58	72	66	58	72	66	58	72	66	58	72	66	58	72	66	58	68	66	58	64	64	58	64	64	58	59	59	58	57	57	57	55	55	55	53	53	53	52	43	32	37	33	24

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

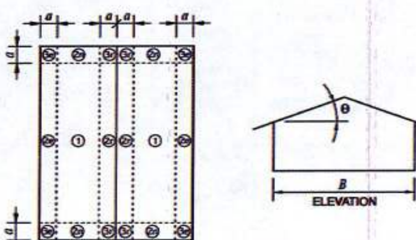


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 67.5", Max Module SF: 21 SF
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf			80 psf			90 psf			100 psf			110 psf			120 psf			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	130	118	105	110	110	105	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	111	90	80	82	72	64
	21-27	131	128	120	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	124	99	91	96	77	72
	28-45	128	128	118	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	118	106	96	91	83	75
95 mph	8-20	130	110	97	110	110	97	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	101	84	74	77	66	60
	21-27	131	119	112	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	115	92	85	88	72	67
	28-45	128	124	111	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	111	100	88	86	79	72
100 mph	8-20	126	103	91	110	103	91	92	92	91	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	96	78	72	74	64	53
	21-27	131	112	104	105	105	104	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	108	86	79	84	68	64
	28-45	128	118	105	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	104	96	83	81	75	67
105 mph	8-20	120	96	86	110	96	86	92	92	86	91	91	86	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	87	73	65	72	59	48
	21-27	129	105	97	105	105	97	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	102	81	74	80	65	60
	28-45	125	112	99	103	103	99	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	99	89	78	77	72	64
110 mph	8-20	112	90	80	110	90	80	92	90	80	91	90	80	82	82	80	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	82	69	61	67	52	42
	21-27	124	99	92	105	99	92	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	96	77	72	77	61	54
	28-45	118	106	96	103	103	96	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	93	84	74	73	68	61
115 mph	8-20	104	85	75	104	85	75	92	85	75	91	85	75	82	82	75	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	78	65	56	64	48	38
	21-27	117	96	86	105	96	86	89	89	86	87	87	86	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	91	72	66	73	58	48
	28-45	112	101	90	103	101	90	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	88	80	72	72	65	58
120 mph	8-20	96	80	72	96	80	72	92	80	72	91	80	72	82	80	72	74	74	72	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	74	61	48	61	42	35
	21-27	111	88	82	105	88	82	89	88	82	87	87	82	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	87	69	64	72	53	43
	28-45	107	96	85	103	96	85	88	88	85	87	87	85	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	83	76	67	66	64	52
130 mph	8-20	85	72	64	85	72	64	85	72	64	85	72	64	82	72	64	74	72	64	68	68	64	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	68	49	39	54	36	30
	21-27	100	80	73	100	80	73	89	80	73	87	80	73	81	80	73	76	76	73	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	79	64	52	65	43	33
	28-45	97	88	77	97	88	77	88	88	77	87	87	77	80	80	77	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	75	69	61	61	56	43
140 mph	8-20	79	66	57	79	66	57	79	66	57	79	66	57	79	66	57	74	66	57	68	66	57	64	64	57	60	60	57	57	57	57	54	54	54	51	51	51	49	49	49	64	40	33	48	32	25
	21-27	92	73	66	92	73	66	89	73	66	87	73	66	81	73	66	76	73	66	72	72	66	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	73	52	40	60	37	28
	28-45	88	80	72	88	80	72	88	80	72	87	80	72	80	80	72	75	75	72	72	72	72	67	67	67	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	69	64	52	54	48	36
150 mph	8-20	73	60	44	73	60	44	73	60	44	73	60	44	73	60	44	73	60	44	68	60	44	64	60	44	60	60	44	57	57	44	54	54	44	51	51	44	49	49	44	56	35	29	40	27	22
	21-27	85	66	61	85	66	61	85	66	61	85	66	61	81	66	61	76	66	61	72	66	61	65	65	61	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	67	42	32	54	32	24
	28-45	82	74	65	82	74	65	82	74	65	82	74	65	79	74	65	74	74	65	72	72	65	66	66	65	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	64	58	41	45	40	30
160 mph	8-20	67	48	38	67	48	38	67	48	38	67	48	38	67	48	38	67	48	38	67	48	38	64	48	38	60	48	38	57	48	38	54	48	38	51	48	38	49	48	38	48	30	25	35	24	19
	21-27	79	61	50	79	61	50	79	61	50	79	61	50	79	61	50	76	61	50	72	61	50	65	61	50	61	61	50	58	58	50	55	55	50	52	52	50	50	50	50	64	37	27	48	28	19
	28-45	75	69	60	75	69	60	75	69	60	75	69	60	75	69	60	72	69	60	68	68	60	65	65	60	64	64	60	60	60	60	57	57	57	55	55	55	53	53	53	58	48	35	39	35	26
170 mph	8-20	64	41	34	64	41	34	64	41	34	64	41	34	64	41	34	64	41	34	64	41	34	64	41	34	60	41	34	57	41	34	54	41	34	51	41	34	49	41	34	41	27	22	32	21	17
	21-27	74	54	40	74	54	40	74	54	40	74	54	40	74	54	40	74	54	40	72	54	40	65	54	40	61	54	40	58	54	40	55	54	40	52	52	40	50	50	40	59	32	24	42	25	17
	28-45	72	64	53	72	64	53	72	64	53	72	64	53	72	64	53	72	64	53	67	64	53	64	64	53	61	61	53	59	59	53	56	56	53	54	54	53	53	53	53	48	40	30	35	32	22
175 mph	8-20	61	38	32	61	38	32	61	38	32	61	38	32	61	38	32	61	38	32	61	38	32	61	38	32	60	38	32	57	38	32	54	38	32	51	38	32	49	38	32	38	25	21	29	19	16
	21-27	72	49	37	72	49	37	72	49	37	72	49	37	72	49	37	72	49	37	69	49	37	65	49	37	61	49	37	58	49	37	55	49	37	52	49	37	50	49	37	54	30	22	40	24	16
	28-45	67	64	48	67	64	48	67	64	48	67	64	48	67	64	48	67	64	48	66	64	48	64	64	48	60	60	48	58	58	48	56	56	48	54	54	48	52	52	48	43	38	28	33	29	20
180 mph	8-20	59	36	30	59	36	30	59	36	30	59	36	30	59	36	30	59	36	30	59	36	30	59	36	30	59	36	30	57	36	30	54	36	30	51	36	30	49	36	30	36	24	20	28	18	15
	21-27	69	44	35	69	44	35	69	44	35	69	44	35	69	44	35	69	44	35	69	44	35	65	44	35	61	44	35	58	44	35	55	44	35	52	44	35	50	44	35	51	29	20	37	22	15
	28-45	65	60	44	65	60	44	65	60	44	65	60	44	65	60	44	65	60	44	65	60	44	64	60	44	60	60	44	58	58	44	56	56	44	54	54	44	52	52	44	40	36	26	32	28	19

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

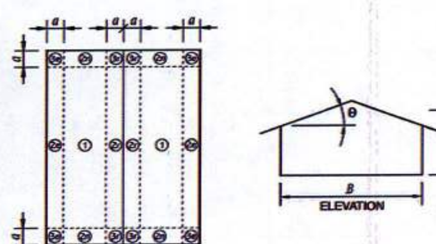


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 80", Max Module SF: 24 SF
Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
95 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
100 mph	8-20	123	123	122	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
105 mph	8-20	123	123	114	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
110 mph	8-20	123	120	107	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
115 mph	8-20	123	113	101	102	102	101	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	121	115	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	112	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
120 mph	8-20	123	107	96	102	102	96	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	115	109	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	117	106	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
130 mph	8-20	123	96	85	102	96	85	86	86	85	84	84	84	75	75	75	68	68	68	64	64	64
	21-27	121	104	98	99	99	98	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	117	109	98	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
140 mph	8-20	110	87	77	102	87	77	86	86	77	84	84	77	75	75	75	68	68	68	64	64	64
	21-27	118	96	88	99	96	88	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64
	28-45	113	101	90	98	98	90	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
150 mph	8-20	98	79	72	98	79	72	86	79	72	84	79	72	75	75	72	68	68	68	64	64	64
	21-27	108	87	80	99	87	80	84	84	80	83	83	80	76	76	76	69	69	69	64	64	64
	28-45	105	96	83	98	96	83	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67
160 mph	8-20	88	72	65	88	72	65	86	72	65	84	72	65	75	72	65	68	68	65	64	64	64
	21-27	100	80	74	99	80	74	84	80	74	83	80	74	76	76	74	69	69	69	64	64	64
	28-45	97	87	77	97	87	77	83	83	77	82	82	77	76	76	76	72	72	72	67	67	67
170 mph	8-20	80	67	59	80	67	59	80	67	59	80	67	59	75	67	59	68	67	59	64	64	59
	21-27	93	74	68	93	74	68	84	74	68	83	74	68	76	74	68	69	69	68	64	64	64
	28-45	90	81	72	90	81	72	83	81	72	82	81	72	76	76	72	72	72	72	67	67	67
175 mph	8-20	77	64	55	77	64	55	77	64	55	77	64	55	75	64	55	68	64	55	64	64	55
	21-27	90	72	65	90	72	65	84	72	65	83	72	65	76	72	65	69	69	65	64	64	64
	28-45	87	78	69	87	78	69	83	78	69	82	78	69	76	76	69	72	72	69	66	66	66
180 mph	8-20	73	64	48	73	64	48	73	64	48	73	64	48	73	64	48	68	64	48	64	64	48
	21-27	87	69	64	87	69	64	84	69	64	83	69	64	76	69	64	69	69	64	64	64	64
	28-45	84	76	67	84	76	67	83	76	67	81	76	67	75	75	67	72	72	67	66	66	66

Wind Speed (mph)	Roof Slope (deg.)	70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	124	120	107	106	87	79
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	121	121	113	96	88
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	117	110	99	90
95 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	124	112	99	99	82	74
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	120	113	107	88	83
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	110	104	96	85
100 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	124	103	92	92	77	72
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	112	106	101	84	78
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	104	99	90	81
105 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	124	97	87	86	73	66
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	106	99	96	79	74
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	111	99	96	85	77
110 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	119	91	81	81	69	64
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	99	93	92	76	72
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	105	96	90	81	73
115 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	109	86	76	76	66	59
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	117	96	88	87	72	67
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	113	100	89	85	78	72
120 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	102	81	72	72	64	54
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	111	89	83	84	69	64
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	108	96	85	81	74	67
130 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	90	73	65	67	55	44
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	101	80	74	77	64	58
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	98	87	77	75	69	61
140 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	78	66	59	64	45	36
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	92	73	67	72	58	48
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	90	80	72	69	64	56
150 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	72	60	45	57	38	32
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	84	67	61	66	48	38
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	82	74	65	64	59	48
160 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	66	49	36	50	33	27
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	78	64	52	64	41	33
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	76	69	60	59	54	40
170 mph	8-20	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	64	40	32	44	29	24
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	72	55	41	59	35	27
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	72	64	54	54	45	34
175 mph	8-20	58	58	55	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	60	36	30	42	27	24
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	72	49	37	56	33	26
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	67	64	48	49	42	32
180 mph	8-20	58	58	48	55	55	48	52	52	48	49	49	48	48	48	48	45	45	45	57	34	28	39	26	21
	21-27	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	68	44	33	53	32	24
	28-45	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	65	59	44	48	40	30

= min 72" span = min 64" span = min 48" span
= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

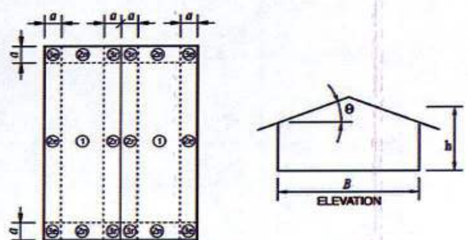


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 80", Max Module SF: 24 SF
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	123	123	112	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	124	96	85	84	72	65
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	103	97	96	78	73
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	109	97	92	84	76
95 mph	8-20	123	117	104	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	113	88	79	78	67	61
	21-27	121	121	119	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	120	97	90	90	74	69
	28-45	117	117	114	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	116	103	91	87	80	72
100 mph	8-20	123	109	97	102	102	97	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	105	83	73	73	64	56
	21-27	121	117	110	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	113	91	84	85	72	65
	28-45	117	117	108	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	109	97	86	83	76	68
105 mph	8-20	123	102	91	102	102	91	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	96	77	69	72	60	49
	21-27	121	110	103	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	106	85	79	81	66	61
	28-45	117	115	103	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	103	92	81	78	72	65
110 mph	8-20	123	96	85	102	96	85	86	86	85	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	90	73	65	67	55	44
	21-27	121	104	98	99	99	98	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	101	80	74	77	64	58
	28-45	117	109	98	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	98	87	77	75	69	61
115 mph	8-20	116	90	80	102	90	80	86	86	80	84	84	80	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	83	69	61	64	49	38
	21-27	121	98	92	99	98	92	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	96	76	72	73	59	51
	28-45	117	104	92	98	98	92	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	92	83	73	72	66	58
120 mph	8-20	108	85	76	102	85	76	86	85	76	84	84	76	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	77	65	56	61	44	35
	21-27	116	93	87	99	93	87	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	90	72	66	72	55	45
	28-45	112	99	88	98	98	88	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	88	79	69	68	64	55
130 mph	8-20	96	76	68	96	76	68	86	76	68	84	76	68	75	75	68	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	69	58	41	54	36	30
	21-27	105	84	78	99	84	78	84	84	78	83	83	78	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	82	65	59	65	45	36
	28-45	102	91	80	97	91	80	83	83	80	82	82	80	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	80	72	64	64	58	45
140 mph	8-20	84	69	64	84	69	64	84	69	64	84	69	64	75	69	64	68	68	64	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	64	44	33	48	32	25
	21-27	96	76	72	96	76	72	84	76	72	83	76	72	76	76	72	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	74	59	45	60	37	30
	28-45	93	83	74	93	83	74	83	83	74	82	82	74	76	76	74	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	72	66	58	58	49	37
150 mph	8-20	74	64	51	74	64	51	74	64	51	74	64	51	74	64	51	68	64	51	64	64	51	58	58	51	55	55	51	52	52	51	49	49	49	48	48	48	45	45	45	59	35	29	40	27	22
	21-27	88	72	64	88	72	64	84	72	64	83	72	64	76	72	64	69	69	64	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	69	48	34	54	32	24
	28-45	85	77	68	85	77	68	83	77	68	82	77	68	75	75	68	72	72	68	66	66	66	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	66	60	48	48	41	32
160 mph	8-20	69	56	40	69	56	40	69	56	40	69	56	40	69	56	40	68	56	40	64	56	40	58	56	40	55	55	40	52	52	40	49	49	40	48	48	40	45	45	40	50	30	25	35	24	19
	21-27	81	65	59	81	65	59	81	65	59	81	65	59	76	65	59	69	65	59	64	64	59	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	64	37	29	48	28	20
	28-45	79	72	64	79	72	64	79	72	64	79	72	64	74	72	64	69	69	64	65	65	64	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	61	54	37	40	35	26
170 mph	8-20	64	45	34	64	45	34	64	45	34	64	45	34	64	45	34	64	45	34	64	45	34	58	45	34	55	45	34	52	45	34	49	45	34	48	45	34	45	45	34	42	27	22	32	21	17
	21-27	75	59	48	75	59	48	75	59	48	75	59	48	75	59	48	69	59	48	64	59	48	59	59	48	56	56	48	53	53	48	50	50	48	48	48	48	48	48	48	60	32	24	42	25	18
	28-45	73	66	58	73	66	58	73	66	58	73	66	58	72	66	58	67	66	58	64	64	58	60	60	58	58	58	58	55	55	55	53	53	53	51	51	51	49	49	49	56	44	32	35	32	24
175 mph	8-20	64	40	32	64	40	32	64	40	32	64	40	32	64	40	32	64	40	32	64	40	32	58	40	32	55	40	32	52	40	32	49	40	32	48	40	32	45	40	32	39	25	21	29	19	16
	21-27	73	56	41	73	56	41	73	56	41	73	56	41	73	56	41	69	56	41	64	56	41	59	56	41	56	56	41	53	53	41	50	50	41	48	48	41	48	48	41	58	30	24	40	24	16
	28-45	72	64	55	72	64	55	72	64	55	72	64	55	72	64	55	67	64	55	64	64	55	60	60	55	57	57	55	55	55	55	53	53	53	51	51	51	49	49	49	49	40	29	33	29	21
180 mph	8-20	60	36	30	60	36	30	60	36	30	60	36	30	60	36	30	60	36	30	60	36	30	58	36	30	55	36	30	52	36	30	49	36	30	48	36	30	45	36	30	36	24	20	28	18	15
	21-27	72	51	37	72	51	37	72	51	37	72	51	37	72	51	37	69	51	37	64	51	37	59	51	37	56	51	37	53	51	37	50	50	37	48	48	37	48	48	37	53	29	21	37	22	15
	28-45	68	64	49	68	64	49	68	64	49	68	64	49	68	64	49	66	64	49	64	64	49	59	59	49	57	57	49	55	55	49	52	52	49	51	51	49	49	49	49	44	36	27	32	28	20

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

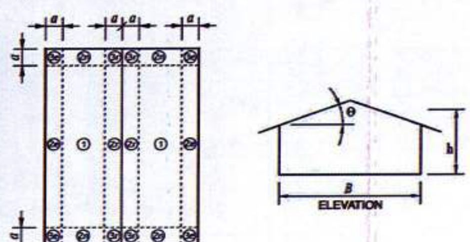


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 80", Max Module SF: 24 SF
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf Group 1	Group 2	Group 3	10 psf Group 1	Group 2	Group 3	20 psf Group 1	Group 2	Group 3	30 psf Group 1	Group 2	Group 3	40 psf Group 1	Group 2	Group 3
90 mph	8-20	123	112	99	102	102	99	86	86	86	84	84	84	75	75	75
	21-27	121	120	114	99	99	99	84	84	84	83	83	83	76	76	76
	28-45	117	117	111	98	98	98	83	83	83	82	82	82	76	76	76
95 mph	8-20	123	104	92	102	102	92	86	86	86	84	84	84	75	75	75
	21-27	121	113	106	99	99	99	84	84	84	83	83	83	76	76	76
	28-45	117	117	105	98	98	98	83	83	83	82	82	82	76	76	76
100 mph	8-20	123	97	87	102	97	87	86	86	86	84	84	84	75	75	75
	21-27	121	105	99	99	99	99	84	84	84	83	83	83	76	76	76
	28-45	117	110	99	98	98	98	83	83	83	82	82	82	76	76	76
105 mph	8-20	117	91	81	102	91	81	86	86	81	84	84	81	75	75	75
	21-27	121	99	92	99	99	92	84	84	84	83	83	83	76	76	76
	28-45	117	105	93	98	98	93	83	83	83	82	82	82	76	76	76
110 mph	8-20	109	85	76	102	85	76	86	85	76	84	84	76	75	75	75
	21-27	116	96	87	99	96	87	84	84	84	83	83	83	76	76	76
	28-45	112	100	88	98	98	88	83	83	83	82	82	82	76	76	76
115 mph	8-20	101	80	72	101	80	72	86	80	72	84	80	72	75	75	72
	21-27	110	88	82	99	88	82	84	84	82	83	83	82	76	76	76
	28-45	106	96	84	98	96	84	83	83	83	82	82	82	76	76	76
120 mph	8-20	96	76	67	96	76	67	86	76	67	84	76	67	75	75	67
	21-27	104	84	77	99	84	77	84	84	77	83	83	77	76	76	76
	28-45	101	90	80	97	90	80	83	83	80	82	82	80	76	76	76
130 mph	8-20	83	68	60	83	68	60	83	68	60	83	68	60	75	68	60
	21-27	96	76	69	96	76	69	84	76	69	83	76	69	76	76	69
	28-45	92	83	73	92	83	73	83	83	73	82	82	73	76	76	73
140 mph	8-20	73	64	48	73	64	48	73	64	48	73	64	48	73	64	48
	21-27	86	69	64	86	69	64	84	69	64	83	69	64	76	69	64
	28-45	84	76	66	84	76	66	83	76	66	81	76	66	75	75	66
150 mph	8-20	67	52	37	67	52	37	67	52	37	67	52	37	67	52	37
	21-27	79	64	56	79	64	56	79	64	56	79	64	56	76	64	56
	28-45	77	72	61	77	72	61	77	72	61	77	72	61	73	72	61
160 mph	8-20	64	41	32	64	41	32	64	41	32	64	41	32	64	41	32
	21-27	73	58	42	73	58	42	73	58	42	73	58	42	73	58	42
	28-45	72	65	56	72	65	56	72	65	56	72	65	56	72	65	56
170 mph	8-20	58	34	28	58	34	28	58	34	28	58	34	28	58	34	28
	21-27	68	45	34	68	45	34	68	45	34	68	45	34	68	45	34
	28-45	66	60	45	66	60	45	66	60	45	66	60	45	66	60	45
175 mph	8-20	54	32	27	54	32	27	54	32	27	54	32	27	54	32	27
	21-27	66	41	32	66	41	32	66	41	32	66	41	32	66	41	32
	28-45	64	58	41	64	58	41	64	58	41	64	58	41	64	58	41
180 mph	8-20	50	30	25	50	30	25	50	30	25	50	30	25	50	30	25
	21-27	64	37	29	64	37	29	64	37	29	64	37	29	64	37	29
	28-45	61	55	37	61	55	37	61	55	37	61	55	37	61	55	37

Wind Speed (mph)	Roof Slope (deg.)	50 psf Group 1	Group 2	Group 3	60 psf Group 1	Group 2	Group 3	70 psf* Group 1	Group 2	Group 3	80 psf* Group 1	Group 2	Group 3	90 psf* Group 1	Group 2	Group 3
90 mph	8-20	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
95 mph	8-20	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
100 mph	8-20	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
105 mph	8-20	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
110 mph	8-20	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
115 mph	8-20	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
120 mph	8-20	68	68	67	64	64	64	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
130 mph	8-20	68	68	60	64	64	60	58	58	58	55	55	55	52	52	52
	21-27	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56
140 mph	8-20	68	64	48	64	64	48	58	58	48	55	55	48	52	52	48
	21-27	69	69	64	64	64	64	59	59	59	56	56	56	53	53	53
	28-45	72	72	66	66	66	66	64	64	64	59	59	59	56	56	56
150 mph	8-20	67	52	37	64	52	37	58	52	37	55	52	37	52	52	37
	21-27	69	64	56	64	64	56	59	59	56	56	56	56	53	53	53
	28-45	68	68	61	65	65	61	61	61	61	58	58	58	56	56	56
160 mph	8-20	64	41	32	64	41	32	58	41	32	55	41	32	52	41	32
	21-27	69	58	42	64	58	42	59	58	42	56	56	42	53	53	42
	28-45	67	65	56	64	64	56	60	60	56	57	57	56	55	55	55
170 mph	8-20	58	34	28	58	34	28	58	34	28	55	34	28	52	34	28
	21-27	68	45	34	64	45	34	59	45	34	56	45	34	53	45	34
	28-45	65	60	45	64	60	45	59	59	45	56	56	45	54	54	45
175 mph	8-20	54	32	27	54	32	27	54	32	27	54	32	27	52	32	27
	21-27	66	41	32	64	41	32	59	41	32	56	41	32	53	41	32
	28-45	64	58	41	61	58	41	58	58	41	56	56	41	54	54	41
180 mph	8-20	50	30	25	50	30	25	50	30	25	50	30	25	50	30	25
	21-27	64	37	29	64	37	29	59	37	29	56	37	29	53	37	29
	28-45	61	55	37	60	55	37	58	55	37	55	55	37	53	53	37

Wind Speed (mph)	Roof Slope (deg.)	100 psf* Group 1	Group 2	Group 3	110 psf* Group 1	Group 2	Group 3	120 psf* Group 1	Group 2	Group 3	Exposed Mod. Group 1	Group 2	Group 3	Edge Mod. Group 1	Group 2	Group 3
90 mph	8-20	49	49	49	48	48	48	45	45	45	108	85	76	76	65	59
	21-27	50	50	50	48	48	48	48	48	48	116	93	87	87	72	66
	28-45	53	53	53	51	51	51	49	49	49	112	99	88	85	77	69
95 mph	8-20	49	49	49	48	48	48	45	45	45	98	79	72	72	61	51
	21-27	50	50	50	48	48	48	48	48	48	108	87	81	82	67	64
	28-45	53	53	53	51	51	51	49	49	49	105	96	83	80	73	65
100 mph	8-20	49	49	49	48	48	48	45	45	45	91	74	66	67	57	45
	21-27	50	50	50	48	48	48	48	48	48	102	81	75	77	64	59
	28-45	53	53	53	51	51	51	49	49	49	99	88	78	76	69	64
105 mph	8-20	49	49	49	48	48	48	45	45	45	84	69	64	64	49	40
	21-27	50	50	50	48	48	48	48	48	48	96	76	72	74	60	52
	28-45	53	53	53	51	51	51	49	49	49	93	84	74	72	66	59
110 mph	8-20	49	49	49	48	48	48	45	45	45	77	65	56	61	44	35
	21-27	50	50	50	48	48	48	48	48	48	91	72	66	72	56	45
	28-45	53	53	53	51	51	51	49	49	49	88	79	72	68	64	55
115 mph	8-20	49	49	49	48	48	48	45	45	45	73	61	48	59	40	32
	21-27	50	50	50	48	48	48	48	48	48	85	68	64	67	49	40
	28-45	53	53	53	51	51	51	49	49	49	83	75	66	65	60	49
120 mph	8-20	49	49	49	48	48	48	45	45	45	69	56	40	54	35	29
	21-27	50	50	50	48	48	48	48	48	48	81	65	59	64	44	36
	28-45	53	53	53	51	51	51	49	49	49	79	72	64	64	57	44
130 mph	8-20	49	49	49	48	48	48	45	45	45	64	41	32	48	30	25
	21-27	50	50	50	48	48	48	48	48	48	74	58	44	60	36	29
	28-45	53	53	53	51	51	51	49	49	49	72	65	57	56	48	36
140 mph	8-20	49	49	48	48	48	48	45	45	45	57	34	28	39	26	21
	21-27	50	50	50	48	48	48	48	48	48	68	44	33	53	32	24
	28-45	53	53	53	51	51	51	49	49	49	65	59	44	48	40	30
150 mph	8-20	49	49	37	48	48	37	45	45	37	48	29	24	34	22	19
	21-27	50	50	50	48	48	48	48	48	48	64	35	27	48	27	19
	28-45	53	53	53	51	51	51	49	49	49	59	51	34	38	34	25
160 mph	8-20	49	41	32	48	41	32	45	41	32	40	26	21	30	20	16
	21-27	50	50	42	48	48	42	48	48	42	58	32	24	40	24	16
	28-45	53	53	53	51	51	51	49	49	49	51	40	30	33	30	22
170 mph	8-20	49	34	28	48	34	28	45	34	28	34	24	19	26	17	14
	21-27	50	45	34	48	45	34	48	45	34	50	27	20	35	21	14
	28-45	52	52	45	50	50	45	49	49	45	40	34	26	29	26	19
175 mph	8-20	49	32	27	48	32	27	45	32	27	32	21	18	25	16	13
	21-27	50	41	32	48	41	32	48	41	32	48	26	18	33	20	13
	28-45	52	52	41	50	50	41	48	48	41	36	32	24	27	25	17
180 mph	8-20	49	30	25	48	30	25	45	30	25	30	20	17	24	15	13
	21-27	50	37	29	48	37	29	48	37	29	43	24	17	32	19	13
	28-45	51	51	37	49	49	37	48	48	37	34	30	22	26	24	16

= min 72" span
= min 64" span
= min 48" span
= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

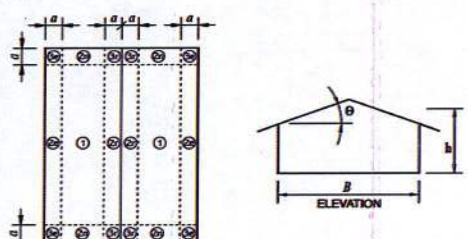


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
****Max Module Length: 86", Max Module SF: 24.5 SF**
Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	114	102	104	84	76
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	114	114	109	91	85
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	110	105	96	86
95 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	106	96	96	79	72
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	114	108	103	85	80
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	104	100	90	82
100 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	99	88	89	75	68
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	107	101	97	81	76
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	110	99	96	86	77
105 mph	8-20	116	116	109	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	93	82	84	72	64
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	100	96	93	76	72
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	105	96	90	82	74
110 mph	8-20	116	114	102	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	114	87	78	79	67	61
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	96	89	88	73	68
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	100	89	86	78	72
115 mph	8-20	116	108	96	97	97	96	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	105	82	73	74	64	57
	21-27	114	114	110	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	111	90	84	84	69	65
	28-45	111	111	106	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	107	96	85	82	75	67
120 mph	8-20	116	102	91	97	97	91	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	98	77	69	72	61	51
	21-27	114	110	104	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	105	85	79	80	66	61
	28-45	111	111	101	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	102	91	81	79	72	64
130 mph	8-20	116	91	81	97	91	81	82	82	81	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	85	69	64	64	52	41
	21-27	114	99	96	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	96	77	72	74	60	54
	28-45	111	104	93	96	96	93	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	96	83	73	72	66	59
140 mph	8-20	106	83	74	97	83	74	82	82	74	80	80	74	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	76	64	52	59	42	33
	21-27	112	90	84	96	90	84	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	87	72	64	68	54	44
	28-45	108	96	85	96	96	85	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	85	76	67	67	61	52
150 mph	8-20	96	75	67	96	75	67	82	75	67	80	75	67	72	72	67	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	68	57	39	53	35	29
	21-27	103	83	77	96	83	77	81	81	77	80	80	77	73	73	73	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	80	64	59	64	45	36
	28-45	99	89	79	96	89	79	81	81	79	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	78	72	64	64	57	44
160 mph	8-20	85	69	64	85	69	64	82	69	64	80	69	64	72	69	64	65	65	64	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	64	44	32	48	32	25
	21-27	96	76	72	96	76	72	81	76	72	80	76	72	73	73	72	66	66	66	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	74	59	48	60	38	30
	28-45	92	82	73	92	82	73	81	81	73	79	79	73	74	74	73	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	72	65	57	58	49	38
170 mph	8-20	76	64	54	76	64	54	76	64	54	76	64	54	72	64	54	65	64	54	60	60	54	56	56	54	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	59	35	29	41	27	22
	21-27	88	72	65	88	72	65	81	72	65	80	72	65	73	72	65	66	66	65	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	69	49	37	55	33	25
	28-45	86	77	68	86	77	68	80	77	68	79	77	68	73	73	68	68	68	68	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	67	61	48	51	42	32
175 mph	8-20	74	61	48	74	61	48	74	61	48	74	61	48	72	61	48	65	61	48	60	60	48	56	56	48	53	53	48	50	50	48	48	48	48	45	45	45	43	43	43	56	33	27	39	25	21
	21-27	85	68	64	85	68	64	81	68	64	80	68	64	73	68	64	66	66	64	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	66	44	32	52	32	24
	28-45	83	74	66	83	74	66	79	74	66	78	74	66	72	72	66	67	67	66	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	65	59	44	48	39	30
180 mph	8-20	72	59	44	72	59	44	72	59	44	72	59	44	72	59	44	65	59	44	60	59	44	56	56	44	53	53	44	50	50	44	48	48	44	45	45	44	43	43	43	52	32	25	37	24	20
	21-27	82	65	60	82	65	60	81	65	60	80	65	60	73	65	60	66	65	60	61	61	60	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	64	39	30	49	29	22
	28-45	80	72	64	80	72	64	79	72	64	78	72	64	72	72	64	67	67	64	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	64	57	39	42	37	28

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

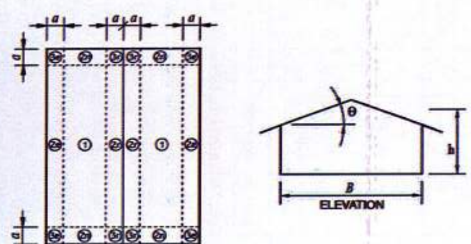


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Gable Roof Flush Mount System Span Table (Inches) - Portrait or Landscape Installation
**Max Module Length: 86", Max Module SF: 24.5 SF
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	116	116	107	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
95 mph	8-20	116	111	99	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	113	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	111	111	108	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
100 mph	8-20	116	104	92	97	97	92	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	111	106	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	111	111	103	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
105 mph	8-20	116	97	86	97	97	86	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	105	99	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	111	109	97	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
110 mph	8-20	116	91	81	97	91	81	82	82	81	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	99	93	96	96	93	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	111	103	92	96	96	92	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
115 mph	8-20	112	86	76	97	86	76	82	82	76	80	80	76	72	72	72	65	65	65	60	60	60
	21-27	114	96	88	96	96	88	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	111	99	88	96	96	88	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
120 mph	8-20	104	81	72	97	81	72	82	81	72	80	80	72	72	72	72	65	65	65	60	60	60
	21-27	110	89	83	96	89	83	81	81	81	80	80	80	73	73	73	66	66	66	61	61	61
	28-45	106	96	84	96	96	84	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
130 mph	8-20	91	73	65	91	73	65	82	73	65	80	73	65	72	72	65	65	65	65	60	60	60
	21-27	100	80	74	96	80	74	81	80	74	80	80	74	73	73	73	66	66	66	61	61	61
	28-45	97	86	76	96	86	76	81	81	76	79	79	76	74	74	74	69	69	69	64	64	64
140 mph	8-20	80	66	59	80	66	59	80	66	59	80	66	59	72	66	59	65	65	59	60	60	59
	21-27	91	73	67	91	73	67	81	73	67	80	73	67	73	73	67	66	66	66	61	61	61
	28-45	89	79	72	89	79	72	81	79	72	79	79	72	73	73	72	68	68	68	64	64	64
150 mph	8-20	72	60	45	72	60	45	72	60	45	72	60	45	72	60	45	65	60	45	60	60	45
	21-27	84	67	61	84	67	61	81	67	61	80	67	61	73	67	61	66	66	61	61	61	61
	28-45	82	73	65	82	73	65	79	73	65	78	73	65	72	72	65	67	67	65	64	64	64
160 mph	8-20	66	51	35	66	51	35	66	51	35	66	51	35	66	51	35	65	51	35	60	51	35
	21-27	77	61	54	77	61	54	77	61	54	77	61	54	73	61	54	66	61	54	61	61	54
	28-45	75	68	60	75	68	60	75	68	60	75	68	60	72	68	60	66	66	60	64	64	60
170 mph	8-20	61	39	32	61	39	32	61	39	32	61	39	32	61	39	32	61	39	32	60	39	32
	21-27	72	56	42	72	56	42	72	56	42	72	56	42	72	56	42	66	56	42	61	56	42
	28-45	72	64	55	72	64	55	72	64	55	72	64	55	69	64	55	64	64	55	61	61	55
175 mph	8-20	59	35	29	59	35	29	59	35	29	59	35	29	59	35	28	59	35	29	59	35	29
	21-27	69	49	37	69	49	37	69	49	37	69	49	37	69	49	37	66	49	37	61	49	37
	28-45	67	61	49	67	61	49	67	61	49	67	61	49	67	61	49	64	61	49	60	60	49
180 mph	8-20	57	33	27	57	33	27	57	33	27	57	33	27	57	33	27	57	33	27	57	33	27
	21-27	67	45	34	67	45	34	67	45	34	67	45	34	67	45	34	66	45	34	61	45	34
	28-45	65	59	45	65	59	45	65	59	45	65	59	45	65	59	45	64	59	45	60	59	45

Wind Speed (mph)	Roof Slope (deg.)	70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	91	81	82	69	64
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	99	93	91	75	72
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	103	92	89	81	73
95 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	109	85	75	76	65	59
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	92	86	86	72	66
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	110	97	87	84	77	69
100 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	100	79	72	72	64	52
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	107	86	81	82	67	64
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	103	92	82	80	73	65
105 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	92	74	66	67	58	45
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	101	81	75	78	64	59
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	98	87	77	76	69	64
110 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	85	69	64	64	51	41
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	96	76	72	74	60	54
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	96	83	73	72	66	59
115 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	79	65	58	61	45	35
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	90	72	67	72	58	48
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	88	79	72	69	64	56
120 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	74	64	49	59	41	32
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	86	69	64	67	51	42
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	84	75	66	66	60	51
130 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	66	51	37	51	33	28
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	78	64	55	64	42	34
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	76	68	60	60	55	41
140 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	61	38	30	43	29	24
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	72	54	41	58	34	27
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	69	64	53	54	45	34
150 mph	8-20	56	56	45	53	53	45	50	50	45	48	48	45	45	45	45	43	43	43	54	32	26	38	25	20
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	65	42	32	51	30	22
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	64	58	41	45	38	29
160 mph	8-20	56	51	35	53	51	35	50	50	35	48	48	35	45	45	35	43	43	35	45	26	24	33	22	18
	21-27	57	57	54	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	61	33	27	44	26	19
	28-45	59	59	59	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	58	48	33	37	33	25
170 mph	8-20	56	39	32	53	39	32	50	39	32	48	39	32	45	39	32	43	39	32	38	24	20	29	19	16
	21-27	57	56	42	53	53	42	51	51	42	48	48	42	48	48	42	44	44	42	56	29	22	39	24	17
	28-45	58	58	55	55	55	55	53	53	53	51	51	51	48	48	48	48	48	48	49	39	28	32	29	21
175 mph	8-20	56	35	29	53	35	29	50	35	29	48	35	29	45	35	29	43	35	29	35	24	19	27	18	15
	21-27	57	49	37	53	49	37	51	49	37	48	48	37	48	48	37	44	44	37	52	28	21	37	22	15
	28-45	57	57	49	55	55	49	53	53	49	51	51	49	48	48	48	48	48	48	44	35	27	30	27	19
180 mph	8-20	56	33	27	53	33	27	50	33	27	48	33	27	45	33	27	43	33	27	33	22	18	26	17	14
	21-27	57	45	34	53	45	34	51	45	34	48	45	34	48	45	34	44	44	34	48	26	19	35	20	14
	28-45	57	57	45	54	54	45	52	52	45	50	50	45	48	48	45	48	48	45	39	33	25	29	26	18

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

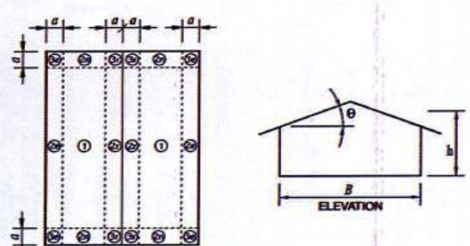


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100		Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation **Max Module Length: 86", Max Module SF: 24.5 SF Exposure D																																												
Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	116	107	96	97	97	96	82	82	82	81	81	81	73	73	73	66	66	66	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	104	81	72	74	64	55
	21-27	114	114	109	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	110	89	83	83	69	64
	28-45	111	111	105	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	106	96	84	82	74	67
95 mph	8-20	116	99	88	97	97	88	82	82	82	81	81	81	73	73	73	66	66	66	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	96	75	67	68	59	48
	21-27	114	107	101	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	103	83	77	79	65	60
	28-45	111	110	99	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	100	89	79	77	72	64
100 mph	8-20	116	92	82	97	92	82	82	82	82	81	81	81	73	73	73	66	66	66	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	86	72	64	65	53	41
	21-27	114	100	96	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	97	78	72	75	61	55
	28-45	111	105	96	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	96	84	74	73	67	60
105 mph	8-20	113	86	77	97	86	77	82	82	77	81	81	77	73	73	73	66	66	66	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	81	66	59	64	48	37
	21-27	114	96	88	96	96	88	81	81	81	81	81	81	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	91	73	67	72	58	48
	28-45	111	99	89	96	96	89	81	81	81	80	80	80	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	89	79	72	69	64	57
110 mph	8-20	104	81	72	97	81	72	82	81	72	81	81	72	73	73	72	66	66	66	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	75	64	51	59	41	33
	21-27	110	89	83	96	89	83	81	81	81	81	81	81	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	86	69	64	67	52	42
	28-45	106	96	84	96	96	84	81	81	81	80	80	80	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	84	75	66	66	60	51
115 mph	8-20	96	76	68	96	76	68	82	76	68	81	76	68	73	73	68	66	66	66	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	69	59	42	55	37	30
	21-27	104	84	78	96	84	78	81	81	78	81	81	78	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	82	65	59	64	48	37
	28-45	101	90	80	96	90	80	81	81	80	80	80	80	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	79	72	64	64	58	45
120 mph	8-20	89	72	65	89	72	65	82	72	65	81	72	65	73	72	65	66	66	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	66	51	35	50	33	27
	21-27	99	80	74	96	80	74	81	80	74	81	80	74	74	74	74	67	67	67	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	77	64	54	64	41	34
	28-45	96	86	76	96	86	76	81	81	76	80	80	76	74	74	74	72	72	72	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	75	68	60	60	54	41
130 mph	8-20	79	65	58	79	65	58	79	65	58	79	65	58	73	65	58	66	65	58	60	60	58	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	60	37	30	42	28	24
	21-27	90	72	66	90	72	66	81	72	66	81	72	66	74	72	66	67	67	66	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	72	52	38	57	34	27
	28-45	87	78	69	87	78	69	81	78	69	80	78	69	74	74	69	69	69	69	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	68	64	51	52	44	34
140 mph	8-20	72	59	44	72	59	44	72	59	44	72	59	44	72	59	44	66	59	44	60	59	44	56	56	44	53	53	44	50	50	44	48	48	44	45	45	44	44	44	44	51	32	25	36	24	20
	21-27	82	65	60	82	65	60	81	65	60	81	65	60	74	65	60	67	65	60	61	61	60	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	64	39	30	49	29	22
	28-45	80	72	64	80	72	64	79	72	64	78	72	64	72	72	64	67	67	64	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	64	57	39	42	37	28
150 mph	8-20	64	48	34	64	48	34	64	48	34	64	48	34	64	48	34	64	48	34	60	48	34	56	48	34	53	48	34	50	48	34	48	48	34	45	45	34	44	44	34	43	27	22	32	21	17
	21-27	75	60	49	75	60	49	75	60	49	75	60	49	74	60	49	67	60	49	61	60	49	57	57	49	54	54	49	51	51	49	48	48	48	48	48	48	44	44	44	59	32	25	42	25	18
	28-45	73	66	58	73	66	58	73	66	58	73	66	58	72	66	58	66	66	58	64	64	58	59	59	58	56	56	56	54	54	54	51	51	51	49	49	49	48	48	48	57	45	32	35	32	24
160 mph	8-20	60	37	29	60	37	29	60	37	29	60	37	29	60	37	29	60	37	29	60	37	29	56	37	29	53	37	29	50	37	29	48	37	29	45	37	29	44	37	29	36	24	19	28	18	15
	21-27	72	51	38	72	51	38	72	51	38	72	51	38	72	51	38	67	51	38	61	51	38	57	51	38	54	51	38	51	51	38	48	48	38	48	48	38	44	44	38	53	28	21	37	22	15
	28-45	68	64	50	68	64	50	68	64	50	68	64	50	68	64	50	64	64	50	61	61	50	58	58	50	55	55	50	53	53	50	51	51	50	49	49	49	48	48	48	45	37	27	32	28	19
170 mph	8-20	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	50	32	26	48	32	26	45	32	26	44	32	26	32	20	17	24	16	13
	21-27	65	41	32	65	41	32	65	41	32	65	41	32	65	41	32	65	41	32	61	41	32	57	41	32	54	41	32	51	41	32	48	41	32	48	41	32	44	41	32	45	25	18	33	19	13
	28-45	64	57	41	64	57	41	64	57	41	64	57	41	64	57	41	64	57	41	59	57	41	57	57	41	54	54	41	52	52	41	50	50	41	48	48	41	48	48	41	35	32	24	27	24	17
175 mph	8-20	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	48	29	24	45	29	24	44	29	24	29	19	16	24	15	12
	21-27	64	37	28	64	37	28	64	37	28	64	37	28	64	37	28	64	37	28	61	37	28	57	37	28	54	37	28	51	37	28	48	37	28	48	37	28	44	37	28	41	24	17	32	18	12
	28-45	61	54	37	61	54	37	61	54	37	61	54	37	61	54	37	61	54	37	59	54	37	56	54	37	54	54	37	52	52	37	50	50	37	48	48	37	48	48	37	33	29	21	26	24	16
180 mph	8-20	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	45	28	24	44	28	24	28	18	15	22	14	12
	21-27	61	34	27	61	34	27	61	34	27	61	34	27	61	34	27	61	34	27	61	34	27	57	34	27	54	34	27	51	34	27	48	34	27	48	34	27	44	34	27	38	22	15	20	17	12
	28-45	58	48	33	58	48	33	58	48	33	58	48	33	58	48	33	58	48	33	58	48	33	55	48	33	53	48	33	51	48	33	49	48	33	48	48	33	48	48	33	32	28	20	24	22	15

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

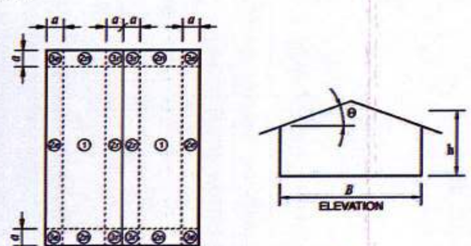


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100		Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation **Max Module Length: 92.5", Max Module SF: 29.5 SF Exposure B																																											
Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	108	96	101	81	74
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	110	110	105	88	83
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	105	102	92	83
95 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	100	89	96	77	69
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	108	102	99	83	78
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	99	97	87	79
100 mph	8-20	112	112	110	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	96	83	88	72	65
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	101	96	96	78	73
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	105	96	92	83	75
105 mph	8-20	112	112	103	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	88	78	82	68	64
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	96	89	90	74	72
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	99	89	88	79	72
110 mph	8-20	112	108	97	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	108	82	73	77	65	58
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	90	84	85	72	66
	28-45	107	107	105	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	96	84	84	76	68
115 mph	8-20	112	102	91	96	96	91	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	100	78	69	72	61	53
	21-27	110	109	104	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	105	85	79	81	67	64
	28-45	107	107	100	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	102	90	80	80	72	65
120 mph	8-20	112	96	86	96	96	86	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	92	73	65	69	58	48
	21-27	110	104	98	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	100	80	75	78	64	60
	28-45	107	107	96	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	97	86	76	76	72	64
130 mph	8-20	112	86	77	96	86	77	79	79	77	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	81	66	58	64	48	38
	21-27	110	96	88	93	93	88	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	90	72	67	72	58	50
	28-45	107	98	88	92	92	88	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	88	79	72	72	64	57
140 mph	8-20	101	78	72	96	78	72	79	78	72	77	77	72	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	72	60	44	57	39	32
	21-27	106	85	80	93	85	80	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	83	66	61	66	50	41
	28-45	102	91	81	92	91	81	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	81	72	64	65	59	49
150 mph	8-20	89	72	64	89	72	64	79	72	64	77	72	64	72	72	64	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	64	48	33	49	33	27
	21-27	97	78	73	93	78	73	79	78	73	78	78	73	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	76	60	51	64	41	33
	28-45	96	84	74	92	84	74	79	79	74	78	78	74	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	74	67	59	60	54	41
160 mph	8-20	81	65	58	81	65	58	79	65	58	77	65	58	72	65	58	64	64	58	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	59	38	29	43	28	24
	21-27	90	72	67	90	72	67	79	72	67	78	72	67	72	72	67	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	72	53	39	58	35	27
	28-45	88	78	69	88	78	69	79	78	69	78	78	69	72	72	69	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	69	64	51	55	48	35
170 mph	8-20	73	60	45	73	60	45	73	60	45	73	60	45	72	60	45	64	60	45	58	58	45	54	54	45	51	51	45	48	48	45	48	48	45	44	44	44	42	42	42	52	32	25	38	25	21
	21-27	83	67	61	83	67	61	79	67	61	78	67	61	72	67	61	64	64	61	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	65	42	30	51	30	24
	28-45	81	73	64	81	73	64	77	73	64	76	73	64	72	72	64	65	65	64	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	64	57	41	48	39	30
175 mph	8-20	72	58	41	72	58	41	72	58	41	72	58	41	72	58	41	64	58	41	58	58	41	54	54	41	51	51	41	48	48	41	48	48	41	44	44	41	42	42	41	48	29	24	36	24	20
	21-27	80	64	59	80	64	59	79	64	59	78	64	59	72	64	59	64	64	59	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	64	38	28	48	29	22
	28-45	79	72	64	79	72	64	76	72	64	75	72	64	72	72	64	65	65	64	61	61	61	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	61	55	37	44	36	27
180 mph	8-20	67	53	36	67	53	36	67	53	36	67	53	36	67	53	36	64	53	36	58	53	36	54	53	36	51	51	36	48	48	36	48	48	36	44	44	36	42	42	36	45	27	22	34	22	18
	21-27	78	64	57	78	64	57	78	64	57	78	64	57	72	64	57	64	64	57	59	59	57	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	61	33	26	48	27	20
	28-45	76	68	60	76	68	60	75	68	60	74	68	60	69	68	60	64	64	60	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	59	50	33	39	34	26

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

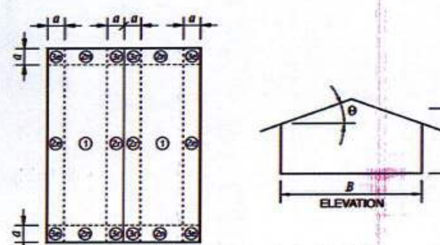


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
****Max Module Length: 92.5", Max Module SF: 29.5 SF**
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	112	112	101	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	86	77	80	67	61
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	96	88	88	73	68
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	98	87	86	78	72
95 mph	8-20	112	105	96	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	104	80	72	75	64	56
	21-27	110	110	107	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	108	87	82	83	69	64
	28-45	107	107	103	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	104	92	82	82	74	67
100 mph	8-20	112	98	87	96	96	87	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	96	75	66	72	60	48
	21-27	110	106	100	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	101	82	76	79	65	61
	28-45	107	107	97	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	98	87	78	77	72	64
105 mph	8-20	112	92	82	96	92	82	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	88	72	64	66	54	42
	21-27	110	99	96	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	96	77	72	75	61	57
	28-45	107	103	92	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	96	83	73	73	67	60
110 mph	8-20	112	86	77	96	86	77	79	79	77	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	81	66	58	64	48	38
	21-27	110	96	88	93	93	88	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	90	72	67	72	58	50
	28-45	107	98	88	92	92	88	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	88	78	72	72	64	57
115 mph	8-20	106	81	72	96	81	72	79	79	72	77	77	72	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	75	64	50	59	42	33
	21-27	109	88	83	93	88	83	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	85	69	64	68	54	44
	28-45	106	96	83	92	92	83	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	83	75	66	67	61	53
120 mph	8-20	98	77	69	96	77	69	79	77	69	77	77	69	72	72	69	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	72	58	42	55	38	30
	21-27	104	84	78	93	84	78	79	79	78	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	81	65	60	65	48	39
	28-45	101	89	79	92	89	79	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	79	72	64	64	58	48
130 mph	8-20	86	69	61	86	69	61	79	69	61	77	69	61	72	69	61	64	64	61	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	64	44	32	48	32	26
	21-27	96	76	72	93	76	72	79	76	72	78	76	72	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	74	58	48	60	39	32
	28-45	92	82	72	92	82	72	79	79	72	78	78	72	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	72	65	57	58	51	38
140 mph	8-20	76	64	51	76	64	51	76	64	51	76	64	51	72	64	51	64	64	51	58	58	51	54	54	51	51	51	51	48	48	48	48	48	48	44	44	44	43	43	43	67	45	33	54	32	26
	21-27	86	69	64	86	69	64	79	69	64	78	69	64	72	69	64	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	67	45	33	54	32	26
	28-45	84	75	66	84	75	66	78	75	66	77	75	66	72	72	66	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	65	59	45	51	42	32
150 mph	8-20	68	55	39	68	55	39	68	55	39	68	55	39	68	55	39	64	55	39	58	55	39	54	54	39	51	51	39	48	48	39	48	48	39	44	44	39	42	42	39	48	28	24	35	24	19
	21-27	79	64	58	79	64	58	79	64	58	78	64	58	72	64	58	64	64	58	59	59	58	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	64	35	27	48	28	21
	28-45	77	72	61	77	72	61	76	72	61	75	72	61	72	72	61	64	64	61	61	61	61	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	60	52	35	41	35	27
160 mph	8-20	64	42	32	64	42	32	64	42	32	64	42	32	64	42	32	64	42	32	58	42	32	54	42	32	51	42	32	48	42	32	48	42	32	44	42	32	42	42	32	39	24	20	32	20	17
	21-27	73	58	45	73	58	45	73	58	45	73	58	45	72	58	45	64	58	45	59	58	45	55	55	45	52	52	45	49	49	45	48	48	45	44	44	44	43	43	43	57	29	24	41	24	17
	28-45	72	64	57	72	64	57	72	64	57	72	64	57	67	64	57	64	64	57	59	59	57	56	56	56	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	54	41	29	35	30	24
170 mph	8-20	58	33	27	58	33	27	58	33	27	58	33	27	58	33	27	58	33	27	58	33	27	54	33	27	51	33	27	48	33	27	48	33	27	44	33	27	42	33	27	33	23	18	27	18	15
	21-27	68	48	35	68	48	35	68	48	35	68	48	35	68	48	35	64	48	35	59	48	35	55	48	35	52	48	35	49	48	35	48	48	35	44	44	35	43	43	35	49	26	19	36	21	15
	28-45	66	60	48	66	60	48	66	60	48	66	60	48	66	60	48	64	60	48	58	58	48	55	55	48	53	53	48	51	51	48	49	49	48	48	48	48	45	45	45	42	33	25	30	27	20
175 mph	8-20	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	53	32	26	51	32	26	48	32	26	48	32	26	44	32	26	42	32	26	32	20	17	25	17	14
	21-27	65	42	32	65	42	32	65	42	32	65	42	32	65	42	32	64	42	32	59	42	32	55	42	32	52	42	32	49	42	32	48	42	32	44	42	32	43	42	32	45	24	18	34	20	14
	28-45	64	58	42	64	58	42	64	58	42	64	58	42	64	58	42	61	58	42	58	58	42	55	55	42	53	53	42	50	50	42	49	49	42	48	48	42	45	45	42	36	32	24	28	25	18
180 mph	8-20	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	49	29	24	48	29	24	48	29	24	48	29	24	44	29	24	42	29	24	29	19	16	24	16	13
	21-27	64	38	29	64	38	29	64	38	29	64	38	29	64	38	29	64	38	29	59	38	29	55	38	29	52	38	29	49	38	29	48	38	29	44	38	29	43	38	29	42	24	17	32	19	13
	28-45	61	55	38	61	55	38	61	55	38	61	55	38	61	55	38	60	55	38	57	55	38	54	54	38	52	52	38	50	50	38	48	48	38	48	48	38	45	45	38	33	29	22	27	24	17

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

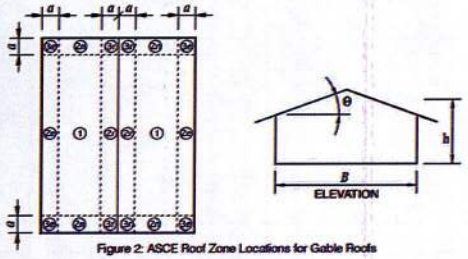


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

***B* = Horizontal dimension of building measured normal to wind direction, in ft (m).**

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
****Max Module Length: 92.5", Max Module SF: 29.5 SF**
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	112	101	90	96	96	90	79	79	79	78	78	78	72	72	72
	21-27	110	108	103	93	93	93	79	79	79	79	79	79	72	72	72
	28-45	107	107	99	92	92	92	79	79	79	78	78	78	72	72	72
95 mph	8-20	112	96	83	96	96	83	79	79	79	78	78	78	72	72	72
	21-27	110	101	96	93	93	93	79	79	79	79	79	79	72	72	72
	28-45	107	105	96	92	92	92	79	79	79	78	78	78	72	72	72
100 mph	8-20	112	87	78	96	87	78	79	79	78	78	78	78	72	72	72
	21-27	110	96	89	93	93	89	79	79	79	79	79	79	72	72	72
	28-45	107	99	89	92	92	89	79	79	79	78	78	78	72	72	72
105 mph	8-20	107	82	73	96	82	73	79	79	73	78	78	73	72	72	72
	21-27	110	89	83	93	89	83	79	79	79	79	79	79	72	72	72
	28-45	106	96	84	92	92	84	79	79	79	78	78	78	72	72	72
110 mph	8-20	99	77	69	96	77	69	79	77	69	78	77	69	72	72	69
	21-27	104	84	79	93	84	79	79	79	79	79	79	79	72	72	72
	28-45	101	90	80	92	90	80	79	79	79	78	78	78	72	72	72
115 mph	8-20	92	73	64	92	73	64	79	73	64	78	73	64	72	72	64
	21-27	99	79	74	93	79	74	79	79	74	79	79	74	72	72	72
	28-45	96	85	76	92	85	76	79	79	76	78	78	76	72	72	72
120 mph	8-20	85	69	61	85	69	61	79	69	61	78	69	61	72	69	61
	21-27	96	75	72	93	75	72	79	75	72	79	75	72	72	72	72
	28-45	91	81	72	91	81	72	79	79	72	78	78	72	72	72	72
130 mph	8-20	75	61	48	75	61	48	75	61	48	75	61	48	72	61	48
	21-27	85	68	64	85	68	64	79	68	64	79	68	64	72	68	64
	28-45	83	74	65	83	74	65	77	74	65	77	74	65	72	72	65
140 mph	8-20	66	51	36	66	51	36	66	51	36	66	51	36	66	51	36
	21-27	78	64	55	78	64	55	78	64	55	78	64	55	72	64	55
	28-45	76	68	60	76	68	60	75	68	60	75	68	60	69	68	60
150 mph	8-20	60	39	30	60	39	30	60	39	30	60	39	30	60	39	30
	21-27	72	55	42	72	55	42	72	55	42	72	55	42	72	55	42
	28-45	72	64	54	72	64	54	72	64	54	72	64	54	67	64	54
160 mph	8-20	54	32	26	54	32	26	54	32	26	54	32	26	54	32	26
	21-27	66	44	32	66	44	32	66	44	32	66	44	32	66	44	32
	28-45	64	58	42	64	58	42	64	58	42	64	58	42	64	58	42
170 mph	8-20	48	28	24	48	28	24	48	28	24	48	28	24	48	28	24
	21-27	61	35	27	61	35	27	61	35	27	61	35	27	61	35	27
	28-45	59	51	35	59	51	35	59	51	35	59	51	35	59	51	35
175 mph	8-20	42	26	21	42	26	21	42	26	21	42	26	21	42	26	21
	21-27	59	32	25	59	32	25	59	32	25	59	32	25	59	32	25
	28-45	57	45	32	57	45	32	57	45	32	57	45	32	57	45	32
180 mph	8-20	39	24	20	39	24	20	39	24	20	39	24	20	39	24	20
	21-27	57	30	24	57	30	24	57	30	24	57	30	24	57	30	24
	28-45	54	41	29	54	41	29	54	41	29	54	41	29	54	41	29

Wind Speed (mph)	Roof Slope (deg.)	50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
95 mph	8-20	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
100 mph	8-20	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
105 mph	8-20	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
110 mph	8-20	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
115 mph	8-20	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
120 mph	8-20	64	64	61	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	67	67	67	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
130 mph	8-20	64	61	48	58	58	48	54	54	48	51	51	48	48	48	48	48	48	48
	21-27	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	66	66	65	64	64	64	58	58	58	54	54	54	52	52	52	49	49	49
140 mph	8-20	64	51	36	58	51	36	54	51	36	51	51	36	48	48	36	48	48	36
	21-27	64	64	55	59	59	55	55	55	55	52	52	52	49	49	49	48	48	48
	28-45	64	64	60	61	61	60	58	58	58	54	54	54	52	52	52	49	49	49
150 mph	8-20	60	39	30	58	39	30	54	39	30	51	39	30	48	39	30	48	39	30
	21-27	64	55	42	59	55	42	55	55	42	52	52	42	49	49	42	48	48	42
	28-45	64	64	54	60	60	54	56	56	54	54	54	54	52	52	52	49	49	49
160 mph	8-20	54	32	26	54	32	26	54	32	26	51	32	26	48	32	26	48	32	26
	21-27	64	44	32	59	44	32	55	44	32	52	44	32	49	44	32	48	44	32
	28-45	64	58	42	58	58	42	55	55	42	53	53	42	51	51	42	49	49	42
170 mph	8-20	48	28	24	48	28	24	48	28	24	48	28	24	48	28	24	48	28	24
	21-27	61	35	27	59	35	27	55	35	27	52	35	27	49	35	27	48	35	27
	28-45	59	51	35	57	51	35	54	51	35	52	51	35	50	50	35	48	48	35
175 mph	8-20	42	26	21	42	26	21	42	26	21	42	26	21	42	26	21	42	26	21
	21-27	59	32	25	59	32	25	55	32	25	52	32	25	49	32	25	48	32	25
	28-45	57	45	32	56	45	32	54	45	32	51	45	32	49	45	32	48	45	32
180 mph	8-20	39	24	20	39	24	20	39	24	20	39	24	20	39	24	20	39	24	20
	21-27	57	30	24	57	30	24	55	30	24	52	30	24	49	30	24	48	30	24
	28-45	54	41	29	54	41	29	53	41	29	51	41	29	49	41	29	48	41	29

Wind Speed (mph)	Roof Slope (deg.)	110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	44	44	44	42	42	42	98	77	69	72	61	51
	21-27	45	45	45	43	43	43	104	84	78	81	67	64
	28-45	48	48	48	45	45	45	101	89	79	79	72	64
95 mph	8-20	44	44	44	42	42	42	89	72	64	67	57	44
	21-27	45	45	45	43	43	43	97	78	73	76	64	58
	28-45	48	48	48	45	45	45	96	84	75	75	68	61
100 mph	8-20	44	44	44	42	42	42	82	67	59	64	50	39
	21-27	45	45	45	43	43	43	91	73	68	72	59	51
	28-45	48	48	48	45	45	45	89	79	72	72	65	58
105 mph	8-20	44	44	44	42	42	42	76	64	51	59	43	33
	21-27	45	45	45	43	43	43	86	69	64	69	54	45
	28-45	48	48	48	45	45	45	84	75	66	67	61	54
110 mph	8-20	44	44	44	42	42	42	72	59	42	56	38	30
	21-27	45	45	45	43	43	43	81	65	60	65	48	39
	28-45	48	48	48	45	45	45	79	72	64	64	58	48
115 mph	8-20	44	44	44	42	42	42	66	51	35	51	33	28
	21-27	45	45	45	43	43	43	77	61	54	64	43	35
	28-45	48	48	48	45	45	45	75	68	60	61	56	42
120 mph	8-20	44	44	44	42	42	42	64	42	32	48	32	25
	21-27	45	45	45	43	43	43	73	58	45	60	38	30
	28-45	48	48	48	45	45	45	72	64	57	58	50	38
130 mph	8-20	44	44	44	42	42	42	55	32	26	39	26	21
	21-27	45	45	45	43	43	43	66	44	32	53	32	25
	28-45	48	48	48	45	45	45	65	58	44	49	41	32
140 mph	8-20	44	44	36	42	42	36	45	27	22	34	22	18
	21-27	45	45	45	43	43	43	61	33	26	48	27	20
	28-45	48	48	48	45	45	45	59	50	33	39	34	26
150 mph	8-20	44	39	30	42	39	30	37	24	19	29	19	16
	21-27	45	45	42	43	43	42	55	28	22	39	24	17
	28-45	48	48	48	45	45	45	50	38	27	33	29	22
160 mph	8-20	44	32	26	42	32	26	32	21	17	26	17	14
	21-27	45	44	32	43	43	32	48	25	19	35	20	14
	28-45	48	48	42	45	45	42	38	32	24	29	26	19
170 mph	8-20	44	28	24	42	28	24	28	18	15	24	15	12
	21-27	45	35	27	43	35	27	39	22	16	30	18	12
	28-45	48	48	35	45	45	35	32	27	20	25	24	16
175 mph	8-20	42	26	21	42	26	21	26	17	14	21	14	12
	21-27	45	32	25	43	32	25	36	21	14	29	17	12
	28-45	48	45	32	45	45	32	29	26	19	24	21	14
180 mph	8-20	39	24	20	39	24	20	24	16	13	20	13	11
	21-27	45	30	24	43	30	24	34	19	13	27	16	11
	28-45	48	41	29	44	41	29	27	24	17	22	20	14

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

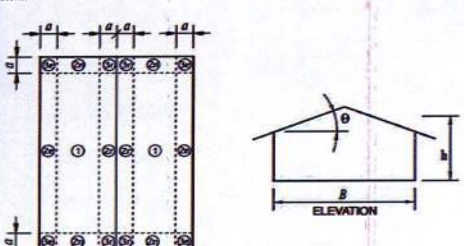


Figure 2: ASCE Roof Zone Locations for Gable Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 67.5", Max Module SF: 21 SF
Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf			80 psf			90 psf			100 psf			110 psf			120 psf			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	130	130	128	116	103	99
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	131	131	131	112	112
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	128	123	124	104
95 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	130	126	122	108	97	93
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	131	131	129	106	106
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	128	117	117	99
100 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	130	121	116	102	92	88
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	131	131	123	100	100
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	121	112	111	96
105 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	128	114	108	96	87	83
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	126	126	117	96	96
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	114	107	105	89
110 mph	8-20	130	130	128	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	122	107	101	91	83	79
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	118	118	111	91	91
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	109	101	100	84
115 mph	8-20	130	128	123	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	116	101	96	87	79	75
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	112	112	106	87	87
	28-45	128	128	127	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	125	125	103	97	96	80
120 mph	8-20	130	123	116	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	109	96	91	83	75	72
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	107	107	101	83	83
	28-45	128	128	122	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	120	118	97	93	91	77
130 mph	8-20	126	111	105	110	110	105	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	97	87	82	77	69	66
	21-27	131	121	121	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	122	96	96	93	76	76
	28-45	128	128	111	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	109	108	88	86	83	72
140 mph	8-20	114	101	96	110	101	96	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	88	79	75	72	64	61
	21-27	131	111	111	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	112	88	88	86	72	72
	28-45	124	124	102	103	103	102	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	100	99	80	79	75	64
150 mph	8-20	104	92	88	104	92	88	92	91	88	91	91	88	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	81	73	69	66	59	53
	21-27	128	102	102	105	102	102	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	101	80	80	79	65	65
	28-45	115	114	93	103	103	93	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	92	90	74	74	72	59
160 mph	8-20	96	85	80	96	85	80	92	85	80	91	85	80	82	82	80	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	75	66	64	64	50	45
	21-27	119	96	96	105	96	96	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	96	74	74	74	61	61
	28-45	107	105	87	103	103	87	88	88	87	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	86	82	67	69	65	49
170 mph	8-20	88	79	75	88	79	75	88	79	75	88	79	75	82	79	75	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	72	64	58	59	44	40
	21-27	111	88	88	105	88	88	89	88	88	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	87	69	69	69	54	54
	28-45	100	97	81	100	97	81	88	88	81	87	87	81	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	80	75	64	65	60	40
175 mph	8-20	85	76	72	85	76	72	85	76	72	85	76	72	82	76	72	74	74	72	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	68	60	53	55	41	38
	21-27	107	84	84	105	84	84	89	84	84	87	84	84	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	84	66	66	67	50	50
	28-45	97	93	78	97	93	78	88	88	78	87	87	78	80	80	78	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	77	73	60	64	58	36
180 mph	8-20	83	74	72	83	74	72	83	74	72	83	74	72	81	74	72	74	73	72	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	66	56	48	52	39	36
	21-27	103	82	82	103	82	82	89	82	82	87	82	82	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	80	64	64	65	48	48
	28-45	93	91	75	93	91	75	88	88	75	87	87	75	80	80	75	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	75	72	57	61	56	33

= min 72" span = min 64" span = min 48" span
= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

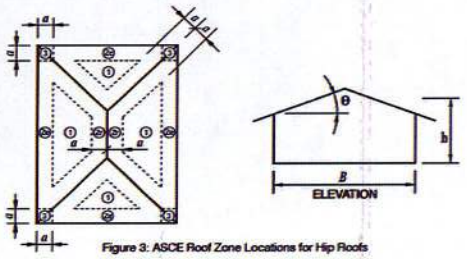


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 67.5", Max Module SF: 21 SF
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	130	130	130	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
95 mph	8-20	130	130	126	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
100 mph	8-20	130	125	121	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	126	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
105 mph	8-20	130	118	113	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	130	130	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	120	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
110 mph	8-20	126	112	107	110	110	107	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	124	124	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	113	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
115 mph	8-20	121	105	100	110	105	100	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	117	117	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	128	128	108	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
120 mph	8-20	114	100	96	110	100	96	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68
	21-27	131	111	111	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	124	124	103	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
130 mph	8-20	103	91	86	103	91	86	92	91	86	91	91	86	82	82	82	74	74	74	68	68	68
	21-27	128	100	100	105	100	100	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	113	112	92	103	103	92	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72
140 mph	8-20	92	82	78	92	82	78	92	82	78	91	82	78	82	82	78	74	74	74	68	68	68
	21-27	116	92	92	105	92	92	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72
	28-45	104	103	84	103	103	84	88	88	84	87	87	84	80	80	80	75	75	75	72	72	72
150 mph	8-20	84	75	72	84	75	72	84	75	72	84	75	72	82	75	72	74	74	72	68	68	68
	21-27	107	84	84	105	84	84	89	84	84	87	84	84	81	81	81	76	76	76	72	72	72
	28-45	96	96	78	96	96	78	88	88	78	87	87	78	80	80	78	75	75	75	72	72	72
160 mph	8-20	79	72	66	79	72	66	79	72	66	79	72	66	79	72	66	74	72	66	68	68	66
	21-27	99	78	78	99	78	78	89	78	78	87	78	78	81	78	78	75	75	75	72	72	72
	28-45	90	86	72	90	86	72	88	86	72	87	86	72	80	80	72	75	75	72	72	72	72
170 mph	8-20	73	65	61	73	65	61	73	65	61	73	65	61	73	65	61	73	65	61	68	65	61
	21-27	91	72	72	91	72	72	88	72	72	87	72	72	80	72	72	74	72	72	69	69	69
	28-45	83	79	65	83	79	65	83	79	65	83	79	65	80	79	65	75	75	65	72	72	65
175 mph	8-20	72	64	58	72	64	58	72	64	58	72	64	58	72	64	58	72	64	58	68	64	58
	21-27	87	69	69	87	69	69	87	69	69	86	69	69	79	69	69	73	69	69	69	69	69
	28-45	80	77	64	80	77	64	80	77	64	80	77	64	80	77	64	75	75	64	72	72	64
180 mph	8-20	69	60	53	69	60	53	69	60	53	69	60	53	69	60	53	69	60	53	67	60	53
	21-27	84	67	67	84	67	67	84	67	67	84	67	67	78	67	67	73	67	67	68	67	67
	28-45	78	74	61	78	74	61	78	74	61	78	74	61	78	74	61	75	74	61	72	72	61

Wind Speed (mph)	Roof Slope (deg.)	70 psf			80 psf			90 psf			100 psf			110 psf			120 psf			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	126	112	107	96	86	82
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	124	124	115	96	96
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	113	105	103	87
95 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	120	104	99	89	81	77
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	116	116	108	89	89
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	128	128	105	99	97	83
100 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	112	97	92	84	77	73
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	108	108	103	84	84
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	121	121	100	96	92	78
105 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	104	92	87	80	73	69
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	129	101	101	97	79	79
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	114	114	96	90	87	74
110 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	97	87	82	77	69	66
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	122	96	96	92	76	76
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	109	108	88	86	83	72
115 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	92	82	78	73	66	64
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	116	91	91	88	72	72
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	104	101	83	82	78	66
120 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	87	78	74	72	64	60
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	109	86	86	84	69	69
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	99	96	79	78	74	64
130 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	79	72	66	65	56	50
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	99	78	78	77	64	64
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	90	87	72	72	67	57
140 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	73	64	61	60	48	42
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	90	72	72	72	58	58
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	82	78	65	67	64	44
150 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	67	57	50	54	40	37
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	82	65	65	66	49	49
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	76	72	58	64	57	35
160 mph	8-20	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	64	48	42	48	35	32
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	75	60	60	61	42	42
	28-45	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	72	65	44	58	48	30
170 mph	8-20	64	64	61	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	57	40	37	41	32	28
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	72	52	52	56	37	37
	28-45	68	68	65	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	65	60	36	50	39	24
175 mph	8-20	64	64	58	60	60	58	57	57	57	54	54	54	51	51	51	49	49	49	53	38	35	39	29	27
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	67	48	48	52	35	35
	28-45	68	68	64	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	64	57	32	48	35	22
180 mph	8-20	64	60	53	60	60	53	57	57	53	54	54	53	51	51	51	49	49	49	49	36	33	37	27	25
	21-27	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	65	43	43	48	33	33
	28-45	67	67	61	64	64	61	61	61	61	58	58	58	55	55	55	53	53	53	61	52	30	44	32	20

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

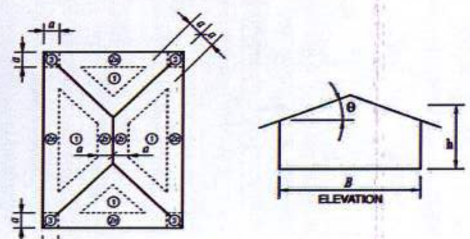


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 67.5", Max Module SF: 21 SF
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf			80 psf			90 psf			100 psf			110 psf			120 psf			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	130	126	122	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	114	100	96	86	78	75
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	131	112	112	105	86	86
	28-45	128	128	128	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	124	124	103	96	96	80
95 mph	8-20	130	121	116	110	110	110	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	107	96	89	82	74	72
	21-27	131	131	131	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	130	104	104	99	81	81
	28-45	128	128	121	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	117	116	96	91	88	75
100 mph	8-20	128	113	108	110	110	108	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	99	88	83	78	72	67
	21-27	131	125	125	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	124	97	97	96	77	77
	28-45	128	128	114	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	111	109	90	87	83	72
105 mph	8-20	122	107	101	110	107	101	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	92	82	78	74	66	64
	21-27	131	118	118	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	116	92	92	89	73	73
	28-45	128	128	108	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	104	103	84	83	79	67
110 mph	8-20	114	100	96	110	100	96	92	92	92	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	87	78	74	72	64	60
	21-27	131	112	112	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	109	87	87	84	69	69
	28-45	124	125	103	103	103	103	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	99	96	79	79	75	64
115 mph	8-20	108	96	91	108	96	91	92	92	91	91	91	91	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	83	74	72	67	60	56
	21-27	131	105	105	105	105	105	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	104	82	82	80	66	66
	28-45	118	118	97	103	103	97	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	96	91	75	75	72	60
120 mph	8-20	101	90	86	101	90	86	92	90	86	91	90	86	82	82	82	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	79	72	66	65	55	50
	21-27	126	100	100	105	100	100	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	99	78	78	77	64	64
	28-45	113	112	92	103	103	92	88	88	88	87	87	87	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	90	86	72	72	67	57
130 mph	8-20	91	82	78	91	82	78	91	82	78	91	82	78	82	82	78	74	74	74	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	72	64	60	60	45	41
	21-27	114	91	91	105	91	91	89	89	89	87	87	87	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	88	72	72	72	57	57
	28-45	103	101	83	103	101	83	88	88	83	87	87	83	80	80	80	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	82	78	64	66	61	43
140 mph	8-20	83	74	72	83	74	72	83	74	72	83	74	72	81	74	72	74	74	72	68	68	68	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	66	56	48	52	39	36
	21-27	104	83	83	104	83	83	89	83	83	87	83	83	81	81	81	76	76	76	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	80	64	64	65	48	48
	28-45	96	92	77	96	92	77	88	88	77	87	87	77	80	80	77	75	75	75	72	72	72	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	74	72	57	61	56	33
150 mph	8-20	77	67	65	77	67	65	77	67	65	77	67	65	77	67	65	74	67	65	68	67	65	64	64	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	61	44	40	45	33	32
	21-27	96	75	75	96	75	75	89	75	75	87	75	75	80	75	75	75	75	75	72	72	72	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	74	58	58	60	40	40
	28-45	87	83	69	87	83	69	87	83	69	87	83	69	80	80	69	75	75	69	72	72	69	68	68	68	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	69	64	40	56	44	27
160 mph	8-20	72	64	60	72	64	60	72	64	60	72	64	60	72	64	60	72	64	60	68	64	60	64	64	60	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	53	38	35	39	29	27
	21-27	88	72	72	88	72	72	88	72	72	86	72	72	79	72	72	73	72	72	69	69	69	65	65	65	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	68	48	48	53	35	35
	28-45	80	77	64	80	77	64	80	77	64	80	77	64	80	77	64	75	75	64	72	72	64	68	68	64	64	64	64	61	61	61	58	58	58	55	55	55	53	53	53	64	58	32	48	36	22
170 mph	8-20	66	57	49	66	57	49	66	57	49	66	57	49	66	57	49	66	57	49	66	57	49	64	57	49	60	57	49	57	57	49	54	54	49	51	51	49	49	49	49	45	34	32	35	26	24
	21-27	82	65	65	82	65	65	82	65	65	82	65	65	78	65	65	72	65	65	68	65	65	64	64	64	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	64	41	41	45	32	32
	28-45	75	72	58	75	72	58	75	72	58	75	72	58	75	72	58	75	72	58	72	72	58	67	67	58	64	64	58	61	61	58	58	58	58	55	55	55	53	53	53	58	48	27	41	30	18
175 mph	8-20	65	52	44	65	52	44	65	52	44	65	52	44	65	52	44	65	52	44	65	52	44	64	52	44	60	52	44	57	52	44	54	52	44	51	50	44	49	49	44	43	32	28	33	24	22
	21-27	79	64	64	79	64	64	79	64	64	79	64	64	77	64	64	72	64	64	67	64	64	64	64	64	61	61	61	58	58	58	55	55	55	52	52	52	50	50	50	61	38	38	42	29	29
	28-45	73	67	52	73	67	52	73	67	52	73	67	52	73	67	52	73	67	52	72	67	52	66	66	52	64	64	52	61	61	52	58	58	52	55	55	52	53	53	52	56	40	26	39	27	16
180 mph	8-20	64	48	42	64	48	42	64	48	42	64	48	42	64	48	42	64	48	42	64	48	42	64	48	42	59	48	42	57	48	42	54	48	42	51	48	42	49	48	42	40	30	28	32	24	21
	21-27	75	60	60	75	60	60	75	60	60	75	60	60	75	60	60	72	60	60	66	60	60	64	60	60	60	60	60	58	58	58	55	55	55	52	52	52	50	50	50	58	36	36	40	28	28
	28-45	72	65	44	72	65	44	72	65	44	72	65	44	72	65	44	72	65	44	72	65	44	66	65	44	64	64	44	60	60	44	58	58	44	55	55	44	53	53	44	50	37	24	37	26	15

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

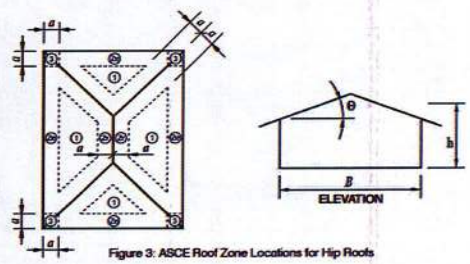


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation

Max Module Length: 80", Max Module SF: 24 SF

Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	123	123	123	108	96	91
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	121	121	121	104	104
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	117	114	115	97
95 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	123	122	116	101	90	86
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	121	121	120	98	98
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	117	109	109	92
100 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	123	114	109	96	85	81
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	121	121	114	93	93
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	114	103	103	87
105 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	123	108	102	90	81	77
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	119	119	108	88	88
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	109	99	98	83
110 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	117	101	96	85	77	73
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	112	112	103	84	84
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	103	96	93	78
115 mph	8-20	123	122	116	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	110	96	91	81	73	72
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	106	106	98	80	80
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	98	90	88	75
120 mph	8-20	123	116	110	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	103	90	85	77	72	67
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	101	101	96	77	77
	28-45	117	117	116	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	112	113	92	86	85	72
130 mph	8-20	120	105	99	102	101	99	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	92	81	77	72	64	61
	21-27	121	115	115	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	116	91	91	86	72	72
	28-45	117	117	106	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	102	102	84	80	77	66
140 mph	8-20	109	96	91	102	96	91	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	84	74	72	65	59	54
	21-27	121	106	106	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	105	83	83	79	65	65
	28-45	117	117	97	98	98	97	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	96	96	77	74	72	60
150 mph	8-20	99	87	83	99	87	83	86	84	83	84	84	83	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	76	67	65	61	49	45
	21-27	118	97	97	99	97	97	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	96	76	76	74	60	60
	28-45	109	108	89	98	98	89	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	87	85	72	69	66	54
160 mph	8-20	91	80	76	91	80	76	86	80	76	84	80	76	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	72	64	59	56	42	38
	21-27	113	89	89	99	89	89	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	88	72	72	69	54	54
	28-45	101	100	82	98	98	82	83	83	82	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	81	78	65	64	60	41
170 mph	8-20	84	74	72	84	74	72	84	74	72	84	74	72	75	74	72	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	66	58	49	49	37	34
	21-27	105	83	83	99	83	83	84	83	83	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	82	65	65	64	48	48
	28-45	96	93	77	96	93	77	83	83	77	82	82	77	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	76	73	59	60	56	34
175 mph	8-20	79	72	68	79	72	68	79	72	68	79	72	68	75	72	68	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	64	51	44	48	35	32
	21-27	101	80	80	99	80	80	84	80	80	83	80	80	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	78	64	64	64	42	42
	28-45	91	89	74	91	89	74	83	83	74	82	82	74	76	76	74	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	73	69	58	58	51	32
180 mph	8-20	78	69	66	78	69	66	78	69	66	78	69	66	75	69	66	68	67	66	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	61	48	40	44	33	30
	21-27	97	77	77	97	77	77	84	77	77	83	77	77	76	75	75	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	76	60	60	60	40	40
	28-45	88	86	72	88	86	72	83	83	72	82	82	72	76	76	72	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	72	67	51	56	48	29

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

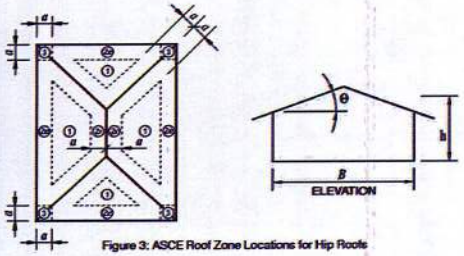


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 80", Max Module SF: 24 SF
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	123	123	123	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	123	105	101	88	79	76
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	116	116	107	87	87
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	107	97	96	81
95 mph	8-20	123	123	119	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	113	98	96	83	75	72
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	109	109	101	82	82
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	117	117	101	92	91	77
100 mph	8-20	123	117	111	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	106	92	87	78	72	68
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	102	102	96	78	78
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	114	114	96	88	86	73
105 mph	8-20	123	110	104	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	99	87	82	74	67	64
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	96	96	90	74	74
	28-45	117	117	110	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	108	108	88	83	81	69
110 mph	8-20	122	103	98	102	102	98	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	92	81	77	72	64	61
	21-27	121	114	114	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	115	91	91	86	72	72
	28-45	117	117	104	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	102	102	84	80	77	66
115 mph	8-20	115	98	92	102	98	92	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	87	77	73	67	60	58
	21-27	121	108	108	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	109	85	85	82	67	67
	28-45	117	117	99	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	98	96	80	76	73	64
120 mph	8-20	107	92	88	102	92	88	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	83	73	69	64	57	52
	21-27	121	103	103	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	103	81	81	78	64	64
	28-45	114	114	96	98	98	96	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	92	91	76	73	72	59
130 mph	8-20	96	84	79	96	84	79	86	84	79	84	84	79	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	73	66	64	60	48	42
	21-27	118	92	92	99	92	92	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	96	73	73	72	58	58
	28-45	104	103	85	98	98	85	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	84	83	67	67	64	48
140 mph	8-20	85	76	72	85	76	72	85	76	72	84	76	72	75	75	72	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	67	60	54	52	39	36
	21-27	107	84	84	99	84	84	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	85	67	67	66	49	49
	28-45	97	96	78	97	96	78	83	83	78	82	82	78	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	77	74	64	64	58	37
150 mph	8-20	78	72	66	78	72	66	78	72	66	78	72	66	75	72	66	68	68	66	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	64	48	42	45	34	32
	21-27	98	78	78	98	78	78	84	78	78	83	78	78	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	77	64	64	61	41	41
	28-45	89	87	72	89	87	72	83	83	72	82	82	72	76	76	72	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	72	69	55	58	48	30
160 mph	8-20	72	64	61	72	64	61	72	64	61	72	64	61	72	64	61	68	64	61	64	64	61	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	57	40	35	39	29	27
	21-27	91	72	72	91	72	72	84	72	72	82	72	72	75	72	72	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	72	54	54	55	35	35
	28-45	83	80	67	83	80	67	83	80	67	82	80	67	76	76	67	72	72	67	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	66	64	37	49	40	24
170 mph	8-20	68	60	55	68	60	55	68	60	55	68	60	55	68	60	55	67	60	55	64	60	55	58	58	55	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	48	34	32	35	26	24
	21-27	84	66	66	84	66	66	82	66	66	81	66	66	74	66	66	68	66	66	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	66	44	44	48	32	32
	28-45	77	75	61	77	75	61	77	75	61	77	75	61	76	75	61	72	72	61	67	67	61	64	64	61	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	64	58	30	42	33	20
175 mph	8-20	65	57	51	65	57	51	65	57	51	65	57	51	65	57	51	65	57	51	64	57	51	58	57	51	55	55	51	52	52	51	49	49	49	48	48	48	45	45	45	45	32	29	33	24	22
	21-27	81	64	64	81	64	64	80	64	64	79	64	64	73	64	64	68	64	64	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	64	40	40	44	29	29
	28-45	75	72	59	75	72	59	75	72	59	75	72	59	75	72	59	72	72	59	66	66	59	64	64	59	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	59	51	27	40	30	19
180 mph	8-20	64	54	45	64	54	45	64	54	45	64	54	45	64	54	45	64	54	45	64	54	45	58	54	45	55	54	45	52	52	45	49	49	45	48	48	45	45	45	45	41	30	28	32	24	21
	21-27	78	64	64	78	64	64	78	64	64	78	64	64	72	64	64	67	64	64	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	64	36	36	41	28	28
	28-45	72	68	57	72	68	57	72	68	57	72	68	57	72	68	57	72	68	57	66	66	57	64	64	57	59	59	57	56	56	56	53	53	53	51	51	51	49	49	49	58	44	24	37	27	18

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

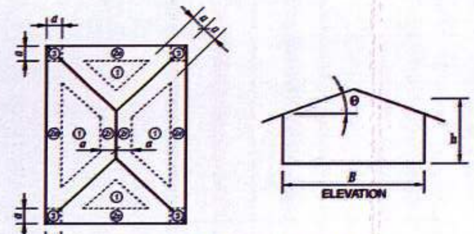


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
Max Module Length: 80", Max Module SF: 24 SF
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	123	123	117	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	109	96	90	80	72	69
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	105	105	98	80	80
	28-45	117	117	117	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	116	117	96	90	88	74
95 mph	8-20	123	114	109	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	101	88	84	75	68	65
	21-27	121	121	121	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	121	98	98	92	75	75
	28-45	117	117	114	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	110	110	91	85	83	72
100 mph	8-20	123	108	102	102	102	102	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	96	83	78	72	65	64
	21-27	121	119	119	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	117	92	92	87	72	72
	28-45	117	117	109	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	103	103	85	80	78	66
105 mph	8-20	117	101	96	102	101	96	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	88	77	74	68	61	59
	21-27	121	112	112	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	110	87	87	83	67	67
	28-45	117	117	102	98	98	98	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	98	98	80	76	74	64
110 mph	8-20	109	96	90	102	96	90	86	86	86	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	83	73	69	65	58	52
	21-27	121	105	105	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	103	81	81	78	64	64
	28-45	117	117	96	98	98	96	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	96	92	76	73	72	59
115 mph	8-20	102	90	85	102	90	85	86	86	85	84	84	84	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	77	69	66	64	51	48
	21-27	121	99	99	99	99	99	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	98	77	77	74	61	61
	28-45	111	112	92	98	98	92	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	88	87	72	72	66	55
120 mph	8-20	96	85	80	96	85	80	86	85	80	84	84	80	75	75	75	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	73	65	64	59	48	42
	21-27	120	96	96	99	96	96	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	92	73	73	72	58	58
	28-45	106	106	87	98	98	87	83	83	83	82	82	82	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	84	83	67	66	64	48
130 mph	8-20	87	77	73	87	77	73	86	77	73	84	77	73	75	75	73	68	68	68	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	67	59	52	51	38	35
	21-27	109	85	85	99	85	85	84	84	84	83	83	83	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	84	66	66	65	48	48
	28-45	97	96	78	97	96	78	83	83	78	82	82	78	76	76	76	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	77	74	60	61	58	36
140 mph	8-20	78	72	66	78	72	66	78	72	66	78	72	66	75	72	66	68	68	66	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	61	48	40	44	32	30
	21-27	99	77	77	99	77	77	84	77	77	83	77	77	76	76	76	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	76	60	60	60	40	40
	28-45	90	87	72	90	87	72	83	83	72	82	82	72	76	76	72	72	72	72	67	67	67	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	72	66	48	56	48	29
150 mph	8-20	72	64	60	72	64	60	72	64	60	72	64	60	72	64	60	68	64	60	64	64	60	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	54	37	34	38	28	26
	21-27	91	72	72	91	72	72	83	72	72	82	72	72	74	72	72	69	69	69	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	72	51	51	52	34	34
	28-45	83	80	66	83	80	66	83	80	66	82	80	66	76	76	66	72	72	66	67	67	66	64	64	64	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	65	60	34	48	37	24
160 mph	8-20	66	59	51	66	59	51	66	59	51	66	59	51	66	59	51	66	59	51	64	59	51	58	58	51	55	55	51	52	52	51	49	49	49	48	48	48	45	45	45	45	32	30	33	25	24
	21-27	83	66	66	83	66	66	81	66	66	80	66	66	73	66	66	68	66	66	64	64	64	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	65	40	40	45	30	30
	28-45	76	73	60	76	73	60	76	73	60	76	73	60	76	73	60	72	72	60	66	66	60	64	64	60	59	59	59	56	56	56	53	53	53	51	51	51	49	49	49	59	54	27	40	30	19
170 mph	8-20	64	48	41	64	48	41	64	48	41	64	48	41	64	48	41	64	48	41	64	48	41	58	48	41	55	48	41	52	48	41	49	48	41	48	48	41	45	45	41	38	28	26	29	22	20
	21-27	77	60	60	77	60	60	77	60	60	77	60	60	72	60	60	67	60	60	64	60	60	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	59	34	34	38	26	26
	28-45	72	67	54	72	67	54	72	67	54	72	67	54	72	67	54	69	67	54	65	65	54	64	64	54	59	59	54	56	56	54	53	53	53	51	51	51	49	49	49	54	37	24	35	24	15
175 mph	8-20	60	44	37	60	44	37	60	44	37	60	44	37	60	44	37	60	44	37	60	44	37	58	44	37	55	44	37	52	44	37	49	44	37	48	44	37	45	44	37	36	27	25	28	20	19
	21-27	74	59	59	74	59	59	74	59	59	74	59	59	72	59	59	66	59	59	64	59	59	59	59	59	56	56	56	53	53	53	50	50	50	48	48	48	48	48	48	55	32	32	36	25	25
	28-45	69	65	44	69	65	44	69	65	44	69	65	44	69	65	44	69	65	44	65	65	44	64	64	44	59	59	44	56	56	44	53	53	44	51	51	44	49	49	44	48	34	22	33	24	15
180 mph	8-20	58	40	35	58	40	35	58	40	35	58	40	35	58	40	35	58	40	35	58	40	35	58	40	35	55	40	35	52	40	35	49	40	35	48	40	35	45	40	35	34	25	24	26	19	18
	21-27	72	55	55	72	55	55	72	55	55	72	55	55	72	55	55	65	55	55	64	55	55	58	55	55	55	55	55	53	53	53	50	50	50	48	48	48	48	48	48	51	30	30	34	24	24
	28-45	66	64	37	66	64	37	66	64	37	66	64	37	66	64	37	66	64	37	64	64	37	61	61	37	58	58	37	56	56	37	53	53	37	51	51	37	49	49	37	42	32	19	32	22	13

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

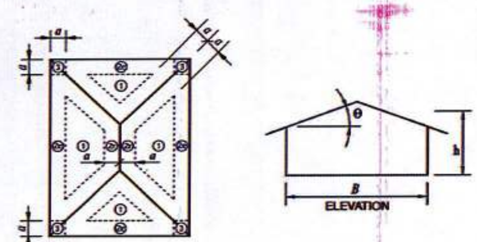


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation

**Max Module Length: 86", Max Module SF: 24.5 SF

Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
95 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
100 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
105 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
110 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
115 mph	8-20	116	116	112	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
120 mph	8-20	116	112	106	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
130 mph	8-20	116	101	96	97	97	96	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	111	111	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	102	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
140 mph	8-20	106	92	87	97	92	87	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	102	102	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	111	111	96	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
150 mph	8-20	96	84	80	96	84	80	82	82	80	80	80	80	72	72	72	65	65	65	60	60	60
	21-27	114	96	96	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	104	105	86	96	96	86	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64
160 mph	8-20	88	77	74	88	77	74	82	77	74	80	77	74	72	72	72	65	65	65	60	60	60
	21-27	109	86	86	96	86	86	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	97	97	80	96	96	80	81	81	80	79	79	79	74	74	74	69	69	69	64	64	64
170 mph	8-20	81	72	68	81	72	68	81	72	68	80	72	68	72	72	68	65	65	65	60	60	60
	21-27	101	80	80	96	80	80	81	80	80	80	80	80	73	73	73	66	66	66	64	64	64
	28-45	91	90	74	91	90	74	81	81	74	79	79	74	74	74	74	69	69	69	64	64	64
175 mph	8-20	78	69	66	78	69	66	78	69	66	78	69	66	72	69	66	65	65	65	60	60	60
	21-27	98	77	77	96	77	77	81	77	77	80	77	77	73	73	73	66	66	66	64	64	64
	28-45	88	87	72	88	87	72	81	81	72	79	79	72	74	74	72	69	69	69	64	64	64
180 mph	8-20	75	67	64	75	67	64	75	67	64	75	67	64	72	67	64	65	65	64	60	60	60
	21-27	96	74	74	96	74	74	81	74	74	80	74	74	73	73	73	66	66	66	64	64	64
	28-45	85	84	69	85	84	69	81	81	69	79	79	69	74	74	69	69	69	69	64	64	64

Wind Speed (mph)	Roof Slope (deg.)	70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	116	116	104	92	88
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	114	114	114	100	100
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	111	109	111	96
95 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	116	111	98	87	83
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	114	114	114	96	96
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	111	104	105	88
100 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	109	104	92	82	78
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	114	114	110	90	90
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	109	99	99	84
105 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	102	97	87	78	74
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	113	113	104	85	85
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	103	96	96	80
110 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	112	96	92	82	74	72
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	106	106	99	81	81
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	98	90	90	76
115 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	105	91	86	78	72	67
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	101	101	96	77	77
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	96	86	86	72
120 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	99	86	82	74	67	64
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	96	96	90	74	74
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	106	108	88	83	82	69
130 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	89	78	74	68	64	59
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	110	86	86	83	68	68
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	98	98	80	76	75	64
140 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	80	72	67	64	55	49
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	100	79	79	76	64	64
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	90	89	73	72	69	58
150 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	73	65	64	59	48	42
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	92	72	72	72	58	58
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	83	82	67	66	64	49
160 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	67	60	55	52	38	36
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	85	67	67	66	49	49
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	77	75	64	64	59	39
170 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	64	51	44	48	34	32
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	78	64	64	64	42	42
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	72	69	57	58	52	32
175 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	60	48	39	43	32	30
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	76	59	59	60	39	39
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	69	67	51	56	48	28
180 mph	8-20	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	59	41	37	41	30	28
	21-27	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	73	58	58	58	37	37
	28-45	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	67	64	44	52	44	27

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

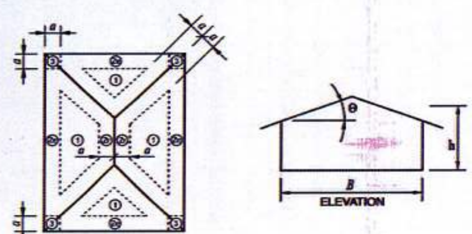


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

***B* = Horizontal dimension of building measured normal to wind direction, in ft (m).**

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
****Max Module Length: 86", Max Module SF: 24.5 SF**
Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	116	100	96	85	76	73
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	111	111	103	84	84
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	102	96	96	78
95 mph	8-20	116	116	116	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	109	96	89	80	72	69
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	104	104	97	79	79
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	111	111	96	88	88	74
100 mph	8-20	116	114	108	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	101	88	84	76	68	65
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	97	97	92	75	75
	28-45	111	111	111	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	108	109	90	84	83	72
105 mph	8-20	116	107	102	97	97	97	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	96	82	79	72	65	64
	21-27	114	114	114	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	114	92	92	87	72	72
	28-45	111	111	107	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	102	103	85	80	79	66
110 mph	8-20	116	101	96	97	97	96	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	89	78	74	68	64	59
	21-27	114	111	111	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	110	86	86	83	68	68
	28-45	111	111	102	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	97	97	80	76	75	64
115 mph	8-20	111	96	91	97	96	91	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	84	74	72	65	58	54
	21-27	114	105	105	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	104	82	82	79	64	64
	28-45	111	111	97	96	96	96	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	96	92	76	73	72	60
120 mph	8-20	104	90	86	97	90	86	82	82	82	80	80	80	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	79	69	66	64	53	48
	21-27	114	100	100	96	96	96	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	98	78	78	75	64	64
	28-45	110	111	92	96	96	92	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	88	87	72	72	68	57
130 mph	8-20	96	81	77	96	81	77	82	81	77	80	80	77	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	72	64	60	56	44	39
	21-27	114	90	90	96	90	90	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	89	72	72	69	55	55
	28-45	101	102	84	96	96	84	81	81	81	79	79	79	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	81	79	65	64	64	45
140 mph	8-20	84	74	72	84	74	72	82	74	72	80	74	72	72	72	72	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	64	57	48	48	36	33
	21-27	105	82	82	96	82	82	81	81	81	80	80	80	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	81	64	64	64	45	45
	28-45	96	96	76	96	96	76	81	81	76	79	79	76	74	74	74	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	74	72	59	60	57	35
150 mph	8-20	76	68	65	76	68	65	76	68	65	76	68	65	72	68	65	65	65	65	60	60	60	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	59	44	38	42	32	29
	21-27	96	76	76	96	76	76	81	76	76	80	76	76	73	73	73	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	74	59	59	59	38	38
	28-45	86	85	72	86	85	72	81	81	72	79	79	72	74	74	72	69	69	69	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	68	65	48	54	45	28
160 mph	8-20	72	64	59	72	64	59	72	64	59	72	64	59	72	64	59	65	64	59	60	60	59	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	43	43	43	51	35	32	37	27	25
	21-27	88	72	72	88	72	72	80	72	72	78	72	72	72	72	72	66	66	66	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	68	48	48	52	33	33
	28-45	80	79	65	80	79	65	80	79	65	79	79	65	74	74	65	69	69	65	64	64	64	60	60	60	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	64	59	34	48	37	22
170 mph	8-20	65	58	49	65	58	49	65	58	49	65	58	49	65	58	49	65	58	49	60	58	49	56	56	49	53	53	49	50	50	49	48	48	48	45	45	45	43	43	43	44	32	28	32	24	22
	21-27	82	65	65	82	65	65	78	65	65	77	65	65	72	65	65	65	65	65	64	64	64	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	64	38	38	44	29	29
	28-45	75	72	59	75	72	59	75	72	59	75	72	59	73	72	59	68	68	59	64	64	59	60	60	59	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	59	51	27	39	29	18
175 mph	8-20	64	52	45	64	52	45	64	52	45	64	52	45	64	52	45	64	52	45	60	52	45	56	52	45	53	52	45	50	50	45	48	48	45	45	45	45	43	43	43	41	29	27	30	24	21
	21-27	79	64	64	79	64	64	77	64	64	76	64	64	72	64	64	65	64	64	61	61	61	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	61	35	35	41	27	27
	28-45	72	72	58	72	72	58	72	72	58	72	72	58	72	72	58	67	67	58	64	64	58	60	60	58	56	56	56	53	53	53	51	51	51	48	48	48	48	48	48	57	44	25	37	28	17
180 mph	8-20	61	48	41	61	48	41	61	48	41	61	48	41	61	48	41	61	48	41	60	48	41	56	48	41	53	48	41	50	48	41	48	48	41	45	45	41	43	43	41	38	27	25	29	21	20
	21-27	76	60	60	76	60	60	76	60	60	75	60	60	72	60	60	64	60	60	60	60	60	57	57	57	53	53	53	51	51	51	48	48	48	48	48	48	44	44	44	59	33	33	38	26	26
	28-45	72	67	54	72	67	54	72	67	54	72	67	54	72	67	54	67	67	54	64	64	54	60	60	54	56	56	54	53	53	53	51	51	51	48	48	48	48	48	48	52	38	22	34	25	15

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

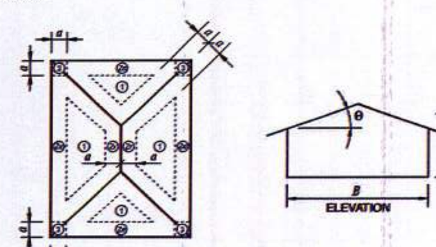


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

***B* = Horizontal dimension of building measured normal to wind direction, in ft (m).**

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
****Max Module Length: 86", Max Module SF: 24.5 SF**
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	116	116	111	97	97	97	82	82	82	81	81	81	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	104	90	86	77	72	67
	21-27	114	114	114	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	114	100	100	96	77	77
	28-45	111	111	111	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	110	111	92	86	85	72
95 mph	8-20	116	109	104	97	97	97	82	82	82	81	81	81	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	96	84	80	73	66	64
	21-27	114	114	114	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	114	96	96	89	72	72
	28-45	111	111	109	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	104	105	86	81	80	68
100 mph	8-20	116	102	97	97	97	97	82	82	82	81	81	81	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	90	79	75	69	64	59
	21-27	114	113	113	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	111	88	88	84	68	68
	28-45	111	111	103	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	99	99	81	77	76	64
105 mph	8-20	112	96	91	97	96	91	82	82	82	81	81	81	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	84	74	72	65	59	54
	21-27	114	106	106	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	105	83	83	79	65	65
	28-45	111	111	98	96	96	96	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	96	96	76	74	72	61
110 mph	8-20	105	90	86	97	90	86	82	82	82	81	81	81	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	79	72	67	64	54	48
	21-27	114	100	100	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	99	78	78	76	64	64
	28-45	110	111	92	96	96	92	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	89	88	72	72	68	58
115 mph	8-20	98	85	81	97	85	81	82	82	81	81	81	81	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	74	66	64	59	48	44
	21-27	114	96	96	96	96	96	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	96	74	74	72	59	59
	28-45	105	107	88	96	96	88	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	84	83	68	67	65	52
120 mph	8-20	92	81	77	92	81	77	82	81	77	81	81	77	73	73	73	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	72	64	59	56	43	39
	21-27	114	90	90	96	90	90	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	89	72	72	69	54	54
	28-45	101	101	83	96	96	83	81	81	81	80	80	80	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	80	79	65	64	64	44
130 mph	8-20	83	73	69	83	73	69	82	73	69	81	73	69	73	73	69	66	66	66	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	64	54	48	48	35	32
	21-27	103	81	81	96	81	81	81	81	81	81	81	81	74	74	74	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	80	64	64	64	44	44
	28-45	92	92	76	92	92	76	81	81	76	80	80	76	74	74	74	72	72	72	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	73	72	58	59	55	34
140 mph	8-20	75	67	64	75	67	64	75	67	64	75	67	64	72	67	64	66	66	64	61	61	61	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	58	41	37	41	30	28
	21-27	96	74	74	96	74	74	81	74	74	81	74	74	73	73	73	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	73	58	58	58	37	37
	28-45	85	84	69	85	84	69	81	81	69	80	80	69	74	74	69	72	72	69	65	65	65	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	67	64	44	52	42	27
150 mph	8-20	68	61	58	68	61	58	68	61	58	68	61	58	68	61	58	66	61	58	61	61	58	56	56	56	53	53	53	50	50	50	48	48	48	45	45	45	44	44	44	49	33	32	35	26	24
	21-27	86	68	68	86	68	68	79	68	68	79	68	68	72	68	68	67	67	67	64	64	64	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	67	45	45	49	32	32
	28-45	78	76	64	78	76	64	78	76	64	78	76	64	74	74	64	69	69	64	65	65	64	60	60	60	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	64	58	32	44	34	21
160 mph	8-20	64	54	48	64	54	48	64	54	48	64	54	48	64	54	48	64	54	48	61	54	48	56	54	48	53	52	48	50	50	48	48	48	48	45	45	45	44	44	44	41	29	27	32	24	21
	21-27	79	64	64	79	64	64	77	64	64	77	64	64	72	64	64	65	64	64	61	61	61	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	64	37	37	41	28	28
	28-45	73	72	58	73	72	58	73	72	58	73	72	58	73	72	58	68	68	58	64	64	58	60	60	58	57	57	57	54	54	54	51	51	51	49	49	49	48	48	48	57	48	25	37	28	17
170 mph	8-20	59	42	37	59	42	37	59	42	37	59	42	37	59	42	37	59	42	37	59	42	37	56	42	37	53	42	37	50	42	37	48	42	37	45	42	37	44	42	37	35	26	24	27	20	19
	21-27	74	58	58	74	58	58	74	58	58	74	58	58	69	58	58	64	58	58	60	58	58	57	57	57	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	57	32	32	35	26	24
	28-45	68	65	48	68	65	48	68	65	48	68	65	48	68	65	48	67	65	48	64	64	48	60	60	48	57	57	48	54	54	48	51	51	48	49	49	48	48	48	48	48	34	21	32	24	14
175 mph	8-20	55	38	34	55	38	34	55	38	34	55	38	34	55	38	34	55	38	34	55	38	34	55	38	34	53	38	34	50	38	34	48	38	34	45	38	34	44	38	34	33	24	22	26	19	18
	21-27	72	54	54	72	54	54	72	54	54	72	54	54	68	54	54	64	54	54	60	54	54	57	54	54	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	49	29	29	33	24	24
	28-45	65	64	38	65	64	38	65	64	38	65	64	38	65	64	38	65	64	38	64	64	38	59	59	38	57	57	38	54	54	38	51	51	38	49	49	38	48	48	38	42	32	19	30	21	14
180 mph	8-20	51	35	32	51	35	32	51	35	32	51	35	32	51	35	32	51	35	32	51	35	32	51	35	32	51	35	32	50	35	32	48	35	32	45	35	32	44	35	32	32	24	21	24	18	17
	21-27	68	48	48	68	48	48	68	48	48	68	48	48	68	48	48	64	48	48	59	48	48	56	48	48	54	48	48	51	48	48	48	48	48	48	48	48	44	44	44	45	28	28	32	22	22
	28-45	64	59	34	64	59	34	64	59	34	64	59	34	64	59	34	64	59	34	64	59	34	59	59	34	56	56	34	54	54	34	51	51	34	49	49	34	48	48	34	38	28	17	29	19	12

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

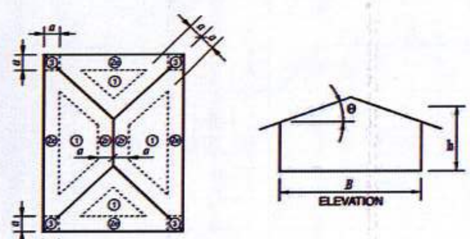


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

***B* = Horizontal dimension of building measured normal to wind direction, in ft (m).**

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100		Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation **Max Module Length: 92.5", Max Module SF: 29.5 SF Exposure B																																									
Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	112	112	101	89	85
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	110	110	110	97	97
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	107	106	107	91
95 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	110	105	96	84	80
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	110	110	110	92	92
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	107	101	102	86
100 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	103	98	89	79	76
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	110	110	106	87	87
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	104	96	96	81
105 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	112	97	92	84	75	72
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	107	107	101	82	82
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	98	91	92	77
110 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	106	91	86	80	72	68
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	101	101	96	78	78
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	96	87	87	74
115 mph	8-20	112	112	106	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	100	86	82	76	68	65
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	96	96	92	75	75
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	105	107	88	84	83	72
120 mph	8-20	112	106	100	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	96	81	77	72	65	64
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	91	91	88	72	72
	28-45	107	107	106	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	101	102	84	80	79	67
130 mph	8-20	111	96	91	96	96	91	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	84	73	72	66	59	55
	21-27	110	105	105	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	104	82	82	80	65	65
	28-45	107	107	97	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	92	96	76	74	73	61
140 mph	8-20	101	86	82	96	86	82	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	76	67	64	60	51	48
	21-27	110	96	96	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	96	75	75	74	60	60
	28-45	106	107	89	92	92	89	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	85	84	72	69	67	57
150 mph	8-20	91	79	76	91	79	76	79	79	76	77	77	76	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	69	61	58	55	43	39
	21-27	110	88	88	93	88	88	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	87	69	69	69	54	54
	28-45	99	100	82	92	92	82	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	79	77	64	64	64	48
160 mph	8-20	83	73	72	83	73	72	79	73	72	77	73	72	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	64	54	48	48	36	33
	21-27	103	81	81	93	81	81	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	80	64	64	64	48	48
	28-45	92	92	76	92	92	76	79	79	76	78	78	76	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	73	72	58	60	57	36
170 mph	8-20	77	67	64	77	67	64	77	67	64	77	67	64	72	67	64	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	59	44	38	43	32	29
	21-27	96	76	76	93	76	76	79	76	76	78	76	76	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	74	58	58	60	39	39
	28-45	86	85	72	86	85	72	79	79	72	78	78	72	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	68	66	50	56	48	29
175 mph	8-20	74	65	64	74	65	64	74	65	64	74	65	64	72	65	64	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	55	39	35	40	30	27
	21-27	92	73	73	92	73	73	78	73	73	77	73	73	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	72	54	54	58	37	37
	28-45	83	82	67	83	82	67	79	79	67	78	78	67	72	72	67	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	66	64	41	53	44	26
180 mph	8-20	72	64	60	72	64	60	72	64	60	72	64	60	72	64	60	64	64	60	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	51	35	32	38	28	26
	21-27	89	72	72	89	72	72	78	72	72	77	72	72	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	69	50	50	55	34	34
	28-45	81	79	65	81	79	65	79	79	65	78	78	65	72	72	65	66	66	65	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	64	61	35	48	39	25

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

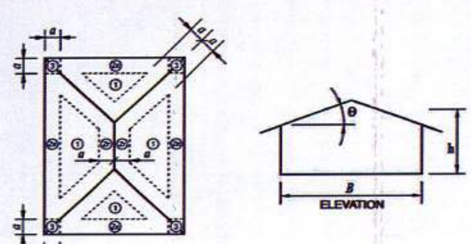


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

B = Horizontal dimension of building measured normal to wind direction, in ft (m).

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Hip Roof Flush Mount System Span Table (Inches) - Portrait or Landscape Installation

**Max Module Length: 92.5", Max Module SF: 29.5 SF

Exposure C

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	112	112	112	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	111	96	90	83	74	72
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	105	105	100	81	81
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	97	90	90	76
95 mph	8-20	112	112	109	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	103	89	84	78	72	67
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	98	98	96	77	77
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	107	107	91	86	85	72
100 mph	8-20	112	108	102	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	96	83	79	73	66	64
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	92	92	89	72	72
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	102	104	85	81	80	68
105 mph	8-20	112	101	96	96	96	96	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	89	78	74	69	64	60
	21-27	110	110	110	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	110	87	87	84	69	69
	28-45	107	107	102	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	97	98	80	77	76	64
110 mph	8-20	111	96	91	96	96	91	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	83	73	72	66	59	55
	21-27	110	105	105	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	104	82	82	80	65	65
	28-45	107	107	97	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	92	96	76	74	72	61
115 mph	8-20	105	90	86	96	90	86	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	79	72	66	64	55	50
	21-27	110	100	100	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	98	77	77	76	64	64
	28-45	107	107	92	92	92	92	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	88	88	72	72	69	58
120 mph	8-20	98	85	81	96	85	81	79	79	79	77	77	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	75	66	64	60	50	45
	21-27	110	96	96	93	93	93	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	96	73	73	73	59	59
	28-45	105	107	87	92	92	87	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	84	83	68	68	66	55
130 mph	8-20	88	77	73	88	77	73	79	77	73	77	77	73	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	67	59	54	52	41	36
	21-27	109	86	86	93	86	86	79	79	79	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	84	66	66	67	51	51
	28-45	96	97	79	92	92	79	79	79	79	78	78	78	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	76	75	61	64	60	42
140 mph	8-20	79	72	67	79	72	67	79	72	67	77	72	67	72	72	67	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	61	48	41	45	33	32
	21-27	99	78	78	93	78	78	79	78	78	78	78	78	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	77	61	61	64	42	42
	28-45	88	88	72	88	88	72	79	79	72	78	78	72	72	72	72	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	72	68	55	58	53	32
150 mph	8-20	72	64	61	72	64	61	72	64	61	72	64	61	72	64	61	64	64	61	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	54	38	32	39	29	27
	21-27	91	72	72	91	72	72	78	72	72	77	72	72	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	72	53	53	57	35	35
	28-45	82	81	66	82	81	66	79	79	66	78	78	66	72	72	66	66	66	66	64	64	64	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	64	64	38	51	42	26
160 mph	8-20	66	59	53	66	59	53	66	59	53	66	59	53	66	59	53	64	59	53	58	58	53	54	54	53	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	45	37	28	34	25	24
	21-27	83	66	66	83	66	66	76	66	66	75	66	66	69	66	66	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	64	41	41	48	32	32
	28-45	76	74	61	76	74	61	76	74	61	76	74	61	72	72	61	66	66	61	64	64	61	58	58	58	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	60	57	29	42	33	20
170 mph	8-20	61	50	42	61	50	42	61	50	42	61	50	42	61	50	42	61	50	42	58	50	42	54	50	42	51	50	42	48	48	42	48	48	42	44	44	42	42	42	42	38	37	25	30	22	21
	21-27	77	61	61	77	61	61	75	61	61	74	61	61	68	61	61	64	61	61	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	60	33	33	41	27	27
	28-45	72	69	57	72	69	57	72	69	57	72	69	57	72	69	57	65	65	57	64	64	57	58	58	57	54	54	54	51	51	51	49	49	49	48	48	48	45	45	45	54	41	24	36	27	17
175 mph	8-20	59	44	38	59	44	38	59	44	38	59	44	38	59	44	38	59	44	38	58	44	38	54	44	38	51	44	38	48	44	38	48	44	38	44	44	38	42	42	38	33	26	24	28	21	19
	21-27	75	59	59	75	59	59	74	59	59	73	59	59	67	59	59	64	59	59	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	58	32	32	38	25	25
	28-45	69	66	53	69	66	53	69	66	53	69	66	53	69	66	53	65	65	53	61	61	53	58	58	53	54	54	53	51	51	51	49	49	49	48	48	48	45	45	45	50	35	22	34	26	15
180 mph	8-20	57	41	35	57	41	35	57	41	35	57	41	35	57	41	35	57	41	35	57	41	35	54	41	35	51	41	35	48	41	35	44	41	35	42	41	35	38	24	22	27	20	18
	21-27	72	55	55	72	55	55	72	55	55	72	55	55	66	55	55	64	55	55	58	55	55	55	55	55	52	52	52	49	49	49	48	48	48	44	44	44	43	43	43	53	29	29	35	24	24
	28-45	66	64	44	66	64	44	66	64	44	66	64	44	66	64	44	64	64	44	60	60	44	57	57	44	54	54	44	51	51	44	49	49	44	48	48	44	45	45	44	44	32	19	32	24	14

= min 72" span = min 64" span = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

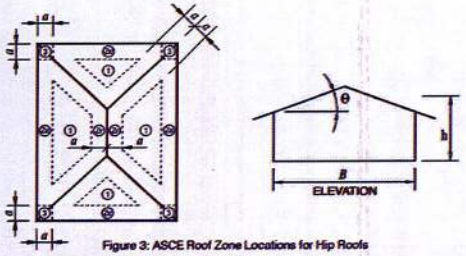


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

***B* = Horizontal dimension of building measured normal to wind direction, in ft (m).**

h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

Rail: XR100

Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation
****Max Module Length: 92.5", Max Module SF: 29.5 SF**
Exposure D

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf			70 psf*			80 psf*			90 psf*			100 psf*			110 psf*			120 psf*			Exposed Mod.			Edge Mod.		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
90 mph	8-20	112	111	105	96	96	96	79	79	79	78	78	78	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	99	85	81	75	67	65
	21-27	110	110	110	93	93	93	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	110	96	96	91	74	74
	28-45	107	107	107	92	92	92	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	105	107	88	83	82	72
95 mph	8-20	112	103	98	96	96	96	79	79	79	78	78	78	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	92	80	76	72	64	61
	21-27	110	110	110	93	93	93	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	110	88	88	86	72	72
	28-45	107	107	104	92	92	92	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	99	100	82	79	78	66
100 mph	8-20	112	97	92	96	96	92	79	79	79	78	78	78	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	85	75	72	66	60	57
	21-27	110	107	107	93	93	93	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	105	83	83	81	66	66
	28-45	107	107	98	92	92	92	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	96	96	77	75	73	64
105 mph	8-20	106	91	86	96	91	86	79	79	79	78	78	78	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	80	72	67	64	55	51
	21-27	110	100	100	93	93	93	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	99	78	78	77	64	64
	28-45	107	107	96	92	92	92	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	89	88	73	72	72	59
110 mph	8-20	99	85	81	96	85	81	79	79	79	78	78	78	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	75	66	64	60	50	45
	21-27	110	96	96	93	93	93	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	96	74	74	73	60	60
	28-45	105	107	88	92	92	88	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	84	83	69	68	66	55
115 mph	8-20	96	81	77	96	81	77	79	79	77	78	78	77	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	72	64	59	57	44	40
	21-27	110	90	90	93	90	90	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	88	72	72	72	57	57
	28-45	100	101	83	92	92	83	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	80	79	64	65	64	48
120 mph	8-20	88	76	73	88	76	73	79	76	73	78	76	73	72	72	72	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	66	59	53	52	40	36
	21-27	108	85	85	93	85	85	79	79	79	79	79	79	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	84	66	66	66	51	51
	28-45	96	96	79	92	92	79	79	79	79	78	78	78	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	76	75	61	64	60	41
130 mph	8-20	79	69	66	79	69	66	79	69	66	78	69	66	72	69	66	64	64	64	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	60	48	39	44	33	30
	21-27	98	77	77	93	77	77	79	77	77	79	77	77	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	76	60	60	61	41	41
	28-45	87	87	72	87	87	72	79	79	72	78	78	72	72	72	72	67	67	67	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	72	67	54	57	51	30
140 mph	8-20	72	64	60	72	64	60	72	64	60	72	64	60	72	64	60	64	64	60	58	58	58	54	54	54	51	51	51	48	48	48	48	48	48	44	44	44	42	42	42	51	35	32	38	28	26
	21-27	89	72	72	89	72	72	78	72	72	77	72	72	72	72	72	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	69	50	50	54	34	34
	28-45	80	79	65	80	79	65	79	79	65	78	78	65	72	72	65	67	67	65	64	64	64	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	64	61	35	48	39	25
150 mph	8-20	64	57	50	64	57	50	64	57	50	64	57	50	64	57	50	64	57	50	58	57	50	54	54	50	51	51	50	48	48	48	48	48	48	44	44	44	42	42	42	42	30	27	33	24	22
	21-27	82	64	64	82	64	64	76	64	64	76	64	64	69	64	64	64	64	64	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	64	38	38	45	29	29
	28-45	74	73	60	74	73	60	74	73	60	74	73	60	72	72	60	67	67	60	64	64	60	58	58	58	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	58	53	26	41	32	20
160 mph	8-20	60	45	39	60	45	39	60	45	39	60	45	39	60	45	39	60	45	39	58	45	39	54	45	39	51	45	39	48	45	39	48	45	39	44	44	39	42	42	39	36	26	24	29	21	20
	21-27	75	59	59	75	59	59	74	59	59	74	59	59	68	59	59	64	59	59	59	59	59	55	55	55	52	52	52	49	49	49	48	48	48	45	45	45	43	43	43	58	32	32	38	26	26
	28-45	69	67	53	69	67	53	69	67	53	69	67	53	69	67	53	66	66	53	61	61	53	58	58	53	55	55	53	52	52	52	49	49	49	48	48	48	45	45	45	50	38	22	35	26	16
170 mph	8-20	53	36	32	53	36	32	53	36	32	53	36	32	53	36	32	53	36	32	53	36	32	53	36	32	51	36	32	48	36	32	48	36	32	44	36	32	42	36	32	32	24	21	25	19	17
	21-27	72	51	51	72	51	51	72	51	51	72	51	51	66	51	51	64	51	51	58	51	51	55	51	51	52	51	51	49	49	49	48	48	48	45	45	45	43	43	43	48	28	28	33	24	24
	28-45	64	61	35	64	61	35	64	61	35	64	61	35	64	61	35	64	61	35	60	60	35	57	57	35	55	55	35	52	52	35	49	49	35	48	48	35	45	45	35	41	29	17	30	22	13
175 mph	8-20	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	48	33	30	44	33	30	42	33	30	29	21	20	24	18	16
	21-27	67	45	45	67	45	45	67	45	45	67	45	45	66	45	45	61	45	45	57	45	45	54	45	45	52	45	45	49	45	45	48	45	45	45	45	45	43	43	43	42	26	26	32	21	21
	28-45	64	59	30	64	59	30	64	59	30	64	59	30	64	59	30	64	59	30	60	59	30	57	57	30	54	54	30	52	52	30	49	49	30	48	48	30	45	45	30	36	26	16	28	20	13
180 mph	8-20	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	45	32	28	44	32	28	42	32	28	27	20	19	22	17	15
	21-27	64	41	41	64	41	41	64	41	41	64	41	41	64	41	41	60	41	41	57	41	41	54	41	41	51	41	41	49	41	41	48	41	41	45	41	41	43	41	41	38	24	24	29	20	20
	28-45	60	57	29	60	57	28	60	57	29	60	57	29	60	57	29	60	57	29	59	57	29	56	56	29	54	54	29	51	51	29	49	49	29	48	48	29	45	45	29	32	25	14	27	19	11

= min 72" span   = min 64" span   = min 48" span

= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded. See Note 9 on page 2 for details.

* = Note: additional installation requirement for CAMO module clamp. See Note 10 on Page 3 for details.

REV 02/09/2021

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

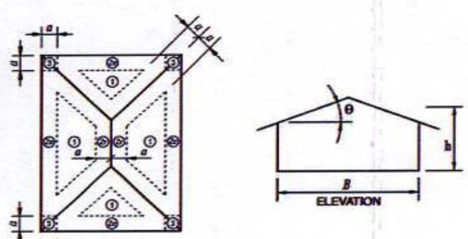


Figure 3: ASCE Roof Zone Locations for Hip Roofs

Notation (Per ASCE 7-16)

a = 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). If an overhang exists, the edge distance shall be measured from the outside edge of the overhang. The horizontal dimensions used to compute the edge distance shall not include any overhang distances.

***B* = Horizontal dimension of building measured normal to wind direction, in ft (m).**

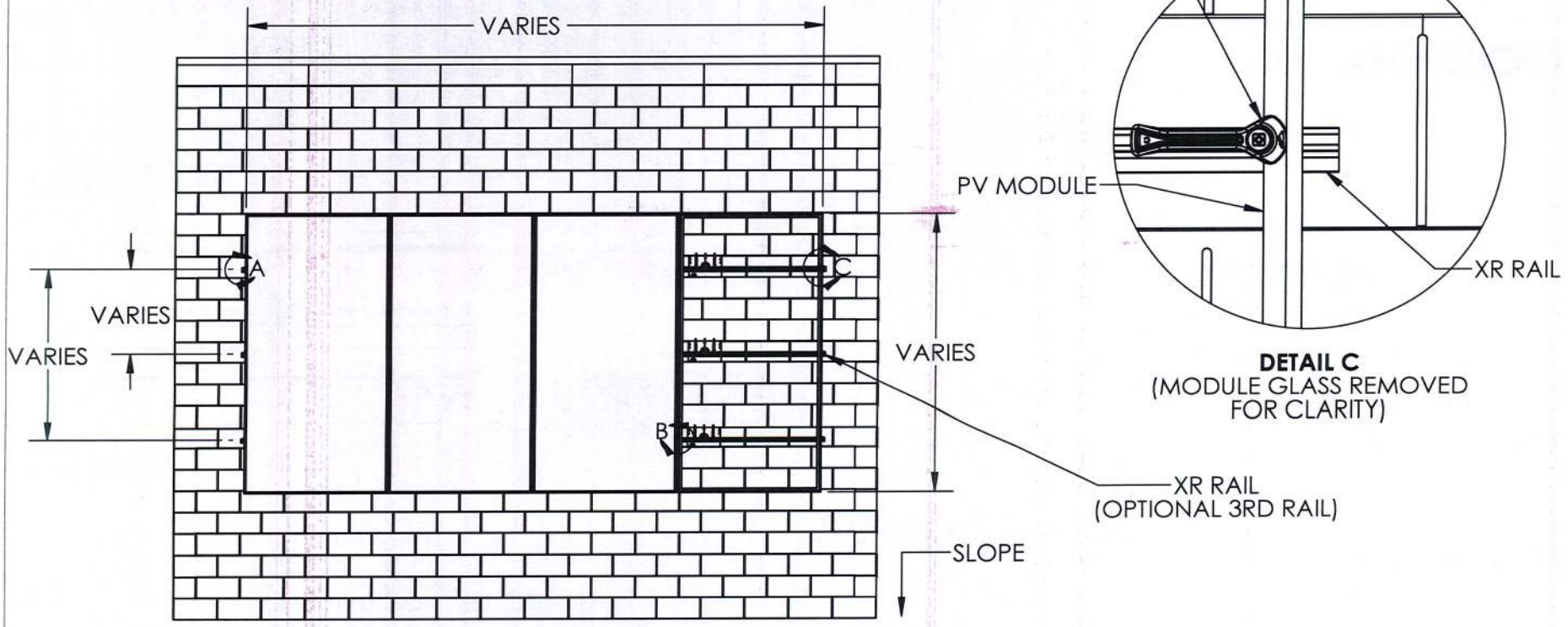
h = Mean roof height, in ft (m).

θ = Angle of plane of roof from horizontal, in degrees.

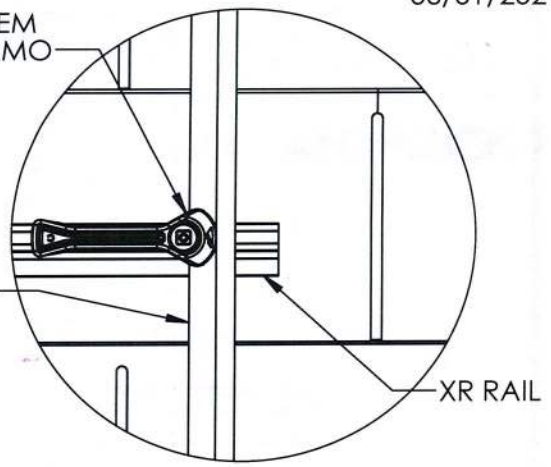
**Wind pressure loads used to generate the span tables for modules with maximum lengths of 86" and 92.5" are based on the wind tunnel study "*Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*"[1], referenced in ASCE 7-16 Section 29.4.4.

1. Sarah E. Stenabaugh 2015 *Design Wind Loads for Solar Modules Mounted Parallel to the Roof of a Low-rise Building*, University of Western Ontario, Ph.D Program Dissertation.

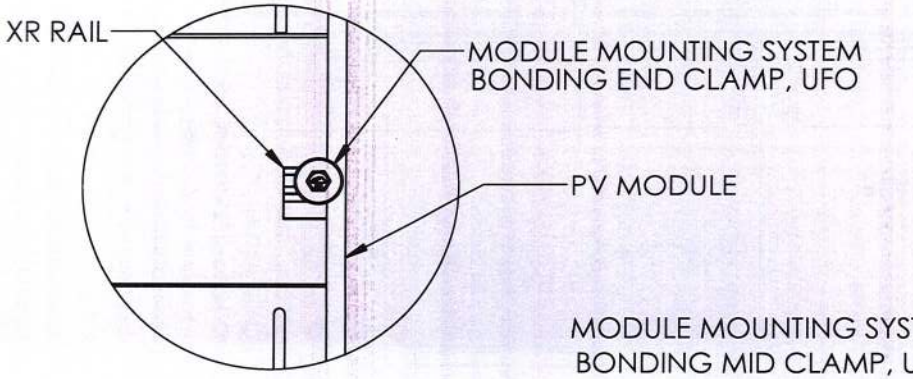
06/01/2021



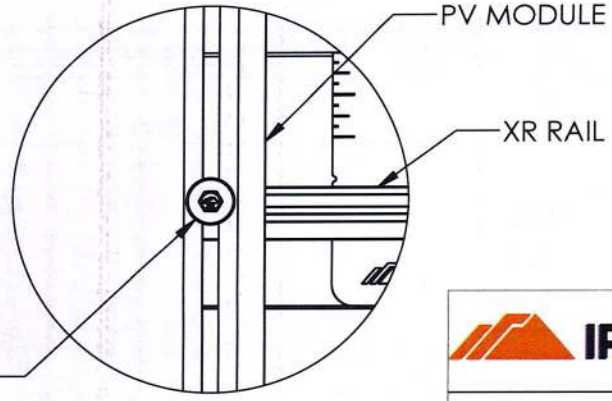
PLAN VIEW



DETAIL C
(MODULE GLASS REMOVED FOR CLARITY)



DETAIL A



DETAIL B
(MODULE GLASS REMOVED FOR CLARITY)

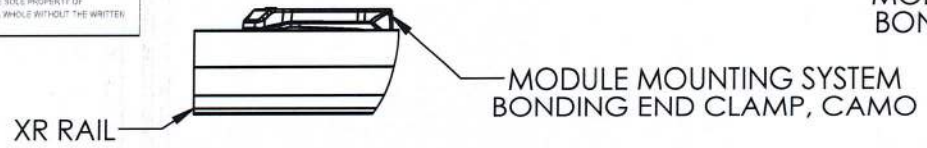
IRONRIDGE

FLUSH MOUNT SYSTEM

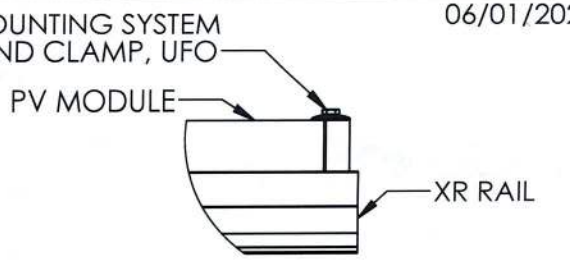
SIZE	DWG. NO.	
--	EX-0015	
SCALE: NTS	WEIGHT: N/A	SHEET 1 OF 2

EXHIBIT: EX-0015 - page 1 of 2

06/01/2021

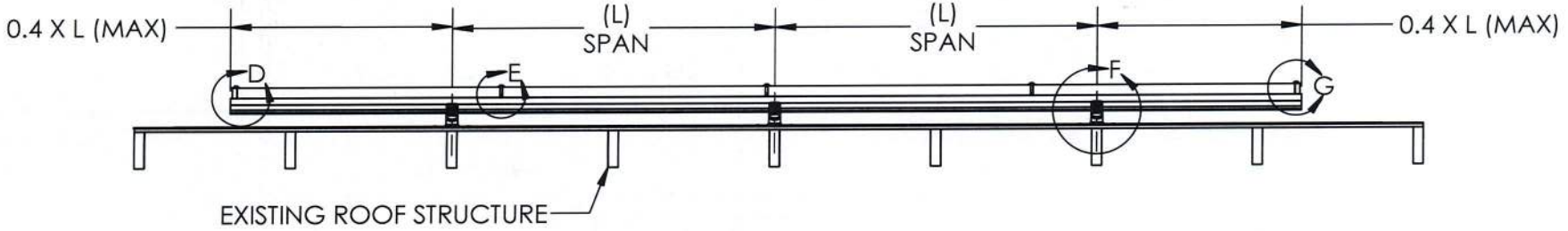


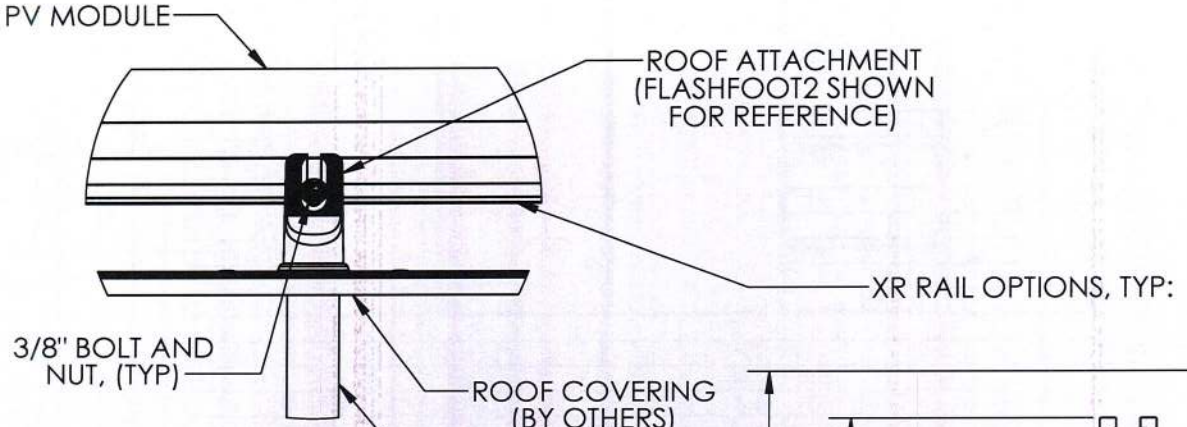
DETAIL D
(MODULE REMOVED FOR CLARITY)



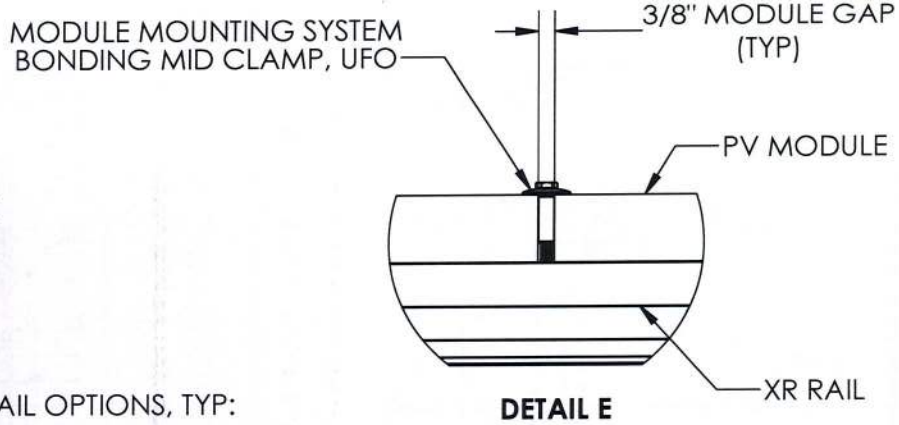
DETAIL G

PLAN VIEW

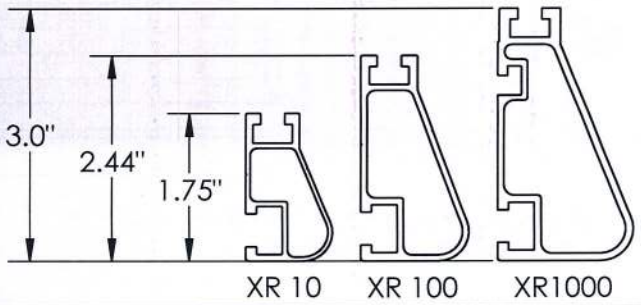




DETAIL F



DETAIL E



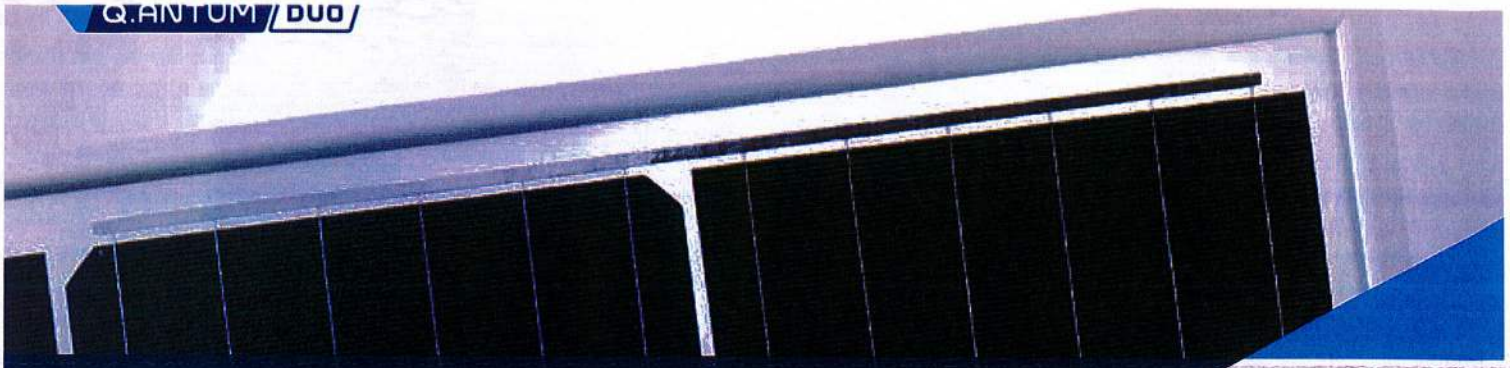
IRONRIDGE

FLUSH MOUNT SYSTEM

SIZE	DWG. NO.	
--	EX-0015	
SCALE: NTS	WEIGHT: N/A	SHEET 2 OF 2

EXHIBIT: EX-0015 - page 2 of 2

Q.ANTUM DUO



Q.PEAK DUO L-G5.3
380-400

ENDURING HIGH PERFORMANCE

Q.ANTUM TECHNOLOGY: LOW LEVELISED COST OF ELECTRICITY
Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 20.1%.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behaviour.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance warranty[2].

STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

[1] APT test conditions according to IEC/TS 62804-1:2015, method B (-1500 V, 168 h)
[2] See data sheet on rear for further information.

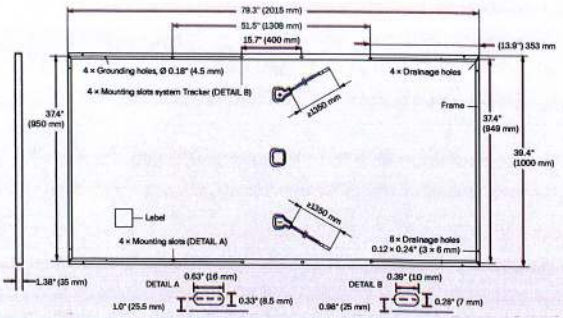
THE IDEAL SOLUTION FOR:

Rooftop arrays on commercial/industrial buildings

Ground-mounted solar power plants

Q CELLS

Format	79.3 in × 39.4 in × 1.38 in (including frame) (2015 mm × 1000 mm × 35 mm)
Weight	50.7 lbs (23 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Anodized aluminum
Cell	6 × 24 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥53.1 in (1350 mm), (–) ≥53.1 in (1350 mm)
Connector	Stäubli MC4-Evo2, Amphenol UTX, Renhe 05-8, Tonglin TL-Cable01S-F; IP68 or Friends PV2e; IP67

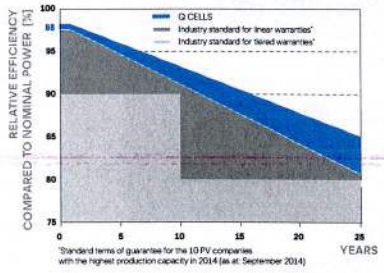


ELECTRICAL CHARACTERISTICS

POWER CLASS				380	385	390	395	400
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / –0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	380	385	390	395	400
	Short Circuit Current[1]	I_{SC}	[A]	10.05	10.10	10.14	10.19	10.24
	Open Circuit Voltage[1]	V_{OC}	[V]	47.95	48.21	48.48	48.74	49.00
	Current at MPP	I_{MPP}	[A]	9.57	9.61	9.66	9.70	9.75
	Voltage at MPP	V_{MPP}	[V]	39.71	40.05	40.38	40.71	41.04
	Efficiency[1]	η	[%]	≥18.9	≥19.1	≥19.4	≥19.6	≥19.9
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	284.4	288.2	291.9	295.6	299.4
	Short Circuit Current	I_{SC}	[A]	8.10	8.14	8.17	8.21	8.25
	Open Circuit Voltage	V_{OC}	[V]	45.21	45.46	45.71	45.96	46.21
	Current at MPP	I_{MPP}	[A]	7.53	7.57	7.60	7.64	7.67
	Voltage at MPP	V_{MPP}	[V]	37.77	38.08	38.40	38.71	39.02

[1]Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2°C, AM 1.5 G according to IEC 60904-3 • [2]800 W/m², NMOT, spectrum AM 1.5 G

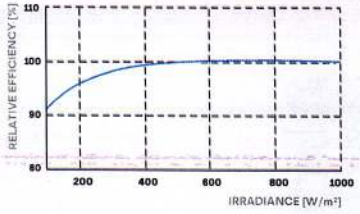
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.54% degradation per year. At least 93.1% of nominal power up to 10 years. At least 85% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	–0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	–0.36	Normal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3°C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1500 (IEC) / 1500 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating	C / TYPE 1
Max. Design Load, Push / Pull[3]	[lbs / ft²]	75 (3600 Pa) / 33 (1600 Pa)	Permitted Module Temperature on Continuous Duty	–40 °F up to +185 °F (–40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs / ft²]	113 (5400 Pa) / 50 (2400 Pa)		

[3]See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 1703, CE-compliant, IEC 61215:2016, IEC 61730:2016, Application Class II, U.S. Patent No. 9,893,215 (solar cells)

PACKAGING INFORMATION

Number of Modules per Pallet	29
Number of Pallets per 53' Trailer	27
Number of Pallets per 40' HC-Container	22
Pallet Dimensions (L × W × H)	81.9 × 45.3 × 46.9 in (2080 × 1150 × 1190 mm)
Pallet Weight	1603 lbs (727 kg)

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.

INVERTERS

Single Phase Inverter with HD-Wave Technology

for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

12-25 YEAR WARRANTY

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: embedded consumption metering and production revenue grade metering, ANSI C12.20 Class 0.5 (0.5% accuracy)

solaredge

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/ SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
Power Factor	1, adjustable -0.85 to 0.85							
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V[2]	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V[2]	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

[1] For other regional settings please contact SolarEdge support

[2] A higher current source may be used; the inverter will limit its input current to the values stated

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/ SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Metering, ANSI C12.20	Optional[3]							
Consumption metering								
Inverter Commissioning	with the SetApp mobile application using built-in Wi-Fi Access Point for local connection							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	1" Maximum / 14-6 AWG					1" Maximum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	1" Maximum / 1-2 strings / 14-6 AWG					1" Maximum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4	26.2 / 11.9		38.8 / 17.6		lb / kg
Noise	< 25				<50			dBA
Cooling	Natural Convection							
Operating Temperature Range	-40 to +140 / -40 to +60[4]							°F / °C
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

[3] Inverter with Revenue grade meter P/N: SExxxxH-US000BNC4; Inverter with Revenue grade and consumption meter P/N: SExxxxH-US000BNI4 . For consumption metering current transformers should be ordered separately: SEACT0750-200NA-20 or SEACT0750-400NA-20. 20 units per box

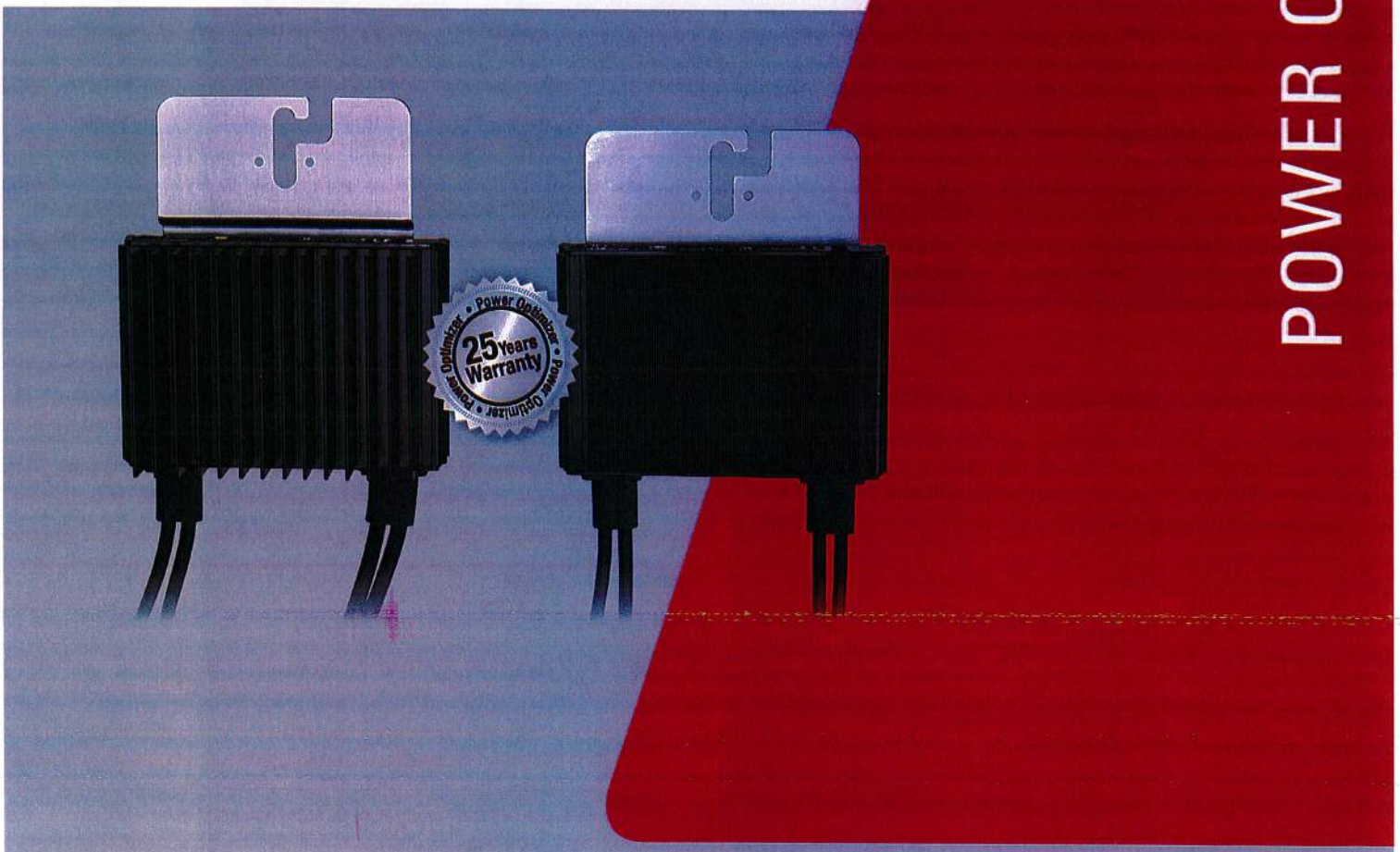
[4] Full power up to at least 50°C / 122°F; for power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf

solaredge

Power Optimizer

P320 / P370 / P400 / P405 / P505

POWER OPTIMIZER



PV power optimization at the module-level

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Compliant with arc fault protection and rapid shutdown NEC requirements (when installed as part of the SolarEdge system)
- Module-level voltage shutdown for installer and firefighter safety

solaredge Power Optimizer

P320 / P370 / P400 / P405 / P505

OPTIMIZER MODEL (typical module compatibility)	P320 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	P505 (for higher current modules)	
INPUT						
Rated Input DC Power[1]	320	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	60	80	125	83	Vdc
MPPT Operating Range	8 - 48	8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11		10.1		14	Adc
Maximum DC Input Current	13.75		12.63		17.5	Adc
Maximum Efficiency	99.5					%
Weighted Efficiency	98.8				98.6	%
Overvoltage Category	II					
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)						
Maximum Output Current	15					Adc
Maximum Output Voltage	60			85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)						
Safety Output Voltage per Power Optimizer	1 ± 0.1					Vdc
STANDARD COMPLIANCE						
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3					
Safety	IEC62109-1 (class II safety), UL1741					
RoHS	Yes					
INSTALLATION SPECIFICATIONS						
Maximum Allowed System Voltage	1000					Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters					
Dimensions (W x L x H)	128 x 152 x 28 / 5 x 5.97 x 1.1		128 x 152 x 36 / 5 x 5.97 x 1.42	128 x 152 x 50 / 5 x 5.97 x 1.96	128 x 152 x 59 / 5 x 5.97 x 2.32	mm / in
Weight (including cables)	630 / 1.4		750 / 1.7	845 / 1.9	1064 / 2.3	gr / lb
Input Connector	MC4[2]					
Output Wire Type / Connector	Double Insulated; MC4					
Output Wire Length	0.95 / 3.0	1.2 / 3.9				m / ft
Operating Temperature Range	-40 - +85 / -40 - +185					°C / °F
Protection Rating	IP68 / NEMA6P					
Relative Humidity	0 - 100					%

[1] Rated STC power of the module. Module of up to +5% power tolerance allowed.

[2] For other connector types please contact SolarEdge

PV SYSTEM DESIGN USING A SOLAREDGE INVERTER[3][4]		SINGLE PHASE HD-WAVE	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	P320, P370, P400	8		10	18	
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50[5]	
Maximum Power per String		5700 (6000 with SE7600-US - SE11400-US)	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations		Yes				

[3] For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf.

[4] It is not allowed to mix P405/P505 with P320/P370/P400/P600/P700/P800 in one string.

[5] A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

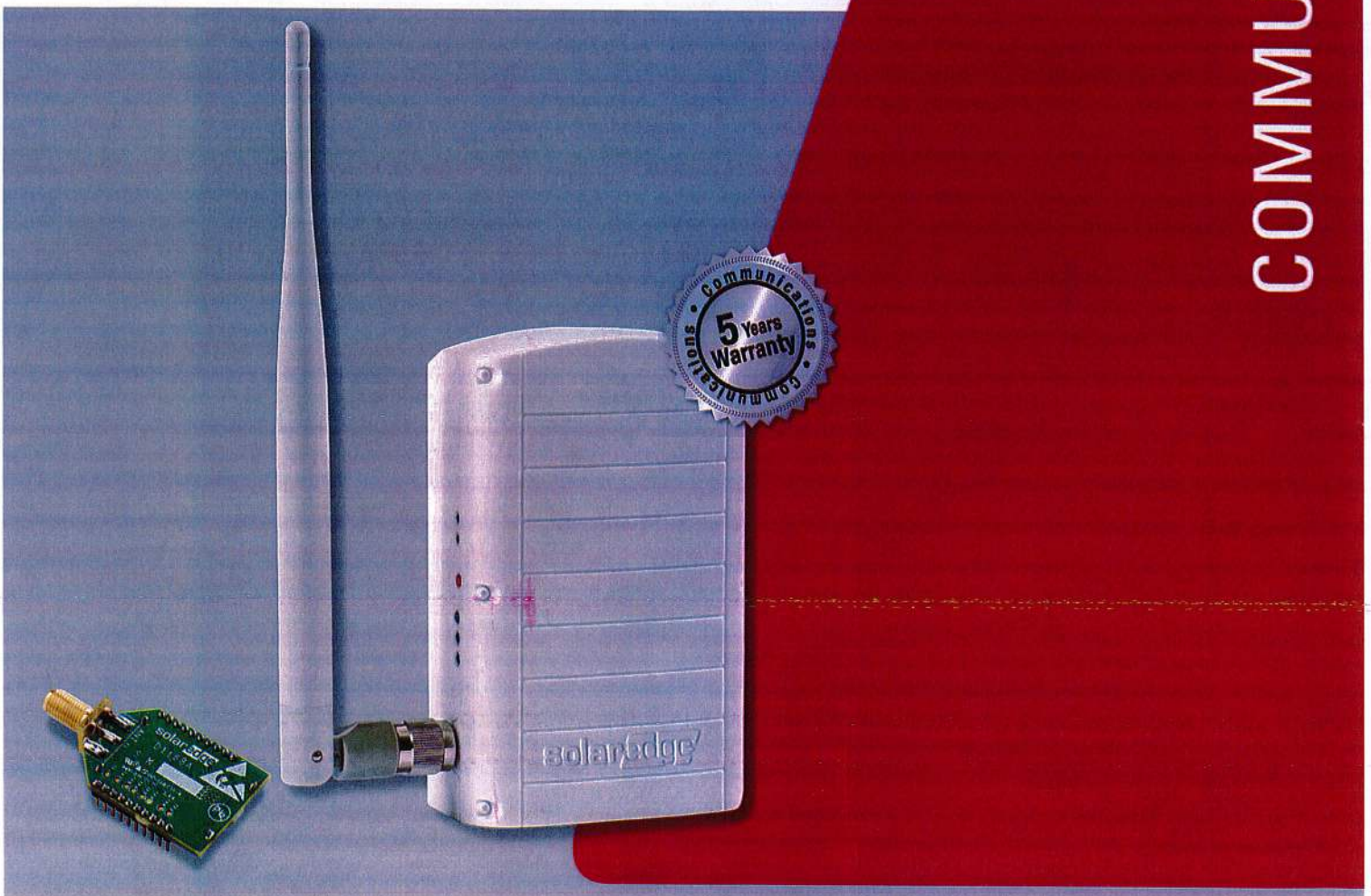
CE ETL

solaredge

ZigBee Plug-in
for North America

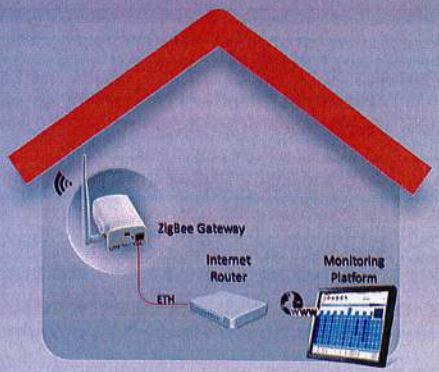
SE1000-ZBGW-K5-NA / SE1000-ZB05-SLV / SE1000-ZBRPT05-NA

COMMUNICATION



Simple Wireless Connectivity

- Connects SolarEdge inverters wirelessly to an Internet router
- ZigBee Plug-in installed within the inverter enclosure for outdoor resilience
- Antenna external to inverter for wider range
- Communication to Internet via Ethernet
- The ZigBee Gateway supports up to 15 SolarEdge devices (e.g. inverters) on the wireless network



solaredge

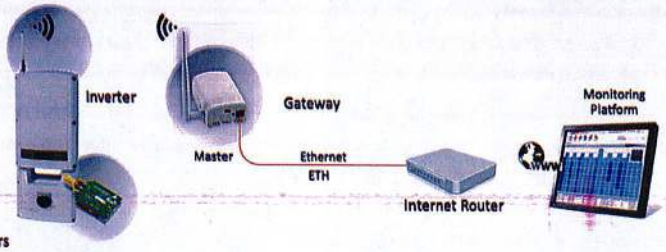
ZigBee Plug-in for North America

SE1000-ZBGW-K5-NA / SE1000-ZB05-SLV / SE1000-ZBRPT05-NA

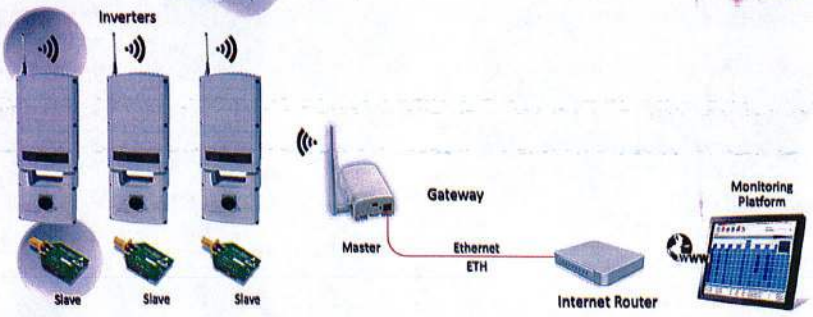
COMPATIBLE INVERTERS	SEXXXX-XXXXXNXXX (INVERTERS WITH A DISPLAY)	
FUNCTIONAL		**UNIT**
Number of devices that can be monitored	1-15	
RF PERFORMANCE		
Transmit power	22.8	dBm
Receiver Sensitivity	-102	dBm
EIRP with antenna	27.8	dBm
Maximum Emitted Power	≤ 30	dBm
Antenna gain	5	dBi
Operating Frequency Range	2.4-2.5	GHz
Outdoor (LOS) range	400 / 1300	m / ft
Indoor range[1]	50 / 160	m / ft
ZIGBEE GATEWAY / ZIGBEE REPEATER		
Antenna	Included	
Power supply	Included, 100-240VAC	
Operating temperature	-20 to +60 / -4 to +140	°C / °F
Relative humidity (non condensing)	0 - 80	%
Ingress protection	IP20 (Indoor)	
ZIGBEE PLUG-IN		
Antenna, mounting bracket and RF cable	Included	
Dimensions (H x W x D)	22.0 x 32.9 x 4.1 / 0.9 x 1.3 x 0.2	mm / in
Ingress protection	IP65 (IP20 / indoor rated when installed inside Commercial Gateway or Firefighter Gateway)	
CERTIFICATION		
Safety	IEC60950, UL60950	
EMC Approvals	FCC(USA), IC(Canada)	

[1] Approximate values, may differ depending on specific installation conditions

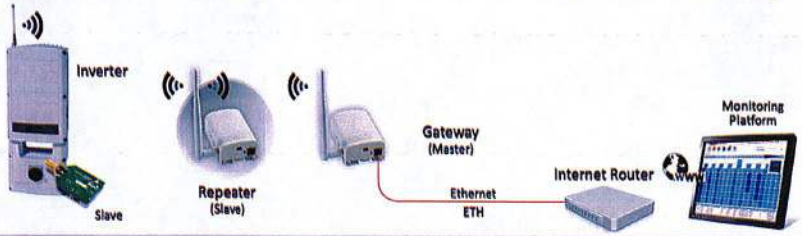
Scenario A: Basic Kit
Part Number: SE1000-ZBGW-K5-NA
- 1 x ZigBee Gateway
- 1 x ZigBee Plug-in
for single SolarEdge device



Scenario B: Adding additional slave units
Part Number: SE1000-ZB05-SLV
- 1x ZigBee Plug-in
for connecting multiple devices to the same home gateway



Scenario C: Extending range using a repeater
Part Number: SE1000-ZBRPT05-NA
- 1 x ZigBee Repeater
for extending the ZigBee range



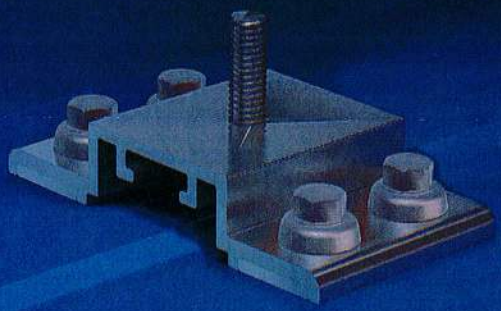
S-5!®

The Right Way!

NEW PRODUCT
SolarFoot™

Introducing the new SolarFoot™ for exposed fastener metal roofing with the strength, testing, quality, and time-proven integrity you expect from S-5!. The SolarFoot provides an ideal mounting platform to attach the L-Foot (not included) of a rail-mounted PV system to the roof. This solution is The Right Way to secure rail-mounted solar systems to exposed fastener metal such as AG-Panel or R-Panel.

The right way to attach almost anything to metal roofs!

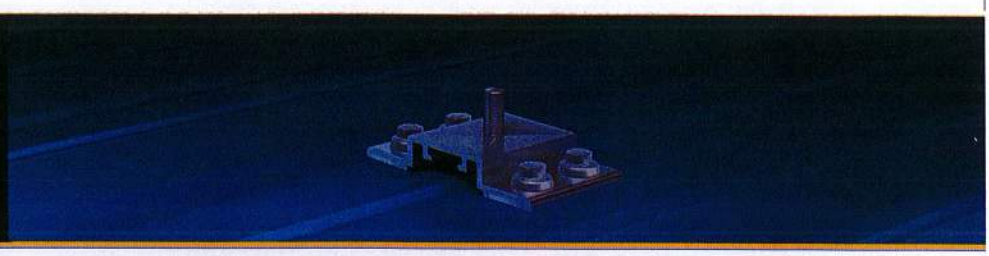


SolarFoot Features:

- Manufactured in the U.S.A. from certified raw material
- Fabricated in our own ISO 9001:2015 certified factory
- All aluminum and stainless components
- 25yr limited warranty
- Compatible with all commercial L-Foot products on the market
- Factory applied 40-year isobutylene/ isoprene crosslink polymer sealant for reliable weathertightness
- Sealant reservoir to prevent over-compression of sealant
- Load-to-failure tested Normal to Seam by a nationally accredited laboratory on numerous metal roof materials and substrates
- Four points of attachment into structure or deck with tested holding strength for engineered applications
- Integrated M8-1.25x17mm stud and M8-1.25 stainless steel hex flange nut included

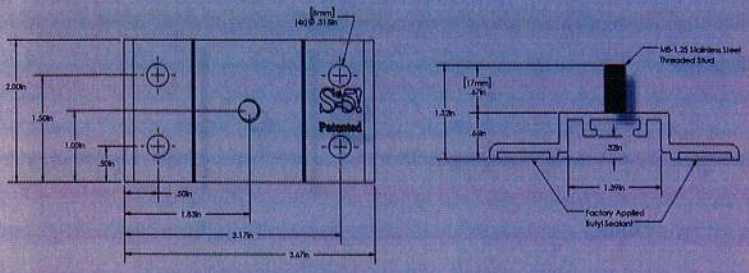
888-825-3432 | www.S-5.com |

S-5!®
The Right Way!



SolarFoot™ Mounting for Exposed Fastener Roofing

The SolarFoot is a simple, cost-effective pedestal for L-Foot (not included) attachment of rail-mounted solar PV. The unique design is compatible with all rail producer L-Foot components. The new SolarFoot assembly ensures a durable weathertight solution for the life of the roof. Special factory applied butyl co-polymeric sealant contained in a reservoir is The Right Way, allowing a water-tested seal. Stainless integrated stud and hex flange lock-nut secure the L-Foot into position. A low center of gravity reduces the moment arm commonly associated with L-Foot attachments. Direct attachment of the SolarFoot to the structural member or deck provides unparalleled holding strength.



**Fasteners sold separately. Fastener type varies with substrate. Contact S-5! on how to purchase fasteners and obtain our test results. L-Foot also sold separately.*

Fastener Selection

Metal to Metal:
1/4-14 Self Drilling Screw
1-1/2" to 2-1/2"

Metal to Wood:
1/4-14 Type 17 AB Milled Point
1-1/2" to 2-1/2"

To source fasteners for your projects, contact S-5!

When other brands claim to be "just as good as S-5!", tell them to PROVE IT.

SolarFoot Advantages:

- Exposed fastener mounting platform for solar arrays attached via L-Foot and Rails
- Weatherproof attachment to exposed fastener roofing
- Butyl sealant reservoir provides long-term waterproof seal
- M8-1.25x17mm stud with M8 hex flange nut for attachment of all popular L-Foot/rail combinations
- Tool: 13 mm Hex Socket or ½" Hex Socket
- Tool Required: Electric screw gun with hex drive socket for self-tapping screws.
- Low Center of Gravity reduces moment arm commonly associated with L-Foot/Rail solar mounting scenarios
- Attaches directly to structure or deck for optimal holding strength
- S-5! Recommended substrate-specific (e.g. steel purlin, wood 2x4, OSB, etc.) fasteners provide excellent waterproofing and pull-out strength
- Fastener through-hole locations comply with NDS (National Design Specification)for Wood Construction

S-5!® Warning! Please use this product responsibly!

The independent lab test data found at www.S-5.com can be used for load-critical designs and applications.

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, fastener torque, patents, and trademarks, visit the S-5! website at www.S-5.com. Copyright 2017, Metal Roof Innovations, Ltd. S-5! products are patent protected.

Distributed by: