

Design Criteria for Span Tables:

Values in the maximum allowable rail span tables provided herein are subject to the following general criteria and additional criteria shown on individual span tables sheets. Values in span tables are based on the same engineering methodology and calculation algorithms used for U-Builder and are provided here for reference.

Building Assumptions

- Building Risk Category: II
- Mean Roof Height: 30 ft
- Roof Pitch: 0°-45°
- Site Elevation: 0 ft

Wind Design Assumptions

- Wind loads used are based on ASCE 7-22 Sec. 29.4.4
- Exposure Category B, C, or D
- Basic Wind Speed = 90 – 180 mph
- Level terrain. Topographic factor, $k_{zt} = 1.0$
- $\gamma_E = 1.0$ for ‘Interior’ spans, $\gamma_E = 1.5$ for ‘Exposed’ spans (ASCE 7-22, Fig. 29.4-7)

Snow Design Assumptions

- Ground Snow Load = 0-100 psf
- Exposure Factor coefficients of Partially Exposed condition
- Thermal Factor = 1.0
- Results based on uniform snow load

Seismic Design Assumptions

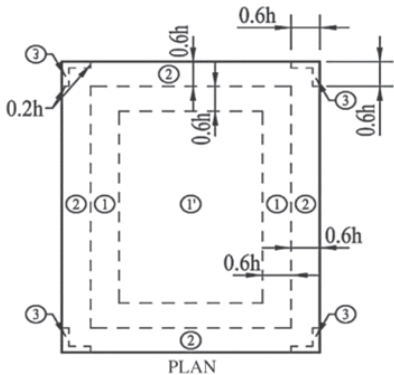
- 0.2-s Spectral Response Acceleration
- $S_s = 1.25$ and 3 with $S_{ds} = 1, 2.4$ respectively per criteria shown on individual span tables sheets.
- $S_1 = 0.5$ & $S_{d1} = 0.6$
- Seismic site class D

Array Assumptions

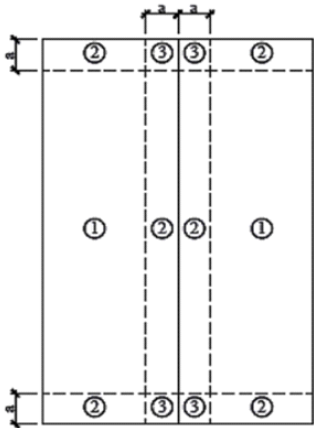
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1” x 67” (~19 sq.ft, 47.65 lbs) and 41” x 80” (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at least twice the module height above roof surface.
- Modules are parallel to roof surface and maximum height above roof surface is 5” to 10” depending on attachment type.
- Gaps between module rows and columns is 0.25” in to 1” depending on clamp type.
- The most restrictive of all roof zone spans shall be used when any part of the module is attributed to that span.
- ‘Exposed’ spans as defined in ASCE 7-22 sec. 29.4.4 shall be used when any part of an exposed module or panel as is attributed to that span.

Span Tables

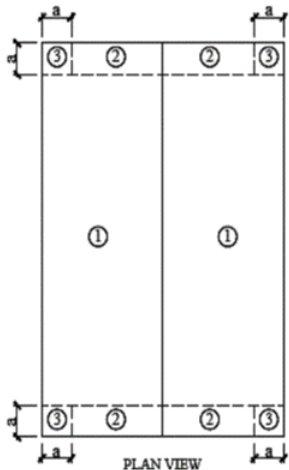
Zone should be considered as per ASCE 7-22, Fig. 30.3-2A to 30.3-2D



Gable Roofs $\theta \leq 7^\circ$

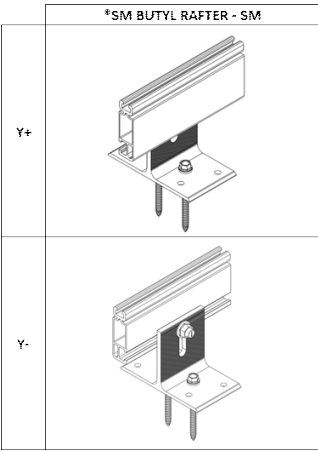


Gable Roofs $7^\circ < \theta \leq 27^\circ$



Gable Roofs $27^\circ < \theta \leq 45^\circ$

Rails can be installed in these possible orientations.



[illegible]

Highlighted cell with strikethrough indicate 3-rail system span and module clamp allowable capacity exceeds with 3-rails. 4-Rail system required. Contact Unirac Engineering Services for support.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

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ASCE 7-22
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

19 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

SM
Rail Type

PRO SERIES
Clamp

SM BUYL Rafter
Attachment

SPAN TABLES

Maximum Allowable Rail Spans for Rooftop Solar Panels Parallel to the Roof Surface (inches)

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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[illegible]

10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.

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Maximum Allowable Rail Spans for Rooftop Solar Panels Parallel to the Roof Surface (inches)

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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			Exposed	120	120	118	120	120	112	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

Highlighted cell with strikethrough indicate 3-rail system span and module clamp allowable capacity exceeds with 3-rails. 4-Rail system required. Contact Unirac Engineering Services for support.

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

[illegible]

10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

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[illegible]

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Highlighted cell with strikethrough indicate 3-rail system span and module clamp allowable capacity exceeds with 3-rails. 4-Rail system required. Contact Unirac Engineering Services for support.

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[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

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[illegible]

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[illegible]

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[illegible]

10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

Maximum Allowable Rail Spans for Rooftop Solar Panels Parallel to the Roof Surface (inches)

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																																													
				90						95						100						105						110						115						120						130						140						150						160						170						180					
				Roof Wind Zone																																																																													
				1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3																																				
0	B	0-7	Interior	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120																																		
			Exposed	120	120	115	120	120	108	120	119	90	120	114	75	120	105	64	120	90	55	116	78	48	101	61	37	78	48	31	63	39	27	51	33	24	42	29	31	26	26	28	28	28	28	28																																			
		7-20	Interior	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	108*	112*	112*	90	112*	111*	64	112*	84	48	112*	63	37	93	49	32	71	40	28	56	34	25	28	28	28	28	28																																			
			Exposed	112*	112*	112*	112*	112*	104	112*	112*	82	112*	112*	66	112*	100	55	112*	82	47	112*	69	40	95	50	32	69	38	28	52	32	24	41	28	31	24	25	28	30	22	25	25																																						
		20-27	Interior	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*																																			
			Exposed	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*																																			
	27-45	Interior	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																			
		Exposed	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																			
	C	0-7	Interior	120	120	118	120	120	112	120	120	99	120	116	83	120	111	70	120	99	60	118	86	52	109	66	40	85	52	33	68	42	29	56	35	25	46	31	22	39	28	29	29	29	29	29																																			
			Exposed	120	110	69	120	95	58	116	80	49	111	68	42	97	59	36	84	51	33	73	45	30	56	36	25	45	30	22	36	26	28	32	23	25	28	31	22	25	27	27	27	27																																					
		7-20	Interior	112*	112*	112*	112*	112*	111*	112*	112*	92	112*	112*	74	112*	110*	61	112*	92	51	112*	76	44	108*	56	34	77	42	29	58	34	25	45	30	22	36	26	29	32	23	23	26																																						
			Exposed	112*	109*	61	112*	87	49	112*	70	41	110*	58	35	91	49	32	75	41	29	63	35	26	46	30	22	35	26	29	30	22	25	27	29	22	23	26	26	26	26	26	26	26																																					
		20-27	Interior	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*																																			
			Exposed	105*	105*	92	105*	105*	72	105*	85	58	105*	69	48	105*	57	40	105*	48	35	98	41	32	73	32	27	56	28	23	44	24	30	36	21	26	32	28	23	28	25	24	24																																						
	27-45	Interior	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																			
		Exposed	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																			
	D	0-7	Interior	120	120	106	120	118	86	120	112	72	120	100	61	118	86	52	114	74	45	108	65	39	82	50	32	64	40	27	52	34	24	42	29	31	26	28	31	23	23	25	25																																						
			Exposed	118	85	52	112	71	43	100	60	37	85	52	33	73	45	30	63	40	27	55	35	25	43	30	32	35	25	27	30	22	24	26	29	24	23	26	16	31	23	16																																							
		7-20	Interior	112*	112*	100	112*	112*	78	112*	111*	63	112*	94	52	112*	76	44	112*	64	37	104	54	33	72	40	28	54	33	24	41	28	32	34	25	28	30	22	24	26	29	22	22																																						
			Exposed	112*	76	44	112*	61	36	95	50	32	76	42	29	62	35	26	52	32	24	45	30	22	34	25	28	29	21	24	25	28	24	22	25	18	30	22	16	26	19	14																																							
		20-27	Interior	105*	105*	105*	105*	105*	105*	105*	105*	97	105*	105*	77	105*	93	63	105*	76	53	105*	64	45	105*	46	34	84	35	29	66	31	25	53	27	22	43	24	30	36	32	26																																							
			Exposed	105*	92	62	105*	72	50	105*	59	41	105*	48	35	97	41	32	82	35	29	71	32	26	54	27	22	42	23	29	34	30	25	30	27	22	26	23	19	23	24	17																																							
	27-45	Interior	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																				
		Exposed	98*	98*	84	98*	98*	98*	98*	98*	81	56	98*	68	47	78	58	40	65	49	35	54	43	32	40	34	27	32	29	23	28	25	30	25	22	26	22	29	23	29	26	24																																							
10	B	0-7	Interior	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111																																				
			Exposed	111	111	111	111	111	108	111	111	90	111	111	75	111	105	64	111	90	55	111	78	48	101	61	37	78	48	31	63	39	27	51	33	24	42	29	31	26	26	28	28	28	28																																				
		7-20	Interior	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	112*	108*	112*	112*	90	112*	111*	64	112*	84	48	112*	63	37	93	49	32	71	40	28	56	34	25	28	28	28	28	28																																			
			Exposed	112*	112*	112*	112*	112*	104	112*	112*	82	112*	112*	66	112*	100	55	112*	82	47	112*	69	40	95	50	32	69	38	28	52	32	24	41	28	31	24	25	28	30	22	25	25																																						
		20-27	Interior	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*																																			
			Exposed	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*	105*																																				
	27-45	Interior	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																				
		Exposed	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*	98*																																			
	C	0-7	Interior	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111																																				
			Exposed	111	110	69	111	95	58	111	80	49	111	68	42	97	59	36	84	51	33	73	45	30	56	36	25	45	30	22	36	26	28	32	23	25	28	31	22	25	27	27	27	27																																					
		7-20	Interior	112*	112*	112*	112*	112*	111*	112*	112*	92	112*	112*	74	112*	110*	61	112*	92	51	112*	76	44	108*	56	34	77	42	29	58	34	25	45	30	22	36	26	29	32	23	23	26																																						
			Exposed	112*	109*	61	112*	87	49	112*	70	41	110*	58																																																																			

[illegible]

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Highlighted cell with strikethrough indicate 3-rail system span and module clamp allowable capacity exceeds with 3-rails. 4-Rail system required. Contact Unirac Engineering Services for support.

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Maximum Allowable Rail Spans for Rooftop Solar Panels Parallel to the Roof Surface (inches)

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
				90			95			100			105			110			115			120			130			140			150			160			170			180																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

[illegible]

* Cells with an asterisk indicates that the L-foot must be oriented in the Y- direction as indicated in the image.

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