

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 7-16 Sec 29.4.4 with Provisions from SEAOC PV2-2017
- 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 7-16, 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

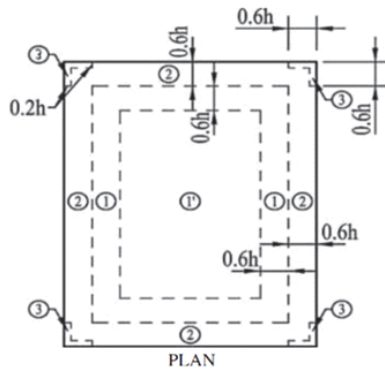
Seismic Design Assumptions

- 0.2-s Spectral Response Acceleration, $S_S \leq 3$
- $S_S = 1.25$ and 3 per criteria shown on individual span tables sheets.
- $S_1 = 0.5$
- Seismic site class D

Array Assumptions

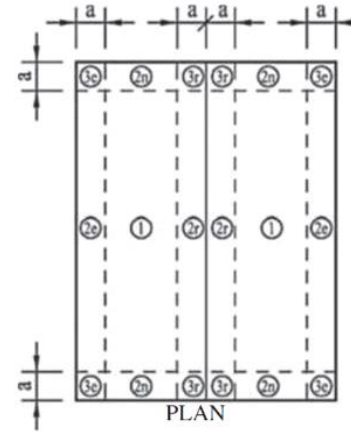
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1" x 67" (~19 sq.ft, 47.65 lbs) and 41" x 80" (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at 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 7-16 sec. 29.4.4 shall be used when any part of an exposed module or panel as is attributed to that span.

Zone should be considered as per ASCE 7-16, Fig. 30.3-2A to 30.3-2D



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

Rails can be installed in these possible orientations.



Gable Roofs $7^\circ < \theta \leq 45^\circ$

Grouping of ASCE 7-16 Roof Zones (Gable and Flat)

- **Roof Tilt 0° - 7°**
 - Roof Zone 1 = 1
 - Roof Zone 2 = 2
 - Roof Zone 3 = 3
- **Roof Tilt 7° - 27°**
 - Roof Zone 1 = 1, 2e
 - Roof Zone 2 = 2n, 2r, 3e
 - Roof Zone 3 = 3r
- **Roof Tilt 27° - 45°**
 - Roof Zone 1 = 1, 2e, 2r
 - Roof Zone 2 = 2n, 3r
 - Roof Zone 3 = 3e

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

10 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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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												
0	B	0-7	Interior	39	39	37	39	39	32	39	39	29	39	39	26	39	34	23	39	31	21	39	28	19	33	23	16	28	20	14	24	17	12	21	15	10	18	13	9	16	11	8									
			Exposed	39	34	23	39	30	21	38	27	18	34	24	17	30	22	15	27	30	21	14	25	18	12	21	15	10	18	13	9	15	11	12	13	10	10	12	8	9	10	11	8								
		Exposed	39	25	20	35	22	18	31	20	16	28	18	15	25	16	13	23	15	12	21	13	11	17	11	9	15	10	12	13	8	10	11	11	9	10	10	8	9	8	7										
		Exposed	40	30	23	40	27	19	40	24	17	39	22	15	34	20	13	31	18	12	28	16	11	24	14	9	20	12	8	17	10	7	15	9	9	13	12	8	12	10	7										
		Exposed	40	39	29	40	34	25	34	30	22	30	27	19	27	25	17	25	22	15	23	20	14	19	17	11	16	15	9	14	13	8	12	11	7	11	10	9	10	9	8										
		Exposed	32	23	16	29	21	14	26	18	13	23	16	12	21	15	10	19	14	9	17	12	9	14	10	11	12	9	9	11	12	8	9	10	7	8	9	6	11	8	5										
	Exposed	27	17	14	24	15	13	21	14	11	19	12	10	17	11	9	16	10	8	14	9	12	12	10	10	10	8	9	9	7	12	8	6	10	7	5	9	6	5												

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ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 3.00
Seismic

23 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

SML
Rail Type

PRO SERIES
Clamp

SM BUTYL Plywood
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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0	B	0-7	Interior	47	47	40	47	47	36	47	47	32	47	41	29	47	37	26	47	34	23	43	31	21	36	26	18	30	22	15	27	20	14	23	17	12	19	14	10	17	12	8	15	11	7	13	9	6	11	8	9																														
			Exposed	47	37	26	47	33	23	41	29	20	37	26	18	33	24	17	30	22	15	27	20	14	23	17	12	19	14	10	17	12	8	15	11	7	13	9	6	11	8	9	6	11	8	9	6	11	8	9																															
		7-20	Interior	47	43	35	47	38	31	47	34	28	47	30	25	43	28	23	39	25	20	36	23	19	30	19	16	25	16	13	22	14	12	19	12	10	17	11	9	15	9	6	11	8	9	6	11	8	9																																
			Exposed	43	27	22	38	24	20	34	22	18	30	20	16	28	18	15	25	16	13	23	15	12	19	12	10	16	11	9	14	9	7	12	8	6	11	7	9	9	9	8	9	8	9	8	9																																		
		20-27	Interior	48	48	45	48	48	37	48	41	32	48	37	28	48	33	24	48	30	22	48	28	19	41	23	16	35	20	13	30	17	12	26	15	10	23	13	9	20	12	8	16	13	7	8	16	13	7	8																															
			Exposed	48	33	24	48	30	21	48	26	18	42	24	16	38	22	15	34	20	13	31	18	12	26	15	10	22	13	9	19	11	7	17	10	6	15	8	6	13	7	8	16	13	7	8																																			
	27-45	Interior	48	48	48	48	48	47	48	48	40	48	48	35	48	42	31	43	38	28	39	35	25	33	29	20	28	25	17	24	21	14	21	19	12	18	16	10	16	15	9	16	13	7	8	16	13	7	8																																
		Exposed	48	42	31	42	37	27	37	33	24	33	30	21	30	27	18	27	25	16	25	22	15	21	19	12	18	16	10	16	14	8	14	12	7	12	11	6	11	9	6	11	9	6	11	9	6																																		
	C	0-7	Interior	47	40	28	47	35	25	45	32	22	40	28	20	36	26	18	32	23	16	29	21	15	25	18	12	21	15	11	18	13	9	16	11	8	14	10	7	12	9	6	11	8	9	6	11	8	9																																
			Exposed	36	25	18	31	23	16	28	20	14	25	18	13	23	16	12	21	15	10	19	14	10	16	11	8	14	10	7	12	8	9	10	7	8	9	6	7	8	9	6	7	8	9	6	7	8																																	
		7-20	Interior	47	30	24	41	26	21	37	23	19	33	21	17	30	19	16	27	17	14	25	16	13	21	13	11	18	11	9	15	10	8	13	8	7	12	7	9	10	7	8	9	6	7	8	9																																		
			Exposed	30	19	16	26	17	14	23	15	12	21	14	11	19	12	10	17	11	9	16	10	8	13	9	7	11	7	9	10	10	8	8	8	7	7	6	7	7	6	7	6	7	6	7	6																																		
		20-27	Interior	48	36	27	48	32	23	48	28	20	46	26	17	41	23	16	37	21	14	33	19	13	28	16	11	24	14	9	21	12	8	18	10	7	16	9	6	14	8	5	10	6	14	8	5																																		
			Exposed	40	23	16	36	20	14	32	18	12	29	17	11	26	15	10	24	14	9	21	12	8	18	10	7	15	9	6	13	8	8	12	7	7	10	9	6	9	8	8	5	10	6	9	8	5																																	
	27-45	Interior	48	47	34	47	40	29	40	36	26	36	32	23	33	29	20	30	26	18	27	24	16	23	20	13	19	17	11	17	15	9	15	13	8	13	11	7	11	10	6	9	8	5	10	6	9	8	5																																
		Exposed	32	29	20	29	26	17	26	23	15	23	21	14	21	19	12	19	17	11	17	16	10	15	13	8	13	11	7	11	10	6	9	8	5	8	7	7	6	7	7	6	7	6	7	6																																			
	D	0-7	Interior	47	33	23	41	29	20	37	26	18	33	24	16	30	21	15	27	19	14	24	18	12	21	15	10	17	13	9	15	11	8	13	9	7	11	8	9	10	7	8	9	6	7	8	9																																		
			Exposed	29	21	15	26	19	13	23	17	12	21	15	11	19	14	10	17	12	9	16	11	8	13	10	7	11	8	9	10	7	8	8	9	7	7	8	6	7	7	6	7	6	7	6																																			
		7-20	Interior	38	25	20	34	22	18	30	20	16	27	18	14	25	16	13	22	14	12	20	13	11	17	11	9	15	9	8	13	8	7	11	7	9	10	10	8	9	8	5	10	6	9	8	5																																		
			Exposed	25	16	13	22	14	12	20	13	10	18	11	9	16	10	8	14	9	8	13	9	7	11	7	9	9	8	8	8	7	7	6	10	6	6	8	5	8	5	4	5	4	5	4	5																																		
		20-27	Interior	48	30	21	48	27	18	42	24	16	37	21	14	34	19	13	31	18	12	28	16	11	23	13	9	20	11	8	17	10	7	15	9	6	13	8	8	12	7	7	10	9	6	9	8	5																																	
			Exposed	34	19	13	30	17	12	27	15	10	24	14	9	22	12	8	20	11	8	18	10	7	15	9	6	13	7	8	11	6	7	10	9	6	8	7	5	7	7	4	5	7	4	5																																			
	27-45	Interior	42	37	27	37	33	24	33	30	21	30	27	18	27	24	16	25	22	15	23	20	13	19	17	11	16	14	9	14	12	8	12	11	7	11	10	6	9	8	5	10	6	9	8	5																																			
		Exposed	27	24	16	24	21	14	22	19	12	19	17	11	18	16	10	16	14	9	15	13	8	12	11	7	11	9	6	9	8	7	7	6	10	6	6	8	5	8	5	4	5	4	5																																				
10	B	0-7	Interior	33	33	33	33	33	33	33	32	33	33	29	33	33	26	33	23	33	33	33	31	21	33	26	18	30	22	15	26	19	13	23	16	11	20	14	10	18	13	9	6	11	8	9	6	11	8	9																															
			Exposed	33	33	33	33	33	33	33	29	20	33	26	18	33	24	17	30	22	15	27	20	14	23	17	12	19	14	10	17	12	8	15	11	7	13	9	6	11	8	9	6	11	8	9																																			
		7-20	Interior	33	33	33	33	33	31	33	33	28	33	30	25	33	28	23	33	25	20	33	23	19	30	19	16	25	16	13	22	14	12	19	12	10	17	11	9	15	9	6	11	8	9	6	11	8	9																																
			Exposed	33	27	22	33	24	20	33	22	18	30	20	16	28	18	15	25	16	13	23	15	12	19	12	10	16	11	9	14	9	7	12	8	6	11	7	9	9	9	8	9	8	9	8	9																																		
		20-27	Interior	44	44	44	44	44	37	44	41	32	44	37	28	44	33	24	44	30	22	44	28	19	41	23	16	35	20	13	30	17	12	26	15	10	23	13	9	20	12	8	16	13	7	8	16	13	7	8																															
			Exposed	44	33	24	44	30	21	44	26	18	42	24	16	38	22	15	34	20	13	31	18	12	26	15	10	22	13	9	19	11	7	17	10	6	15	8	6	13	7	8	16	13	7	8																																			
	27-45	Interior	47	47	47	47	47	47	47	47	40	47	47	35	47	42	31	43	38	28	39	35	25	33	29	20	28	25	17	24	21	14	21	19	12	18	16	10	16	15	9	16	13	7	8	16	13	7	8																																
		Exposed	47	42	31	42	37	27	37	33	24	33	30	21	30	27	18	27	25	16	25	22	15	21	19	12	18	16	10	16	14	8	14	12	7	12	11	6	11	9	6	11	9	6	11	9	6																																		
	C	0-7	Interior	33	33	28	33	33	25	33	32	22	33	28	20	33	26	18	32	23	16	29	21	15	25	18	12	21	15	11	18	13	9	16	11	8	14	10	7	12	9	6	11	8	9	6	11	8	9																																
			Exposed	33	25	18	31	23	16	28	20	14	25	18	13	23	16	12	21	15	10	19	14	10	16	11	8	14	10	7	12	8	9	10	7	8	9	6	7	8	9	6	7	8	9	6	7	8																																	
		7-20	Interior	33	30	24	33	26	21	33	23	19	33	21	17	30	19	16	27	17	14	25	16	13	21	13	11	18	11	9	15	10	8	13	8	7	12	7	9	10	7	8	9	6	7	8	9																																		
			Exposed	30	19	16	26	17	14	23	15	12	21	14	11	19	12	10	17	11	9	16	10	8	13	9	7	11	7	9	10	10	8	8	8	7	7	6	7	7	6	7	6	7	6	7	6																																		
		20-27	Interior	44	36	27	44	32	23	44	28	20	44	26	17	41	23	16	37	21	14	33	19	13	28	16	11	24	14	9	21	12	8	18	10	7	16	9	6	14	8	5	10	6	14	8	5																																		
			Exposed	40	23	16	36	20	14	32	18	12																																																																					

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								
30	B	0-7	Interior	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	19	13	22	16	11	20	14	10	18	13	9													
			Exposed	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	15	22	20	14	10	17	12	9	6	11	8	9												
		7-20	Interior	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	19	16	23	16	13	22	14	12	19	12	10	17	11	9	15	9	8						
			Exposed	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	19	16	23	16	13	22	14	12	19	12	10	17	11	9	15	9	8						
		20-27	Interior	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	23	16	28	20	13	28	17	12	26	15	10	23	13	9	20	12	8					
			Exposed	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	23	16	28	20	13	28	17	12	26	15	10	23	13	9	20	12	8				
	C	0-7	Interior	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	18	12	21	15	11	18	13	9	16	11	8	14	10	7	12	9	9						
			Exposed	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	18	12	21	15	11	18	13	9	16	11	8	14	10	7	12	9	9						
		7-20	Interior	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	19	16	23	16	13	21	13	11	18	11	9	15	10	8	13	8	7	12	9	10	7	8
			Exposed	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	19	16	23	16	13	21	13	11	18	11	9	15	10	8	13	8	7	12	9	10	7	8
		20-27	Interior	28	28	27	28	28	23	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	23	16	28	20	13	28	18	10	7	16	9	6	14</							

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[illegible]

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[illegible]

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

Ground Snow Load (psf)				Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																															
							Roof Wind Zone																															
							90			95			100			105			110			115			120			130			140			150			160	
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			
90	B	0-7	Interior	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
			Exposed	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
		7-20	Interior	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
			Exposed	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
		20-27	Interior	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
			Exposed	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
	27-45	Interior	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
		Exposed	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27		
	C	0-7	Interior	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
			Exposed	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14		
		7-20	Interior	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
			Exposed	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16		
20-27		Interior	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21		
		Exposed	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21		
27-45	Interior	27	27	27	27	27</																																

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

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

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]

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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									
0	B	0-7	Interior	76	76	70	76	76	59	76	76	52	76	67	73	47	76	61	43	76	56	39	76	51	35	59	42	30	50	36	25	43	31	22	37	27	19	33	24	17	29	21	15								
			Exposed	76	61	42	76	54	38	72	48	34	61	43	30	55	39	27	50	36	25	45	32	23	38	27	19	32	23	16	28	20	14	24	18	12	21	15	17	19	14	15									
		Exposed	75	45	37	63	40	33	56	36	30	50	32	27	45	29	24	41	27	22	38	24	20	32	21	17	27	18	14	23	15	12	20	13	17	18	12	15	16	16	13										
		Exposed	77	55	40	77	49	35	77	44	30	71	39	27	62	36	24	56	32	22	51	30	20	43	25	17	37	21	14	32	18	12	28	16	11	24	14	10	21	12	13										
		Exposed	79	79	51	79	61	44	61	55	39	55	49	34	50	45	31	45	41	27	41	37	25	35	31	20	30	27	17	26	23	14	23	20	12	20	18	11	18	16	10										
		Exposed	59	42	29	52	37	26	46	33	23	42	30	21	38	27	19	34	25	17	31	23	16	26	19	13	22	16	17	19	14	15	17	12	13	15	16	12	10												
	Exposed	49	31	26	43	28	23	39	25	21	35	23	19	32	20	17	29	19	15	26	17	14	22	14	12	19	12	15	16	16	13	14	14	12	12	14	10	17	11	9											

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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.

[illegible]

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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									
0	B	0-7	Interior	78	78	76	78	78	60	78	78	54	78	48	78	63	44	78	57	39	78	52	36	60	43	30	51	37	26	44	32	22	38	28	19	34	24	17	30	22	15										
			Exposed	78	62	43	78	55	39	77	49	34	62	44	31	56	40	28	51	36	26	46	33	23	39	28	20	33	24	17	28	21	15	25	18	13	22	16	11	19	14	15									
		7-20	Interior	78	78	59	78	64	53	78	57	47	78	51	42	78	46	38	66	42	35	60	38	32	50	32	27	43	28	23	37	24	20	32	21	17	28	18	15	25	16	13									
			Exposed	78	46	38	64	41	34	57	37	30	51	33	27	46	30	25	42	27	22	38	25	21	32	21	17	28	18	15	24	16	13	21	14	11	18	12	15	16	16	13									
		20-27	Interior	79	79	79	79	79	65	79	79	54	79	63	47	79	56	41	79	51	36	79	47	32	71	39	27	58	33	23	50	29	20	44	25	17	38	22	15	34	20	13									
			Exposed	79	56	41	79	50	35	79	45	31	74	40	27	63	36	25	58	33	22	52	30	20	44	25	17	37	22	15	32	19	13	28	16	11	25	14	10	22	13	13									
	27-45	Interior	80	80	80	80	80	80	80	80	80	80	80	59	80	53	80	64	47	69	58	42	55	49	34	47	42	28	41	36	24	35	32	20	31	28	18	28	25	15											
		Exposed	80	80	52	80	63	45	63	56	40	56	50	35	51	46	31	46	41	28	42	38	25	36	32	21	31	27	17	26	24	14	23	21	13	20	18	11	18	16	10										
	C	0-7	Interior	78	71	47	78	60	41	78	53	37	70	48	33	60	43	30	55	39	27	50	36	25	42	30	21	35	26	18	31	22	16	27	19	14	23	17	12	21	15	16									
			Exposed	60	43	30	53	38	27	47	34	24	43	31	22	39	28	20	35	25	18	32	23	16	27	20	14	23	17	12	20	14	15	17	13	13	15	11	12	13	15	11									
		7-20	Interior	78	50	41	72	44	36	62	40	33	55	36	29	50	32	27	45	29	24	41	27	22	35	23	19	30	19	16	26	17	14	22	15	12	20	13	16	17	11	14									
			Exposed	50	32	26	44	29	24	40	26	21	36	23	19	32	21	17	29	19	16	27	17	14	23	15	12	19	13	16	17	11	14	15	14	12	13	13	13	10	11	9									
20-27		Interior	79	61	45	79	54	39	79	48	34	79	43	30	71	39	26	62	36																																

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Ground Snow Load (psf)				Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																		
							Roof Wind Zone																																		
							90			95			100			105			110			115			120			130			140			150			160			170	
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						
90	B	0-7	Interior	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14			
			Exposed	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	15		
		7-20	Interior	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	13	
			Exposed	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	13		
		20-27	Interior	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	20	21	21	17	21	21	15	21	20	13	
			Exposed	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	15	21	19	13	21	16	11	21	13	13	
	C	27-45	Interior	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	26	24	25	25	20	24	24	18	24	24	15	
			Exposed	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	26	24	24	23	21	13	20	18	11	18	16	10
		0-7	Interior	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	16	
			Exposed	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
		7-20	Interior	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	14
			Exposed	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	14	
D	20-27	Interior	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	20	14	21	18	12	20	15	11	20	14	9	
		Exposed	21	21																																					

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

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						
0	B	0-7	Interior	39	39	34	39	39	30	39	39	27	39	34	24	39	31	21	39	28	19	36	26	18	30	21	15	25	18	13	22	16	11	19	14	9	17	12	8	15	11	7
			Exposed	39	31	21	39	39	27	19	34	24	17	31	22	15	28	20	14	25	18	13	23	16	11	19	14	10	16	12	8	14	7	12	9	11	8	9	7	12	8	6
		7-20	Interior	39	36	29	39	32	26	39	28	23	39	25	21	36	23	19	33	21	17	30	19	16	25	16	13	21	14	11	18	12	10	16	10	8	14	9	7	12	8	6
			Exposed	36	23	19	32	20	17	28	18	15	25	16	13	23	15	12	21	13	11	19	12	10	16	10	8	14	9	7	12	8	6	10	7	8	9	7	12	8	6	
		20-27	Interior	40	40	37	40	40	31	40	35	27	40	31	23	40	28	20	40	25	18	40	23	16	34	19	13	29	16	11	25	14	10	22	12	8	19	11	7	17	10	6
			Exposed	40	28	20	40	40	25	17	40	22	15	35	20	13	31	18	12	28	16	11	26	15	10	22	12	8	18	11	7	16	9	6	14	8	5	12	7	11	9	6
	C	27-45	Interior	40	40	40	40	40	40	40	40	34	40	40	29	40	35	26	36	32	23	32	29	21	27	24	17	23	21	14	20	18	12	17	16	10	15	14	9	14	12	7
			Exposed	40	35	26	35	31	22	31	28	20	28	25	17	25	23	15	23	20	14	21	19	12	18	16	10	10	15	13	8	13	12	7	11	10	6	10	9	5	9	8
		0-7	Interior	39	33	23	39	29	20	38	26	18	33	24	16	30	21	15	27	19	13	25	18	12	21	15	10	17	13	9	15	11	8	13	9	7	11	8	9	10	7	8
			Exposed	30	21	15	26	19	13	23	17	12	21	15	11	19	14	10	17	12	9	16	11	8	13	10	7	11	8	9	10	7	7	8	9	7	7	8	6	7	5	
		7-20	Interior	39	25	20	34	22	18	31	20	16	27	18	14	25	16	13	22	14	12	20	13	11	17	11	9	15	9	8	13	8	7	11	7	9	10	6	8	8	7	
			Exposed	25	16	13	22	14	12	20	13	10	18	11	9	16	10	8	14	9	8	13	8	7	11	7	9	9	8	8	13	8	7	7	11	7	9	10	6	8	8	7
D	20-27	Interior	40	30	22	40	27	19	40	24	17	38	21	14	34	19	13	31	18	12	28	16	11	23	13	9	20	11	8	17	10	7	15	9	6	13	8	5	12			

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

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.



ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 3.00
Seismic

23 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

SML
Rail Type

UAF
Clamp

SM BUTYL Plywood
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)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
				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																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
90	B	0-7	Interior	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		Exposed	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
		7-20	Interior	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	

#N/A

* Cells with an asterisks indicates that the L-foot must be oriented in the Y- direction as indicated in the image.
10 Highlighted cell indicate 3-rail system span. Contact Unirac Engineering Services for support.
10 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.

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			
0	B	0-7	Interior	76	76	70	76	76	59	76	76	52	76	73	47	76	61	43	76	56	39	76	51	35	59	42	30	50	36	25	43	31	22	37	27	19	33	24	17	29	21	15
			Exposed	76	61	42	76	54	38	72	48	34	61	43	30	55	39	27	50	36	25	45	32	23	38	42	27	19	32	23	16	28	20	14	24	18	12	21	15	17	19	14
		Exposed	75	45	37	63	40	33	56	36	30	50	32	27	45	29	24	41	27	22	38	24	20	32	21	17	27	18	14	23	15	12	20	13	17	18	12	15	16	16	13	
		Exposed	77	55	40	77	49	35	77	44	30	71	39	27	62	36	24	56	32	22	51	30	20	43	25	17	37	21	14	32	18	12	28	16	11	24	14	10	21	12	13	
		Exposed	79	79	51	79	61	44	61	55	39	55	49	34	50	45	31	45	41	27	41	37	25	35	31	20	30	27	17	26	23	14	23	20	12	20	18	11	18	16	10	
		Exposed	59	42	29	52	37	26	46	33	23	42	30	21	38	27	19	34	25	17	31	23	16	26	19	13	22	16	17	19	14	15	17	12	13	15	16	12	13	15	14	
	Exposed	49	31	26	43	28	23	39	25	21	35	23	19	32	20	17	29	19	15	26	17	14	22	14	12	19	12	15	16	16	13	14	14	12	12	14	16	17	14	9		

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

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

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.