

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

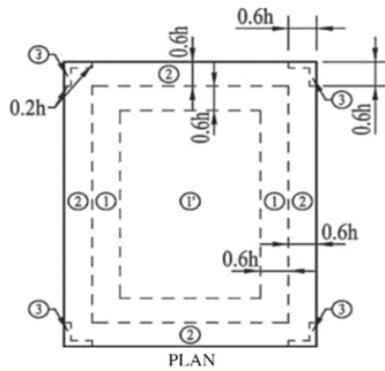
- 0.2-s Spectral Response Acceleration, $S_S \leq 3$
- $S_S = 1.25$ and 3 per criteria shown on individual span tables sheets.
- $S_1 = 0.5$
- Seismic site class D

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.

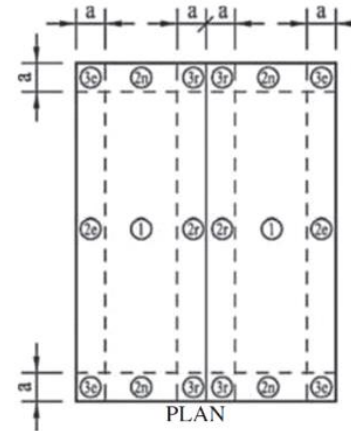
Span Tables

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

#N/A

* 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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[illegible]

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

40 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.



ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

19 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

SML
Rail Type

PRO SERIES
Clamp

SM BUTYL OSB
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									
				Roof Wind Zone																																															
0	B	0-7	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	90	98	98	86	98	94	75	98	90	62	98	86	56	95	83	51	92	67	47	85	56	39	66	48	34	57	41	29	49	36	25	44	32	34	39	28	30	32	27	30	28	30				
		7-20	Interior	99	99	99	99	99	99	99	99	99	99	99	92	99	96	87	95	91	83	99	67	63	92	65	53	86	55	45	78	48	39	64	42	34	56	37	30	50	32	27	30	27	27						
			Exposed	99	96	87	99	90	77	99	86	60	93	69	54	89	60	49	86	54	45	83	50	41	65	42	35	55	36	30	48	31	26	42	27	34	37	36	30	32	32	27	27	27	27						
		20-27	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99					
			Exposed	99	99	98	99	99	99	92	99	93	87	99	89	82	99	85	58	98	68	51	93	60	45	87	51	37	80	43	30	64	38	26	56	33	22	49	29	30	44	26	27	27							
	C	0-7	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99				
			Exposed	99	99	99	99	99	97	99	99	99	99	99	99	99	99	93	84	97	89	65	93	86	57	85	64	47	61	54	39	53	47	33	46	41	28	40	36	24	36	32	21	21							
		7-20	Interior	98	98	93	98	98	89	98	97	84	98	93	69	98	89	60	98	85	55	95	79	50	88	60	42	78	51	36	61	44	31	53	39	27	47	34	36	41	30	32	27	27	27						
			Exposed	98	89	60	98	85	53	93	72	48	89	61	43	85	56	39	76	51	36	64	46	33	54	39	28	46	33	36	40	29	31	35	38	27	30	34	24	27	30	24	24	29							
		20-27	Interior	99	99	90	99	94	85	99	89	65	98	84	58	92	64	53	88	58	48	53	44	71	45	37	59	39	32	51	33	28	45	29	36	39	26	32	35	34	29	29	29	29							
			Exposed	92	64	53	88	57	47	84	51	42	74	46	38	64	42	35	58	38	31	53	35	29	45	29	37	39	38	32	33	27	29	29	24	26	25	21	34	24	19	19	19	19							
	D	0-7	Interior	99	99	99	99	99	96	99	97	91	99	92	86	99	88	66	99	84	56	97	65	50	90	55	40	84	47	33	71	40	28	60	35	24	53	31	21	47	28	28	28	28	28						
			Exposed	99	87	65	99	83	54	95	62	47	91	56	41	87	51	36	84	46	32	76	42	29	61	36	24	52	30	21	45	26	27	39	35	24	35	31	21	31	27	19	19	19	19						
		7-20	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99						
			Exposed	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99					
		20-27	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99					
			Exposed	99	96	86	99	91	76	94	87	59	89	81	52	85	63	47	64	58	42	59	53	37	50	45	31	43	38	26	37	33	22	32	29	28	26	24	38	34	21	21	21	21							
10	B	0-7	Interior	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88				
			Exposed	88	88	88	88	88	86	88	75	88	88	88	86	56	88	83	51	88	67	47	85	56	39	66	48	34	57	41	29	49	36	25	44	32	34	39	28	30	32	27	30	28	30						
		7-20	Interior	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88				
			Exposed	88	88	87	88	88	77	88	86	60	88	69	54	88	60	49	86	54	45	83	50	41	65	42	35	55	36	30	48	31	26	42	27	34	37	36	30	32	32	27	30	27	27	27					
		20-27	Interior	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96						
			Exposed	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96					
	C	0-7	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	97	98	98	92	98	97	88	98	93	84	96	89	64	92	85	56	88	73	50	64	57	41	55	49	34	47	42	29	41	37	25	36	33	21	32	29	28						
		7-20	Interior	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88				
			Exposed	88	88	88	88	88	85	88	72	48	88	61	43	85	56	39	76	51	36	64	46	33	54	39	28	46	33	36	40	29	31	35	38	27	30	34	24	27	30	24	24	29							
		20-27	Interior	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88				
			Exposed	88	64	53	88	57	47	84	51	42	74	46	38	64	42	35	58	38	31	53	35	29	45	29	37	39	38	32	33	27	29	29	24	26	25														

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ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

23 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

SML
Rail Type

PRO SERIES
Clamp

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Attachment

SPAN TABLES

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Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																													
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				110												115												120												130									
				Roof Wind Zone																																													
90	B	0-7	Interior	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
			Exposed	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
		7-20	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	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22			
			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	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22		
		20-27	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	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	27	27	27	27	27	27	27	27	27			
		27-45	Interior	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*			
			Exposed	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*		
	C	0-7	Interior	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
			Exposed	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
		7-20	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	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22		
			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	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22		
		20-27	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	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	27	27	27	27	27	27	27	27	27	27		
		27-45	Interior	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*		
			Exposed	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*	62*		
	D	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	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	14	14	14	14	14	14	14	14	14		
		7-20	Interior	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25		
			Exposed	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25		
		20-27	Interior	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34		
			Exposed	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34		
		27-45	Interior	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*		
			Exposed	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	66*	
100	B	0-7	Interior	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11			
			Exposed	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
		7-20	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	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22		
			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	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	
		20-27	Interior	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26		



ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

23 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

SML
Rail Type

PRO SERIES
Clamp

SM BUTYL OSB
Attachment

SPAN TABLES

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

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				110												115												120												130											
				Roof Wind Zone																																															
0	B	0-7	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	98	98	98	
			Exposed	98	98	90	98	98	85	98	93	71	98	89	60	98	86	55	95	79	50	91	65	46	84	55	38	64	47	33	55	40	28	48	35	38	43	31	33	38	41	29	40	32	40	32	40	32	40	32	40
		7-20	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	98	98	98	
			Exposed	98	95	86	98	89	68	98	85	59	92	65	53	88	58	48	85	53	44	80	49	40	63	41	34	54	35	29	47	30	38	41	27	33	36	35	29	32	31	26	26	26	26	26	26	26	26	26	
		20-27	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	98	98	98	
			Exposed	99	98	97	98	98	91	98	92	86	98	88	68	98	84	56	97	64	50	93	59	44	87	50	36	77	42	29	63	37	25	55	32	22	48	28	29	43	38	26	26	26	26	26	26	26	26	26	
	C	27-45	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
			Exposed	99	99	99	99	99	96	99	99	91	99	96	87	99	92	83	96	88	63	92	85	56	84	62	46	59	53	38	51	46	32	45	40	27	40	35	24	35	31	31	31	31	31	31	31	31	31	31	
		0-7	Interior	98	98	93	98	98	88	98	96	84	98	92	65	98	88	59	88	85	54	94	75	49	87	59	41	74	50	35	60	43	31	52	38	40	46	33	36	40	29	32	29	24	29	24	29	24	29	24	
			Exposed	98	88	59	97	84	52	92	68	47	88	60	42	84	54	38	72	49	35	62	45	32	53	38	41	45	33	35	39	28	30	34	37	26	30	33	28	40	29	24	29	24	29	24	29	24	29	24	
		7-20	Interior	98	98	89	98	93	85	98	88	63	96	84	57	91	63	52	88	57	47	85	52	43	69	44	36	58	38	31	50	33	27	44	29	36	38	38	31	34	34	28	28	28	28	28	28	28	28		
			Exposed	91	63	52	87	56	46	83	50	41	72	45	37	63	41	34	57	37	31	52	34	28	44	29	36	38	37	31	33	32	27	43	28	28	38	25	24	34	22	18	22	18	22	18	22	18	22		
	D	20-27	Interior	98	98	98	98	98	95	98	96	90	98	91	85	98	87	62	98	83	55	96	63	49	89	53	39	84	46	32	69	39	27	59	34	24	52	30	31	46	27	28	27	28	27	28	27	28	27	28	
			Exposed	98	87	62	98	75	53	94	61	46	90	55	40	86	49	36	83	45	32	74	41	28	60	35	24	51	30	31	44	39	27	38	34	23	34	30	24	30	27	18	27	18	27	18	27	18	27		
		27-45	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
			Exposed	99	95	86	98	90	71	93	86	58	88	75	51	84	62	46	63	56	41	58	52	37	49	44	30	42	37	25	36	32	32	28	27	28	38	24	37	33	24	37	33	24	37	33	24	37	33	24	
10	B	0-7	Interior	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	
			Exposed	87	87	87	87	87	85	87	87	71	87	87	60	87	86	55	87	79	50	87	65	46	84	55	38	64	47	33	55	40	28	48	35	38	43	31	33	38	41	29	40	32	40	32	40	32	40	32	40
		7-20	Interior	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
			Exposed	87	87	86	87	87	68	87	85	59	87	65	53	87	58	48	85	53	44	80	49	40	63	41	34	54	35	29	47	30	38	41	27	33	36	35	29	32	31	26	26	26	26	26	26	26	26	26	26
		20-27	Interior	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	
			Exposed	95	95	95	95	95	91	95	92	86	95	88	68	95	84	56	95	64	50	93	59	44	87	50	36	77	42	29	63	37	25	55	32	22	48	28	29	43	38	26	26	26	26	26	26	26	26	26	
	C	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	98	98	98	
			Exposed	98	98	98	98	98	96	98	98	91	98	96	87	99	92	81	95	88	62	91	84	55	87	68	49	62	56	40	53	48	34	46	41	28	40	36	24	36	32	32	28	27	28	27	28	27	28	27	28
		0-7	Interior	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	
			Exposed	87	87	87	87	87	85	87	87	71	87	87	60	87	86	55	87	79	50	87	65	46	84	55	38	64	47	33	55	40	28	48	35	38	43	31	33	38	41	29	40	32	40	32	40	32	40	32	40
		7-20	Interior	87	87	87	87	87	85	87	87	63	87	63	52	87	57	47	85	52	43	69	44	36	57	37	31	48	32	39	42	27	34	37	36	30	32	32	26	43	28	23	28	23	28	23	28	23	28		
	D		Exposed	85	52	43	75	47	39	64	42																																								

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.

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

[illegible]

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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

UAF
Clamp

SM BUTYL OSB
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)																																							
				Roof Wind Zone																																							
				90			95			100			105			110			115			120			130			140			150			160			170			180			
				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	98	98	98	98	98	98	98	98	96	98	98	91	98	98	87	98	96	83	98	92	64	98	86	54	92	67	46	86	57	40	74	50	35	60	44	31	53	39	27	
			Exposed	98	98	87	98	95	78	98	91	62	98	87	56	96	83	50	92	65	46	88	59	42	76	50	35	59	43	30	51	37	26	44	32	23	39	29	31	35	25	27	
		7-20	Interior	98	98	98	98	98	98	98	98	93	98	97	88	98	92	84	98	87	62	97	84	57	89	58	48	83	50	41	66	43	35	57	37	31	50	33	27	45	29	24	
			Exposed	98	92	83	98	86	61	94	69	54	90	59	49	86	54	44	83	49	40	71	45	37	58	38	31	50	32	27	43	28	23	37	24	31	33	22	27	29	29	24	
		20-27	Interior	98	98	98	98	98	98	98	98	98	98	98	98	98	98	94	98	96	89	98	91	85	98	84	56	94	60	45	89	52	38	84	45	32	70	40	27	61	35	24	
			Exposed	98	98	94	98	94	88	98	89	83	98	85	57	98	65	51	94	59	45	90	54	40	84	46	32	68	39	27	58	34	23	51	30	20	44	26	18	39	23	24	
	27-45	Interior	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	92	83	93	86	57	87	65	48	63	57	41	56	50	35	49	44	31	
		Exposed	99	99	98	99	99	93	99	98	88	99	93	84	98	89	64	93	85	57	88	75	51	64	57	41	55	49	34	47	42	29	41	37	25	36	33	21	32	29	19		
	C	0-7	Interior	98	98	90	98	98	85	98	94	69	98	89	60	98	86	54	95	78	49	91	64	45	84	54	38	64	46	33	55	40	28	48	35	25	42	31	22	37	27	29	
			Exposed	98	85	54	94	73	48	89	61	43	85	55	39	75	50	35	63	45	32	57	42	29	48	35	25	41	30	32	36	26	28	31	23	24	27	30	21	24	27	19	
		7-20	Interior	98	95	86	98	90	65	98	85	58	92	64	53	89	58	48	85	53	43	80	48	40	62	41	34	53	35	29	46	30	25	40	26	22	35	23	29	31	31	26	
			Exposed	88	58	47	84	51	42	75	46	38	64	42	34	58	38	31	53	34	28	48	31	26	41	27	22	35	23	28	30	30	25	26	26	22	23	23	19	31	20	17	
20-27		Interior	98	98	98	98	98	92	98	93	86	98	88	64	98	84	55	97	64	49	93	58	44	87	49	35	77	42	29	62	36	25	54	32	22	48	28	19	42	25	17		
		Exposed	98	84	55	96	62	47	91	56	41	87	50	36	84	46	32	75	41	28	65	38	26	55	32	22	47	27	19	41	24	25	35	31	22	31	28	19	28	25	17		
27-45	Interior	99	99	99	99	99	96	99	99	91	99	97	87	99	92	83	96	88	62	92	85	55	84	61	45	59	53	38	51	45	32	44	40	27	39	35	23	35	31	20			
	Exposed	99	92	83	95	87	60	90	83	52	85	63	46	64	57	41	58	52	37	53	47	33	45	40	27	38	34	23	33	30	19	29	26	25	26	23	22	23	31	19			
D	0-7	Interior	98	96	81	98	91	62	98	86	55	96	81	50	91	64	45	88	59	41	84	53	38	62	45	32	53	39	27	46	33	24	40	29	31	35	26	27	31	23	24		
		Exposed	91	64	45	87	57	40	80	51	36	64	46	33	58	42	30	52	38	27	48	35	25	40	29	31	35	25	27	30	22	23	26	29	20	23	25	16	31	23	16		
	7-20	Interior	98	87	61	94	70	54	89	59	49	86	53	44	81	48	40	69	44	36	62	40	33	52	34	28	45	29	24	39	25	21	34	22	28	30	29	24	26	26	22		
		Exposed	80	48	40	67	43	35	59	39	32	53	35	29	48	32	26	44	29	24	40	26	22	34	22	28	29	24	25	25	21	33	22	18	29	19	16	26	17	14			
	20-27	Interior	98	95	88	98	89	83	98	85	57	98	65	50	93	58	44	89	53	39	86	49	35	74	41	28	60	35	24	52	30	21	45	27	18	40	23	24	35	31	22		
		Exposed	93	58	44	89	52	38	85	47	33	77	42	29	66	38	26	60	35	24	54	32	22	46	27	18	39	23	24	34	30	21	30	26	18	26	23	16	23	14	14		
27-45	Interior	99	99	93	99	98	88	99	93	84	97	89	63	92	85	56	88	70	50	84	61	45	57	51	37	49	44	30	43	38	26	37	33	22	33	29	19	29	26	25			
	Exposed	92	85	55	87	65	48	65	58	42	59	53	38	53	48	33	49	44	30	44	40	27	38	34	22	32	29	19	28	25	24	24	22	20	22	29	18	29	26	16			
10	B	0-7	Interior	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	86	54	87	67	46	86	57	40	74	50	35	60	44	31	53	39	27		
			Exposed	87	87	87	87	87	78	87	87	62	87	87	56	87	83	50	87	65	46	87	59	42	76	50	35	59	43	30	51	37	26	44	32	23	39	29	31	35	25	27	
		7-20	Interior	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
			Exposed	87	87	83	87	86	61	87	69	54	87	59	49	86	54	44	83	49	40	71	45	37	58	38	31	50	32	27	43	28	23	37	24	31	33	22	27	29	29	24	
		20-27	Interior	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
			Exposed	95	95	94	95	94	88	95	89	83	95	85	57	95	65	51	94	59	45	90	54	40	84	46	32	68	39	27	58	34	23	51	30	20	44	26	18	39	23	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	92	83	93	86	57	87	65	48	63	57	41	56	50	35	49	44	31	
		Exposed	98	98	98	98	98	93	98	98	88	98	93	84	98	89	64	93	85	57	88	75	51	64	57	41	55	49	34	47	42	29	41	37	25	36	33	21	32	29	19		
	C	0-7	Interior	87	87	87	87	87	85	87	87	69	87	60	87	86	54	87	78	49	87	64	45	84	54	38	64	46	33	55	40	28	48	35	25	42	31	22	37	27	29		
			Exposed	87	85	54	87	73	48	87	61	43	85	55	39	75	50	35	63	45	32	57	42	29	48	35	25	41	30	32	36	26	28	31	23	24	27	30	21	24	27	19	
		7-20	Interior	87	87	86	87	87	65	87	85	58	87	64	53	87	58	48	85	53	43	80	48	40	62	41	34	53	35	29	46	30	25	40	26	22	35	23	29	31	31	26	
			Exposed	87	58	47	84	51	42	75	46	38	64	42	34	58	38	31	53	34	28	48	31	26	41	27	22	35	23	28	30	30	25	26	26	22	23	23	19	31	20	17	
20-27		Interior	95	95	95	95	95	92	95	93	86	95	88	64	95	84	55	95	64	49	93	58	44	87	49	35	77	42	29	62	36	25	54	32	22	48	28	19	42	25	17		
		Exposed	95	84	55	95	62	47	91	56	41	87	50	36	84	46	32	75	41	28	65	38	26	55	32	22	47	27	19	41	24	25	35	31	22	31	28	19	28	25	17		
27-45	Interior	98	98	98	98	98	96	98	98	91	98	97	87	98	92	83	96	88	62	92	85	55	84	61	45	59	53	38	51	45	32	44	40	27	39	35	23	35	31	20			
	Exposed	98	92	83	95	87	60	90	83	52	85	63	46	64	57	41	58	52	37	53	47	33	45	4																			

* 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.

[illegible]

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