

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

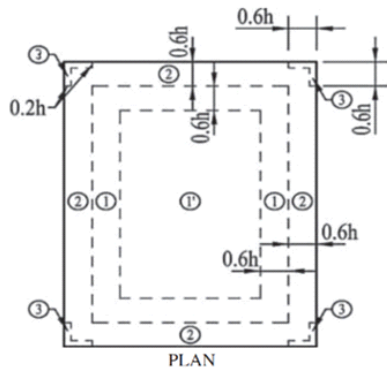
- 0.2-s Spectral Response Acceleration, $SS \leq 3$
- $S_S = 1.25$ and 3 per criteria shown on individual span tables sheets.
- $S_1 = 0.5$
- Seismic site class D

Array Assumptions

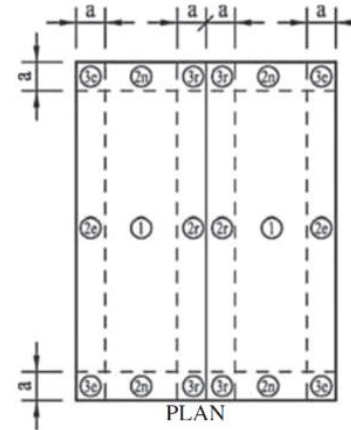
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1" x 67" (~19 sq.ft, 47.65 lbs) and 41" x 80" (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at 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 $\theta \leq 7^\circ$



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

Rails can be installed in these possible orientations.

*Flashloc DUO for Plywood	
Y+	
Y-	Alternate orientation not allowed



ASCE 7-16
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

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



ASCE 7-16
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
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Flashloc DUO Plywood
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				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			
60	B	0-7	Interior	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	9				
			Exposed	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	9				
		7-20	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	8			
			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	8				
		20-27	Interior	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	8			
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	27-45	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	6			
		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	6				
	C	0-7	Interior	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	10				
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		7-20	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	9			
			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	9			
		20-27	Interior	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	6		
			Exposed	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	6			
	27-45	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	6			
		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	6			
	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	8			
			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	8			
		7-20	Interior	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	7			
			Exposed	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	7			
		20-27	Interior	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	7		
			Exposed	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	7			
	27-45	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	23	23	23	23	23	23	23	23	23	5		
		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	23	23	23	23	23	23	23	23	5			
70	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	9				
			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	9				
		7-20	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	8		
			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	8			
		20-27	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	8		
			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	8			
	27-45	Interior	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	9			
		Exposed	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	9				
	C	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	10			
			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	10			
		7-20	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	9		
			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	9			
		20-27	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	9		
			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	9			
	27-45	Interior	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	10			
		Exposed	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	10				
	D	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	10		
			Exposed	12	12	12	12	1																																		



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

SM
Rail Type

PRO SERIES
Clamp

Flashloc DUO 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		
0	B	0-7	Interior	77	77	77	77	63	77	77	56	77	77	51	77	67	46	77	60	41	77	54	38	64	45	32	54	39	27	46	33	23	40	29	20	35	25	18	31	23	16			
			Exposed	77	66	45	77	58	40	77	52	36	65	47	33	59	42	29	53	38	27	48	35	24	41	29	21	35	25	18	30	22	15	26	19	13	23	17	12	20	15	16		
		7-20	Interior	77	77	62	77	77	55	77	60	49	77	54	44	77	49	40	72	44	36	63	40	33	53	34	28	45	29	24	39	25	21	34	22	18	29	19	16	26	17	14		
			Exposed	77	49	40	69	43	35	60	39	32	54	35	29	49	31	26	44	29	24	40	26	21	34	22	18	29	19	15	25	16	13	22	14	12	19	12	16	17	14	14		
		20-27	Interior	78	78	78	78	78	78	78	78	78	78	58	78	68	50	78	59	44	78	54	39	78	49	34	77	41	28	61	35	24	53	30	21	46	26	18	40	23	16	35	21	14
			Exposed	78	59	44	78	52	38	78	47	33	78	42	29	68	38	26	60	35	23	55	32	21	46	27	18	39	23	15	34	20	13	29	17	12	26	15	10	23	13	9		
	27-45	Interior	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	
		Exposed	80	80	55	80	67	48	71	59	42	59	53	37	53	48	33	49	43	29	44	40	26	37	33	22	32	29	18	28	25	15	24	22	13	21	19	12	19	17	10			
	C	0-7	Interior	77	77	49	77	63	43	77	56	39	77	50	35	63	45	32	57	41	29	52	37	26	44	31	22	37	27	19	32	23	16	28	20	14	24	18	12	22	16	17		
			Exposed	63	45	31	56	40	28	50	36	25	45	32	23	40	29	20	37	27	19	33	24	17	28	20	14	24	17	12	21	15	16	18	13	14	16	12	12	14	16	11		
		7-20	Interior	77	77	62	77	77	46	38	65	42	34	58	37	31	53	34	28	48	31	25	43	28	23	37	24	19	31	20	17	27	17	14	23	15	13	21	13	17	18	12	15	
			Exposed	52	34	28	46	30	25	42	27	22	37	24	20	34	22	18	31	20	16	28	18	15	24	15	13	20	13	16	17	11	14	15	15	12	13	13	11	12	12	14		
20-27		Interior	78	64	48	78	56	41	78	50	36	78	45	31	76	41	28	65	37	25	59	34	23	50	29	19	42	24	17	36	21	14	32	18	13	28	16	11	25	14	10			
		Exposed	76	41	28	64	36	25	57	33	22	51	29	20	46	27	18	42	24	16	38	22	15	32	19	13	27	16	11	24	14	9	21	12	12	18	16	11	16	14	10			
27-45	Interior	80	80	61	80	80	52	80	63	46	64	57	40	58	51	36	52	47	32	48	43	29	40	36	24	34	31	20	30	27	17	26	23	14	23	20	12	20	18	11				
	Exposed	57	51	36	51	45	31	46	41	27	41	37	24	37	33	22	34	30	19	31	28	17	26	23	14	22	20	12	19	17	11	17	15	9	15	13	12	13	12	11				
D	0-7	Interior	77	59	41	77	52	36	65	46	32	58	42	29	53	38	26	48	34	24	43	31	22	36	26	18	31	22	16	27	19	14	23	17	12	20	15	16	18	13	14			
		Exposed	52	38	26	46	33	23	41	30	21	37	27	19	34	24	17	31	22	16	28	20	14	24	17	12	20	15	16	17	13	14	15	17	12	13	15	10	12	13	9			
	7-20	Interior	70	44	36	60	39	32	54	35	28	48	31	26	44	28	23	40	26	21	36	23	19	30	20	16	26	17	14	22	15	12	20	13	16	17	11	14	15	15	12			
		Exposed	44	28	23	39	25	21	35	22	18	31	20	17	28	18	15	26	17	14	23	15	13	20	13	16	17	17	14	15	14	12	13	13	10	17	11	14	15	10				
	20-27	Interior	78	53	38	78	47	33	78	42	28	67	38	26	60	34	23	54	31	21	49	28	19	41	24	16	35	20	14	30	18	12	26	15	10	23	14	9	21	12	12			
		Exposed	59	34	23	53	30	21	47	27	18	42	24	17	38	22	15	35	20	14	32	18	13	27	16	11	23	13	9	20	11	12	17	15	10	15	13	9	13	12	8			
27-45	Interior	80	69	49	73	59	42	59	53	37	53	47	33	48	43	29	44	39	26	40	36	23	34	30	19	29	26	16	25	22	14	22	19	12	19	17	10	17	15	9				
	Exposed	48	43	29	43	38	25	38	34	22	34	31	20	31	28	18	28	25	16	26	23	14	22	20	12	19	17	11	17	15	9	15	13	12	12	13	12	17	15	9				
10	B	0-7	Interior	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55			
			Exposed	55	55	45	55	55	40	55	52	36	55	47	33	55	42	29	53	38	27	48	35	24	41	29	21	35	25	18	30	22	15	26	19	13	23	17	12	20	15	16		
		7-20	Interior	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	
			Exposed	55	49	40	55	43	35	55	39	32	54	35	29	49	31	26	44	29	24	40	26	21	34	22	18	29	19	15	25	16	13	22	14	12	19	12	16	17	17	14		
		20-27	Interior	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72		
			Exposed	72	59	44	72	52	38	72	47	33	72	42	29	68	38	26	60	35	23	55	32	21	46	27	18	39	23	15	34	20	13	29	17	12	26	15	10	23	13	9		
	27-45	Interior	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77			
		Exposed	77	77	55	77	67	48	71	59	42	59	53	37	53	48	33	49	43	29	44	40	26	37	33	22	32	29	18	28	25	15	24	22	13	21	19	12	19	17	10			
	C	0-7	Interior	55	55	49	55	55	43	55	55	39	55	50	35	55	45	32	55	41	29	52	37	26	44	31	22	37	27	19	32	23	16	28	20	14	24	18	12	22	16	17		
			Exposed	55	45	31	55	40	28	50	36	25	45	32	23	40	29	20	37	27	19	33	24	17	28	20	14	24	17	12	21	15	16	18	13	14	16	12	12	14	16	11		
		7-20	Interior	55	52	43	55	46	38	55	42	34	55	37	31	53	34	28	48	31	25	43	28	23	37	24	19	31	20	17	27	17	14	23	15	13	21	13	17	18	12	15		
			Exposed	52	34	28	46	30	25	42	27	22	37	24	20	34	22	18	31	20	16	28	18	15	24	15	13	20	13	16	17	11	14	15	15	12	13	13	11	12	12	14		
20-27		Interior	72	64	48	72	56	41	72	50	36	72	45	31	72	41	28	65	37	25	59	34	23	50	29	19	42	24	17	36	21	14	32	18	13	28	16	11	25	14	10			
		Exposed	72	41	28	64	36	25	57	33	22	51	29	20	46	27	18	42	24	16	38	22	15	32	19	13	27	16	11	24	14	9	21	12	12	18	16	11	16	14	10			
27-45	Interior	77	77	61	77	77	5																																					



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

SM
Rail Type

PRO SERIES
Clamp

Flashloc DUO 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	
0	B	0-7	Interior	39	39	35	39	39	31	39	39	28	39	36	25	39	33	23	39	29	20	39	27	19	31	22	16	27	19	13	23	16	11	20	14	10	17	12	9	15	11	8	
			Exposed	39	32	22	39	29	20	36	26	18	32	23	16	29	21	14	26	19	13	24	17	12	20	14	10	17	12	9	15	11	7	13	9	10	11	8	9	10	7	8	
		7-20	Interior	39	39	31	39	33	27	39	30	24	39	27	22	38	24	20	34	22	18	31	20	16	26	17	14	22	14	12	19	12	10	17	11	9	14	9	14	9	8	13	8
			Exposed	38	24	20	33	21	17	30	19	16	27	17	14	24	15	13	22	14	12	20	13	10	17	11	9	14	9	7	12	8	6	11	7	9	9	8	8	8	8	7	
		20-27	Interior	40	40	40	40	40	33	40	37	29	40	33	25	40	29	22	40	27	19	40	24	17	36	20	14	30	17	12	26	15	10	23	13	9	20	11	8	17	10	7	
			Exposed	40	29	21	40	26	18	40	23	16	37	21	14	33	19	13	30	17	11	27	16	10	23	13	9	19	11	7	17	10	6	14	8	6	13	7	8	11	6	7	
	27-45	Interior	40	40	40	40	40	40	40	36	40	40	31	40	37	27	39	33	24	34	30	22	29	25	18	24	22	15	21	19	12	18	16	10	16	14	9	14	13	8	8		
		Exposed	40	37	27	37	32	24	33	29	21	29	26	18	26	24	16	24	21	14	22	20	13	18	16	11	16	14	9	14	12	7	12	11	6	10	9	6	9	8	5		
	C	0-7	Interior	39	35	24	39	31	21	39	28	19	35	25	17	31	22	16	28	20	14	26	18	13	22	15	11	18	13	9	16	11	8	14	10	7	12	9	11	8	8		
			Exposed	31	22	15	28	20	14	25	18	12	22	16	11	20	14	10	18	13	9	16	12	8	14	10	7	12	8	9	10	7	8	9	10	7	8	9	6	7	8	5	
		7-20	Interior	39	26	21	36	23	19	32	20	17	29	18	15	26	17	14	24	15	12	21	14	11	18	12	9	15	10	8	13	8	7	11	7	9	10	6	8	9	9	7	
			Exposed	26	17	14	23	15	12	20	13	11	18	12	10	17	11	9	15	10	8	14	9	7	12	7	9	10	8	8	8	7	7	7	6	10	6	5	9	6	5		
		20-27	Interior	40	31	24	40	28	20	40	25	18	40	22	15	36	20	14	32	18	12	29	17	11	25	14	9	21	12	8	18	10	7	16	9	6	14	8	5	12	7	7	
			Exposed	35	20	14	31	18	12	28	16	11	25	14	10	23	13	9	21	12	8	19	11	7	16	9	6	13	8	5	12	7	7	10	9	6	9	8	5	8	7	6	
	27-45	Interior	40	40	30	40	35	26	35	31	23	31	28	20	28	25	18	26	23	16	24	21	14	20	18	12	17	15	10	15	13	8	13	11	7	11	10	6	10	9	5		
		Exposed	28	25	18	25	22	15	23	20	13	20	18	12	18	16	11	17	15	9	15	14	8	13	11	7	11	10	6	9	8	5	8	7	7	7	10	6	6	9	5		
	D	0-7	Interior	39	29	20	36	26	18	32	23	16	29	21	14	26	19	13	23	17	12	21	15	11	18	13	9	15	11	8	13	9	7	11	8	9	10	7	8	9	10	7	
			Exposed	26	18	13	23	16	11	20	15	10	18	13	9	17	12	8	14	10	7	12	8	9	10	7	8	8	9	7	11	7	8	6	10	7	5	9	6	4			
		7-20	Interior	34	21	18	30	19	16	27	17	14	24	15	13	22	14	11	20	13	10	18	11	9	15	10	8	13	8	7	11	7	9	10	9	8	8	8	7	7	7	6	
			Exposed	21	14	11	19	12	10	17	11	9	15	10	8	14	9	7	13	8	7	11	7	9	10	8	8	8	7	7	7	7	6	9	6	5	8	5	4	7	5	4	
		20-27	Interior	40	26	19	40	23	16	37	21	14	33	19	13	29	17	11	27	15	10	24	14	9	20	12	8	17	10	7	15	9	6	13	7	8	11	7	7	10	9	6	
			Exposed	29	17	11	26	15	10	23	13	9	21	12	8	19	11	7	17	10	7	16	9	6	13	8	8	11	6	7	10	9	6	8	7	5	7	6	4	10	6	4	
	27-45	Interior	38	33	24	33	29	21	29	26	18	26	23	16	24	21	14	22	19	13	20	18	11	17	15	9	14	13	8	12	11	7	11	9	6	9	8	5	8	7	7		
		Exposed	24	21	14	21	19	12	19	17	11	17	15	10	15	9	14	12	8	13	11	7	11	10	6	9	8	5	8	7	6	7	9	6	9	8	5	8	7	4			
10	B	0-7	Interior	27	27	27	27	27	27	27	27	27	25	27	27	23	27	27	20	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	22	27	27	20	27	26	18	27	23	16	27	21	14	26	19	13	24	17	12	20	14	10	17	12	9	15	11	7	13	9	10	11	8	9	10	7	8	
		7-20	Interior	28	28	28	28	28	27	28	28	24	28	27	22	28	24	20	28	22	18	28	20	16	26	17	14	22	14	12	19	12	10	17	11	9	14	9	8	13	8	7	
			Exposed	28	24	20	28	21	17	28	19	16	27	17	14	24	15	13	22	14	12	20	13	10	17	11	9	14	9	7	12	8	6	11	7	9	9	8	8	8	7		
		20-27	Interior	36	36	36	36	36	33	36	36	29	36	33	25	36	29	22	36	27	19	36	24	17	36	20	14	30	17	12	26	15	10	23	13	9	20	11	8	17	10	7	
			Exposed	36	29	21	36	26	18	36	23	16	36	21	14	33	19	13	30	17	11	27	16	10	23	13	9	19	11	7	17	10	6	14	8	6	13	7	8	11	6	7	
	27-45	Interior	39	39	39	39	39	39	39	39	39	39	39	31	39	37	27	39	33	24	34	30	22	29	25	18	24	22	15	21	19	12	18	16	10	16	14	9	14	13	8		
		Exposed	39	37	27	37	32	24	33	29	21	29	26	18	26	24	16	24	22	13	18	16	11	16	14	9	14	12	7	12	11	6	10	9	6	9	8	5	8	8	5		
	C	0-7	Interior	27	27	24	27	27	21	27	27	19	27	25	17	27	22	16	27	20	14	26	18	13	22	15	11	18	13	9	16	11	8	14	10	7	12	9	11	8	8		
			Exposed	27	22	15	27	20	14	25	18	12	22	16	11	20	14	10	18	13	9	16	12	8	14	10	7	12	8	9	10	7	8	9	10	7	8	9	6	7	8	5	
		7-20	Interior	28	26	21	28	23	19	28	20	17	28	18	15	26	17	14	24	15	12	21	14	11	18	12	9	15	10	8	13	8	7	11	7	9	10	6	8	9	9	7	
			Exposed	26	17	14	23	15	12	20	13	11	18	12	10	17	11	9	15	10	8	14	9	7	12	7	9	10	8	8	8	7	7	7	6	10	6	5	9	6	5		
		20-27	Interior	36	31	24	36	28	20	36	25	18	36	22	15	36	20	14	32	18	12	29	17	11	25	14	9	21	12	8	18	10	7	16	9	6	14	8	5	12	7	7	
			Exposed	35	20	14	31	18	12	28	16	11	25	14	10	23	13	9	21	12	8	19	11	7	16	9	6	13	8	5	12	7	7	10	9	6	9	8	5	8	7	5	
	27-45	Interior	39	39	30	39	35	26	35	31	23	31	28	20	28	25	18	26	23	16	24	21	14	20	18	12	17	15	10	15	13	8	13	11	7	11	10	6	10	9	5		
		Exposed	28	25	18	25	22	15	23	20	13	20	18	12	18	16	11	17	15	9	15	14	8	13	11	7	11	10	6	9	8	5	8	7	7</								



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

SM
Rail Type

PRO SERIES
Clamp

Flashloc DUO 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)																																								
				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	75	75	75	75	62	75	75	55	75	75	49	75	65	45	75	58	41	75	53	37	62	44	31	53	38	26	45	33	23	39	28	20	34	25	17	30	22	15			
			Exposed	75	64	44	75	57	39	75	51	35	64	46	32	57	41	29	52	37	26	47	34	24	40	29	20	34	24	17	29	21	15	25	18	13	22	16	17	20	14	15		
		7-20	Interior	76	76	61	76	72	54	76	59	48	76	53	43	76	48	39	70	43	36	62	39	32	52	33	27	44	28	23	38	24	20	33	21	18	29	19	15	26	17	14		
			Exposed	76	48	39	67	42	35	59	38	31	53	34	28	48	31	25	43	28	23	39	26	21	33	22	18	28	18	15	24	16	13	21	14	17	19	12	15	17	16	14		
		20-27	Interior	77	77	77	77	77	77	77	77	77	77	67	77	64	49	77	58	43	77	53	38	77	48	34	74	40	27	60	34	23	51	30	20	45	26	17	39	23	15	35	20	14
			Exposed	77	58	43	77	51	37	77	46	32	77	41	28	65	37	25	59	34	23	54	31	21	45	26	18	38	22	15	33	19	13	29	17	11	25	15	10	22	13	14		
	27-45	Interior	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	67	78	60	43	57	50	35	48	43	29	42	37	25	36	32	21	32	28	18	28	25	16				
		Exposed	78	78	54	78	64	47	64	57	41	58	52	36	52	47	32	48	42	29	43	39	26	37	33	21	31	28	18	27	24	15	24	21	13	21	19	11	18	16	10			
	C	0-7	Interior	75	75	48	75	61	43	75	55	38	75	49	34	62	44	31	56	40	28	51	37	26	43	31	22	36	26	18	31	23	16	27	20	14	24	17	12	21	15	16		
			Exposed	62	44	31	58	39	27	49	35	25	44	32	22	40	29	20	36	26	18	33	24	17	28	20	14	24	17	12	20	15	16	18	13	14	16	17	12	14	15	11		
		7-20	Interior	76	51	42	75	45	37	64	41	33	57	37	30	51	33	27	47	30	25	42	27	23	36	23	19	30	20	16	26	17	14	23	15	12	20	13	16	18	18	15		
			Exposed	51	33	27	45	29	24	41	26	22	37	24	19	33	21	18	30	19	16	27	18	15	23	15	12	20	13	16	17	17	14	15	15	12	13	13	14	14	9			
20-27		Interior	77	62	47	77	55	40	77	49	35	77	44	31	74	40	27	64	36	25	58	33	23	49	28	19	41	24	16	36	21	14	31	18	12	27	16	11	24	14	10			
		Exposed	73	40	27	62	36	24	55	32	22	50	29	19	45	26	18	41	24	16	37	22	15	31	18	12	26	15	10	22	13	19	17	12	17	15	10	15	13	9	13	12	8	
27-45	Interior	78	78	59	78	78	51	78	62	45	62	56	40	56	50	35	51	46	31	47	42	28	39	35	23	34	30	19	29	26	16	25	23	14	22	20	12	20	12	20	18	11		
	Exposed	56	50	35	50	44	30	45	40	27	40	36	24	36	33	21	33	30	19	30	27	17	26	23	14	22	20	12	19	17	10	16	15	14	15	13	12	13	17	11				
D	0-7	Interior	75	57	40	75	51	35	64	45	32	57	41	29	51	37	26	47	33	23	42	31	21	36	26	18	30	22	15	26	19	13	23	17	18	20	15	16	18	13	14			
		Exposed	51	37	26	45	33	23	41	29	21	36	26	18	33	24	17	30	22	15	27	20	14	23	17	18	20	14	15	17	12	13	15	16	12	13	14	16	18	13	9			
	7-20	Interior	68	43	35	59	38	31	53	34	28	47	30	25	43	28	23	39	25	21	35	23	19	30	19	16	25	17	14	22	14	12	19	12	16	17	17	14	15	15	12			
		Exposed	43	27	23	38	24	20	34	22	18	30	20	16	28	18	15	25	16	13	23	15	12	19	13	16	17	16	13	14	14	12	19	12	16	17	14	15	15	10				
	20-27	Interior	77	52	37	77	46	32	77	41	28	65	37	25	58	33	23	53	30	21	48	28	19	40	23	16	34	20	14	30	17	12	26	15	10	23	13	14	20	12	12			
		Exposed	58	33	23	52	30	20	46	27	18	41	24	16	37	22	15	34	20	13	31	18	12	26	15	10	22	13	19	17	12	17	15	10	15	13	9	13	12	8				
27-45	Interior	78	65	47	65	57	41	58	51	36	52	46	32	47	42	28	43	38	25	39	35	23	33	29	19	28	25	16	24	22	13	21	19	12	19	17	10	17	15	14				
	Exposed	47	42	28	42	37	25	37	33	22	34	30	19	30	27	17	28	25	15	25	23	14	21	19	12	18	16	10	16	14	13	14	12	11	12	17	10	16	15	9				
10	B	0-7	Interior	53	53	53	53	53	53	53	53	53	49	53	53	45	53	53	41	53	53	37	53	44	31	53	38	26	45	33	23	39	28	20	34	25	17	30	22	15				
			Exposed	53	53	44	53	53	39	53	51	35	53	46	32	53	41	29	52	37	26	47	34	24	40	29	20	34	24	17	29	21	15	25	18	13	22	16	17	20	14	15		
		7-20	Interior	54	54	54	54	54	54	54	54	48	54	53	43	54	48	39	54	43	36	54	39	32	52	33	27	44	28	23	38	24	20	33	21	18	29	19	15	26	17	14		
			Exposed	54	48	39	54	42	35	54	38	31	53	34	28	48	31	25	43	28	23	39	26	21	33	22	18	28	18	15	24	16	13	21	14	17	19	12	15	17	16	14		
		20-27	Interior	70	70	70	70	70	70	70	70	64	49	70	58	43	70	53	38	70	48	34	70	40	27	60	34	23	51	30	20	45	26	17	39	23	15	35	20	14				
			Exposed	70	58	43	70	51	37	70	46	32	70	41	28	65	37	25	59	34	23	54	31	21	45	26	18	38	22	15	33	19	13	29	17	11	25	15	10	22	13	14		
	27-45	Interior	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	67	75	60	43	57	50	35	48	43	29	42	37	25	36	32	21	32	28	18	28	25	16				
		Exposed	75	75	54	75	64	47	64	57	41	58	52	36	52	47	32	48	42	29	43	39	26	37	33	21	31	28	18	27	24	15	24	21	13	21	19	11	18	16	10			
	C	0-7	Interior	53	53	48	53	53	43	53	53	38	53	49	34	53	44	31	53	40	28	51	37	26	43	31	22	36	26	18	31	23	16	27	20	14	24	17	12	21	15	16		
			Exposed	53	44	31	53	39	27	49	35	25	44	32	22	40	29	20	36	26	18	33	24	17	28	20	14	24	17	12	20	15	16	18	13	14	16	17	12	14	15	11		
		7-20	Interior	54	51	42	54	45	37	54	41	33	54	37	30	51	33	27	47	30	25	42	27	23	36	23	19	30	20	16	26	17	14	23	15	12	20	13	16	18	18	15		
			Exposed	51	33	27	45	29	24	41	26	22	37	24	19	33	21	18	30	19	16	27	18	15	23	15	12	20	13	16	17	17	14	15	15	12	13	13	14	14	9			
20-27		Interior	70	62	47	70	55	40	70	49	35	70	44	31	70	40	27	64	36	25	58	33	23	49	28	19	41	24	16	36	21	14	31	18	12	27	16	11	24	14	10			
		Exposed	70	40	27	62	36	24	55	32	22	50	29	19	45	26	18	41	24	16	37	22	15	31	18	12	26	15	10	22	13	19	17	12	17	15	10	15	13	9	13	12	8	
27-45	Interior	75	75	59	75	75	51	75	62																																			

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

Table with columns for Ground Snow Load, Wind Exposure Category, Roof Tilt Angle, Panel Exposure, Basic Wind Speed (90-180 mph), and Roof Wind Zone (1-3). Rows are categorized by Ground Snow Load (0, 10, 20 psf) and Wind Exposure Category (B, C, D). Each cell contains a numerical value representing the allowable rail span in inches.

* 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.
19 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.

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																																													
0	B	0-7	Interior	77	77	77	77	63	77	77	56	77	77	51	77	67	46	77	60	41	77	54	38	64	45	32	54	39	27	46	33	23	40	29	20	35	25	18	31	23	16	Exposed	77	66	45	77	58	40	77	52	36	65	47	33	59	42	29	53	38	27	48	35	24	41	29	21	35	25	18	30	22	15	26	19	13	23	17	12	20	15	16				
			7-20	Interior	77	77	62	77	77	55	77	60	49	77	54	44	77	49	40	72	44	36	63	40	33	53	34	28	45	29	24	39	25	21	34	22	18	29	19	16	26	17	14	Exposed	77	49	40	69	43	35	60	39	32	54	35	29	49	31	26	44	29	24	40	26	21	34	22	18	29	19	15	25	16	13	22	14	12	19	12	16	17	17	14		
		20-27		Interior	78	78	78	78	78	78	78	78	78	78	58	78	68	50	78	59	44	78	54	39	78	49	34	77	41	28	61	35	24	53	30	21	46	26	18	40	23	16	35	21	14	Exposed	78	59	44	78	52	38	78	47	33	78	42	29	68	38	26	60	35	23	55	32	21	46	27	18	39	23	15	34	20	13	29	17	12	26	15	10	23	13	9
			27-45	Interior	80	80	80	80	80	80	80	80	80	80	80	80	80	80	64	80	56	80	73	50	80	61	44	58	52	36	49	44	30	42	38	25	37	33	21	33	29	18	29	16	26	16	Exposed	80	80	55	80	67	48	71	59	42	59	53	37	53	48	33	49	43	29	44	40	26	37	33	22	32	29	18	28	25	15	24	22	13	21	19	12	19	17
		C		0-7	Interior	77	77	49	77	63	43	77	56	39	77	50	35	63	45	32	57	41	29	52	37	26	44	31	22	37	27	19	32	23	16	28	20	14	24	18	12	22	16	17	Exposed	63	45	31	56	40	28	50	36	25	45	32	23	40	29	20	37	27	19	33	24	17	28	20	14	24	17	12	21	15	16	18	13	14	16	12	12	14	16	14	
			7-20		Interior	77	77	52	43	77	46	38	65	42	34	58	37	31	53	34	28	48	31	25	43	28	23	37	24	19	31	20	17	27	17	14	23	15	13	21	13	17	18	12	15	Exposed	52	34	28	46	30	25	42	27	22	37	24	20	34	22	18	31	20	16	28	18	15	24	15	13	20	13	16	17	11	14	15	15	12	13	13	11	25	14	10
	20-27			Interior	78	64	48	78	56	41	78	50	36	78	45	31	76	41	28	65	37	25	59	34	23	50	29	19	42	24	17	36	21	14	32	18	13	28	16	11	25	14	10	Exposed	76	41	28	64	36	25	57	33	22	51	29	20	46	27	18	42	24	16	38	22	15	32	19	13	27	16	11	24	14	9	21	12	12	18	16	11	16	14	10		
			27-45	Interior	80	80	61	80	80	52	80	63	46	64	57	40	58	51	36	52	47	32	48	43	29	40	36	24	34	31	20	30	27	17	26	23	14	23	20	12	20	18	11	Exposed	57	51	36	51	45	31	46	41	27	41	37	24	37	33	22	34	30	19	31	28	17	26	23	14	22	20	12	19	17	11	17	15	9	15	13	12	13	12	11		
	D			0-7	Interior	77	59	41	77	52	36	65	46	32	58	42	29	53	38	26	48	34	24	43	31	22	36	26	18	31	22	16	27	19	14	23	17	12	20	15	16	18	13	14	Exposed	52	38	26	46	33	23	41	30	21	37	27	19	34	24	17	31	22	16	28	20	14	24	17	12	20	15	16	17	13	14	15	17	12	13	15	10	12	13	9	
			7-20		Interior	70	44	36	60	39	32	54	35	28	48	31	26	44	28	23	40	26	21	36	23	19	30	20	16	26	17	14	22	15	12	20	13	16	17	11	14	15	15	12	Exposed	44	28	23	39	25	21	35	22	18	31	20	17	28	18	15	26	17	14	23	15	13	20	13	16	17	17	14	15	14	12	13	13	13	10	17	14	15	10	8	
		20-27		Interior	78	53	38	78	47	33	78	42	28	67	38	26	60	34	23	54	31	21	49	28	19	41	24	16	35	20	14	30	18	12	26	15	10	23	14	9	21	12	12	Exposed	59	34	28	53	30	21	47	27	18	42	24	17	38	22	15	35	20	14	32	18	13	27	16	11	23	13	9	20	11	12	17	15	10	15	13	9	13	12	8		
			27-45	Interior	80	69	49	73	59	42	59	53	37	53	47	33	48	43	29	44	39	26	40	36	23	34	30	19	29	26	16	25	22	14	22	19	12	19	17	10	17	15	9	Exposed	48	43	29	43	38	25	38	34	22	34	31	20	31	28	18	28	25	16	26	23	14	22	20	12	19	17	11	17	15	9	15	13	12	13	12	11					
10		B		0-7	Interior	55	55	55	55	55	55	55	55	55	55	55	55	46	55	55	41	55	54	38	55	45	32	54	39	27	46	33	23	40	29	20	35	25	18	31	23	16	Exposed	55	55	45	55	55	40	55	52	36	55	47	33	55	42	29	53	38	27	48	35	24	41	29	21	35	25	18	30	22	15	26	19	13	23	17	12	20	15	16			
			7-20		Interior	55	55	55	55	55	55	55	55	49	55	54	44	55	49	40	55	44	36	55	40	33	53	34	28	45	29	24	39	25	21	34	22	18	29	19	16	26	17	14	Exposed	55	49	40	55	43	35	55	39	32	54	35	29	49	31	26	44	29	24	40	26	21	34	22	18	29	19	15	25	16	13	22	14	12	19	12	16	17	17	14	
	20-27			Interior	72	72	72	72	72	72	72	72	58	72	68	50	72	59	44	72	54	39	72	49	34	72	41	28	61	35	24	53	30	21	46	26	18	40	23	16	35	21	14	Exposed	72	59	44	72	52	38	72	47	33	72	42	29	68	38	26	60	35	23	55	32	21	46	27	18	39	23	15	34	20	13	29	17	12	26	15	10	23	13	9		
			27-45	Interior	77	77	77	77	77	77	77	77	77	77	77	77	77	64	77	77	56	77	73	50	77	61	44	58	52	36	49	44	30	42	38	25	37	33	21	33	29	18	29	26	16	Exposed	77	77	55	77	67	48	71	59	42	59	53	37	53	48	33	49	43	29	44	40	26	37	33	22	32	29	18	28	25	15	24	22	13	21	19	12	19	17	10
	C			0-7	Interior	55	55	49	55	55	43	55	55	39	55	50	35	55	45	32	55	41	29	52	37	26	44	31	22	37	27	19	32	23	16	28	20	14	24	18	12	22	16	17	Exposed	55	45	31	55	40	28	50	36	25	45	32	23	40	29	20	37	27	19	33	24	17	28	20	14	24	17	12	21	15	16	18	13	14	16	12	12	14	16	14	
			7-20		Interior	55	52	43	55	46	38	55	42	34	55	37	31	53	34	28	48	31	25	43	28	23	37	24	19	31	20	17	27	17	14	23	15	13	21	13	17	18	12	15	Exposed	52	34	28	46	30	25	42	27	22	37	24	20	34	22	18	31	20	16	28	18	15	24	15	13	20	13	16	17	11	14	15	15	12	13	13	11	25	14	10	
		20-27		Interior	72	64	48	72	56	41	72	50	36	72	45	31	72	41	28	65	37	25	59	34	23	50	29	19	42	24	17	36	21	14	32	18	13	28	16	11	25	14	10	Exposed	72	41	28	64	36	25	57	33	22	51	29	20	46	27	18	42	24	16	38	22	15	32	19	13	27	16	11	24	14	9	21	12	12	18	16	11	16	14	10		
			27-45	Interior	77	77	61	77	77	52	77	63	46	64	57	40	58	51	36	52	47	32	48	43	29	40	36	24	34	31	20	30	27	17	26	23	14	23	20	12	20	18	11	Exposed	57	51	36	51	45	31	46	41	27	41																															

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																
30	B	0-7	Interior	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37																
			Exposed	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37													
		7-20	Interior	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39											
			Exposed	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39									
		20-27	Interior	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47								
			Exposed	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47						
	27-45	Interior	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53						
		Exposed	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53				
	40	B	0-7	Interior	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31							
				Exposed	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31		
			7-20	Interior	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33		
				Exposed	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33		
			20-27	Interior	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40		
				Exposed	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40		
		27-45	Interior	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46		
			Exposed	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46		
		50	B	0-7	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	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	25	25	25	25	25	25	25	25	25
				7-20	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	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	27	27	27	27	27	27	27	27
				20-27	Interior	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
					Exposed	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
			27-45	Interior	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
				Exposed	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41

* 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.
 19 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 = 3.00

Seismic

23 sq.ft

Module Area

PORTRAIT

Orientation

CROSS-SLOPE

Rail Direction

SM

Rail Type

PRO SERIES

Clamp

Flashloc DUO 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					
0	B	0-7	Interior	39	39	35	39	39	31	39	39	28	39	36	25	39	33	23	39	29	20	39	27	19	31	22	16	27	19	13	23	16	11	20	14	10	17	12	9	15	11	8		
			Exposed	39	32	22	39	29	20	36	26	18	32	23	16	29	21	14	26	19	13	24	17	12	20	14	10	17	12	9	15	11	7	13	9	10	11	8	9	10	7	8		
		7-20	Interior	39	39	31	39	33	27	39	30	24	39	27	22	38	24	20	34	22	18	31	20	16	26	17	14	22	14	12	19	12	10	17	11	9	14	9	14	9	8	13	8	7
			Exposed	38	24	20	33	21	17	30	19	16	27	17	14	24	15	13	22	14	12	20	13	10	17	11	9	14	9	7	12	8	6	11	7	9	9	8	8	8	8	7	8	
		20-27	Interior	40	40	40	40	40	33	40	37	29	40	33	25	40	29	22	40	27	19	40	24	17	36	20	14	30	17	12	26	15	10	23	13	9	20	11	8	17	10	7		
			Exposed	40	29	21	40	26	18	40	23	16	37	21	14	33	19	13	30	17	11	27	16	10	23	13	9	19	11	7	17	10	6	14	8	6	13	7	8	11	6	7		
	27-45	Interior	40	40	40	40	40	40	40	40	36	40	40	31	40	37	27	39	33	24	34	30	22	29	25	18	24	22	15	21	19	12	18	16	10	16	14	9	14	13	8	8		
		Exposed	40	37	27	37	32	24	33	29	21	29	26	18	26	24	16	24	21	14	22	20	13	18	16	11	16	14	9	14	12	7	12	11	6	10	9	6	9	8	5			
	C	0-7	Interior	39	35	24	39	31	21	39	28	19	35	25	17	31	22	16	28	20	14	26	18	13	22	15	11	18	13	9	16	11	8	14	10	7	12	9	11	8	8	8		
			Exposed	31	22	15	28	20	14	25	18	12	22	16	11	20	14	10	18	13	9	16	12	8	14	10	7	12	8	9	10	7	8	9	10	7	8	9	6	7	8	5		
		7-20	Interior	39	26	21	36	23	19	32	20	17	29	18	15	26	17	14	24	15	12	21	14	11	18	12	9	15	10	8	13	8	7	11	7	9	10	6	8	9	9	7	7	
			Exposed	26	17	14	23	15	12	20	13	11	18	12	10	17	11	9	15	10	8	14	9	7	12	7	9	10	8	8	8	7	7	7	6	10	6	5	9	6	5	6	5	
		20-27	Interior	40	31	24	40	28	20	40	25	18	40	22	15	36	20	14	32	18	12	29	17	11	25	14	9	21	12	8	18	10	7	16	9	6	14	8	5	12	7	7	7	7
			Exposed	35	20	14	31	18	12	28	16	11	25	14	10	23	13	9	21	12	8	19	11	7	16	9	6	13	8	5	12	7	7	10	9	6	9	8	5	8	7	6	6	
	27-45	Interior	40	40	40	40	40	35	26	35	31	23	31	28	20	28	25	18	26	23	16	24	21	14	20	18	12	17	15	10	15	13	8	13	11	7	11	10	6	10	9	5	5	
		Exposed	28	25	18	25	22	15	23	20	13	20	18	12	18	16	11	17	15	9	15	14	8	13	11	7	11	10	6	9	8	5	8	7	7	7	10	6	6	9	8	5		
	D	0-7	Interior	39	29	20	36	26	18	32	23	16	29	21	14	26	19	13	23	17	12	21	15	11	18	13	9	15	11	8	13	9	7	11	8	9	10	7	8	9	10	7	7	
			Exposed	26	18	13	23	16	11	20	15	10	18	13	9	17	12	8	14	10	7	12	8	9	10	7	8	8	9	7	11	8	6	10	7	8	6	10	7	5	9	6	4	4
		7-20	Interior	34	21	18	30	19	16	27	17	14	24	15	13	22	14	11	20	13	10	18	11	9	15	10	8	13	8	7	11	7	9	10	9	8	8	8	7	7	7	7	6	6
			Exposed	21	14	11	19	12	10	17	11	9	15	10	8	14	9	7	13	8	7	11	7	9	10	8	8	8	7	7	7	7	6	9	6	6	8	5	4	7	5	4	4	
		20-27	Interior	40	26	19	40	23	16	37	21	14	33	19	13	29	17	11	27	15	10	24	14	9	20	12	8	17	10	7	15	9	6	13	7	8	11	7	7	10	9	6	6	
			Exposed	29	17	11	26	15	10	23	13	9	21	12	8	19	11	7	17	10	7	16	9	6	13	8	8	11	6	7	10	9	6	8	7	5	7	6	4	10	6	4	4	
	27-45	Interior	38	33	24	33	29	21	29	26	18	26	23	16	24	21	14	22	19	13	20	18	11	17	15	9	14	13	8	12	11	7	11	9	6	9	8	5	8	7	7	7		
		Exposed	24	21	14	21	19	12	19	17	11	17	15	10	15	9	14	12	8	13	11	7	11	10	6	9	8	5	8	7	6	7	9	6	9	8	5	8	7	4	4			
10	B	0-7	Interior	27	27	27	27	27	27	27	27	27	25	27	27	23	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	22	27	27	20	27	26	18	27	23	16	27	21	14	26	19	13	24	17	12	20	14	10	17	12	9	15	11	7	13	9	10	11	8	9	10	7	8		
		7-20	Interior	28	28	28	28	27	28	28	24	28	27	22	28	24	20	28	22	18	28	20	16	26	17	14	22	14	12	19	12	10	17	11	9	14	9	8	13	8	7	7		
			Exposed	28	24	20	28	21	17	28	19	16	27	17	14	24	15	13	22	14	12	20	13	10	17	11	9	14	9	7	12	8	6	11	7	9	9	8	8	8	8	7	7	
		20-27	Interior	36	36	36	36	36	33	36	36	36	36	33	25	36	29	22	36	27	19	36	24	17	36	20	14	30	17	12	26	15	10	23	13	9	20	11	8	17	10	7	7	
			Exposed	36	29	21	36	26	18	36	23	16	36	21	14	33	19	13	30	17	11	27	16	10	23	13	9	19	11	7	17	10	6	14	8	6	13	7	8	11	6	7	7	
	27-45	Interior	39	39	39	39	39	39	39	39	39	39	36	39	31	39	37	27	39	33	24	34	30	22	29	25	18	24	22	15	21	19	12	18	16	10	16	14	9	14	13	8	8	
		Exposed	39	37	27	37	32	24	33	29	21	29	26	18	26	24	16	24	22	13	18	16	11	16	14	9	14	12	7	12	11	6	10	9	6	9	8	5	8	8	5			
	C	0-7	Interior	27	27	24	27	27	21	27	27	19	27	25	17	27	22	16	27	20	14	26	18	13	22	15	11	18	13	9	16	11	8	14	10	7	12	9	11	8	8			
			Exposed	27	22	15	27	20	14	25	18	12	22	16	11	20	14	10	18	13	9	16	12	8	14	10	7	12	8	9	10	7	8	9	10	7	8	9	6	7	8	5		
		7-20	Interior	28	26	21	28	23	19	28	20	17	28	18	15	26	17	14	24	15	12	21	14	11	18	12	9	15	10	8	13	8	7	11	7	9	10	6	8	9	9	7	7	
			Exposed	26	17	14	23	15	12	20	13	11	18	12	10	17	11	9	15	10	8	14	9	7	12	7	9	10	8	8	8	7	7	7	6	10	6	5	9	6	5	6	5	
		20-27	Interior	36	31	24	36	28	20	36	25	18	36	22	15	36	20	14	32	18	12	29	17	11	25	14	9	21	12	8	18	10	7	16	9	6	14	8	5	12	7	7	7	
			Exposed	35	20	14	31	18	12	28	16	11	25	14	10	23	13	9	21	12	8	19	11	7	16	9	6	13	8	5	12	7	7	10	9	6	9	8	5	8	7	5	5	
	27-45	Interior	39	39	30	39	35	26	35	31	23	31	28	20	28	25	18	26	23	16	24	21	14																					

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	
30	B	0-7	Interior	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37							
			Exposed	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37						
			Interior	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39					
			Exposed	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39				
			Interior	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47			
			Exposed	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47		
		C	7-20	Interior	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39				
				Exposed	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39		
				Interior	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	
				Exposed	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47
				Interior	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	
				Exposed	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
	20-27		Interior	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37			
			Exposed	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37		
			Interior	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	
			Exposed	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	
			Interior	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	
			Exposed	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47
	27-45	Interior	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53			
		Exposed	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53		
		Interior	38	38	37	38	38	33	38	38	30	38	38	27	38	35	24	38	32	22	38	29	20	34	24	17	29	21	15	25	18	13	21	16	11	19	14	10	17	12	13			
		Exposed	38	35	24	38	31	22	38	28	19	34	25	17	31	22	16	28	20	14	26	19	13	22	16	11	19	13	9	16	12	14	10	11	12	14	10	11	12	8	8			
		Interior	39	39	33	39	36	29	39	32	26	39	29	24	39	26	21	37	24	19	33	22	18	28	18	15	24	16	13	21	13	11	18	12	10	16	10	13	14	14	11			
		Exposed	39	26	21	36	23	19	32	21	17	29	19	15	26	17	14	24	15	13	22	14	12	18	12	10	16	10	13	13	13	11	12	12	10	10	8	14	9	7				
	D	20-27	Interior	50	49	34	50	43	29	50	39	26	50	35	24	50	32	21	50	29	19	45	26	18	38	22	15	32	19	13	28	16	11	24	14	10	21	12	8	19	11	11		
			Exposed	50	31	21	48	28	19	43	25	17	39	23	15	35	20	14	32	19	13	29	17	12	25	14	10	21	12	8	18	11	11	16	14	10	14	12	8	12	11	7		
			Interior	56	56	44	56	54	38	54	48	34	49	44	30	44	49	36	40	36	24	37	33	21	31	28	17	26	24	15	23	20	12	20	18	11	18	16	10	16	14	8		
			Exposed	56	44	39	26	39	35	23	35	31	20	32	28	18	29	26	16	26	23	14	24	21	13	20	18	11	17	15	9	15	13	8	13	12	11	11	10	10	14	8		
			B	0-7	Interior	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	
					Exposed	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	Interior	33			33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
	Exposed	33			33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
	Interior	40			40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40		
	Exposed	40			40	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	
	C	27-45	Interior	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46			
			Exposed	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46		
Interior			31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31			
Exposed			31	31	29	31	31	26	31	31	23	31	30	21	31	27	19	31	24	17	31	22	16	26	19	13	22	16	19	13	22	16	11	19	14	10	17	12	13	15	11			
Interior			33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33			
Exposed			33	31	26	33	33	28	33	33	25	33	33	22	18	31	20	17	28	18	15	26	17	14	22	14	12	19	12	10	16	10	13	14	14	11	12	12	10	11	9			
D	20-27	Interior	40	40	40	40</																																						



ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 3.00
Seismic

19 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

SM
Rail Type

UAF
Clamp

Flashloc DUO 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			
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	21	15	15	22	18	13	14	11	19	14	10	17	12	9		
			40	B	0-7	Interior	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		50				B	0-7	Interior	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

* 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.
 49 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 = 3.00

Seismic

19 sq.ft

Module Area

PORTRAIT

Orientation

CROSS-SLOPE

Rail Direction

SM

Rail Type

UAF

Clamp

Flashloc DUO 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			
90	B	0-7	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						
			Exposed	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				
		7-20	Interior	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9				
	C	20-27	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					
			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				
		27-45	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	16				
		D	0-7	Interior	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9				
				Exposed	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9			
	7-20		Interior	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10				
			Exposed	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10			
	20-27		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			
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			
100	B	27-45	Interior	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18					
			Exposed	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18				
		0-7	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				
	C	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				
			Exposed	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				
		20-27	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				
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					
27-45		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				
		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			
D	0-7	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					
		Exposed	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				
	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				
		Exposed	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				
	20-27	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				
		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				
27-45	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					
	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					

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

19 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 = 3.00
Seismic

19 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

SM
Rail Type

UAF
Clamp

Flashloc DUO Plywood
Attachment

SPAN TABLES

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

Table with columns for Ground Snow Load (psf), Wind Exposure Category, Roof Tilt Angle (deg), Panel Exposure, Basic Wind Speed (mph), Roof Wind Zone, and various span values (1-3) for different roof heights and wind directions.

* 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.
19 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 = 3.00
Seismic

23 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

SM
Rail Type

UAF
Clamp

Flashloc DUO Plywood
Attachment

SPAN TABLES

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

Table with columns: Ground Snow Load (psf), Wind Exposure Category, Roof Tilt Angle (deg), Panel Exposure, Basic Wind Speed (mph), Roof Wind Zone, and span values for various wind speeds (90-180 mph) and roof zones (1-3).

* 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.
19 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.

