

Design Criteria for Span Tables:

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

Building Assumptions

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

Wind Design Assumptions

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

Snow Design Assumptions

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

Seismic Design Assumptions

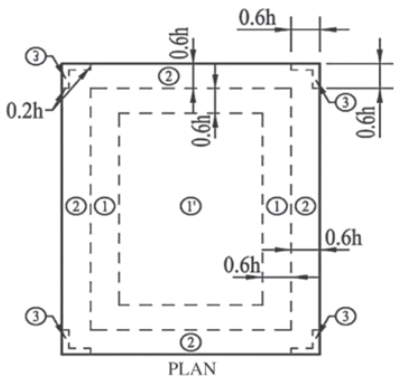
- 0.2-s Spectral Response Acceleration
- $S_s = 1.25$ and 3 with $S_{ds} = 1, 2.4$ respectively per criteria shown on individual span tables sheets.
- $S_1 = 0.5$ & $S_{d1} = 0.6$
- Seismic site class D

Array Assumptions

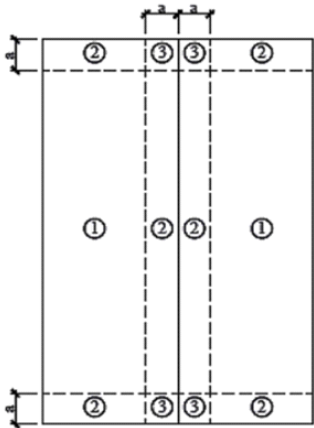
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1" x 67" (~19 sq.ft, 47.65 lbs) and 41" x 80" (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at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

Span Tables

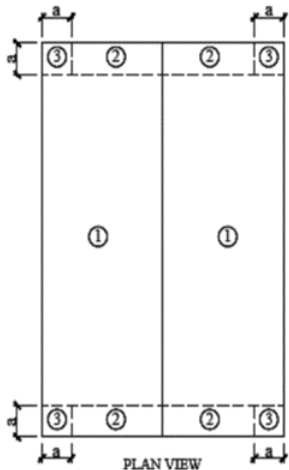
Zone should be considered as per ASCE 7-22, Fig. 30.3-2A to 30.3-2D



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



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



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

Rails can be installed in these possible orientations.

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

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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.

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

[illegible]

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[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	75	75	75	75	75	63	75	75	56	75	56	75	75	50	75	67	45	75	59	41	75	54	38	63	45	32	54	39	27	46	33	23	40	29	20	35	25	18	31	22	16							
			Exposed	75	66	45	75	75	58	40	75	52	36	65	46	32	59	42	29	53	38	27	48	35	24	40	29	20	34	25	17	30	21	15	26	19	13	23	16	18	20	15	16								
		7-20	Interior	76	76	62	76	76	55	76	76	49	76	61	44	76	55	40	76	49	36	63	45	33	53	38	28	45	32	24	38	28	20	33	24	18	29	21	16	26	19	14									
			Exposed	76	54	40	76	48	35	60	43	32	54	39	28	49	35	26	44	32	23	40	29	21	34	24	18	29	21	15	25	18	13	22	16	12	19	14	16	17	12	14									
			Interior	77	77	77	77	77	77	77	77	77	60	77	68	54	77	59	48	77	54	44	77	49	40	77	41	34	61	35	29	52	30	25	45	26	22	40	23	19	35	20	17								
			Exposed	77	59	48	77	52	43	77	47	38	77	42	34	70	38	31	60	34	28	55	31	26	46	27	22	39	23	19	34	20	16	29	17	14	26	15	12	23	13	17									
	27-45	Interior	78	78	78	78	78	78	78	78	78	78	78	78	64	78	78	58	78	72	53	78	61	48	58	51	40	49	44	34	42	38	30	37	33	26	32	29	23	29	26	20									
		Exposed	78	78	58	78	66	51	68	58	46	59	53	41	53	48	37	48	43	34	44	39	31	37	33	26	32	28	22	27	25	19	24	21	17	21	19	15	19	17	13										
	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	55	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	58	42	76	51	37	64	46	33	57	41	30	52	37	27	47	34	25	43	31	23	36	26	19	30	22	16	26	19	14	23	17	12	20	15	16	18	13	15									
			Exposed	51	37	27	46	33	24	41	29	22	37	27	20	33	24	18	30	22	16	27	20	15	23	17	12	20	14	16	17	12	14	15	16	12	13	15	11	9											
Interior			77	62	51	77	55	45	77	49	41	77	44	36	77	40	33	64	3																																

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II

30 ft
Roof Height

Ss = 3.00

19 sq.ft

ORIENTATION

CROSS-SLOPE
Rail Direction

SM
Rail Type

PRO SERIES
Clamp

Flashloc DUO Plywood

SPAN TABLES

[illegible]

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

[illegible]

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ASCE 7-22
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

19 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

SM
Rail Type

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

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ASCE 7-22
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

19 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

SM
Rail Type

UAF
Clamp

Flashloc DUO Plywood
Attachment

SPAN TABLES

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* 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.
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.

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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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																																															
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0	B	0-7	Interior	75	75	66	75	75	58	75	75	52	75	70	46	75	60	42	75	55	38	75	50	35	58	42	29	49	35	25	42	31	21	37	27	19	32	23	16	29	21	15									
			Exposed	75	60	42	75	75	53	37	69	47	52	73	60	43	30	54	39	27	49	35	25	44	32	22	37	27	19	32	23	16	27	20	14	24	17	12	15	11	19	13	14								
		7-20	Interior	76	76	57	76	76	51	76	62	45	76	56	41	76	50	37	64	46	33	58	41	30	48	35	26	41	30	22	35	26	19	31	22	16	27	20	14	24	17	13									
			Exposed	76	50	37	62	44	32	55	40	29	50	36	26	45	32	24	41	29	22	37	27	20	31	23	17	27	19	14	23	17	12	20	15	11	18	13	14	16	11	13									
			Interior	77	77	77	77	77	61	77	77	55	77	60	49	77	54	45	77	49	40	77	45	37	69	38	31	56	32	26	48	28	23	42	24	20	37	21	18	32	19	16									
			Exposed	77	54	44	77	48	39	77	43	35	77	39	32	61	35	29	55	32	26	50	29	24	42	24	20	36	21	17	31	18	15	27	16	13	24	14	11	21	12	10									
	C	0-7	Interior	78	78	78	78	78	78	78	68	78	78	59	78	78	53	78	62	48	63	56	44	53	47	37	45	40	32	39	35	27	34	30	24	30	27	21	26	24	19										
			Exposed	78	78	53	78	60	47	60	54	42	54	48	38	49	44	35	45	30	41	41	36	29	34	31	24	29	26	21	25	23	18	22	20	16	19	17	14	17	15	12									
		7-20	Interior	75	64	44	75	56	39	75	50	35	63	45	32	57	41	29	52	37	26	47	34	24	39	28	20	34	24	17	29	21	15	25	18	13	22	16	11	20	14	15									
			Exposed	57	41	28	50	36	25	45	32	23	40	29	20	36	26	19	33	24	17	30	22	15	25	18	13	22	16	11	19	14	15	16	12	13	14	10	11	13	14	10									
			Interior	76	53	39	71	47	34	59	42	31	53	38	28	47	34	25	43	31	23	39	28	21	33	24	18	28	20	15	24	18	13	21	15	11	19	14	10	16	12	13									
			Exposed	47	34	25	42	30	22	37	27	20	34	24	18	31	22	16	28	20	15	25	18	14	21	16	11	18	13	10	16	11	13	14	10	11	12	9	11	12	9										
10	B	0-7	Interior	76	76	57	76	76	51	76	62	45	76	56	41	76	50	37	64	46																															

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