

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

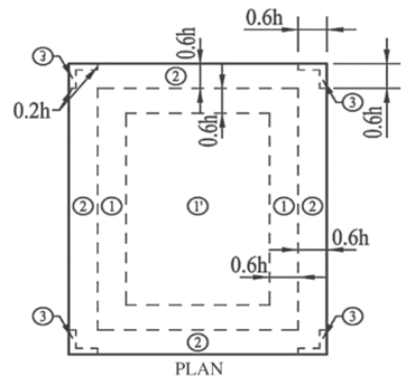
- 0.2-s Spectral Response Acceleration
- $S_s = 1.25$ and 3 with $S_{ds} = 1, 2.4$ respectively per criteria shown on individual span tables sheets.
- $S_1 = 0.5$ & $S_{d1} = 0.6$
- Seismic site class D

Array Assumptions

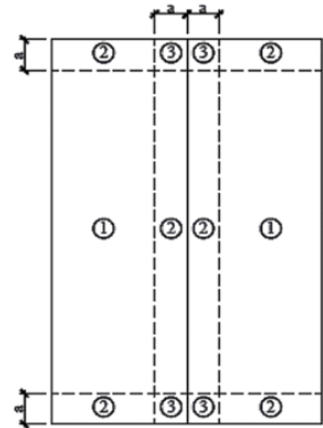
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1" x 67" (~19 sq.ft, 47.65 lbs) and 41" x 80" (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at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

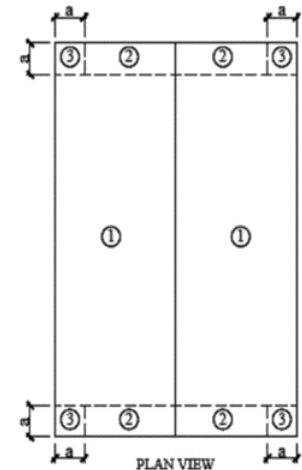
Zone should be considered as per ASCE 7-22, Fig. 30.3-2A to 30.3-2D



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

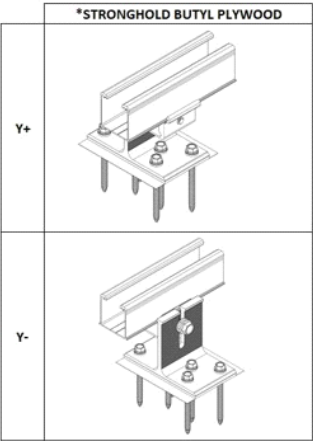


Gable Roofs $7^\circ < \theta \leq 27^\circ$



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

Rails can be installed in these possible orientations.



* 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.

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

[illegible]

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



Stronghold BUTYL
Plywood #14S
Attachment

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

[illegible]

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

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



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

NXT
Rail Type

NXT COMBO
Clamp

Stronghold BUTL
Plywood #14S
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									
				1			2			3			4			5			6			7			8			9			10			11			12			13			14						
				1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3				
0	B	0-7	Interior	78	78	77	78	78	60	78	78	54	78	78	48	78	63	44	78	57	40	78	52	36	61	43	30	51	37	26	44	32	22	38	28	20	34	24	17	30	22	15							
			Exposed	78	63	43	78	56	39	78	50	35	62	45	31	56	40	28	51	37	26	46	33	23	39	28	20	33	24	17	29	21	15	25	18	13	22	16	11	19	14	15							
		7-20	Interior	78	78	59	78	78	53	78	65	47	78	58	42	78	52	38	78	48	35	60	43	32	50	36	27	43	31	23	37	27	20	32	23	17	28	21	15	25	18	13							
			Exposed	78	52	38	65	46	34	58	41	30	52	37	27	47	34	25	42	31	23	39	28	21	33	24	17	28	20	15	24	17	13	21	15	11	18	13	15	16	12	13							
		20-27	Interior	80	80	80	80	80	64	80	80	57	80	63	51	80	57	46	80	51	42	80	47	39	80	39	32	59	34	28	50	29	24	44	25	21	38	22	18	34	20	16							
			Exposed	80	56	46	80	50	41	80	45	37	80	40	33	64	37	30	58	33	27	53	30	25	44	26	21	38	22	18	32	19	16	28	16	14	25	14	12	22	13	11							
	C	0-7	Interior	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81			
			Exposed	81	81	55	81	63	49	63	56	44	57	51	40	51	46	36	47	42	33	43	38	30	36	32	25	31	27	22	27	24	19	23	21	16	20	18	14	18	16	13							
		7-20	Interior	78	68	46	78	59	41	78	53	37	67	47	33	59	43	30	54	39	27	49	35	25	41	30	21	35	25	18	30	22	15	26	19	13	23	17	12	21	15	10							
			Exposed	59	42	30	53	38	26	47	34	24	42	30	21	38	28	19	35	25	18	32	23	16	27	19	14	23	16	12	20	14	10	17	12	13	15	11	12	13	15	10							
		20-27	Interior	78	55	40	78	49	36	61	44	32	55	39	29	49	36	26	45	32	24	41	30	22	34	25	18	29	21	16	25	18	14	22	16	12	19	14	10	17	13	14							
			Exposed	49	36	26	44	32	23	39	28	21	35	26	19	32	23	17	29	21	16	26	19	14	22	16	12	19	14	10	17	12	13	14	10	12	13	14	10	11	12	9							
	D	0-7	Interior	80	60	49	80	53	44	80	48	39	80	43	35	75	39	32	61	35	29	56	32	26	51	29	24	46	27	22	40	23	19	34	20	16	30	17	14	26	15	13	23	14	11				
			Exposed	74	38	32	60	34	28	53	31	25	48	28	23	43	25	21	39	23	19	36	21	17	33	19	16	30	17	14	25	15	12	21	13	10	19	11	14	16	13	11	9						
		7-20	Interior	81	81	59	81	70	52	81	59	47	60	54	42	54	48	38	49	44	35	45	40	32	38	34	27	32	29	23	28	25	20	24	22	17	22	19	15	19	17	14							
			Exposed	54	48	38	48	43	34	43	39	30	39	35	27	35	31	25	32	29	23	29	26	21	25	22	18	21	19	15	18	16	13	16	14	11	14	13	15	12	11	13							
	B	0-7	Interior	78	55	38	73	49	34	61	43	30	54	39	27	49	35	25	44	32	23	41	29	21	34	25	17	29	21	15	25	18	13	22	16	11	19	14	15	17	12	13							
			Exposed	49	35	25	43	31	22	39	28	20	35	25	18	32	23	16	29	21	15	26	19	13	22	16	11	19	14	15	16	12	13	14	10	11	13	14	10	11	12	9							
		7-20	Interior	64	46	33	56	41	30	50	36	27	45	33	24	41	30	22	37	27	20	34	25	18	29	21	15	24	18	13	21	15	11	18	13	15	16	12	13	14	10	12							
			Exposed	41	29	22	36	26	19	32	24	17	29	21	16	26	19	14	24	18	13	22	16	12	19	14	15	16	12	13	14	15	11	12	13	14	10	11	12	9	14	10	8						
		20-27	Interior	80	49	41	80	44	36	80	39	32	62	35	29	56	32	26	51	29	24	46	27	22	39	33	19	16	29	17	14	25	14	12	22	13	10	19	11	14									
			Exposed	55	32	26	49	28	23	44	26	21	40	23	19	36	21	17	33	19	16	30	17	14	25	15	12	21	13	10	19	11	14	16	14	12	13	10	13	11	9								
10	B	0-7	Interior	81	62	49	62	55	43	55	49	39	50	44	35	45	40	32	41	37	29	37	33	26	32	28	22	27	24	19	23	21	17	20	18	14	18	16	13	16	14	11							
			Exposed	45	40	32	40	36	28	36	32	25	32	29	23	29	26	21	27	24	19	24	22	17	21	18	15	18	16	12	15	14	11	13	12	14	12	10	13	10	14	11							
		7-20	Interior	64	64	64	64	64	60	64	64	54	64	64	48	64	63	44	64	57	40	64	52	36	61	43	30	51	37	26	44	32	22	38	28	20	34	24	17	30	22	15							
			Exposed	64	63	43	64	56	39	64	50	35	62	45	31	56	40	28	51	37	26	46	33	23	39	28	20	33	24	17	29	21	15	25	18	13	22	16	11	19	14	15							
		20-27	Interior	64	64	59	64	64	53	64	64	47	64	58	42	64	52	38	64	48	35	60	43	32	50	36	27	43	31	23	37	27	20	32	23	17	28	21	15	25	18	13							
			Exposed	64	52	38	64	46	34	58	41	30	52	37	27	47	34	25	42	31	23	39	28	21	33	24	17	28	20	15	24	17	13	21	15	11	18	13	15	16	12	13							
	C	0-7	Interior	73	73	73	73	73	64	73	73	57	73	63	51	73	57	46	73	51	42	73	47	39	73	39	32	59	34	28	50	29	24	44	25	21	38	22	18	34	20	16							
			Exposed	73	56	46	73	50	41	73	45	37	73	40	33	64	37	30	58	33	27	53	30	25	44	26	21	38	22	18	32	19	16	28	16	14	25	14	12	22	13	11							
		7-20	Interior	78	78	78	78	78	78	78	78	78	78	78	62	78	56	78	64	51	74	59	46	55	49	39	47	42	33	41	36	29	35	32	25	31	28	22	28	25	20								
			Exposed	78																																													

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

[illegible]

* Cells with an astrisks 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.

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 7-22
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 1.25
Seismic

23 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

NXT
Rail Type

NXT COMBO
Clamp

Stronghold BURL
Plywood #14S
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	39	39	34	39	39	30	39	39	27	39	35	24	39	31	22	39	28	20	36	26	18	30	21	15	25	18	13	22	16	11	19	14	10	17	12	8	15	11	7	7								
			Exposed	39	31	21	39	27	19	34	25	17	31	22	15	28	20	14	25	18	13	23	16	11	19	14	10	16	12	8	14	10	7	12	9	6	11	8	8	9	7	7									
		7-20	Interior	39	39	29	39	36	26	39	32	23	39	29	21	37	26	19	33	24	17	30	21	16	25	18	13	21	15	11	18	13	10	16	11	8	14	10	7	12	9	7	12	9	6	6					
			Exposed	37	26	19	32	23	17	28	20	15	26	18	13	23	17	12	21	15	11	19	14	10	16	12	8	14	10	7	12	8	6	10	7	8	9	6	7	8	6	7	8	6	6						
		20-27	Interior	40	40	36	40	40	32	40	35	28	40	31	25	40	28	23	40	25	21	40	23	19	34	19	16	29	17	14	25	14	12	22	12	10	19	11	9	17	10	8									
			Exposed	40	28	23	40	25	20	40	22	18	35	20	16	32	18	15	29	16	13	26	15	12	22	13	10	19	11	9	16	9	8	14	8	7	12	7	6	11	6	8									
	C	0-7	Interior	41	41	41	41	41	40	41	41	34	41	41	31	41	35	28	36	32	25	33	29	23	21	16	20	18	14	18	16	12	15	14	11	14	12	10	11	14	12	10									
			Exposed	41	35	27	35	31	24	31	28	22	28	25	20	25	23	18	23	21	16	21	19	15	18	16	12	15	13	11	13	12	9	11	10	8	10	9	7	9	8	6									
		7-20	Interior	39	33	23	39	29	20	37	26	18	33	23	16	29	21	15	27	19	13	24	17	12	20	15	10	17	12	9	15	11	7	13	9	6	11	8	9	10	7	8									
			Exposed	29	21	15	26	19	13	23	17	12	21	15	10	19	14	9	17	12	9	16	11	8	13	9	7	11	8	6	10	7	7	8	6	7	8	6	9	7	8	8	6	7							
		20-27	Interior	39	27	20	34	24	18	30	22	16	27	19	14	24	18	13	22	16	12	20	15	11	17	12	9	14	10	8	12	9	7	11	8	6	9	7	8	8	6	7									
			Exposed	24	18	13	22	16	11	19	14	10	17	13	9	16	11	8	14	10	8	13	9	7	11	8	6	9	7	8	8	6	7	7	8	6	6	7	8	6	4										
	D	0-7	Interior	40	30	24	40	26	22	40	24	19	38	21	17	33	19	16	30	17	14	28	16	13	23	13	11	20	11	9	17	10	8	15	8	7	13	7	6	11	7	8									
			Exposed	33	19	16	30	17	14	26	15	12	24	14	11	21	12	10	19	11	9	18	10	8	15	9	7	12	7	6	11	6	8	10	8	7	8	7	6	7	7	8									
		7-20	Interior	41	38	29	38	33	26	33	29	23	30	27	21	27	24	19	24	22	17	22	20	16	19	17	13	16	14	11	14	12	10	12	11	8	11	9	7	9	8	8	7								
			Exposed	27	24	19	24	21	17	21	19	15	19	17	13	17	15	12	16	14	11	14	13	10	12	11	8	10	9	7	9	8	6	8	7	8	6	7	6	8	7	8	6								
		20-27	Interior	39	27	19	34	24	17	30	21	15	27	19	13	24	17	12	22	16	11	20	14	10	17	12	8	14	10	7	12	9	6	11	8	9	7	7	8	6	7	8	6	6							
			Exposed	24	17	12	21	15	11	19	14	10	17	12	9	16	11	8	14	10	8	13	9	7	12	9	6	11	8	9	6	7	7	8	6	6	7	8	6	6	7	8	6	4							
10	B	0-7	Interior	32	32	32	32	32	30	32	32	27	32	32	24	32	31	22	32	28	20	32	26	18	30	21	15	25	18	13	22	16	11	19	14	10	17	12	8	15	11	7									
			Exposed	32	31	21	32	27	19	32	25	17	31	22	15	28	20	14	25	18	13	23	16	11	19	14	10	16	12	8	14	10	7	12	9	6	11	8	9	7	8	8	6	7							
		7-20	Interior	32	32	29	32	32	26	32	32	23	32	29	21	32	26	19	32	24	17	30	21	16	25	18	13	21	15	11	18	13	10	16	11	8	14	10	7	12	9	6	6								
			Exposed	32	26	19	32	23	17	28	20	15	26	18	13	23	17	12	21	15	11	19	14	10	16	12	8	14	10	7	12	8	6	10	7	8	9	6	7	8	6	7	12	9	6	6					
		20-27	Interior	37	37	36	37	37	32	37	35	28	37	31	25	37	28	23	37	25	21	37	23	19	34	19	16	29	17	14	25	14	12	22	12	10	19	11	9	17	10	8									
			Exposed	37	28	23	37	25	20	37	22	18	35	20	16	32	18	15	29	16	13	26	15	12	22	13	10	19	11	9	16	9	8	14	8	7	12	7	6	11	7	10	6	8							
	C	0-7	Interior	39	39	39	39	39	39	39	39	34	39	39	31	39	35	28	36	32	25	33	29	23	27	24	19	23	21	16	20	18	14	18	16	12	15	14	11	14	12	10									
			Exposed	39	35	27	35	31	24	31	28	22	28	25	20	25	23	18	23	21	16	21	19	15	18	16	12	15	13	11	13	12	9	11	10	8	10	9	7	9	8	6	7	8	6						
		7-20	Interior	32	32	23	32	29	20	32	26	18	32	23	16	29	21	15	27	19	13	24	17	12	20	15	10	17	12	9	15	11	7	13	9	6	11	8	9	10	7	8									
			Exposed	29	21	15	26	19	13	23	17	12	21	15	10	19	14	9	17	12	9	16	11	8	13	9	7	11	8	6	10	7	7	8	6	6	7	8	6	7	8	6	5								
		20-27	Interior	32	27	20	32	24	18	30	22	16	27	19	14	24	18	13	22	16	12	20	15	11	17	12	9	14	10	8	12	9	7	11	8	6	9	7	8	8	6	7									
			Exposed	24	18	13	22	16	11	19	14	10	17	13	9	16	11	8	14	10	8	13	9	7	11	8	6	9	7	8	8	6	7	7	8	6	6	7	8	6	4										
	D	0-7	Interior	37	30	24	37	26	22	37	24	19	37	21	17	33	19	16	30	17	14	28	16	13	23	13	11	20	11	9	17	10	8	15	8	7	13	7	6	11	7	8									
			Exposed	33	19	16	30	17	14	26	15	12	24	14	11	21	12	10																																	

[illegible]

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

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

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

[illegible]

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																						
				90			95			100			105			110			115			120			130			140			150			160			170			180		
				Roof Wind Zone																																						
				1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
0	B	0-7	Interior	76	76	71	76	76	59	76	76	53	76	74	47	76	62	43	76	56	39	76	51	35	59	43	30	50	36	25	43	31	22	38	27	19	33	24	17	29	21	15
			Exposed	76	61	43	76	76	54	38	73	48	34	61	44	30	55	39	28	50	36	25	45	33	23	38	27	19	32	23	17	28	20	14	24	18	12	21	16	11	19	14
		7-20	Interior	77	77	58	77	77	52	77	63	46	77	57	41	77	51	37	65	46	34	59	42	31	49	36	26	42	30	22	36	26	19	31	23	17	28	20	15	24	18	13
			Exposed	77	51	37	63	45	33	56	41	30	51	36	27	46	33	24	41	30	22	38	27	20	32	23	17	27	20	15	23	17	13	20	15	11	18	13	15	16	12	13
		20-27	Interior	78	78	78	78	78	63	78	78	56	78	61	50	78	55	45	78	50	41	78	46	38	75	39	32	57	33	27	49	28	23	43	25	20	38	22	18	33	19	16
			Exposed	78	55	45	78	49	40	78	44	36	78	39	32	62	36	29	56	32	27	51	30	24	43	25	21	37	21	18	32	18	15	28	16	13	24	14	12	22	13	10
	27-45	Interior	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	
		Exposed	79	79	54	79	61	48	62	55	43	55	49	39	50	45	35	46	41	32	42	37	29	35	31	25	30	27	21	26	23	18	23	16	20	18	14	16	12	19		
	C	0-7	Interior	76	65	45	76	58	40	76	51	36	65	46	32	58	42	29	53	38	27	48	35	24	40	29	20	34	25	17	30	21	15	26	19	13	23	16	12	20	15	16
			Exposed	58	42	29	51	37	26	46	33	23	41	30	21	37	27	19	34	24	17	31	22	16	26	19	13	22	16	11	19	14	15	17	12	13	15	16	11	13	14	10
		7-20	Interior	77	54	40	77	48	35	60	43	31	54	39	28	48	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
			Exposed	48	35	26	43	31	23	38	28	20	34	25	18	31	23	17	28	21	15	26	19	14	22	16	12	19	14	15	16	12	13	14	16	12	14	10	11	12	9	
20-27		Interior	78	59	48	78	52	43	78	46	38	78	42	34	69	38	31	60	34	28	55	31	26	46																		

* 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.

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

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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 7-22
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 3.00
Seismic

19 sq.ft
Module Area

PORTRAIT
Orientation

CROSS-SLOPE
Rail Direction

NXT
Rail Type

NXT COMBO
Clamp

Stronghold BURL
Plywood #14S
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																																																	
				1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3					
0	B	0-7	Interior	47	47	40	47	47	36	47	47	32	47	41	29	47	37	26	47	34	23	43	31	21	36	26	18	31	22	15	27	20	14	23	17	12	20	14	10	17	12	9	15	11	7	13	9	6	11	8	9		
			Exposed	47	37	26	47	33	23	41	29	20	37	26	18	33	24	17	30	22	15	27	20	14	23	17	12	20	14	10	17	12	9	15	11	7	13	9	6	11	8	9	6	11	8	9	6	11	8	9			
		7-20	Interior	47	47	35	47	44	31	47	38	28	47	34	25	44	31	23	39	28	21	36	26	19	30	22	16	25	18	13	22	16	12	19	14	10	17	12	9	15	11	7	13	9	6	11	8	9					
			Exposed	44	31	23	38	27	20	34	25	18	31	22	16	28	20	15	25	18	13	23	17	12	19	14	10	16	12	9	14	10	7	12	9	7	11	8	9	10	7	8	9	10	7	8	9						
		20-27	Interior	48	48	43	48	48	38	48	42	34	48	37	30	48	34	28	48	31	25	48	28	23	41	23	19	35	20	16	30	17	14	26	15	12	23	13	11	20	12	10	18	13	9	16	12	10					
			Exposed	48	33	27	48	30	24	48	27	22	42	24	20	38	22	18	34	20	16	31	18	15	26	15	12	22	13	11	19	11	9	17	10	8	15	8	7	13	7	6	10	7	8	9	10	7	8				
		27-45	Interior	48	48	48	48	48	48	48	48	41	48	48	37	48	42	33	43	30	39	35	27	33	29	23	28	25	20	24	22	17	21	19	15	18	16	13	16	15	12	10	18	13	9	16	12	10					
			Exposed	48	42	33	42	37	29	37	33	26	34	30	24	30	24	20	27	21	28	25	19	25	23	18	21	19	15	18	16	13	16	14	11	14	12	10	12	11	8	11	9	7	10	8	9						
	C	0-7	Interior	47	39	27	47	35	24	44	31	22	39	28	20	35	25	18	32	23	16	29	21	15	24	18	12	21	15	10	18	13	9	16	11	8	14	10	7	12	9	6	11	8	9	6	11	8	9				
			Exposed	35	25	18	31	22	16	28	20	14	25	18	13	23	16	11	20	15	10	19	13	9	16	11	8	13	10	7	12	8	9	10	7	8	9	6	7	8	9	6	7	8	9	6	7	8	9				
		7-20	Interior	47	33	24	41	29	21	36	26	19	32	23	17	29	21	15	27	19	14	24	18	13	20	15	11	17	13	9	15	11	8	13	9	7	11	8	6	10	7	8	9	6	10	7	8	9					
			Exposed	29	21	15	26	19	14	23	17	12	21	15	11	19	14	10	17	12	9	16	11	8	13	10	7	11	8	6	10	7	8	8	6	7	7	8	6	7	8	6	7	8	6	7	8	6	7				
		20-27	Interior	48	36	29	48	32	26	48	28	23	46	25	21	40	23	19	36	21	17	33	19	16	28	16	13	24	14	11	20	12	10	18	10	8	16	9	7	14	8	6	10	7	8	6	10	7	8				
			Exposed	40	23	19	35	20	17	32	18	15	28	16	13	26	15	12	23	13	11	21	12	10	18	10	8	15	9	7	13	8	6	11	7	8	10	9	7	8	6	10	7	8	6	10	7	8					
		27-45	Interior	48	46	35	46	39	31	40	35	28	36	32	25	32	29	23	29	26	21	27	24	19	22	20	16	19	17	14	17	15	12	14	13	10	13	11	9	11	10	8	10	8	9	10	7	8	9				
			Exposed	32	29	23	29	25	20	26	23	18	23	21	16	21	19	15	19	17	13	17	15	12	15	13	10	12	11	9	11	10	8	9	8	7	8	7	9	7	9	7	10	8	9	7	8	9					
	D	0-7	Interior	47	32	23	40	29	20	36	26	18	32	23	16	29	21	15	26	19	13	24	17	12	20	15	10	17	12	9	15	11	7	13	9	6	11	8	9	10	7	8	9	6	11	8	9	6	11	8	9		
			Exposed	29	21	15	26	18	13	23	17	12	21	15	10	19	13	9	17	12	9	15	11	8	13	9	7	11	8	6	10	7	8	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7		
		7-20	Interior	38	27	20	33	24	18	30	22	16	27	19	14	24	17	13	22	16	12	20	15	11	17	12	9	14	10	8	12	9	7	11	8	9	9	7	8	8	6	10	7	8	6	10	7	8	6	10	7	8	
			Exposed	24	17	13	21	16	11	19	14	10	17	12	9	16	11	8	14	10	8	13	9	7	11	8	6	9	7	8	8	9	7	7	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7	
		20-27	Interior	48	29	24	48	26	21	41	23	19	37	21	17	33	19	16	30	17	14	27	16	13	23	13	11	20	11	9	17	10	8	15	8	7	13	7	6	11	7	8	6	11	7	8	6	11	7	8			
			Exposed	33	19	16	29	17	14	26	15	12	23	14	11	21	12	10	19	11	9	18	10	8	15	9	7	13	7	6	11	6	8	9	8	7	8	7	6	7	8	6	7	8	6	7	8	6	7				
		27-45	Interior	41	37	29	37	33	26	33	29	23	29	26	21	27	24	19	24	22	17	22	20	16	19	17	13	16	14	11	14	12	10	12	11	8	11	9	7	9	8	7	9	8	7	9	8	7	9	8	7		
			Exposed	27	24	19	24	21	17	21	19	15	19	17	13	17	15	12	16	14	11	14	13	10	12	11	9	10	9	7	9	8	6	8	7	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7			
10	B	0-7	Interior	38	38	38	38	36	38	38	32	38	38	29	38	37	26	38	34	23	38	31	21	36	26	18	31	22	15	26	19	13	23	16	11	20	14	10	18	13	9	16	11	8	14	10	7	12	9	6	11	8	9
			Exposed	38	37	26	38	33	23	38	29	20	37	26	18	33	24	17	30	22	15	27	20	14	23	17	12	20	14	10	17	12	9	15	11	7	13	9	6	11	8	9	6	11	8	9	6	11	8	9			
		7-20	Interior	38	38	35	38	38	31	38	28	38	34	25	38	31	23	38	28	21	36	26	19	30	22	16	25	18	13	22	16	12	19	14	10	17	12	9	15	11	8	14	10	7	12	9	6	11	8	9			
			Exposed	38	31	23	38	27	20	34	25	18	31	22	16	28	20	15	25	18	13																																

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



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



30 ft

$$S_s = 3.00$$

19 sq.ft

PORTRAIT

CROSS-SLOPE

NXT

NXT COMBO

Stronghold BUTYL
Plywood #14S
Attachment

SPAN TABLES

[illegible]

* Cells with an astrisks 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.

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 7-22
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 3.00
Seismic

19 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

NXT
Rail Type

NXT COMBO
Clamp

Stronghold BUTL
Plywood #14S
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															
				1			2			3			1			2			3			1			2			3			1			2			3			1			2			3			1			2			3		
				Roof Wind Zone																																																					
0	B	0-7	Interior	78	78	77	78	78	60	78	78	54	78	78	48	78	63	44	78	57	40	78	52	36	61	43	30	51	37	26	44	32	22	38	28	20	34	24	17	30	22	15	10	14	15	10	14	15	10	14	15	10					
			Exposed	78	63	43	78	56	39	78	50	35	62	45	31	56	40	28	51	37	26	46	33	23	39	28	20	33	24	17	29	21	15	25	18	13	22	16	11	19	14	15	10	14	15	10	14	15	10	14	15	10					
		7-20	Interior	78	78	59	78	78	53	78	65	47	78	58	42	78	52	38	78	48	35	60	43	32	50	36	27	43	31	23	37	27	20	32	23	17	28	21	15	25	18	13	22	16	11	19	14	15	10	14	15	10					
			Exposed	78	52	38	65	46	34	58	41	30	52	37	27	47	34	25	42	31	23	39	28	21	33	24	17	28	20	15	24	17	13	21	15	11	18	13	15	16	12	13	15	16	12	13	15	16	12	13	15	16					
		20-27	Interior	80	80	80	80	80	64	80	80	57	80	63	51	80	57	46	80	51	42	80	47	39	80	39	32	59	34	28	50	29	24	44	25	21	38	22	18	34	20	16	16	16	16	16	16	16	16	16	16	16					
			Exposed	80	56	46	80	50	41	80	45	37	80	40	33	64	37	30	58	33	27	53	30	25	44	26	21	38	22	18	32	19	16	28	16	14	25	14	12	22	13	11	11	11	11	11	11	11	11	11	11	11					
	C	0-7	Interior	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81					
			Exposed	81	81	55	81	63	49	63	56	44	57	51	40	51	46	36	47	42	33	43	38	30	36	32	25	31	27	22	27	24	19	23	21	16	20	18	14	18	16	13	14	18	16	13	14	18	16	13	14	18	16				
		7-20	Interior	78	68	46	78	59	41	78	53	37	67	47	33	59	43	30	54	39	27	49	35	25	41	30	21	35	25	18	30	22	15	26	19	13	23	17	12	21	15	10	14	15	10	14	15	10	14	15	10	14	15	10			
			Exposed	59	42	30	53	38	26	47	34	24	42	30	21	38	28	19	35	25	18	32	23	16	27	19	14	23	16	12	20	14	10	17	12	13	15	11	12	13	15	10	14	15	10	14	15	10	14	15	10						
		20-27	Interior	78	55	40	78	49	36	61	44	32	55	39	29	49	36	26	45	32	24	41	30	22	34	25	18	29	21	16	25	18	14	22	16	12	19	14	10	17	13	14	10	17	13	14	10	17	13	14	10						
			Exposed	49	36	26	44	32	23	39	28	21	35	26	19	32	23	17	29	21	16	26	19	14	22	16	12	19	14	10	17	12	13	14	10	12	13	14	10	12	13	14	10	12	13	14	10	12	13	14	10						
	D	0-7	Interior	80	60	49	80	53	44	80	48	39	80	43	35	75	39	32	61	35	29	56	32	26	51	29	24	46	27	22	39	22	19	33	19	16	29	17	14	25	14	12	22	13	10	19	11	14	11	14	11	14	11				
			Exposed	74	38	32	60	34	28	53	31	25	48	28	23	43	25	21	39	23	19	36	21	17	33	19	16	30	17	14	25	15	12	21	13	10	19	11	14	16	14	12	13	10	13	11	9	11	9	11	9	11					
		7-20	Interior	81	81	59	81	70	52	81	59	47	60	54	42	54	48	38	49	44	35	45	40	32	38	34	27	32	29	23	28	25	20	24	22	17	22	19	15	19	15	17	14	17	14	17	14	17	14	17	14						
			Exposed	54	48	38	48	43	34	43	39	30	39	35	27	35	31	25	32	29	23	29	26	21	25	22	18	21	19	15	23	18	16	13	16	14	11	14	13	15	12	11	13	15	12	11	13	15	12	11	13	15					
	B	0-7	Interior	78	55	38	73	49	34	61	43	30	54	39	27	49	35	25	44	32	23	41	29	21	34	25	17	29	21	15	25	18	13	22	16	11	19	14	15	17	12	13	15	17	12	13	15	17	12	13	15	17					
			Exposed	49	35	25	43	31	22	39	28	20	35	25	18	32	23	16	29	21	15	26	19	13	22	16	11	19	14	15	16	12	13	14	10	11	13	14	10	11	13	14	10	11	13	14	10	11	13	14	10						
		7-20	Interior	64	46	33	56	41	30	50	36	27	45	33	24	41	30	22	37	27	20	34	25	18	29	21	15	24	18	13	21	15	11	18	13	15	16	12	13	14	10	12	13	14	10	12	13	14	10	12	13	14					
			Exposed	41	29	22	36	26	19	32	24	17	29	21	16	26	19	14	24	18	13	22	16	12	19	14	15	16	12	19	14	15	16	12	13	14	10	11	12	13	14	10	11	12	13	14	10	11	12	13	14						
		20-27	Interior	80	49	41	80	44	36	80	39	32	62	35	29	56	32	26	51	29	24	46	27	22	39	22	19	33	19	16	29	17	14	25	14	12	22	13	10	19	11	14	11	14	11	14	11	14	11	14	11						
			Exposed	55	32	26	49	28	23	44	26	21	40	23	19	36	21	17	33	19	16	30	17	14	25	15	12	21	13	10	19	11	14	16	14	12	14	13	10	13	11	9	11	9	11	9	11	9	11	9	11						
10	B	0-7	Interior	81	81	62	49	62	55	43	55	49	39	50	44	35	45	40	32	41	37	29	37	33	26	32	28	22	27	24	19	23	21	17	20	18	14	18	16	13	16	14	11	14	16	14	11	14	16	14							
			Exposed	45	40	32	40	36	28	36	32	25	32	29	23	29	26	21	27	24	19	24	22	17	21	18	15	18	16	12	15	14	11	13	12	14	12	10	13	10	14	11	13	10	14	11	13	10	14	11							
		7-20	Interior	64	64	64	64	64	60	64	64	54	64	64	48	64	63	44	64	57	40	64	52	36	61	43	30	51	37	26	44	32	22	38	28	20	34	24	17	30	22	15	10	14	15	10	14	15	10	14	15	10					
			Exposed	64	63	43	64	56	39	64	50	35	62	45	31	56	40	28	51	37	26	46	33	23	39	28	20	33	24	17	29	21	15	25	18	13	22	16	11	19	14	15	10														

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[illegible]

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																					
				90												95												100														105															
				110												115												120																		130											
				Roof Wind Zone																																																					
0	B	0-7	Interior	39	39	34	39	39	30	39	39	27	39	35	24	39	31	22	39	28	20	36	26	18	30	21	15	25	18	13	22	16	11	19	14	10	17	12	8	15	11	7	7														
			Exposed	39	31	21	39	27	19	34	25	17	31	22	15	28	20	14	25	18	13	23	16	11	19	14	10	16	12	8	14	10	7	12	9	6	11	8	8	9	7	7															
		7-20	Interior	39	39	29	39	36	26	39	32	23	39	29	21	37	26	19	33	24	17	30	21	16	25	18	13	21	15	11	18	13	10	16	11	8	14	10	7	12	9	7	12	9	6	6											
			Exposed	37	26	19	32	23	17	28	20	15	26	18	13	23	17	12	21	15	11	19	14	10	16	12	8	14	10	7	12	8	6	10	7	8	9	6	7	8	6	7	8	6	6												
		20-27	Interior	40	40	36	40	40	32	40	35	28	40	31	25	40	28	23	40	25	21	40	23	19	34	19	16	29	17	14	25	14	12	22	12	10	19	11	9	17	10	8															
			Exposed	40	28	23	40	25	20	40	22	18	35	20	16	32	18	15	29	16	13	26	15	12	22	13	10	19	11	9	16	9	8	14	8	7	12	7	6	11	6	8															
	C	0-7	Interior	41	41	41	41	41	40	41	41	34	41	41	31	41	35	28	36	32	25	33	29	23	21	16	20	18	14	18	16	12	15	14	11	14	12	10	11	14	12	10															
			Exposed	41	35	27	35	31	24	31	28	22	28	25	20	25	23	18	23	21	16	21	19	15	18	16	12	15	13	11	13	12	9	11	10	8	10	9	7	9	8	6															
		7-20	Interior	39	33	23	39	29	20	37	26	18	33	23	16	29	21	15	27	19	13	24	17	12	20	15	10	17	12	9	15	11	7	13	9	6	11	8	9	10	7	8															
			Exposed	29	21	15	26	19	13	23	17	12	21	15	10	19	14	9	17	12	9	16	11	8	13	9	7	11	8	9	10	7	7	8	6	7	8	6	9	7	8	8	6	7													
		20-27	Interior	39	27	20	34	24	18	30	22	16	27	19	14	24	18	13	22	16	12	20	15	11	17	12	9	14	10	8	12	9	7	11	8	6	9	7	8	8	6	7															
			Exposed	24	18	13	22	16	11	19	14	10	17	13	9	16	11	8	14	10	8	13	9	7	11	8	6	9	7	8	8	6	7	7	8	6	6	7	8	6	9	7	8	8	6	7											
	D	0-7	Interior	40	30	24	40	26	22	40	24	19	38	21	17	33	19	16	30	17	14	28	16	13	23	13	11	20	11	9	17	10	8	15	8	7	13	7	6	11	7	8															
			Exposed	33	19	16	30	17	14	26	15	12	24	14	11	21	12	10	19	11	9	18	10	8	15	9	7	12	7	6	11	6	8	10	8	7	8	7	6	7	6	7	7	8	6	7											
		7-20	Interior	41	38	29	38	33	26	33	29	23	30	27	21	27	24	19	24	22	17	22	20	16	19	17	13	16	14	11	14	12	10	12	11	8	11	9	7	9	8	7	8	6	7												
			Exposed	27	24	19	24	21	17	21	19	15	19	17	13	17	15	12	16	14	11	14	13	10	12	11	8	10	9	7	9	8	6	8	7	8	7	6	7	6	8	6	8	7	8	6	6										
		20-27	Interior	39	27	19	34	24	17	30	21	15	27	19	13	24	17	12	22	16	11	20	14	10	17	12	8	14	10	7	12	9	6	11	8	9	7	7	8	6	7	8	6	6													
			Exposed	24	17	12	21	15	11	19	14	10	17	12	9	16	11	8	14	10	8	13	9	7	12	9	6	11	8	9	6	7	7	8	6	6	7	7	6	8	6	7	5	8	6	4											
10	B	0-7	Interior	32	32	32	32	32	30	32	32	27	32	32	24	32	31	22	32	28	20	32	26	18	30	21	15	25	18	13	22	16	11	19	14	10	17	12	8	15	11	7	7														
			Exposed	32	31	21	32	27	19	32	25	17	31	22	15	28	20	14	25	18	13	23	16	11	19	14	10	16	12	8	14	10	7	12	9	6	11	8	9	7	8	6	7	7													
		7-20	Interior	32	32	29	32	32	26	32	32	29	32	29	21	32	26	19	32	24	17	30	21	16	25	18	13	21	15	11	18	13	10	16	11	8	14	10	7	12	9	7	12	9	6	6											
			Exposed	32	26	19	32	23	17	28	20	15	26	18	13	23	17	12	21	15	11	19	14	10	16	12	8	14	10	7	12	8	6	10	7	8	9	6	7	8	6	7	8	6	6												
		20-27	Interior	37	37	36	37	37	32	37	35	28	37	31	25	37	28	23	37	25	21	37	23	19	34	19	16	29	17	14	25	14	12	22	12	10	19	11	9	17	10	8															
			Exposed	37	28	23	37	25	20	37	22	18	35	20	16	32	18	15	29	16	13	26	15	12	22	13	10	19	11	9	16	9	8	14	8	7	12	7	6	11	7	8	6	8													
	C	0-7	Interior	39	39	39	39	39	39	39	39	34	39	39	31	39	35	28	36	32	25	33	29	23	27	24	19	23	21	16	20	18	14	18	16	12	15	14	11	14	12	10															
			Exposed	39	35	27	35	31	24	31	28	22	28	25	20	25	23	18	23	21	16	21	19	15	18	16	12	15	13	11	13	12	9	11	10	8	10	9	7	9	8	6	7	8	6	6											
		7-20	Interior	32	32	23	32	29	20	32	26	18	32	23	16	29	21	15	27	19	13	24	17	12	20	15	10	17	12	9	15	11	7	13	9	6	11	8	9	10	7	8															
			Exposed	29	21	15	26	19	13	23	17	12	21	15	10	19	14	9	17	12	9	16	11	8	13	9	7	11	8	9	10	7	7	8	6	6	7	8	6	9	7	8	8	6	7												
		20-27	Interior	32	27	20	32	24	18	30	22	16	27	19	14	24	18	13	22	16	12	20	15	11	17	12	9	14	10	8	12	9	7	11	8	6	9	7	8	8	6	7															
			Exposed	24</																																																					

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

[illegible]

* Cells with an astrisks 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.

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)

[illegible]

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