

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

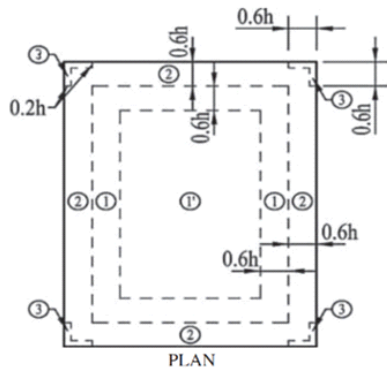
- 0.2-s Spectral Response Acceleration, $SS \leq 3$
- $S_S = 1.25$ and 3 per criteria shown on individual span tables sheets.
- $S_1 = 0.5$
- Seismic site class D

Array Assumptions

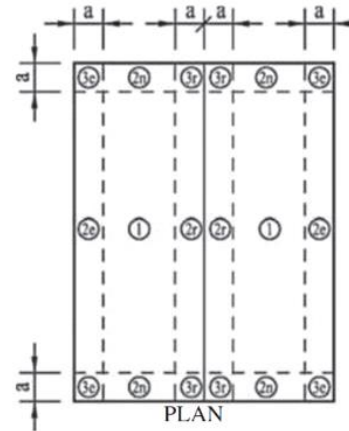
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1" x 67" (~19 sq.ft, 47.65 lbs) and 41" x 80" (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at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

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

NXT
Rail Type

NXT COMBO
Clamp

Flashloc DUO OSB
Attachment

SPAN TABLES

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																						
				90			95			100			105			110			115			120			130			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	57	57	53	57	57	47	57	57	42	57	54	38	57	49	34	57	44	31	56	40	28	47	34	24	40	29	20	34	25	17	30	22	15	26	19	13	23	17	12
			Exposed	57	49	34	57	43	30	54	38	27	48	35	24	43	31	22	39	28	20	36	26	18	30	22	15	26	19	13	22	16	11	19	14	10	17	12	9	15	11	12
		7-20	Interior	57	56	46	57	50	41	57	45	37	57	40	33	57	36	30	51	33	27	47	30	25	39	25	21	33	22	18	29	19	15	25	16	13	22	14	12	19	13	10
			Exposed	56	36	30	50	32	26	45	29	24	40	26	21	36	23	19	33	21	17	30	19	16	25	16	13	22	14	11	19	12	10	16	11	9	14	9	12	13	8	10
		20-27	Interior	58	58	53	58	58	45	58	54	39	58	49	34	58	44	30	58	40	27	58	36	25	54	31	21	45	26	18	39	23	15	34	20	13	30	17	12	26	15	10
			Exposed	58	44	30	58	39	26	58	35	24	55	31	21	49	28	19	45	26	17	41	24	16	34	20	13	29	17	11	25	15	10	22	13	9	19	11	8	17	10	7
	27-45	Interior	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
		Exposed	59	55	39	55	49	34	49	44	30	44	39	26	40	36	23	36	32	21	33	30	19	28	25	15	24	21	13	21	18	11	18	16	10	16	14	9	14	13	8	
	C	0-7	Interior	57	52	36	57	46	32	57	41	29	52	37	26	47	34	24	42	31	21	39	28	20	32	23	16	28	20	14	24	17	12	21	15	11	18	13	9	16	12	8
			Exposed	47	33	23	41	30	21	37	27	19	33	24	17	30	22	15	27	20	14	25	18	13	21	15	11	18	13	9	15	11	12	13	10	10	12	9	10	12	8	
		7-20	Interior	57	39	32	54	34	28	48	31	25	43	28	23	39	25	21	35	23	19	32	21	17	27	18	14	23	15	12	20	13	11	17	11	9	15	10	8	14	9	11
			Exposed	39	25	21	34	22	18	31	20	16	28	18	15	25	16	13	23	15	12	21	14	11	18	11	9	15	10	12	13	8	11	11	11	9	10	10	8	9	9	7
20-27		Interior	58	47	33	58	42	28	58	37	25	58	34	23	53	30	21	48	28	19	44	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	18	11	7	
		Exposed	53	30	21	47	27	18	42	24	16	38	22	15	34	20	13	31	18	12	28	17	11	26	15	10	24	14	9	20	12	8	18	10	7	15	9	13	12	8	12	11
27-45	Interior	59	59	42	59	52	37	53	47	32	47	42	28	43	28	25	39	35	23	35	32	20	30	27	17	26	23	14	22	20	12	19	17	10	17	15	9	15	13	8		
	Exposed	43	38	25	38	34	22	34	30	19	31	27	17	28	25	15	25	23	14	23	21	13	19	17	11	17	15	9	14	13	8	13	11	7	11	10	9	10	9	8		
D	0-7	Interior	57	43	30	54	39	27	48	34	24	43	31	22	39	28	20	35	25	18	32	23	16	27	20	14	23	17	12	20	14	10	17	13	9	15	11	12	13	10	10	
		Exposed	39	28	20	34	25	17	31	22	16	28	14	25	18	13	23	16	12	21	15	11	25	16	12	13	9	15	11	12	13	8	9	10	11	8	9	10	7	10	7	
	7-20	Interior	50	32	27	45	29	24	40	26	21	36	23	19	32	21	17	29	19	16	27	17	14	23	15	12	19	13	10	17	11	9	15	9	12	13	8	10	11	11	9	
		Exposed	32	21	17	29	19	15	26	17	14	23	15	12	21	14	11	19	12	10	17	11	9	15	10	12	13	8	10	11	11	9	9	9	8	8	7	11	7	6		
	20-27	Interior	58	39	26	58	35	24	55	31	21	49	28	19	44	25	17	40	23	16	37	21	14	31	18	12	26	15	10	23	13	9	20	11	8	17	10	7	15	9	9	
		Exposed	44	25	17	39	23	15	35	20	14	31	18	12	28	17	11	26	15	10	24	14	9	20	12	8	17	10	7	15	9	13	11	8	11	10	7	10	9	6		
27-45	Interior	55	49	34	49	44	30	44	39	26	39	35	23	36	32	21	32	29	18	30	27	17	25	22	14	21	19	12	18	17	10	16	14	9	14	13	8	13	11	7		
	Exposed	36	32	20	32	28	18	28	25	16	26	23	14	23	21	13	21	19	11	19	17	10	16	15	9	14	12	8	12	11	6	10	9	9	8	8	8	8	11	7		
10	B	0-7	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	
			Exposed	40	40	34	40	40	30	40	38	27	40	35	24	40	31	22	39	28	20	36	26	18	30	22	15	26	19	13	22	16	11	19	14	10	17	12	9	15	11	12
		7-20	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
			Exposed	41	36	30	41	32	26	41	29	24	40	26	21	36	23	19	33	21	17	30	19	16	25	16	13	22	14	11	19	12	10	16	11	9	14	9	12	13	8	10
		20-27	Interior	53	53	53	53	53	45	53	39	53	49	34	53	44	30	53	40	27	53	36	25	53	31	21	45	26	18	39	23	15	34	20	13	30	17	12	26	15	10	
			Exposed	53	44	30	53	39	26	53	35	24	53	31	21	49	28	19	45	26	17	41	24	16	34	20	13	29	17	11	25	15	10	22	13	9	19	11	8	17	10	7
	27-45	Interior	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	
		Exposed	57	55	39	55	49	34	49	44	30	44	39	26	40	36	23	36	32	21	33	30	19	28	25	15	24	21	13	21	18	11	18	16	10	16	14	9	14	13	8	
	C	0-7	Interior	40	40	36	40	40	32	40	40	29	40	37	26	40	34	24	40	31	21	39	28	20	32	23	16	28	20	14	24	17	12	21	15	11	18	13	9	16	12	8
			Exposed	40	33	23	40	30	21	37	27	19	33	24	17	30	22	15	27	20	14	25	18	13	21	15	11	18	13	9	15	11	12	13	10	10	12	9	9	10	12	8
		7-20	Interior	41	39	32	41	34	28	41	31	25	41	28	23	39	25	21	35	23	19	32	21	17	27	18	14	23	15	12	20	13	11	17	11	9	15	10	8	14	9	11
			Exposed	39	25	21	34	22	18	31	20	16	28	18	15	25	16	13	23	15	12	21	14	11	18	11	9	15	10	12	13	8	11	11	11	9	10	10	8	9	9	7
20-27		Interior	53	47	33	53	42	28	53	37	25	53	34	23	53	30	21	48	28	19	44	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	18	11	7	
		Exposed	53	30	21	47	27	18	42	24	16	38	22	15	34	20	13	31	18	12	28	16	11	24	14	9	20	12	8	18	10	7	15	9	13	12	8	12	11	7		
27-45	Interior	57	57	42	57	52	37	53	47	32	47	42	28	43	28	25	39	35	23	35	32	20	30	27	17	26	23	14	22	20	12	19										



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

NXT
Rail Type

NXT COMBO
Clamp

Flashloc DUO OSB
Attachment

SPAN TABLES

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																										
				90			95			100			105			110			115			120			130			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	29	29	26	29	29	23	29	29	21	29	27	18	29	24	17	29	22	15	28	20	14	23	17	12	20	14	10	17	12	8	15	11	7	13	9	6	11	8	6	11	8	6	
			Exposed	29	24	17	29	21	15	27	19	13	24	17	12	21	15	11	19	14	10	18	13	9	15	11	7	13	9	6	11	8	5	9	7	5	8	6	6	6	7	5	6	6		
		7-20	Interior	29	28	23	29	25	20	29	22	18	29	20	16	28	18	15	25	16	13	23	15	12	19	12	10	16	11	9	14	9	7	12	8	6	11	7	6	9	6	5	6	5		
			Exposed	28	18	15	25	16	13	22	14	12	20	13	10	18	11	9	16	10	9	15	9	8	12	8	6	11	7	6	9	6	5	8	5	6	7	7	6	6	6	5	5			
		20-27	Interior	29	29	26	29	29	22	29	27	19	29	24	17	29	22	15	29	20	13	29	18	12	26	15	10	22	13	9	19	11	7	17	10	6	15	8	6	11	7	5	6	13	7	5
			Exposed	29	22	15	29	19	13	29	17	12	27	15	10	24	14	9	22	13	8	20	12	8	17	10	6	14	9	6	12	7	5	11	6	4	9	5	6	8	5	5	5	5		
	27-45	Interior	29	29	29	29	29	28	29	29	25	29	29	22	29	22	19	28	25	17	25	23	15	21	19	12	18	16	10	16	14	9	14	12	7	12	11	6	10	9	6	10	9	6		
		Exposed	29	27	19	27	24	17	24	22	15	22	19	13	20	18	11	18	16	10	16	15	9	14	12	7	12	10	6	10	9	5	9	8	5	8	7	4	7	4	7	6	4	7	6	4
	C	0-7	Interior	29	26	18	29	23	16	29	20	14	26	18	13	23	17	12	21	15	10	19	14	10	16	11	8	14	10	7	12	8	5	9	6	10	7	5	9	6	6	7	8	6	6	
			Exposed	23	16	11	20	15	10	18	13	9	16	12	8	15	11	7	13	10	7	12	9	6	10	7	5	9	6	7	7	5	6	6	5	5	6	6	5	6	6	4	5	6	4	
		7-20	Interior	29	19	16	27	17	14	24	15	12	21	14	11	19	12	10	17	11	9	16	10	8	13	9	7	11	7	6	10	6	5	8	5	7	7	5	6	7	6	5	6	7	6	5
			Exposed	19	12	10	17	11	9	15	10	8	14	9	7	12	8	6	11	7	6	10	7	5	9	5	7	7	5	6	6	5	5	5	4	5	5	4	5	5	4	6	4	3	3	
20-27		Interior	29	23	16	29	21	14	29	18	12	29	17	11	26	15	10	24	14	9	22	12	8	18	10	7	15	9	6	13	8	5	12	7	4	10	6	4	9	5	5	5	5	5		
		Exposed	26	15	10	23	13	9	21	12	8	19	11	7	17	10	6	15	9	6	14	8	5	12	7	4	10	6	4	9	5	5	7	7	4	6	6	4	6	4	6	5	3			
27-45	Interior	29	29	21	29	26	18	26	23	16	23	21	14	21	19	12	19	17	11	18	16	10	15	13	8	13	11	7	11	10	6	9	8	5	8	7	4	7	6	4	6	5	5			
	Exposed	21	19	12	19	17	11	17	15	9	15	13	8	14	12	7	12	11	7	11	10	6	9	8	5	8	7	4	7	6	4	6	5	5	5	5	5	4	5	6	4	5				
D	0-7	Interior	29	21	15	27	19	13	24	17	12	21	15	11	19	14	10	17	12	9	16	11	8	13	10	7	11	8	6	10	7	5	8	6	6	7	5	8	6	6	7	5	5			
		Exposed	19	14	10	17	12	8	15	11	8	14	10	7	12	9	6	11	8	6	10	7	5	9	6	7	7	5	6	7	5	5	6	4	5	5	6	4	5	5	4	6	5	3		
	7-20	Interior	25	16	13	22	14	12	20	13	10	18	11	9	16	10	8	14	9	8	13	8	7	11	7	6	9	6	5	8	5	7	7	6	6	6	5	5	5	5	5	5	4			
		Exposed	16	10	8	14	9	7	13	8	7	11	7	6	10	7	5	9	6	5	8	5	7	7	5	6	6	5	5	5	4	7	4	4	6	4	3	5	5	3	3					
	20-27	Interior	29	19	13	29	17	12	27	15	10	24	14	9	22	12	8	20	11	8	18	10	7	15	9	6	13	7	5	11	6	4	10	5	4	8	5	5	7	7	4	5	5			
		Exposed	22	12	8	19	11	7	17	10	7	15	9	6	14	8	5	13	7	5	12	7	4	10	6	4	8	5	5	7	6	4	6	5	4	5	5	3	5	4	4	3				
27-45	Interior	27	24	17	24	22	15	22	19	13	19	17	11	18	16	10	16	14	9	15	13	8	12	11	7	10	9	6	9	8	5	8	7	4	7	6	4	6	5	5						
	Exposed	18	16	10	16	14	9	14	12	8	13	11	7	11	10	6	10	9	6	9	8	5	8	7	4	7	6	4	6	5	5	5	7	4	7	6	4	6	5	3						
10	B	0-7	Interior	20	20	20	20	20	20	20	20	20	18	20	20	17	20	20	15	20	15	20	14	20	17	12	20	14	10	17	12	8	15	11	7	13	9	6	11	8	6					
			Exposed	20	20	17	20	15	20	19	13	20	17	12	20	15	11	19	14	10	18	13	9	15	11	7	13	9	6	11	8	5	9	7	5	8	6	6	7	5	6	6	5			
		7-20	Interior	20	20	20	20	20	20	20	18	20	20	16	20	18	15	20	16	13	20	15	12	19	12	10	16	11	9	14	9	7	12	8	6	11	7	6	9	6	5					
			Exposed	20	18	15	20	16	13	20	14	12	20	13	10	18	11	9	16	10	9	15	9	8	12	8	6	11	7	6	9	6	5	8	5	6	7	7	6	6	6	5				
		20-27	Interior	26	26	26	26	26	22	26	26	19	26	24	17	26	22	15	26	20	13	26	18	12	26	15	10	22	13	9	19	11	7	17	10	6	15	8	6	13	7	5				
			Exposed	26	22	15	26	19	13	26	17	12	26	15	10	24	14	9	22	13	8	20	12	8	17	10	6	14	8	6	12	7	5	11	6	4	9	5	6	8	5	5				
	27-45	Interior	29	29	29	29	29	28	29	29	25	29	29	22	29	22	19	28	25	17	25	23	15	21	19	12	18	16	10	16	14	9	14	12	7	12	11	6	10	9	6					
		Exposed	29	27	19	27	24	17	24	22	15	22	19	13	20	18	11	18	16	10	16	15	9	14	12	7	12	10	6	10	9	5	9	8	5	8	7	4	7	6	4	7	6	4		
	C	0-7	Interior	20	20	18	20	20	16	20	20	14	20	18	13	20	17	12	20	15	10	19	14	10	16	11	8	14	10	7	12	8	5	9	6	10	7	5	9	6	7	8	6			
			Exposed	20	16	11	20	15	10	18	13	9	16	12	8	15	11	7	13	10	7	12	9	6	10	7	5	9	6	7	7	5	6	6	5	5	6	6	4	5	6	4				
		7-20	Interior	20	19	16	20	17	14	20	15	12	20	14	11	19	12	10	17	11	9	16	10	8	13	9	7	11	7	6	10	6	5	8	5	7	7	5	6	7	6	5				
			Exposed	19	12	10	17	11	9	15	10	8	14	9	7	12	8	6	11	7	6	10	7	5	9	5	7	7	5	6	6	5	5	5	4	5	5	4	6	4	3					
20-27		Interior	26	23	16	26	21	14	26	18	12	26	17	11	26	15	10	24	14	9	22	12	8	18	10	7	15	9	6	13	8	5	12	7	4	10	6	4	9	5	5					
		Exposed	26	15	10	23	13	9	21	12	8	19	11	7	17	10	6	15	9	6	14	8	5	12	7	4	10	6	4	9	5	5	7	7	4	6	6	4	6	5	3					
27-45	Interior	29	29	21	29	26	18	26	23	16	23	21	14	21	19	12	19	17	11	18	16	10	15	13	8	13	11	7	11	10	6	9	8	5	8	7	4	7	6	4	7	6	4			
	Exposed	21	19																																											



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

NXT
Rail Type

NXT COMBO
Clamp

Flashloc DUO OSB
Attachment

SPAN TABLES

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																								
				90			95			100			105			110			115			120			130			140			150			160			170			180				
				Roof Wind Zone																																								
0	B	0-7	Interior	56	56	52	56	56	46	56	56	41	56	53	37	56	48	33	56	43	30	55	39	27	46	33	23	39	28	20	34	24	17	29	21	15	26	19	13	23	16	12		
			Exposed	56	47	33	56	42	29	53	38	26	47	34	24	43	31	21	39	28	19	35	25	18	29	21	15	25	18	13	22	16	11	19	14	10	17	12	13	15	11	11		
		7-20	Interior	56	55	45	56	49	40	56	44	36	56	39	32	56	35	29	50	32	26	46	29	24	38	25	20	33	21	17	28	18	15	24	16	13	21	14	11	19	12	10		
			Exposed	55	35	29	49	31	26	44	28	23	39	25	21	35	23	19	32	21	17	29	19	16	25	16	13	21	14	11	18	12	10	16	10	8	14	9	11	12	10			
		20-27	Interior	57	57	52	57	57	44	57	53	38	57	48	33	57	43	29	57	39	26	57	36	24	52	30	20	44	26	17	38	22	15	33	19	13	29	17	11	26	15	10		
			Exposed	57	43	29	57	38	26	57	34	23	54	31	21	48	28	19	44	25	17	40	23	16	34	19	13	29	17	11	25	14	10	21	12	8	19	11	7	17	10	10		
	27-45	Interior	57	57	57	57	57	56	57	57	49	57	57	43	57	48	34	55	49	34	50	45	30	42	38	25	36	32	21	31	28	17	27	24	15	24	21	13	21	19	11			
		Exposed	57	54	38	53	48	33	48	43	29	43	38	26	39	35	23	35	32	20	32	29	18	27	24	15	23	21	13	20	18	11	18	16	10	15	14	8	14	12	7			
	C	0-7	Interior	56	51	36	56	45	32	56	41	28	51	36	25	46	33	23	42	30	21	38	27	19	32	23	16	27	20	14	23	17	12	20	15	10	18	13	9	16	11	12		
			Exposed	46	33	23	40	29	20	36	26	18	33	23	16	29	21	15	27	19	14	24	18	12	20	15	10	17	13	9	15	11	12	13	10	12	13	9	10	11	8			
		7-20	Interior	56	38	31	53	34	28	47	30	25	42	27	22	38	25	20	35	22	18	32	20	17	27	17	14	23	15	12	20	13	10	17	11	9	15	10	12	13	9	11		
			Exposed	38	24	20	34	22	18	30	20	16	27	18	14	25	16	13	22	14	12	20	13	11	17	11	9	15	10	12	13	13	10	11	11	9	10	10	8	13	9	7		
		20-27	Interior	57	46	32	57	41	28	57	37	25	57	33	22	52	30	20	47	27	18	43	25	17	36	21	14	31	18	12	26	15	10	23	13	9	20	12	8	18	10	7		
			Exposed	52	30	20	46	26	18	41	24	16	37	21	14	33	19	13	30	18	12	28	16	11	23	14	9	20	12	8	17	10	7	15	9	9	13	12	8	12	10	7		
	27-45	Interior	57	57	41	57	51	36	51	46	31	46	41	28	42	37	25	38	34	22	35	31	20	29	26	16	25	22	14	22	19	12	19	17	10	17	15	9	15	13	8			
		Exposed	42	37	25	37	33	22	33	30	19	30	27	17	27	24	15	25	28	22	13	23	20	12	19	17	10	16	15	9	14	13	8	12	11	7	11	10	9	10	8			
	D	0-7	Interior	56	42	30	53	38	26	47	34	24	42	30	21	38	27	19	35	25	17	31	23	16	26	19	13	23	16	11	19	14	10	17	12	9	15	11	12	13	10	10		
			Exposed	38	27	19	34	24	17	30	22	15	27	20	14	24	18	12	22	16	11	20	15	10	17	12	9	15	11	11	13	9	10	11	12	9	10	11	7	13	9	7		
		7-20	Interior	49	32	26	44	28	23	39	25	21	35	23	19	32	21	17	29	19	15	26	17	14	22	14	12	19	12	10	16	11	9	14	9	12	12	10	11	11	9			
			Exposed	32	20	17	28	18	15	25	16	13	23	15	12	21	13	11	19	12	10	17	11	9	14	9	12	12	10	11	10	9	9	8	12	8	7	11	7	7	6			
		20-27	Interior	57	38	26	57	34	23	53	31	21	48	27	19	43	25	17	39	23	15	36	21	14	30	17	12	26	15	10	22	13	9	19	11	8	17	10	7	15	9	9		
			Exposed	43	25	17	38	22	15	34	20	13	31	18	12	28	16	11	25	15	10	23	13	9	19	11	8	17	10	10	14	13	9	13	11	8	11	10	7	10	9	6		
	27-45	Interior	54	48	33	48	43	29	43	38	25	39	34	23	35	31	20	32	28	18	29	26	16	24	22	13	21	19	11	18	16	10	16	14	9	14	12	7	12	11	7			
		Exposed	35	31	20	31	28	17	28	25	15	25	22	14	23	20	12	21	18	11	19	17	10	16	14	9	14	12	7	12	11	10	10	9	9	12	7	12	11	7				
10	B	0-7	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			
			Exposed	39	39	33	39	39	29	39	38	26	39	34	24	39	31	21	39	28	19	35	25	18	29	21	15	25	18	13	22	16	11	19	14	10	17	12	13	15	11	11		
		7-20	Interior	40	40	40	40	40	40	40	40	36	40	39	32	40	35	29	40	32	26	40	29	24	38	25	20	33	21	17	28	18	15	24	16	13	21	14	11	19	12	10		
			Exposed	40	35	29	40	31	26	40	28	23	39	25	21	35	23	19	32	21	17	29	19	16	25	16	13	21	14	11	18	12	10	16	10	8	14	9	11	12	12	10		
		20-27	Interior	52	52	52	52	52	44	52	52	38	52	48	33	52	43	29	52	39	26	52	36	24	52	30	20	44	26	17	38	22	15	33	19	13	29	17	11	26	15	10		
			Exposed	52	43	29	52	38	26	52	34	23	52	31	21	48	28	19	44	25	17	40	23	16	34	19	13	29	17	11	25	14	10	21	12	8	19	11	7	17	10	10		
	27-45	Interior	56	56	56	56	56	56	56	56	56	49	56	56	43	56	34	56	54	38	55	49	34	50	45	30	42	38	25	36	32	21	31	28	17	27	24	15	24	21	13	21	19	11
		Exposed	56	54	38	53	48	33	48	43	29	43	38	26	39	35	23	35	32	20	32	29	18	27	24	15	23	21	13	20	18	11	18	16	10	15	14	8	14	12	7			
	C	0-7	Interior	39	39	36	39	39	32	39	39	28	39	36	25	39	33	23	39	30	21	38	27	19	32	23	16	27	20	14	23	17	12	20	15	10	18	13	9	16	11	12		
			Exposed	39	33	23	39	29	20	36	26	18	33	23	16	29	21	15	27	19	14	24	18	12	20	15	10	17	13	9	15	11	12	13	10	12	13	9	10	11	8			
		7-20	Interior	40	38	31	40	34	28	40	30	25	40	27	22	38	25	20	35	22	18	32	20	17	27	17	14	23	15	12	20	13	10	17	11	9	15	10	12	13	9	11		
			Exposed	38	24	20	34	22	18	30	20	16	27	18	14	25	16	13	22	14	12	20	13	11	17	11	9	15	10	12	13	13	10	11	11	9	10	10	8	13	9	7		
20-27		Interior	52	46	32	52	41	28	52	37	25	52	33	22	52	30	20	47	27	18	43	25	17	36	21	14	31	18	12	26	15	10	23	13	9	20	12	8	18	10	7			
		Exposed	52	30	20	46	26	18	41	24	16	37	21	14	33	19	13	30	18	12	28	16	11	23	14	9	20	12	8	17	10	7	15	9	9	13	12	8	12	10	7			
27-45	Interior	56	56	41	56	51	36	51	46	31	46	41	28	42	37	25	38	34	22	35	31	20	29	26	16	25	22	14	22	19	12	19	17	10	17	15	9	15	13	8				
	Exposed	42	37	25	37	33	22	33	30	19	30	27	17	27	24	15	25	28	22	13	23	20																						



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

NXT
Rail Type

NXT COMBO
Clamp

Flashloc DUO OSB
Attachment

SPAN TABLES

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																						
				90			95			100			105			110			115			120			130			140			150			160			170			180		
				Roof Wind Zone																																						
0	B	0-7	Interior	57	57	53	57	57	47	57	57	42	57	54	38	57	49	34	57	44	31	56	40	28	47	34	24	40	29	20	34	25	17	30	22	15	26	19	13	23	17	12
			Exposed	57	49	34	57	43	30	54	38	27	48	35	24	43	31	22	39	28	20	36	26	18	30	22	15	26	19	13	22	16	11	19	14	10	17	12	9	15	11	12
		7-20	Interior	57	56	46	57	50	41	57	45	37	57	40	33	57	36	30	51	33	27	47	30	25	39	25	21	33	22	18	29	19	15	25	16	13	22	14	12	19	13	10
			Exposed	56	36	30	50	32	26	45	29	24	40	26	21	36	23	19	33	21	17	30	19	16	25	16	13	22	14	11	19	12	10	16	11	9	14	9	12	13	8	10
		20-27	Interior	58	58	53	58	58	45	58	54	39	58	49	34	58	44	30	58	40	27	58	36	25	54	31	21	45	26	18	39	23	15	34	20	13	30	17	12	26	15	10
			Exposed	58	44	30	58	39	26	58	35	24	55	31	21	49	28	19	45	26	17	41	24	16	34	20	13	29	17	11	25	15	10	22	13	9	19	11	8	17	10	7
	27-45	Interior	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
		Exposed	59	55	39	55	49	34	49	44	30	44	39	26	40	36	23	36	32	21	33	30	19	28	25	15	24	21	13	21	18	11	18	16	10	16	14	9	14	13	8	
	C	0-7	Interior	57	52	36	57	46	32	57	41	29	52	37	26	47	34	24	42	31	21	39	28	20	32	23	16	28	20	14	24	17	12	21	15	11	18	13	9	16	12	8
			Exposed	47	33	23	41	30	21	37	27	19	33	24	17	30	22	15	27	20	14	25	18	13	21	15	11	18	13	9	15	11	12	13	10	10	12	9	10	12	8	
		7-20	Interior	57	39	32	54	34	28	48	31	25	43	28	23	39	25	21	35	23	19	32	21	17	27	18	14	23	15	12	20	13	11	17	11	9	15	10	8	14	9	11
			Exposed	39	25	21	34	22	18	31	20	16	28	18	15	25	16	13	23	15	12	21	14	11	18	11	9	15	10	12	13	8	11	11	11	9	10	10	8	9	9	7
		20-27	Interior	58	47	33	58	42	28	58	37	25	58	34	23	53	30	21	48	28	19	44	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	18	11	7
			Exposed	53	30	21	47	27	18	42	24	16	38	22	15	34	20	13	31	18	12	28	16	11	24	14	9	20	12	8	18	10	7	15	9	9	13	12	8	12	11	7
	27-45	Interior	59	59	42	59	52	37	53	47	32	47	42	28	43	28	25	39	35	23	35	32	20	30	27	17	26	23	14	22	20	12	19	17	10	17	15	9	15	13	8	
		Exposed	43	38	25	38	34	22	34	30	19	31	27	17	28	25	15	25	23	14	23	21	13	19	17	11	17	15	9	14	13	8	13	11	7	11	10	9	10	9	8	
	D	0-7	Interior	57	43	30	54	39	27	48	34	24	43	31	22	39	28	20	35	25	18	32	23	16	27	20	14	23	17	12	20	14	10	17	13	9	15	11	12	13	10	10
			Exposed	39	28	20	34	25	17	31	22	14	26	18	13	23	16	12	21	15	11	18	12	13	9	15	11	12	13	9	10	11	8	9	10	11	8	9	10	7	10	7
		7-20	Interior	50	32	27	45	29	24	40	26	21	36	23	19	32	21	17	29	19	16	27	17	14	23	15	12	19	13	10	17	11	9	15	9	12	13	8	10	11	11	9
			Exposed	32	21	17	29	19	15	26	17	14	23	15	12	21	14	11	19	12	10	17	11	9	15	10	12	13	8	10	11	11	9	9	9	8	8	7	11	7	6	
		20-27	Interior	58	39	26	58	35	24	55	31	21	49	28	19	44	25	17	40	23	16	37	21	14	31	18	12	26	15	10	23	13	9	20	11	8	17	10	7	15	9	9
			Exposed	44	25	17	39	23	15	35	20	14	31	18	12	28	17	11	26	15	10	24	14	9	20	12	8	17	10	7	15	9	9	13	11	8	11	10	7	10	9	6
	27-45	Interior	55	49	34	49	44	30	44	39	26	39	35	23	36	32	21	32	29	18	30	27	17	25	22	14	21	19	12	18	17	10	16	14	9	14	13	8	13	11	7	
		Exposed	36	32	20	32	28	18	28	25	16	26	23	14	23	21	13	21	19	11	19	17	10	16	15	9	14	12	8	12	11	6	10	9	9	8	8	8	8	11	7	
10	B	0-7	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	
			Exposed	40	40	34	40	40	30	40	38	27	40	35	24	40	31	22	39	28	20	36	26	18	30	22	15	26	19	13	22	16	11	19	14	10	17	12	9	15	11	12
		7-20	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
			Exposed	41	36	30	41	32	26	41	29	24	40	26	21	36	23	19	33	21	17	30	19	16	25	16	13	22	14	11	19	12	10	16	11	9	14	9	12	13	8	10
		20-27	Interior	53	53	53	53	53	45	53	53	39	53	49	34	53	44	30	53	40	27	53	36	25	53	31	21	45	26	18	39	23	15	34	20	13	30	17	12	26	15	10
			Exposed	53	44	30	53	39	26	53	35	24	53	31	21	49	28	19	45	26	17	41	24	16	34	20	13	29	17	11	25	15	10	22	13	9	19	11	8	17	10	7
	27-45	Interior	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	
		Exposed	57	55	39	55	49	34	49	44	30	44	39	26	40	36	23	36	32	21	33	30	19	28	25	15	24	21	13	21	18	11	18	16	10	16	14	9	14	13	8	
	C	0-7	Interior	40	40	36	40	40	32	40	40	29	40	37	26	40	34	24	40	31	21	39	28	20	32	23	16	28	20	14	24	17	12	21	15	11	18	13	9	16	12	8
			Exposed	40	33	23	40	30	21	37	27	19	33	24	17	30	22	15	27	20	14	25	18	13	21	15	11	18	13	9	15	11	12	13	10	10	12	9	9	10	12	8
		7-20	Interior	41	39	32	41	34	28	41	31	25	41	28	23	39	25	21	35	23	19	32	21	17	27	18	14	23	15	12	20	13	11	17	11	9	15	10	8	14	9	11
			Exposed	39	25	21	34	22	18	31	20	16	28	18	15	25	16	13	23	15	12	21	14	11	18	11	9	15	10	12	13	8	11	11	11	9	10	10	8	9	9	7
		20-27	Interior	53	47	33	53	42	28	53	37	25	53	34	23	53	30	21	48	28	19	44	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	18	11	7
			Exposed	53	30	21	47	27	18	42	24	16	38	22	15	34	20	13	31	18	12	28	16	11	24	14	9	20	12	8	18	10	7	15	9	9	13	12	8	12	11	7
	27-45	Interior	57	57	42	57	52	37	53	47	32	47	42	28	43	28	25	39	35	23	35	32	20	30	27	17	26	23	14	22	20	12	19	17	10	17	15	9	15	13	8	
		Exposed	43	38	25	38	34	22	34	30	19	31	27	17	28	25	15	25	2																							



ASCE 7-16
Design Standard

II
Risk Category

30 ft
Roof Height

Ss = 3.00
Seismic

23 sq.ft
Module Area

LANDSCAPE
Orientation

CROSS-SLOPE
Rail Direction

NXT
Rail Type

NXT COMBO
Clamp

Flashloc DUO OSB
Attachment

SPAN TABLES

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																						
				90			95			100			105			110			115			120			130			140			150			160			170			180		
				Roof Wind Zone																																						
0	B	0-7	Interior	56	56	52	56	56	46	56	56	41	56	53	37	56	48	33	56	43	30	55	39	27	46	33	23	39	28	20	34	24	17	29	21	15	26	19	13	23	16	12
			Exposed	56	47	33	56	42	29	53	38	26	47	34	24	43	31	21	39	28	19	35	25	18	29	21	15	25	18	13	22	16	11	19	14	10	17	12	13	15	11	11
		7-20	Interior	56	55	45	56	49	40	56	44	36	56	39	32	56	35	29	50	32	26	46	29	24	38	25	20	33	21	17	28	18	15	24	16	13	21	14	11	19	12	10
			Exposed	55	35	29	49	31	26	44	28	23	39	25	21	35	23	19	32	21	17	29	19	16	25	16	13	21	14	11	18	12	10	16	10	8	14	9	11	12	10	
		20-27	Interior	57	57	52	57	57	44	57	53	38	57	48	33	57	43	29	57	39	26	57	36	24	52	30	20	44	26	17	38	22	15	33	19	13	29	17	11	26	15	10
			Exposed	57	43	29	57	38	26	57	34	23	54	31	21	48	28	19	44	25	17	40	23	16	34	19	13	29	17	11	25	14	10	21	12	8	19	11	7	17	10	10
	27-45	Interior	57	57	57	57	57	56	57	57	49	57	57	43	57	48	34	55	49	34	50	45	30	42	38	25	36	32	21	31	28	17	27	24	15	24	21	13	21	19	11	
		Exposed	57	54	38	53	48	33	48	43	29	43	38	26	39	35	23	35	32	20	32	29	18	27	24	15	23	21	13	20	18	11	18	16	10	15	14	8	14	12	7	
	C	0-7	Interior	56	51	36	56	45	32	56	41	28	51	36	25	46	33	23	42	30	21	38	27	19	32	23	16	27	20	14	23	17	12	20	15	10	18	13	9	16	11	12
			Exposed	46	33	23	40	29	20	36	26	18	33	23	16	29	21	15	27	19	14	24	18	12	20	15	10	17	13	9	15	11	12	13	10	12	13	9	10	11	8	
		7-20	Interior	56	38	31	53	34	28	47	30	25	42	27	22	38	25	20	35	22	18	32	20	17	27	17	14	23	15	12	20	13	10	17	11	9	15	10	12	13	9	11
			Exposed	38	24	20	34	22	18	30	20	16	27	18	14	25	16	13	22	14	12	20	13	11	17	11	9	15	10	12	13	13	10	11	11	9	10	10	8	13	9	7
		20-27	Interior	57	46	32	57	41	28	57	37	25	57	33	22	52	30	20	47	27	18	43	25	17	36	21	14	31	18	12	26	15	10	23	13	9	20	12	8	18	10	7
			Exposed	52	30	20	46	26	18	41	24	16	37	21	14	33	19	13	30	18	12	28	16	11	23	14	9	20	12	8	17	10	7	15	9	9	13	12	8	12	10	7
	27-45	Interior	57	57	41	57	51	36	51	46	31	46	41	28	42	37	25	38	34	22	35	31	20	29	26	16	25	22	14	22	19	12	19	17	10	17	15	9	15	13	8	
		Exposed	42	37	25	37	33	22	33	30	19	30	27	17	27	24	15	25	28	22	13	23	20	12	19	17	10	16	15	9	14	13	8	12	11	7	11	10	9	10	9	8
	D	0-7	Interior	56	42	30	53	38	26	47	34	24	42	30	21	38	27	19	35	25	17	31	23	16	26	19	13	23	16	11	19	14	10	17	12	9	15	11	12	13	10	10
			Exposed	38	27	19	34	24	17	30	22	15	27	20	14	24	18	12	22	16	11	20	15	10	17	12	9	15	11	11	13	9	10	11	12	9	10	11	7	13	9	7
		7-20	Interior	49	32	26	44	28	23	39	25	21	35	23	19	32	21	17	29	19	15	26	17	14	22	14	12	19	12	10	16	11	9	14	9	12	12	10	11	11	9	11
			Exposed	32	20	17	28	18	15	25	16	13	23	15	12	21	13	11	19	12	10	17	11	9	14	9	12	12	10	11	10	9	9	8	12	8	7	11	7	7	6	
		20-27	Interior	57	38	26	57	34	23	53	31	21	48	27	19	43	25	17	39	23	15	36	21	14	30	17	12	26	15	10	22	13	9	19	11	8	17	10	7	15	9	9
			Exposed	43	25	17	38	22	15	34	20	13	31	18	12	28	16	11	25	15	10	23	13	9	19	11	8	17	10	10	14	13	9	13	11	8	11	10	7	10	9	6
	27-45	Interior	54	48	33	48	43	29	43	38	25	39	34	23	35	31	20	32	28	18	29	26	16	24	22	13	21	19	11	18	16	10	16	14	9	14	12	7	12	11	7	
		Exposed	35	31	20	31	28	17	28	25	15	25	22	14	23	20	12	21	18	11	19	17	10	16	14	9	14	12	7	12	11	10	10	9	9	12	7	12	11	7		
10	B	0-7	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	
			Exposed	39	39	33	39	39	29	39	38	26	39	34	24	39	31	21	39	28	19	35	25	18	29	21	15	25	18	13	22	16	11	19	14	10	17	12	13	15	11	11
		7-20	Interior	40	40	40	40	40	40	40	40	36	40	39	32	40	35	29	40	32	26	40	29	24	38	25	20	33	21	17	28	18	15	24	16	13	21	14	11	19	12	10
			Exposed	40	35	29	40	31	26	40	28	23	39	25	21	35	23	19	32	21	17	29	19	16	25	16	13	21	14	11	18	12	10	16	10	8	14	9	11	12	12	10
		20-27	Interior	52	52	52	52	52	44	52	52	38	52	48	33	52	43	29	52	39	26	52	36	24	52	30	20	44	26	17	38	22	15	33	19	13	29	17	11	26	15	10
			Exposed	52	43	29	52	38	26	52	34	23	52	31	21	48	28	19	44	25	17	40	23	16	34	19	13	29	17	11	25	14	10	21	12	8	19	11	7	17	10	10
27-45	Interior	56	56	56	56	56	56	56	56	56	49	56	56	43	56	54	38	55	49	34	50	45	30	42	38	25	36	32	21	31	28	17	27	24	15	24	21	13	21	19	11	
	Exposed	56	54	38	53	48	33	48	43	29	43	38	26	39	35	23	35	32	20	32	29	18	27	24	15	23	21	13	20	18	11	18	16	10	15	14	8	14	12	7		
C	0-7	Interior	39	39	36	39	39	32	39	39	28	39	36	25	39	33	23	39	30	21	38	27	19	32	23	16	27	20	14	23	17	12	20	15	10	18	13	9	16	11	12	
		Exposed	39	33	23	39	29	20	36	26	18	33	23	16	29	21	15	27	19	14	24	18	12	20	15	10	17	13	9	15	11	12	13	10	12	13	9	10	11	8		
	7-20	Interior	40	38	31	40	34	28	40	30	25	40	27	22	38	25	20	35	22	18	32	20	17	27	17	14	23	15	12	20	13	10	17	11	9	15	10	12	13	9	11	
		Exposed	38	24	20	34	22	18	30	20	16	27	18	14	25	16	13	22	14	12	20	13	11	17	11	9	15	10	12	13	13	10	11	11	9	10	10	8	13	9	7	
	20-27	Interior	52	46	32	52	41	28	52	37	25	52	33	22	52	30	20	47	27	18	43	25	17	36	21	14	31	18	12	26	15	10	23	13	9	20	12	8	18	10	7	
		Exposed	52	30	20	46	26	18	41	24	16	37	21	14	33	19	13	30	18	12	28	16	11	23	14	9	20	12	8	17	10	7	15	9	9	13	12	8	12	10	7	
27-45	Interior	56	56	41	56	51	36	51	46	31	46	41	28	42	37	25	38	34	22	35	31	20	29	26	16	25	22	14	22	19	12	19	17	10	17	15	9	15	13	8		
	Exposed	42	37	25	37	33	22	33	30	19	30	27	17	27	24	15	25	28	22	13	23	20																				

