

Design Criteria for Span Tables:

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

Building Assumptions

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

Wind Design Assumptions

- Wind loads used are based on ASCE 7-16 Sec 29.4.4 with Provisions from SEAOC PV2-2017
- Exposure Category B, C, or D
- Basic Wind Speed = 90 – 180 mph
- Level terrain. Topographic factor, $k_{zt} = 1.0$
- $\gamma_E = 1.0$ for ‘Interior’ spans, $\gamma_E = 1.5$ for ‘Exposed’ spans (ASCE 7-16, Fig. 29.4-7)

Snow Design Assumptions

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

Seismic Design Assumptions

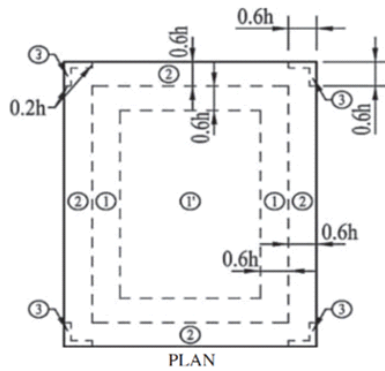
- 0.2-s Spectral Response Acceleration, $S_S \leq 3$
- $S_S = 1.25$ and 3 per criteria shown on individual span tables sheets.
- $S_1 = 0.5$
- Seismic site class D

Array Assumptions

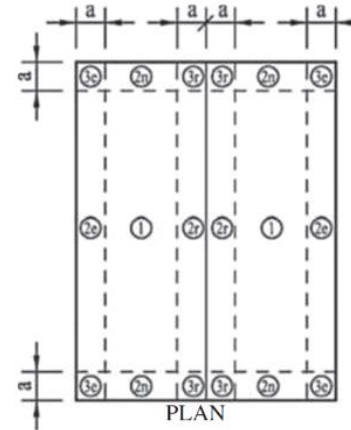
- Module orientation and Rail direction per criteria shown on individual span tables sheets.
- Maximum module dimensions of 40.1” x 67” (~19 sq.ft, 47.65 lbs) and 41” x 80” (~23 sq.ft, 58.6 lbs) per criteria shown on individual span tables sheets.
- Minimum distance between modules and roof edge is at least twice the module height above roof surface.
- Modules are parallel to roof surface and maximum height above roof surface is 5” to 10” depending on attachment type.
- Gaps between module rows and columns is 0.25” in to 1” depending on clamp type.
- The most restrictive of all roof zone spans shall be used when any part of the module is attributed to that span.
- ‘Exposed’ spans as defined in ASCE 7-16 sec. 29.4.4 shall be used when any part of an exposed module or panel as is attributed to that span.

Span Tables

Zone should be considered as per ASCE 7-16, Fig. 30.3-2A to 30.3-2D



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

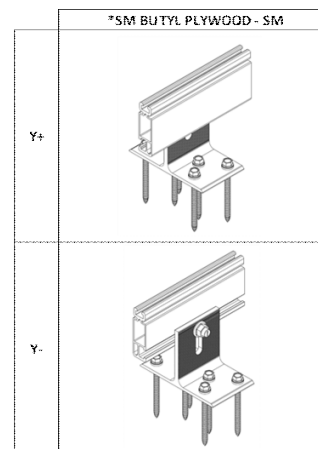


Gable Roofs $7^\circ < \theta \leq 45^\circ$

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.



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	1	2	3																																				
0	B	0-7	Interior	46	46	43	46	46	38	46	46	34	46	45	30	46	40	27	46	36	25	46	32	23	38	27	19	32	23	16	28	20	14	24	17	12	21	15	11	19	13	9	10	8	9	9	9																																		
			Exposed	46	39	27	46	35	24	44	31	22	39	28	19	35	25	18	32	23	16	29	21	15	24	17	12	21	15	10	18	13	9	15	11	8	14	10	7	12	9	7	12	9	7	12	9	7																																	
		7-20	Interior	47	47	37	47	41	33	47	36	29	47	32	26	47	29	24	42	26	22	38	24	20	32	20	17	27	17	14	23	15	12	20	13	11	18	11	9	16	10	8	9	10	8	9	10	8	9																																
			Exposed	47	29	24	41	26	21	36	23	19	32	21	17	29	19	15	26	17	14	24	16	13	20	13	11	17	11	9	15	10	8	13	8	7	11	7	9	10	10	8	9	10	8	9																																			
		20-27	Interior	47	47	47	47	47	41	47	45	35	47	39	30	47	36	26	47	32	23	47	29	21	44	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	9	10	8	9																																			
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	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	48	48	48	48	48	48																																		
		Exposed	48	45	33	46	39	29	39	35	25	35	32	22	32	29	20	29	26	18	27	24	16	22	20	13	19	17	11	16	15	9	14	13	8	13	11	7	11	10	6	10	6	10	6	10																																			
	C	0-7	Interior	46	42	29	46	38	26	46	33	23	42	30	21	38	27	19	34	25	17	31	22	16	26	19	13	22	16	11	19	14	10	17	12	8	15	11	7	13	9	7	10	8	9	10	8	9																																	
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20-27		Interior	47	38	29	47	34	25	47	30	21	47	27	19	43	25	17	39	22	15	36	20	14	30	17	12	25	15	10	22	13	8	19	11	7	17	10	6	15	8	6	15	8	6	15	8	6																																		
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27-45	Interior	48	48	36	48	42	32	43	38	28	38	34	24	34	31	22	31	28	19	29	25	17	24	21	14	21	18	12	16	10	15	14	8	14	12	7	12	11	6	10	9	7	12	11	6	10																																			
	Exposed	34	31	21	31	27	19	27	24	16	25	22	14	22	20	13	20	18	12	18	12	10	16	14	8	13	12	7	11	10	6	10	9	5	9	8	7	8	7	8	7	8	7	6																																					
D	0-7	Interior	46	35	24	44	31	22	39	28	19	35	25	17	31	23	16	28	20	14	26	19	13	22	16	11	19	13	9	16	12	8	14	10	7	12	9	9	11	8	8	9	11	8	8																																				
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		Exposed	26	17	14	23	15	12	21	13	11	19	12	10	17	11	9	15	10	8	14	9	7	12	8	10	10	8	9	9	7	7	6	7	7	6	7	7	6	7	6	7	6	7	6																																				
	20-27	Interior	47	32	23	47	28	20	45	25	17	40	23	15	36	20	14	32	19	13	29	17	11	25	14	10	21	12	8	18	10	7	16	9	6	14	8	5	12	7	7	11	9	6	9	8	7	7																																	
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27-45	Interior	46	40	29	40	35	25	35	32	22	32	28	20	29	26	17	26	23	16	24	21	14	20	18	11	17	15	9	15	13	8	13	12	7	11	10	6	10	9	5	9	15	10	9	5																																				
	Exposed	29	26	17	25	23	15	23	20	12	23	21	18	12	19	17	10	17	15	9	15	14	8	13	12	7	11	10	6	10	9	5	8	7	7	7	10	6	10	9	5	10	9	5																																					
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		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																																
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		20-27	Interior	43	43	43	43	43	41	43	43	35	43	39	30	43	36	26	43	32	23	43	29	21	43	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	9	10	8	9																																			
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	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	47	47	47	47	47	47																																		
		Exposed	47	45	33	46	39	29	39	35	25	35	32	22	32	29	20	29	26	18	27	24	16	22	20	13	19	17	11	16	15	9	14	13	8	13	11	7	11	10	6	10	6	10	6	10																																			
	C	0-7	Interior	33	33	29	33	33	26	33	33	23	33	30	21	33	27	19	33	25	17	31	22	16	26	19	13	22	16	11	19	14	10	17	12	8	15	11	7	13	9	7	10	8	9	10	8	9																																	
			Exposed	33	27	19	33	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	10	7	12	8	9	7	7	8	9	6	7	8	5	6																																			
		7-20	Interior	33	31	26	33	28	23	33	25	20	33	22	18	31	20	17	29	18	15	26	17	14	22	14	12	19	12	10	16	10	8	14	9	7	12	8	10	11	7	9	7	10	8	9																																			
			Exposed	31	20	17	28	18	15	25	16	13	22	14	12	20	13	11	18	12	10	17	11	9	14	9	7	12	8	10	10	7	8	9	9	7	8	8	6	7	7	6	7	6	7	6																																			
20-27		Interior	43	38	29	43	34	25	43	30	21	43	27	19	43	25	17	39	22	15	36	20	14	30	17	12	25	15	10	22	13	8	19	11	7	17	10	6	15	8	6	15	8	6																																					
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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.

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

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

Ground Snow Load (psf)	Wind Exposure Category	Roof Tilt Angle (deg)	Panel Exposure	Basic Wind Speed (mph)																																																																									
				Roof Wind Zone																								160				170		180																																											
				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	1	2	3	1	2	3	1	2	3																																	
0	B	0-7	Interior	77	77	77	77	77	64	77	77	57	57	77	77	51	77	69	46	77	60	42	77	55	38	64	46	32	55	39	27	47	34	24	41	29	21	36	26	18	32	23	16																																		
			Exposed	77	77	68	46	77	59	41	77	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	20	15	16																																		
		7-20	Interior	77	77	63	77	77	56	77	61	50	77	55	45	77	49	40	73	45	77	64	41	34	53	34	28	45	29	24	39	25	21	34	22	18	30	19	16	26	17	14																																			
			Exposed	77	77	49	40	70	44	36	61	39	32	55	35	29	49	32	26	45	29	24	41	26	22	34	22	18	29	19	16	25	16	14	22	14	12	19	13	16	17	11	14																																		
		20-27	Interior	78	78	78	78	78	78	78	78	59	78	73	51	78	60	45	78	54	39	78	50	35	78	42	28	62	35	24	53	31	21	46	27	18	41	23	16	36	21	14																																			
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	C	0-7	Interior	80	80	80	80	80	80	80	80	80	80	80	80	80	66	80	56	80	77	50	80	62	45	58	52	37	50	44	30	43	38	26	37	33	22	33	29	19	29	26	16																																		
			Exposed	80	80	56	80	69	49	80	59	43	60	53	38	54	48	33	49	44	30	45	40	27	38	34	22	32	29	18	28	25	15	24	22	13	21	19	12	19	17	10																																			
		7-20	Interior	77	77	50	77	64	44	77	57	39	77	51	35	64	46	32	58	42	29	53	38	27	44	32	22	38	27	19	32	23	16	28	20	14	25	18	13	22	16	11																																			
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		20-27	Interior	77	53	43	77	47	39	66	42	35	59	38	31	53	34	28	48	31	26	44	28	23	37	24	20	31	20	17	27	18	15	24	15	13	21	14	11	18	12	15																																			
			Exposed	53	34	28	47	30	25	42	27	22	38	24	20	34	22	18	31	20	17	28	18	15	24	16	13	20	13	17	18	11	14	15	15	13	14	13	14	12	12	16																																			
D	0-7	Interior																																																																											

* 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 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.

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

[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.

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)																																																																													
				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	1	2	3																																				
0	B	0-7	Interior	46	46	43	46	46	38	46	46	34	46	45	30	46	40	27	46	36	25	46	32	23	38	27	19	32	23	16	28	20	14	24	17	12	21	15	11	19	13	9	10	8	9	9	9																																		
			Exposed	46	39	27	46	35	24	44	31	22	39	28	19	35	25	18	32	23	16	29	21	15	24	17	12	21	15	10	18	13	9	15	11	8	14	10	7	12	9	10	8	9	9	9																																			
		7-20	Interior	47	47	37	47	41	33	47	36	29	47	32	26	47	29	24	42	26	22	38	24	20	32	20	17	27	17	14	23	15	12	20	13	11	18	11	9	16	10	8	9	9	9																																				
			Exposed	47	29	24	41	26	21	36	23	19	32	21	17	29	19	15	26	17	14	24	16	13	20	13	11	17	11	9	15	10	8	13	8	7	11	7	9	10	10	8	9	9	9																																				
		20-27	Interior	47	47	47	47	41	47	45	35	47	39	30	47	36	26	47	32	23	47	29	21	44	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	9	9	9																																					
			Exposed	47	35	26	47	31	22	47	28	20	45	25	17	40	23	15	36	21	14	33	19	13	28	16	11	24	14	9	20	12	8	18	10	7	15	9	6	14	8	9	9	9																																					
	27-45	Interior	48	48	48	48	48	48	48	48	43	48	48	38	48	40	30	41	37	27	35	31	22	29	26	18	25	23	15	22	20	13	19	17	11	17	15	10	9	9	9	9	9																																						
		Exposed	48	45	33	46	39	29	39	35	25	35	32	22	32	29	20	29	26	18	27	24	16	22	20	13	19	17	11	16	15	9	14	13	8	13	11	7	11	10	6	9	9	9																																					
	C	0-7	Interior	46	42	29	46	38	26	46	33	23	42	30	21	38	27	19	34	25	17	31	22	16	26	19	13	22	16	11	19	14	10	17	12	8	15	11	7	13	9	10	8	9	9	9																																			
			Exposed	38	27	19	33	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	10	11	8	9	7	7	8	9	6	9	9	9																																					
		7-20	Interior	47	31	26	44	28	23	39	25	20	35	22	18	31	20	17	29	18	15	26	17	14	22	14	12	19	12	10	16	10	8	14	9	7	12	8	10	11	7	9	9	9																																					
			Exposed	31	20	17	28	18	15	25	16	13	22	14	12	20	13	11	18	12	10	17	11	9	14	9	7	12	8	10	10	7	8	9	9	7	8	8	6	7	7	6	9	9	9																																				
20-27		Interior	47	38	29	47	34	25	47	30	21	47	27	19	43	25	17	39	22	15	36	20	14	30	17	12	25	15	10	22	13	8	19	11	7	17	10	6	15	8	9	9	9																																						
		Exposed	43	24	16	38	22	15	34	19	13	30	17	12	28	16	11	25	14	10	23	13	9	19	11	7	16	9	6	14	8	5	12	7	7	11	9	6	9	8	6	9	9																																						
27-45	Interior	48	48	36	48	42	32	43	38	28	38	34	24	34	31	22	31	28	19	29	25	17	24	21	14	21	18	12	16	10	15	14	8	14	12	7	12	11	6	9	9	9																																							
	Exposed	34	31	21	31	27	19	27	24	16	25	22	14	22	20	13	20	18	12	18	17	10	16	14	8	13	12	7	11	10	6	10	9	5	9	8	7	8	7	6	9	9	9																																						
D	0-7	Interior	46	35	24	44	31	22	39	28	19	35	25	17	31	23	16	28	20	14	26	19	13	22	16	11	19	13	9	16	12	8	14	10	7	12	9	9	11	8	8	9	9	9																																					
		Exposed	31	22	16	28	20	14	25	18	12	22	16	11	20	15	10	18	13	9	17	12	8	14	10	7	12	9	9	10	7	8	9	10	7	8	9	6	7	8	5	9	9	9																																					
	7-20	Interior	41	26	21	36	23	19	32	21	17	29	19	15	26	17	14	24	15	13	22	14	11	18	12	10	15	10	8	13	9	7	12	7	9	10	7	8	9	9	9	9																																							
		Exposed	26	17	14	23	15	12	21	13	11	19	12	10	17	11	9	15	10	8	14	9	7	12	8	10	10	8	9	9	7	7	7	6	7	7	6	5	9	6	5	9	9	9																																					
	20-27	Interior	47	32	23	47	28	20	45	25	17	40	23	15	36	20	14	32	19	13	29	17	11	25	14	10	21	12	8	18	10	7	16	9	6	14	8	5	12	7	7	6	9	9	9																																				
		Exposed	36	20	14	32	18	12	28	16	11	25	15	10	23	13	9	21	12	8	19	11	7	16	9	6	14	8	12	7	7	10	9	6	9	8	5	8	6	7	5	9	9	9																																					
27-45	Interior	46	40	29	40	35	25	35	32	22	32	28	20	29	26	17	26	23	16	24	21	14	20	18	11	17	15	9	15	13	8	13	12	7	11	10	6	10	9	5	9	9	9																																						
	Exposed	29	26	17	25	23	15	23	20	13	21	18	12	19	17	10	17	15	9	15	14	8	13	12	7	11	10	6	10	9	5	8	7	7	7	10	6	10	9	5	9	9	9																																						
10	B	0-7	Interior	33	33	33	33	33	33	33	33	33	33	30	33	33	27	33	25	33	32	23	33	27	19	32	23	16	28	20	14	24	17	12	21	15	11	19	13	9	10	8	9	9	9																																				
			Exposed	33	33	27	33	33	24	33	31	22	33	28	19	33	25	18	32	23	16	29	21	15	24	17	12	21	15	10	18	13	9	15	11	8	14	10	7	12	9	9	9																																						
		7-20	Interior	33	33	33	33	33	33	33	33	29	33	32	26	33	29	24	33	26	22	33	24	20	32	20	17	27	17	14	23	15	12	20	13	11	18	11	9	16	10	8	9	9	9																																				
			Exposed	33	29	24	33	26	21	33	23	19	32	21	17	29	19	15	26	17	14	24	16	13	20	13	11	17	11	9	15	10	8	13	8	7	11	7	9	10	10	8	9	9	9																																				
		20-27	Interior	43	43	43	43	41	43	43	35	43	39	30	43	36	26	43	32	23	43	29	21	43	25	17	37	21	14	31	18	12	27	16	11	24	14	9	21	12	8	9	9	9																																					
			Exposed	43	35	26	43	31	22	43	28	20	43	25	17	40	23	15	36	21	14	33	19	13	28	16	11	24	14	9	20	12	8	18	10	7	15	9	6	14	8	9	9	9																																					
	27-45	Interior	47	47	47	47	47	47	47	47	47	47	47	47	47	40	30	41	37	27	35	31	22	29	26	18	25	23	15	22	20	13	19	17	11	17	15	10	9	9	9	9																																							
		Exposed	47	45	33	46	39	29	39	35	25	35	32	22	32	29	20	29	26	18	27	24	16	22	20	13	19	17	11	16	15	9	14	13	8	13	11	7	11	10	6	9	9	9																																					
	C	0-7	Interior	33	33	29	33	33	26	33	33	23	33	30	21	33	27	19	33	25	17	31	22	16	26	19	13	22	16	11	19	14	10	17	12	8	15	11	7	13	9	10	8	9	9	9																																			
			Exposed	33	27	19	33	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	10	11	8	9	7	7	8	9	6	9	9	9																																					
		7-20	Interior	33	31	26	33	28	23	33	25	20	33	22	18	31	20	17	29	18	15	26	17	14	22	14	12	19	12	10	16	10	8	14	9	7	12	8	10	11	7	9	9	9																																					
			Exposed	31	20	17	28	18	15	25	16	13	22	14	12	20	13	11	18	12	10	17	11	9	14	9	7	12	8	10	10	7	8	9	9	7	8	8	6	7	7	6	9	9	9																																				
20-27		Interior	43	38	29	43	34	25	43	30	21	43	27	19	43	25	17	39	22	15	36	20	14	30	17	12	25	15	10	22	13	8	19	11	7	17	10	6	15	8	9	9	9																																						
		Exposed	43	24	16	38	22	15	34	19	13	30	17	12	28	16	11	25	14	10	23	13	9	19	11	7	16	9	6	14	8	5	12	7	7	11	9	6	9	8	6	9	9																																						
27-45	Interior	47	47	36	47	42	32	43	38	28	38	34	24	34	31	22	31	28	19	29	25	17	24	21	14	21	18	12	16	10	15	14	8	14	12	7	12	11	6	9	9	9																																							
	Exposed	34	31	21	31	27	19	27	24	16	25	22	14	22	20	13	20	18	12	18	17	10	16	14	8	13	12	7	11	10	6	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.

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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* 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.

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

[illegible]

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

* 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.

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																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
90	B	0-7	Interior	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
			Exposed	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
		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	8	8	8	8	8	7	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	8	8	8	8	7	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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

* 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.

[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.

[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									
				1			2			3			1			2			3			1			2			3			1			2			3			1			2			3			
				Roof Wind Zone																																													
0	B	0-7	Interior	77	77	70	77	77	59	77	77	52	77	74	47	77	61	42	77	55	39	77	50	35	59	42	30	50	36	25	43	31	22	37	27	19	33	24	17	29	21	15	10	10	10	10			
			Exposed	77	61	42	77	54	38	72	48	34	61	43	30	55	39	27	49	36	25	45	32	23	38	27	19	32	23	16	28	20	14	24	18	12	21	15	11	19	14	10	10	10	10				
		7-20	Interior	77	77	58	77	63	51	77	56	46	77	50	41	76	45	37	65	41	34	59	38	31	49	32	26	42	27	22	36	23	19	31	20	17	27	18	15	24	16	13	13	13	13				
			Exposed	75	45	37	63	40	33	56	36	30	50	32	27	45	29	24	41	27	22	38	24	20	32	21	17	27	18	14	23	15	12	20	13	11	18	12	10	16	10	10	10	10	10				
		20-27	Interior	78	78	78	78	78	62	78	78	53	78	61	46	78	55	40	78	50	35	78	46	31	69	38	26	57	33	22	49	28	19	43	25	17	37	22	15	33	19	13	13	13	13				
			Exposed	78	55	40	78	49	34	78	44	30	71	39	27	62	36	24	56	32	22	51	29	20	43	25	17	37	21	14	32	18	12	27	16	11	24	14	10	21	12	8	8	8	8				
	C	0-7	Interior	80	80	80	80	80	80	80	80	73	80	80	58	80	80	80	51	80	63	45	64	57	41	54	48	33	46	41	28	40	35	23	34	31	20	30	27	17	27	24	15	10	10	10			
			Exposed	80	80	51	80	61	44	61	55	39	55	49	34	50	44	30	45	40	27	41	37	24	35	31	20	30	27	17	26	23	14	22	20	12	20	18	11	18	16	10	10	10	10				
		7-20	Interior	77	67	46	77	58	40	77	52	36	66	47	33	59	42	29	53	38	27	49	35	24	41	29	21	35	25	18	30	22	15	26	19	13	23	17	12	20	15	10	10	10	10				
			Exposed	59	42	29	52	37	26	46	33	23	42	30	21	38	27	19	34	25	17	31	23	16	26	19	13	22	16	11	19	14	10	17	12	13	15	11	12	13	10	10	10	10					
		20-27	Interior	77	49	40	70	43	35	60	39	32	54	35	29	49	31	26	44	29	24	40	26	22	34	22	18	29	19	16	25	16	13	22	14	12	19	12	10	17	11	14	14	14					
			Exposed	49	31	26	43	28	23	39	25	21	35	23	19	31	20	17	29	19	15	26	17	14	22	14	12	19	12	10	16	11	13	14	14	12	12	10	11	11	9	9	9	9					
	D	0-7	Interior	78	59	44	78	53	38	78	47	33	78	42	29	68	38	26	61	35	24	55	32	21	46	27	18	39	23	15	34	20	13	30	17	12	26	15	10	23	13	9	9	9	9				
			Exposed	68	38	26	59	34	23	53	30	21	47	27	19	43	25	17	39	23	15	35	21	14	30	17	12	25	15	10	22	13	9	19	11	12	17	10	10	15	13	9	9	9					
		7-20	Interior	80	80	56	80	67	48	80	59	42	59	53	37	54	48	33	49	43	30	44	27	37	33	22	32	29	18	28	25	15	24	22	13	21	19	12	19	12	19	17	10	10	10				
			Exposed	53	48	33	47	42	29	43	38	25	38	34	22	35	31	20	32	48	28	18	29	26	16	24	22	13	21	19	11	18	16	10	16	14	9	14	12	8	12	11	10	10					
		20-27	Interior	77	54	38	73	48	34	60	43	30	54	39	27	49	35	25	44	32	22	40	29	20	34	25	17	29	21	15	25	18	13	22	16	11	19	14	10	17	12	13	13	13					
			Exposed	49	35	24	43	31	22	39	28	20	35	25	18	31	23	16	29	21	15	26	19	13	22	16	11	19	14	10	16	12	13	14	10	11	12	14	10	11	12	9	9	9					
10	B	0-7	Interior	63	41	33	56	36	30	50	32	27	45	29	24	41	26	22	37	24	20	34	22	18	28	18	15	24	16	13	21	14	11	18	12	10	16	10	13	14	14	12	12	12					
			Exposed	41	26	22	36	23	19	32	21	17	29	19	16	26	17	14	24	16	13	22	14	12	18	12	10	16	10	13	14	11	12	12	10	10	9	14	9	8	8	8	8	8					
		7-20	Interior	78	49	35	78	44	30	71	39	26	62	35	24	55	32	22	50	29	20	46	26	18	39	22	15	33	19	13	28	16	11	25	14	10	22	13	9	19	11	12	12	12					
			Exposed	55	32	22	49	28	19	44	25	17	39	23	16	36	21	14	32	19	13	30	17	12	25	15	10	21	12	8	18	11	11	16	14	10	14	13	9	13	11	8	8	8					
		20-27	Interior	80	62	45	61	55	39	55	49	34	49	44	30	45	40	27	41	36	24	37	33	22	31	28	18	27	24	15	23	21	13	20	18	11	18	16	10	16	14	9	9	9	9				
			Exposed	44	40	27	40	35	23	36	32	20	32	29	18	29	26	16	26	24	15	24	22	13	20	18	11	17	16	9	15	14	8	13	12	11	12	10	10	14	9	9	9	9					
	C	0-7	Interior	55	55	46	55	55	40	55	52	36	55	47	33	55	42	29	53	38	27	49	35	24	41	29	21	35	25	18	30	22	15	26	19	13	23	17	12	20	15	10	10	10	10				
			Exposed	55	42	29	52	37	26	46	33	23	42	30	21	38	27	19	34	25	17	31	23	16	26	19	13	22	16	11	19	14	10	17	12	13	15	11	12	13	10	10	10	10					
		7-20	Interior	55	49	40	55	43	35	55	39	32	54	35	29	49	31	26	44	29	24	40	26	22	34	22	18	29	19	16	25	16	13	22	14	12	19	12	10	17	11	14	14	14					
			Exposed	49	31	26	43	28	23	39	25	21	35	23	19	31	20	17	29	19	15	26	17	14	22	14	12	19	12	10	16	11	13	14	14	12	12	10	11	11	9	9	9	9					
		20-27	Interior	72	59	44	72	53	38	72	47	33	72	42	29	68	38	26	61	35	24	55	32	21	46	27	18	39	23	15	34	20	13	30	17	12	26	15	10	23	13	9	9	9	9				
			Exposed	68	38	26	59	34	23	53	30	21	47	27	19	43	25	17	39	23	15	35	21	14	30	17	12	25	15	10</																			

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

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

[illegible]

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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[illegible]

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[illegible]

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	1	2	3	1	2	3	1	2	3																																																																																																												
0	B	0-7	Interior	75	75	65	75	75	57	75	75	51	75	69	46	75	60	42	75	54	38	75	49	34	58	41	29	49	35	25	42	30	21	37	26	19	32	23	16	28	21	14	10	10	10	10	10	10	10	10	10	10	10	10	10																																																																																																								
			Exposed	75	60	41	75	53	37	68	47	33	59	42	30	53	38	27	48	35	24	44	32	22	37	27	19	31	23	16	27	20	14	24	17	12	21	15	11	18	13	14	14	14	14	14	14	14	14	14	14	14	14	14	14																																																																																																								
		7-20	Interior	75	75	57	75	61	50	75	55	45	75	49	40	73	44	36	63	40	33	57	37	30	48	31	25	41	26	22	35	23	19	31	20	16	27	17	14	24	15	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																							
			Exposed	73	44	36	61	39	32	55	35	29	49	32	26	44	29	24	40	26	21	37	24	20	31	20	17	26	17	14	23	15	12	20	13	11	17	11	14	15	10	13	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																									
		20-27	Interior	77	77	77	77	77	60	77	77	51	77	60	45	77	54	39	77	49	35	77	45	31	66	37	25	56	32	22	48	28	19	42	24	16	36	21	14	32	19	13	13	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																								
			Exposed	77	54	39	77	48	34	77	43	29	69	38	26	61	35	24	55	32	21	50	29	20	42	24	16	36	21	14	31	18	12	27	16	11	24	14	9	21	12	8	8	8	8	8	8	8	8	8	8	8	8																																																																																																										
	27-45	Interior	78	78	78	78	78	78	78	78	78	66	78	78	56	78	76	50	78	61	44	63	56	40	53	47	32	45	40	27	39	35	23	34	30	19	30	27	17	26	24	14	14	14	14	14	14	14	14	14	14	14	14	14																																																																																																									
		Exposed	78	75	50	78	60	43	60	53	38	54	48	33	49	43	30	44	40	27	40	36	24	34	30	20	29	26	16	25	23	14	22	20	12	19	17	11	17	15	9	9	9	9	9	9	9	9	9	9	9	9																																																																																																											
	C	0-7	Interior	75	64	45	75	57	40	75	51	35	64	46	32	58	41	29	52	37	26	47	34	24	40	29	20	34	24	17	29	21	15	25	18	13	22	16	11	20	14	10	10	10	10	10	10	10	10	10	10	10	10	10	10																																																																																																								
			Exposed	57	41	29	51	36	26	45	33	23	41	29	21	37	27	19	33	24	17	31	22	16	26	19	13	22	16	11	19	14	15	16	12	13	14	11	11	13	14	11	13	14	14	14	14	14	14	14	14	14																																																																																																											
		7-20	Interior	75	48	39	67	42	35	59	38	31	53	34	28	48	31	25	43	28	23	40	26	21	33	22	18	28	18	15	24	16	13	21	14	11	19	12	10	17	11	11	11	11	11	11	11	11	11	11	11	11	11																																																																																																										
			Exposed	48	31	25	42	27	22	38	24	20	34	22	18	31	20	16	28	18	15	26	17	14	22	14	12	18	12	10	16	10	13	14	14	11	12	12	10	11	11	9	9	9	9	9	9	9	9	9	9	9	9																																																																																																										
20-27		Interior	77	58	43	77	51	37	77	46	32	77	41	28	66	37	25	59	34	23	54	31	21	45	26	18	39	22	15	33	19	13	29	17	11	25	15	10	22	13	9	9	9	9	9	9	9	9	9	9	9	9	9																																																																																																										
		Exposed	65	37	25	58	33	22	52	30	20	46	27	18	42	24	16	38	22	15	35	20	14	29	17	12	25	14	10	22	13	8	19	11	17	15	10	15	13	9	9	9	9	9	9	9	9	9	9	9	9	9																																																																																																											
27-45	Interior	78	78	54	78	64	47	64	57	41	58	52	36	52	47	32	48	43	29	43	29	43	26	37	33	21	31	28	18	27	24	15	24	21	13	21	19	11	18	16	10	10	10	10	10	10	10	10	10	10	10	10	10																																																																																																										
	Exposed	52	47	32	46	41	28	42	37	25	37	33	22	34	30	19	31	28	17	28	25	16	24	21	13	20	18	11	18	16	10	15	14	8	14	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12																																																																																																											
D	0-7	Interior	75	53	37	68	47	33	59	42	30	53	38	27	48	34	24	43	31	22	39	28	20	33	24	17	28	20	14	24	18	12	21	15	11	19	14	15	17	12	13	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																										
		Exposed	48	34	24	42	30	21	38	27	19	34	25	17	31	22	16	28	20	14	25	18	13	21	16	11	18	13	14	16	11	12	14	15	11	12	13	9	11	12	6	6	6	6	6	6	6	6	6	6	6	6																																																																																																											
	7-20	Interior	62	40	33	55	35	29	49	32	26	44	28	23	40	26	21	36	23	19	33	21	18	28	18	15	24	15	13	20	13	11	18	12	15	16	10	13	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14																																																																																																										
		Exposed	40	26	21	35	23	19	32	20	17	28	18	15	26	17	14	23	15	13	21	14	11	18	12	15	15	10	13	13	13	11	12	11	9	16	10	8	14	9	7	7	7	7	7	7	7	7	7	7	7																																																																																																												
	20-27	Interior	77	48	34	77	43	29	68	38	26	60	34	23	54	31	21	49	28	19	45	26	18	38	22	15	32	19	13	28	16	11	24	14	10	21	12	8	19	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11																																																																																																									
		Exposed	54	31	21	48	28	19	43	25	17	39	22	15	35	20	14	32	18	12	29	17	11	24	14	10	21	12	8	18	10	11	16	14	9	14	12	8	12	11	7	7	7	7	7	7	7	7	7	7	7	7																																																																																																											
27-45	Interior	78	60	44	60	54	38	54	48	33	48	43	29	44	39	26	40	36	23	36	32	21	31	27	17	26	23	14	23	20	12	20	18	11	17	16	9	15	14	8	8	8	8	8	8	8	8	8	8	8	8																																																																																																												
	Exposed	44	39	26	39	35	23	35	31	20	31	20	18	28	25	16	26	23	14	24	21	13	20	18	11	17	15	9	15	13	8	13	12	11	11	10	9	10	14	8	8	8	8	8	8	8	8	8	8	8																																																																																																													
10	B	0-7	Interior	53	53	53	53	53	53	53	53	51	53	53	46	53	53	42	53	53	38	53	49	34	53	41	29	49	35	25	42	30	21	37	26	19	32	23	16	28	21	14	10	10	10	10	10	10	10	10	10	10	10	10																																																																																																									
			Exposed	53	53	41	53	53	37	53	47	33	53	42	30	53	38	27	48	35	24	44	32	22	37	27	19	31	23	16	27	20	14	24	17	12	21	15	11	18	13	14	14	14	14	14	14	14	14	14	14	14	14	14																																																																																																									
		7-20	Interior	54	54	44	54	54	50	54	54	45	54	49	40	54	44	36	54	40	33	54	37	30	48	31	25	41	26	22	35	23	19	31	20	16	27	17	14	24	15	13	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																									
			Exposed	54	44	36	54	39	32	54	35	29	49	32	26	44	29	24	40	26	21	37	24	20	31	20	17	26	17	14	23	15	12	20	13	11	17	11	14	15	10	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																										
		20-27	Interior	70	70	70	70	70	60	70	70	51	70	60	45	70	54	39	70	49	35	70	45	31	66	37	25	56	32	22	48	28	19	42	24	16	36	21	14	32	19	13	13	13	13	13	13	13	13	13	13	13	13	13																																																																																																									
			Exposed	70	54	39	70	48	34	70	43	29	69	38	26	61	35	24	55	32	21	50	29	20	42	24	16	36	21	14	31	18	12	27	16	11	24	14	9	21	12	8	8	8	8	8	8	8	8	8	8	8																																																																																																											
	27-45	Interior	75	75	75	75	75	75	75	75	66	75	75	56	75	75	50	75	61	44	63	56	40	53	47	32	45	40	27	39	35	23	34	30	19	30	27	17	26	24	14	14	14	14	14	14	14	14	14	14	14	14	14																																																																																																										
		Exposed	75	75	50	75	60	43	60	53	38	54	48	33	49	43	30	44	40	27	40	36	24	34	30	20	29	26	16	25	23	14	22	20	12	19	17	11	17	15	9	9	9	9	9	9	9	9	9	9	9	9																																																																																																											
	C	0-7	Interior	53	53	45	53	53	40																																																																																																																																																						

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