



June 2, 2017

Mounting Systems, Inc.
820 Riverside Pkwy
Sacramento, California 95606
TEL: (855) 731-9996

Attn.: Mounting Systems, Inc. - Engineering Department

Re: Engineering Certification for the Mounting Systems, Inc. 13/52 Rail Alpha+ System
Project No.: 2014-07680

PZSE, Inc.-Structural Engineers has reviewed Mounting Systems, Inc.'s 13/52 rail span charts, rail allowable uplift wind force and performed rail component capacity check including L foot bracket, end clamp and mid-clamp. All information, data and analysis contained within the Mounting Systems, Inc. rail span charts are based on, and comply with Mounting Systems, Inc.'s *Alpha Engineering and Technical Data* and the following codes:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-05 or ASCE/SEI 7-10
2. 2006 / 2009 or 2012 / 2015 International Building Code, by International Code Council, Inc.
3. 2006 / 2009 or 2012 / 2015 International Residential Code, by International Code Council, Inc.
4. 2010 or 2015 Aluminum Design Manual, by The Aluminum Association
5. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES

Following are typical specifications for the connections to meet the above code requirements:

Attachment Spacing: Mounting Systems, Inc. strongly recommends a maximum span of 8 feet, but in any case, not to exceed the maximum span indicated on the charts.

Cantilever: Maximum cantilever length is $L/3$, where "L" is the span noted in the Span Chart Tables

Clearance: 2" to 10" clear from top of roof to bottom of PV panel

This letter is to certify the structural capacity of the Mounting Systems Inc.'s rail. The requirements of the overall structure need to be in compliance with the above document and codes.

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA



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13/52 Rail Zone 1 Span Chart

Exposure	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	130	9.5	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	140	9.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	150	8.0	8.0	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	160	7.5	7.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	170	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	180	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
Category C	100	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	9.5	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	9.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	130	8.0	8.0	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	140	7.5	7.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	150	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	160	6.5	6.5	6.5	5.5	5.0	5.0	4.5	4.0	4.0	3.5
	170	6.0	6.0	6.0	5.5	5.0	5.0	4.5	4.0	4.0	3.5
	180	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
Category D	100	10.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	9.5	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	9.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	8.5	8.0	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	130	7.5	7.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	140	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	150	6.5	6.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	160	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	170	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	180	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5

- a. The table above ONLY includes 13-52 rail capacity check. It does not include roof attachment or roof capacity check
- b. Wind risk category II per ASCE7-10
- c. Topographic factor, k_{zt} is 1.0
- d. Maximum mean roof height is 60 ft.
- e. Average parapet height is 0 ft
- f. Roof pitch is between 7 degree and 27 degree
- g. Maximum solar panel weight is 50 lbs
- h. Height of solar panel is between 2" and 10" to roof

13/52 Rail Zone 2 Span Chart

Exposure	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	9.5	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	9.0	8.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	8.5	8.0	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	7.5	7.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	130	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	140	6.5	6.5	6.5	5.5	5.0	5.0	4.5	4.0	4.0	3.5
	150	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	160	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	170	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	180	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
Category C	100	8.0	8.0	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	7.5	7.5	7.0	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	7.5	7.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	6.5	6.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	130	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	140	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	150	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	160	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	170	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	3.5
	180	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	3.5
Category D	100	7.5	7.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	6.5	6.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	130	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	140	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	150	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	160	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	3.5
	170	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
	180	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5

- a. The table above ONLY includes 13-52 rail capacity check. It does not include roof attachment or roof capacity check
- b. Wind risk category II per ASCE7-10
- c. Topographic factor, k_{zt} is 1.0
- d. Maximum mean roof height is 60 ft.
- e. Average parapet height is 0 ft
- f. Roof pitch is between 7 degree and 27 degree
- g. Maximum solar panel weight is 50 lbs
- h. Height of solar panel is between 2" and 10" to roof

13/52 Rail Zone 3 Span Chart

Exposure	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	7.5	7.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	105	7.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	110	6.5	6.5	6.5	6.0	5.5	5.0	4.5	4.0	4.0	3.5
	120	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	130	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	140	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	150	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	160	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	3.5
	170	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
	180	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
Exposure	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category C	100	6.5	6.5	6.5	5.5	5.0	5.0	4.5	4.0	4.0	3.5
	105	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	110	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	120	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	130	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	140	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	3.5
	150	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
	160	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
	170	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	180	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Exposure	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category D	100	6.0	6.0	6.0	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	105	5.5	5.5	5.5	5.5	5.0	4.5	4.5	4.0	4.0	3.5
	110	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	120	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.0	4.0	3.5
	130	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	3.5
	140	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
	150	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
	160	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	170	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	180	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

- a. The table above ONLY includes 13-52 rail capacity check. It does not include roof attachment or roof capacity check
- b. Wind risk category II per ASCE7-10
- c. Topographic factor, k_{zt} is 1.0
- d. Maximum mean roof height is 60 ft.
- e. Average parapet height is 0 ft
- f. Roof pitch is between 7 degree and 27 degree
- g. Maximum solar panel weight is 50 lbs
- h. Height of solar panel is between 2" and 10" to roof

13/52 Rail Allowable Uplift Wind Force (plf)															
Rail Span (ft)	70	80	90	100	110	130	150	170	200	240	300	380	480	650	900
3.0															13/52 Rail
3.5														13/52 Rail	
4.0													13/52 Rail		
4.5												13/52 Rail			
5.0											13/52 Rail				
5.5										13/52 Rail					
6.0									13/52 Rail						
6.5								13/52 Rail							
7.0							13/52 Rail								
7.5						13/52 Rail									
8.0					13/52 Rail										
8.5				13/52 Rail											
9.0			13/52 Rail												
9.5		13/52 Rail													
10.0	13/52 Rail														

13/52 Rail Span (ft)	Allowable Uplift Force (lb)
3.0	1764
3.5	1480
4.0	1243
4.5	1101
5.0	960
5.5	838
6.0	756
6.5	690
7.0	651
7.5	598
8.0	533
8.5	510
9.0	480
9.5	444
10.0	402