

STRUCTURAL REPORT

Magerack Series 101 PV Mounting System

130 mph Wind, Exposure B & C

California

DESIGNER OF RECORD

Magerack Corporation

4453 Enterprise Street
Fremont, CA 94538

Date: January 1, 2015



INTRODUCTION

The purpose of this report is to summarize the results of our structural calculations for the Magerack Series 101 Photovoltaic Mounting System, dated February 18, 2011. The design wind calculations are in accordance with the Section 1609.6 Alternate All-Heights Method of 2013 California Building Code (CBC) wind design provisions on regularly shaped buildings with conditions as stated in section 1609.6.1 of the 2013 CBC. Design snow loads are determined in accordance with Section 1608 of the 2013 CBC. The support system has been designed to withstand code-prescribed forces due to the support system's own weight, the weight of the solar panels, snow loads, and wind forces, using LRFD load combinations.

RAIL SPANS

The main rails which support the solar panels shall be supported by Standoffs at certain intervals. The Standoffs are attached to the roof framing. The maximum span of the rails are calculated for various loading conditions and the results are shown for 8'-0", 6'-0", 4'-0", and 2'-0" rail spans supported by Standoff Shaft or L-Foot.

Several factors that would produce multiple load cases and load combinations have been considered in our analysis. These factors include building height, pitch of the panels, wind exposure region B and C, wind speed, and snow loads.

SITE-SPECIFIC ANALYSIS

There may be certain cases which will require a site-specific analysis to be performed in order to determine the allowable spans for the rails. Such cases include, but are not limited to, installations over open or partially enclosed structures, structures having Monoslope, Stepped, Multispan Gable, Sawtooth, Mansard, Arched or Domed roofs, and building sites where a topographic effect needs to be considered (e.g. hills, mesas, seashore). A site-specific analysis is required if it is found that the location of the solar panel installation corresponds to any of the following conditions:

- The solar panels are installed at locations other than Zone 1 or Zone 2 of Gable or Hipped roof configurations for regularly shaped, enclosed structures per table 1609.6.2(2) of CBC 2013 edition. For description of Zone 1 and Zone 2, see ASCE 7-10 Components and Cladding - Part 4 Table 30.7-2.
- Tributary width of applied loads from the photovoltaic module, including module's overhang, to each rail exceeds 33 inches.
- The total slope of the solar panel (solar panel pitch plus roof pitch) is greater than 45 degrees above the horizontal.
- The roof of the structure that the solar panels are to be installed on is greater than 50 feet above grade.
- A combination of loads and/or site conditions applies that is not addressed in the attached rail span charts.



RACKING CONNECTIONS TO THE EXISTING ROOF

Magerack components for transferring the rail forces to roof framing consist of Standoff Shaft, and L-Foot. These components accommodate up to 3/8" diameter fasteners (lag screws or through bolts) to be used for attachments to roof framing. Appropriate depth of penetration for lag screws and material specifications of the fasteners shall be determined in accordance to applicable codes by the project's Structural-Engineer-of-Record prior to the installation of the photovoltaic and racking system.

RAIL SPAN TABLES

Our structural evaluation of the rails is based on analytical procedures. The attached tables as shown on pages 4 through 11, contain allowable spans of the rails and the allowable interior support reactions for some of the most common building configurations with varying snow conditions and basic wind speed of 130 miles per hour for exposures B and C. These tables can be used as a reference for selecting maximum rail span lengths based on the height above grade, and total pitch of the panels. The PV modules shall be parallel to surface of the roof with no more than 10 inches of space between the roof surface and bottom of the PV module.

EXISTING BUILDING LIMITATIONS AND EXCEPTIONS

The attached tables and information presented on the following pages are intended as a guide, and only for the structural adequacy of the solar racking system itself. The ability of the existing roofing or roof framing to support the new loads imposed upon them by the new system, as well as, the new localized forces between the roofing and the roof framing that may be imposed by the new standoff installations, are not addressed in this report. Furthermore, this report does not address the additional lateral forces that will be imposed upon the building due to added seismic mass by the new system. Prior to installation of the photovoltaic and racking system, the user and/or project's Structural-Engineer-of-Record shall determine structural adequacy of supports and the supporting structure and shall also determine compliance with applicable codes.

When installing the photovoltaic and racking systems, it is the responsibility of the contractor or professional solar installer to provide waterproofing, roofing repairs, and proper drainage.

DRAWING REFERENCES

All sizes, material specifications, and weights are based on the Magerack's design drawings listed below:

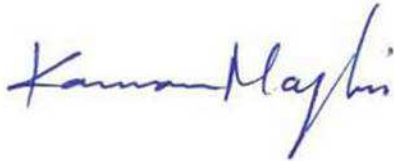
DRAWING TITLE	DRAWING NUMBER	DATE	REVISION
Rail	101-001-101/2/3	02/18/11	
Rail Nut	101-001-201	02/18/11	
Rail Connector (splice)	101-001-301	02/18/11	
Rail Connector Nut	101-001-202	02/18/11	
Mid Clamp Top	101-002-101	02/18/11	
Mid Clamp Bottom	101-002-201	02/18/11	
End Clamp Top	101-003-101/2/3/4/5	02/18/11	
End Clamp Bottom	101-003-201	02/18/11	
L-Foot	101-006-102	03/08/11	
Standoff Shaft	101-007-101/2/3/4	02/18/11	
Standoff Base	101-007-201	03/08/11	
L-Foot for Standoff	101-007-301	02/18/11	



Rails and components of Magerack system are manufactured from Aluminum alloy 6061-T6. Magerack's nuts and bolts mounted to the Magerack rails and fittings shall be tightened to 12 ft-lbs for 5/16" diameter and 19 ft-lbs for 3/8" diameter, Stainless Steel bolts.

Seismic Consulting Engineers assumes that the racking systems are installed to the specifications presented in Magerack's installation manual and the requirements contained in this report.

Sincerely,



Kamran R. Majlessi, P.E.
Principal
Seismic Consulting Engineers



MAGERACK CORPORATION
SERIES 101 PV MOUNTING SYSTEM
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT SUPPORTS
130 mph Wind Speed, Exposure B, Enclosed Building, Risk Category Type II
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 1

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	6.0
0 to 19 Degree Pitch 0-10 psf Ground Snow Load	6.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.3
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	6.0
0 to 19 Degree Pitch 0-10 psf Ground Snow Load	6.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.3
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	6.0
20 to 30 Degree Pitch 0-10 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 0-10 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.3

See notes on page 11



MAGERACK CORPORATION
SERIES 101 PV MOUNTING SYSTEM
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT SUPPORTS
130 mph Wind Speed, Exposure B, Enclosed Building, Risk Category Type II
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 1

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	6.0
31 to 45 Degree Pitch 0>-10 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 0-10 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Maximum Design Reactions at Mid-Support ⁽¹²⁾⁽¹³⁾	
Force Direction	Reaction (lbs)
Uplift Perpendicular to Module	539
Downforce Perpendicular to Module	512
Shear Parallel to Module	91

See notes on page 11



MAGERACK CORPORATION
SERIES 101 PV MOUNTING SYSTEM
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT SUPPORTS
130 mph Wind Speed, Exposure B, Enclosed Building, Risk Category Type II
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 2

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	4.0
<hr/>	
0 to 19 Degree Pitch 0>-10 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.3
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	2.0
<hr/>	
0 to 19 Degree Pitch 0-10 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.3
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	4.0
<hr/>	
20 to 30 Degree Pitch 0>-10 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	4.0
<hr/>	
20 to 30 Degree Pitch 0-10 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.3

See notes on page 11



MAGERACK CORPORATION
SERIES 101 PV MOUNTING SYSTEM
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT SUPPORTS
130 mph Wind Speed, Exposure B, Enclosed Building, Risk Category Type II
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 2

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 0>-10 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 0-10 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Maximum Design Reactions at Mid-Support ⁽¹²⁾⁽¹³⁾	
Force Direction	Reaction (lbs)
Uplift Perpendicular to Module	533
Downforce Perpendicular to Module	497
Shear Parallel to Module	91

See notes on page 11



MAGERACK CORPORATION
SERIES 101 PV MOUNTING SYSTEM
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT SUUPORTS
130 mph Wind Speed, Exposure C, Enclosed Building, Risk Category Type III
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 1

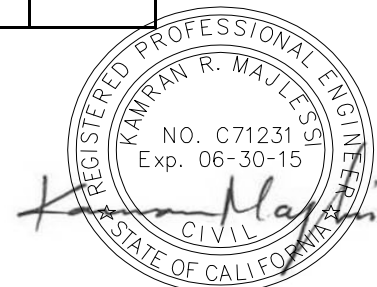
Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	4.0
<hr style="border-top: 1px dashed black;"/>	
0 to 19 Degree Pitch 0>-10 psf Ground Snow Load	4.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.3
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	2.0
<hr style="border-top: 1px dashed black;"/>	
0 to 19 Degree Pitch 0-10 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.3
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	2.0
<hr style="border-top: 1px dashed black;"/>	
20 to 30 Degree Pitch 0>-10 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	1.3
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.3

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	2.0
<hr style="border-top: 1px dashed black;"/>	
20 to 30 Degree Pitch 0-10 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	1.3
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.3

See notes on page 11



MAGERACK CORPORATION
SERIES 101 PV MOUNTING SYSTEM
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT SUUPORTS
130 mph Wind Speed, Exposure C, Enclosed Building, Risk Category Type III
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 1

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 0>-10 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 0-10 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Maximum Design Reactions at Mid-Support ⁽¹²⁾⁽¹³⁾	
Force Direction	Reaction (lbs)
Uplift Perpendicular to Module	441
Downforce Perpendicular to Module	455
Shear Parallel to Module	85

See notes on page 11



MAGERACK CORPORATION

MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT

130 mph Wind Speed, Exposure C, Enclosed Building, Risk Category Type III

2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 2

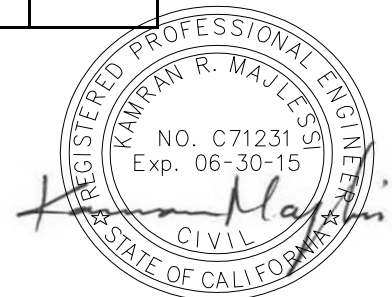
Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 0>-10 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.33
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.33

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
0 to 26 Degree Pitch 0 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 0-10 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 11-20 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 21-30 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 31-40 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 41-60 psf Ground Snow Load	2.0
0 to 19 Degree Pitch 61-80 psf Ground Snow Load	1.33
0 to 19 Degree Pitch 81-100 psf Ground Snow Load	1.33

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 0>-10 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	2.00
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.33

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
27 to 30 Degree Pitch 0 psf Ground Snow Load	4.0
20 to 30 Degree Pitch 0-10 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 11-20 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 21-30 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 31-40 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 41-60 psf Ground Snow Load	2.0
20 to 30 Degree Pitch 61-80 psf Ground Snow Load	2.00
20 to 30 Degree Pitch 81-100 psf Ground Snow Load	1.33

See notes on page 11



MAGERACK CORPORATION
MAXIMUM RAIL SPANS BETWEEN STANDOFF SHAFT OR L-FOOT
130 mph Wind Speed, Exposure C, Enclosed Building, Risk Category Type III
2013 CBC, Components and Claddings, Gable or Hipped roof configurations, Zone 2

Building Ht. is 30 ft. or Less	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 0>-10 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Building Ht. is 31 ft. to 50 ft.	
Conditions	Span (ft)
31 to 45 Degree Pitch 0 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 0-10 psf Ground Snow Load	4.0
31 to 45 Degree Pitch 11-20 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 21-30 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 31-40 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 41-60 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 61-80 psf Ground Snow Load	2.0
31 to 45 Degree Pitch 81-100 psf Ground Snow Load	2.0

Maximum Design Reactions at Mid-Support ⁽¹²⁾⁽¹³⁾	
Force Direction	Reaction (lbs)
Uplift Perpendicular to Module	583
Downforce Perpendicular to Module	482
Shear Parallel to Module	91

Notes

- 1) Wind loads are determined in conformance with 2013 edition of the California Building Code Section 1609A.6 "Alternate All-Heights Method" for regularly shaped enclosed buildings, or other enclosed structures that are regularly shaped, which meet all of the Section 1609A.6.1 CBC 2013 conditions.
- 2) Wind topographic factor $K_{tz} = 1.00$
- 3) Snow load importance factor $I_s = 1.00$
- 4) Snow exposure factor $C_e = 0.9$
- 5) Thermal factor $C_t = 1.2$
- 6) Localized load intensities produced by snow drifts and unbalanced snow loads have not been considered.
- 7) Module frame ends shall not overhang mounting rails by more than 25% of total module frame length.
- 8) Module overhangs shall be symmetrical on both sides.
- 9) Tributary width of applied loads, including module's overhang, to each mounting rail shall not exceed 33 inches.
- 10) Rail end cantilever length shall not exceed 30% of allowable rail span.
- 11) The modules shall be parallel to surface of the roof with no more than 10 inches of space between the roof surface attachment and bottom of the PV module.
- 12) Maximum design reactions are based on allowable rail spans and include all loading and slope conditions.
- 13) Actual mid-support reactions shall not exceed the values listed.
- 14) All allowable loads and rail spans published in these charts are based on "LRFD" load combinations of CBC 2013.
- 15) All allowable loads and rail spans published in these charts are subject to change without notice.

