SM SOLAR MOUNT

DESIGN & ENGINEERING GUIDE

SOLARMOUNT ENHANCEMENTS: FLUSH-TO-ROOF DESIGN

PUB14DEC18

Table of Contents

Letter to the Consumer

To you, Our Loyal Customer:

The SOLARMOUNT product line has been upgraded to incorporate the needs of you, our customer. While the system rails remain the same, Unirac has enhanced SOLARMOUNT with the following improvements:

- Integrated Bonding Rail Splice
- Integrated Bonding Module Midclamp Assembly
- Module Endclamp Assembly
- Bonding Microinverter Mounting Bolt Assembly
- Wire Management Clip
- Integrated Bonding L-Foot T-Bolt

The goal of these enhancements was to permit for easier installation, reduce time spent in the field, and as always, to provide you with a quality product you can rely on for years to come.

In addition to these improvements, Unirac has teamed up with TÜV Rheinland. Our system now has integrated full system grounding and bonding to UL 2703. As an added bonus, if you utilize Enphase Energy Microinverters in addition to your Unirac SOLARMOUNT system components, lugs and coper wire are not required for the system. Grounding and bonding of modules is accomplished with the clamps. This will save you both time and money on your installation!

When you select a Unirac system, you select a quality system with years of engineering behind it. We hope these improvements serve you well with your upcoming installation.

Getting Started - Introduction

This manual is for professional engineers and permitting authorities. For assistance with your array's engineering and a Bill of Materials, see our U-Builder at http://design.unirac.com/tool/project_info/solarmount_2/?pitched=true

SOLARMOUNT Flush-to-Roof is an extruded aluminum rail system that is engineered to hold most framed solar modules to a roof structure and installed parallel to the roof. With SOLARMOUNT, you'll be able to solve virtually any PV module mounting challenge.

Some of the features of this product include:

- Integrated Full System Grounding and Bonding to UL 2703
  - Integrated Bonding Rail Splice
  - Integrated Bonding Module Midclamp Assembly
  - Module Endclamp Assembly
  - Bonding Microinverter Mounting Bolt Assembly
  - Integrated Bonding L-Foot T-Bolt
- Module Landscape (with rails running north/south) or Portrait (with rails running east/west) Orientation
- Works with Most Framed Modules
- Wire Management Clip
- Designed per the ASCE 7-05 and ASCE 7-10 Building Code
- Component Testing
- Rigorous Engineering Analysis

Installer Responsibility & Disclaimer

Please review this guide and the SOLARMOUNT Installation Guide thoroughly before installing your SOLARMOUNT system. These guides provide supporting documentation for building permit applications, planning and assembling the SOLARMOUNT system.

The installer is solely responsible for:

- Complying with all applicable local or national building codes, including code requirements that can be more strenuous than the guidelines set forth in this manual;
- Maintaining and enforcing all aspects of a safe working environment;
- Ensuring that Unirac and other products are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, connections, and any other structural support members can support the array under all code level loading conditions (this total building assembly is referred to as the building structure);
- Using only Unirac parts and installer-supplied parts as specified by Unirac (substitution of parts may void the warranty and invalidate the letters of certification in all Unirac publications);
- Ensuring that lag screws have adequate pullout strength and shear capacities as installed;
- Verifying the strength of any alternate mounting if used in lieu of the lag screws;
- Maintaining the waterproof integrity of the roof, including selection and proper installation of appropriate flashing;
- Ensuring safe installation of all electrical aspects of the PV array, including proper grounding/bonding;
- Array shading and output analysis;
- Ensuring correct and appropriate design parameters are used in determining the design loading used for design of the specific installation. Parameters, such as snow loading, wind speed, exposure and topographic factor should be confirmed with the local building official or a licensed professional engineer.

Unirac shall not be liable for any losses, damages, or injuries that directly or indirectly result from any non-conformance with the above.

Design Methodology

SOLARMOUNT was designed using the *Minimum Design Loads for Buildings and Other Structures* by the *American Society of Civil Engineers and Structural Engineering Institute,* 2005 and 2010 editions. These are referred to as ASCE 7-05 and ASCE 7-10, respectively. Three methods have been provided to aide in design of your project. The use of these methods is discussed in the *Project Requirements & Design Aid* section in the next page.

Quick Note – The online U-Builder is highly recommended for all projects. It will provide you with a Bill of Materials, Certification Letter, and Calculations for your project. Please review Table 1 in the *Project Requirements and Design Aid* section of this Guide.

Project Requirements & Design Aid

Table 1 - Project Requirements & Design Aid

Project Requirements (Blank Cells for Project Specific Input Provided for your Convenience)		Design Aid					
		U-Builder[1a] (Online Design Tool)		Prescriptive Design Method[1b]		Do It Yourself[1c] (Analytical Method)	
Project Name:							
Project Address:							
AHJ (Authority Having Jurisdiction):							
Current Adopted Building Code:		ASCE 7-05	ASCE 7-10	ASCE 7-05	ASCE 7-10	ASCE 7-05	ASCE 7-10
Local Jurisdiction Code Amendments:							
Occupancy/Risk Category*:		II		II		As Permitted by Code	
Basic Wind Speed*:		85-150 mph	110-170 mph	***	***	As Permitted by Code	
Wind Exposure Category*:		B or C		B, C or D		As Permitted by Code	
Ground Snow Load*:		0-60 psf		***		As Permitted by Code	
Seismic Coefficient, Ss*:		⩽ 3.1g		⩽ 3.1g		As Permitted by Code	
Roof Height (Eave & Ridge)*:		≤ 30 feet		≤ 60 feet		As Permitted by Code	
Roof Slope*:		0-45 Degrees		0-45 Degrees		As Permitted by Code	
Roof Zone(s)*:		1, 2, or 3		1, 2, and 3		As Permitted by Code	
Framed Module Type & Module*:		User Input		Most 60 and 72 Cell		User Input	
Module Weight*:		Module Dependent		See Appendix E		User Input	
Module Dimensions*:		Module Dependent		Module Dependent		User Input	
Total Module Quantity*:		1 to 200		Unlimited		User Input	
Design Method:		Allowable Stress Design		Allowable Stress Design		Unlimited**	
Project Specific Calculations for Solar System Provided:		Yes		No		No	
Stamped/Certified Engineering Letter for Solar System Provided:		Yes		Yes		No	
Bill of Materials for Unirac Components of Solar System Provided:		Yes		No		No	

* Requirements must fall within defined range to utilize specified design aid.

** The design professional could use the appropriate code to perform the design in LRFD, LSD, or ASD. The ASD procedure for the Analytical Method has been provided.

*** Prescriptive Pressure tables located in Appendix B and Online. Pressure Tables exist for Basic Wind Speeds of 85-170 mph for ASCE 7-05 and 110-190 mph for ASCE 7-10.

1a. U-Builder: This is an easy-to-use online design tool that is recommended for all preliminary and final designs, estimating, and layout validation. It is located on our website at www.unirac.com.

The U-Builder allows for a customized project design that results in a final design, bill of materials, price quote and stamped/certified engineering approval letters.

1b. Prescriptive Design Method: This method is a simplified approach to the design of your SOLARMOUNT project. This method is recommended when computers or internet access is not available. Once project specific requirements are known, the project design load pressures can be looked up in the Pressure Lookup Tables located in Appendix B. If additional tables are needed, they can be found online at www.unirac.com .

1c. Do It Yourself (Analytical Method): This design approach follows the ASD calculations step by step through both the ASCE 7-05 and 7-10 design codes. Equations, figures, tables, and commentary are provided for your convenience to aid in generating the specific design load pressures for your loading conditions, such as wind and snow. This method has been provided for design or layout requirements that fall outside of the other two options or for design professionals that prefer to perform their own calculation package.

Prescriptive Design Method - Quick Design Steps

Step 1: **Define Project Requirements**

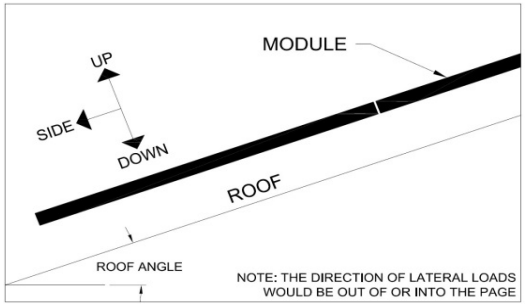
a. Fill in the Table 1 - Project Requirements & Design Aid on previous page.
b. Once project specific information is determined, confirm that the Prescriptive Design Method may be utilized.
c. Review the Prescriptive Pressure Tables in the Appendix to see if they meet your needs. If a more precise design is needed (if the tables in the Appendix don't meet your project requirements, but per Table 1, you can still utilize the Prescriptive Design Method) please utilize the online tool for design.

Step 2: **Create Initial Array Layout**

a. Identify the structural supporting members of your building. A sketch/drawing of the roof/building with location of supporting members, vents, skylights, cable/wires, areas to avoid, etc., is highly recommended.
b. Create a "rough draft" layout of solar modules on the actual project roof. (Refer to the SOLARMOUNT Installation Guide.)

Step 3: **Determine Array Design Pressure by Roof Zone to Select a Rail Span**

a. Using information in Steps 1 & 2, select a Prescriptive Pressure Table contained Appendix B or online.
b. Use fill-in boxes below to document your project specific pressures and tables utilized.



Pressure Table Used:	
Basic Wind Speed -	
Building Height -	
Exposure Category -	
Seismic Coefficient (Ss) -	
Roof Pitch -	
Ground Snow Load -	

Controlling Pressure:

	Up (psf)	Down (psf)	Side (psf)	Lateral (psf)
Roof zone 1:				
Roof zone 2:				
Roof zone 3:				

Note: For Low Profile Mode, where rails are perpendicular to the roof tilt (E-W Rails), "Side Load" (Down Slope) is load applied in weak axis bending of the SOLARMOUNT rail along the roof tilt and "Lateral" is load applied as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt. For High Profile Mode, where rails are parallel to the roof tilt (N-S Rails), "Side Load" (Downslope) is load applied in as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt and "Lateral Load" is applied in weak axis bending of the SOLARMOUNT rail along the roof tilt.

c. Convert pressures (lbs/ft^2 or psf) from the boxes just filled in to pounds per liner foot (lb/ft or plf) using the following steps:
   i. Pressure (from table above) * Area of Module = Total Pounds per Module
   ii. Total Pounds Per Module / 2 (Number of rails) = Pounds Per Rail
   iii. Pounds Per Rail / Width of Module Parallel with the Rail = Pounds per Linear Foot (plf)
d. Use the *Downward and Upward Span Length Tables* in Appendix C with the plf loads to determine maximum spans.
   i. Look up the table "Downward Span Lengths". Using the "Down" plf load and the "Side" plf load combinations, choose the maximum span length in the table.
   ii. Look up the table "Uplift Span Lengths" and using the "Up" plf and "Side" plf load combinations to choose the maximum span length.
   iii. Use the smaller length of the "Down" and "Up" maximum span length.
   iv. Cantilever lengths can be up to 33% of the span length. For example, a 9 foot span length can have a 3 foot cantilever.

Step 4: **Determine Load to the Roof**

*The U-Builder online can automatically calculate maximum point loads to the roof.

a. To determine the load on the roof through the attachment:
    i. Determine the tributary area to each attachment.
    ii. Review the controlling pressure in Step 3b.
    iii. Determine pressure zones on the roof per ASCE 7-05, Figure 6-3 or ASCE 7-10, Figure 30.5-1.
    iv. Multiply the tributary area by the roof pressure to obtain loads to the roof attachment.
    v. Determine the point load to the roof at each attachment.

Step 5: **Check Roof Load**

a. Ensure that the supporting structure is capable of withstanding the additional loads imposed by the proposed solar system.

Step 6: **Check the Connections**

a. Similar to Step 3c, determine the tributary area to each connection and the applied load from the Controlling Pressures table in Step 3.
b. Convert the applied psf loads into pounds through tributary area.
c. Look up the Technical Data Sheets in Appendix H for maximum permissible load to each connection.
d. From Step 4, determine if the attachment (lag bolt or other appropriate attachment) is capable of withstanding the point loads applied.
e. If the maximum permissible load is greater than the applied load, then the connections are adequate.

Step 7: **Define Grounding and Bonding Path**

a. Refer to the Installation Guide for how to determine the Grounding and Bonding Path.

ASCE 7-05 Analytical Method

Step 1: **User Inputs (ASCE 7-05)**

Roof Height (ft):		Mean roof height (15 ft, 30 ft, or 60 ft)
Roof Angle (degrees):		Convert roof pitch to angle in degrees [See Appendix D]
Basic Wind Speed (mph):		Per Basic Wind Speed - US Map (ASCE 7-05, Figure 6-1)
Wind Exposure Category:		Determine the Exposure Category (B, C or D) by using the definitions for Surface Roughness Categories (ASCE 7-05, Sections 6.5.6.2 and 6.5.6.3)
Roof Zone:		Determine the Roof Zone (1, 2 or 3) (ASCE 7-05, Figure 6-3)
Ground Snow Load (psf):		Pg = Ground Snow Load in psf. Ground Snow Loads (ASCE 7-05, Figure 7-1)
Seismic Coefficient Ss (g):		ASCE 7-05 (Figures 22-1, 22-3, 22-5, 22-7, 22-9 through 22-11, 22-13, and 22-14)
Roof Live Load[1] (psf):		0 psf, 20 psf, etc.
Module Manufacturer/Type:		
Solar Module Length (in):		
Solar Module Width (in):		
Solar Module Weight (lb):		
Module Dead Load (psf)		

Commentary:

1) Most Building Officials allow for all or a portion of the roofs original live load design load to be removed/reduced at the time that solar panels are being added to the roof. The rationale behind this is that live load or roof foot traffic is eliminated or reduced to designated paths. in other words, the roof top solar array and live load foot traffic cannot occupy the same space. If all of the roof live load can be utilized by the proposed solar array, 0 psf should be entered.

Step 2: **Wind Pressure (ASCE 7-05, Chapter 6)**

Wind Pressure Equation - Method 2 - Analytical Procedure (ASCE 7-05, Section 6.5):

	Pp=qh (GCpp-GCpi) (ASCE 7-05, Section 6.5.12.4.1) (GCpp - Positive Downforce Factor)
	Pn=qh (GCpn-GCpi) (ASCE 7-05, Section 6.5.12.4.1) (GCpn - Negative Uplift Factor)
	Gcpi equals zero (per AC428, November 2012) (internal pressure coefficient)
	GCp is defined below (ASCE 7-05 Figure 6-11) and is a function of the roof zone, effective wind area (feet squared), and roof angle (degrees) (external pressure coefficient)
	GCpp (Positive downforce factor)
	GCpn (Negative uplift factor)
	(ASCE 7-05, Figure 6-11B) for roof angles ≤ 7°
	(ASCE 7-05, Figure 6-11C) for roof angles > 7° and ≤ 27°
	(ASCE 7-05, Figure 6-11D) for roof angles > 27° and ≤ 45°
	qh = qz
	qz=0.00256Kz*Kzt*Kd*V^2*I (ASCE 7-05, Section 6.5.10)

	Kz	Velocity Pressure Coefficient (ASCE 7-05, Table 6-3)
	Kzt	Topographic Factor (ASCE 7-05, Section 6.5.7.1 & Figure 6-4)
	Kd	Directionality Factor (ASCE 7-05, Table 6-4)
	V	Basic Wind Speed in MPH from User Inputs in Step 1
	I	Importance Factor[2] (ASCE 7-05, Table 6-1)

Calculate the wind pressure for uplift and downforce, using GCpn & GCpp respectively, in the provided boxes.

Commentary:

2) Typical values for the Importance Factor are 0.87 based on Occupancy Category I and 1.0 based on Occupancy Category II. Occupancy I is defined by ASCE 7-05 to mean "Buildings and other structures that present a low hazard to human life in the event of failure…". Occupancy II is defined by ASCE 7-05 to mean "All buildings and other structures except those listed in Occupancy Categories I, III, and IV".

Step 3: **Dead Load**

Module Dead Load (psf):		Module Dead Load (psf) should be determined from User Inputs in Step 1
Racking System Dead Load[3] (psf):		[See Appendix E] (The racking system dead load should be taken as the total weight of the racking system (hardware, rails, nuts, bolts, attachments, etc.) divided by the total module area of the system.) Component weights can be found in the technical datasheets.
Total Dead Load (psf):		Sum of Module Dead Load and Racking System Dead Load

Calculated Dead Load in the provided boxes.

Step 4: **Snow Load (ASCE 7-05, Chapter 7)**

Sloped Roof Snow Load Pressure Equation:

	Ps=0.7*Cs*Ce*Ct*I*Pg (ASCE 7-05, Section 7.3)	
	Pg	Ground Snow Load[4] (psf) from User inputs in Step 1.
	Cs	Slope Factor (ASCE 7-05, Figure 7-2)
	C_t	Thermal Factor[5] (ASCE 7-05, Table 7-3)
	I	Importance Factor[6] (snow) (ASCE 7-05, Table 7-4)
	Ce	Exposure Factor (ASCE 7-05, Table 7-2)

Calculate Ps (Sloped roof snow load) in the provided boxes.

Commentary:

3) To be combined with the module dead load and used in wind load combinations.

4) The ground snow load is utlilized to calculate the roof snow load, which is the load applied to the structure.

5) From Section C7.8 of ASCE 7-05, "the collectors should be designed to sustain a load calculated by using the "unobstructed slippery surfaces" curve in Fig. 7-2a". This graph recommends the use of a Ct value of less than or equal to 1.0.

6) The Snow Importance Factor for Occupancy Category I = 0.8 and for Occupancy Category II = 1.0.

Step 5: **Seismic Load (ASCE 7-05)**

Seismic Load Equation (Horizontal):

$F_{p(horizontal)}=[(0.4*a_p*S_{DS}*Wp)/(Rp/Ip)]*(1+2*z/h)$ (ASCE 7-05, 13.3.1)

F_p need not exceed $1.6*S_{SD}*Ip*Wp$ and Fp shall not be less than $Fp=0.3*S_{DS}*Ip*Wp$

psf (seismic load (horiz.) on the module, divide Fp by the effected area)

a_p	Component Amplification Factor[7] (ASCE 7-05, Table 13.6-1)
Rp	Component Response Modification Factor[8] (ASCE 7-05, Table 13.6-1)
S_{DS}	Spectral Acceleration (ASCE 7-05, Section 11.4.4) $S_{DS}=2/3*S_{MS}$
	$S_{MS}=Fa*Ss$ (ASCE 7-05, Section 11.4.3)
Fa	Site Coefficient (ASCE 7-05, Table 11.4-1)
Ss	from User Inputs in Step 1
Wp	Component operating weight (lbs) (determine by using total dead load (psf) multiplied by the effected area (SF) of the component or attachment)
Ip	Seismic Importance Factor[9] (ASCE 7-05, section 13.1.3)
z	Height in structure of point of attachment of component with respect to the base (ASCE 7-05, Section 13.3.1)
h	average roof height of structure with respect to the base (ASCE 7-05, Section 13.3.1)
	z/h need not exceed 1.0

Seismic Load Equation (Vertical):

$F_{p(vertical)}=\pm 0.2*S_{DS}*Wp$ (ASCE 7-05, Section 12.4.2.2)

psf (seismic load (vert.) on the module, divide Fp by the effected area)

Calculate seismic loads for both horizontal and vertical in the provided boxes.

Commentary:

7) The Component Amplification Factor (ap) for flush-mount systems should be taken as 1.0 (International Code Council (ICC) Acceptanc Criteria (AC) 428, Section 3.1.3.3).

8) The Component Response Modification Factor (Rp) for flush-mount systems should be taken as 1.5 (International Code Council (ICC) Acceptanc Criteria (AC) 428, Section 3.1.3.3).

9) The Seismic Importance Factor for Occupancy Categories I and II = 1.0.

Step 6: **Rewrite Your Loads**

*Depending on your coordinate system, certain loads will need to be split into their horizontal and vertical components.

Total Dead Load:		psf
Wind Pressure Up:		psf
Wind Pressure Down:		psf
Snow Load:		psf
Seismic Load Horizontal:		lbs
Seismic Load Vertical:		psf

Step 7: **Allowable Stress Design (ASD) Load Combinations (ASCE 7-05, Chapter 2, Section 2.4.1)**

*The load combinations below have been identified as the likely controling cases for the roof structure.

1) D
2) D + Lr
3) D + S
4) D + W_{up}
5) D + W_{down}
6) D + 0.75W_{down} + 0.75S
7) D + 0.75W_{down} + 0.75Lr
8) D + 0.75(0.7E) + 0.75Lr
9) D + 0.75(0.7E) + 0.75S
10) D + 0.7E
11) 0.6D + W_{up}
12) 0.6 D + W_{down}
13) 0.6 D + 0.7E

D = Dead Load
Lr = Live Load to Roof
S = Snow Load
W_{up} = Wind Load Up
W_{down} = Wind Load Down
E = Earthquake/Seismic Load

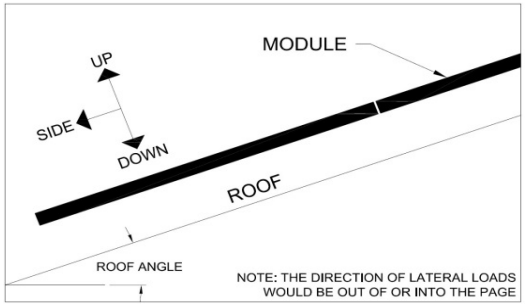
Step 8: **Create Initial Array Layout**

a. Identify the structural supporting members of your building. A sketch/drawing of the roof/building with location of supporting members, vents, skylights, cable/wires, areas to avoid, etc., is highly recommended.
b. Create a "rough draft" layout of solar modules on the actual project roof. (Refer to the SOLARMOUNT Installation Guide.)

Step 9: **Determine a Rail Span**

*For structural engineers who would like to determine the rail span without utilizing the Perscriptive Method, section properties can be found in Appendix F - Technical Data Sheets.

a. Using information in Step 1 & 8, select a Prescriptive Pressure Table contained the Appendix B or
b. Use fill-in boxes below to document your project specific pressures and tables utilized.



Pressure Table Used:

Basic Wind Speed -	
Building Height -	
Exposure Category -	
Lateral (Ss) -	
Roof Pitch -	
Ground Snow Load -	

Controlling Pressure:

	Up (psf)	Down (psf)	Side (psf)	Lateral (psf)
Roof zone 1:				
Roof zone 2:				
Roof zone 3:				

Note: For Low Profile Mode, where rails are perpendicular to the roof tilt (E-W Rails), "Side Load" (Down Slope) is load applied in weak axis bending of the SOLARMOUNT rail along the roof tilt and "Lateral" is load applied as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt. For High Profile Mode, where rails are parallel to the roof tilt (N-S Rails), "Side Load" (Downslope) is load applied in as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt and "Lateral Load" is applied in weak axis bending of the SOLARMOUNT rail along the roof tilt.

c. Convert pressures (lbs/ft^2 or psf) from the boxes just filled in to pounds per liner foot (lb/ft or plf) using the following steps:
   i. Pressure (from table above) * Area of Module = Total Pounds per Module
   ii. Total Pounds Per Module / 2 (Number of rails) = Pounds Per Rail
   iii. Pounds Per Rail / Width of Module Parallel with the Rail = Pounds per Linear Foot (plf)
d. Use the *Downward and Upward Span Length Tables* in Appendix C with the plf loads to determine maximum spans.
   i. Using the plf loads for "Down", look up the table "Downward Span Lengths" in Appendix B and using the "Down" plf load and the "Side" plf load combinations to choose the maximum span
   ii. Using the plf loads for "Up", look up the table "Uplift Span Lengths" in Appendix and using the "Up" plf and "Side" plf load combinations to choose the maximum span length.
   iii. Use the smaller length of the "Down" and "Up" maximum span length.
   iv. Cantilever lengths can be up to 33% of the utilized span length. For example, a 9 foot span length can have a 3 foot cantilever.

Step 10: **Look-up Layout and Attachment Guidelines for Array**

a. Review your layout in Step 8 above and the Layout and Attachment Guidelines to determine potential attachment points to your structure.

Step 11: **Determine Load to the Roof**

a. To determine the load on the roof through the attachment:
   i. Determine the tributary area to each attachment.
   ii. Review the controlling pressure in Step 9.
   iii. Determine pressure zones on the roof per ASCE 7-05, Figure 6-3.
   iv. Multiply the tributary area by the roof pressure to obtain loads to the roof attachment.
   v. Determine the point load to the roof at each attachment.

Step 12: **Check Roof Load**

a. Ensure that the supporting structure is capable of withstanding the additional loads imposed by the proposed solar system.

Step 13: **Check the Connections**

a. Similar to Step 9c, determine the tributary area to each connection and the applied load from the Controlling Pressures table in Step 9.
b. Convert the applied psf loads into pounds through tributary area.
c. Look up the Technical Data Sheets in Appendix H for maximum permissible load to each connection.
d. From Step 11, determine if the attachment (lag bolt or other appropriate attachment) is capable of withstanding the point loads applied.
e. If the maximum permissible load is greater than the applied load, then the connections are adequate.

Step 14: **Define Grounding and Bonding Path**

a. Refer to the SOLARMOUNT Installation Guide for how to determine the Grounding and Bonding Path.

ASCE 7-10 Analytical Method

Step 1: **User Inputs (ASCE 7-10)**

		Notes / Clarifications:
Roof Height (ft):		Mean roof height (15 ft, 30 ft, or 60 ft)
Roof Angle (degrees):		Convert roof pitch to angle in degrees [See Appendix D]
Risk Category:		Table 1.5-1
Basic Wind Speed (mph):		Per Basic Wind Speeds for Risk Category II (ASCE 7-10, Figure 26.5-1A)
Wind Exposure Category:		Determine the Exposure Category (B, C or D) by using the definitions for Surface Roughness Categories (ASCE 7-10, Sections 26.7.2 and 26.7.3)
Roof Zone:		Determine the Roof Zone (1, 2 or 3) (ASCE 7-10, Figure 30.5-1)
Ground Snow Load (psf):		Pg = Ground Snow Load in psf. Ground Snow Loads (ASCE 7-10, Figure 7-1)
Seismic Coefficient Ss (g):		ASCE 7-10 (Figures 22-1, 22-3, 22-5, 22-6 and 22-17)
Roof Live Load[1] (psf):		0 psf, 20 psf, etc.
Module Manufacturer/Type:		
Solar Module Length (in):		
Solar Module Width (in):		
Solar Module Weight (lb):		
Module Dead Load (psf)		

Commentary:

1) Most Building Officials allow for all or a portion of the roofs original live load design load to be removed/reduced at the time that solar panels are being added to the roof. The rationale behind this is that live load or roof foot traffic is eliminated or reduced to designated paths. in other words, the roof top solar array and live load foot traffic cannot occupy the same space. If all of the roof live load can be utilized by the proposed solar array, 0 psf should be entered.

Step 2: **Wind Pressure (ASCE 7-10, Chapter 30)**

Wind Pressure Equation - Components & Cladding (ASCE 7-10, Section 30.4.2):

Pp=qh (GCpp-GCpi) (ASCE 7-10, Section 30.4.2) (GCpp - Positive Downforce Factor)

Pn=qh (GCpn-GCpi) (ASCE 7-10, Section 30.4.2) (GCpn - Negative Uplift Factor)

Gcpi equals zero (per AC428 - Nov, 2012) (internal pressure coefficient)

GCp is defined below (ASCE 7-10 Figure 30.4-2) and is a function of the roof zone, effective wind area (feet squared), and roof angle (degrees) (external pressure coefficient)

GCpp (Positive downforce factor)

GCpn (Negative uplift factor)

(ASCE 7-10, Figure 30.4-2A) for roof angles ≤ 7°

(ASCE 7-10, Figure 30.4-2B) for roof angles > 7° and ≤ 27°

(ASCE 7-10, Figure 30.4-2C) for roof angles > 27° and ≤ 45°

qh = qz

qz=0.00256*Kz*Kzt*Kd*V^2 (ASCE 7-10, Section 30.3.2)

Kz	Velocity Pressure Coefficient (ASCE 7-10, Table 30.3-1)
Kzt	Topographic Factor (ASCE 7-10, Section 26.8 & Figure 268-1)
Kd	Directionality Factor (ASCE 7-10, Table 26.6-1)
V	Basic Wind Speed in MPH from User Inputs in Step 1

Calculate the wind pressure for uplift and downforce, using GCpn & GCpp respectively, in the provided boxes.

Step 3: **Dead Load**

Module Dead Load (psf):		Module Dead Load (psf) should be determined from User Inputs in Step 1
Racking System Dead Load[2] (psf):		[See Appendix E] (The racking system dead load should be taken as the total weight of the racking system (hardware, rails, nuts, bolts, attachments, etc.) divided by the total module area of the system.)Component weights can be found in the technical datasheets.
Total Dead Load (psf):		Sum of Module Dead Load and Racking System Dead Load

Calculated Dead Load in the provided boxes.

Commentary:
2) To be combined with the module dead load and used in wind load combinations.

3) The ground snow load is utlilized to calculate the roof snow load, which is the load applied to the structure.

4) The Snow Importance Factor for Occupancy Category I = 0.8 and for Occupancy Category II = 1.0.

Step 4: **Snow Load (ASCE 7-10, Chapter 7)**

Sloped Roof Snow Load Pressure Equation:

	Ps=0.7*Cs*Ce*Ct*I*Pg (ASCE 7-10, Sections 7.3 & 7.4 Flat and Sloped Roof Snow Load)		
		Pg	Ground Snow Load[3] (psf) from User inputs in Step 1.
		Cs	Slope Factor (ASCE 7-10, Figure 7-2)
		C_t	Thermal Factor (ASCE 7-10, Table 7-3)
		I	Importance Factor[4] (snow) (ASCE 7-10, Table 1.5-2)
		Ce	Exposure Factor (ASCE 7-10, Table 7-2)

Calculate Ps (Sloped roof snow load) in the provided boxes.

Step 5: **Seismic Load (ASCE 7-10)**

Seismic Load Equation (Horizontal):

	$F_{p(horizontal)}=[(0.4*a_p*S_{DS}*Wp)/(Rp/Ip)]*(1+2*z/h)$ (ASCE 7-10, 13.3.1)
	F_p need not exceed $1.6*S_{SD}*Ip*Wp$ and Fp shall not be less than $Fp=0.3*S_{DS}*Ip*Wp$
	psf (seismic load (horiz.) on the module, divide Fp by the effected area)
	a_p Component Amplification Factor[5] (ASCE 7-10, Table 13.5-1)
	Rp Component Response Modification Factor[6] (ASCE 7-10, Table 13.5-1)
	S_{DS} Spectral Acceleration (ASCE 7-10, Section 11.4.4) $S_{DS}=2/3*S_{MS}$
	$S_{MS}=Fa*Ss$ (ASCE 7-10, Section 11.4.3)
	Fa Site Coefficient (ASCE 7-10, Table 11.4-1)
	Ss from User Inputs in Step 1
	Wp Component operating weight (lbs) (determine by using total dead load (psf) multiplied by the effected area (SF) of the component or attachment)
	Ip Seismic Importance Factor[7] (ASCE 7-10, section 1.5-2)
	z Height in structure of point of attachment of component with respect to the base (ASCE 7-10, Section 13.3.1)
	h Average roof height of structure with respect to the base (ASCE 7-10, Section 13.3.1)
	z/h need not exceed 1.0

Seismic Load Equation (Vertical):

	$F_{p(vertical)}=\pm 0.2*S_{DS}*Wp$ (ASCE 7-10, Section 12.4.2.2)
	psf (seismic load (vert.) on the module, divide Fp by the effected area)

Calculate seismic loads for both horizontal and vertical in the provided boxes.

Commentary:

5) The Component Amplification Factor (ap) for flush-mount systems should be taken as 1.0 (International Code Council (ICC) Acceptanc Criteria (AC) 428, Section 3.1.3.3).

6) The Component Response Modification Factor (Rp) for flush-mount systems should be taken as 1.5 (International Code Council (ICC) Acceptanc Criteria (AC) 428, Section 3.1.3.3).

7) The Seismic Importance Factor for Occupancy Categories I and II = 1.0.

Step 6: **Rewrite Your Loads**

*Depending on your coordinate system, certain loads will need to be split into their horizontal and vertical components.

Total Dead Load:		psf
Wind Pressure Up:		psf
Wind Pressure Down:		psf
Snow Load:		psf
Seismic Load Horizontal:		lbs
Seismic Load Vertical:		psf

Step 7: **Allowable Stress Design (ASD) Load Combinations (ASCE 7-10, Chapter 2, Section 2.4.1)**

*The load combinations below have been identified as the likely controling cases for the roof structure.

1) D
2) D + Lr
3) D + S
4) D + 0.6W_{up}
5) D + 0.6W_{down}
6) D + 0.75(0.6)W_{down} + 0.75S
7) D + 0.75(0.6)W_{down} + 0.75Lr
8) D + 0.75(0.7E) + 0.75Lr
9) D + 0.75(0.7E) + 0.75S
10) D + 0.7E
11) 0.6D + 0.6W_{up}
12) 0.6 D + 0.6W_{down}
13) 0.6 D + 0.7E

D = Dead Load
Lr = Live Load to Roof
S = Snow Load
W_{up} = Wind Load Up
W_{down} = Wind Load Down
E = Earthquake/Seismic Load

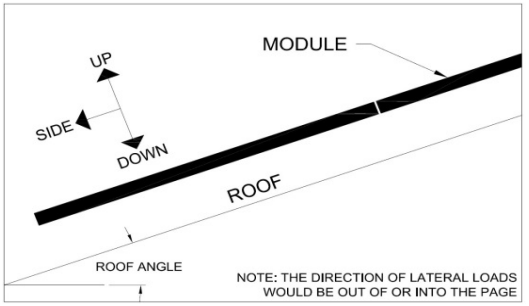
Step 8: **Create Initial Array Layout**

a. Identify the structural supporting members of your building. A sketch/drawing of the roof/building with location of supporting members, vents, skylights, cable/wires, areas to avoid, etc., is highly recommended.
b. Create a "rough draft" layout of solar modules on the actual project roof. (Refer to the SOLARMOUNT Installation Guide.)

Step 9: **Determine a Rail Span**

*For structural engineers who would like to determine the rail span without utilizing the Perscriptive Method, section properties can be found in Appendix F - Technical Data Sheets.

a. Using information in Step 1 & 8, select a Prescriptive Pressure Table contained Appendix B or
b. Use fill-in boxes below to document your project specific pressures and tables utilized.



Pressure Table Used:

Basic Wind Speed -	
Building Height -	
Exposure Category -	
Lateral (Ss) -	
Roof Pitch -	
Ground Snow Load -	

Controlling Pressure:

	Up (psf)	Down (psf)	Side (psf)	Lateral (psf)
Roof zone 1:				
Roof zone 2:				
Roof zone 3:				

Note: For Low Profile Mode, where rails are perpendicular to the roof tilt (E-W Rails), "Side Load" (Down Slope) is load applied in weak axis bending of the SOLARMOUNT rail along the roof tilt and "Lateral" is load applied as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt. For High Profile Mode, where rails are parallel to the roof tilt (N-S Rails), "Side Load" (Downslope) is load applied in as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt and "Lateral Load" is applied in weak axis bending of the SOLARMOUNT rail along the roof tilt.

c. Convert pressures (lbs/ft^2 or psf) from the boxes just filled in to pounds per liner foot (lb/ft or plf) using the following steps:
   i. Pressure (from table above) * Area of Module = Total Pounds per Module
   ii. Total Pounds Per Module / 2 (Number of rails) = Pounds Per Rail
   iii. Pounds Per Rail / Width of Module Parallel with the Rail = Pounds per Linear Foot (plf)
d. Use the *Downward and Upward Span Length Tables* in Appendix C with the plf loads to determine maximum spans.
   i. Using the plf loads for "Down", look up the table "Downward Span Lengths" in the Appendix and using the "Down" plf load and the "Side" plf load combinations to choose the maximum span
   ii. Using the plf loads for "Up", look up the table "Uplift Span Lengths" in the Appendix and using the "Up" plf and "Side" plf load combinations to choose the maximum span length.
   iii. Use the smaller length of the "Down" and "Up" maximum span length.
   iv. Cantilever lengths can be up to 33% of the utilized span length. For example, a 9 foot span length can have a 3 foot cantilever.

Step 10: **Look-up Layout and Attachment Guidelines for Array**

a. Review your layout in Step 8 above and the Layout and Attachment Guidelines to determine potential attachment points to your structure.

Step 11: **Determine Load to the Roof**

a. To determine the load on the roof through the attachment:
   i. Determine the tributary area to each attachment.
   ii. Review the controlling pressure in Step 9.
   iii. Determine pressure zones on the roof per ASCE 7-10, Figure 30.5-1.
   iv. Multiply the tributary area by the roof pressure to obtain loads to the roof attachment.
   v. Determine the point load to the roof at each attachment.

Step 12: **Check Roof Load**

a. Ensure that the supporting structure is capable of withstanding the additional loads imposed by the proposed solar system.

Step 13: **Check the Connections**

a. Similar to Step 9c, determine the tributary area to each connection and the applied load from the Controlling Pressures table in Step 9.
b. Convert the applied psf loads into pounds through tributary area.
c. Look up the Technical Data Sheets in Appendix H for maximum permissible load to each connection.
d. From Step 11, determine if the attachment (lag bolt or other appropriate attachment) is capable of withstanding the point loads applied.
e. If the maximum permissible load is greater than the applied load, then the connections are adequate.

Step 14: **Define Grounding and Bonding Path**

a. Refer to the SOLARMOUNT Installation Guide for how to determine the Grounding and Bonding Path.

Technical Support

If you have further questions regarding the SOLARMOUNT product, please contact your distributer. If further clarification is needed, please review the Unirac website online resources at:

http://www.unirac.com/residential/residential-products/solar-mount-residential

The Unirac website contains up-to-date manuals, design guides, webinars, online calculations, information, certification letters, technical data sheets, additional products that Unirac provides, and anything else you might need for your project.

SM SOLAR MOUNT

INSTALLATION GUIDE

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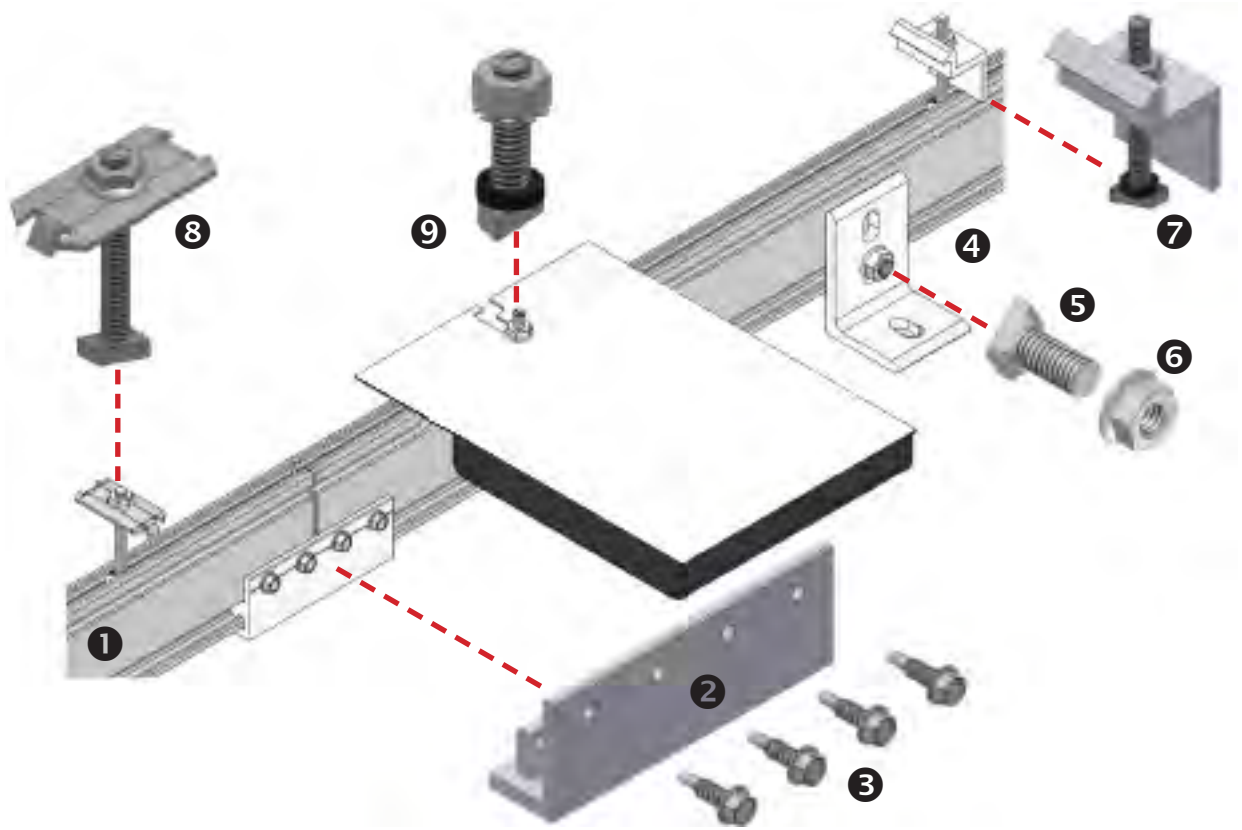


❶RAIL: Supports PV modules. Use at least two per row of modules. Aluminum extrusion, available in mill, clear anodized, or dark anodized.

❷RAIL SPLICE: Non structural splice joins, aligns, and electrically bonds rail sections into single length of rail. Forms either a rigid or thermal expansion joint, 4 inches long, pre-drilled. Anodized aluminum extrusion available in clear or dark.

❸SELF-DRILLING SCREW: (No. 12 x ¾") – Use 4 per rigid splice or 2 per expansion joint. Stainless steel. Supplied with splice. In combination with rail splice, provides rail to rail bond.

❹L-FOOT: Use to secure rails through roofing material to building structure. Refer to loading tables or U-Builder for spacing.

❺L-FOOT T- BOLT: (3/8" x ¾") – Use one per L-foot to secure rail to L-foot. Stainless steel. Supplied with L-foot. In combination with flange nut, provides electrical bond between rail and L-foot.

❻SERRATED FLANGE NUT (3/8"): Use one per L-foot to secure and bond rail to L-foot. Stainless steel. Supplied with L-foot.

❼MODULE ENDCLAMP: Provides bond from rail to Endclamp. Pre-assembled aluminum clamp available in clear or dark finish. Supplied washers keep clamp and bolt upright for ease of assembly.

❽MODULE MIDCLAMP: Pre-assembled clamp provides module to module and module to rail bond. Stainless steel clamp and T-bolt. Available in clear and dark finish.

❾MICRO-INVERTER MOUNTING BOLT: Pre-assembled bolt and nut attaches and bonds microinverter to rail. Washer at base keeps bolt upright for ease of assembly.

NOTE - POSITION INDICATOR: T-bolts have a slot in the hardware end corresponding to the direction of the T-Head.

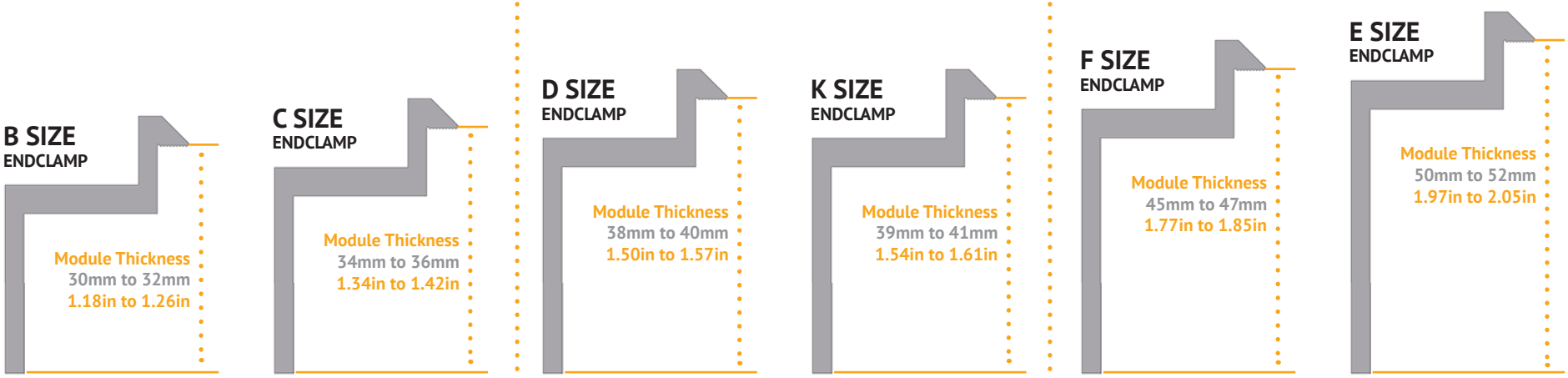
Wrenches and Torque

	Wrench Size	Recommended Torque (ft-lbs)
1/4" Hardware ❼❽❾	7/16"	*10
3/8" Hardware ❺	9/16"	*30
#12 Hardware ❸	5/16"	10

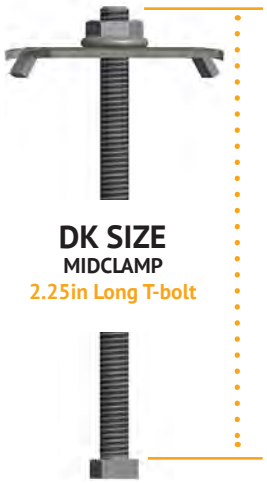
Torques are not designed for use with wood connectors *w/Anti-Seize.

Anti-Seize*

Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood:
1. Apply minimal lubricant to bolts, preferably Anti-Seize commonly found at auto parts stores
2. Shade hardware prior to installation, and
3. Avoid spinning stainless nuts onto bolts at high speed.



BC SIZE
MIDCLAMP
2in Long T-bolt



DK SIZE
MIDCLAMP
2.25in Long T-bolt

EF SIZE
MIDCLAMP
2.5in Long T-bolt

PLANNING YOUR SOLARMOUNT INSTALLATIONS

The installation can be laid out with rails parallel to the rafters or perpendicular to the rafters. Note that SOLARMOUNT rails make excellent straight edges for doing layouts.

Center the installation area over the structural members as much as possible.

Leave enough room to safely move around the array during installation. Some building codes and fire codes require minimum clearances around such installations, and the installer should check local building code requirements for compliance.

The length of the installation area is equal to:

- the total width of the modules,
- plus ¼" inch for each space between modules (for mid- clamp),
- plus approximately 3 inches (1½ inches for each Endclamp).
- plus 2.75 inches on the south-side for a high profile installation for SM Trim.

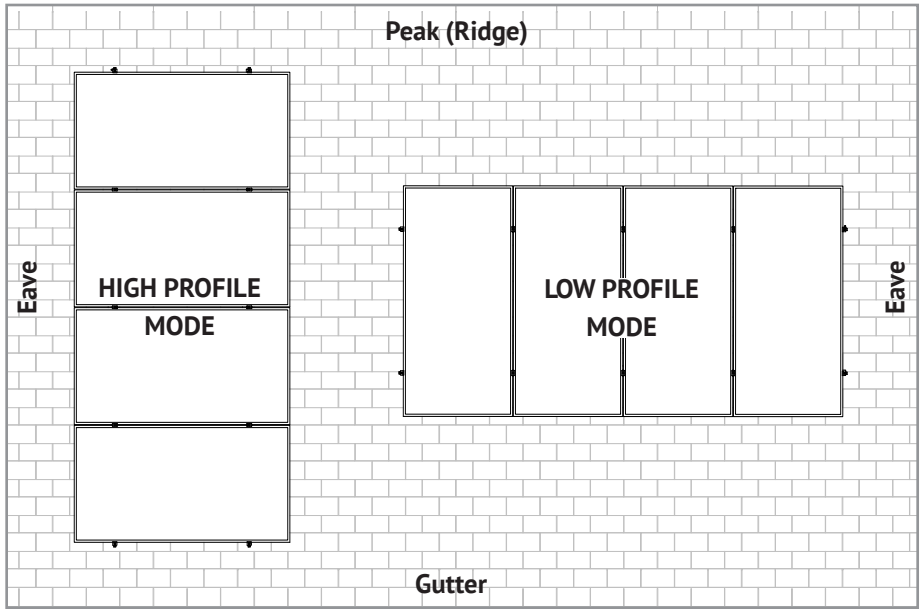
LAYING OUT L-FEET FOR TOP CLAMPS

L-feet, in conjunction with proper flashing equipment and techniques, can be used for attachment through existing roofing material, such as asphalt shingles, sheathing or sheet metal to the building structure.

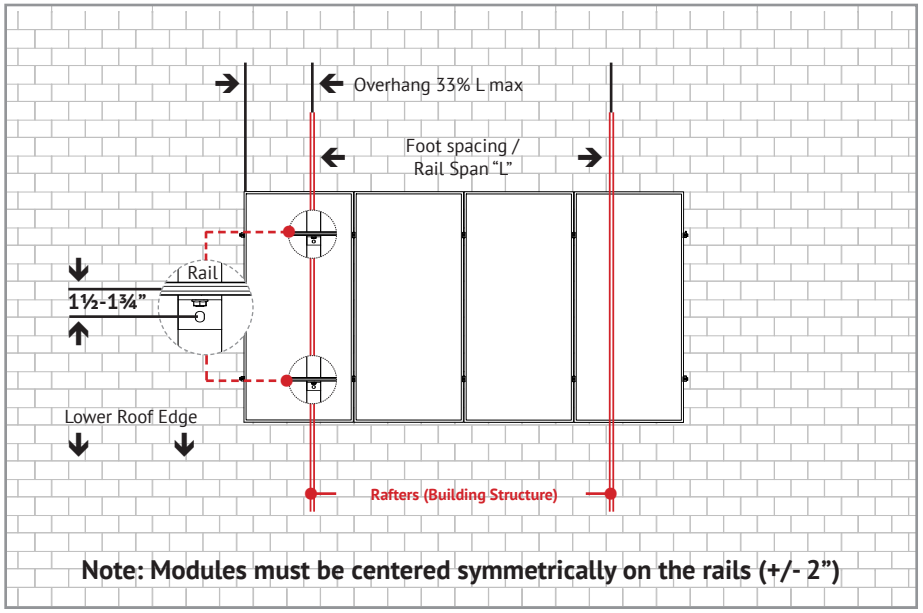
Locate and mark the position of the L-feet lag screw holes within the installation area as shown below. Follow manufacturer module guide for rail spacing based on appropriate mounting locations.

If multiple rows are to be installed adjacent to one another, it is not likely that each row will be centered above the rafters. Adjust as needed, following the guidelines below as closely as possible.

RAILS MAY BE PLACED PARALLEL OR PERPENDICULAR TO RAFTERS



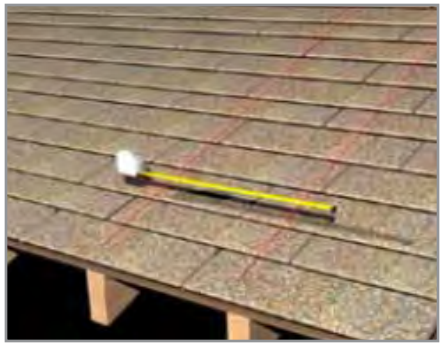
LAYOUT WITH RAILS PERPENDICULAR TO RAFTERS (RECOMMENDED)



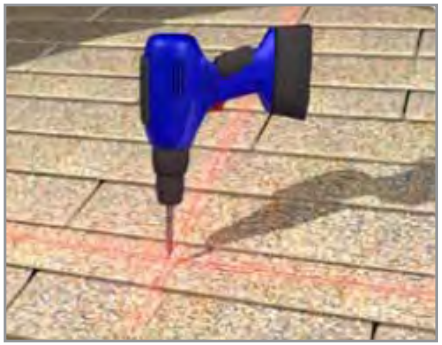
SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of UL 1703. This UL 1703 classification has been incorporated into our UL 2703 product certification. SOLARMOUNT has achieved Class A system level performance for steep sloped roofs when used in conjunction with type 1, type 2, type 3 and type 10 module constructions. Class A system level fire performance is inherent in the SOLARMOUNT design, and no additional mitigation measures are required. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes ≥ 2 inches per foot, or 9.5 degrees). There is no required minimum or maximum height limitation above the roof deck to maintain the Class A fire rating for SOLARMOUNT.

Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Type 1, Type 2, Type 3 & Type 10	Class A	East-West	Landscape OR Portrait	None Required
		North-South	Landscape OR Portrait	None Required



ROOF PREPARATION: Layout and install flashing at rafter locations determined per Design and Engineering Guide.

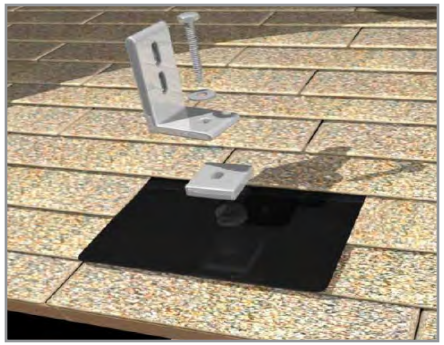


DRILL PILOT HOLES: Center the roof attachment over the rafter and drill a pilot hole(s) for the lag bolt(s)

NOTE: Determine lag bolt size and embedment depth.

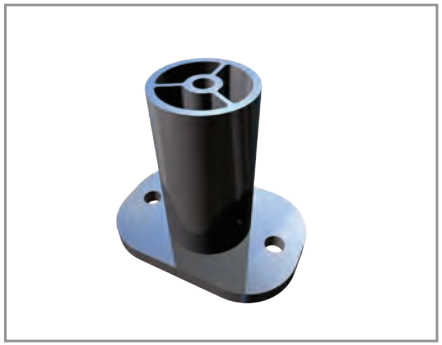
Quick Tip: Pre-drill the pilot hole through the flat flashing lag bolt location for easier installation.

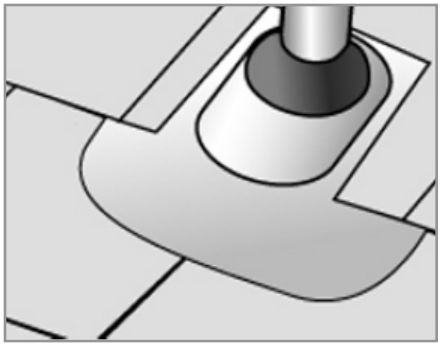
FLAT FLASHING INSTALLATION: Insert the Flat Flashing so the top part is under the next row of shingles and the hole lines up with the pilot hole.



INSTALL LAG BOLTS & L-FOOT: Insert the lag bolt through the L-Foot in the order shown in the illustration. Verify proper orientation before tightening lag bolts.

See Unirac Flat Flashing Manual for Additional Details.





2 PIECE ALUMINUM STANDOFF WITH FLASHING & L-FOOT:

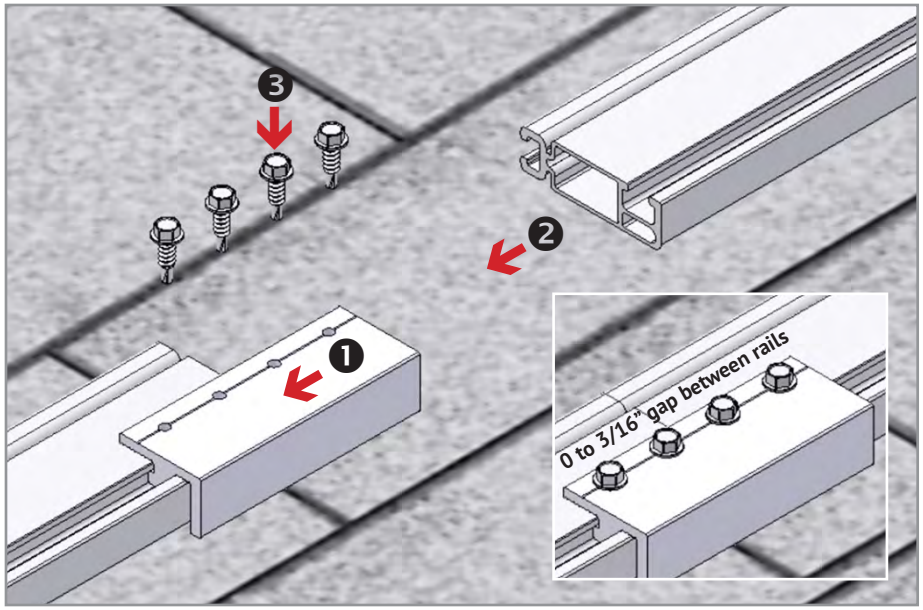
- If necessary cut an opening in the roofing material over a rafter to accommodate the flashing riser.
- Install the standoff, ensuring that both lag bolts are screwed into the rafter.
- Insert the flashing under the shingle above and over the shaft of the standoff. (No-Calk™ collar does not require sealing of the flashing and standoff shaft)
- Add L-Foot to top with bolt that secures the EPDM washer to the top of the standoff.

See Standoffs & Flashings Installation Manual 907.2 for Additional Details.

TOP MOUNT TILE HOOK & L-FOOT:

- Remove or slide up the roof tile, position the roof hook above the roof rafter
- Place Tile Hook in the middle of the underlying interlocking tile's valley. Drill 3/16 inch pilot holes through the underlayment into the center of the rafters. Securely fasten each tile hook to the rafters with two 5/16" x 3½" lag screws. Slide down or re-insert the tile
- Attach L Foot to tile roof hook

See Tile Hook Universal Mount Installation Manual for Additional Information.

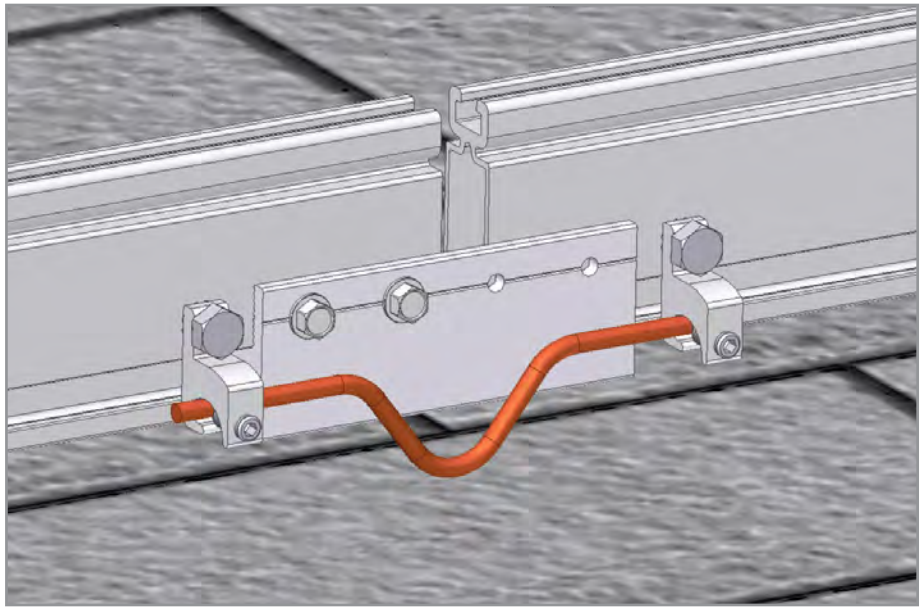


SPLICE INSTALLATION (IF REQUIRED PER SYSTEM DESIGN)

If your installation uses SOLARMOUNT splice bars, attach the rails together before mounting to the L-feet / footings. Use splice bars only with flush installations or those that use low-profile tilt legs. A rail should always be supported by more than one footing on both sides of the splice. There should be a gap between rails, up to 3/16" at the splice connections. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice with the exception of the high profile mode installation for the Trim.

TORQUE VALUE (See Note on PG. 1)

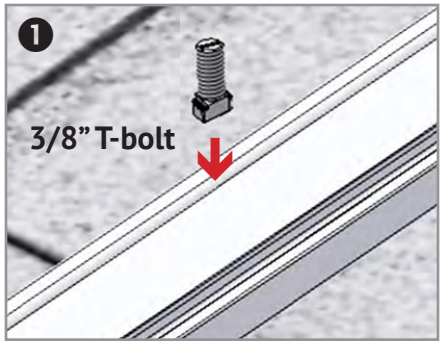
Hex head socket size 5/16" - Do not exceed 10 ft-lbs. Do not use Anti-Seize.



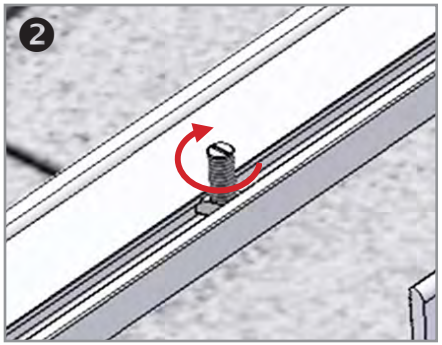
EXPANSION JOINT USED AS THERMAL BREAK

Expansion joints prevent buckling of rails due to thermal expansion. Splice bars may be used for thermal expansion joints. To create a thermal expansion joint, slide the splice bar into the footing slots of both rail lengths. Leave approximately ½" between the rail segments. Secure the splice bar with two screws on one side only. Footings (such as L-feet or standoffs) should be secured normally on both sides of the splice. No PV module or mounting hardware component should straddle the expansion joint. Modules must clearly end before the joint with mounting hardware (top mount Endclamps) terminating on that rail. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice with the exception of the high profile mode installation for the Trim. The next set of modules would then start after the splice with mounting hardware beginning on the next rail. **A thermal break is required every 40 feet of continuously connected rail. For additional concerns on thermal breaks in your specific project, please consult a licensed structural engineer. Runs of rail less than 40 feet in length, with more than two pairs spliced together, are an acceptable installation for the SOLARMOUNT systems.** **Bonding connection for splice used as a thermal break. Option shown uses two Ilsco lugs (Model No. GBL-4DBT P/N GBL-4DBT - see product data sheet for more details) and solid copper wire.**

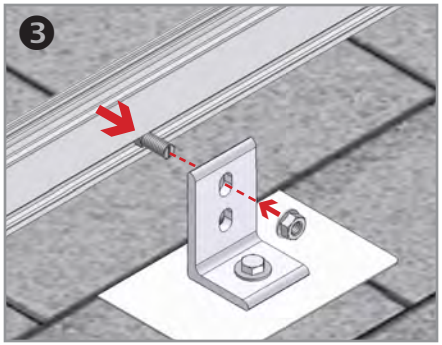
ATTACH RAIL TO L-FEET



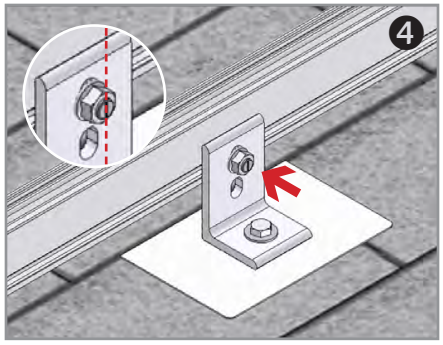
PLACE T-BOLT INTO RAIL: Insert 3/8" T-bolt into rail at L-foot locations.



SECURE T-BOLT: Apply Anti-Seize to bolt. Rotate T-bolt into position

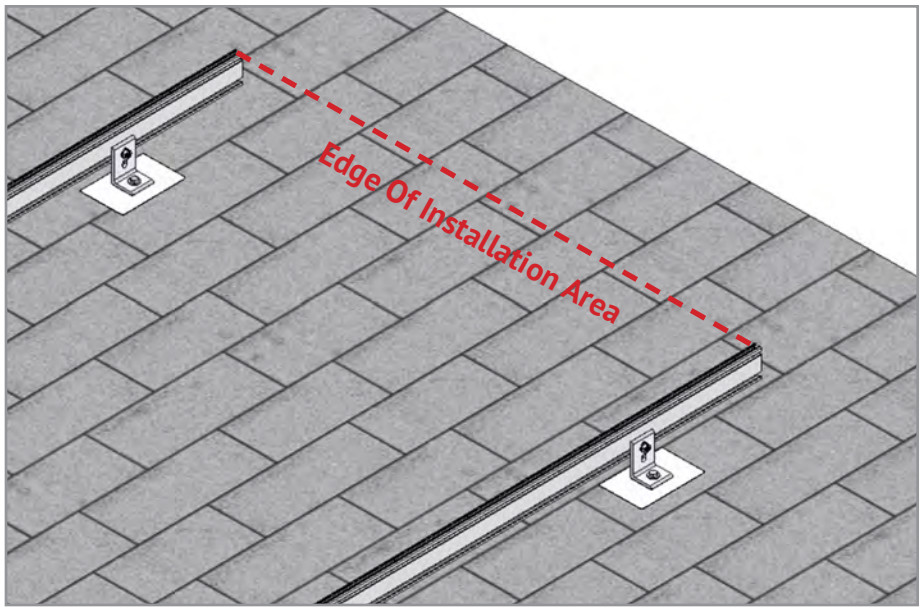


CONNECT RAIL TO L-FOOT: Raise rail to upright position and attach to L-feet to T-bolt with 3/8" Serrated Flange Nut. Use either slot to obtain desired height and alignment.



ALIGN POSITION INDICATOR: Hand tighten nut until rail alignment is complete. Verify that position indicator on bolt is vertical (perpendicular to rail)

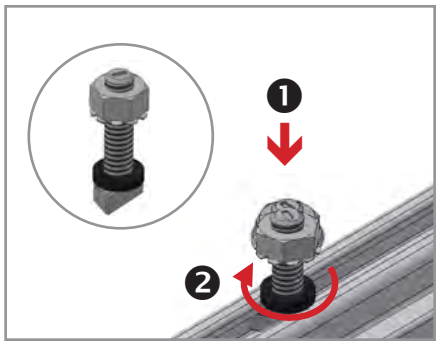
TORQUE VALUE (See Note on PG. 1)
3/8" nut to 30 ft-lbs



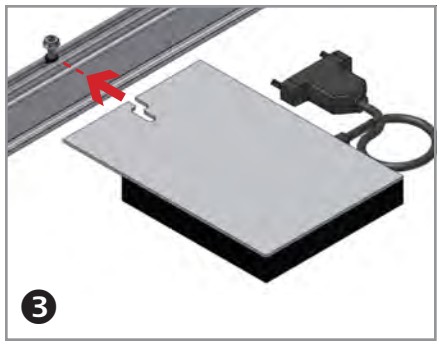
ALIGN RAILS:
Align one pair of rail ends to the edge of the installation area. The opposite pair of rail ends will overhang installation area. Do not Trim them off until the installation is complete. If the rails are perpendicular to the rafters, either end of the rails can be aligned, but the first module must be installed at the aligned end.

If the rails are parallel to the rafters, the aligned end of the rails must face the lower edge of the roof. Securely tighten all hardware after alignment is complete.

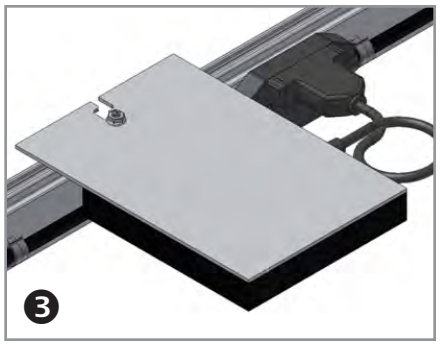
Mount modules to the rails as soon as possible. Large temperature changes may bow the rails within a few hours if module placement is delayed.



INSTALL MICROINVERTER MOUNT T-BOLT: Apply Anti-Seize and install pre-assembled ¼" x 1" bonding T-bolts into top ¼" rail slot at microinverter locations. Rotate bolts into position.

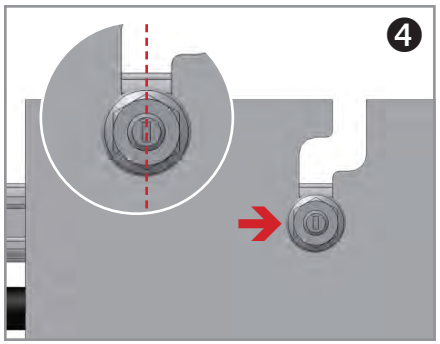


INSTALL MICROINVERTER: Install microinverter on to rail. Engage with bolt.

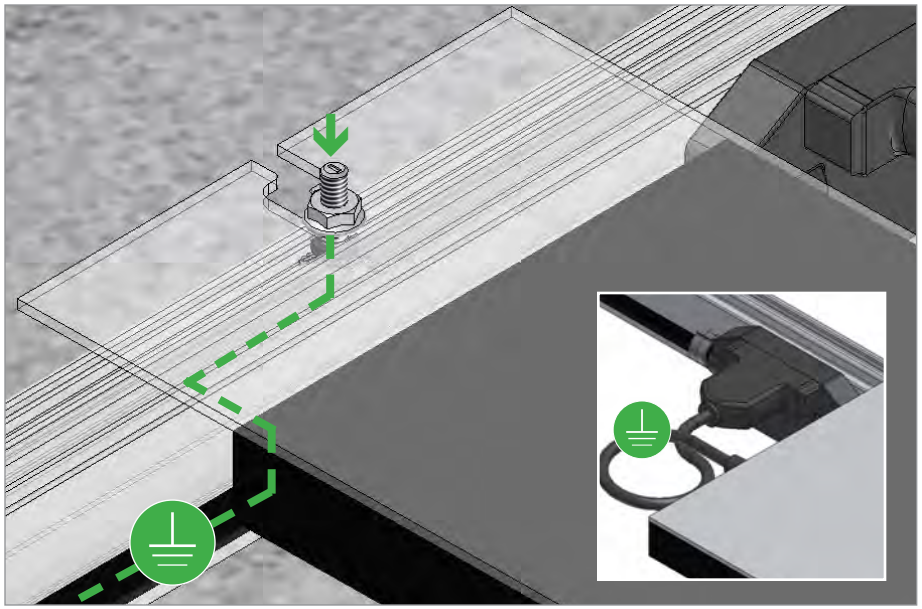


INSTALL MICROINVERTER:

TORQUE VALUE (See Note on PG. 1)
1/4" nut to 10 ft-lbs w/Anti-Seize



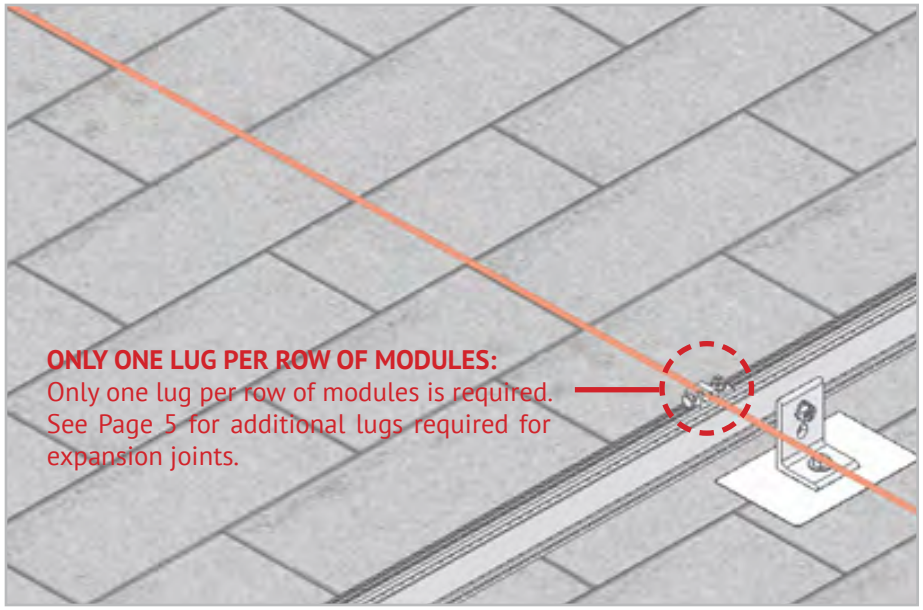
ALIGN POSITION INDICATOR: Verify that position indicator on bolt is perpendicular to rail



SM EQUIPMENT GROUNDING THROUGH ENPHASE MICROINVERTERS

The Enphase M215, M250 and C250 microinverters have integrated grounding capabilities built in. In this case, the DC circuit is isolated from the AC circuit, and the AC equipment grounding conductor (EGC) is built into the Enphase Engage integrated grounding (IG) cabling.

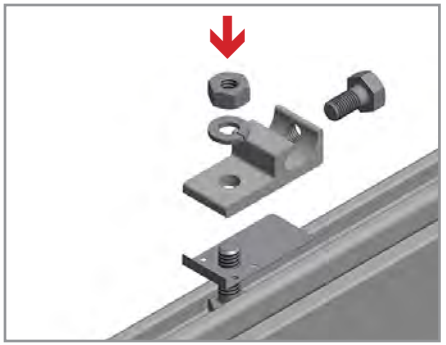
A minimum of one Enphase microinverter with integrated ground must be present on a single trunk cable. The microinverter is bonded to the SOLARMOUNT rail via the mounting hardware. Complete equipment grounding is achieved through the Enphase Engage cabling with integrated grounding (IG). No additional EGC grounding cables are required, as all fault current is carried to ground through the Engage cable.

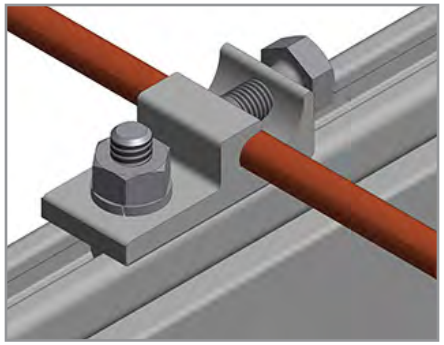


GROUNDING LUG MOUNTING DETAILS:
Details are provided for both the WEEB and Ilsco products. The WEEBLug has a grounding symbol located on the lug assembly. The Ilsco lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size

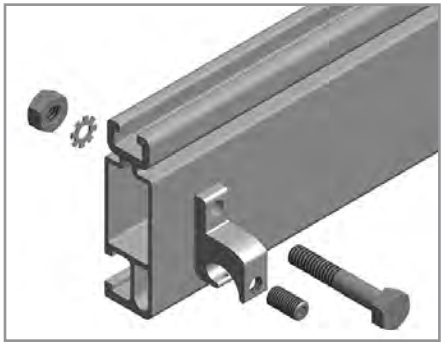
GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	**BOLT SIZE**	**DRILL SIZE**
WEEBLug	7/16”	N/A - Place in Top SM Rail Slot
IlSCO Lug	#10-32	7/32"

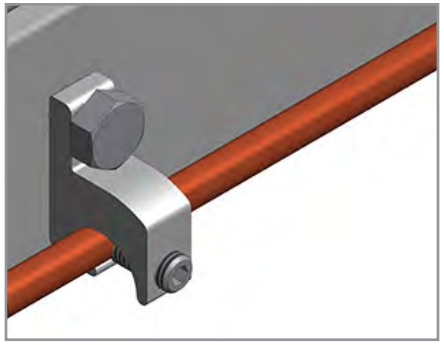
- Torque value depends on conductor size.
- See product data sheet for torque value.



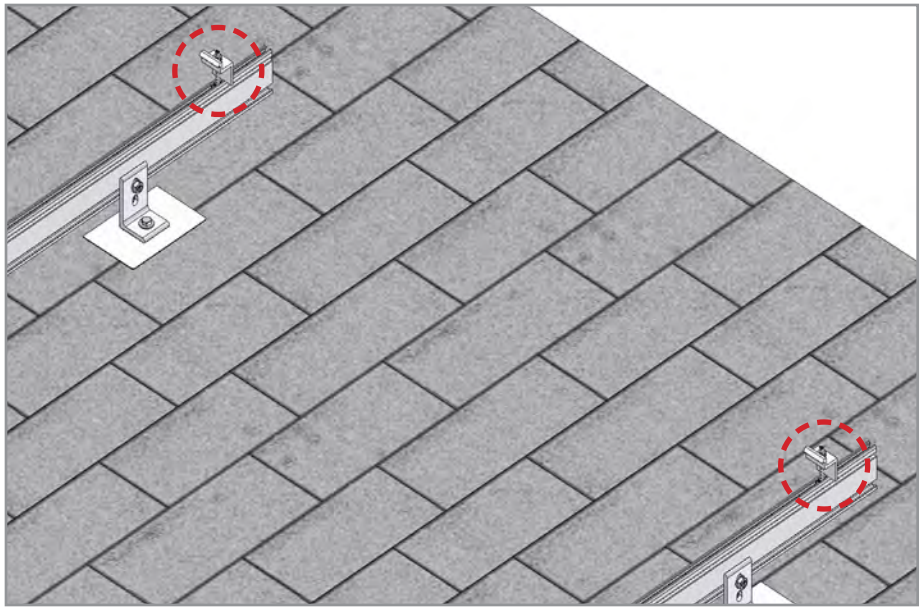


WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install stainless steel flat washer, lock washer and nut. Tighten the nut until the dimples are completely embedded into the rail and lug.
TORQUE VALUE 10 ft lbs. (See Note on PG. 1)
See product data sheet for more details, Model No. WEEB-LUG-6.7





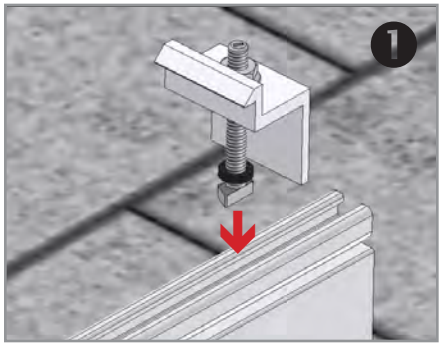
ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG. 1)
See product data sheet for more details, Model No. GBL-4DBT.



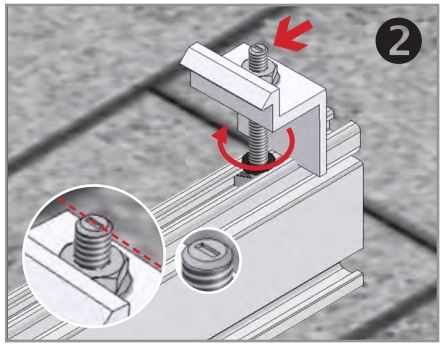
INSTALL MODULE ENDCLAMPS: The Endclamp is supplied as an assembly with a bonding T-bolt, serrated flange nut, and two washers. One washer retains the clamp at the top of the assembly. The other washer should be against the bolt head during assembly. This will enable the clamp to remain upright for module installation.

End clamps are positioned on rails prior to the first end module and installed after the last end module.

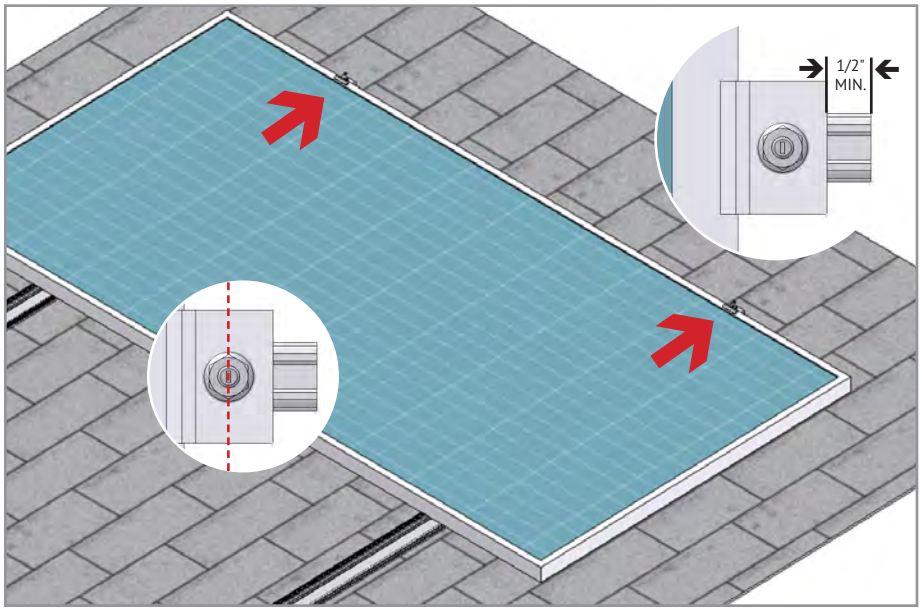
NOTE: If installing SM Trim in High Profile Mode (N-S Rails) See Fire Trim Installation Procedures on Page M & N of this installation guide.



INSERT ENDCLAMP T-BOLT: Insert 1/4" T-bolt into rail.



ROTATE ENDCLAMP T-BOLT: Rotate T-bolt into position. Verify that the position indicator on the bolt is perpendicular to the rail

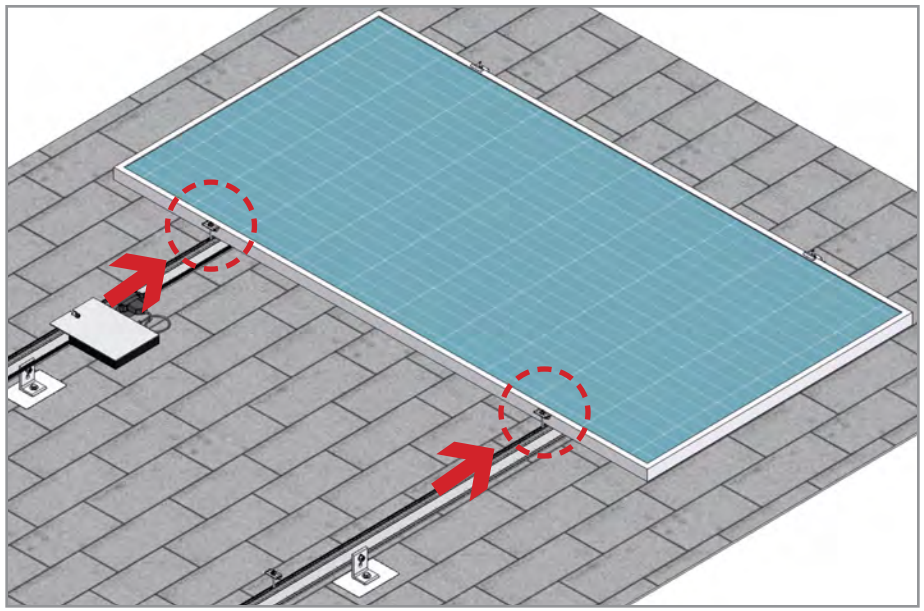


INSTALL FIRST MODULE: Install the first end module on to rails. Engage module frame with Endclamps. Verify that the position indicator on the bolt is perpendicular to the rail.

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs. w/Anti Seize

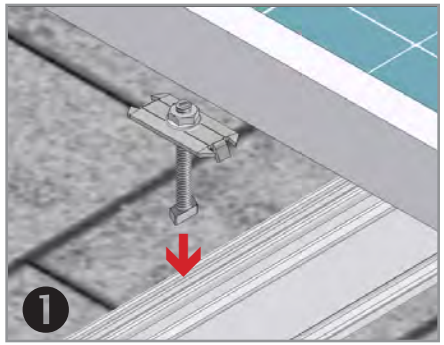
BONDING MIDCLAMP

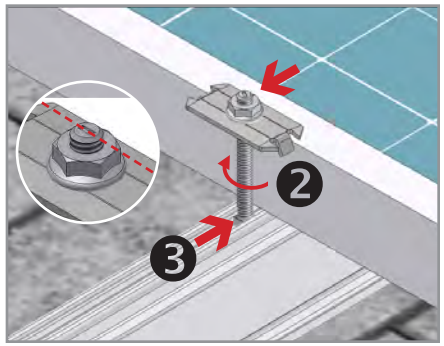
INSTALLATION GUIDE



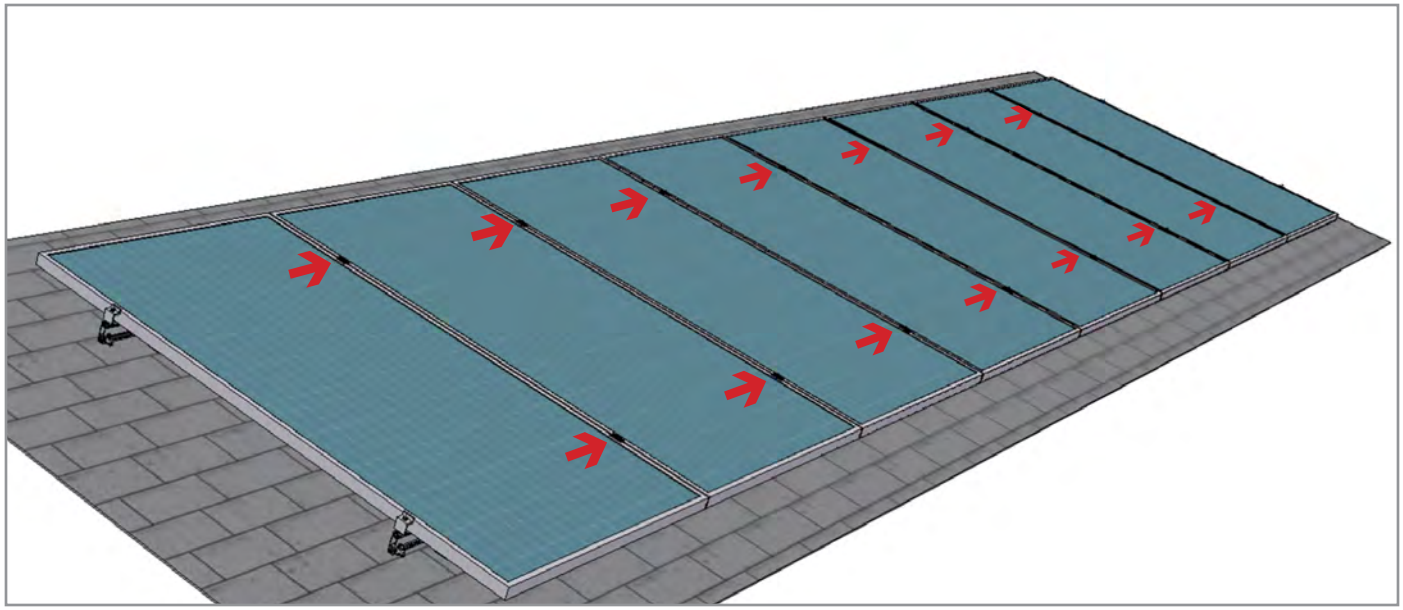
Mid clamp is supplied as an assembly with a bonding T-bolt and a retaining washer to hold the clamp upright for module installation. Clamp assemblies may be positioned in rail near point of use prior to module placement.

INSERT MIDCLAMP T-BOLT: Apply Anti-Seize and insert 1/4" T-bolt into rail.



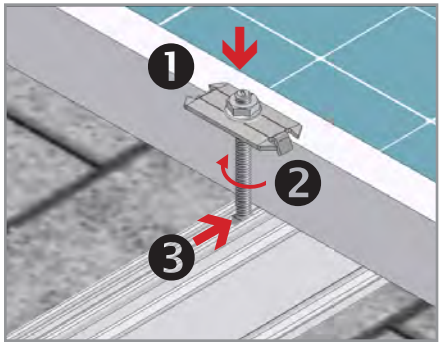


ROTATE MIDCLAMP T-BOLT: Rotate bolt into position and slide until bolt and clamp are against module frame. Do not tighten nut until next module is in position. Verify that the position indicator on the bolt is perpendicular to the rail



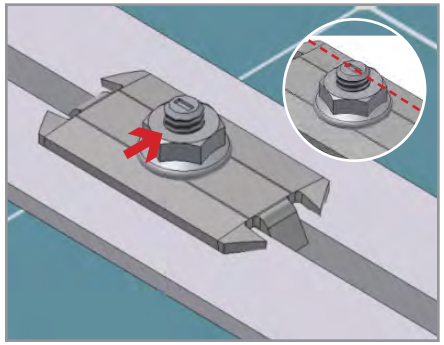
FINISH MODULE INSTALLATION:
Proceed with module installation. Engage each module with the previously positioned clamp assembly:

- Install remaining mid-clamps
- Install End Clamps
- Position alignment marks
- Cut Rail to Desired Length



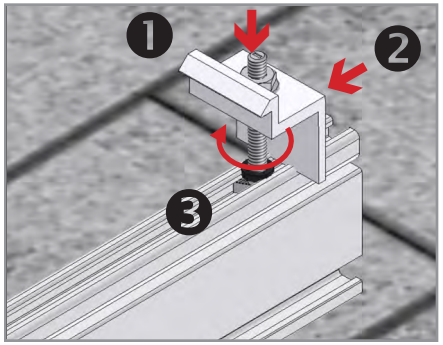
INSTALL REMAINING MID-CLAMPS:
Proceed with module installation. Engage each module with previously positioned Midclamp assemblies.

NOTE: Apply Anti-Seize to each Mid Clamp prior to installation.



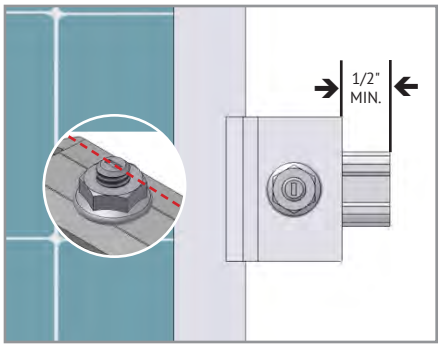
POSITION ALIGNMENT MARKS:
Verify that alignment marks are perpendicular to rail.

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs. w/Anti Seize



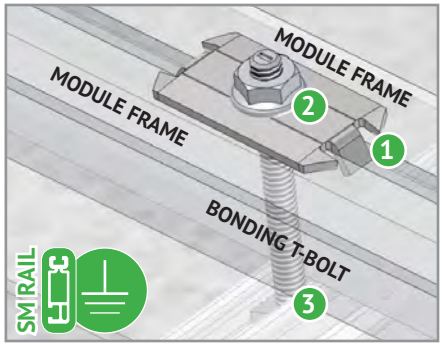
INSTALL ENDCLAMPS:
Apply Anti-Seize and install final Endclamps in same manner as first Endclamps. Slide clamps against module .

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs. w/Anti Seize



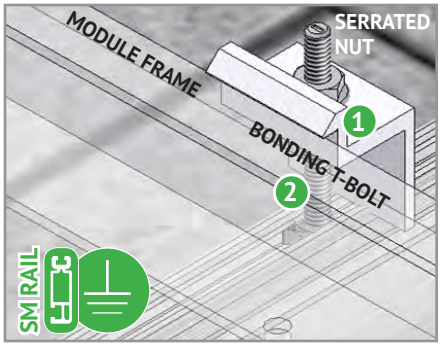
ALIGN POSITION MARKS & CUT RAIL:
Trim off any excess rail, being careful not to cut into the roof. Allow ½" between the Endclamp and the end of the rail

BONDING CONNECTION GROUND PATHS



BONDING MIDCLAMP ASSEMBLY

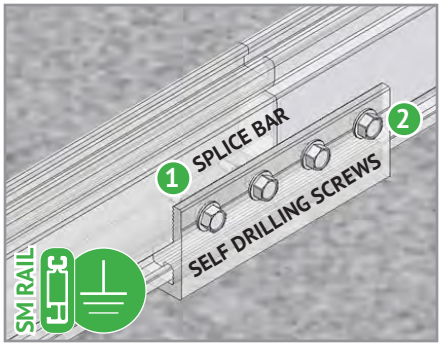
1. Stainless steel Midclamp points, 2 per module, pierce module frame anodization to bond module to module through clamp.
2. Serrated flange nut bonds stainless steel clamp to stainless steel T-bolt
3. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to grounded SM rail.



ENDCLAMP ASSEMBLY

1. Serrated flange nut bonds aluminum Endclamp to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and Endclamp to grounded SM rail

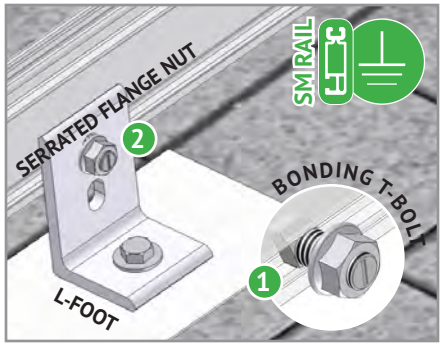
Note: End clamp does not bond to module frame.



BONDING RAIL SPLICE BAR

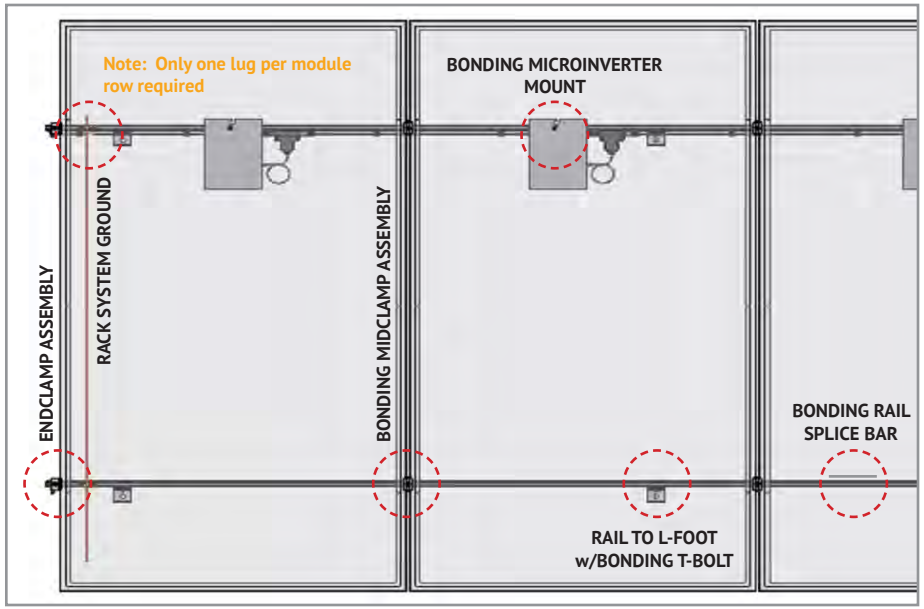
1. Stainless steel self drilling screws drill and tap into splice bar and rail creating bond between splice bar and each rail section
2. Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

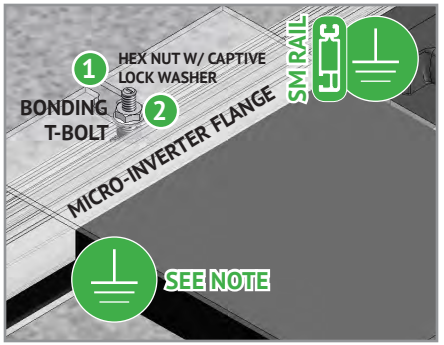
Note: Splice bar and bolted connection are non-structural. The splice bar function is rail alignment and bonding.



RAIL TO L-FOOT w/BONDING T-BOLT

1. Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail

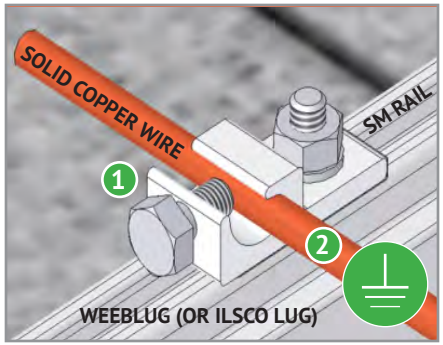




BONDING MICROINVERTER MOUNT

1. Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail **System ground including racking and modules may be achieved with integrated grounding in approved microinverter systems.**

See page H for details



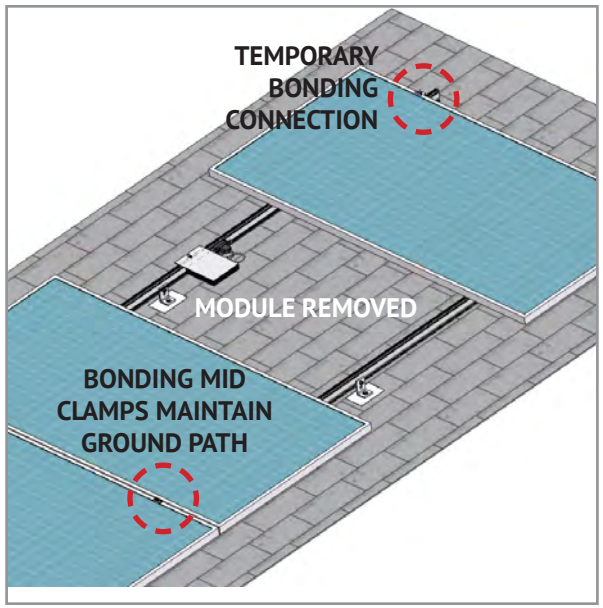
RACK SYSTEM GROUND

1. WEEB washer dimples pierce anodized rail to create bond between rail and lug
2. Solid copper wire connected to lug is routed to provide final system ground connection.

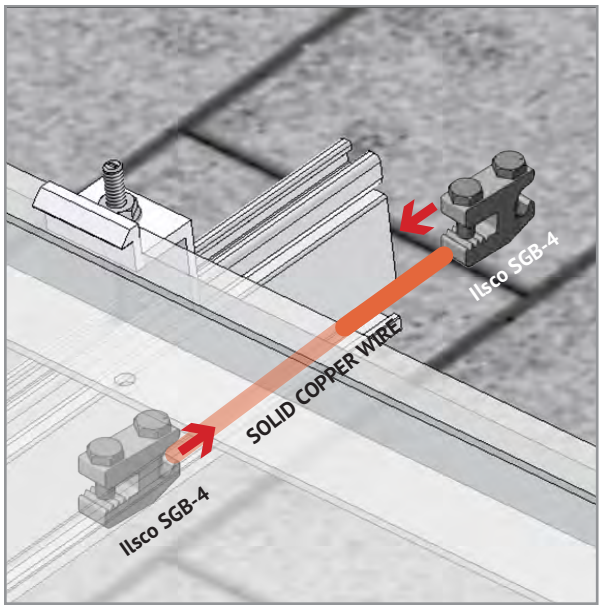
NOTE: Ilsco lug can also be used when secured to the side of the rail.

See page I for details

BONDING CONNECTION GROUND PATHS



TEMPORARY BONDING CONNECTION DURING ARRAY MAINTENANCE: When removing modules for replacement or system maintenance, any module left in place that is secured with a bonding Midclamp will be properly grounded. If a module adjacent to the end module of a row is removed or if any other maintenance condition leaves a module without a bonding mid clamp, a temporary bonding connection must be installed as shown.



TEMPORARY BONDING CONNECTION

- Attach Ilsco SGB4 to wall of rail
- Attach Ilsco SGB4 to module frame
- Install solid copper wire jumper to Ilsco lugs

ELECTRICAL CONSIDERATIONS:
SOLARMOUNT is intended to be used with PV modules that have a system voltage less than or equal to 1000 VDC. A minimum 10AWG, 105 °C copper grounding conductor should be used to ground a 1000 VDC system, according to the National Electric Code (NEC). It is the installer's responsibility to check local codes, which may vary. See below for interconnection information.

INTERCONNECTION INFORMATION
There is no size limit on how many SOLARMOUNT & PV modules can be mechanically interconnected for any given configuration, provided that the installation meets the requirements of applicable building and fire codes.

GROUNDING NOTES: The installation must be conducted in accordance with the National Electric Code (NEC) and the authority having jurisdiction. Please refer to these resources in your location for required grounding lug quantities specific to your project.

The grounding / bonding components may overhang parts of the array so care must be made when walking around the array to avoid damage.

Conductor fastener torque values depend on conductor size. See product data sheets for correct torque values.

Appendix – Table of Contents

APPENDIX A

Product Catalog of Parts List

Please refer to the **Master Price List** at www.unirac.com for a list of part numbers, part descriptions, and prices.

85 mph	5 psf
Basic Wind Speed	Ground Snow Load

ASCE 7-05

California (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-9.6	-18.4	-29.4	14.7	-9.6	-18.4	-29.4	14.7	-12.0	-22.7	-36.0	14.7
	2:12	-8.6	-17.4	-27.3	14.3	-8.6	-17.4	-27.3	14.3	-10.7	-21.4	-33.4	14.3
	3:12	-8.7	-17.4	-27.3	13.9	-8.7	-17.4	-27.3	13.9	-10.7	-21.4	-33.4	13.9
	4:12	-8.7	-17.4	-27.3	13.5	-8.7	-17.4	-27.3	13.5	-10.7	-21.4	-33.4	13.5
	5:12	-8.7	-17.4	-27.3	13.2	-8.7	-17.4	-27.3	13.2	-10.8	-21.4	-33.5	13.2
	6:12	-8.8	-17.5	-27.4	13.1	-8.8	-17.5	-27.4	13.1	-10.8	-21.5	-33.5	13.1
	7:12	-9.8	-12.0	-12.0	13.0	-9.8	-12.0	-12.0	13.0	-12.2	-14.8	-14.8	15.0
	8:12	-9.9	-12.1	-12.1	12.9	-9.9	-12.1	-12.1	12.9	-12.2	-14.9	-14.9	14.9
	9:12	-9.9	-12.1	-12.1	12.8	-9.9	-12.1	-12.1	12.8	-12.3	-14.9	-14.9	14.8
	10:12	-9.9	-12.1	-12.1	12.7	-9.9	-12.1	-12.1	12.7	-12.3	-15.0	-15.0	14.7
	11:12	-10.0	-12.2	-12.2	12.6	-10.0	-12.2	-12.2	12.6	-12.3	-15.0	-15.0	14.6
	12:12	-10.0	-12.2	-12.2	12.5	-10.0	-12.2	-12.2	12.5	-12.4	-15.1	-15.1	14.5
Exposure Category C	1:12	-12.0	-22.7	-36.0	14.7	-14.0	-26.4	-41.8	14.7	-16.4	-30.6	-48.4	14.7
	2:12	-10.7	-21.4	-33.4	14.3	-12.5	-24.8	-38.7	14.3	-14.6	-28.8	-44.8	14.3
	3:12	-10.7	-21.4	-33.4	13.9	-12.5	-24.9	-38.7	13.9	-14.7	-28.9	-44.9	13.9
	4:12	-10.7	-21.4	-33.4	13.5	-12.6	-24.9	-38.8	13.5	-14.7	-28.9	-44.9	13.5
	5:12	-10.8	-21.4	-33.5	13.2	-12.6	-24.9	-38.8	13.2	-14.7	-28.9	-44.9	13.2
	6:12	-10.8	-21.5	-33.5	13.1	-12.6	-25.0	-38.8	13.1	-14.8	-29.0	-45.0	13.1
	7:12	-12.2	-14.8	-14.8	15.0	-14.2	-17.3	-17.3	16.9	-16.6	-20.1	-20.1	19.0
	8:12	-12.2	-14.9	-14.9	14.9	-14.3	-17.3	-17.3	16.8	-16.6	-20.2	-20.2	18.9
	9:12	-12.3	-14.9	-14.9	14.8	-14.3	-17.4	-17.4	16.7	-16.7	-20.2	-20.2	18.8
	10:12	-12.3	-15.0	-15.0	14.7	-14.4	-17.4	-17.4	16.6	-16.7	-20.3	-20.3	18.7
	11:12	-12.3	-15.0	-15.0	14.6	-14.4	-17.5	-17.5	16.4	-16.8	-20.3	-20.3	18.6
	12:12	-12.4	-15.1	-15.1	14.5	-14.4	-17.5	-17.5	16.3	-16.8	-20.3	-20.3	18.5
Exposure Category D	1:12	-14.8	-27.8	-44.0	14.7	-16.9	-31.5	-49.7	14.7	-19.2	-35.7	-56.3	14.7
	2:12	-13.2	-26.2	-40.7	14.3	-15.1	-29.6	-46.1	14.3	-17.2	-33.7	-52.2	14.6
	3:12	-13.2	-26.2	-40.8	13.9	-15.1	-29.7	-46.1	13.9	-17.2	-33.7	-52.2	14.2
	4:12	-13.3	-26.2	-40.8	13.5	-15.1	-29.7	-46.1	13.5	-17.2	-33.7	-52.2	13.7
	5:12	-13.3	-26.3	-40.8	13.2	-15.1	-29.7	-46.1	13.2	-17.3	-33.7	-52.3	13.5
	6:12	-13.3	-26.3	-40.9	13.1	-15.2	-29.8	-46.2	13.1	-17.3	-33.8	-52.3	13.4
	7:12	-15.0	-18.2	-18.2	17.6	-17.0	-20.7	-20.7	19.4	-19.4	-23.5	-23.5	21.6
	8:12	-15.0	-18.3	-18.3	17.5	-17.1	-20.7	-20.7	19.3	-19.5	-23.6	-23.6	21.4
	9:12	-15.1	-18.3	-18.3	17.4	-17.1	-20.8	-20.8	19.2	-19.5	-23.6	-23.6	21.3
	10:12	-15.1	-18.4	-18.4	17.3	-17.2	-20.8	-20.8	19.1	-19.5	-23.7	-23.7	21.2
	11:12	-15.2	-18.4	-18.4	17.2	-17.2	-20.9	-20.9	19.0	-19.6	-23.7	-23.7	21.1
	12:12	-15.2	-18.5	-18.5	17.0	-17.3	-20.9	-20.9	18.9	-19.6	-23.7	-23.7	21.0

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	0.7	0.8	0.9	1.1	1.2	1.3	1.8	2.0	2.3	2.9	3.6	4.4
	2:12	1.3	1.3	1.5	1.6	1.7	1.9	2.3	2.4	2.7	3.3	3.9	4.7
	3:12	1.9	1.9	2.0	2.1	2.2	2.3	2.7	2.9	3.1	3.7	4.2	5.0
	4:12	2.4	2.4	2.4	2.5	2.6	2.8	3.2	3.3	3.6	4.1	4.6	5.3
	5:12	2.7	2.7	2.7	2.9	3.0	3.1	3.5	3.6	3.9	4.4	4.9	5.5
	6:12	3.1	3.1	3.1	3.1	3.3	3.4	3.8	3.9	4.2	4.7	5.1	5.7
	7:12	3.3	3.3	3.3	3.4	3.5	3.6	4.0	4.1	4.4	4.9	5.3	5.9
	8:12	3.5	3.5	3.5	3.5	3.7	3.8	4.1	4.3	4.5	5.0	5.5	6.0
	9:12	3.6	3.6	3.6	3.7	3.8	3.9	4.3	4.4	4.6	5.1	5.6	6.1
	10:12	3.7	3.7	3.7	3.8	3.9	4.0	4.4	4.5	4.7	5.2	5.6	6.2
	11:12	3.8	3.8	3.8	3.9	4.0	4.1	4.4	4.5	4.8	5.2	5.7	6.2
	12:12	3.8	3.8	3.8	3.9	4.0	4.1	4.4	4.6	4.8	5.2	5.7	6.2

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

7-05 ASCE

Southwest (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

90 mph
Basic Wind Speed

5 psf
Ground Snow Load

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-11.0	-20.8	-33.2	14.7	-11.0	-20.8	-33.2	14.7	-13.6	-25.6	-40.6	14.7
	2:12	-9.7	-19.6	-30.7	14.3	-9.7	-19.6	-30.7	14.3	-12.1	-24.1	-37.6	14.3
	3:12	-9.8	-19.6	-30.7	13.9	-9.8	-19.6	-30.7	13.9	-12.1	-24.1	-37.6	13.9
	4:12	-9.8	-19.7	-30.8	13.5	-9.8	-19.7	-30.8	13.5	-12.2	-24.2	-37.6	13.5
	5:12	-9.8	-19.7	-30.8	13.2	-9.8	-19.7	-30.8	13.2	-12.2	-24.2	-37.7	13.2
	6:12	-9.9	-19.7	-30.8	13.1	-9.9	-19.7	-30.8	13.1	-12.3	-24.2	-37.7	13.1
	7:12	-11.1	-13.6	-13.6	14.1	-11.1	-13.6	-13.6	14.1	-13.8	-16.8	-16.8	16.5
	8:12	-11.2	-13.7	-13.7	14.0	-11.2	-13.7	-13.7	14.0	-13.8	-16.8	-16.8	16.4
	9:12	-11.2	-13.7	-13.7	13.9	-11.2	-13.7	-13.7	13.9	-13.9	-16.9	-16.9	16.3
	10:12	-11.3	-13.7	-13.7	13.8	-11.3	-13.7	-13.7	13.8	-13.9	-16.9	-16.9	16.2
	11:12	-11.3	-13.8	-13.8	13.7	-11.3	-13.8	-13.8	13.7	-14.0	-17.0	-17.0	16.1
	12:12	-11.4	-13.8	-13.8	13.6	-11.4	-13.8	-13.8	13.6	-14.0	-17.0	-17.0	16.0
Exposure Category C	1:12	-13.6	-25.6	-40.6	14.7	-15.9	-29.7	-47.0	14.7	-18.5	-34.5	-54.4	14.7
	2:12	-12.1	-24.1	-37.6	14.3	-14.2	-28.0	-43.6	14.3	-16.6	-32.5	-50.4	14.3
	3:12	-12.1	-24.1	-37.6	13.9	-14.2	-28.0	-43.6	13.9	-16.6	-32.5	-50.4	13.9
	4:12	-12.2	-24.2	-37.6	13.5	-14.2	-28.1	-43.6	13.5	-16.6	-32.6	-50.5	13.5
	5:12	-12.2	-24.2	-37.7	13.2	-14.3	-28.1	-43.6	13.2	-16.7	-32.6	-50.5	13.2
	6:12	-12.3	-24.2	-37.7	13.1	-14.3	-28.1	-43.7	13.1	-16.7	-32.6	-50.6	13.1
	7:12	-13.8	-16.8	-16.8	16.5	-16.1	-19.5	-19.5	18.6	-18.7	-22.7	-22.7	20.9
	8:12	-13.8	-16.8	-16.8	16.4	-16.1	-19.6	-19.6	18.5	-18.8	-22.8	-22.8	20.8
	9:12	-13.9	-16.9	-16.9	16.3	-16.2	-19.6	-19.6	18.3	-18.8	-22.8	-22.8	20.7
	10:12	-13.9	-16.9	-16.9	16.2	-16.2	-19.7	-19.7	18.2	-18.9	-22.8	-22.8	20.6
	11:12	-14.0	-17.0	-17.0	16.1	-16.3	-19.7	-19.7	18.1	-18.9	-22.9	-22.9	20.5
	12:12	-14.0	-17.0	-17.0	16.0	-16.3	-19.8	-19.8	18.0	-18.9	-22.9	-22.9	20.4
Exposure Category D	1:12	-16.8	-31.3	-49.5	14.7	-19.1	-35.4	-55.9	14.7	-21.7	-40.2	-63.3	14.7
	2:12	-15.0	-29.5	-45.8	14.3	-17.0	-33.4	-51.8	14.5	-19.4	-37.9	-58.7	15.5
	3:12	-15.0	-29.5	-45.9	13.9	-17.1	-33.4	-51.8	14.1	-19.4	-37.9	-58.7	15.1
	4:12	-15.0	-29.6	-45.9	13.5	-17.1	-33.5	-51.9	13.7	-19.5	-37.9	-58.7	14.9
	5:12	-15.1	-29.6	-45.9	13.2	-17.1	-33.5	-51.9	13.5	-19.5	-38.0	-58.8	14.8
	6:12	-15.1	-29.6	-46.0	13.1	-17.2	-33.5	-51.9	13.4	-19.6	-38.0	-58.8	14.7
	7:12	-17.0	-20.6	-20.6	19.4	-19.3	-23.3	-23.3	21.4	-21.9	-26.5	-26.5	23.8
	8:12	-17.0	-20.6	-20.6	19.2	-19.3	-23.4	-23.4	21.3	-21.9	-26.6	-26.6	23.7
	9:12	-17.1	-20.7	-20.7	19.1	-19.3	-23.4	-23.4	21.2	-22.0	-26.6	-26.6	23.6
	10:12	-17.1	-20.7	-20.7	19.0	-19.4	-23.5	-23.5	21.1	-22.0	-26.7	-26.7	23.5
	11:12	-17.1	-20.8	-20.8	18.9	-19.4	-23.5	-23.5	21.0	-22.1	-26.7	-26.7	23.4
	12:12	-17.2	-20.8	-20.8	18.8	-19.5	-23.6	-23.6	20.9	-22.1	-26.7	-26.7	23.3

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	0.7	0.8	0.9	1.1	1.2	1.3	1.8	2.0	2.3	2.9	3.6	4.4
	2:12	1.3	1.3	1.5	1.6	1.7	1.9	2.3	2.4	2.7	3.3	3.9	4.7
	3:12	1.9	1.9	2.0	2.1	2.2	2.3	2.7	2.9	3.1	3.7	4.2	5.0
	4:12	2.4	2.4	2.4	2.5	2.6	2.8	3.2	3.3	3.6	4.1	4.6	5.3
	5:12	2.7	2.7	2.7	2.9	3.0	3.1	3.5	3.6	3.9	4.4	4.9	5.5
	6:12	3.1	3.1	3.1	3.1	3.3	3.4	3.8	3.9	4.2	4.7	5.1	5.7
	7:12	3.3	3.3	3.3	3.4	3.5	3.6	4.0	4.1	4.4	4.9	5.3	5.9
	8:12	3.5	3.5	3.5	3.5	3.7	3.8	4.1	4.3	4.5	5.0	5.5	6.0
	9:12	3.6	3.6	3.6	3.7	3.8	3.9	4.3	4.4	4.6	5.1	5.6	6.1
	10:12	3.7	3.7	3.7	3.8	3.9	4.0	4.4	4.5	4.7	5.2	5.6	6.2
	11:12	3.8	3.8	3.8	3.9	4.0	4.1	4.4	4.5	4.8	5.2	5.7	6.2
	12:12	3.8	3.8	3.8	3.9	4.0	4.1	4.4	4.6	4.8	5.2	5.7	6.2

Lateral

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

7-05 ASCE

90 mph — Basic Wind Speed

25 psf — Ground Snow Load

Mid US (Medium Snow)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-11.0	-20.8	-33.2	25.9	-11.0	-20.8	-33.2	25.9	-13.6	-25.6	-40.6	25.9
	2:12	-9.7	-19.6	-30.7	24.5	-9.7	-19.6	-30.7	24.5	-12.1	-24.1	-37.6	24.5
	3:12	-9.8	-19.6	-30.7	23.0	-9.8	-19.6	-30.7	23.0	-12.1	-24.1	-37.6	23.0
	4:12	-9.8	-19.7	-30.8	21.5	-9.8	-19.7	-30.8	21.5	-12.2	-24.2	-37.6	21.5
	5:12	-9.8	-19.7	-30.8	20.0	-9.8	-19.7	-30.8	20.0	-12.2	-24.2	-37.7	20.0
	6:12	-9.9	-19.7	-30.8	18.6	-9.9	-19.7	-30.8	18.6	-12.3	-24.2	-37.7	18.6
	7:12	-11.1	-13.6	-13.6	18.2	-11.1	-13.6	-13.6	18.2	-13.8	-16.8	-16.8	20.0
	8:12	-11.2	-13.7	-13.7	17.0	-11.2	-13.7	-13.7	17.0	-13.8	-16.8	-16.8	18.8
	9:12	-11.2	-13.7	-13.7	16.0	-11.2	-13.7	-13.7	16.0	-13.9	-16.9	-16.9	17.8
	10:12	-11.3	-13.7	-13.7	15.1	-11.3	-13.7	-13.7	15.1	-13.9	-16.9	-16.9	16.9
	11:12	-11.3	-13.8	-13.8	14.4	-11.3	-13.8	-13.8	14.4	-14.0	-17.0	-17.0	16.1
	12:12	-11.4	-13.8	-13.8	13.7	-11.4	-13.8	-13.8	13.7	-14.0	-17.0	-17.0	16.0
Exposure Category C	1:12	-13.6	-25.6	-40.6	25.9	-15.9	-29.7	-47.0	25.9	-18.5	-34.5	-54.4	25.9
	2:12	-12.1	-24.1	-37.6	24.5	-14.2	-28.0	-43.6	24.5	-16.6	-32.5	-50.4	24.5
	3:12	-12.1	-24.1	-37.6	23.0	-14.2	-28.0	-43.6	23.0	-16.6	-32.5	-50.4	23.0
	4:12	-12.2	-24.2	-37.6	21.5	-14.2	-28.1	-43.6	21.5	-16.6	-32.6	-50.5	21.5
	5:12	-12.2	-24.2	-37.7	20.0	-14.3	-28.1	-43.6	20.0	-16.7	-32.6	-50.5	20.0
	6:12	-12.3	-24.2	-37.7	18.6	-14.3	-28.1	-43.7	18.6	-16.7	-32.6	-50.6	18.6
	7:12	-13.8	-16.8	-16.8	20.0	-16.1	-19.5	-19.5	21.5	-18.7	-22.7	-22.7	23.3
	8:12	-13.8	-16.8	-16.8	18.8	-16.1	-19.6	-19.6	20.4	-18.8	-22.8	-22.8	22.2
	9:12	-13.9	-16.9	-16.9	17.8	-16.2	-19.6	-19.6	19.4	-18.8	-22.8	-22.8	21.1
	10:12	-13.9	-16.9	-16.9	16.9	-16.2	-19.7	-19.7	18.5	-18.9	-22.8	-22.8	20.6
	11:12	-14.0	-17.0	-17.0	16.1	-16.3	-19.7	-19.7	18.1	-18.9	-22.9	-22.9	20.5
	12:12	-14.0	-17.0	-17.0	16.0	-16.3	-19.8	-19.8	18.0	-18.9	-22.9	-22.9	20.4
Exposure Category D	1:12	-16.8	-31.3	-49.5	25.9	-19.1	-35.4	-55.9	25.9	-21.7	-40.2	-63.3	25.9
	2:12	-15.0	-29.5	-45.8	24.5	-17.0	-33.4	-51.8	24.7	-19.4	-37.9	-58.7	25.7
	3:12	-15.0	-29.5	-45.9	23.0	-17.1	-33.4	-51.8	23.2	-19.4	-37.9	-58.7	24.2
	4:12	-15.0	-29.6	-45.9	21.5	-17.1	-33.5	-51.9	21.7	-19.5	-37.9	-58.7	22.7
	5:12	-15.1	-29.6	-45.9	20.0	-17.1	-33.5	-51.9	20.2	-19.5	-38.0	-58.8	21.2
	6:12	-15.1	-29.6	-46.0	18.6	-17.2	-33.5	-51.9	18.8	-19.6	-38.0	-58.8	19.8
	7:12	-17.0	-20.6	-20.6	22.1	-19.3	-23.3	-23.3	23.7	-21.9	-26.5	-26.5	25.4
	8:12	-17.0	-20.6	-20.6	21.0	-19.3	-23.4	-23.4	22.5	-21.9	-26.6	-26.6	24.3
	9:12	-17.1	-20.7	-20.7	19.9	-19.3	-23.4	-23.4	21.5	-22.0	-26.6	-26.6	23.6
	10:12	-17.1	-20.7	-20.7	19.1	-19.4	-23.5	-23.5	21.1	-22.0	-26.7	-26.7	23.5
	11:12	-17.1	-20.8	-20.8	18.9	-19.4	-23.5	-23.5	21.0	-22.1	-26.7	-26.7	23.4
	12:12	-17.2	-20.8	-20.8	18.8	-19.5	-23.6	-23.6	20.9	-22.1	-26.7	-26.7	23.3

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	2.0	2.0	2.0	2.0	2.1	2.2	2.6	2.8	3.0	3.5	4.0	4.6
	2:12	3.6	3.6	3.6	3.6	3.6	3.6	4.0	4.1	4.4	4.9	5.4	6.0
	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.2	5.5	6.0	6.5	7.1
	4:12	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.4	6.9	7.4	8.0
	5:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.5	8.0	8.6
	6:12	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8.0	8.5	9.1
	7:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.8	9.4
	8:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.5	9.0	9.5
	9:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	9.6
	10:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	9.5
	11:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.4	8.9	9.4
	12:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.7	9.2

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

90 mph
Basic Wind Speed

40 psf
Ground Snow Load

ASCE 7-05

Massachusetts (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

		Bldg. Height = 15 ft.				Bldg. Height = 30 ft.				Bldg. Height = 60 ft.			
		Up Pressures (psf)			Down	Up Pressures (psf)			Down	Up Pressures (psf)			Down
	Roof Pitch	Zone 1	Zone 2	Zone 3	(psf)	Zone 1	Zone 2	Zone 3	(psf)	Zone 1	Zone 2	Zone 3	(psf)
Exposure Category B	1:12	-11.0	-20.8	-33.2	31.8	-11.0	-20.8	-33.2	31.8	-13.6	-25.6	-40.6	31.8
	2:12	-9.7	-19.6	-30.7	30.0	-9.7	-19.6	-30.7	30.0	-12.1	-24.1	-37.6	30.0
	3:12	-9.8	-19.6	-30.7	27.9	-9.8	-19.6	-30.7	27.9	-12.1	-24.1	-37.6	27.9
	4:12	-9.8	-19.7	-30.8	25.8	-9.8	-19.7	-30.8	25.8	-12.2	-24.2	-37.6	25.8
	5:12	-9.8	-19.7	-30.8	23.8	-9.8	-19.7	-30.8	23.8	-12.2	-24.2	-37.7	23.8
	6:12	-9.9	-19.7	-30.8	21.9	-9.9	-19.7	-30.8	21.9	-12.3	-24.2	-37.7	21.9
	7:12	-11.1	-13.6	-13.6	20.9	-11.1	-13.6	-13.6	20.9	-13.8	-16.8	-16.8	22.7
	8:12	-11.2	-13.7	-13.7	19.4	-11.2	-13.7	-13.7	19.4	-13.8	-16.8	-16.8	21.1
	9:12	-11.2	-13.7	-13.7	18.0	-11.2	-13.7	-13.7	18.0	-13.9	-16.9	-16.9	19.8
	10:12	-11.3	-13.7	-13.7	16.8	-11.3	-13.7	-13.7	16.8	-13.9	-16.9	-16.9	18.6
	11:12	-11.3	-13.8	-13.8	15.7	-11.3	-13.8	-13.8	15.7	-14.0	-17.0	-17.0	17.5
	12:12	-11.4	-13.8	-13.8	14.8	-11.4	-13.8	-13.8	14.8	-14.0	-17.0	-17.0	16.6
Exposure Category C	1:12	-13.6	-25.6	-40.6	31.8	-15.9	-29.7	-47.0	31.8	-18.5	-34.5	-54.4	31.8
	2:12	-12.1	-24.1	-37.6	30.0	-14.2	-28.0	-43.6	30.0	-16.6	-32.5	-50.4	30.0
	3:12	-12.1	-24.1	-37.6	27.9	-14.2	-28.0	-43.6	27.9	-16.6	-32.5	-50.4	27.9
	4:12	-12.2	-24.2	-37.6	25.8	-14.2	-28.1	-43.6	25.8	-16.6	-32.6	-50.5	25.8
	5:12	-12.2	-24.2	-37.7	23.8	-14.3	-28.1	-43.6	23.8	-16.7	-32.6	-50.5	23.8
	6:12	-12.3	-24.2	-37.7	21.9	-14.3	-28.1	-43.7	21.9	-16.7	-32.6	-50.6	21.9
	7:12	-13.8	-16.8	-16.8	22.7	-16.1	-19.5	-19.5	24.3	-18.7	-22.7	-22.7	26.0
	8:12	-13.8	-16.8	-16.8	21.1	-16.1	-19.6	-19.6	22.7	-18.8	-22.8	-22.8	24.5
	9:12	-13.9	-16.9	-16.9	19.8	-16.2	-19.6	-19.6	21.3	-18.8	-22.8	-22.8	23.1
	10:12	-13.9	-16.9	-16.9	18.6	-16.2	-19.7	-19.7	20.1	-18.9	-22.8	-22.8	21.9
	11:12	-14.0	-17.0	-17.0	17.5	-16.3	-19.7	-19.7	19.1	-18.9	-22.9	-22.9	20.8
	12:12	-14.0	-17.0	-17.0	16.6	-16.3	-19.8	-19.8	18.2	-18.9	-22.9	-22.9	20.4
Exposure Category D	1:12	-16.8	-31.3	-49.5	29.8	-19.1	-35.4	-55.9	29.8	-21.7	-40.2	-63.3	29.8
	2:12	-15.0	-29.5	-45.8	28.1	-17.0	-33.4	-51.8	28.2	-19.4	-37.9	-58.7	29.2
	3:12	-15.0	-29.5	-45.9	26.2	-17.1	-33.4	-51.8	26.4	-19.4	-37.9	-58.7	27.4
	4:12	-15.0	-29.6	-45.9	24.3	-17.1	-33.5	-51.9	24.5	-19.5	-37.9	-58.7	25.5
	5:12	-15.1	-29.6	-45.9	22.5	-17.1	-33.5	-51.9	22.6	-19.5	-38.0	-58.8	23.6
	6:12	-15.1	-29.6	-46.0	20.7	-17.2	-33.5	-51.9	20.9	-19.6	-38.0	-58.8	21.9
	7:12	-17.0	-20.6	-20.6	23.9	-19.3	-23.3	-23.3	25.4	-21.9	-26.5	-26.5	27.2
	8:12	-17.0	-20.6	-20.6	22.5	-19.3	-23.4	-23.4	24.0	-21.9	-26.6	-26.6	25.8
	9:12	-17.1	-20.7	-20.7	21.2	-19.3	-23.4	-23.4	22.8	-22.0	-26.6	-26.6	24.5
	10:12	-17.1	-20.7	-20.7	20.1	-19.4	-23.5	-23.5	21.7	-22.0	-26.7	-26.7	23.5
	11:12	-17.1	-20.8	-20.8	19.2	-19.4	-23.5	-23.5	21.0	-22.1	-26.7	-26.7	23.4
	12:12	-17.2	-20.8	-20.8	18.8	-19.5	-23.6	-23.6	20.9	-22.1	-26.7	-26.7	23.3

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	2.6	2.6	2.6	2.6	2.6	2.7	3.1	3.3	3.5	4.0	4.5	5.1
	2:12	4.9	4.9	4.9	4.9	4.9	4.9	4.9	5.0	5.3	5.8	6.3	6.9
	3:12	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	7.3	7.8	8.4
	4:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.4	8.9	9.5
	5:12	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.7	10.3
	6:12	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	10.3	10.9
	7:12	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.7	11.2
	8:12	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.8	11.4
	9:12	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.8	11.4
	10:12	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.8	11.3
	11:12	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.6	11.1
	12:12	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.3	10.9

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

7-05 ASCE

Mid US (High Snow)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

90 mph — Basic Wind Speed

60 psf — Ground Snow Load

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-11.0	-20.8	-33.2	45.2	-11.0	-20.8	-33.2	45.2	-13.6	-25.6	-40.6	45.2
	2:12	-9.7	-19.6	-30.7	41.5	-9.7	-19.6	-30.7	41.5	-12.1	-24.1	-37.6	41.5
	3:12	-9.8	-19.6	-30.7	37.4	-9.8	-19.6	-30.7	37.4	-12.1	-24.1	-37.6	37.4
	4:12	-9.8	-19.7	-30.8	33.3	-9.8	-19.7	-30.8	33.3	-12.2	-24.2	-37.6	33.3
	5:12	-9.8	-19.7	-30.8	30.3	-9.8	-19.7	-30.8	30.3	-12.2	-24.2	-37.7	30.3
	6:12	-9.9	-19.7	-30.8	27.5	-9.9	-19.7	-30.8	27.5	-12.3	-24.2	-37.7	27.5
	7:12	-11.1	-13.6	-13.6	25.7	-11.1	-13.6	-13.6	25.7	-13.8	-16.8	-16.8	27.5
	8:12	-11.2	-13.7	-13.7	23.4	-11.2	-13.7	-13.7	23.4	-13.8	-16.8	-16.8	25.2
	9:12	-11.2	-13.7	-13.7	21.4	-11.2	-13.7	-13.7	21.4	-13.9	-16.9	-16.9	23.2
	10:12	-11.3	-13.7	-13.7	19.7	-11.3	-13.7	-13.7	19.7	-13.9	-16.9	-16.9	21.4
	11:12	-11.3	-13.8	-13.8	18.1	-11.3	-13.8	-13.8	18.1	-14.0	-17.0	-17.0	19.9
	12:12	-11.4	-13.8	-13.8	16.9	-11.4	-13.8	-13.8	16.9	-14.0	-17.0	-17.0	18.6
Exposure Category C	1:12	-13.6	-25.6	-40.6	45.2	-15.9	-29.7	-47.0	45.2	-18.5	-34.5	-54.4	45.2
	2:12	-12.1	-24.1	-37.6	41.5	-14.2	-28.0	-43.6	41.5	-16.6	-32.5	-50.4	41.5
	3:12	-12.1	-24.1	-37.6	37.4	-14.2	-28.0	-43.6	37.4	-16.6	-32.5	-50.4	37.4
	4:12	-12.2	-24.2	-37.6	33.3	-14.2	-28.1	-43.6	33.3	-16.6	-32.6	-50.5	33.3
	5:12	-12.2	-24.2	-37.7	30.3	-14.3	-28.1	-43.6	30.3	-16.7	-32.6	-50.5	30.3
	6:12	-12.3	-24.2	-37.7	27.5	-14.3	-28.1	-43.7	27.5	-16.7	-32.6	-50.6	27.5
	7:12	-13.8	-16.8	-16.8	27.5	-16.1	-19.5	-19.5	29.1	-18.7	-22.7	-22.7	30.8
	8:12	-13.8	-16.8	-16.8	25.2	-16.1	-19.6	-19.6	26.8	-18.8	-22.8	-22.8	28.5
	9:12	-13.9	-16.9	-16.9	23.2	-16.2	-19.6	-19.6	24.7	-18.8	-22.8	-22.8	26.5
	10:12	-13.9	-16.9	-16.9	21.4	-16.2	-19.7	-19.7	23.0	-18.9	-22.8	-22.8	24.8
	11:12	-14.0	-17.0	-17.0	19.9	-16.3	-19.7	-19.7	21.5	-18.9	-22.9	-22.9	23.3
	12:12	-14.0	-17.0	-17.0	18.6	-16.3	-19.8	-19.8	20.2	-18.9	-22.9	-22.9	22.0
Exposure Category D	1:12	-16.8	-31.3	-49.5	41.0	-19.1	-35.4	-55.9	41.0	-21.7	-40.2	-63.3	41.0
	2:12	-15.0	-29.5	-45.8	37.7	-17.0	-33.4	-51.8	37.7	-19.4	-37.9	-58.7	37.8
	3:12	-15.0	-29.5	-45.9	34.0	-17.1	-33.4	-51.8	34.0	-19.4	-37.9	-58.7	35.0
	4:12	-15.0	-29.6	-45.9	31.1	-17.1	-33.5	-51.9	31.2	-19.5	-37.9	-58.7	32.2
	5:12	-15.1	-29.6	-45.9	28.3	-17.1	-33.5	-51.9	28.5	-19.5	-38.0	-58.8	29.5
	6:12	-15.1	-29.6	-46.0	25.8	-17.2	-33.5	-51.9	26.0	-19.6	-38.0	-58.8	26.9
	7:12	-17.0	-20.6	-20.6	28.2	-19.3	-23.3	-23.3	29.8	-21.9	-26.5	-26.5	31.5
	8:12	-17.0	-20.6	-20.6	26.1	-19.3	-23.4	-23.4	27.7	-21.9	-26.6	-26.6	29.5
	9:12	-17.1	-20.7	-20.7	24.3	-19.3	-23.4	-23.4	25.8	-22.0	-26.6	-26.6	27.6
	10:12	-17.1	-20.7	-20.7	22.7	-19.4	-23.5	-23.5	24.3	-22.0	-26.7	-26.7	26.0
	11:12	-17.1	-20.8	-20.8	21.3	-19.4	-23.5	-23.5	22.9	-22.1	-26.7	-26.7	24.7
	12:12	-17.2	-20.8	-20.8	20.2	-19.5	-23.6	-23.6	21.7	-22.1	-26.7	-26.7	23.5

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	3.8	3.8	4.0	4.5	4.9	5.3	6.6	7.1	8.0	9.7	11.6	14.3
	2:12	7.0	7.0	7.0	7.0	7.3	7.7	9.0	9.5	10.3	11.9	13.5	15.5
	3:12	9.6	9.6	9.6	9.6	9.6	9.6	10.8	11.3	12.1	13.6	15.2	17.0
	4:12	11.6	11.6	11.6	11.6	11.6	11.6	12.2	12.7	13.4	14.9	16.3	18.1
	5:12	13.1	13.1	13.1	13.1	13.1	13.1	13.2	13.6	14.3	15.7	17.0	18.7
	6:12	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.2	14.8	16.1	17.4	18.9
	7:12	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	15.1	16.3	17.4	18.9
	8:12	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	16.2	17.3	18.6
	9:12	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	15.9	16.9	18.1
	10:12	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	15.5	16.4	17.6
	11:12	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.9	15.8	16.9
	12:12	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	14.4	15.2	16.2

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.7	1.4	2.1	2.6	3.1	4.9	5.6	6.7	8.9	11.1	13.8

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

East Coast (Medium Snow)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

7-05 ASCE

100 mph Basic Wind Speed

25 psf Ground Snow Load

Up and Down (psf)

		Bldg. Height = 15 ft.				Bldg. Height = 30 ft.				Bldg. Height = 60 ft.			
		Up Pressures (psf)			Down (psf)	Up Pressures (psf)			Down (psf)	Up Pressures (psf)			Down (psf)
	Roof Pitch	Zone 1	Zone 2	Zone 3		Zone 1	Zone 2	Zone 3		Zone 1	Zone 2	Zone 3	
Exposure Category B	1:12	-13.9	-26.0	-41.3	25.9	-13.9	-26.0	-41.3	25.9	-17.1	-31.9	-50.4	25.9
	2:12	-12.4	-24.5	-38.2	24.5	-12.4	-24.5	-38.2	24.5	-15.3	-30.1	-46.7	24.5
	3:12	-12.4	-24.6	-38.3	23.0	-12.4	-24.6	-38.3	23.0	-15.3	-30.1	-46.8	23.0
	4:12	-12.4	-24.6	-38.3	21.5	-12.4	-24.6	-38.3	21.5	-15.3	-30.1	-46.8	21.5
	5:12	-12.4	-24.6	-38.3	20.0	-12.4	-24.6	-38.3	20.0	-15.4	-30.2	-46.8	20.0
	6:12	-12.5	-24.7	-38.4	18.6	-12.5	-24.7	-38.4	18.6	-15.4	-30.2	-46.9	18.6
	7:12	-14.0	-17.1	-17.1	20.1	-14.0	-17.1	-17.1	20.1	-17.3	-21.0	-21.0	22.3
	8:12	-14.1	-17.1	-17.1	19.0	-14.1	-17.1	-17.1	19.0	-17.4	-21.1	-21.1	21.2
	9:12	-14.1	-17.2	-17.2	18.0	-14.1	-17.2	-17.2	18.0	-17.4	-21.1	-21.1	20.2
	10:12	-14.2	-17.2	-17.2	17.1	-14.2	-17.2	-17.2	17.1	-17.4	-21.1	-21.1	19.3
	11:12	-14.2	-17.3	-17.3	16.3	-14.2	-17.3	-17.3	16.3	-17.5	-21.2	-21.2	19.2
	12:12	-14.3	-17.3	-17.3	16.2	-14.3	-17.3	-17.3	16.2	-17.5	-21.2	-21.2	19.1
Exposure Category C	1:12	-17.1	-31.9	-50.4	25.9	-20.0	-37.0	-58.3	25.9	-23.2	-42.9	-67.5	25.9
	2:12	-15.3	-30.1	-46.7	24.5	-17.8	-34.9	-54.1	25.0	-20.8	-40.4	-62.6	26.3
	3:12	-15.3	-30.1	-46.8	23.0	-17.9	-34.9	-54.1	23.5	-20.8	-40.5	-62.6	24.8
	4:12	-15.3	-30.1	-46.8	21.5	-17.9	-34.9	-54.1	22.0	-20.8	-40.5	-62.6	23.2
	5:12	-15.4	-30.2	-46.8	20.0	-17.9	-35.0	-54.2	20.5	-20.9	-40.5	-62.7	21.8
	6:12	-15.4	-30.2	-46.9	18.6	-18.0	-35.0	-54.2	19.1	-20.9	-40.6	-62.7	20.4
	7:12	-17.3	-21.0	-21.0	22.3	-20.1	-24.4	-24.4	24.3	-23.4	-28.3	-28.3	26.5
	8:12	-17.4	-21.1	-21.1	21.2	-20.2	-24.4	-24.4	23.1	-23.4	-28.4	-28.4	25.3
	9:12	-17.4	-21.1	-21.1	20.2	-20.2	-24.5	-24.5	22.1	-23.5	-28.4	-28.4	24.9
	10:12	-17.4	-21.1	-21.1	19.3	-20.3	-24.5	-24.5	21.9	-23.5	-28.4	-28.4	24.8
	11:12	-17.5	-21.2	-21.2	19.2	-20.3	-24.6	-24.6	21.8	-23.6	-28.5	-28.5	24.7
	12:12	-17.5	-21.2	-21.2	19.1	-20.4	-24.6	-24.6	21.7	-23.6	-28.5	-28.5	24.6
Exposure Category D	1:12	-21.0	-39.0	-61.4	25.9	-23.9	-44.1	-69.3	25.9	-27.1	-49.9	-78.4	25.9
	2:12	-18.8	-36.7	-56.9	25.4	-21.4	-41.6	-64.3	26.5	-24.3	-47.1	-72.8	27.7
	3:12	-18.8	-36.8	-56.9	24.0	-21.4	-41.6	-64.3	25.0	-24.3	-47.1	-72.8	26.2
	4:12	-18.9	-36.8	-57.0	22.4	-21.4	-41.6	-64.3	23.5	-24.4	-47.2	-72.8	24.7
	5:12	-18.9	-36.8	-57.0	20.9	-21.4	-41.6	-64.4	22.0	-24.4	-47.2	-72.8	23.2
	6:12	-18.9	-36.9	-57.0	19.6	-21.5	-41.7	-64.4	20.6	-24.4	-47.2	-72.9	21.8
	7:12	-21.2	-25.7	-25.7	25.0	-24.1	-29.1	-29.1	26.9	-27.3	-33.0	-33.0	29.1
	8:12	-21.3	-25.8	-25.8	23.8	-24.1	-29.1	-29.1	25.7	-27.4	-33.1	-33.1	28.6
	9:12	-21.3	-25.8	-25.8	23.0	-24.1	-29.2	-29.2	25.5	-27.4	-33.1	-33.1	28.5
	10:12	-21.4	-25.8	-25.8	22.9	-24.2	-29.2	-29.2	25.4	-27.4	-33.1	-33.1	28.3
	11:12	-21.4	-25.9	-25.9	22.7	-24.2	-29.3	-29.3	25.3	-27.5	-33.2	-33.2	28.2
	12:12	-21.4	-25.9	-25.9	22.6	-24.3	-29.3	-29.3	25.2	-27.5	-33.2	-33.2	28.1

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	2.0	2.0	2.0	2.0	2.1	2.2	2.6	2.8	3.0	3.5	4.0	4.6
	2:12	3.6	3.6	3.6	3.6	3.6	3.6	4.0	4.1	4.4	4.9	5.4	6.0
	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.2	5.5	6.0	6.5	7.1
	4:12	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.4	6.9	7.4	8.0
	5:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.5	8.0	8.6
	6:12	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8.0	8.5	9.1
	7:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.8	9.4
	8:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.5	9.0	9.5
	9:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	9.6
	10:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	9.5
	11:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.4	8.9	9.4
	12:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.7	9.2

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

110 mph
Basic Wind Speed

10 psf
Ground Snow Load

ASCE 7-05

East Coast (Low Snow)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

Exposure	Roof Pitch	15 ft. Up Zone 1	15 ft. Up Zone 2	15 ft. Up Zone 3	15 ft. Down (psf)	30 ft. Up Zone 1	30 ft. Up Zone 2	30 ft. Up Zone 3	30 ft. Down (psf)	60 ft. Up Zone 1	60 ft. Up Zone 2	60 ft. Up Zone 3	60 ft. Down (psf)
Exposure Category B	1:12	-17.1	-31.8	-50.2	18.4	-17.1	-31.8	-50.2	18.4	-21.0	-38.9	-61.3	18.4
	2:12	-15.2	-30.0	-46.6	17.7	-15.2	-30.0	-46.6	17.7	-18.8	-36.7	-56.8	18.6
	3:12	-15.3	-30.0	-46.6	17.0	-15.3	-30.0	-46.6	17.0	-18.8	-36.7	-56.9	17.9
	4:12	-15.3	-30.0	-46.6	16.2	-15.3	-30.0	-46.6	16.2	-18.8	-36.7	-56.9	17.1
	5:12	-15.3	-30.1	-46.7	15.4	-15.3	-30.1	-46.7	15.4	-18.9	-36.8	-56.9	16.3
	6:12	-15.4	-30.1	-46.7	14.6	-15.4	-30.1	-46.7	14.6	-18.9	-36.8	-57.0	15.5
	7:12	-17.2	-20.9	-20.9	19.6	-17.2	-20.9	-20.9	19.6	-21.2	-25.7	-25.7	23.2
	8:12	-17.3	-21.0	-21.0	19.5	-17.3	-21.0	-21.0	19.5	-21.2	-25.7	-25.7	23.1
	9:12	-17.3	-21.0	-21.0	19.4	-17.3	-21.0	-21.0	19.4	-21.3	-25.8	-25.8	22.9
	10:12	-17.4	-21.1	-21.1	19.3	-17.4	-21.1	-21.1	19.3	-21.3	-25.8	-25.8	22.8
	11:12	-17.4	-21.1	-21.1	19.2	-17.4	-21.1	-21.1	19.2	-21.4	-25.8	-25.8	22.7
	12:12	-17.5	-21.1	-21.1	19.1	-17.5	-21.1	-21.1	19.1	-21.4	-25.9	-25.9	22.6
Exposure Category C	1:12	-21.0	-38.9	-61.3	18.4	-24.4	-45.1	-70.9	18.4	-28.4	-52.2	-81.9	18.4
	2:12	-18.8	-36.7	-56.8	18.6	-21.9	-42.5	-65.7	19.9	-25.4	-49.2	-76.0	21.4
	3:12	-18.8	-36.7	-56.9	17.9	-21.9	-42.5	-65.8	19.1	-25.4	-49.2	-76.0	20.6
	4:12	-18.8	-36.7	-56.9	17.1	-21.9	-42.6	-65.8	18.3	-25.5	-49.3	-76.1	19.8
	5:12	-18.9	-36.8	-56.9	16.3	-22.0	-42.6	-65.8	17.6	-25.5	-49.3	-76.1	19.0
	6:12	-18.9	-36.8	-57.0	15.5	-22.0	-42.6	-65.9	16.8	-25.5	-49.3	-76.1	18.3
	7:12	-21.2	-25.7	-25.7	23.2	-24.6	-29.8	-29.8	26.2	-28.6	-34.5	-34.5	29.8
	8:12	-21.2	-25.7	-25.7	23.1	-24.7	-29.8	-29.8	26.1	-28.6	-34.6	-34.6	29.7
	9:12	-21.3	-25.8	-25.8	22.9	-24.7	-29.9	-29.9	26.0	-28.7	-34.6	-34.6	29.6
	10:12	-21.3	-25.8	-25.8	22.8	-24.7	-29.9	-29.9	25.9	-28.7	-34.6	-34.6	29.5
	11:12	-21.4	-25.8	-25.8	22.7	-24.8	-29.9	-29.9	25.8	-28.7	-34.7	-34.7	29.4
	12:12	-21.4	-25.9	-25.9	22.6	-24.8	-30.0	-30.0	25.7	-28.8	-34.7	-34.7	29.3
Exposure Category D	1:12	-25.7	-47.4	-74.6	18.4	-29.2	-53.6	-84.1	18.4	-33.1	-60.7	-95.2	18.7
	2:12	-23.1	-44.7	-69.2	20.4	-26.1	-50.6	-78.1	21.7	-29.7	-57.3	-88.3	23.2
	3:12	-23.1	-44.8	-69.2	19.6	-26.2	-50.6	-78.1	20.9	-29.7	-57.3	-88.3	22.4
	4:12	-23.1	-44.8	-69.2	18.8	-26.2	-50.6	-78.1	20.1	-29.7	-57.3	-88.4	21.6
	5:12	-23.1	-44.8	-69.2	18.1	-26.2	-50.7	-78.1	19.3	-29.8	-57.4	-88.4	20.8
	6:12	-23.2	-44.9	-69.3	17.3	-26.3	-50.7	-78.2	18.6	-29.8	-57.4	-88.4	20.4
	7:12	-25.9	-31.4	-31.4	27.4	-29.4	-35.5	-35.5	30.5	-33.3	-40.2	-40.2	34.1
	8:12	-26.0	-31.4	-31.4	27.3	-29.4	-35.5	-35.5	30.4	-33.3	-40.2	-40.2	34.0
	9:12	-26.0	-31.4	-31.4	27.2	-29.4	-35.6	-35.6	30.3	-33.4	-40.3	-40.3	33.8
	10:12	-26.1	-31.5	-31.5	27.1	-29.5	-35.6	-35.6	30.2	-33.4	-40.3	-40.3	33.7
	11:12	-26.1	-31.5	-31.5	27.0	-29.5	-35.6	-35.6	30.1	-33.5	-40.4	-40.4	33.6
	12:12	-26.1	-31.6	-31.6	26.9	-29.6	-35.7	-35.7	30.0	-33.5	-40.4	-40.4	33.5

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	1.1	1.1	1.2	1.4	1.5	1.6	2.0	2.2	2.4	2.9	3.6	4.4
	2:12	2.1	2.1	2.1	2.2	2.3	2.4	2.8	3.0	3.2	3.7	4.2	4.8
	3:12	2.9	2.9	2.9	2.9	3.0	3.1	3.5	3.7	3.9	4.4	4.9	5.5
	4:12	3.6	3.6	3.6	3.6	3.6	3.7	4.1	4.2	4.5	5.0	5.5	6.1
	5:12	4.1	4.1	4.1	4.1	4.1	4.1	4.5	4.7	4.9	5.4	5.9	6.5
	6:12	4.6	4.6	4.6	4.6	4.6	4.6	4.9	5.0	5.3	5.8	6.3	6.9
	7:12	4.8	4.8	4.8	4.8	4.8	4.8	5.1	5.3	5.5	6.0	6.5	7.1
	8:12	5.0	5.0	5.0	5.0	5.0	5.0	5.3	5.5	5.7	6.2	6.6	7.2
	9:12	5.2	5.2	5.2	5.2	5.2	5.2	5.4	5.6	5.8	6.3	6.7	7.3
	10:12	5.2	5.2	5.2	5.2	5.2	5.2	5.5	5.6	5.8	6.3	6.7	7.3
	11:12	5.2	5.2	5.2	5.2	5.2	5.2	5.5	5.6	5.8	6.3	6.7	7.3
	12:12	5.2	5.2	5.2	5.2	5.2	5.2	5.5	5.6	5.8	6.2	6.7	7.2

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

ASCE 7-05

New Jersey (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

115 mph Basic Wind Speed

25 psf Ground Snow Load

Up and Down (psf)

Exposure	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-18.8	-34.9	-55.0	25.9	-18.8	-34.9	-55.0	25.9	-23.1	-42.7	-67.1	25.9
	2:12	-16.8	-32.9	-51.0	24.6	-16.8	-32.9	-51.0	24.6	-20.7	-40.2	-62.2	26.2
	3:12	-16.8	-32.9	-51.0	23.1	-16.8	-32.9	-51.0	23.1	-20.7	-40.2	-62.3	24.7
	4:12	-16.8	-32.9	-51.1	21.6	-16.8	-32.9	-51.1	21.6	-20.7	-40.3	-62.3	23.2
	5:12	-16.9	-33.0	-51.1	20.1	-16.9	-33.0	-51.1	20.1	-20.7	-40.3	-62.3	21.7
	6:12	-16.9	-33.0	-51.1	18.7	-16.9	-33.0	-51.1	18.7	-20.8	-40.4	-62.4	20.3
	7:12	-19.0	-23.0	-23.0	23.5	-19.0	-23.0	-23.0	23.5	-23.3	-28.2	-28.2	26.4
	8:12	-19.0	-23.0	-23.0	22.3	-19.0	-23.0	-23.0	22.3	-23.3	-28.2	-28.2	25.2
	9:12	-19.0	-23.1	-23.1	21.3	-19.0	-23.1	-23.1	21.3	-23.4	-28.3	-28.3	24.8
	10:12	-19.1	-23.1	-23.1	20.8	-19.1	-23.1	-23.1	20.8	-23.4	-28.3	-28.3	24.7
	11:12	-19.1	-23.2	-23.2	20.7	-19.1	-23.2	-23.2	20.7	-23.4	-28.3	-28.3	24.6
	12:12	-19.2	-23.2	-23.2	20.6	-19.2	-23.2	-23.2	20.6	-23.5	-28.4	-28.4	24.5
Exposure Category C	1:12	-23.1	-42.7	-67.1	25.9	-26.8	-49.4	-77.6	25.9	-31.1	-57.2	-89.7	25.9
	2:12	-20.7	-40.2	-62.2	26.2	-24.0	-46.6	-72.0	27.6	-27.9	-53.9	-83.2	29.2
	3:12	-20.7	-40.2	-62.3	24.7	-24.0	-46.6	-72.0	26.1	-27.9	-53.9	-83.2	27.7
	4:12	-20.7	-40.3	-62.3	23.2	-24.1	-46.6	-72.0	24.6	-28.0	-54.0	-83.2	26.2
	5:12	-20.7	-40.3	-62.3	21.7	-24.1	-46.7	-72.1	23.1	-28.0	-54.0	-83.3	24.7
	6:12	-20.8	-40.4	-62.4	20.3	-24.2	-46.7	-72.1	21.7	-28.0	-54.1	-83.3	23.3
	7:12	-23.3	-28.2	-28.2	26.4	-27.0	-32.7	-32.7	28.9	-31.3	-37.8	-37.8	32.3
	8:12	-23.3	-28.2	-28.2	25.2	-27.1	-32.7	-32.7	28.3	-31.4	-37.9	-37.9	32.2
	9:12	-23.4	-28.3	-28.3	24.8	-27.1	-32.7	-32.7	28.2	-31.4	-37.9	-37.9	32.1
	10:12	-23.4	-28.3	-28.3	24.7	-27.1	-32.8	-32.8	28.1	-31.5	-38.0	-38.0	32.0
	11:12	-23.4	-28.3	-28.3	24.6	-27.2	-32.8	-32.8	28.0	-31.5	-38.0	-38.0	31.8
	12:12	-23.5	-28.4	-28.4	24.5	-27.2	-32.9	-32.9	27.9	-31.5	-38.0	-38.0	31.7
Exposure Category D	1:12	-28.3	-52.0	-81.6	25.9	-32.0	-58.7	-92.1	25.9	-36.3	-66.5	-104.2	26.9
	2:12	-25.3	-49.0	-75.7	28.2	-28.7	-55.4	-85.4	29.6	-32.6	-62.7	-96.7	31.2
	3:12	-25.3	-49.1	-75.7	26.7	-28.7	-55.4	-85.5	28.1	-32.6	-62.8	-96.7	29.7
	4:12	-25.4	-49.1	-75.8	25.1	-28.7	-55.4	-85.5	26.5	-32.6	-62.8	-96.7	28.2
	5:12	-25.4	-49.1	-75.8	23.7	-28.8	-55.5	-85.5	25.1	-32.7	-62.8	-96.7	26.7
	6:12	-25.4	-49.2	-75.8	22.3	-28.8	-55.5	-85.6	23.7	-32.7	-62.9	-96.8	25.3
	7:12	-28.5	-34.4	-34.4	29.9	-32.2	-38.9	-38.9	33.1	-36.5	-44.1	-44.1	36.9
	8:12	-28.5	-34.4	-34.4	29.6	-32.2	-38.9	-38.9	33.0	-36.6	-44.1	-44.1	36.8
	9:12	-28.5	-34.5	-34.5	29.5	-32.3	-39.0	-39.0	32.8	-36.6	-44.1	-44.1	36.7
	10:12	-28.6	-34.5	-34.5	29.4	-32.3	-39.0	-39.0	32.7	-36.6	-44.2	-44.2	36.6
	11:12	-28.6	-34.6	-34.6	29.3	-32.4	-39.0	-39.0	32.6	-36.7	-44.2	-44.2	36.5
	12:12	-28.7	-34.6	-34.6	29.1	-32.4	-39.1	-39.1	32.5	-36.7	-44.3	-44.3	36.4

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	2.0	2.0	2.0	2.0	2.1	2.2	2.6	2.8	3.0	3.5	4.0	4.6
	2:12	3.6	3.6	3.6	3.6	3.6	3.6	4.0	4.1	4.4	4.9	5.4	6.0
	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.2	5.5	6.0	6.5	7.1
	4:12	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.4	6.9	7.4	8.0
	5:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.5	8.0	8.6
	6:12	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8.0	8.5	9.1
	7:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.8	9.4
	8:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.5	9.0	9.5
	9:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	9.6
	10:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	9.5
	11:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.4	8.9	9.4
	12:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.7	9.2

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

120 mph
Basic Wind Speed

0 psf
Ground Snow Load

ASCE 7-05

Louisiana (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

Exposure	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-20.6	-38.1	-60.0	13.5	-20.6	-38.1	-60.0	13.5	-25.3	-46.6	-73.2	13.5
	2:12	-18.4	-35.9	-55.7	14.4	-18.4	-35.9	-55.7	14.4	-22.6	-43.9	-67.9	16.8
	3:12	-18.4	-36.0	-55.7	14.4	-18.4	-36.0	-55.7	14.4	-22.6	-43.9	-67.9	16.7
	4:12	-18.4	-36.0	-55.7	14.3	-18.4	-36.0	-55.7	14.3	-22.7	-44.0	-67.9	16.6
	5:12	-18.5	-36.0	-55.8	14.2	-18.5	-36.0	-55.8	14.2	-22.7	-44.0	-68.0	16.5
	6:12	-18.5	-36.1	-55.8	14.1	-18.5	-36.1	-55.8	14.1	-22.7	-44.0	-68.0	16.4
	7:12	-20.7	-25.1	-25.1	22.8	-20.7	-25.1	-25.1	22.8	-25.4	-30.8	-30.8	27.0
	8:12	-20.8	-25.2	-25.2	22.7	-20.8	-25.2	-25.2	22.7	-25.5	-30.8	-30.8	26.9
	9:12	-20.8	-25.2	-25.2	22.5	-20.8	-25.2	-25.2	22.5	-25.5	-30.9	-30.9	26.8
	10:12	-20.9	-25.3	-25.3	22.4	-20.9	-25.3	-25.3	22.4	-25.6	-30.9	-30.9	26.7
	11:12	-20.9	-25.3	-25.3	22.3	-20.9	-25.3	-25.3	22.3	-25.6	-30.9	-30.9	26.5
	12:12	-21.0	-25.3	-25.3	22.2	-21.0	-25.3	-25.3	22.2	-25.7	-31.0	-31.0	26.4
Exposure Category C	1:12	-25.3	-46.6	-73.2	13.5	-29.3	-53.9	-84.6	13.5	-34.0	-62.4	-97.8	14.1
	2:12	-22.6	-43.9	-67.9	16.8	-26.3	-50.8	-78.5	18.8	-30.5	-58.8	-90.7	21.2
	3:12	-22.6	-43.9	-67.9	16.7	-26.3	-50.9	-78.5	18.7	-30.5	-58.9	-90.7	21.1
	4:12	-22.7	-44.0	-67.9	16.6	-26.3	-50.9	-78.5	18.7	-30.6	-58.9	-90.8	21.0
	5:12	-22.7	-44.0	-68.0	16.5	-26.4	-50.9	-78.6	18.6	-30.6	-58.9	-90.8	20.9
	6:12	-22.7	-44.0	-68.0	16.4	-26.4	-51.0	-78.6	18.5	-30.6	-59.0	-90.8	20.8
	7:12	-25.4	-30.8	-30.8	27.0	-29.5	-35.7	-35.7	30.7	-34.2	-41.3	-41.3	34.9
	8:12	-25.5	-30.8	-30.8	26.9	-29.6	-35.7	-35.7	30.5	-34.3	-41.3	-41.3	34.8
	9:12	-25.5	-30.9	-30.9	26.8	-29.6	-35.7	-35.7	30.4	-34.3	-41.4	-41.4	34.7
	10:12	-25.6	-30.9	-30.9	26.7	-29.7	-35.8	-35.8	30.3	-34.4	-41.4	-41.4	34.6
	11:12	-25.6	-30.9	-30.9	26.5	-29.7	-35.8	-35.8	30.2	-34.4	-41.5	-41.5	34.4
	12:12	-25.7	-31.0	-31.0	26.4	-29.7	-35.9	-35.9	30.1	-34.4	-41.5	-41.5	34.3
Exposure Category D	1:12	-30.9	-56.7	-89.0	13.5	-35.0	-64.1	-100.4	14.4	-39.7	-72.5	-113.6	15.8
	2:12	-27.7	-53.5	-82.6	19.6	-31.4	-60.4	-93.1	21.6	-35.6	-68.4	-105.4	24.0
	3:12	-27.7	-53.5	-82.6	19.5	-31.4	-60.5	-93.2	21.6	-35.6	-68.4	-105.4	23.9
	4:12	-27.7	-53.6	-82.6	19.5	-31.4	-60.5	-93.2	21.5	-35.6	-68.5	-105.4	23.8
	5:12	-27.8	-53.6	-82.6	19.4	-31.4	-60.5	-93.2	21.4	-35.7	-68.5	-105.5	23.8
	6:12	-27.8	-53.6	-82.7	19.3	-31.5	-60.6	-93.3	21.3	-35.7	-68.6	-105.5	23.7
	7:12	-31.1	-37.5	-37.5	32.1	-35.2	-42.4	-42.4	35.7	-39.9	-48.1	-48.1	40.0
	8:12	-31.1	-37.6	-37.6	32.0	-35.2	-42.5	-42.5	35.6	-39.9	-48.1	-48.1	39.9
	9:12	-31.2	-37.6	-37.6	31.8	-35.2	-42.5	-42.5	35.5	-39.9	-48.2	-48.2	39.7
	10:12	-31.2	-37.7	-37.7	31.7	-35.3	-42.6	-42.6	35.4	-40.0	-48.2	-48.2	39.6
	11:12	-31.3	-37.7	-37.7	31.6	-35.3	-42.6	-42.6	35.3	-40.0	-48.2	-48.2	39.5
	12:12	-31.3	-37.8	-37.8	31.5	-35.4	-42.6	-42.6	35.2	-40.1	-48.3	-48.3	39.4

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	0.3	0.5	0.7	0.9	1.1	1.2	1.8	2.0	2.3	2.9	3.6	4.4
	2:12	0.6	0.8	1.0	1.2	1.4	1.5	2.1	2.3	2.6	3.3	3.9	4.7
	3:12	0.8	1.1	1.3	1.5	1.6	1.8	2.3	2.5	2.9	3.5	4.2	5.0
	4:12	1.1	1.3	1.5	1.7	1.9	2.0	2.6	2.8	3.1	3.8	4.5	5.3
	5:12	1.3	1.6	1.8	2.0	2.1	2.3	2.8	3.0	3.3	4.0	4.7	5.5
	6:12	1.6	1.8	2.0	2.2	2.3	2.5	3.0	3.2	3.5	4.2	4.8	5.6
	7:12	1.8	2.0	2.2	2.4	2.5	2.7	3.2	3.4	3.7	4.3	5.0	5.8
	8:12	1.9	2.1	2.3	2.5	2.7	2.8	3.3	3.5	3.8	4.5	5.1	5.9
	9:12	2.1	2.3	2.5	2.7	2.8	3.0	3.5	3.6	4.0	4.6	5.2	5.9
	10:12	2.2	2.4	2.6	2.8	3.0	3.1	3.6	3.8	4.1	4.7	5.3	6.0
	11:12	2.4	2.6	2.7	2.9	3.1	3.2	3.7	3.8	4.1	4.7	5.3	6.0
	12:12	2.5	2.7	2.8	3.0	3.2	3.3	3.7	3.9	4.2	4.8	5.4	6.1

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

140 mph	0 psf
Basic Wind Speed	Ground Snow Load

ASCE 7-05

Florida (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

		Bldg. Height = 15 ft.				Bldg. Height = 30 ft.				Bldg. Height = 60 ft.			
		Up Pressures (psf)			Down (psf)	Up Pressures (psf)			Down (psf)	Up Pressures (psf)			Down (psf)
	Roof Pitch	Zone 1	Zone 2	Zone 3		Zone 1	Zone 2	Zone 3		Zone 1	Zone 2	Zone 3	
Exposure Category B	1:12	-28.5	-52.4	-82.2	13.5	-28.5	-52.4	-82.2	13.5	-34.9	-63.9	-100.1	14.4
	2:12	-25.5	-49.4	-76.3	18.4	-25.5	-49.4	-76.3	18.4	-31.3	-60.3	-92.9	21.6
	3:12	-25.5	-49.4	-76.3	18.3	-25.5	-49.4	-76.3	18.3	-31.3	-60.3	-92.9	21.5
	4:12	-25.6	-49.4	-76.3	18.2	-25.6	-49.4	-76.3	18.2	-31.3	-60.3	-93.0	21.4
	5:12	-25.6	-49.5	-76.4	18.2	-25.6	-49.5	-76.4	18.2	-31.4	-60.4	-93.0	21.4
	6:12	-25.6	-49.5	-76.4	18.1	-25.6	-49.5	-76.4	18.1	-31.4	-60.4	-93.0	21.3
	7:12	-28.7	-34.6	-34.6	29.9	-28.7	-34.6	-34.6	29.9	-35.1	-42.3	-42.3	35.6
	8:12	-28.7	-34.7	-34.7	29.8	-28.7	-34.7	-34.7	29.8	-35.1	-42.4	-42.4	35.5
	9:12	-28.8	-34.7	-34.7	29.7	-28.8	-34.7	-34.7	29.7	-35.2	-42.4	-42.4	35.4
	10:12	-28.8	-34.8	-34.8	29.6	-28.8	-34.8	-34.8	29.6	-35.2	-42.4	-42.4	35.3
	11:12	-28.8	-34.8	-34.8	29.4	-28.8	-34.8	-34.8	29.4	-35.2	-42.5	-42.5	35.2
	12:12	-28.9	-34.9	-34.9	29.3	-28.9	-34.9	-34.9	29.3	-35.3	-42.5	-42.5	35.1
Exposure Category C	1:12	-34.9	-63.9	-100.1	14.4	-40.4	-73.9	-115.7	16.0	-46.8	-85.4	-133.6	17.9
	2:12	-31.3	-60.3	-92.9	21.6	-36.3	-69.7	-107.3	24.3	-42.0	-80.6	-123.9	27.5
	3:12	-31.3	-60.3	-92.9	21.5	-36.3	-69.7	-107.3	24.3	-42.0	-80.6	-124.0	27.5
	4:12	-31.3	-60.3	-93.0	21.4	-36.3	-69.7	-107.4	24.2	-42.1	-80.6	-124.0	27.4
	5:12	-31.4	-60.4	-93.0	21.4	-36.3	-69.8	-107.4	24.1	-42.1	-80.7	-124.0	27.3
	6:12	-31.4	-60.4	-93.0	21.3	-36.4	-69.8	-107.4	24.0	-42.1	-80.7	-124.1	27.2
	7:12	-35.1	-42.3	-42.3	35.6	-40.6	-49.0	-49.0	40.6	-47.0	-56.6	-56.6	46.4
	8:12	-35.1	-42.4	-42.4	35.5	-40.7	-49.0	-49.0	40.5	-47.0	-56.7	-56.7	46.3
	9:12	-35.2	-42.4	-42.4	35.4	-40.7	-49.1	-49.1	40.4	-47.1	-56.7	-56.7	46.2
	10:12	-35.2	-42.4	-42.4	35.3	-40.7	-49.1	-49.1	40.3	-47.1	-56.8	-56.8	46.1
	11:12	-35.2	-42.5	-42.5	35.2	-40.8	-49.1	-49.1	40.2	-47.2	-56.8	-56.8	46.0
	12:12	-35.3	-42.5	-42.5	35.1	-40.8	-49.2	-49.2	40.1	-47.2	-56.9	-56.9	45.8
Exposure Category D	1:12	-42.6	-77.7	-121.6	16.7	-48.1	-87.7	-137.2	18.3	-54.5	-99.2	-155.1	20.2
	2:12	-38.2	-73.3	-112.9	25.4	-43.2	-82.7	-127.3	28.2	-48.9	-93.6	-143.9	31.4
	3:12	-38.2	-73.3	-112.9	25.4	-43.2	-82.8	-127.3	28.1	-48.9	-93.6	-143.9	31.3
	4:12	-38.2	-73.4	-112.9	25.3	-43.2	-82.8	-127.3	28.1	-49.0	-93.7	-144.0	31.3
	5:12	-38.3	-73.4	-112.9	25.2	-43.3	-82.8	-127.4	28.0	-49.0	-93.7	-144.0	31.2
	6:12	-38.3	-73.4	-113.0	25.1	-43.3	-82.9	-127.4	27.9	-49.1	-93.8	-144.0	31.1
	7:12	-42.7	-51.5	-51.5	42.6	-48.3	-58.2	-58.2	47.5	-54.7	-65.9	-65.9	53.3
	8:12	-42.8	-51.6	-51.6	42.4	-48.3	-58.2	-58.2	47.4	-54.7	-65.9	-65.9	53.2
	9:12	-42.8	-51.6	-51.6	42.3	-48.4	-58.3	-58.3	47.3	-54.8	-65.9	-65.9	53.1
	10:12	-42.9	-51.7	-51.7	42.2	-48.4	-58.3	-58.3	47.2	-54.8	-66.0	-66.0	53.0
	11:12	-42.9	-51.7	-51.7	42.1	-48.5	-58.4	-58.4	47.1	-54.9	-66.0	-66.0	52.9
	12:12	-43.0	-51.7	-51.7	42.0	-48.5	-58.4	-58.4	47.0	-54.9	-66.1	-66.1	52.8

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	0.3	0.5	0.7	0.9	1.1	1.2	1.8	2.0	2.3	2.9	3.6	4.4
	2:12	0.6	0.8	1.0	1.2	1.4	1.5	2.1	2.3	2.6	3.3	3.9	4.7
	3:12	0.8	1.1	1.3	1.5	1.6	1.8	2.3	2.5	2.9	3.5	4.2	5.0
	4:12	1.1	1.3	1.5	1.7	1.9	2.0	2.6	2.8	3.1	3.8	4.5	5.3
	5:12	1.3	1.6	1.8	2.0	2.1	2.3	2.8	3.0	3.3	4.0	4.7	5.5
	6:12	1.6	1.8	2.0	2.2	2.3	2.5	3.0	3.2	3.5	4.2	4.8	5.6
	7:12	1.8	2.0	2.2	2.4	2.5	2.7	3.2	3.4	3.7	4.3	5.0	5.8
	8:12	1.9	2.1	2.3	2.5	2.7	2.8	3.3	3.5	3.8	4.5	5.1	5.9
	9:12	2.1	2.3	2.5	2.7	2.8	3.0	3.5	3.6	4.0	4.6	5.2	5.9
	10:12	2.2	2.4	2.6	2.8	3.0	3.1	3.6	3.8	4.1	4.7	5.3	6.0
	11:12	2.4	2.6	2.7	2.9	3.1	3.2	3.7	3.8	4.1	4.7	5.3	6.0
	12:12	2.5	2.7	2.8	3.0	3.2	3.3	3.7	3.9	4.2	4.8	5.4	6.1

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

California (Typical)*

ASCE 7-10

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

110 mph — Basic Wind Speed

5 psf — Ground Snow Load

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-9.8	-18.6	-29.7	14.8	-9.8	-18.6	-29.7	14.8	-12.1	-22.9	-36.3	14.8
	2:12	-8.7	-17.5	-27.5	14.4	-8.7	-17.5	-27.5	14.4	-10.8	-21.6	-33.6	14.4
	3:12	-8.7	-17.6	-27.5	14.0	-8.7	-17.6	-27.5	14.0	-10.8	-21.6	-33.7	14.0
	4:12	-8.7	-17.6	-27.5	13.5	-8.7	-17.6	-27.5	13.5	-10.9	-21.6	-33.7	13.5
	5:12	-8.8	-17.6	-27.6	13.2	-8.8	-17.6	-27.6	13.2	-10.9	-21.6	-33.7	13.2
	6:12	-8.8	-17.7	-27.6	13.0	-8.8	-17.7	-27.6	13.0	-10.9	-21.7	-33.8	13.0
	7:12	-9.9	-12.2	-12.2	13.3	-9.9	-12.2	-12.2	13.3	-12.3	-15.0	-15.0	15.4
	8:12	-10.0	-12.2	-12.2	13.2	-10.0	-12.2	-12.2	13.2	-12.4	-15.0	-15.0	15.3
	9:12	-10.0	-12.2	-12.2	13.0	-10.0	-12.2	-12.2	13.0	-12.4	-15.1	-15.1	15.2
	10:12	-10.1	-12.3	-12.3	12.9	-10.1	-12.3	-12.3	12.9	-12.4	-15.1	-15.1	15.0
	11:12	-10.1	-12.3	-12.3	12.8	-10.1	-12.3	-12.3	12.8	-12.5	-15.2	-15.2	14.9
	12:12	-10.2	-12.4	-12.4	12.7	-10.2	-12.4	-12.4	12.7	-12.5	-15.2	-15.2	14.8
Exposure Category C	1:12	-12.1	-22.9	-36.3	14.8	-14.2	-26.6	-42.1	14.8	-16.6	-30.9	-48.7	14.8
	2:12	-10.8	-21.6	-33.6	14.4	-12.7	-25.1	-39.0	14.4	-14.8	-29.1	-45.1	14.4
	3:12	-10.8	-21.6	-33.7	14.0	-12.7	-25.1	-39.0	14.0	-14.8	-29.1	-45.2	14.0
	4:12	-10.9	-21.6	-33.7	13.5	-12.7	-25.1	-39.0	13.5	-14.8	-29.1	-45.2	13.5
	5:12	-10.9	-21.6	-33.7	13.2	-12.7	-25.1	-39.1	13.2	-14.9	-29.2	-45.2	13.2
	6:12	-10.9	-21.7	-33.8	13.0	-12.8	-25.2	-39.1	13.0	-14.9	-29.2	-45.3	13.0
	7:12	-12.3	-15.0	-15.0	15.4	-14.4	-17.5	-17.5	17.3	-16.7	-20.3	-20.3	19.4
	8:12	-12.4	-15.0	-15.0	15.3	-14.4	-17.5	-17.5	17.1	-16.8	-20.4	-20.4	19.3
	9:12	-12.4	-15.1	-15.1	15.2	-14.5	-17.6	-17.6	17.0	-16.8	-20.4	-20.4	19.1
	10:12	-12.4	-15.1	-15.1	15.0	-14.5	-17.6	-17.6	16.9	-16.9	-20.4	-20.4	19.0
	11:12	-12.5	-15.2	-15.2	14.9	-14.5	-17.6	-17.6	16.8	-16.9	-20.5	-20.5	18.9
	12:12	-12.5	-15.2	-15.2	14.8	-14.6	-17.7	-17.7	16.7	-16.9	-20.5	-20.5	18.8
Exposure Category D	1:12	-15.0	-28.0	-44.3	14.8	-17.0	-31.7	-50.0	14.8	-19.4	-36.0	-56.7	14.8
	2:12	-13.4	-26.4	-41.0	14.4	-15.2	-29.9	-46.4	14.4	-17.4	-33.9	-52.5	15.0
	3:12	-13.4	-26.4	-41.1	14.0	-15.2	-29.9	-46.4	14.0	-17.4	-33.9	-52.6	14.5
	4:12	-13.4	-26.4	-41.1	13.5	-15.3	-29.9	-46.4	13.5	-17.4	-34.0	-52.6	14.1
	5:12	-13.5	-26.5	-41.1	13.2	-15.3	-30.0	-46.5	13.2	-17.4	-34.0	-52.6	13.9
	6:12	-13.5	-26.5	-41.2	13.0	-15.3	-30.0	-46.5	13.0	-17.5	-34.0	-52.7	13.8
	7:12	-15.2	-18.4	-18.4	18.0	-17.2	-20.9	-20.9	19.8	-19.6	-23.7	-23.7	21.9
	8:12	-15.2	-18.5	-18.5	17.8	-17.3	-20.9	-20.9	19.7	-19.6	-23.8	-23.8	21.8
	9:12	-15.2	-18.5	-18.5	17.7	-17.3	-21.0	-21.0	19.6	-19.7	-23.8	-23.8	21.7
	10:12	-15.3	-18.5	-18.5	17.6	-17.3	-21.0	-21.0	19.4	-19.7	-23.8	-23.8	21.6
	11:12	-15.3	-18.6	-18.6	17.5	-17.4	-21.0	-21.0	19.3	-19.7	-23.9	-23.9	21.5
	12:12	-15.4	-18.6	-18.6	17.4	-17.4	-21.1	-21.1	19.2	-19.8	-23.9	-23.9	21.3

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	0.7	0.8	1.0	1.1	1.3	1.4	1.9	2.1	2.5	3.2	4.0	4.8
	2:12	1.4	1.4	1.6	1.7	1.9	2.0	2.4	2.6	2.9	3.6	4.3	5.2
	3:12	1.9	1.9	2.0	2.2	2.4	2.5	2.9	3.1	3.4	3.9	4.6	5.5
	4:12	2.4	2.4	2.5	2.6	2.8	2.9	3.3	3.5	3.8	4.3	4.9	5.8
	5:12	2.8	2.8	2.8	3.0	3.1	3.2	3.7	3.8	4.1	4.6	5.2	6.0
	6:12	3.1	3.1	3.1	3.2	3.4	3.5	3.9	4.1	4.3	4.9	5.4	6.2
	7:12	3.3	3.3	3.3	3.4	3.6	3.7	4.1	4.3	4.5	5.1	5.6	6.3
	8:12	3.4	3.4	3.4	3.6	3.7	3.8	4.3	4.4	4.7	5.2	5.7	6.5
	9:12	3.5	3.5	3.6	3.7	3.8	3.9	4.4	4.5	4.8	5.3	5.8	6.5
	10:12	3.6	3.6	3.6	3.8	3.9	4.0	4.4	4.6	4.8	5.3	5.8	6.6
	11:12	3.7	3.7	3.7	3.8	4.0	4.1	4.5	4.6	4.9	5.3	5.9	6.6
	12:12	3.7	3.7	3.7	3.9	4.0	4.1	4.5	4.6	4.9	5.3	5.9	6.7

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

ASCE 7-10

115 mph	5 psf
Basic Wind Speed	Ground Snow Load

Southwest (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-10.8	-20.5	-32.6	14.8	-10.8	-20.5	-32.6	14.8	-13.4	-25.1	-39.8	14.8
	2:12	-9.6	-19.3	-30.2	14.4	-9.6	-19.3	-30.2	14.4	-11.9	-23.7	-36.9	14.4
	3:12	-9.6	-19.3	-30.2	14.0	-9.6	-19.3	-30.2	14.0	-12.0	-23.7	-36.9	14.0
	4:12	-9.7	-19.3	-30.2	13.5	-9.7	-19.3	-30.2	13.5	-12.0	-23.7	-36.9	13.5
	5:12	-9.7	-19.4	-30.2	13.2	-9.7	-19.4	-30.2	13.2	-12.0	-23.8	-37.0	13.2
	6:12	-9.7	-19.4	-30.3	13.0	-9.7	-19.4	-30.3	13.0	-12.1	-23.8	-37.0	13.0
	7:12	-11.0	-13.4	-13.4	14.2	-11.0	-13.4	-13.4	14.2	-13.6	-16.5	-16.5	16.5
	8:12	-11.0	-13.4	-13.4	14.1	-11.0	-13.4	-13.4	14.1	-13.6	-16.5	-16.5	16.4
	9:12	-11.1	-13.5	-13.5	14.0	-11.1	-13.5	-13.5	14.0	-13.6	-16.6	-16.6	16.3
	10:12	-11.1	-13.5	-13.5	13.8	-11.1	-13.5	-13.5	13.8	-13.7	-16.6	-16.6	16.2
	11:12	-11.1	-13.6	-13.6	13.7	-11.1	-13.6	-13.6	13.7	-13.7	-16.7	-16.7	16.0
	12:12	-11.2	-13.6	-13.6	13.6	-11.2	-13.6	-13.6	13.6	-13.8	-16.7	-16.7	15.9
Exposure Category C	1:12	-13.4	-25.1	-39.8	14.8	-15.6	-29.2	-46.1	14.8	-18.2	-33.8	-53.4	14.8
	2:12	-11.9	-23.7	-36.9	14.4	-14.0	-27.5	-42.7	14.4	-16.3	-31.9	-49.5	14.5
	3:12	-12.0	-23.7	-36.9	14.0	-14.0	-27.5	-42.7	14.0	-16.3	-31.9	-49.5	14.1
	4:12	-12.0	-23.7	-36.9	13.5	-14.0	-27.5	-42.8	13.5	-16.3	-32.0	-49.5	13.6
	5:12	-12.0	-23.8	-37.0	13.2	-14.0	-27.6	-42.8	13.2	-16.4	-32.0	-49.5	13.3
	6:12	-12.1	-23.8	-37.0	13.0	-14.1	-27.6	-42.8	13.0	-16.4	-32.0	-49.6	13.2
	7:12	-13.6	-16.5	-16.5	16.5	-15.8	-19.2	-19.2	18.6	-18.4	-22.3	-22.3	20.9
	8:12	-13.6	-16.5	-16.5	16.4	-15.9	-19.2	-19.2	18.4	-18.4	-22.3	-22.3	20.8
	9:12	-13.6	-16.6	-16.6	16.3	-15.9	-19.3	-19.3	18.3	-18.5	-22.4	-22.4	20.6
	10:12	-13.7	-16.6	-16.6	16.2	-15.9	-19.3	-19.3	18.2	-18.5	-22.4	-22.4	20.5
	11:12	-13.7	-16.7	-16.7	16.0	-16.0	-19.4	-19.4	18.1	-18.6	-22.5	-22.5	20.4
	12:12	-13.8	-16.7	-16.7	15.9	-16.0	-19.4	-19.4	17.9	-18.6	-22.5	-22.5	20.3
Exposure Category D	1:12	-16.5	-30.7	-48.5	14.8	-18.7	-34.8	-54.8	14.8	-21.3	-39.4	-62.1	14.8
	2:12	-14.7	-29.0	-45.0	14.4	-16.8	-32.8	-50.8	14.7	-19.1	-37.2	-57.5	15.7
	3:12	-14.8	-29.0	-45.0	14.0	-16.8	-32.8	-50.8	14.3	-19.1	-37.2	-57.6	15.3
	4:12	-14.8	-29.0	-45.0	13.5	-16.8	-32.8	-50.9	13.8	-19.1	-37.2	-57.6	15.0
	5:12	-14.8	-29.0	-45.1	13.2	-16.8	-32.9	-50.9	13.6	-19.2	-37.3	-57.6	14.9
	6:12	-14.9	-29.1	-45.1	13.0	-16.9	-32.9	-50.9	13.5	-19.2	-37.3	-57.7	14.8
	7:12	-16.7	-20.2	-20.2	19.3	-18.9	-22.9	-22.9	21.3	-21.5	-26.0	-26.0	23.7
	8:12	-16.7	-20.3	-20.3	19.2	-19.0	-23.0	-23.0	21.2	-21.6	-26.1	-26.1	23.6
	9:12	-16.8	-20.3	-20.3	19.1	-19.0	-23.0	-23.0	21.1	-21.6	-26.1	-26.1	23.4
	10:12	-16.8	-20.4	-20.4	19.0	-19.0	-23.0	-23.0	21.0	-21.6	-26.2	-26.2	23.3
	11:12	-16.8	-20.4	-20.4	18.8	-19.1	-23.1	-23.1	20.9	-21.7	-26.2	-26.2	23.2
	12:12	-16.9	-20.4	-20.4	18.7	-19.1	-23.1	-23.1	20.7	-21.7	-26.2	-26.2	23.1

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	0.7	0.8	1.0	1.1	1.3	1.4	1.9	2.1	2.5	3.2	4.0	4.8
	2:12	1.4	1.4	1.6	1.7	1.9	2.0	2.4	2.6	2.9	3.6	4.3	5.2
	3:12	1.9	1.9	2.0	2.2	2.4	2.5	2.9	3.1	3.4	3.9	4.6	5.5
	4:12	2.4	2.4	2.5	2.6	2.8	2.9	3.3	3.5	3.8	4.3	4.9	5.8
	5:12	2.8	2.8	2.8	3.0	3.1	3.2	3.7	3.8	4.1	4.6	5.2	6.0
	6:12	3.1	3.1	3.1	3.2	3.4	3.5	3.9	4.1	4.3	4.9	5.4	6.2
	7:12	3.3	3.3	3.3	3.4	3.6	3.7	4.1	4.3	4.5	5.1	5.6	6.3
	8:12	3.4	3.4	3.4	3.6	3.7	3.8	4.3	4.4	4.7	5.2	5.7	6.5
	9:12	3.5	3.5	3.6	3.7	3.8	3.9	4.4	4.5	4.8	5.3	5.8	6.5
	10:12	3.6	3.6	3.6	3.8	3.9	4.0	4.4	4.6	4.8	5.3	5.8	6.6
	11:12	3.7	3.7	3.7	3.8	4.0	4.1	4.5	4.6	4.9	5.3	5.9	6.6
	12:12	3.7	3.7	3.7	3.9	4.0	4.1	4.5	4.6	4.9	5.3	5.9	6.7

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

Mid US (Medium Snow)*

ASCE 7-10

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

115 mph Basic Wind Speed

25 psf Ground Snow Load

Up and Down (psf)

Exposure	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-10.8	-20.5	-32.6	25.9	-10.8	-20.5	-32.6	25.9	-13.4	-25.1	-39.8	25.9
	2:12	-9.6	-19.3	-30.2	24.6	-9.6	-19.3	-30.2	24.6	-11.9	-23.7	-36.9	24.6
	3:12	-9.6	-19.3	-30.2	23.1	-9.6	-19.3	-30.2	23.1	-12.0	-23.7	-36.9	23.1
	4:12	-9.7	-19.3	-30.2	21.6	-9.7	-19.3	-30.2	21.6	-12.0	-23.7	-36.9	21.6
	5:12	-9.7	-19.4	-30.2	20.1	-9.7	-19.4	-30.2	20.1	-12.0	-23.8	-37.0	20.1
	6:12	-9.7	-19.4	-30.3	18.7	-9.7	-19.4	-30.3	18.7	-12.1	-23.8	-37.0	18.7
	7:12	-11.0	-13.4	-13.4	18.3	-11.0	-13.4	-13.4	18.3	-13.6	-16.5	-16.5	20.1
	8:12	-11.0	-13.4	-13.4	17.2	-11.0	-13.4	-13.4	17.2	-13.6	-16.5	-16.5	18.9
	9:12	-11.1	-13.5	-13.5	16.1	-11.1	-13.5	-13.5	16.1	-13.6	-16.6	-16.6	17.9
	10:12	-11.1	-13.5	-13.5	15.2	-11.1	-13.5	-13.5	15.2	-13.7	-16.6	-16.6	17.0
	11:12	-11.1	-13.6	-13.6	14.4	-11.1	-13.6	-13.6	14.4	-13.7	-16.7	-16.7	16.2
	12:12	-11.2	-13.6	-13.6	13.8	-11.2	-13.6	-13.6	13.8	-13.8	-16.7	-16.7	15.9
Exposure Category C	1:12	-13.4	-25.1	-39.8	25.9	-15.6	-29.2	-46.1	25.9	-18.2	-33.8	-53.4	25.9
	2:12	-11.9	-23.7	-36.9	24.6	-14.0	-27.5	-42.7	24.6	-16.3	-31.9	-49.5	24.7
	3:12	-12.0	-23.7	-36.9	23.1	-14.0	-27.5	-42.7	23.1	-16.3	-31.9	-49.5	23.2
	4:12	-12.0	-23.7	-36.9	21.6	-14.0	-27.5	-42.8	21.6	-16.3	-32.0	-49.5	21.7
	5:12	-12.0	-23.8	-37.0	20.1	-14.0	-27.6	-42.8	20.1	-16.4	-32.0	-49.5	20.2
	6:12	-12.1	-23.8	-37.0	18.7	-14.1	-27.6	-42.8	18.7	-16.4	-32.0	-49.6	18.8
	7:12	-13.6	-16.5	-16.5	20.1	-15.8	-19.2	-19.2	21.6	-18.4	-22.3	-22.3	23.3
	8:12	-13.6	-16.5	-16.5	18.9	-15.9	-19.2	-19.2	20.4	-18.4	-22.3	-22.3	22.2
	9:12	-13.6	-16.6	-16.6	17.9	-15.9	-19.3	-19.3	19.4	-18.5	-22.4	-22.4	21.1
	10:12	-13.7	-16.6	-16.6	17.0	-15.9	-19.3	-19.3	18.5	-18.5	-22.4	-22.4	20.5
	11:12	-13.7	-16.7	-16.7	16.2	-16.0	-19.4	-19.4	18.1	-18.6	-22.5	-22.5	20.4
	12:12	-13.8	-16.7	-16.7	15.9	-16.0	-19.4	-19.4	17.9	-18.6	-22.5	-22.5	20.3
Exposure Category D	1:12	-16.5	-30.7	-48.5	25.9	-18.7	-34.8	-54.8	25.9	-21.3	-39.4	-62.1	25.9
	2:12	-14.7	-29.0	-45.0	24.6	-16.8	-32.8	-50.8	24.9	-19.1	-37.2	-57.5	25.9
	3:12	-14.8	-29.0	-45.0	23.1	-16.8	-32.8	-50.8	23.4	-19.1	-37.2	-57.6	24.4
	4:12	-14.8	-29.0	-45.0	21.6	-16.8	-32.8	-50.9	21.9	-19.1	-37.2	-57.6	22.8
	5:12	-14.8	-29.0	-45.1	20.1	-16.8	-32.9	-50.9	20.4	-19.2	-37.3	-57.6	21.4
	6:12	-14.9	-29.1	-45.1	18.7	-16.9	-32.9	-50.9	19.0	-19.2	-37.3	-57.7	19.9
	7:12	-16.7	-20.2	-20.2	22.2	-18.9	-22.9	-22.9	23.7	-21.5	-26.0	-26.0	25.4
	8:12	-16.7	-20.3	-20.3	21.0	-19.0	-23.0	-23.0	22.5	-21.6	-26.1	-26.1	24.3
	9:12	-16.8	-20.3	-20.3	20.0	-19.0	-23.0	-23.0	21.5	-21.6	-26.1	-26.1	23.4
	10:12	-16.8	-20.4	-20.4	19.1	-19.0	-23.0	-23.0	21.0	-21.6	-26.2	-26.2	23.3
	11:12	-16.8	-20.4	-20.4	18.8	-19.1	-23.1	-23.1	20.9	-21.7	-26.2	-26.2	23.2
	12:12	-16.9	-20.4	-20.4	18.7	-19.1	-23.1	-23.1	20.7	-21.7	-26.2	-26.2	23.1

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	2.0	2.0	2.0	2.1	2.2	2.3	2.8	2.9	3.2	3.8	4.3	5.0
	2:12	3.7	3.7	3.7	3.7	3.7	3.7	4.1	4.3	4.6	5.1	5.7	6.3
	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.2	5.4	5.6	6.2	6.7	7.4
	4:12	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.2	6.4	7.0	7.6	8.2
	5:12	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	7.0	7.6	8.1	8.8
	6:12	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.4	7.9	8.4	9.1
	7:12	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.5	8.1	8.6	9.2
	8:12	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.6	8.1	8.6	9.2
	9:12	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.3	7.5	8.0	8.5	9.2
	10:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.1	7.4	7.9	8.4	9.0
	11:12	6.8	6.8	6.8	6.8	6.8	6.8	6.8	7.0	7.2	7.7	8.2	8.8
	12:12	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.8	7.0	7.5	8.0	8.6

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

ASCE 7-10

115 mph
Basic Wind Speed

40 psf
Ground Snow Load

Massachusetts (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

Exposure	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-10.8	-20.5	-32.6	31.9	-10.8	-20.5	-32.6	31.9	-13.4	-25.1	-39.8	31.9
	2:12	-9.6	-19.3	-30.2	30.0	-9.6	-19.3	-30.2	30.0	-11.9	-23.7	-36.9	30.0
	3:12	-9.6	-19.3	-30.2	27.9	-9.6	-19.3	-30.2	27.9	-12.0	-23.7	-36.9	27.9
	4:12	-9.7	-19.3	-30.2	25.8	-9.7	-19.3	-30.2	25.8	-12.0	-23.7	-36.9	25.8
	5:12	-9.7	-19.4	-30.2	23.8	-9.7	-19.4	-30.2	23.8	-12.0	-23.8	-37.0	23.8
	6:12	-9.7	-19.4	-30.3	21.9	-9.7	-19.4	-30.3	21.9	-12.1	-23.8	-37.0	21.9
	7:12	-11.0	-13.4	-13.4	21.1	-11.0	-13.4	-13.4	21.1	-13.6	-16.5	-16.5	22.8
	8:12	-11.0	-13.4	-13.4	19.5	-11.0	-13.4	-13.4	19.5	-13.6	-16.5	-16.5	21.2
	9:12	-11.1	-13.5	-13.5	18.1	-11.1	-13.5	-13.5	18.1	-13.6	-16.6	-16.6	19.8
	10:12	-11.1	-13.5	-13.5	16.9	-11.1	-13.5	-13.5	16.9	-13.7	-16.6	-16.6	18.6
	11:12	-11.1	-13.6	-13.6	15.8	-11.1	-13.6	-13.6	15.8	-13.7	-16.7	-16.7	17.6
	12:12	-11.2	-13.6	-13.6	14.9	-11.2	-13.6	-13.6	14.9	-13.8	-16.7	-16.7	16.7
Exposure Category C	1:12	-13.4	-25.1	-39.8	31.9	-15.6	-29.2	-46.1	31.9	-18.2	-33.8	-53.4	31.9
	2:12	-11.9	-23.7	-36.9	30.0	-14.0	-27.5	-42.7	30.0	-16.3	-31.9	-49.5	30.1
	3:12	-12.0	-23.7	-36.9	27.9	-14.0	-27.5	-42.7	27.9	-16.3	-31.9	-49.5	28.1
	4:12	-12.0	-23.7	-36.9	25.8	-14.0	-27.5	-42.8	25.8	-16.3	-32.0	-49.5	26.0
	5:12	-12.0	-23.8	-37.0	23.8	-14.0	-27.6	-42.8	23.8	-16.4	-32.0	-49.5	23.9
	6:12	-12.1	-23.8	-37.0	21.9	-14.1	-27.6	-42.8	21.9	-16.4	-32.0	-49.6	22.0
	7:12	-13.6	-16.5	-16.5	22.8	-15.8	-19.2	-19.2	24.3	-18.4	-22.3	-22.3	26.1
	8:12	-13.6	-16.5	-16.5	21.2	-15.9	-19.2	-19.2	22.7	-18.4	-22.3	-22.3	24.5
	9:12	-13.6	-16.6	-16.6	19.8	-15.9	-19.3	-19.3	21.4	-18.5	-22.4	-22.4	23.1
	10:12	-13.7	-16.6	-16.6	18.6	-15.9	-19.3	-19.3	20.1	-18.5	-22.4	-22.4	21.9
	11:12	-13.7	-16.7	-16.7	17.6	-16.0	-19.4	-19.4	19.1	-18.6	-22.5	-22.5	20.8
	12:12	-13.8	-16.7	-16.7	16.7	-16.0	-19.4	-19.4	18.2	-18.6	-22.5	-22.5	20.3
Exposure Category D	1:12	-16.5	-30.7	-48.5	29.8	-18.7	-34.8	-54.8	29.8	-21.3	-39.4	-62.1	29.8
	2:12	-14.7	-29.0	-45.0	28.1	-16.8	-32.8	-50.8	28.4	-19.1	-37.2	-57.5	29.4
	3:12	-14.8	-29.0	-45.0	26.2	-16.8	-32.8	-50.8	26.6	-19.1	-37.2	-57.6	27.5
	4:12	-14.8	-29.0	-45.0	24.3	-16.8	-32.8	-50.9	24.7	-19.1	-37.2	-57.6	25.6
	5:12	-14.8	-29.0	-45.1	22.5	-16.8	-32.9	-50.9	22.8	-19.2	-37.3	-57.6	23.8
	6:12	-14.9	-29.1	-45.1	20.7	-16.9	-32.9	-50.9	21.1	-19.2	-37.3	-57.7	22.0
	7:12	-16.7	-20.2	-20.2	24.0	-18.9	-22.9	-22.9	25.5	-21.5	-26.0	-26.0	27.2
	8:12	-16.7	-20.3	-20.3	22.5	-19.0	-23.0	-23.0	24.0	-21.6	-26.1	-26.1	25.8
	9:12	-16.8	-20.3	-20.3	21.2	-19.0	-23.0	-23.0	22.8	-21.6	-26.1	-26.1	24.5
	10:12	-16.8	-20.4	-20.4	20.1	-19.0	-23.0	-23.0	21.7	-21.6	-26.2	-26.2	23.4
	11:12	-16.8	-20.4	-20.4	19.2	-19.1	-23.1	-23.1	20.9	-21.7	-26.2	-26.2	23.2
	12:12	-16.9	-20.4	-20.4	18.7	-19.1	-23.1	-23.1	20.7	-21.7	-26.2	-26.2	23.1

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	2.6	2.6	2.6	2.6	2.7	2.8	3.3	3.4	3.7	4.2	4.8	5.5
	2:12	4.9	4.9	4.9	4.9	4.9	4.9	5.0	5.2	5.5	6.0	6.6	7.2
	3:12	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.9	7.4	8.0	8.6
	4:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.4	9.0	9.6
	5:12	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	9.1	9.7	10.3
	6:12	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.5	10.0	10.7
	7:12	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.7	10.2	10.8
	8:12	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.6	10.2	10.8
	9:12	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.5	10.0	10.6
	10:12	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	9.3	9.8	10.4
	11:12	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	9.0	9.5	10.0
	12:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.7	9.1	9.7

Lateral	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

ASCE 7-10

Mid US (High Snow)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

115 mph — Basic Wind Speed

60 psf — Ground Snow Load

Up and Down (psf)

	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-10.8	-20.5	-32.6	45.5	-10.8	-20.5	-32.6	45.5	-13.4	-25.1	-39.8	45.5
	2:12	-9.6	-19.3	-30.2	41.9	-9.6	-19.3	-30.2	41.9	-11.9	-23.7	-36.9	41.9
	3:12	-9.6	-19.3	-30.2	37.8	-9.6	-19.3	-30.2	37.8	-12.0	-23.7	-36.9	37.8
	4:12	-9.7	-19.3	-30.2	33.6	-9.7	-19.3	-30.2	33.6	-12.0	-23.7	-36.9	33.6
	5:12	-9.7	-19.4	-30.2	30.3	-9.7	-19.4	-30.2	30.3	-12.0	-23.8	-37.0	30.3
	6:12	-9.7	-19.4	-30.3	27.5	-9.7	-19.4	-30.3	27.5	-12.1	-23.8	-37.0	27.5
	7:12	-11.0	-13.4	-13.4	25.9	-11.0	-13.4	-13.4	25.9	-13.6	-16.5	-16.5	27.6
	8:12	-11.0	-13.4	-13.4	23.5	-11.0	-13.4	-13.4	23.5	-13.6	-16.5	-16.5	25.3
	9:12	-11.1	-13.5	-13.5	21.5	-11.1	-13.5	-13.5	21.5	-13.6	-16.6	-16.6	23.3
	10:12	-11.1	-13.5	-13.5	19.7	-11.1	-13.5	-13.5	19.7	-13.7	-16.6	-16.6	21.5
	11:12	-11.1	-13.6	-13.6	18.2	-11.1	-13.6	-13.6	18.2	-13.7	-16.7	-16.7	20.0
	12:12	-11.2	-13.6	-13.6	16.9	-11.2	-13.6	-13.6	16.9	-13.8	-16.7	-16.7	18.7
Exposure Category C	1:12	-13.4	-25.1	-39.8	45.5	-15.6	-29.2	-46.1	45.5	-18.2	-33.8	-53.4	45.5
	2:12	-11.9	-23.7	-36.9	41.9	-14.0	-27.5	-42.7	41.9	-16.3	-31.9	-49.5	41.9
	3:12	-12.0	-23.7	-36.9	37.8	-14.0	-27.5	-42.7	37.8	-16.3	-31.9	-49.5	37.8
	4:12	-12.0	-23.7	-36.9	33.6	-14.0	-27.5	-42.8	33.6	-16.3	-32.0	-49.5	33.6
	5:12	-12.0	-23.8	-37.0	30.3	-14.0	-27.6	-42.8	30.3	-16.4	-32.0	-49.5	30.4
	6:12	-12.1	-23.8	-37.0	27.5	-14.1	-27.6	-42.8	27.5	-16.4	-32.0	-49.6	27.6
	7:12	-13.6	-16.5	-16.5	27.6	-15.8	-19.2	-19.2	29.1	-18.4	-22.3	-22.3	30.9
	8:12	-13.6	-16.5	-16.5	25.3	-15.9	-19.2	-19.2	26.8	-18.4	-22.3	-22.3	28.6
	9:12	-13.6	-16.6	-16.6	23.3	-15.9	-19.3	-19.3	24.8	-18.5	-22.4	-22.4	26.5
	10:12	-13.7	-16.6	-16.6	21.5	-15.9	-19.3	-19.3	23.0	-18.5	-22.4	-22.4	24.8
	11:12	-13.7	-16.7	-16.7	20.0	-16.0	-19.4	-19.4	21.5	-18.6	-22.5	-22.5	23.2
	12:12	-13.8	-16.7	-16.7	18.7	-16.0	-19.4	-19.4	20.2	-18.6	-22.5	-22.5	21.9
Exposure Category D	1:12	-16.5	-30.7	-48.5	41.4	-18.7	-34.8	-54.8	41.4	-21.3	-39.4	-62.1	41.4
	2:12	-14.7	-29.0	-45.0	38.0	-16.8	-32.8	-50.8	38.0	-19.1	-37.2	-57.5	38.0
	3:12	-14.8	-29.0	-45.0	34.4	-16.8	-32.8	-50.8	34.4	-19.1	-37.2	-57.6	35.2
	4:12	-14.8	-29.0	-45.0	31.1	-16.8	-32.8	-50.9	31.4	-19.1	-37.2	-57.6	32.4
	5:12	-14.8	-29.0	-45.1	28.4	-16.8	-32.9	-50.9	28.7	-19.2	-37.3	-57.6	29.6
	6:12	-14.9	-29.1	-45.1	25.8	-16.9	-32.9	-50.9	26.1	-19.2	-37.3	-57.7	27.1
	7:12	-16.7	-20.2	-20.2	28.3	-18.9	-22.9	-22.9	29.8	-21.5	-26.0	-26.0	31.5
	8:12	-16.7	-20.3	-20.3	26.2	-19.0	-23.0	-23.0	27.7	-21.6	-26.1	-26.1	29.4
	9:12	-16.8	-20.3	-20.3	24.3	-19.0	-23.0	-23.0	25.8	-21.6	-26.1	-26.1	27.6
	10:12	-16.8	-20.4	-20.4	22.7	-19.0	-23.0	-23.0	24.2	-21.6	-26.2	-26.2	26.0
	11:12	-16.8	-20.4	-20.4	21.4	-19.1	-23.1	-23.1	22.9	-21.7	-26.2	-26.2	24.6
	12:12	-16.9	-20.4	-20.4	20.2	-19.1	-23.1	-23.1	21.7	-21.7	-26.2	-26.2	23.4

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	3.8	3.8	4.0	4.6	5.0	5.4	6.8	7.3	8.2	9.9	11.9	14.7
	2:12	7.0	7.0	7.0	7.0	7.4	7.7	9.1	9.6	10.4	12.1	13.8	15.8
	3:12	9.4	9.4	9.4	9.4	9.4	9.6	10.8	11.3	12.1	13.7	15.3	17.2
	4:12	11.2	11.2	11.2	11.2	11.2	11.2	12.0	12.5	13.3	14.8	16.3	18.1
	5:12	12.3	12.3	12.3	12.3	12.3	12.3	12.8	13.2	13.9	15.3	16.7	18.5
	6:12	12.9	12.9	12.9	12.9	12.9	12.9	13.1	13.5	14.1	15.5	16.8	18.4
	7:12	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.4	14.1	15.3	16.5	18.0
	8:12	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.2	13.7	14.9	16.1	17.5
	9:12	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.7	13.3	14.3	15.4	16.7
	10:12	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.2	12.7	13.7	14.7	15.9
	11:12	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.6	12.1	13.0	13.9	15.1
	12:12	10.8	10.8	10.8	10.8	10.8	10.8	10.8	11.0	11.4	12.3	13.2	14.2

Lateral

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.7	1.5	2.1	2.7	3.2	5.0	5.7	6.9	9.1	11.4	14.2

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

East Coast (Medium Snow)*

ASCE 7-10

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

120 mph — Basic Wind Speed

25 psf — Ground Snow Load

Up and Down (psf)

Exposure	Roof Pitch	15 ft. Zone 1	15 ft. Zone 2	15 ft. Zone 3	15 ft. Down (psf)	30 ft. Zone 1	30 ft. Zone 2	30 ft. Zone 3	30 ft. Down (psf)	60 ft. Zone 1	60 ft. Zone 2	60 ft. Zone 3	60 ft. Down (psf)
		Bldg. Height = 15 ft. Up Pressures (psf)				Bldg. Height = 30 ft. Up Pressures (psf)				Bldg. Height = 60 ft. Up Pressures (psf)			
Exposure Category B	1:12	-11.9	-22.4	-35.6	25.9	-11.9	-22.4	-35.6	25.9	-14.7	-27.5	-43.5	25.9
	2:12	-10.6	-21.1	-33.0	24.6	-10.6	-21.1	-33.0	24.6	-13.1	-25.9	-40.3	24.6
	3:12	-10.6	-21.1	-33.0	23.1	-10.6	-21.1	-33.0	23.1	-13.1	-25.9	-40.3	23.1
	4:12	-10.6	-21.2	-33.0	21.6	-10.6	-21.2	-33.0	21.6	-13.2	-25.9	-40.3	21.6
	5:12	-10.7	-21.2	-33.0	20.1	-10.7	-21.2	-33.0	20.1	-13.2	-26.0	-40.4	20.1
	6:12	-10.7	-21.2	-33.1	18.7	-10.7	-21.2	-33.1	18.7	-13.2	-26.0	-40.4	18.7
	7:12	-12.1	-14.7	-14.7	19.0	-12.1	-14.7	-14.7	19.0	-14.9	-18.1	-18.1	21.0
	8:12	-12.1	-14.7	-14.7	17.9	-12.1	-14.7	-14.7	17.9	-14.9	-18.1	-18.1	19.8
	9:12	-12.1	-14.8	-14.8	16.9	-12.1	-14.8	-14.8	16.9	-15.0	-18.1	-18.1	18.8
	10:12	-12.2	-14.8	-14.8	16.0	-12.2	-14.8	-14.8	16.0	-15.0	-18.2	-18.2	17.9
	11:12	-12.2	-14.8	-14.8	15.2	-12.2	-14.8	-14.8	15.2	-15.0	-18.2	-18.2	17.2
	12:12	-12.3	-14.9	-14.9	14.6	-12.3	-14.9	-14.9	14.6	-15.1	-18.3	-18.3	17.1
Exposure Category C	1:12	-14.7	-27.5	-43.5	25.9	-17.1	-31.9	-50.3	25.9	-20.0	-37.0	-58.2	25.9
	2:12	-13.1	-25.9	-40.3	24.6	-15.3	-30.1	-46.6	24.6	-17.9	-34.8	-54.0	25.4
	3:12	-13.1	-25.9	-40.3	23.1	-15.3	-30.1	-46.7	23.1	-17.9	-34.9	-54.0	23.9
	4:12	-13.2	-25.9	-40.3	21.6	-15.4	-30.1	-46.7	21.6	-17.9	-34.9	-54.0	22.3
	5:12	-13.2	-26.0	-40.4	20.1	-15.4	-30.1	-46.7	20.1	-17.9	-34.9	-54.1	20.8
	6:12	-13.2	-26.0	-40.4	18.7	-15.4	-30.2	-46.8	18.7	-18.0	-35.0	-54.1	19.4
	7:12	-14.9	-18.1	-18.1	21.0	-17.3	-21.0	-21.0	22.6	-20.1	-24.4	-24.4	24.5
	8:12	-14.9	-18.1	-18.1	19.8	-17.4	-21.0	-21.0	21.4	-20.2	-24.4	-24.4	23.3
	9:12	-15.0	-18.1	-18.1	18.8	-17.4	-21.1	-21.1	20.4	-20.2	-24.5	-24.5	22.3
	10:12	-15.0	-18.2	-18.2	17.9	-17.4	-21.1	-21.1	19.5	-20.3	-24.5	-24.5	22.1
	11:12	-15.0	-18.2	-18.2	17.2	-17.5	-21.2	-21.2	19.4	-20.3	-24.5	-24.5	22.0
	12:12	-15.1	-18.3	-18.3	17.1	-17.5	-21.2	-21.2	19.3	-20.3	-24.6	-24.6	21.8
Exposure Category D	1:12	-18.1	-33.6	-52.9	25.9	-20.5	-38.0	-59.8	25.9	-23.3	-43.1	-67.7	25.9
	2:12	-16.2	-31.7	-49.1	24.6	-18.4	-35.8	-55.4	25.6	-20.9	-40.6	-62.8	26.6
	3:12	-16.2	-31.7	-49.1	23.1	-18.4	-35.8	-55.5	24.1	-20.9	-40.6	-62.8	25.1
	4:12	-16.2	-31.7	-49.1	21.6	-18.4	-35.9	-55.5	22.5	-20.9	-40.7	-62.8	23.6
	5:12	-16.2	-31.7	-49.2	20.1	-18.4	-35.9	-55.5	21.0	-21.0	-40.7	-62.8	22.1
	6:12	-16.3	-31.8	-49.2	18.7	-18.5	-35.9	-55.6	19.6	-21.0	-40.7	-62.9	20.7
	7:12	-18.3	-22.1	-22.1	23.2	-20.7	-25.1	-25.1	24.9	-23.5	-28.4	-28.4	26.8
	8:12	-18.3	-22.2	-22.2	22.1	-20.7	-25.1	-25.1	23.7	-23.6	-28.5	-28.5	25.6
	9:12	-18.3	-22.2	-22.2	21.0	-20.8	-25.1	-25.1	22.7	-23.6	-28.5	-28.5	25.2
	10:12	-18.4	-22.3	-22.3	20.4	-20.8	-25.2	-25.2	22.6	-23.6	-28.6	-28.6	25.1
	11:12	-18.4	-22.3	-22.3	20.3	-20.9	-25.2	-25.2	22.5	-23.7	-28.6	-28.6	25.0
	12:12	-18.5	-22.3	-22.3	20.1	-20.9	-25.3	-25.3	22.3	-23.7	-28.6	-28.6	24.9

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	2.0	2.0	2.0	2.1	2.2	2.3	2.8	2.9	3.2	3.8	4.3	5.0
	2:12	3.7	3.7	3.7	3.7	3.7	3.7	4.1	4.3	4.6	5.1	5.7	6.3
	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.2	5.4	5.6	6.2	6.7	7.4
	4:12	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.2	6.4	7.0	7.6	8.2
	5:12	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	7.0	7.6	8.1	8.8
	6:12	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.4	7.9	8.4	9.1
	7:12	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.5	8.1	8.6	9.2
	8:12	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.6	8.1	8.6	9.2
	9:12	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.3	7.5	8.0	8.5	9.2
	10:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.1	7.4	7.9	8.4	9.0
	11:12	6.8	6.8	6.8	6.8	6.8	6.8	6.8	7.0	7.2	7.7	8.2	8.8
	12:12	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.8	7.0	7.5	8.0	8.6

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

East Coast (Low Snow)*

ASCE 7-10

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

130 mph — Basic Wind Speed

10 psf — Ground Snow Load

Up and Down (psf)

Exposure	Roof Pitch	15 ft. Zone 1	15 ft. Zone 2	15 ft. Zone 3	15 ft. Down (psf)	30 ft. Zone 1	30 ft. Zone 2	30 ft. Zone 3	30 ft. Down (psf)	60 ft. Zone 1	60 ft. Zone 2	60 ft. Zone 3	60 ft. Down (psf)
		Bldg. Height = 15 ft. Up Pressures (psf)				Bldg. Height = 30 ft. Up Pressures (psf)				Bldg. Height = 60 ft. Up Pressures (psf)			
Exposure Category B	1:12	-14.2	-26.5	-42.0	18.5	-14.2	-26.5	-42.0	18.5	-17.5	-32.5	-51.2	18.5
	2:12	-12.6	-25.0	-38.9	17.8	-12.6	-25.0	-38.9	17.8	-15.6	-30.6	-47.5	17.8
	3:12	-12.7	-25.0	-38.9	17.0	-12.7	-25.0	-38.9	17.0	-15.6	-30.6	-47.5	17.0
	4:12	-12.7	-25.0	-38.9	16.2	-12.7	-25.0	-38.9	16.2	-15.7	-30.7	-47.5	16.2
	5:12	-12.7	-25.1	-39.0	15.4	-12.7	-25.1	-39.0	15.4	-15.7	-30.7	-47.6	15.4
	6:12	-12.8	-25.1	-39.0	14.7	-12.8	-25.1	-39.0	14.7	-15.7	-30.7	-47.6	14.7
	7:12	-14.3	-17.4	-17.4	17.2	-14.3	-17.4	-17.4	17.2	-17.6	-21.4	-21.4	20.2
	8:12	-14.4	-17.5	-17.5	17.1	-14.4	-17.5	-17.5	17.1	-17.7	-21.4	-21.4	20.1
	9:12	-14.4	-17.5	-17.5	17.0	-14.4	-17.5	-17.5	17.0	-17.7	-21.5	-21.5	20.0
	10:12	-14.5	-17.5	-17.5	16.9	-14.5	-17.5	-17.5	16.9	-17.8	-21.5	-21.5	19.8
	11:12	-14.5	-17.6	-17.6	16.7	-14.5	-17.6	-17.6	16.7	-17.8	-21.6	-21.6	19.7
	12:12	-14.5	-17.6	-17.6	16.6	-14.5	-17.6	-17.6	16.6	-17.8	-21.6	-21.6	19.6
Exposure Category C	1:12	-17.5	-32.5	-51.2	18.5	-20.3	-37.6	-59.3	18.5	-23.7	-43.6	-68.5	18.5
	2:12	-15.6	-30.6	-47.5	17.8	-18.2	-35.5	-55.0	18.7	-21.2	-41.1	-63.6	19.9
	3:12	-15.6	-30.6	-47.5	17.0	-18.2	-35.5	-55.0	17.9	-21.2	-41.1	-63.6	19.2
	4:12	-15.7	-30.7	-47.5	16.2	-18.2	-35.5	-55.0	17.1	-21.2	-41.2	-63.6	18.4
	5:12	-15.7	-30.7	-47.6	15.4	-18.3	-35.6	-55.0	16.3	-21.3	-41.2	-63.6	17.6
	6:12	-15.7	-30.7	-47.6	14.7	-18.3	-35.6	-55.1	15.6	-21.3	-41.2	-63.7	16.8
	7:12	-17.6	-21.4	-21.4	20.2	-20.5	-24.8	-24.8	22.8	-23.8	-28.8	-28.8	25.8
	8:12	-17.7	-21.4	-21.4	20.1	-20.6	-24.9	-24.9	22.7	-23.9	-28.9	-28.9	25.6
	9:12	-17.7	-21.5	-21.5	20.0	-20.6	-24.9	-24.9	22.5	-23.9	-28.9	-28.9	25.5
	10:12	-17.8	-21.5	-21.5	19.8	-20.6	-25.0	-25.0	22.4	-23.9	-28.9	-28.9	25.4
	11:12	-17.8	-21.6	-21.6	19.7	-20.7	-25.0	-25.0	22.3	-24.0	-29.0	-29.0	25.3
	12:12	-17.8	-21.6	-21.6	19.6	-20.7	-25.0	-25.0	22.2	-24.0	-29.0	-29.0	25.2
Exposure Category D	1:12	-21.4	-39.6	-62.4	18.5	-24.3	-44.8	-70.4	18.5	-27.6	-50.7	-79.7	18.5
	2:12	-19.2	-37.4	-57.8	19.1	-21.8	-42.2	-65.3	20.2	-24.7	-47.9	-73.9	21.4
	3:12	-19.2	-37.4	-57.8	18.3	-21.8	-42.3	-65.3	19.4	-24.8	-47.9	-73.9	20.6
	4:12	-19.2	-37.4	-57.9	17.5	-21.8	-42.3	-65.3	18.6	-24.8	-47.9	-73.9	19.8
	5:12	-19.3	-37.4	-57.9	16.7	-21.9	-42.3	-65.4	17.8	-24.8	-48.0	-74.0	19.0
	6:12	-19.3	-37.5	-57.9	16.0	-21.9	-42.4	-65.4	17.0	-24.9	-48.0	-74.0	18.3
	7:12	-21.6	-26.2	-26.2	23.8	-24.5	-29.6	-29.6	26.4	-27.8	-33.6	-33.6	29.3
	8:12	-21.7	-26.2	-26.2	23.7	-24.5	-29.6	-29.6	26.2	-27.8	-33.6	-33.6	29.2
	9:12	-21.7	-26.2	-26.2	23.5	-24.6	-29.7	-29.7	26.1	-27.9	-33.7	-33.7	29.1
	10:12	-21.7	-26.3	-26.3	23.4	-24.6	-29.7	-29.7	26.0	-27.9	-33.7	-33.7	29.0
	11:12	-21.8	-26.3	-26.3	23.3	-24.6	-29.8	-29.8	25.9	-28.0	-33.7	-33.7	28.9
	12:12	-21.8	-26.4	-26.4	23.2	-24.7	-29.8	-29.8	25.8	-28.0	-33.8	-33.8	28.7

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	1.1	1.1	1.3	1.5	1.6	1.7	2.1	2.3	2.6	3.2	4.0	4.8
	2:12	2.1	2.1	2.1	2.3	2.4	2.5	3.0	3.1	3.4	4.0	4.5	5.2
	3:12	3.0	3.0	3.0	3.0	3.1	3.2	3.7	3.8	4.1	4.7	5.2	5.9
	4:12	3.6	3.6	3.6	3.6	3.7	3.8	4.2	4.4	4.7	5.2	5.8	6.4
	5:12	4.1	4.1	4.1	4.1	4.1	4.2	4.6	4.8	5.1	5.6	6.2	6.8
	6:12	4.4	4.4	4.4	4.4	4.4	4.5	4.9	5.1	5.4	5.9	6.4	7.1
	7:12	4.6	4.6	4.6	4.6	4.6	4.7	5.1	5.3	5.5	6.1	6.6	7.2
	8:12	4.7	4.7	4.7	4.7	4.7	4.8	5.2	5.4	5.6	6.2	6.7	7.3
	9:12	4.8	4.8	4.8	4.8	4.8	4.9	5.3	5.4	5.7	6.2	6.7	7.3
	10:12	4.7	4.7	4.7	4.7	4.8	4.9	5.3	5.4	5.7	6.2	6.7	7.3
	11:12	4.7	4.7	4.7	4.7	4.8	4.9	5.3	5.4	5.6	6.1	6.6	7.2
	12:12	4.6	4.6	4.6	4.6	4.7	4.8	5.2	5.4	5.6	6.1	6.5	7.1

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

ASCE 7-10

New Jersey (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

130 mph Basic Wind Speed

25 psf Ground Snow Load

Up and Down (psf)

Exposure	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-14.2	-26.5	-42.0	25.9	-14.2	-26.5	-42.0	25.9	-17.5	-32.5	-51.2	25.9
	2:12	-12.6	-25.0	-38.9	24.6	-12.6	-25.0	-38.9	24.6	-15.6	-30.6	-47.5	24.6
	3:12	-12.7	-25.0	-38.9	23.1	-12.7	-25.0	-38.9	23.1	-15.6	-30.6	-47.5	23.1
	4:12	-12.7	-25.0	-38.9	21.6	-12.7	-25.0	-38.9	21.6	-15.7	-30.7	-47.5	21.6
	5:12	-12.7	-25.1	-39.0	20.1	-12.7	-25.1	-39.0	20.1	-15.7	-30.7	-47.6	20.1
	6:12	-12.8	-25.1	-39.0	18.7	-12.8	-25.1	-39.0	18.7	-15.7	-30.7	-47.6	18.7
	7:12	-14.3	-17.4	-17.4	20.6	-14.3	-17.4	-17.4	20.6	-17.6	-21.4	-21.4	22.8
	8:12	-14.4	-17.5	-17.5	19.4	-14.4	-17.5	-17.5	19.4	-17.7	-21.4	-21.4	21.7
	9:12	-14.4	-17.5	-17.5	18.4	-14.4	-17.5	-17.5	18.4	-17.7	-21.5	-21.5	20.6
	10:12	-14.5	-17.5	-17.5	17.5	-14.5	-17.5	-17.5	17.5	-17.8	-21.5	-21.5	19.8
	11:12	-14.5	-17.6	-17.6	16.7	-14.5	-17.6	-17.6	16.7	-17.8	-21.6	-21.6	19.7
	12:12	-14.5	-17.6	-17.6	16.6	-14.5	-17.6	-17.6	16.6	-17.8	-21.6	-21.6	19.6
Exposure Category C	1:12	-17.5	-32.5	-51.2	25.9	-20.3	-37.6	-59.3	25.9	-23.7	-43.6	-68.5	25.9
	2:12	-15.6	-30.6	-47.5	24.6	-18.2	-35.5	-55.0	25.5	-21.2	-41.1	-63.6	26.7
	3:12	-15.6	-30.6	-47.5	23.1	-18.2	-35.5	-55.0	24.0	-21.2	-41.1	-63.6	25.2
	4:12	-15.7	-30.7	-47.5	21.6	-18.2	-35.5	-55.0	22.5	-21.2	-41.2	-63.6	23.7
	5:12	-15.7	-30.7	-47.6	20.1	-18.3	-35.6	-55.0	21.0	-21.3	-41.2	-63.6	22.2
	6:12	-15.7	-30.7	-47.6	18.7	-18.3	-35.6	-55.1	19.6	-21.3	-41.2	-63.7	20.8
	7:12	-17.6	-21.4	-21.4	22.8	-20.5	-24.8	-24.8	24.8	-23.8	-28.8	-28.8	27.0
	8:12	-17.7	-21.4	-21.4	21.7	-20.6	-24.9	-24.9	23.6	-23.9	-28.9	-28.9	25.8
	9:12	-17.7	-21.5	-21.5	20.6	-20.6	-24.9	-24.9	22.6	-23.9	-28.9	-28.9	25.5
	10:12	-17.8	-21.5	-21.5	19.8	-20.6	-25.0	-25.0	22.4	-23.9	-28.9	-28.9	25.4
	11:12	-17.8	-21.6	-21.6	19.7	-20.7	-25.0	-25.0	22.3	-24.0	-29.0	-29.0	25.3
	12:12	-17.8	-21.6	-21.6	19.6	-20.7	-25.0	-25.0	22.2	-24.0	-29.0	-29.0	25.2
Exposure Category D	1:12	-21.4	-39.6	-62.4	25.9	-24.3	-44.8	-70.4	25.9	-27.6	-50.7	-79.7	25.9
	2:12	-19.2	-37.4	-57.8	25.9	-21.8	-42.2	-65.3	27.0	-24.7	-47.9	-73.9	28.2
	3:12	-19.2	-37.4	-57.8	24.4	-21.8	-42.3	-65.3	25.5	-24.8	-47.9	-73.9	26.7
	4:12	-19.2	-37.4	-57.9	22.9	-21.8	-42.3	-65.3	24.0	-24.8	-47.9	-73.9	25.2
	5:12	-19.3	-37.4	-57.9	21.4	-21.9	-42.3	-65.4	22.5	-24.8	-48.0	-74.0	23.7
	6:12	-19.3	-37.5	-57.9	20.0	-21.9	-42.4	-65.4	21.1	-24.9	-48.0	-74.0	22.3
	7:12	-21.6	-26.2	-26.2	25.5	-24.5	-29.6	-29.6	27.4	-27.8	-33.6	-33.6	29.7
	8:12	-21.7	-26.2	-26.2	24.3	-24.5	-29.6	-29.6	26.3	-27.8	-33.6	-33.6	29.2
	9:12	-21.7	-26.2	-26.2	23.5	-24.6	-29.7	-29.7	26.1	-27.9	-33.7	-33.7	29.1
	10:12	-21.7	-26.3	-26.3	23.4	-24.6	-29.7	-29.7	26.0	-27.9	-33.7	-33.7	29.0
	11:12	-21.8	-26.3	-26.3	23.3	-24.6	-29.8	-29.8	25.9	-28.0	-33.7	-33.7	28.9
	12:12	-21.8	-26.4	-26.4	23.2	-24.7	-29.8	-29.8	25.8	-28.0	-33.8	-33.8	28.7

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	2.0	2.0	2.0	2.1	2.2	2.3	2.8	2.9	3.2	3.8	4.3	5.0
	2:12	3.7	3.7	3.7	3.7	3.7	3.7	4.1	4.3	4.6	5.1	5.7	6.3
	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.2	5.4	5.6	6.2	6.7	7.4
	4:12	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.2	6.4	7.0	7.6	8.2
	5:12	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	7.0	7.6	8.1	8.8
	6:12	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.4	7.9	8.4	9.1
	7:12	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.5	8.1	8.6	9.2
	8:12	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.6	8.1	8.6	9.2
	9:12	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.3	7.5	8.0	8.5	9.2
	10:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.1	7.4	7.9	8.4	9.0
	11:12	6.8	6.8	6.8	6.8	6.8	6.8	6.8	7.0	7.2	7.7	8.2	8.8
	12:12	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.8	7.0	7.5	8.0	8.6

Lateral	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

160 mph
Basic Wind Speed

0 psf
Ground Snow Load

ASCE 7-10

Florida (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

Up and Down (psf)

Exposure	Roof Pitch	Bldg. Height = 15 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 30 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)	Bldg. Height = 60 ft. Up Pressures (psf) Zone 1	Zone 2	Zone 3	Down (psf)
Exposure Category B	1:12	-22.1	-40.8	-64.2	13.4	-22.1	-40.8	-64.2	13.4	-27.1	-49.9	-78.3	13.4
	2:12	-19.8	-38.5	-59.6	15.5	-19.8	-38.5	-59.6	15.5	-24.3	-47.0	-72.6	18.0
	3:12	-19.8	-38.5	-59.6	15.4	-19.8	-38.5	-59.6	15.4	-24.3	-47.1	-72.6	17.9
	4:12	-19.8	-38.6	-59.6	15.3	-19.8	-38.6	-59.6	15.3	-24.4	-47.1	-72.6	17.9
	5:12	-19.9	-38.6	-59.6	15.2	-19.9	-38.6	-59.6	15.2	-24.4	-47.1	-72.7	17.8
	6:12	-19.9	-38.6	-59.7	15.1	-19.9	-38.6	-59.7	15.1	-24.4	-47.1	-72.7	17.6
	7:12	-22.3	-27.0	-27.0	24.4	-22.3	-27.0	-27.0	24.4	-27.3	-33.0	-33.0	28.9
	8:12	-22.3	-27.0	-27.0	24.3	-22.3	-27.0	-27.0	24.3	-27.3	-33.0	-33.0	28.8
	9:12	-22.4	-27.0	-27.0	24.1	-22.4	-27.0	-27.0	24.1	-27.4	-33.1	-33.1	28.6
	10:12	-22.4	-27.1	-27.1	24.0	-22.4	-27.1	-27.1	24.0	-27.4	-33.1	-33.1	28.5
	11:12	-22.4	-27.1	-27.1	23.9	-22.4	-27.1	-27.1	23.9	-27.5	-33.1	-33.1	28.4
	12:12	-22.5	-27.2	-27.2	23.8	-22.5	-27.2	-27.2	23.8	-27.5	-33.2	-33.2	28.3
Exposure Category C	1:12	-27.1	-49.9	-78.3	13.4	-31.5	-57.7	-90.4	13.7	-36.5	-66.7	-104.5	15.2
	2:12	-24.3	-47.0	-72.6	18.0	-28.2	-54.4	-83.9	20.2	-32.7	-62.9	-96.9	22.7
	3:12	-24.3	-47.1	-72.6	17.9	-28.2	-54.4	-83.9	20.1	-32.7	-63.0	-97.0	22.6
	4:12	-24.4	-47.1	-72.6	17.9	-28.3	-54.5	-83.9	20.0	-32.8	-63.0	-97.0	22.5
	5:12	-24.4	-47.1	-72.7	17.8	-28.3	-54.5	-84.0	19.9	-32.8	-63.0	-97.0	22.4
	6:12	-24.4	-47.1	-72.7	17.6	-28.3	-54.5	-84.0	19.8	-32.8	-63.1	-97.0	22.3
	7:12	-27.3	-33.0	-33.0	28.9	-31.6	-38.2	-38.2	32.8	-36.7	-44.2	-44.2	37.3
	8:12	-27.3	-33.0	-33.0	28.8	-31.7	-38.2	-38.2	32.7	-36.7	-44.3	-44.3	37.2
	9:12	-27.4	-33.1	-33.1	28.6	-31.7	-38.3	-38.3	32.6	-36.7	-44.3	-44.3	37.1
	10:12	-27.4	-33.1	-33.1	28.5	-31.8	-38.3	-38.3	32.4	-36.8	-44.3	-44.3	36.9
	11:12	-27.5	-33.1	-33.1	28.4	-31.8	-38.4	-38.4	32.3	-36.8	-44.4	-44.4	36.8
	12:12	-27.5	-33.2	-33.2	28.3	-31.8	-38.4	-38.4	32.2	-36.9	-44.4	-44.4	36.7
Exposure Category D	1:12	-33.1	-60.7	-95.1	14.2	-37.5	-68.5	-107.3	15.5	-42.5	-77.5	-121.3	17.0
	2:12	-29.7	-57.3	-88.2	21.0	-33.6	-64.6	-99.5	23.2	-38.1	-73.2	-112.6	25.7
	3:12	-29.7	-57.3	-88.3	20.9	-33.6	-64.7	-99.6	23.1	-38.2	-73.2	-112.6	25.6
	4:12	-29.8	-57.3	-88.3	20.9	-33.7	-64.7	-99.6	23.0	-38.2	-73.2	-112.6	25.5
	5:12	-29.8	-57.3	-88.3	20.8	-33.7	-64.7	-99.6	22.9	-38.2	-73.2	-112.7	25.4
	6:12	-29.8	-57.4	-88.4	20.7	-33.7	-64.8	-99.7	22.8	-38.3	-73.3	-112.7	25.3
	7:12	-33.3	-40.2	-40.2	34.3	-37.7	-45.4	-45.4	38.2	-42.7	-51.4	-51.4	42.7
	8:12	-33.4	-40.2	-40.2	34.2	-37.7	-45.5	-45.5	38.1	-42.7	-51.5	-51.5	42.6
	9:12	-33.4	-40.3	-40.3	34.1	-37.7	-45.5	-45.5	38.0	-42.8	-51.5	-51.5	42.5
	10:12	-33.4	-40.3	-40.3	33.9	-37.8	-45.5	-45.5	37.8	-42.8	-51.6	-51.6	42.4
	11:12	-33.5	-40.4	-40.4	33.8	-37.8	-45.6	-45.6	37.7	-42.8	-51.6	-51.6	42.2
	12:12	-33.5	-40.4	-40.4	33.7	-37.9	-45.6	-45.6	37.6	-42.9	-51.6	-51.6	42.1

Side Load (psf)

Down Slope	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
	1:12	0.3	0.6	0.8	1.0	1.2	1.3	1.9	2.1	2.5	3.2	4.0	4.8
	2:12	0.6	0.9	1.1	1.3	1.5	1.7	2.3	2.5	2.8	3.6	4.3	5.2
	3:12	0.9	1.2	1.4	1.6	1.8	2.0	2.6	2.8	3.2	3.9	4.6	5.5
	4:12	1.2	1.5	1.7	1.9	2.1	2.3	2.8	3.1	3.4	4.2	4.9	5.8
	5:12	1.5	1.7	1.9	2.2	2.3	2.5	3.1	3.3	3.7	4.4	5.1	6.0
	6:12	1.7	2.0	2.2	2.4	2.6	2.7	3.3	3.5	3.9	4.6	5.3	6.2
	7:12	1.9	2.2	2.4	2.6	2.8	2.9	3.5	3.7	4.1	4.8	5.5	6.3
	8:12	2.1	2.4	2.6	2.8	3.0	3.1	3.7	3.9	4.2	4.9	5.6	6.5
	9:12	2.3	2.5	2.7	2.9	3.1	3.3	3.8	4.0	4.4	5.0	5.7	6.5
	10:12	2.5	2.7	2.9	3.1	3.3	3.4	3.9	4.1	4.5	5.1	5.8	6.6
	11:12	2.6	2.8	3.0	3.2	3.4	3.5	4.0	4.2	4.6	5.2	5.9	6.6
	12:12	2.7	2.9	3.1	3.3	3.5	3.6	4.1	4.3	4.6	5.3	5.9	6.7

Lateral

Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

Louisiana (Typical)*

APPENDIX - Pressure Tables for Flush Mounted Roof Systems

ASCE 7-10

170 mph
Basic Wind Speed

0 psf
Ground Snow Load

Up and Down (psf)

		Bldg. Height = 15 ft.				Bldg. Height = 30 ft.				Bldg. Height = 60 ft.			
		Up Pressures (psf)			Down	Up Pressures (psf)			Down	Up Pressures (psf)			Down
	Roof Pitch	Zone 1	Zone 2	Zone 3	(psf)	Zone 1	Zone 2	Zone 3	(psf)	Zone 1	Zone 2	Zone 3	(psf)
Exposure Category B	1:12	-25.1	-46.3	-72.7	13.4	-25.1	-46.3	-72.7	13.4	-30.8	-56.4	-88.5	13.5
	2:12	-22.5	-43.6	-67.4	17.0	-22.5	-43.6	-67.4	17.0	-27.6	-53.3	-82.1	19.8
	3:12	-22.5	-43.7	-67.4	16.9	-22.5	-43.7	-67.4	16.9	-27.6	-53.3	-82.1	19.8
	4:12	-22.6	-43.7	-67.5	16.9	-22.6	-43.7	-67.5	16.9	-27.6	-53.3	-82.2	19.7
	5:12	-22.6	-43.7	-67.5	16.8	-22.6	-43.7	-67.5	16.8	-27.7	-53.3	-82.2	19.6
	6:12	-22.6	-43.8	-67.5	16.6	-22.6	-43.8	-67.5	16.6	-27.7	-53.4	-82.2	19.5
	7:12	-25.3	-30.6	-30.6	27.1	-25.3	-30.6	-30.6	27.1	-31.0	-37.4	-37.4	32.2
	8:12	-25.3	-30.6	-30.6	27.0	-25.3	-30.6	-30.6	27.0	-31.0	-37.4	-37.4	32.1
	9:12	-25.4	-30.7	-30.7	26.8	-25.4	-30.7	-30.7	26.8	-31.0	-37.5	-37.5	31.9
	10:12	-25.4	-30.7	-30.7	26.7	-25.4	-30.7	-30.7	26.7	-31.1	-37.5	-37.5	31.8
	11:12	-25.5	-30.7	-30.7	26.6	-25.5	-30.7	-30.7	26.6	-31.1	-37.5	-37.5	31.7
	12:12	-25.5	-30.8	-30.8	26.5	-25.5	-30.8	-30.8	26.5	-31.2	-37.6	-37.6	31.6
Exposure Category C	1:12	-30.8	-56.4	-88.5	13.5	-35.7	-65.3	-102.3	14.9	-41.4	-75.5	-118.1	16.6
	2:12	-27.6	-53.3	-82.1	19.8	-32.0	-61.6	-94.9	22.3	-37.1	-71.2	-109.6	25.1
	3:12	-27.6	-53.3	-82.1	19.8	-32.0	-61.6	-94.9	22.2	-37.1	-71.2	-109.6	25.1
	4:12	-27.6	-53.3	-82.2	19.7	-32.1	-61.6	-94.9	22.1	-37.2	-71.3	-109.6	25.0
	5:12	-27.7	-53.3	-82.2	19.6	-32.1	-61.7	-95.0	22.0	-37.2	-71.3	-109.7	24.9
	6:12	-27.7	-53.4	-82.2	19.5	-32.1	-61.7	-95.0	21.9	-37.2	-71.3	-109.7	24.8
	7:12	-31.0	-37.4	-37.4	32.2	-35.9	-43.3	-43.3	36.6	-41.5	-50.1	-50.1	41.7
	8:12	-31.0	-37.4	-37.4	32.1	-35.9	-43.3	-43.3	36.5	-41.6	-50.1	-50.1	41.6
	9:12	-31.0	-37.5	-37.5	31.9	-35.9	-43.3	-43.3	36.4	-41.6	-50.1	-50.1	41.5
	10:12	-31.1	-37.5	-37.5	31.8	-36.0	-43.4	-43.4	36.2	-41.7	-50.2	-50.2	41.3
	11:12	-31.1	-37.5	-37.5	31.7	-36.0	-43.4	-43.4	36.1	-41.7	-50.2	-50.2	41.2
	12:12	-31.2	-37.6	-37.6	31.6	-36.1	-43.5	-43.5	36.0	-41.7	-50.3	-50.3	41.1
Exposure Category D	1:12	-37.6	-68.7	-107.5	15.5	-42.5	-77.5	-121.3	17.0	-48.1	-87.7	-137.1	18.7
	2:12	-33.7	-64.8	-99.8	23.2	-38.1	-73.1	-112.5	25.7	-43.2	-82.8	-127.2	28.5
	3:12	-33.7	-64.8	-99.8	23.2	-38.1	-73.2	-112.6	25.6	-43.2	-82.8	-127.3	28.4
	4:12	-33.8	-64.9	-99.8	23.1	-38.2	-73.2	-112.6	25.5	-43.3	-82.8	-127.3	28.4
	5:12	-33.8	-64.9	-99.9	23.0	-38.2	-73.2	-112.6	25.4	-43.3	-82.8	-127.3	28.3
	6:12	-33.8	-64.9	-99.9	22.9	-38.2	-73.3	-112.7	25.3	-43.3	-82.9	-127.4	28.2
	7:12	-37.8	-45.5	-45.5	38.3	-42.7	-51.4	-51.4	42.7	-48.3	-58.2	-58.2	47.8
	8:12	-37.8	-45.6	-45.6	38.2	-42.7	-51.5	-51.5	42.6	-48.4	-58.2	-58.2	47.7
	9:12	-37.8	-45.6	-45.6	38.1	-42.7	-51.5	-51.5	42.5	-48.4	-58.3	-58.3	47.6
	10:12	-37.9	-45.6	-45.6	37.9	-42.8	-51.5	-51.5	42.3	-48.4	-58.3	-58.3	47.4
	11:12	-37.9	-45.7	-45.7	37.8	-42.8	-51.6	-51.6	42.2	-48.5	-58.4	-58.4	47.3
	12:12	-38.0	-45.7	-45.7	37.7	-42.9	-51.6	-51.6	42.1	-48.5	-58.4	-58.4	47.2

Side Load (psf)

	Roof Pitch	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Down Slope	1:12	0.3	0.6	0.8	1.0	1.2	1.3	1.9	2.1	2.5	3.2	4.0	4.8
	2:12	0.6	0.9	1.1	1.3	1.5	1.7	2.3	2.5	2.8	3.6	4.3	5.2
	3:12	0.9	1.2	1.4	1.6	1.8	2.0	2.6	2.8	3.2	3.9	4.6	5.5
	4:12	1.2	1.5	1.7	1.9	2.1	2.3	2.8	3.1	3.4	4.2	4.9	5.8
	5:12	1.5	1.7	1.9	2.2	2.3	2.5	3.1	3.3	3.7	4.4	5.1	6.0
	6:12	1.7	2.0	2.2	2.4	2.6	2.7	3.3	3.5	3.9	4.6	5.3	6.2
	7:12	1.9	2.2	2.4	2.6	2.8	2.9	3.5	3.7	4.1	4.8	5.5	6.3
	8:12	2.1	2.4	2.6	2.8	3.0	3.1	3.7	3.9	4.2	4.9	5.6	6.5
	9:12	2.3	2.5	2.7	2.9	3.1	3.3	3.8	4.0	4.4	5.0	5.7	6.5
	10:12	2.5	2.7	2.9	3.1	3.3	3.4	3.9	4.1	4.5	5.1	5.8	6.6
	11:12	2.6	2.8	3.0	3.2	3.4	3.5	4.0	4.2	4.6	5.2	5.9	6.6
	12:12	2.7	2.9	3.1	3.3	3.5	3.6	4.1	4.3	4.6	5.3	5.9	6.7

	Ss = 0.0	Ss = 0.1	Ss = 0.2	Ss = 0.3	Ss = 0.4	Ss = 0.5	Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	Ss = 3.1
Lateral	0.0	0.2	0.5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

* These tables are meant as representative of the areas listed in the title. The local wind speeds and snow loads should be independantly verifed for the specific install location.

SM SOLAR MOUNT

APPENDIX C

Downward & Upward Span Length Tables

SOLARMOUNT Standard Rail		Downforce Span Length										
		20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
Horizontal Load	0 plf	12.5 ft	11.0 ft	10.0 ft	9.0 ft	8.5 ft	7.5 ft	7.0 ft	6.5 ft	6.0 ft	5.0 ft	4.5 ft
	5 plf	12.5 ft	11.0 ft	10.0 ft	9.0 ft	8.0 ft	7.5 ft	7.0 ft	6.5 ft	6.0 ft	5.0 ft	4.5 ft
	10 plf	11.0 ft	10.0 ft	9.0 ft	8.5 ft	8.0 ft	7.5 ft	7.0 ft	6.5 ft	5.5 ft	5.0 ft	4.5 ft
	15 plf	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft
	20 plf	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.0 ft	4.5 ft
	25 plf	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft
	30 plf	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft
	35 plf	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft
	40 plf	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft
	50 plf	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft
	60 plf	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft
	70 plf	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft

SOLARMOUNT Standard Rail		Uplift Span Length										
		20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
Horizontal Load	0 plf	12.5 ft	11.0 ft	10.0 ft	9.0 ft	8.5 ft	7.5 ft	7.0 ft	6.5 ft	6.0 ft	5.0 ft	4.0 ft
	5 plf	12.5 ft	11.0 ft	10.0 ft	9.0 ft	8.0 ft	7.5 ft	7.0 ft	6.5 ft	6.0 ft	5.0 ft	4.0 ft
	10 plf	11.0 ft	10.0 ft	9.0 ft	8.5 ft	8.0 ft	7.5 ft	7.0 ft	6.5 ft	5.5 ft	5.0 ft	4.0 ft
	15 plf	9.0 ft	9.0 ft	8.5 ft	8.0 ft	7.5 ft	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.0 ft
	20 plf	8.0 ft	8.0 ft	7.5 ft	7.5 ft	7.0 ft	6.5 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.0 ft
	25 plf	7.5 ft	7.0 ft	7.0 ft	6.5 ft	6.5 ft	6.5 ft	6.0 ft	5.5 ft	5.5 ft	5.0 ft	4.0 ft
	30 plf	6.5 ft	6.5 ft	6.5 ft	6.5 ft	6.0 ft	6.0 ft	6.0 ft	5.5 ft	5.0 ft	5.0 ft	4.0 ft
	35 plf	6.0 ft	6.0 ft	6.0 ft	6.0 ft	6.0 ft	5.5 ft	5.5 ft	5.5 ft	5.0 ft	4.5 ft	4.0 ft
	40 plf	6.0 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.0 ft
	50 plf	5.0 ft	5.0 ft	5.0 ft	5.0 ft	5.0 ft	5.0 ft	5.0 ft	4.5 ft	4.5 ft	4.5 ft	4.0 ft
	60 plf	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.0 ft	4.0 ft
	70 plf	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.0 ft	4.0 ft	4.0 ft	4.0 ft	4.0 ft	4.0 ft	3.5 ft

Note: No Interpolation Permitted.

Example:

60 plf	Downward Load (strong axis)
50 plf	Upward Load (strong axis)
10 plf	Horizontal Load (weak axis)

8.0 ft	Max Span for Downforce
8.5 ft	Max Span for Uplift
8.0 ft	**Max Span = min (downforce, uplift) with SOLARMOUNT Standard Rail**

SM SOLAR MOUNT

APPENDIX C

Downward & Upward Span Length Tables

SOLARMOUNT Heavy Duty (HD) Rail		Downforce Span Length										
		20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
Horizontal Load	0 plf	18.5 ft	16.0 ft	14.5 ft	13.5 ft	12.5 ft	12.0 ft	11.5 ft	10.5 ft	9.0 ft	7.0 ft	6.0 ft
	5 plf	18.5 ft	16.0 ft	14.5 ft	13.5 ft	12.5 ft	12.0 ft	11.5 ft	10.0 ft	9.0 ft	7.0 ft	6.0 ft
	10 plf	11.5 ft	11.5 ft	11.5 ft	11.5 ft	11.5 ft	11.5 ft	11.0 ft	10.0 ft	9.0 ft	7.0 ft	6.0 ft
	15 plf	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.0 ft	6.0 ft
	20 plf	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft	5.5 ft
	25 plf	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft
	30 plf	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft	3.5 ft
	35 plf	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft	3.0 ft
	40 plf	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft	2.5 ft
	50 plf	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft	2.0 ft
	60 plf	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft
	70 plf	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft	1.5 ft

SOLARMOUNT Heavy Duty (HD) Rail		Uplift Span Length										
		20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
Horizontal Load	0 plf	18.5 ft	16.0 ft	14.5 ft	13.5 ft	12.5 ft	10.5 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	5 plf	18.5 ft	16.0 ft	14.5 ft	13.5 ft	12.5 ft	10.5 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	10 plf	15.5 ft	15.0 ft	14.0 ft	13.0 ft	12.0 ft	10.5 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	15 plf	13.0 ft	13.0 ft	12.5 ft	12.0 ft	11.5 ft	10.5 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	20 plf	11.5 ft	11.5 ft	11.0 ft	10.5 ft	10.5 ft	10.0 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	25 plf	10.5 ft	10.0 ft	10.0 ft	10.0 ft	9.5 ft	9.5 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	30 plf	9.5 ft	9.5 ft	9.5 ft	9.0 ft	9.0 ft	9.0 ft	8.5 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	35 plf	9.0 ft	8.5 ft	8.5 ft	8.5 ft	8.5 ft	8.5 ft	8.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	40 plf	8.0 ft	8.0 ft	8.0 ft	8.0 ft	8.0 ft	8.0 ft	7.5 ft	7.5 ft	6.0 ft	5.0 ft	4.0 ft
	50 plf	7.5 ft	7.5 ft	7.5 ft	7.0 ft	7.0 ft	7.0 ft	7.0 ft	7.0 ft	6.0 ft	5.0 ft	4.0 ft
	60 plf	6.5 ft	6.5 ft	6.5 ft	6.5 ft	6.5 ft	6.5 ft	6.5 ft	6.5 ft	6.0 ft	5.0 ft	4.0 ft
	70 plf	6.0 ft	6.0 ft	6.0 ft	6.0 ft	6.0 ft	6.0 ft	6.0 ft	6.0 ft	6.0 ft	5.0 ft	4.0 ft

Note: No Interpolation Permitted.

Example:

60 plf	Downward Load (strong axis)
50 plf	Upward Load (strong axis)
10 plf	Horizontal Load (weak axis)

11.5 ft	Max Span for Downforce
13.0 ft	Max Span for Uplift
11.5 ft	**Max Span = min (downforce, uplift) with SOLARMOUNT Heavy Duty (HD) Rail**

Roof Pitch to Angle Conversion:

12:12 = 45°

11:12 = 42.50°

10:12 = 39.81°

9:12 = 36.87°

8:12 = 33.69°

7:12 = 30.26°

6:12 = 26.57°

5:12 = 22.62°
Still Walkable

4:12 = 18.43°
Standard Roof Pitch

3:12 = 14.04°
Typical in Southern Climates

2:12 = 9.46°
Low Roof Pitch

APPENDIX E
Dead Load Analysis

The Pressure Lookup Tables and U-Builder include service dead loads ranging from 2.1 to 3.8 psf and include the weight of SOLARMOUNT Standard Rail, SOLARMOUNT Enhancements, and the weight of the module.

To calculate the dead load of your system, please refer to Appendix H - Technical Data Sheet and the project specific Module Specification Sheet. If your loads fall outside the range listed above, please use the Analytical Method in the SOLARMOUNT Design and Engineering Guide for analysis.

Installation Parameters for Equipment Grounding Fault Test

Enphase Energy is looking to perform fault testing to verify that our microinverter enclosure and cabling system can be utilized to clear a 20A fault condition occurring on the metallic racking or module frames within a system in which all of the metallic equipment is bonded using devices listed for bonding the components. These bonding devices can be either WEEB grounding clips or UL-2703 listed bonding components, but the primary test scenario is designed to utilize WEEB grounding clips.

Installation Parameters

Ideally, we would like to show that a single microinverter can clear a fault condition occurring on the second rail of the racking system.

WEEB grounding clips would be used for bonding the modules, microinverters, and racking system. WEEB DMC clips with Unirac SolarMount Rails would be an acceptable pairing.

The wire length between the microinverter and the overcurrent protective device should be maintained to at least 2% voltage drop, but 3% voltage drop (based upon 16A) would be ideal.

If the primary test scenario is adequate to properly open the breaker, then no additional testing would be required.

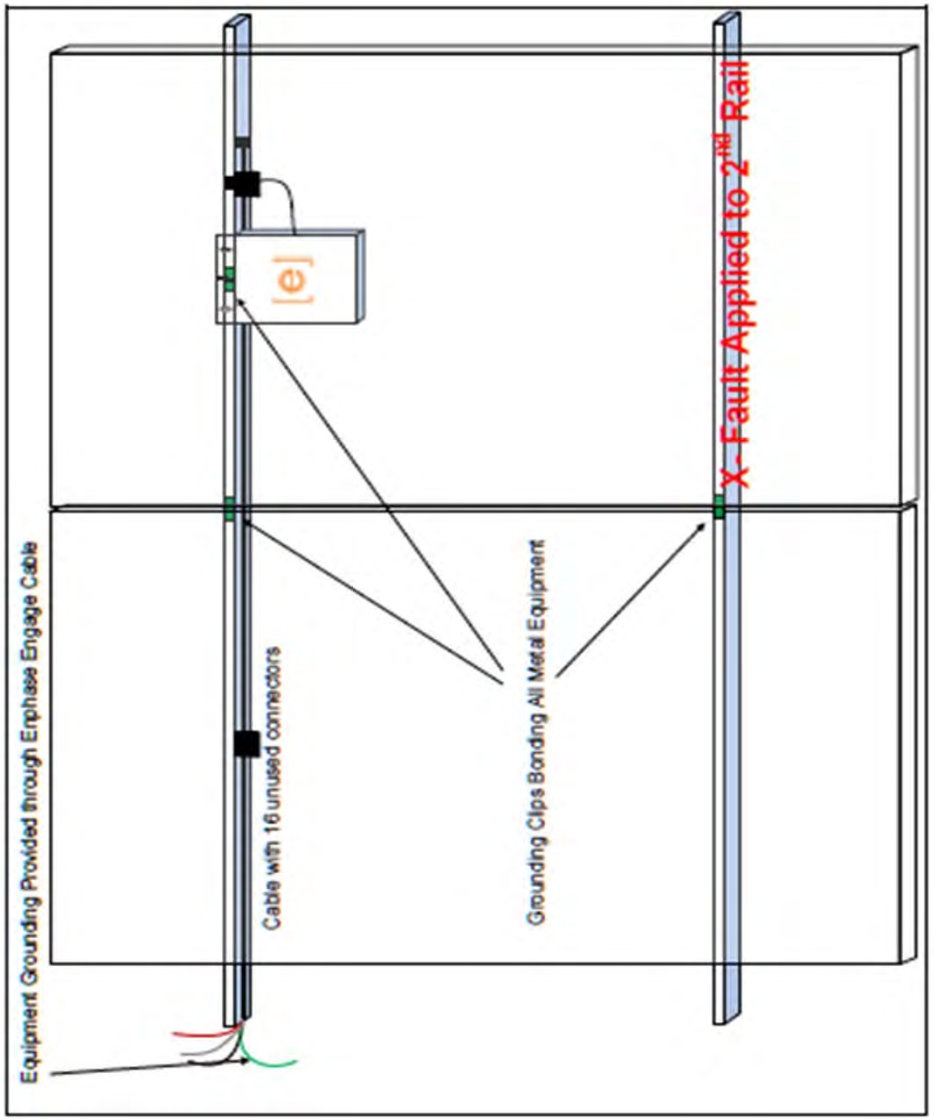
Primary Test Scenio - One inverter to clear fault, 3% voltage drop

Installation Requirements for the primary test scenario

- 2 modules - (could be used Sharp 235s from Enphase inventory)
- 2 rail – 2 x 8' sections of Unirac U-SMR Rail
- 1 - Flat-lid microinverter (M215 and/or M250 acceptable)
- 3 - WEEB-DMC grounding clips between metal components and installed as per Burndy installation requirements
- 1 - WEEB Grounding Lug for bonding of fault to 2nd rail
- Enphase Engage Cable with 17 portrait connectors in portrait (.81% voltage drop when fully populated. The microinverter is to be installed at the 17th connector in the cable.
- **133' of #10 CU conductors**
  - Designed for 3% Voltage Drop total including Engage Cable
  - .81% on Engage Cable with 17 portrait connectors (from Enphase Vrise Technical Brief)
  - 2.19% voltage drop on #10 conductors
  - 133' of #10 CU conductors
  - Could be type NM cable.
  - Vdrop % = 16A x 2 way wire length in kFt x Resistance Ω/kFt / 240V
    - 2.19% = 16A x 2 x Distance x 1.24Ω/kFt / 240V
    - One Way Distance of #10CU = 133 ft
- Fault applied to 2nd rail
- Bonding of modules to rail with 1 WEEB clip per mid clamp
- Bonding of microinverter to rail with 1 WEEB clip

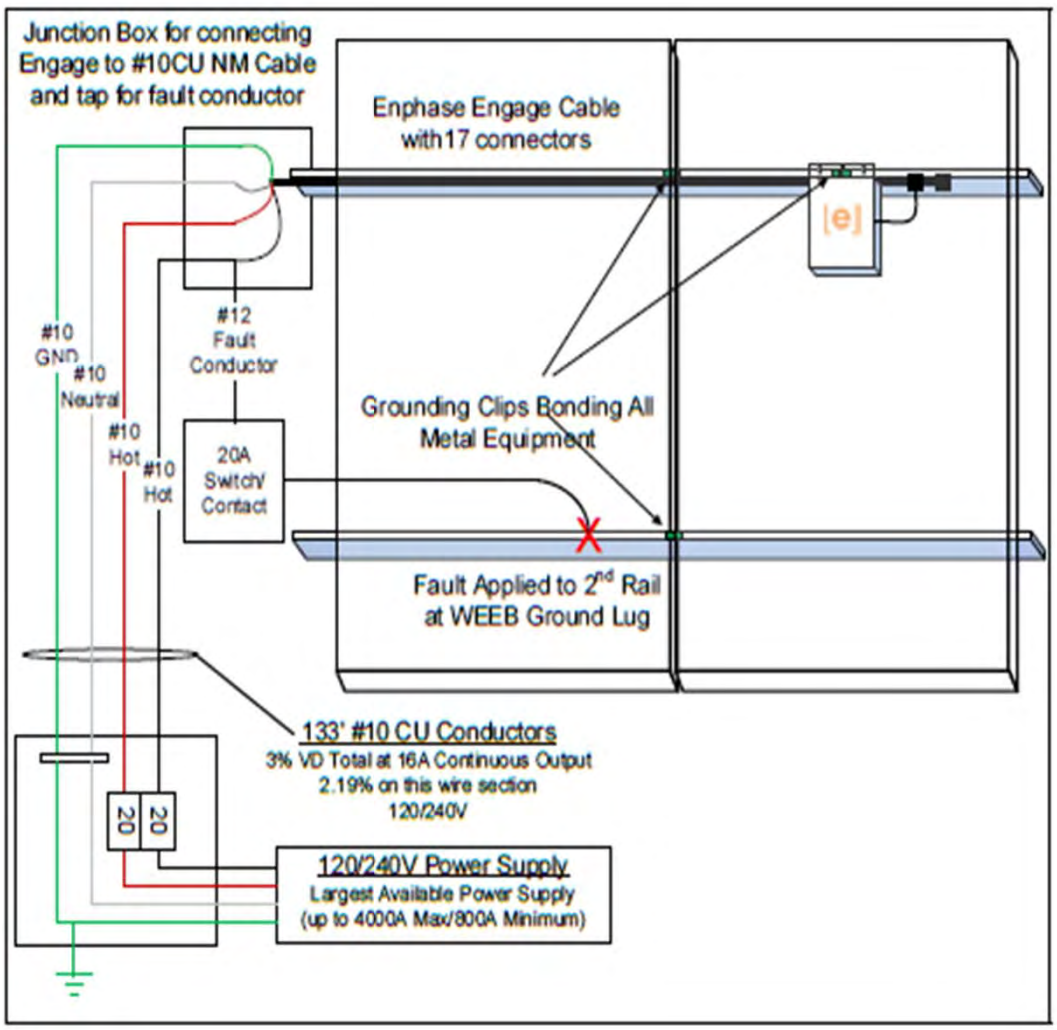
APPENDIX F

Enphase Energy Microinverter Testing



Conceptual Drawing

Electrical Schematic



Other Potential Test Scenarios

Additional test scenarios may be required or preferred. Alternate test parameters may include the following:

- We may want to test both M215 and M250 microinverters
- Decreasing Voltage Drop from 3% to 2% with use of 72' one way wire length of #10CU conductors
- Apply fault to module frame
- Apply fault to 1st rail
- Install 2 or more microinverters on the cable / rail section
- Use UL-2703 racking system in place of WEEB bonding clips (potentially Unirac rail-less system)
- Test with approved Siemens AFCI Breaker

Equipment Grounding in an Enphase System

Overview

An Enphase Energy Microinverter system offers the safest photovoltaic system available. The Enphase Microinverter system provides a system that is safer for service personnel, safer for fire fighter personnel, and less prone to the fire hazards that come with higher voltage DC photovoltaic systems. Many of these safety advantages are widely known:

- DC voltages are maintained at low, safe levels
- Conduits and conductors are de-energized when the main breaker is shut-off.
- Enphase Microinverter systems are free of DC arc-fault hazards and requirements

However, one advantage that is rarely discussed is the high levels of ground bonding that exists in an Enphase Microinverter system.

Each and every microinverter in an Enphase system is bonded to ground through the Enphase Engage cabling system. The Enphase Engage cable provides for a robust grounding path to each microinverter, and when properly bonded to racking and to modules frames provides for robust equipment grounding to this equipment, also. When the microinverters, racking, and modules are properly bonded together, then the equipment grounding may also be provided through the microinverter. This can provide a significant cost savings to the labor and balance of system costs in an Enphase Microinverter system.

Enphase Grounding and the 2011 National Electrical Code

Equipment Grounding and System Grounding Requirements

The Enphase M250-IG and M215-60-2LL-S22-IG meet the requirements of the National Electrical Code Article 690.35 Ungrounded Photovoltaic Power Systems. NEC 690.35 allows for photovoltaic power systems to be installed with ungrounded photovoltaic source and output circuits. Systems that meet the requirements of NEC 690.35 are exempt from the requirements of NEC 690.41 System Grounding.

The NEC calls out two distinct types of grounding; equipment grounding and system grounding. Equipment grounding provides for the grounding of metal equipment and enclosures and is generally provided for with equipment grounding conductors (EGCs). System grounding provides the primary grounding path between a grounding electrode (I.E. ground rod or ufer) and a grounded system. System grounding requires the installation of a grounding electrode conductor (GEC). In an Enphase system, the DC conductors are not bonded to ground and the microinverters do not require a GEC, but do require that EGCs are provided for equipment grounding.

The term ungrounded is somewhat misleading, because ungrounded photovoltaic systems are still required to have equipment grounding provided to the metal frames, equipment, and enclosures in the system, but are not required to meet the requirements for system grounding. This means that a grounding electrode conductor (GEC) is not required to be installed to the enclosure of each Enphase Microinverter.

Systems that do bond the DC conductors of the photovoltaic source and output circuits must meet the installation requirements for the grounding electrode conductors (GEC) as called out in NEC 250.64, which requires that the GEC be continuous and protected against damage. The grounding electrode conductor (GEC) must also be a minimum #8CU conductor, as required by NEC 250.166.

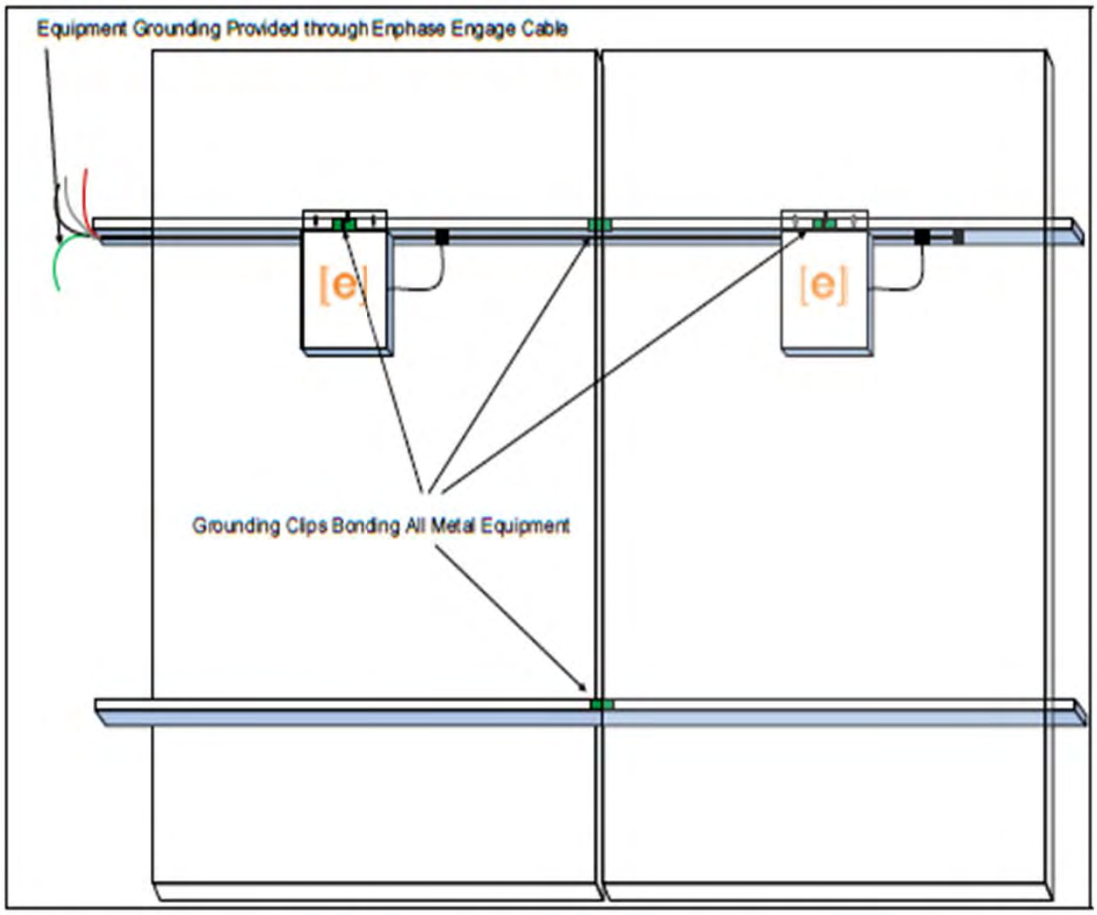
Equipment Grounding Requirements for an Enphase System

In an Enphase system with Integrated Ground Microinverters, the requirements for providing a GEC to the microinverters is removed, and only equipment grounding is required. In these systems, it is reasonable and safe to provide the equipment grounding through the Enphase Engage cabling.

NEC Article 690.43 Equipment Grounding specifies that all exposed non-current-carrying metal parts of PV module frames, electrical equipment, and conductor enclosures shall be provided with equipment grounding.

690.43(C) Structure as Equipment Grounding Conductor allows for equipment to be used as the equipment grounding conductor in a photovoltaic system. Specifically, "*Devices listed and identified for grounding the metallic frames of PV modules or other equipment shall be permitted to bond the exposed metal surfaces or other equipment to mounting surfaces.*"

In an Enphase microinverter system, if the microinverters and modules are bonded to the racking assemblies with the use of listed and approved grounding clips or grounding components, then the equipment grounding conductor provided to the microinverters through the Enphase Engage cable may also be used to ground the other photovoltaic system components.



**Always check with your Authority Having Jurisdiction about your proposed grounding methodology prior to the installation of the system.

Meeting the Requirements of NEC 690.35 Ungrounded Photovoltaic Power Systems

Enphase microinverters meet the requirements of NEC Article 690.35 for Ungrounded Photovoltaic Power systems. The article states:

690.35 Ungrounded Photovoltaic Power Systems. Photovoltaic Power Systems shall be permitted to operate with ungrounded photovoltaic source and output circuits where the system complies with 690.35(A) through (G).

(A) **Disconnects.** In an Enphase microinverter system the AC and DC connectors are the disconnecting means.
(B) **Overcurrent Protection.** In an Enphase system, the AC circuit breaker or fused disconnecting feeding the branch circuit provides overcurrent protection for the inverter output circuit. As per 690.9(A) Exception (b), overcurrent protection is not required on the DC conductors.
(C) **Ground Fault Protection.** In an Enphase microinverter system, ground fault protection is provided in the microinverter. In the Enphase microinverters with integrated grounding, the ground fault protection is provided by a ground fault sensing circuit.
(D) **The DC conductors must be PV Wire.** The DC conductors in an Enphase Microinverter are PV Wire.
(E) Allowed for use in ungrounded battery systems
(F) **Labelling.** The Enphase Microinverters are labeled as specified.
(G) **Listing.** The Enphase Microinverters are listed for use in an ungrounded photovoltaic system.

The SOLARMOUNT system has been certified and listed to the UL 2703 standard (Rack Mounting Systems and Clamping Devices for Flat-Plate Photovoltaic Modules and Panels). This standard included electrical grounding, electrical bonding, mechanical load and fire resistance testing.

In conducting these tests, specific modules are selected for their physical properties so that the certifications can be mostly broadly applied. The following lists the specific modules that were tested and the applicability of those certifications to other modules that might come onto the market.

In addition to UL 2703 certification, Unirac performs internal testing beyond the requirements of certification tests in order to establish system functional limits, allowable loads, and factors of safety. These tests include functional system tests, and destructive load testing.

Mechanical Load Test Modules

The modules selected for UL 2703 mechanical load testing were selected to represent the broadest range possible for modules on the market. The tests performed cover the following basic module parameters:

- 60 cell framed modules only
- Frame thicknesses greater than or equal to 1.2mm
- Basic single and double wall frame profiles (some complex frame profiles could require further analysis to determine applicability)
- Clear and dark anodized aluminum frames
- Certification loads: 50 psf up, 113 psf down

Tested Modules	
Module Manufacturer	Model / Series
Trina	TSM-PA05
CentroSolar	VISION C2
CentroSolar	E Series 60 cell
CentroSolar	T-Series 60 cell

System Level Fire Classification

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of UL 1703. This UL 1703 classification has been incorporated into our UL 2703 product certification. SOLARMOUNT has achieved Class A system level performance for steep sloped roofs when used in conjunction with type 1, type 2, type 3 and type 10 module constructions. Class A system level fire performance is inherent in the SOLARMOUNT design, and no additional mitigation measures are required. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes ⩾ 2 inches per foot, or 9.5 degrees). There is no required minimum or maximum height limitation above the roof deck to maintain the Class A fire rating for SOLARMOUNT.

Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Type 1, Type 2, Type 3, & Type 10	Class A	East-West	Landscape OR Portrait	None Required
		North-South		

Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SOLARMOUNT system.

Manufacturer	Module or Series
SunPower	X-Series
	E-Series
	Sig Black
	AC
Trina	PA05
	PD05
Yingli	YGE 60
	YGE-Z 60
	Panda 60
Canadian Solar	CS6X-P
	CS6P-M
	CS6P-P
	CS5A-M
LG Electronics	MONO X
	MONO NEON
Suntech	STP"XXX"
Sharp	ND-250QCS
	ND-240QCJ
	ND-Q235F4
Kyocera	KD-F-Series
Suniva	Optimus™ Series
	MV Series
ET Solar	ET Module
	ET AC Module
Hanwha SolarOne	HSL 60
Phono Solar Technology	Standard Modules
CentroSolar America	C-Series
	E-Series
	C2-Series
	T-Series
Hyundai Heavy Industries	MG Series
AU Optronics (BenQ Solar)	PM Series
Sun Edison/MEMC	F-Series/R-Series
SolarWorld	Sunmodule Protect/Sunmodule Plus

The modules selected for UL 2703 bonding and grounding testing were selected to represent the broadest range possible of modules on the market. The tests were performed for each specific bonding location using representative module frame profile sections. The tests performed cover the following basic module parameters:

- 60 cell framed modules only
- Frame thicknesses greater than or equal to 1.2mm
- Basic single and double wall frame profiles (some complex frame profiles could require further analysis to determine applicability)
- Clear and dark anodized aluminum frames
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system

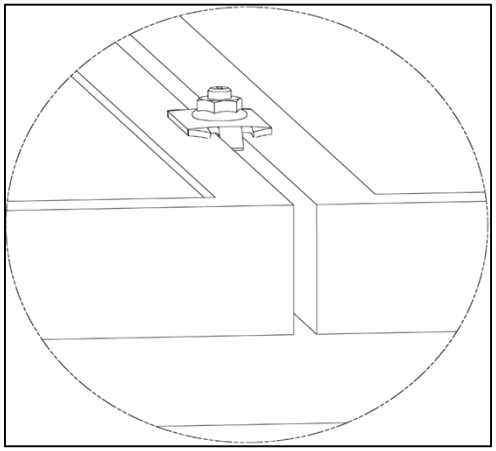
UL 2703 Certification Marketing Label

Unirac SOLARMOUNT has been listed to UL 2703. Marking labels are shipped with the midclamps. After the racking system has been fully assembled, a single marking label should be applied to the SOLARMOUNT rail at the edge of the array. Note: The sticker label should be placed such that it is visible, but not outward facing.

SM SOLAR MOUNT

APPENDIX H
Technical Data Sheets

SOLARMOUNT MID CLAMP



Bonding Midclamp Assembly		
Direction	Allowable Load (lbs)	Design Load (lbs)
X ±, Sliding	425	643
Y ±, Transverse	428	647
Z +, Tension	883	1336

Part No. 302027C, 302027D, 302028C, 302028D,302029C, 302029D

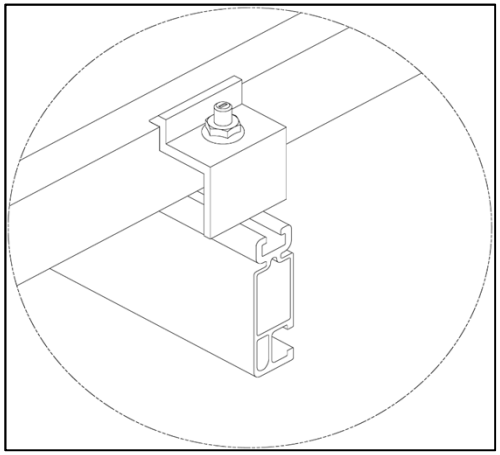
Midclamp Material: Stainless Steel 300 Series

Ultimate Tensile: 85 ksi

Finish: Clear or Black Oxide

Mid Clamp Weight: 0.050 lbs (23g)

SOLARMOUNT END CLAMP



Bonding Endclamp Assembly		
Direction	Allowable Load (lbs)	Design Load (lbs)
X ±, Sliding	529	800
Y ±, Transverse	14	21
Z +, Tension	52	79

Part No. 302021C, 302021D, 302022C, 302022D, 302023C, 302023D, 302024C, 302024D, 302025C, 302025D, 302026C, 302026D

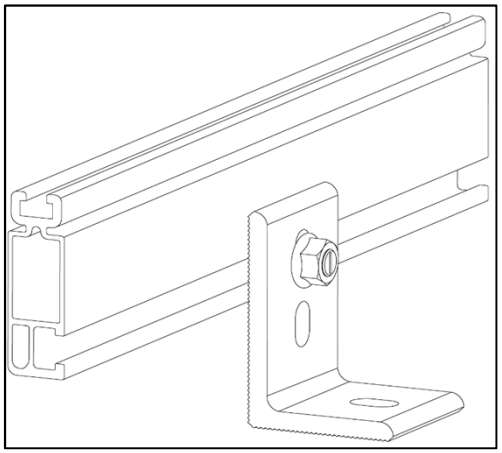
Endclamp material: 6000 Series Aluminum Alloys

Ultimate Tensile: 38 ksi, Yield: 35 ksi

Finish: Clear or Dark Anodized

End Clamp Weight: Varies, ~ 0.058 lbs (26g)

SOLARMOUNT L-FOOT



L-Foot 3/8" T-Bolt		
Direction	Allowable Load (lbs)	Design Load (lbs)
X ±, Sliding	404	651
Y ±, Transverse	136	219
Z +, Tension	681	1239
Z -, Compression	1273	2053

Part No. 304001C, 304001D

L-Foot material: 6000 Series Aluminum Alloys

Ultimate Tensile: 38 ksi, Yield: 35 ksi

Finish: Clear or Dark Anodized

L-Foot Weight: 0.215 lbs (98g)

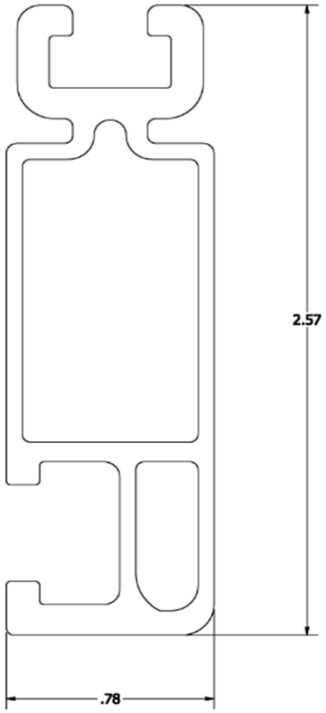
Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents.

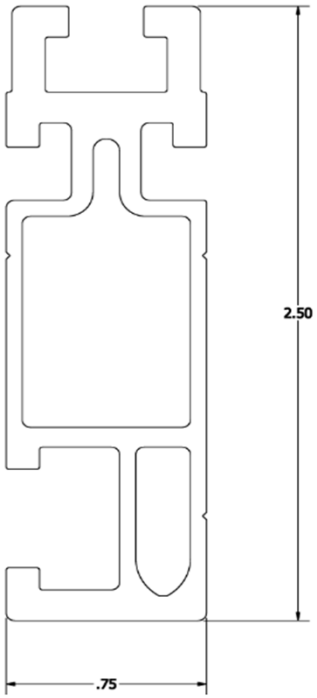
Values represent the allowable and design load capacity of a single midclamp assembly when used with a SOLARMOUNT series beam to retain a module in the direction indicated.

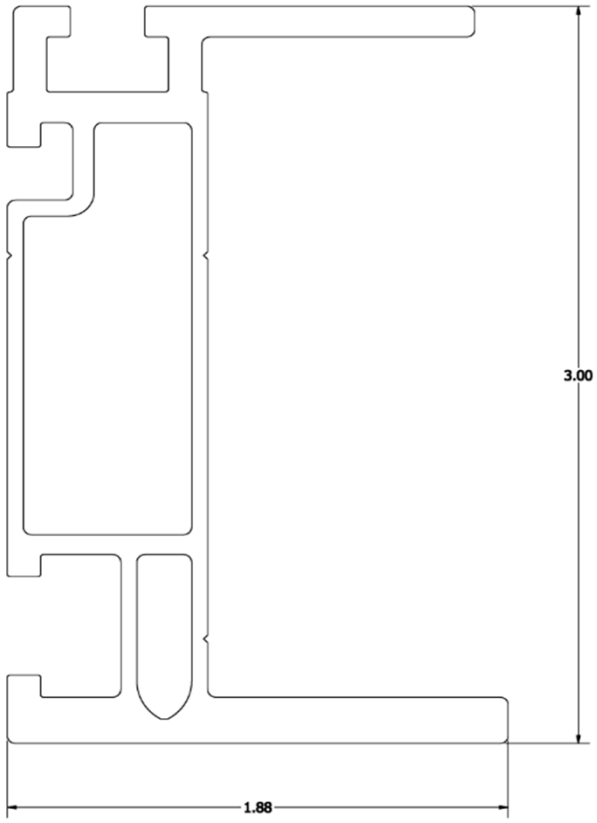
Assemble midclamp and endclamp with one Unirac ¼"-20 T-bolt and one ¼"-20 ASTM F594 serrated flange nut.

For the beam to L-Foot connection: Assemble with one Unirac $^{3}/_{8}$"-20 T-bolt and one $^{3}/_{8}$"-20 ASTM F594 serrated flange nut.

Use anti-seize and tighten to 10 ft-lbs of torque for the midclamp and endclamp and tighten to 30ft-lbs of torque for the L-Foot.



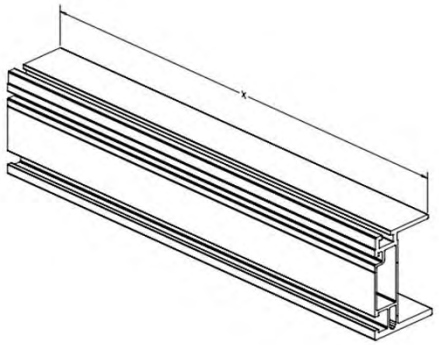


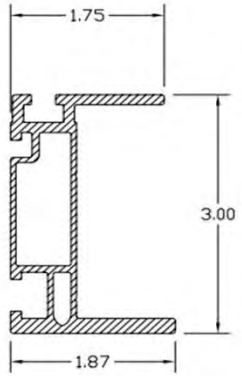


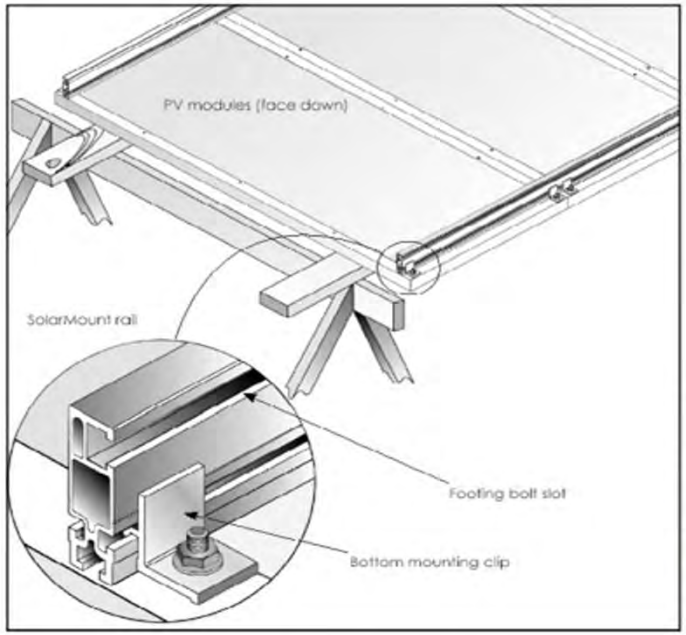
Properties	SOLARMOUNT Rail Profile 2	SOLARMOUNT Rail Profile 1	SOLARMOUNT HD	Units
BEAM HEIGHT	2.57	2.50	3.00	in
APPROX WEIGHT	0.728	0.811	1.271	plf
CROSS SECTION AREA	0.625	0.676	1.059	in^2
SECTION MODULUS (X-AXIS)	0.363	0.353	0.898	in^3
SECTION MODULUS (Y-AXIS)	0.113	0.113	0.221	in^3
MOMENT OF INERTIA (X-AXIS)	0.467	0.464	1.45	in^4
MOMENT OF INERTIA (Y-AXIS)	0.045	0.044	0.267	in^4
RADIUS OF GYRATION (X-AXIS)	0.865	0.829	1.17	in
RADIUS OF GYRATION (Y-AXIS)	0.269	0.254	0.502	in

APPENDIX I
SOLARMOUNT HD Rail

The SOLARMOUNT Installation Guide and system certifications are equally applicable to SOLARMOUNT HD rail. Unless otherwise noted, installation procedures for both are equivalent and sufficient to maintain system certifications. For maximum spans and cantilevers specific to SOLARMOUNT HD, please refer to Appendix C and the SOLARMOUNT Installation Guide.







Bottom Mounting with SOLARMOUNT HD Rail:

Bottom mounting is no longer possible with standard SOLARMOUNT rail, however, SOLARMOUNT HD still accommodates this mounting method. Should you elect to use bottom mounting clamps to secure modules, please refer to the procedure below. NOTE: Bottom mounting of modules does not provide module bonding through clamps and is not covered under the current UL 2703 certification.

	Wrench size	*Recommended torque (ft-lbs)
¼" hardware	7/16"	10
⅜" hardware	9/16"	30

Note: Torque specifications do not apply to lag bolt connections.

**With anti-seize*

Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood, (1) apply lubricant to bolts, preferably an anti-seize lubricant, available at auto parts stores, (2) shade hardware prior to installation, and (3) avoid spinning on nuts at high speed. See Installation Supplement 910, Galling and Its Prevention, at www.unirac.com.