# DESIGN & ENGINEERING GUIDE Solarmount: Flush-to-roof design



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## **GETTING STARTED - INTRODUCTION** DESIGN & ENGINEERING GUIDE PAGE

#### **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 <a href="http://design.unirac.com">http://design.unirac.com</a>

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
  - o 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) Orientations
- 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
- Superior Aesthetics
  - o Optional Front Trim
  - Optional End Caps (SOLARMOUNT Standard and Light Rail Only)

# **INSTALLER RESPONSIBILITY** DESIGN & ENGINEERING GUIDE PAGE

#### 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 stringent 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 & ENGINEERING GUIDE**

#### **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 aid 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 qualifying 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 Re	quireme	nts & D	esign Ai	d											
<b>Project Requirements</b> (Blank Cells for Project Specific Input Provided for your Convenience)	Design Aid														
Project Name: Project Address: AHJ (Authority Having Jurisdiction):	U-Bui (Online De	lder <sup>1a</sup> esign Tool)	Prescripti Meth	ve Design Iod <sup>1b</sup>	Do It Yourself <sup>1c</sup> (Analytical Method)										
Current Adopted Building Code: Local Jurisdiction Code Amendments:	ASCE 7-05	ASCE 7-10	ASCE 7-05	ASCE 7-10	ASCE 7-05	ASCE 7-10									
Occupancy/Risk Category*: Basic Wind Speed*:	85-150 mph	l 110-170 mph	***	***	As Permitted by C As Permitted by C										
Wind Exposure Category*: Ground Snow Load*:	B 0 0-60	or C ) psf	В, С *	or D	As Permitt As Permitt	ed by Code ed by Code									
Seismic Coefficient, Ss*: Roof Height (Eave & Ridge)*:	≤ 3 < 30	.1g feet	≤ 3 < 60	.1g feet	As Permitted by Code										
Roof Slope*:	0-45 C	egrees	0-45 D	egrees	As Permitt	ed by Code									
Roof Zone(s)*: Framed Module Type & Module*:	1, 2, User	or 3 Input	1, 2, 3 Most 60 a	and 3 nd 72 Cell	As Permitt User	ed by Code									
Module Weight*: Module Dimensions*:	Module D Module D	ependent Dependent	See App Module D	endix E ependent	User User	Input Input									
Total Module Quantity*:	Up to	50 x 50 tress Design	Unlir Allowable S	nited	User	User Input									
Project Specific Calculations for Solar System Provided	Y	es	NILOWADLE S	0	No										
Stamped/Certified Engineering Letter for Solar System Provided	: Y	es	Y	es	No										
Bill of Materials for Unirac Components of Solar System Provided	Y	es	N	0	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.

<u>1b.</u> 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.

<u>1c.</u> 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 DESIGN & ENGINEERING GUIDE

#### 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.)

## PRESCRIPTIVE DESIGN METHOD DESIGN & ENGINEERING 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.



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<sup>2</sup> or psf) from the boxes just filled in to pounds per linear 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 (overhang) lengths can be up to 33% of the span length. For example, a 9 foot span length can have a 3 foot cantilever. The cantilever is defined as the distance from the center of a L-Foot to the edge of a rail.

MODULE

# PRESCRIPTIVE DESIGN METHOD DESIGN & ENGINEERING GUIDE

#### 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 G 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.

#### **<u>Step 7:</u>** Define Grounding and Bonding Path

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

#### SOLARMOUNT Front Trim Check

a. SOLARMOUNT Front Trim should not be installed in areas where the wind load exceeds 100 psf, where the distance from clamp to clamp (span) exceeds 52 inches, or where the cantilever (overhang) is greater than 66% of the span length. To determine your pressure, please use Appendix B. You will need to review the table assosciated with your project wind speed and no snow, and review the Up and Down Loads (psf) to determine if SOLARMOUNT Front Trim is appropriate for your project.

## ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### 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)	or a po
Roof Angle (degrees):	Convert roof pitch to angle in degrees [See Appendix D]	remove
Basic Wind Speed (mph):	Per Basic Wind Speed - US Map (ASCE 7-05, Figure 6-1)	panels
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)	rationa roof fo reduce words.
Roof Zone:	Determine the Roof Zone (1, 2 or 3) (ASCE 7-05, Figure 6-3)	load fo
Ground Snow Load (psf):	Pg = Ground Snow Load in psf. Ground Snow Loads (ASCE 7-05, Figur 7-1)	e same s can be
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)	3, 3,
Roof Live Load <sup>1</sup> (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.



# ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

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



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".

# ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

Step 3: Dead Load

#### 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.

Module Dead Load (psf):Module Dead Load (psf) should be determined from User Inputs in Step<br/>1Racking System Dead Load³[See Appendix E] (The racking system dead load should be taken as the<br/>total weight of the racking system (hardware, rails, nuts, bolts,<br/>attachments, etc.) divided by the total module area of the system.)<br/>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.

#### Snow Load (ASCE 7-05, Chapter 7)





Ground Snow Load<sup>4</sup> (psf) from User inputs in Step 1. Slope Factor (ASCE 7-05, Figure 7-2) Thermal Factor<sup>5</sup> (ASCE 7-05, Table 7-3) Importance Factor<sup>6</sup> (snow) (ASCE 7-05, Table 7-4) Exposure Factor (ASCE 7-05, Table 7-2)

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

# ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

Commentary:

7) The Component Amplification Factor

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



Seismic Load Equation (Vertical):

F <sub>p(vertical)</sub> =±0.2*S <sub>DS</sub> *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.

## ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### Step 6: Rewrite Your Loads

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



#### 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 controlling cases for the roof structure.

1) D	8) D + 0.75(0.7E) + 0.75Lr	D = Dead Load
2) D + Lr	9) D + 0.75(0.7E) + 0.75S	Lr = Live Load to Roof
3) D + S	10) D + 0.7E	S = Snow Load
4) D + W <sub>up</sub>	11) 0.6D + W <sub>up</sub>	W <sub>up</sub> = Wind Load Up
5) D + W <sub>down</sub>	12) 0.6 D + W <sub>down</sub>	W <sub>down</sub> = Wind Load Down
6) D + 0.75W <sub>down</sub> + 0.75S	13) 0.6 D + 0.7E	E = Earthquake/Seismic Load
7) D + 0.75W <sub>down</sub> + 0.75Lr		

#### 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.)

## ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### Step 9: Determine a Rail Span

\*For structural engineers who would like to determine the rail span without utilizing the Prescriptive 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.



as an axial load along the SOLARMOUNT rail perpendicular to the roof tilt. For High Profile Mode, where rail 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<sup>2</sup> or psf) from the boxes just filled in to pounds per linear 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 length.
  - 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 (overhang) lengths can be up to 33% of the span length. For example, a 9 foot span length can have a 3 foot cantilever. The cantilever is defined as the distance from the center of a L-Foot to the edge of a rail.

MODULE

### ASCE 7-05 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### **<u>Step 10:</u>** 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.

#### **<u>Step 14:</u>** Define Grounding and Bonding Path

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

#### SOLARMOUNT Front Trim Check

a. SOLARMOUNT Front Trim should not be installed in areas where the wind load exceeds 100 psf, where the distance from clamp to clamp (span) exceeds 52 inches, or where the cantilever (overhang) is greater than 66% of the span length. Please review the Step 6 Up and Down Wind Loads (psf) to determine if Front Trim is appropriate for your project.

# 

# ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### **ASCE 7-10 Analytical Method**

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

	Notes / Clarifications:	Commen
Roof Height (ft):	Mean roof height (15 ft, 30 ft, or 60 ft)	1) Most E
Roof Angle (degrees):	Convert roof pitch to angle in degrees [See Appendix D]	or a porti
Risk Category:	Table 1.5-1	load desi removed,
Basic Wind Speed (mph):	Per Basic Wind Speeds for Risk Category II (ASCE 7-10, Figure	26.5-1A) panels ar rationale
Wind Exposure Category:	Determine the Exposure Category (B, C or D) by using the def for Surface Roughness Categories (ASCE 7-10, Sections 26.7.2 26.7.3)	initions and load foot reduced words, th load foot
Roof Zone:	Determine the Roof Zone (1, 2 or 3) (ASCE 7-10, Figure 30.5-1	) same spa
Ground Snow Load (psf):	Pg = Ground Snow Load in psf. Ground Snow Loads (ASCE 7-1 7-1)	.0, Figure can be ut array, 0 p
Seismic Coefficient Ss (g):	ASCE 7-10 (Figures 22-1, 22-3, 22-5, 22-6 and 22-17)	
Roof Live Load <sup>1</sup> (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)		

#### $\sim$ tary:

Building Officials allow for all ion of the roofs original live ign load to be /reduced at the time that solar re being added to the roof. The e behind this is that live load or traffic is eliminated or to designated paths. in other ne roof top solar array and live traffic cannot occupy the ace. If all of the roof live load tilized by the proposed solar osf should be entered.



## ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

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

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



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

# ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### Step 3: Dead Load

Module Dead Load (psf) should be determined from User Inputs in Step	2) To
1	dead l
[See Appendix E] (The racking system dead load should be taken as the	COMDI
total weight of the racking system (hardware, rails, nuts, bolts,	3) The
attachments, etc.) divided by the total module area of the	calcul
system.)Component weights can be found in the technical datasheets.	the lo
Sum of Module Dead Load and Racking System Dead Load	4) The
	Module Dead Load (psf) should be determined from User Inputs in Step1[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.Sum of Module Dead Load and Racking System Dead Load

Calculated Dead Load in the provided boxes.

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

#### Sloped Roof Snow Load Pressure Equation:



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

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

#### Commentary:

be combined with the module load and used in wind load inations.

e ground snow load is utlilized to late the roof snow load, which is ad applied to the structure.

e Snow Importance Factor for Occupancy Category I = 0.8 and for Occupancy Category II = 1.0.

# ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

Commentary:

5) The Component Amplification Factor

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



Seismic Load Equation (Vertical):

F <sub>p(vertical)</sub> =±0.2*S <sub>DS</sub> *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.

### ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### Step 6: Rewrite Your Loads

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



#### 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 controlling cases for the roof structure.

1) D	8) D + 0.75(0.7E) + 0.75Lr	D = Dead Load
2) D + Lr	9) D + 0.75(0.7E) + 0.75S	Lr = Live Load to Roof
3) D + S	10) D + 0.7E	S = Snow Load
4) D + 0.6W <sub>up</sub>	11) 0.6D + 0.6W <sub>up</sub>	W <sub>up</sub> = Wind Load Up
5) D + 0.6W <sub>down</sub>	12) 0.6 D + 0.6W <sub>down</sub>	W <sub>down</sub> = Wind Load Down
6) D + 0.75(0.6)W <sub>down</sub> + 0.75S	13) 0.6 D + 0.7E	E = Earthquake/Seismic Load
7) D + 0.75(0.6)W <sub>down</sub> + 0.75Lr		

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.)

### ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### Step 9: Determine a Rail Span

\*For structural engineers who would like to determine the rail span without utilizing the Prescriptive 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.



SOLARMOUNT rail along the roof tilt.

- c. Convert pressures (lbs/ft<sup>2</sup> or psf) from the boxes just filled in to pounds per linear 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.
  - using the "Down" plf load and the "Side" plf load combinations to choose the maximum span length
  - 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 (overhang) lengths can be up to 33% of the span length. For example, a 9 foot span length can have a 3 foot cantilever. The cantilever is defined as the distance from the center of a L-Foot to the edge of a rail.

### ASCE 7-10 ANALYTICAL METHOD DESIGN & ENGINEERING GUIDE

#### **<u>Step 10:</u>** 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 G 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.

#### **<u>Step 14:</u>** Define Grounding and Bonding Path

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

#### SOLARMOUNT Front Trim Check

a. SOLARMOUNT Front Trim should not be installed in areas where the wind load exceeds 100 psf, where the distance from clamp to clamp (span) exceeds 52 inches, or where the cantilever (overhang) is greater than 66% of the span length. Please review the Step 6 Up and Down Wind Loads (psf) to determine if Front Trim is appropriate for your project.



# **TECHNICAL SUPPORT** DESIGN & ENGINEERING GUIDE PAGE

#### **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://unirac.com/solarmount

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.

# APPENDIX – TABLE OF CONTENTS Design & Engineering Guide Page

#### Appendix – Table of Contents

Appendix A – Product Catalog of Parts List
Appendix B – Pressure Lookup Tables
Appendix C – Downward & Upward Span Length Tables
Appendix D – Roof Pitch to Angle
Appendix E – Dead Load Analysis
Appendix F – Enphase Energy Microinverter Testing
Appendix G – Technical Data
Appendix H – SM HD Rail
Appendix I – Thermal Expansion





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

# APPENDIX B Pressure Lookup Tables

7-05 ASCE

California (Typical)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

	Basic Wind Speed Ground Snow Load																																															
t. Down /ref1	14.7	14.3	13.9	13.5	13.1	15.0	14.9	14.8	14.7	14.6	14.5	14.7	14.3	13.9	13.5	13.2	13.1	19.0	18.8	18.7	18.6	18.5	14.7	14.6	14.2	13.7	13.5	13.4	21.6	21.4	21.3	21.2	21.0	Ss = 3.1	4.4	4.7	5.0	5.3	5.5	5.7	5.9	6.0	6.1	6.2	6.2	6.2	Ss = 3.1	4.U
ht = 60 f	-36.0	-33.4	-33.4	-33.4	33.5	-14.8	-14.9	-14.9	-15.0	-15.0	-15.1	-48.4	-44.8	-44.9	-44.9	-44.9	-45.0	-20.1	-20.2	-20.3	-20.3	-20.3	-56.3	-52.2	-52.2	-52.2	-52.3	-52.3	-23.5	-23.6	-23.6	-23./	-23.7	Ss = 2.5	3.6	3.9	4.2	4.6	4.9	5.1	5.3	5.5	5.6	5.6	5.7	5.7	Ss = 2.5	5.3 ficinstall loca
dg. Heigl	-22.7	-21.4	-21.4	-21.4	-21.5	-14.8	-14.9	-14.9	-15.0	-15.0	-15.1	-30.6	-28.8	-28.9	-28.9	-28.9	-29.0	-20.1	- 20.2	- 20.3	-20.3	-20.3	-35.7	-33.7	-33.7	-33.7	-33.7	-33.8	-23.5	-23.6	-23.6	- 23.7	-23.7	Ss = 2.0	2.9	3.3	3.7	4.1	4.4	4.7	4.9	5.0	5.1	5.2	5.2	5.2	Ss = 2.0	Z.D
B 0.	-12.0	-10.7	-10.7	-10.7	-10.8	-12.2	-12.2	-12.3	-12.3	-12.3	-12.4	-16.4	-14.6	-14.7	-14.7	-14.7	-14.8	-16.6	-16.7	-16.7	-16.8	-16.8	-19.2	-17.2	-17.2	-17.2	-17.3	-17.3	-19.4	-19.5	-19.5	-19.5	-19.6	Ss = 1.5	2.3	2.7	3.1	3.6	3.9	4.2	4.4	4.5	4.6	4.7	4.8	4.8	Ss = 1.5	Z.U Idantiy verife
ft. Down	14.7	14.3	13.9	13.5	13.1	13.0	12.9	12.8	12.7	12.6	12.5	14.7	14.3	13.9	13.5	13.2	13.1	16.9	16.7	16.6	16.4	16.3	14.7	14.3	13.9	13.5	13.2	13.1	19.4	19.3	19.2	19.1	18.9	Ss = 1.25	2.0	2.4	2.9	3.3	3.6	3.9	4.1	4.3	4.4	4.5	4.5	4.6	Ss = 1.25	I.b Id be indeper
ht = 30 f	-29.4	-27.3	-27.3	-27.3	-27.4	-12.0	-12.1	-12.1	-12.1	-12.2	-12.2	-41.8	-38.7	-38.7	-38.8	-38.8	-38.8	-17.3	-17.4	-17.4	-17.5	-17.5	-49.7	-46.1	-46.1	-46.1	-46.1	-46.2	-20.7	-20.7	-20.8	8.02-	-20.9	Ss = 1.0	1.8	2.3	2.7	3.2	3.5	3.8	4.0	4.1	4.3	4.4	4.4	4.4	Ss = 1.0	1.4 ow loads show
dg. Heig Pressures (	-18.4	-17.4	-17.4	-17.4	-17.5	-12.0	-12.1	-12.1	-12.1	-12.2	-12.2	-26.4	-24.8	-24.9	-24.9	-24.9	-25.0	-17.3	-17.4	-17.4	-17.5	-17.5	-31.5	-29.6	-29.7	-29.7	-29.7	-29.8	-20.7	-20.7	-20.8	8.02-	-20.9	Ss = 0.5	1.3	1.9	2.3	2.8	3.1	3.4	3.6	3.8	3.9	4.0	4.1	4.1	Ss = 0.5	U.Y peeds and sn
BI Up	9.6-	-8.6	-8.7	-8.7	-9.9	-9.8	6.9-	6.6-	6.6-	-10.0	-10.0	-14.0	-12.5	-12.5	-12.6	-12.6	-12.6	-14.2	-14.3	-14.4	-14.4	-14.4	-16.9	-15.1	-15.1	-15.1	-15.1	-15.2	-17.0	-17.1	-17.1	-17.2	-17.3	Ss = 0.4	1.2	1.7	2.2	2.6	3.0	3.3	3.5	3.7	3.8	3.9	4.0	4.0	Ss = 0.4	0.8 e local wind s
ft. Down Incfi	14.7	14.3	13.9	13.5	13.1	13.0	12.9	12.8	12.7	12.6	12.5	14.7	14.3	13.9	13.5	13.2	13.1	14.0	14.8	14.7	14.6	14.5	14.7	14.3	13.9	13.5	13.2	13.1	17.6	17.5	17.4	17.2	17.0	Ss = 0.3	1.1	1.6	2.1	2.5	2.9	3.1	3.4	3.5	3.7	3.8	3.9	3.9	Ss = 0.3	U.D n the title. Th
ht = 151 st) 7000 2	- 29.4	-27.3	-27.3	-27.3	-27.4	-12.0	-12.1	-12.1	-12.1	-12.2	-12.2	-36.0	-33.4	-33.4	-33.4	-33.5	-33.5	-14.8	-14.9	-15.0	-15.0	-15.1	-44.0	-40.7	-40.8	-40.8	-40.8	-40.9	-18.2	-18.3	-18.3	- 10.4	-18.5	Ss = 0.2	<u>0.9</u>	1.5	2.0	2.4	2.7	3.1	3.3	3.5	3.6	3.7	3.8	3.8	Ss = 0.2	0.4 areas listed in
Pressures (	-18.4	-17.4	-17.4	-17.4	-17.5	-12.0	-12.1	-12.1	-12.1	-12.2	-12.2	-22.7	-21.4	-21.4	-21.4	-21.4	-21.5	-14.8	-14.9	-15.0	-15.0	-15.1	-27.8	-26.2	-26.2	-26.2	-26.3	-26.3	-18.2	-18.3	-18.3	-18.4	-18.5	Ss = 0.1	0.8	1.3	1.9	2.4	2.7	3.1	3.3	3.5	3.6	3.7	3.8	3.8	Ss = 0.1	U.Z Intative of the
BI Up	-9.6	-8.6	-8.7	-8.7	-0- -0-	-9.8	-9.9	-9.9	-9.9	-10.0	-10.0	-12.0	-10.7	-10.7	-10.7	-10.8	-10.8	-12.2	-12.3	-12.3	-12.3	-12.4	-14.8	-13.2	-13.2	-13.3	-13.3	-13.3	-15.0	-15.0	-15.1	-15.1	-15.2	Ss = 0.0	0.7	1.3	1.9	2.4	2.7	3.1	3.3	3.5	3.6	3.7	3.8	3.8	Ss = 0.0	U.U int as represe
Doof Ditch	1:12	2:12	3:12	4:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12		tables are mes
		(	Ехр	osu	re	Cat	teg	lor	/ B				E	Хр	os	ure	e C	ateg	gor	y (			Ľ		Exp	008	sure	e C	ate	ego	ory	D						Do	wr	۱S	lop	e	_		_			* Thes
												U	D 8	an	d (	Do	w	n (p	osf	)																5	Sid	le	Lo	bad	d (	ps	f)			l	Late	ral



90 mph

## APPENDIX B Pressure Lookup Tables

al)\* 7.05 Systems ASCE

Southwest (Typical)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

	Da	SIC	Y Y II	u o	pe	su						100			10 %		Juc																																		
t. Down	14.7	143	13.9	13.5	13.2	13.1	16.5	16.4	16.3	16.2	16.1	16.0	14.7	14.3	13.9	13.5	13.2	13.1	20.9	20.8	20.7	20.6	20.5	20.4	14.7	15.5	15.1	14.9	14.8	14.7	23.8	23.7	23.6	23.5	23.4	23.3	Ss = 3.1	4.4	4.7	5.0	5.3	5.5	5.7	5.9	6.0	6.1	6.2	6.2	6.2	Ss = 3.1	4.0
ht = 60 f	40.6	-37.6	-37.6	-37.6	-37.7	-37.7	-16.8	-16.8	-16.9	-16.9	-17.0	-17.0	-54.4	-50.4	-50.4	-50.5	-50.5	-50.6	-22.7	-22.8	-22.8	-22.8	-22.9	-22.9	-63.3	-58.7	-58.7	-58.7	-58.8	-58.8	-26.5	-26.6	-26.6	-26.7	-26.7	-26.7	Ss = 2.5	3.6	3.9	4.2	4.6	4.9	5.1	5.3	5.5	5.6	5.6	5.7	5.7	Ss = 2.5	3.3
dg. Heig Pressures (p	- 25 G	1 40-	-24.1	-24.2	-24.2	-24.2	-16.8	-16.8	-16.9	-16.9	-17.0	-17.0	-34.5	-32.5	-32.5	-32.6	-32.6	-32.6	-22.7	-22.8	-22.8	-22.8	-22.9	-22.9	-40.2	-37.9	-37.9	-37.9	-38.0	-38.0	-26.5	- 26.6	-26.6	-26.7	-26.7	-26.7	Ss = 2.0	2.9	3.3	3.7	4.1	4.4	4.7	4.9	5.0	5.1	5.2	5.2	5.2	Ss = 2.0	2.6
Idn .	-13 G	-101	-12.1	-12.2	-12.2	-12.3	-13.8	-13.8	-13.9	-13.9	-14.0	-14.0	-18.5	-16.6	-16.6	-16.6	-16.7	-16.7	-18.7	-18.8	-18.8	-18.9	-18.9	-18.9	-21.7	-19.4	-19.4	-19.5	-19.5	-19.6	-21.9	-21.9	-22.0	-22.0	-22.1	-22.1	Ss = 1.5	2.3	2.7	3.1	3.6	3.9	4.2	4.4	4.5	4.6	4.7	4.8	4.8	Ss = 1.5	2.0
t. Down	14.7	14.3	13.9	13.5	13.2	13.1	14.1	14.0	13.9	13.8	13.7	13.6	14.7	14.3	13.9	13.5	13.2	13.1	18.6	18.5	18.3	18.2	18.1	18.0	14.7	14.5	14.1	13.7	13.5	13.4	21.4	21.3	21.2	21.1	21.0	20.9	Ss = 1.25	2.0	2.4	2.9	3.3	3.6	3.9	4.1	4.3	4.4	4.5	4.5	4.6	Ss = 1.25	1.6
ht = 30 f	callo2	2002-	-30.7	-30.8	-30.8	-30.8	-13.6	-13.7	-13.7	-13.7	-13.8	-13.8	-47.0	-43.6	-43.6	-43.6	-43.6	-43.7	-19.5	-19.6	-19.6	-19.7	-19.7	-19.8	-55.9	-51.8	-51.8	-51.9	-51.9	-51.9	-23.3	-23.4	-23.4	-23.5	-23.5	-23.6	Ss = 1.0	1.8	2.3	2.7	3.2	3.5	3.8	4.0	4.1	4.3	4.4	4.4	4.4	Ss = 1.0	1.4
dg. Heig	20102	-19.6	-19.6	-19.7	-19.7	-19.7	-13.6	-13.7	-13.7	-13.7	-13.8	-13.8	-29.7	-28.0	-28.0	-28.1	-28.1	-28.1	-19.5	-19.6	-19.6	-19.7	-19.7	-19.8	-35.4	-33.4	-33.4	-33.5	-33.5	-33.5	-23.3	-23.4	-23.4	-23.5	-23.5	-23.6	Ss = 0.5	1.3	1.9	2.3	2.8	3.1	3.4	3.6	3.8	3.9	4.0	4.1	4.1	Ss = 0.5	0.9
dn dn	-11.0	2.6-	-9.8	-9.8	<del>-</del> 9.8	-9.9	-11.1	-11.2	-11.2	-11.3	-11.3	-11.4	-15.9	-14.2	-14.2	-14.2	-14.3	-14.3	-16.1	-16.1	-16.2	-16.2	-16.3	-16.3	-19.1	-17.0	-17.1	-17.1	-17.1	-17.2	-19.3	-19.3	-19.3	-19.4	-19.4	-19.5	Ss = 0.4	1.2	1.7	2.2	2.6	3.0	3.3	3.5	3.7	3.8	3.9	4.0	4.0	Ss = 0.4	0.8
t. Down	14.7	14.3	13.9	13.5	13.2	13.1	14.1	14.0	13.9	13.8	13.7	13.6	14.7	14.3	13.9	13.5	13.2	13.1	16.5	16.4	16.3	16.2	16.1	16.0	14.7	14.3	13.9	13.5	13.2	13.1	19.4	19.2	19.1	19.0	18.9	18.8	Ss = 0.3	1.1	1.6	2.1	2.5	2.9	3.1	3.4	3.5	3.7	3.8	3.9	3.9	Ss = 0.3	0.6
ht = 15 f	-33.7	2.00-	-30.7	-30.8	-30.8	-30.8	-13.6	-13.7	-13.7	-13.7	-13.8	-13.8	-40.6	-37.6	-37.6	-37.6	-37.7	-37.7	-16.8	-16.8	-16.9	-16.9	-17.0	-17.0	-49.5	-45.8	-45.9	-45.9	-45.9	-46.0	-20.6	-20.6	-20.7	-20.7	-20.8	-20.8	Ss = 0.2	6.0	1.5	2.0	2.4	2.7	3.1	3.3	3.5	3.6	3.7	3.8	3.8	Ss = 0.2	0.4
dg. Heig	2 0 0 2	-19.6	-19.6	-19.7	-19.7	-19.7	-13.6	-13.7	-13.7	-13.7	-13.8	-13.8	-25.6	-24.1	-24.1	-24.2	-24.2	-24.2	-16.8	-16.8	-16.9	-16.9	-17.0	-17.0	-31.3	-29.5	-29.5	-29.6	-29.6	-29.6	-20.6	-20.6	-20.7	-20.7	-20.8	-20.8	Ss = 0.1	0.8	1.3	1.9	2.4	2.7	3.1	3.3	3.5	3.6	3.7	3.8	3.8	Ss = 0.1	0.2
dn 18	-11.0	2.0-	-9.8	-9.8	-9.8	-9.9	-11.1	-11.2	-11.2	-11.3	-11.3	-11.4	-13.6	-12.1	-12.1	-12.2	-12.2	-12.3	-13.8	-13.8	-13.9	-13.9	-14.0	-14.0	-16.8	-15.0	-15.0	-15.0	-15.1	-15.1	-17.0	-17.0	-17.1	-17.1	-17.1	-17.2	Ss = 0.0	0.7	1.3	1.9	2.4	2.7	3.1	3.3	3.5	3.6	3.7	3.8	3.8	Ss = 0.0	0.0
1-100 J0	1-12	2112	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12		
L			Exp	oos	ure	C	ate	ego	ory	/ B				E	Exp	oos	ure	e C	Cat	eg	ory	C				E	Exp	os	ure	e C	ate	ego	ory	D							Do	wr	۱S	lop	be			_			

Up and Down (psf)

5 psf





## APPENDIX B Pressure Lookup Tables

7.05 ASCE

Mid US (Medium Snow)\*

90 mph

Basic Wind Speed

Ground Snow Load

25 psf

Lit         -1.1         -0.0         -3.2         -5.9         -1.0         -0.05         -3.2         -5.9         -1.0         -1.01 <th>oof Pitch</th> <th>B Up Zone1</th> <th>dg. Hei Pressures ( Zone 2</th> <th>ght = 15 i psf) zone 3</th> <th>ft. Down (psf)</th> <th>BI Up Zone 1</th> <th>dg. Heig Pressures (r Zone 2</th> <th>ht = 30 1 sef) Zone 3</th> <th>ft. Down (psf)</th> <th>B Up Zone 1</th> <th>Idg. Heig Pressures (r Zone 2</th> <th>ht = 60 1 sf) <sup>zone 3</sup></th> <th>، وم</th>	oof Pitch	B Up Zone1	dg. Hei Pressures ( Zone 2	ght = 15 i psf) zone 3	ft. Down (psf)	BI Up Zone 1	dg. Heig Pressures (r Zone 2	ht = 30 1 sef) Zone 3	ft. Down (psf)	B Up Zone 1	Idg. Heig Pressures (r Zone 2	ht = 60 1 sf) <sup>zone 3</sup>	، وم
3.1.         3.1. <th< th=""><th>21:12</th><th>-11.0</th><th>-20.8</th><th>-33.2</th><th>25.9 24 5</th><th>-11.0</th><th>-20.8</th><th>-33.2</th><th>25.9 24 5</th><th>-12.6</th><th>-25.6</th><th>-40.6</th><th>2</th></th<>	21:12	-11.0	-20.8	-33.2	25.9 24 5	-11.0	-20.8	-33.2	25.9 24 5	-12.6	-25.6	-40.6	2
4:1         9:8         -9:1         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.5         -0:8         21.1         -1:1         -	3:12	-9.8	-19.6	-30.7	23.0	-9.8	-19.6	-30.7	23.0	-12.1	-24.1	-37.6	10
512         98         917         308         200         312         301         302         312         303	4:12	-9.8	-19.7	-30.8	21.5	-9.8	-19.7	-30.8	21.5	-12.2	-24.2	-37.6	2
6612         9.9         -9.9	5:12	-9.8	-19.7	-30.8	20.0	-9.8	-19.7	-30.8	20.0	-12.2	-24.2	-37.7	R
//11         -111         -126         132         111         -137         130         137         130         137         130         137         130         137         130         130         140         170         138         169         170         131         130         140         170         133         140         170         131         140         170         131         140         170         170         131         140         170         170         131         140         170         170         170         170         170         131         140         170         131         140         170         131         140         170         131         140         170         131         140         170         131         131         131         131         131         131	6:12	-9.9	-19.7	-30.8	18.6	6.6-	-19.7	-30.8	18.6	-12.3	-24.2	-37.7	a i
8.11         -11.1         -13.7         <	7:12	-11.1	-13.6	-13.6	18.2	-11.1	-13.6	-13.6	18.2	-13.8	-16.8	-16.8	5
9.12         -1.13         -1.33         1.13         -1.31         1.13         -1.33         1.33	8:12	-11.2	-13.7	-13.7	17.0	-11.2	-13.7	-13.7	17.0	-13.8	-16.8	-16.8	a ;
Matrix         -113         -133         -140         -770           5112         -121         -241         -377         230         -143         231         435         516         -225           5112         -122         -242         -377         138         -143         231         437         516         -225           5113         -166         -169         133         -143         231         463         236         235         232         161         235         235         215         216         225         235         235         213         232         232         233         233	21.12	211-	12.7	10.7	10.01	2.11-	10.1	12.7	10.01	10.01	10.9	10.0	-
Lind         -11.3         -1.3         <	10:12	-11.3	-13./	-13./	1.51	-11.3	-13./	-13./	1.61	-13.9	- 10.4	-10.4	-
Matrix         Matrix<	12:12	-11.4	-13.8	-13.8	12.7	-11.4	-13.8	-13.8	12.7	-14.0	-17 0	-17.0	
1:11         1:16         1:56         -006         5:59         1:59         2:97         470         2:59         1:86         2:30           2:11         2:11         2:41         37.6         2:45         1:42         2:81         436         2:16         1:26         2:26           5:12         1:23         2:41         37.6         1:43         2:81         436         2:16         1:26         2:26           5:12         1:23         2:42         3:77         1:60         1:43         2:81         436         2:00         1:67         2:26           5:12         1:23         2:42         3:77         1:69         1:67         1:95         1:97         1:97         1:97         1:29         2:26           7:12         1:38         1:68         1:63         1:97         1:97         1:97         1:97         1:97         2:29           8:12         1:38         1:66         1:65         1:63         1:97         1:97         1:97         2:29           8:11         1:38         1:68         1:67         1:63         1:63         1:63         1:63         1:63         1:69         1:69         1:69         1:	71:71	+TT-	0.61-	0.61-	13./	+11.4	0.61-	0.61-	/'01	-14.0	0./1-	0./1-	7
2112         -121         -241         -37.6         24,5         -14,2         -280         -436         21,6         -16,6         -22,5           3:12         -121         -241         -37,6         23.0         -14,2         -281         -43,6         21,6         -21,6         -21,6         -22,6           5:12         -123         -241         -37,7         18,6         -14,3         -281         -43,6         21,6         -22,6           7:12         -138         -168         -16,8         18,8         -16,1         -19,6         -19,7         -18,8         -22,7           8:12         -133         -169         -16,8         18,8         -16,1         -19,6         -19,7         -21,8         -22,7           9:12         -133         -16,9         -16,9         16,0         -16,2         -19,7         -21,8         -22,9           9:11,1         -14,0         -17,0         -17,0         16,0         -16,3         -23,6         -23,5         -23,9         -21,7         -21,9         -22,8           9:11,1         -14,0         -17,0         -17,0         16,0         -16,2         -21,6         -21,6         -22,6         -21,6	1:12	-13.6	-25.6	-40.6	25.9	-15.9	-29.7	-47.0	25.9	-18.5	-34.5	-54.4	2
3:12         -1.2.1         2.4.1         -37.6         2.3.0         -1.4.2         2.8.0         -4.3.6         2.1.6         -3.2.6           4:12         -1.2.2         -3.4.2         -3.7.7         2.0.0         -1.4.3         2.8.1         -4.3.6         2.1.5         -1.6.6         -3.2.6           5:12         -1.2.2         -3.7.7         2.0.0         -1.6.1         -1.9.5         2.1.5         -1.6.7         -2.2.6           7:12         -1.3.3         1.6.8         -1.6.8         1.6.8         1.6.8         1.6.8         1.6.8         -1.6.7         -1.6.6         -1.7.7         -2.2.8           9:12         -13.3         1.6.9         -16.9         1.6.7         -1.6.6         -1.6.7         -2.2.6           9:12         -13.3         1.6.9         -16.9         1.6.3         -16.9         1.6.3         -19.8         -1.8.8         -2.2.8           9:12         -13.3         -16.9         -16.0         16.1         1.6.3         -19.8         -2.1.8         -2.2.8           11112         1410         17.0         17.1         1.7.1         1.7.1         1.7.1         1.8.9         -2.1.8         -2.2.1           11112         -15.0	2:12	-12.1	-24.1	-37.6	24.5	-14.2	-28.0	-43.6	24.5	-16.6	-32.5	-50.4	0
4.12         -1.23         -2.42         -37.6         21.5         -1.43         -2.81         -3.66         -3.66         -3.26           5.11         -1.23         -2.42         -37.7         200         -16.1         -3.95         21.6         -3.26           7.12         -1.23         -2.42         -37.7         18.6         -16.1         -19.5         19.5         21.87         -2.87           7.12         -138         -16.8         -16.8         18.8         -16.1         -19.6         -19.6         21.89         -22.8           91.12         -139         -16.9         -16.9         16.9         -16.7         -18.8         -18.8         -22.8           91.12         -139         -16.9         -16.9         16.9         -16.7         -18.9         -22.9           11.12         -17.0         15.1         15.0         -15.0         25.9         -19.7         -19.7         -19.9         -22.9           11.12         -17.0         15.0         -15.1         -33.4         -13.8         -13.9         -23.9         -21.9         -26.6           11.12         -15.0         -5.17         -33.4         -13.8         -13.9         21.9	3:12	-12.1	-24.1	-37.6	23.0	-14.2	-28.0	-43.6	23.0	-16.6	-32.5	-50.4	2
5:12         1:22         2:42         3:77         100         14.3         2:81         4:36         16.7         3:26           7:12         1:23         3:12         3:77         18.6         14.3         2:81         16.5         3:77         3:86         16.7         3:26           7:12         1:38         16.8         16.8         16.8         16.6         14.3         2:81         12.5         3:87         2:26           7:12         1:39         16.9         16.9         16.1         16.5         19.6         19.8         2:83         2:28           11:12         1:39         16.0         17.6         16.1         16.3         19.7         19.7         19.8         2:29           11:12         1:40         1.70         1.70         16.0         16.3         19.7         19.7         19.9         2:29           11:12         1:40         1.70         1.70         16.0         16.3         19.7         19.9         19.9         19.9         19.9         19.9         2:29           11:12         1:16         1:70         1.70         16.0         16.3         19.3         19.3         19.9         19.9	4:12	-12.2	-24.2	-37.6	21.5	-14.2	-28.1	-43.6	21.5	-16.6	-32.6	-50.5	2
6:12         1.23         2.42 $-377$ 18.6 $-14.3$ $28.1$ $-13.6$ $-16.7$ $-32.6$ 7:12         -13.8         -16.8 $-16.8$ $20.0$ $-16.1$ $-19.5$ $-18.7$ $-22.7$ 8:12         -13.8         -16.8 $-16.8$ $16.6$ $-16.5$ $-19.5$ $-18.7$ $-22.8$ 9:12         -13.9         -16.9 $-16.2$ $-19.7$ $-19.7$ $-18.8$ $-22.8$ 9:12 $-13.9$ $-16.9$ $-16.2$ $-19.7$ $-18.9$ $-18.9$ $-22.9$ 11.12 $-14.0$ $-17.0$ $-17.0$ $16.1$ $-19.7$ $-18.8$ $-22.9$ 11.12 $-14.0$ $-17.0$ $-17.0$ $-17.0$ $-16.1$ $-19.7$ $-18.8$ $-22.9$ 11.12 $-15.6$ $-37.9$ $-37.9$ $-37.9$ $-37.9$ $-37.9$ 11.12 $-17.0$ $-10.0$ $-17.1$ $-37.5$ $-19.7$ $-19.7$ $-19.7$ $-22.9$ </td <td>5:12</td> <td>-12.2</td> <td>-24.2</td> <td>-37.7</td> <td>20.0</td> <td>-14.3</td> <td>-28.1</td> <td>-43.6</td> <td>20.0</td> <td>-16.7</td> <td>-32.6</td> <td>-50.5</td> <td>2</td>	5:12	-12.2	-24.2	-37.7	20.0	-14.3	-28.1	-43.6	20.0	-16.7	-32.6	-50.5	2
7:12         1:38         1:68         1:68         1:61         1:95         1:95         1:88         1:62           9:12         1:38         1:68         1:63         1:63         1:63         1:63         1:63         1:63         1:63         1:63         1:63         1:63         1:95         1:83         -228           9:12         1:39         1:69         1:60         1:61         1:63         1:97         1:81         1:83         -228           1:12         1:40         1:70         1:70         1:61         1:63         1:93         1:89         1:78         1:89         1:29 <td>6:12</td> <td>-12.3</td> <td>-24.2</td> <td>-37.7</td> <td>18.6</td> <td>-14.3</td> <td>-28.1</td> <td>-43.7</td> <td>18.6</td> <td>-16.7</td> <td>-32.6</td> <td>-50.6</td> <td>-</td>	6:12	-12.3	-24.2	-37.7	18.6	-14.3	-28.1	-43.7	18.6	-16.7	-32.6	-50.6	-
8:12         13.8         16.8         16.8         16.8         16.8         16.8         16.8         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         16.3         19.7         19.7         18.1         18.8         -2.2.8           11.12         14.0         17.0         17.0         16.1         16.3         19.3         19.3         19.3         19.3         20.3         20.3           11.12         14.0         17.0         17.0         16.1         16.3         19.3         19.3         18.9         2.2.9           11.12         14.0         17.0         16.1         16.3         19.1         33.4         51.8         2.1.7         40.2           2.12         15.0         2.95         45.9         2.30         17.1         33.5         51.9         2.1.7         40.2           3.12         15.0         2.95         45.9         2.3.3         2.3.3         2.3.1         2.9.9         2.7.9           3.12         15.1         2.91         33.4         51.8         2.3.3         2.3.1         2	7:12	-13.8	-16.8	-16.8	20.0	-16.1	-19.5	-19.5	21.5	-18.7	-22.7	-22.7	2
9:12         13.9         16.9         16.9         16.9         16.0 <th< td=""><td>8:12</td><td>-13.8</td><td>-16.8</td><td>-16.8</td><td>18.8</td><td>-16.1</td><td>-19.6</td><td>-19.6</td><td>20.4</td><td>-18.8</td><td>-22.8</td><td>-22.8</td><td>2</td></th<>	8:12	-13.8	-16.8	-16.8	18.8	-16.1	-19.6	-19.6	20.4	-18.8	-22.8	-22.8	2
10.12         13.9         -16.9         -16.0         -16.3         -19.7         -19.7         18.5         -18.9         -22.3           11.112         -14.0         -17.0         -17.0         16.1         -16.3         -19.7         18.1         18.9         -22.9           12.12         -14.0         -17.0         -17.0         16.0         -16.3         -19.8         -19.7         18.1         -18.9         -22.9           12.12         -16.8         -31.3         -49.5         25.9         -19.1         -33.4         -51.8         24.7         -19.4         -37.9           27.12         -15.0         -29.5         -45.9         23.0         -17.1         -33.4         51.8         24.7         -19.4         -37.9           37.12         -15.1         -29.6         -46.0         18.6         -17.1         -33.5         51.9         18.8         -19.6         -38.0           57.12         -15.1         -29.6         -46.0         18.6         -17.1         33.5         51.9         18.9         -16.6         -38.0           6:12         -15.1         -29.6         -46.0         18.6         -17.2         -33.5         21.9         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	2
11:12         140         17.0         17.0         16.1         16.3         19.7         18.1         18.9         -2.29           12:12         14.0         17.0         17.0         16.0         16.3         19.3         19.3         18.0         18.9         -2.29           11:12         16.8         -31.3         -95.5         55.9         17.0         17.0         17.0         17.0         17.0         17.0         18.0         18.9         -2.29	10:12	-13.9	-16.9	-16.9	16.9	-16.2	-19.7	-19.7	18.5	-18.9	-22.8	-22.8	2
12:12         14,0         17,0         15,0         15,0         15,0         15,0         15,0         15,0         15,0         15,0         15,0         15,0         15,0         15,0         13,3         49,5         19,1         35,4         55,9         25,9         12,1         40,2           2112         15,0         29,5         3,6,5         3,3,0         17,1         33,4         51,8         2,4,7         19,4         37,9           3121         15,0         29,5         45,9         23,0         17,1         33,4         51,9         21,7         19,4         37,9           3121         15,0         29,6         46,0         18,6         17,1         33,5         51,9         19,4         37,9           51,1         15,1         29,6         46,0         18,6         17,1         33,5         51,9         19,1         23,1         24,1         24,7         24,9         25,7           51,1         29,6         46,0         18,6         17,1         33,5         51,9         23,1         24,1         24,7         24,0         24,7           51,1         20,1         20,1         19,1         23,2         23,3	11:12	-14.0	-17.0	-17.0	16.1	-16.3	-19.7	-19.7	18.1	-18.9	-22.9	-22.9	
1:12         -168         -31.3         -49.5         25.9         -19.1         -35.4         55.9         21.7         -49.4         -37.9           2:12         -15.0         -29.5         -45.8         24.5         -17.0         -33.4         51.8         24.7         -19.4         -37.9           3:12         -15.0         -29.5         -45.8         24.5         -17.1         -33.4         51.8         23.7         -19.4         -37.9           3:12         -15.0         -29.6         -45.9         21.0         -17.1         -33.5         51.9         21.7         -19.5         -37.9           5:12         -15.1         -29.6         -45.9         20.0         17.1         -33.5         51.9         19.6         -38.0           5:12         -17.0         -20.6         -20.6         19.0         -19.3         -23.3         23.7         -21.9         -26.6           6:12         -17.1         -20.7         20.0         19.1         -19.4         -33.5         21.1         -20.6         -26.6           6:12         -17.1         -20.7         20.1         19.3         -23.4         23.5         21.1         -26.7	12:12	-14.0	-17.0	-17.0	16.0	-16.3	-19.8	-19.8	18.0	-18.9	-22.9	-22.9	2
2:12         :150         :295         :45.8         24.5         :17.0         :33.4         :51.8         24.7         :19.4         :37.9           3:12         :15.0         :295         :45.9         23.0         :17.1         :33.4         :51.8         23.2         :19.4         :37.9           5:12         :15.0         :29.6         :45.9         23.0         :17.1         :33.5         :51.9         20.2         :19.5         :37.9           5:12         :15.1         :29.6         :45.9         20.0         :17.1         :33.5         :51.9         20.2         :19.5         :38.0           5:12         :15.1         :29.6         :46.0         18.6         :17.1         :33.5         :51.9         20.2         :21.9         :26.5         :38.0           5:112         :17.1         :20.6         :20.6         :19.1         :19.3         :23.3         :21.9         :27.9         :26.5         :27.9           6:12         :19.1         :19.1         :19.3         :23.3         :23.3         :23.1         :27.9         :26.5         :26.6           6:12         :19.1         :19.1         :19.3         :23.5         :21.1	1:12	-16.8	-31.3	-49.5	25.9	-19.1	-35.4	-55.9	25.9	-21.7	-40.2	-63.3	$\sim$
3:12         -15.0         -29.5         -45.9         23.0         -17.1         -33.5         -51.8         23.2         -19.4         -37.9           5:12         -15.0         -29.6         -45.9         21.5         -17.1         -33.5         51.9         20.2         -19.5         -38.0           5:12         -15.1         -29.6         -46.0         18.6         -17.1         -33.5         51.9         18.8         -19.6         -38.0           7:12         -15.1         -29.6         -46.0         18.6         -17.2         -33.5         51.9         18.8         -19.6         -38.0           7:12         -17.0         -20.6         -20.6         19.1         -19.3         -23.3         23.7         21.9         25.7         25.6           8:12         -17.1         -20.7         19.1         -19.3         -23.4         23.7         21.1         20.7         26.7           9:12         -17.1         -20.7         19.1         -19.4         -23.4         21.5         21.1         22.5         21.1         26.7           9:12         -17.1         -20.7         19.1         -19.4         -23.5         21.1         22.7	2:12	-15.0	-29.5	-45.8	24.5	-17.0	-33.4	-51.8	24.7	-19.4	-37.9	-58.7	2
4:12         15.0         -29.6         -45.9         21.5         -17.1         -33.5         51.9         21.7         19.5         -33.0           5:12         -15.1         -29.6         -45.9         20.0         -17.1         -33.5         51.9         20.2         -19.5         -38.0           6:12         -15.1         -29.6         -46.0         18.6         -17.2         -33.5         51.9         18.8         -19.6         -38.0           7:12         -17.0         -20.6         -20.6         21.0         -19.3         -23.3         -23.3         23.7         -21.9         26.6           9:12         -17.1         -20.7         19.9         -19.3         -23.4         -23.4         23.7         -21.9         26.7           9:12         -17.1         -20.7         19.1         -19.4         -23.5         -23.1         22.1         26.7           9:11.12         -17.1         -20.7         19.1         -19.4         -23.5         21.1         22.7         26.7           11:12         -17.1         -20.8         18.8         19.4         -23.5         23.1         22.1         26.7           11:12         -17.1	3:12	-15.0	-29.5	-45.9	23.0	-17.1	-33.4	-51.8	23.2	-19.4	-37.9	-58.7	
5:12         -15.1         -29.6         -45.9         20.0         -17.1         -33.5         -51.9         18.8         -19.6         -38.0           6:12         -17.0         -20.6         -46.0         18.6         -17.2         -33.5         -51.9         18.8         -19.6         -38.0           7:12         -17.0         -20.6         -20.6         18.6         -17.2         -33.7         21.9         23.5         -51.9         26.5           8:12         -17.0         -20.6         20.1         19.1         -19.3         -23.4         23.3         23.7         21.9         26.5           9:12         -17.1         -20.7         19.1         -19.4         -23.5         -23.5         21.1         -22.0         -26.7           9:11.1         2.17.1         -20.8         18.9         -19.4         -23.5         -23.5         21.1         -26.7           9:11.1         2.07         19.1         -19.4         -23.5         -23.6         23.1         26.7           9:11.1         2.07         19.2         19.4         -23.5         23.1         27.1         26.7           11.12         -17.1         -20.8         18.8	4:12	-15.0	-29.6	-45.9	21.5	-17.1	-33.5	-51.9	21.7	-19.5	-37.9	-58.7	2
6:12         -15.1         -296         -46.0         18.6         -17.2         -33.5         -51.9         18.8         -19.6         -38.0           7:12         -17.0         -20.6         -20.6         20.1         -19.3         -23.3         23.3         23.3         23.3         23.9         -20.6         -20.6           8:12         -17.0         -20.6         -20.6         21.0         -19.3         -23.4         23.5         -21.9         26.6           9:12         -17.1         -20.7         19.9         -19.4         -23.5         -23.5         21.1         -20.0         -26.6           10:12         -17.1         -20.7         19.9         -19.4         -23.5         -23.5         21.1         -22.0         -26.7           10:12         -17.1         -20.8         -20.8         18.8         -19.4         -23.5         21.1         -22.1         -26.7           11:12         -17.1         -20.8         -20.8         18.8         -19.4         -23.5         21.1         4.0         -26.7           11:12         -17.1         -20.8         20.8         18.8         -19.5         -23.6         23.1         26.7         26.7	5:12	-15.1	-29.6	-45.9	20.0	-17.1	-33.5	-51.9	20.2	-19.5	-38.0	-58.8	2
7:12         -17.0         -20.6         -20.6         20.6         -20.6         20.6         20.1         -19.3         -23.3         -23.3         23.7         -21.9         -26.6           9:12         -17.0         -20.6         -20.6         20.0         -19.3         -23.4         23.5         -21.9         -26.6           9:12         -17.1         -20.7         -20.7         19.0         -19.3         -23.4         21.5         -21.9         -26.6           10:12         -17.1         -20.7         19.1         -19.4         -23.5         23.1         21.2         22.0         -26.7           11:12         -17.1         -20.8         -20.8         18.8         -19.4         -23.5         23.1         21.2         25.1         -26.7           11:12         -17.1         -20.8         -20.8         18.8         -19.4         -23.5         23.1         23.1         25.2         25.1         26.7           11:12         -17.2         -20.8         -20.8         18.8         -19.4         2.2         23.1         25.1         25.1         25.1         25.1         25.1         25.1         25.1         25.1         25.1         25.1	6:12	-15.1	-29.6	-46.0	18.6	-17.2	-33.5	-51.9	18.8	-19.6	-38.0	-58.8	-
8:12 $-17.0$ $-20.6$ $-20.6$ $-20.6$ $-20.6$ $-20.6$ $-20.7$ $-20.8$ $18.9$ $-19.4$ $-23.5$ $-22.1.7$ $-20.7$ $-20.7$ $11:12$ $-17.7$ $-20.8$ $18.9$ $-19.5$ $-23.6$ $-20.7$ $-20.7$ $11:12$ $-17.7$ $-20.8$ $18.9$ $-19.5$ $-23.6$ $-20.7$ $-20.7$ $11:12$ $21.6$ $31.6$ $3.6$ $3.6$ $3.6$ $3.6$ $2.6$ $2.9$ $2.9.7$ $2.6.7$ $11:12$ $21.6$ $31.6$ $3.6$ $3.6$	7:12	-17.0	-20.6	-20.6	22.1	-19.3	-23.3	-23.3	23.7	-21.9	-26.5	-26.5	2
9:12         -17.1         -20.7         19.0         -19.3         -23.4         -23.5         23.6         -22.0         -26.7           10:12         -17.1         -20.7         -20.7         19.1         -19.4         -23.5         23.5         21.1         -22.0         -26.7           11:12         -17.1         -20.8         -20.8         18.9         -19.4         -23.5         23.5         21.1         -22.0         -26.7           11:12         -17.2         -20.8         -20.8         18.8         -19.5         -23.6         23.5         21.1         -22.0         -26.7           12:12         -17.2         -20.8         -20.8         18.8         -19.5         -23.6         23.5         21.1         -20.7         26.7 $0.0 Puch         5s=0.1         5s=0.2         5s=0.3         5s=0.4         5s=0.5         23.6         23.6         5s=1.1         5.6         26.7           0.0 Puch         5s=0.1         5s=0.2         5s=0.2         20.2         2.0         2.0         5.6         5.6         5.6         5.6         5.6         5.6         5.6         5.6         5.6         5.6         5.6         5.6         5.6 $	8:12	-17.0	-20.6	-20.6	21.0	-19.3	-23.4	-23.4	22.5	-21.9	-26.6	-26.6	~
10:12         -17.1         -20.7         -19.1         -19.4         -13.5         23.5         21.1         -22.0         -26.7           11:12         -17.1         -20.8         -20.8         18.9         -19.4         -23.5         23.5         21.0         -22.1         -26.7           11:12         -17.2         -20.8         -20.8         18.9         -19.4         -23.5         -23.6         20.9         -22.1         -26.7           12:112         -17.2         -20.8         -20.8         18.8         -19.5         -23.6         20.9         -22.1         -26.7 $oot Ptru<$ 5s=0.1         5s=0.2         5s=0.3         5s=0.2         5s=0.3         5s=1.0         -22.1         25         5s=1.0 $oot Ptru<$ 5s=0.1         5s=0.2         23.6         3.6         3.6         3.6         3.0         3.5 $21.12$ 2.0         2.0         5.0         5.0         5.0         5.0         5.1         4.0 $21.12$ 5.6         3.6         3.6         3.6         5.1         5.1         5.2         5.5         5.5         5.5         5.5         5.5         5.5	9:12	-17.1	-20.7	-20.7	19.9	-19.3	-23.4	-23.4	21.5	-22.0	-26.6	-26.6	~
11:12         -17.1 $-20.8$ $-20.8$ $18.9$ $-19.4$ $-23.5$ $23.6$ $22.1$ $-26.7$ 12:12         -17.2 $-20.8$ $-20.8$ $18.8$ $-19.5$ $-23.6$ $-22.1$ $-26.7$ $oot$ Pitch $5s = 0.0$ $5s = 0.1$ $5s = 0.2$ $ss = 0.2$ $ss = 0.3$ $ss = 0.5$ $ss = 1.25$ $5s = 1.2$ $2s = 2.2$ $oot$ Pitch $5s = 0.0$ $5s = 0.2$ $5s = 0.2$ $2s = 0.2$ $2s = 0.2$ $2s = 2.2$ $2s = 1.25$ $5s = 1.25$ $5s = 2.2$ $oot$ Pitch $5s = 0.0$ $5s = 0.2$ $2s = 0.2$ $2s = 0.2$ $2s = 0.1$ $2s = 2.2$ $2s = 2.2$ $2112$ $2s = 0.1$ $5s = 0.2$ $2s = 0.2$ $2s = 0.1$ $2s = 2.0$ $3s = 2.2$ $2112$ $2s = 0.1$ $5s = 0.2$ $2s = 0.2$ $2s = 1.2$ $2s = 1.2$ $5s = 1.2$ $5s = 1.2$ $5s = 2.2$ $2112$ $25.0$ $5.0$ $5.0$ $5.0$ $5.1$ $6.1$ $6.1$ $6.1$	10:12	-17.1	-20.7	-20.7	19.1	-19.4	-23.5	-23.5	21.1	-22.0	-26.7	-26.7	~
12:12       -17.2       -20.8       -20.8       18.8       -19.5       -23.6       -23.6       20.9       -22.1       -26.7         11:12 $2_{10}$ $5_{5}=0.1$ $5_{5}=0.1$ $5_{5}=0.2$ $5_{5}=0.2$ $5_{5}=1.2$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=1.5$ $5_{5}=2.0$ 3:12 $5_{10}$ $3.6$ $3.6$ $3.6$ $3.6$ $3.6$ $4.0$ $4.1$ $4.4$ $4.9$ 3:12 $5.0$ $5.0$ $5.0$ $5.0$ $5.0$ $5.1$ $5_{5}=2.6$ $6.0$ 3:12 $5.0$ $5.0$ $5.0$ $5.0$ $5.0$ $5.0$ $5.0$ $7.0$	11:12	-17.1	-20.8	-20.8	18.9	-19.4	-23.5	-23.5	21.0	-22.1	-26.7	-26.7	
oof Pitch         Ss = 0.0         Ss = 0.1         Ss = 0.2         Ss = 0.3         Ss = 0.4         Ss = 0.5         Ss = 1.0         Ss = 1.2         Ss = 1.5	12:12	-17.2	-20.8	-20.8	18.8	-19.5	-23.6	-23.6	20.9	-22.1	-26.7	-26.7	2
1:12       2.0       2.0       2.0       2.0       2.0       2.0       2.0       2.0       3.6 <td< td=""><td>oof Pitch</td><td>Ss = 0.0</td><td>Ss = 0.1</td><td>Ss = 0.2</td><td>Ss = 0.3</td><td>Ss = 0.4</td><td>Ss = 0.5</td><td>Ss = 1.0</td><td>Ss = 1.25</td><td>Ss = 1.5</td><td>Ss = 2.0</td><td>Ss = 2.5</td><td>S</td></td<>	oof 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	S
3.6 $3.6$ $3.6$ $3.6$ $3.6$ $3.6$ $4.0$ $4.1$ $4.4$ $4.9$ $3:12$ $5.0$ $5.0$ $5.0$ $5.0$ $5.0$ $5.0$ $5.1$ $5.2$ $5.5$ $6.0$ $4:12$ $6.1$ $6.1$ $6.1$ $6.1$ $6.1$ $6.1$ $6.6$ $6.0$ $5:12$ $7.0$	1:12	2.0	2.0	2.0	2.0	2.1	2.2	2.6	2.8	3.0	3.5	4.0	
3:12         5.0         5.0         5.0         5.0         5.0         5.0         5.1         5.2         5.5         6.0           4:12         6.1         6.1         6.1         6.1         6.1         6.1         6.1         6.4         6.9           5:12         7.0         8.0         8.3	2:12	3.6	3.6	3.6	3.6	3.6	3.6	4.0	4.1	4.4	4.9	5.4	
4:12         6.1         6.1         6.1         6.1         6.1         6.4         6.9           5:12         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.5           5:12         7.5         7.5         7.5         7.5         7.5         7.5         7.5         8.0           6:12         7.5         7.5         7.5         7.5         7.5         7.5         7.5         8.0           7:12         7.9         7.9         7.9         7.9         7.9         7.9         8.3           7:12         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.3           8:12         8.1         8.1         8.1         8.1         8.1         8.1         8.3         8.5           9:12         8.2         8.2         8.2         8.2         8.2         8.5         8.5           10:12         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.4           11:12         8.1         8.1         8.1         8.1         8.1         8.1         8.4	3:12	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.2	5.5	6.0	6.5	
5:12         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         7.5         8.0           7:12         7.9         7.9         7.9         7.9         7.9         7.9         7.9         7.9         8.3           8:12         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:3           8:12         8:1         8:1         8:1         8:1         8:1         8:1         8:3         8:5           9:12         8:2         8:2         8:2         8:2         8:2         8:2         8:5	4:12	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.4	6.9	7.4	
6:12         7.5         7.5         7.5         7.5         7.5         7.5         7.5         8.0           7:12         7.9         7.9         7.9         7.9         7.9         7.9         7.9         7.9         8.1           8:12         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.3           9:12         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.3           9:12         8.1         8.1         8.1         8.1         8.1         8.1         8.3           9:12         8.2         8.2         8.2         8.2         8.2         8.2         8.5           9:12         8.1         8.1         8.1         8.1         8.1         8.1         8.4           10:12         8.1         8.1         8.1         8.1         8.1         8.1         8.4           11:12         7.4         7.9         7.9         7.9         7.9         7.9         8.4	5:12	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.5	8.0	
7:12         7:9         7:9         7:9         7:9         7:9         7:9         7:9         7:9         8:3           8:12         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:5           9:12         8:2         8:2         8:2         8:2         8:2         8:2         8:2         8:5           9:12         8:2         8:2         8:2         8:2         8:2         8:2         8:5         8:5           9:12         8:2         8:2         8:2         8:2         8:2         8:2         8:5         8:5         8:5         8:5           10:12         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:1         8:4           11:12         7:9         7:9         7:9         7:9         7:9         7:9         7:9         8:4	6:12	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8.0	8.5	
8:12         8.1         8.5 <td>7:12</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>7.9</td> <td>8.3</td> <td>8.8</td> <td></td>	7:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.8	
9:12         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.3         8.5 <td>8:12</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.1</td> <td>8.5</td> <td>9.0</td> <td></td>	8:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.5	9.0	
10:12         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.2         8.3         8.3         8.5 </td <td>9:12</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.2</td> <td>8.5</td> <td>9.0</td> <td></td>	9:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	
11:12         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         8.4           17:12         7.4         7.9         7.9         7.9         7.9         7.9         8.3	10:12	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.5	9.0	
12-12 79 79 79 79 79 79 79 83	11:12	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.4	6.8	
	12:12	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.3	8.7	
		22 - 0.0	T'0 = SC	22 = U.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	З

Up and Down (psf)

Lateral PAGE B3



## APPENDIX B Pressure Lookup Tables

7.05 ASCE 90 mph Basic Wind Speed 40 psf Ground Snow Load

Up and Down (psf)

PAGE B4

Lateral



90 mph

# APPENDIX B Pressure Lookup Tables

7-05 ASCE

Mid US (High Snow)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

	Bas	ic '	Win	d S	pee	d		_		(	Grou	und	Sn	IOW	/ Lo	oad	ł		-																															
t. Down (psf)	45.2	41.5	37.4	33.3	30.3	27.5	25.2	23.2	21.4	19.9	18.6	45.2	41.5	37.4	33.3	30.3	27.5	30.8	28.5	26.5	24.8	23.3	22.0	41.0	37.8	35.0	32.2	29.5	26.9	31.5	29.5	27.6	26.0	24.7	23.5	Ss = 3.1	14.3	15.5	17.0	18.1	18.7	18.9	18.9	18.6	18.1	17.6	707	16.2	Ss = 3.1 13,8	
nt = 60 f sf) zone 3	-40.6	-37.6	-37.6	-37.6	-37.7	-3/./	-16.8	-16.9	-16.9	-17.0	-17.0	-54.4	-50.4	-50.4	-50.5	-50.5	-50.6	-22.7	-22.8	-22.8	-22.8	-22.9	-22.9	-63.3	-58.7	-58.7	-58.7	-58.8	-58.8	-26.5	-26.6	-26.6	-26.7	-26.7	-26.7	Ss = 2.5	11.6	13.5	15.2	16.3	17.0	17.4	17.4	17.3	16.9	16.4	15.0	15.2	Ss = 2.5 11.1	
Ig. Heigh ressures (p Zone 2	-25.6	-24.1	-24.1	-24.2	-24.2	- 24.2	-16.8	-16.9	-16.9	-17.0	-17.0	-34.5	-32.5	-32.5	-32.6	-32.6	-32.6	-22.7	-22.8	-22.8	-22.8	-22.9	-22.9	-40.2	-37.9	-37.9	-37.9	-38.0	-38.0	-26.5	-26.6	-26.6	-26.7	-26.7	-26.7	Ss = 2.0	9.7	11.9	13.6	14.9	15.7	16.1	16.3	16.2	15.9	15.5	14.7	14.4	Ss = 2.0 8.9	2
BIC Up F	-13.6	-12.1	-12.1	-12.2	-12.2	-12.3	-13.8	-13.9	-13.9	-14.0	-14.0	-18.5	-16.6	-16.6	-16.6	-16.7	-16.7	-18.7	-18.8	-18.8	-18.9	-18.9	-18.9	-21.7	-19.4	-19.4	-19.5	-19.5	-19.6	-21.9	-21.9	-22.0	-22.0	-22.1	-22.1	Ss = 1.5	8.0	10.3	12.1	13.4	14.3	14.8	15.1	15.0	14.9	14.7	14.4	13.9	Ss= 1.5 6.7	;
t. Down (psf)	45.2	41.5	37.4	33.3	30.3	25.7	23.4	21.4	19.7	18.1	16.9	45.2	41.5	37.4	33.3	30.3	27.5	29.1	26.8	24.7	23.0	21.5	20.2	41.0	37.7	34.0	31.2	28.5	26.0	29.8	27.7	25.8	24.3	22.9	21.7	Ss = 1.25	7.1	9.5	11.3	12.7	13.6	14.2	14.7	15.0	14.9	14.7	14.4	13.9	5s = 1.25	
ht = 30 f sf) zone 3	-33.2	-30.7	-30.7	-30.8	-30.8	-30.8	-13.7	-13.7	-13.7	-13.8	-13.8	-47.0	-43.6	-43.6	-43.6	-43.6	-43.7	-19.5	-19.6	-19.6	-19.7	-19.7	-19.8	-55.9	-51.8	-51.8	-51.9	-51.9	-51.9	-23.3	-23.4	-23.4	-23.5	-23.5	-23.6	Ss = 1.0	6.6	9.0	10.8	12.2	13.2	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 1.0 <b>4.9</b>	-
dg. Heig Pressures (p Zone 2	-20.8	-19.6	-19.6	-19.7	-19.7	-13.6	-13.7	-13.7	-13.7	-13.8	-13.8	-29.7	-28.0	-28.0	-28.1	-28.1	-28.1	-19.5	-19.6	-19.6	-19.7	-19.7	-19.8	-35.4	-33.4	-33.4	-33.5	-33.5	-33.5	-23.3	-23.4	-23.4	-23.5	-23.5	-23.6	Ss = 0.5	5.3	7.7	9.6	11.6	13.1	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 0.5 3.1	-
Up Zone 1	-11.0	-9.7	-9.8	-9.8	9.6- 0.0	-11.1	-11.2	-11.2	-11.3	-11.3	-11.4	-15.9	-14.2	-14.2	-14.2	-14.3	-14.3	-16.1	-16.1	-16.2	-16.2	-16.3	-16.3	-19.1	-17.0	-17.1	-17.1	-17.1	-17.2	-19.3	-19.3	-19.3	-19.4	-19.4	-19.5	Ss = 0.4	4.9	7.3	9.6	11.6	13.1	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 0.4 2.6	
t. Down (psf)	45.2	41.5	37.4	33.3	30.3	C.12 25.7	23.4	21.4	19.7	18.1	16.9	45.2	41.5	37.4	33.3	30.3	27.5	27.5	25.2	23.2	21.4	19.9	18.6	41.0	37.7	34.0	31.1	28.3	25.8	28.2	26.1	24.3	22.7	21.3	20.2	Ss = 0.3	4.5	7.0	9.6	11.6	13.1	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 0.3 2.1	-
ht = 15 f sf) zone 3	-33.2	-30.7	-30.7	-30.8	-30.8	-30.8	-13.7	-13.7	-13.7	-13.8	-13.8	-40.6	-37.6	-37.6	-37.6	-37.7	-37.7	-16.8	-16.8	-16.9	-16.9	-17.0	-17.0	-49.5	-45.8	-45.9	-45.9	-45.9	-46.0	-20.6	-20.6	-20.7	-20.7	-20.8	-20.8	Ss = 0.2	4.0	7.0	9.6	11.6	13.1	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 0.2 1.4	-
dg. Heig Pressures (p Zone 2	-20.8	-19.6	-19.6	-19.7	-19.7	-13.6	-13.7	-13.7	-13.7	-13.8	-13.8	-25.6	-24.1	-24.1	-24.2	-24.2	-24.2	-16.8	-16.8	-16.9	-16.9	-17.0	-17.0	-31.3	-29.5	-29.5	-29.6	-29.6	-29.6	-20.6	-20.6	-20.7	-20.7	-20.8	-20.8	Ss = 0.1	3.8	7.0	9.6	11.6	13.1	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 0.1	
BI Up Zone 1	-11.0	-9.7	-9.8	-9.8	9.6-	-11.1	-11.2	-11.2	-11.3	-11.3	-11.4	-13.6	-12.1	-12.1	-12.2	-12.2	-12.3	-13.8	-13.8	-13.9	-13.9	-14.0	-14.0	-16.8	-15.0	-15.0	-15.0	-15.1	-15.1	-17.0	-17.0	-17.1	-17.1	-17.1	-17.2	Ss = 0.0	3.8	7.0	9.6	11.6	13.1	14.1	14.7	15.0	14.9	14.7	14.4	13.9	Ss = 0.0	
Roof Pitch	1:12	2:12	3:12	4:12	5:12	5:12 7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	71:11	12:12		
<u> </u>			Exp	os	ure	Ca	teg	jor	y E	3			E	хр	os	sure	e C	Cat	eg	ory	C				6	Exp	os	sure	ə C	ate	ego	ory	D							Do	wr	n S	lor	e						
												11		an	d I	De			(n)	cf)																		0	Sid	0		220	4 (	ne	-f)			L	ater	a

Up and Down (psf)

60 psf





## APPENDIX B Pressure Lookup Tables

7.05 ASCE 100 mph Basic Wind Speed 25 psf Ground Snow Load

ft. Down (psf)	25.9	24.5	23.0	000	18.6	22.3	21.2	20.2	19.3	19.2	19.1	25.9	26.3	24.8	23.2	21.8	20.4	26.5	25.3	24.9	24.8	24.7	24.0	25.5	27.7	24.7	23.2	21.8	29.1	28.6	28.3	28.2	28.1	Ss = 3.1	4.6	6.0	7.1	8.0	8.6	9.1	9.4	9.5	5	9.4
ht = 60 s sf) zone 3	-50.4	-46.7	40.0	46.8	46.0	-21.0	-21.1	-21.1	-21.1	-21.2	-21.2	-67.5	-62.6	-62.6	-62.6	-62.7	-62.7	-28.3	-28.4	-28.4	-28.4	-28.5	C.82-	-/8.4	-72.8	-72.8	-72.8	-72.9	-33.0	-33.1	-33.1	-33.2	-33.2	Ss = 2.5	4.0	5.4	6.5	7.4	8.0	8.5	80.00	9.0	0.0	6.8
dg. Heigl ressures (p zone 2	-31.9	-30.1	-30.1	1.06-	2.06-	-21.0	-21.1	-21.1	-21.1	-21.2	-21.2	-42.9	-40.4	-40.5	-40.5	-40.5	-40.6	-28.3	-28.4	-28.4	-28.4	- 28.5	- 28.5 - 28.5	-49.9	-47.1	-47.2	-47.2	-47.2	-33.0	-33.1	-33.1	-33.2	-33.2	Ss = 2.0	3.5	4.9	6.0	6.9	7.5	8.0	с. 8	8.5 2	5	8.4
BIC UpF Zone 1	-17.1	-15.3	-15.2	-15.4	15.4	-17.3	-17.4	-17.4	-17.4	-17.5	-17.5	-23.2	-20.8	-20.8	-20.8	-20.9	-20.9	-23.4	-23.4	-23.5	-23.5	-23.6	-23.0	1./2-	-24.3	-24.4	-24.4	-24.4	-27.3	-27.4	-27.4	-27.5	-27.5	Ss = 1.5	3.0	4.4	5.5	6.4	7.0	7.5	7.9	1.8	7:0 8 2	8.1
t. Down (psf)	25.9	24.5	23.U	0.00	18.6	20.1	19.0	18.0	17.1	16.3	16.2	25.9	25.0	23.5	22.0	20.5	19.1	24.3	23.1	22.1	21.9	21.8	21./	25.9	26.5 25.0	23.5	22.0	20.6	26.9	25.7 25.5	25.4	25.3	25.2	Ss = 1.25	2.8	4.1	5.2	6.1	7.0	7.5	7.9	8.1	2.0	8.1
ht = 30 f sf) <sup>zone 3</sup>	-41.3	-38.2	-38.5	2.00-	V 85-	-17.1	-17.1	-17.2	-17.2	-17.3	-17.3	-58.3	-54.1	-54.1	-54.1	-54.2	-54.2	-24.4	-24.4	-24.5	-24.5	-24.6	-24.6	-69.3	-64.3	-643	-64.4	-64.4	-29.1	-29.1	-29.2	-29.3	-29.3	Ss = 1.0	2.6	4.0	5.1	6.1	7.0	7.5	7.9	1.8	2.0	8.1
dg. Heigl Pressures (p Zone 2	-26.0	-24.5	-24.b	-24.6	C VC-	-17.1	-17.1	-17.2	-17.2	-17.3	-17.3	-37.0	-34.9	-34.9	-34.9	-35.0	-35.0	-24.4	-24.4	-24.5	-24.5	-24.6	-24.0	-44.1	-41.6	41.6	-41.6	-41.7	-29.1	-29.1	-29.2	-29.3	-29.3	Ss = 0.5	2.2	3.6	5.0	6.1	7.0	7.5	7.9	8.1	2.0	8.1
BIG Up 1 Zone 1	-13.9	-12.4	-12.4	-12.4	10 5	-14.0	-14.1	-14.1	-14.2	-14.2	-14.3	-20.0	-17.8	-17.9	-17.9	-17.9	-18.0	-20.1	-20.2	-20.2	-20.3	-20.3	-20.4	-23.9	-21.4	-21.4	-21.4	-21.5	-24.1	-24.1	-24.2	-24.2	-24.3	Ss = 0.4	2.1	3.6	2:0	6.1	7.0	7.5	7.9	1.8	2.0	8.1
t. Down (psf)	25.9	24.5	23.U	0.00	18.6	20.1	19.0	18.0	17.1	16.3	16.2	25.9	24.5	23.0	21.5	20.0	18.6	22.3	21.2	20.2	19.3	19.2	19.1	25.9	25.4	22.4	20.9	19.6	25.0	23.8	22.9	22.7	22.6	Ss = 0.3	2.0	3.6	2.0	6.1	7.0	7.5	7.9	8.1	2.0	8.1
ht = 15 f sf) zone 3	-41.3	-38.2	- 36.5	- 28.2	V 86-	-17.1	-17.1	-17.2	-17.2	-17.3	-17.3	-50.4	-46.7	-46.8	-46.8	-46.8	-46.9	-21.0	-21.1	-21.1	-21.1	-21.2	7.12-	-61.4	-56.9	-57.0	-57.0	-57.0	-25.7	- 25.8	-25.8	-25.9	-25.9	Ss = 0.2	2.0	3.6	2:0	6.1	7.0	7.5	7.9	1.8	2.0	8.1
dg. Heigl Pressures (p Zone 2	-26.0	-24.5	0.42-	-24.6	C VC-	-17.1	-17.1	-17.2	-17.2	-17.3	-17.3	-31.9	-30.1	-30.1	-30.1	-30.2	-30.2	-21.0	-21.1	-21.1	-21.1	-21.2	7.12-	-39.0	-36.7	-36.8	-36.8	-36.9	-25.7	-25.8	-25.8	-25.9	-25.9	Ss = 0.1	2.0	3.6	2:0	6.1	7.0	7.5	7.9	1.8	2.0	8.1
BI Up1 Zone 1	-13.9	-12.4	-12.4	-124	105	-14.0	-14.1	-14.1	-14.2	-14.2	-14.3	-17.1	-15.3	-15.3	-15.3	-15.4	-15.4	-17.3	-17.4	-17.4	-17.4	-17.5	C/1-	-21.0	-18.8	-18.9	-18.9	-18.9	-21.2	-21.3	-21.4	-21.4	-21.4	Ss = 0.0	2.0	3.6	2.0	6.1	7.0	7.5	7.9		2.0	8.1
Roof Pitch	1:12	2:12	3:12	5.12	5112	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	71:71	1:12	2:12	4:12	5:12	6:12	7:12	8:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	10:12	11:12
		E	(po	su	re	Ca	teg	jor	y E	3			E	Exp	oos	ure	ə C	ate	ego	ory	С		T		Ex	DOS	sur	e C	ate	gor	V D	)					(	Do	wn	ı SI	qol	e		



110 mph

# APPENDIX B Pressure Lookup Tables

7.05 ASCE

East Coast (Low Snow)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

	Bas	ic	Win	d Sp	eed	1				G	irou	Ind	Sr	10%	/ Lo	bad	1				_				-	_																								
t. Down (nef)	18.4	18.6	17.9	17.1	15.5	23.2	23.1	22.9	22.8	22.7	22.6	18.4	21.4	20.6	19.8	19.0	18.3	29.8	29.7	29.6	29.5	29.4	29.3	18.7	23.2	22.4	21.6	20.8	20.4	34.1	34.0	33.8	33.7	33.6	33.5	Ss = 3.1	4.4	4.8	5.5	6.1	6.5	6.9	7.1	7.2	7.3	7.3	7.3	7.2	Ss = 3.1	4.0
ht = 60 f	-61.3	-56.8	-56.9	-56.9	-57.0	-25.7	-25.7	-25.8	-25.8	-25.8	-25.9	-81.9	-76.0	-76.0	-76.1	-76.1	-76.1	-34.5	-34.6	-34.6	-34.6	-34.7	-34.7	-95.2	-88.3	-88.3	-88.4	-88.4	-88.4	-40.2	-40.2	-40.3	-40.3	-40.4	-40.4	Ss = 2.5	3.6	4.2	4,9	5.5	5.9	6.3	6.5	6.6	6.7	6.7	6.7	6.7	Ss = 2.5	3.3
dg. Heigl	-38.9	-36.7	-36.7	-36.7	-30.8	-25.7	-25.7	-25.8	-25.8	-25.8	-25.9	-52.2	-49.2	-49.2	-49.3	-49.3	-49.3	-34.5	-34.6	-34.6	-34.6	-34.7	-34.7	-60.7	-57.3	-57.3	-57.3	-57.4	-57.4	-40.2	-40.2	-40.3	-40.3	-40.4	-40.4	Ss = 2.0	2.9	3.7	4.4	5.0	5.4	5.8	0.9	6.2	6.3	6.3	6.3	6.2	Ss = 2.0	2.6
Upl 7000 1	-21.0	-18.8	-18.8	-18.8	-18.9	-21.2	-21.2	-21.3	-21.3	-21.4	-21.4	-28.4	-25.4	-25.4	-25.5	-25.5	-25.5	-28.6	-28.6	-28.7	-28.7	-28.7	-28.8	-33.1	-29.7	-29.7	-29.7	-29.8	-29.8	-33.3	-33.3	-33.4	-33.4	-33.5	-33.5	Ss = 1.5	2.4	3.2	3.9	4.5	4.9	5.3	5.5	5.7	5.8	5.8	5.8	5.8	Ss = 1.5	2.0
t. Down	18.4	17.7	17.0	16.2	14.6	19.6	19.5	19.4	19.3	19.2	19.1	18.4	19.9	19.1	18.3	17.6	16.8	26.2	26.1	26.0	25.9	25.8	25.7	18.4	21.7	20.9	20.1	19.3	18.6	30.5	30.4	30.3	30.2	30.1	30.0	Ss = 1.25	2.2	3.0	3.7	4.2	4.7	5.0	5.3	5.5	5.6	5.6	5.6	5.6	Ss = 1.25	1.6
ht = 30 f sf) 70003	-50.2	-46.6	-46.6	-46.6	46.7	-20.9	-21.0	-21.0	-21.1	-21.1	-21.1	-70.9	-65.7	-65.8	-65.8	-65.8	-65.9	-29.8	-29.8	-29.9	-29.9	-29.9	-30.0	-84.1	-78.1	-78.1	-78.1	-78.1	-78.2	-35.5	-35.5	-35.6	-35.6	-35.6	-35.7	Ss = 1.0	2.0	2.8	3.5	4.1	4.5	4.9	5.1	5.3	5.4	5.5	5.5	5.5	Ss = 1.0	1.4
dg. Heig Pressures (r	-31.8	-30.0	-30.0	-30.0	-30.1	-20.9	-21.0	-21.0	-21.1	-21.1	-21.1	-45.1	-42.5	-42.5	-42.6	-42.6	-42.6	-29.8	-29.8	-29.9	-29.9	-29.9	-30.0	-53.6	-50.6	-50.6	-50.6	-50.7	-50.7	-35.5	-35.5	-35.6	-35.6	-35.6	-35.7	Ss = 0.5	1.6	2.4	3.1	3.7	4.1	4.6	4.8	5.0	5.2	5.2	5.2	5.2	Ss = 0.5	0.9
BI Up	-17.1	-15.2	-15.3	-15.3	-15.4	-17.2	-17.3	-17.3	-17.4	-17.4	-17.5	-24.4	-21.9	-21.9	-21.9	-22.0	-22.0	-24.6	-24.7	-24.7	-24.7	-24.8	-24.8	-29.2	-26.1	-26.2	-26.2	-26.2	-26.3	-29.4	-29.4	-29.4	-29.5	-29.5	-29.6	Ss = 0.4	1.5	2.3	3.0	3.6	4.1	4.6	4.8	5.0	5.2	5.2	5.2	5.2	Ss = 0.4	0.8
ft. Down Incfl	18.4	17.7	17.0	16.2	14.6	19.6	19.5	19.4	19.3	19.2	19.1	18.4	18.6	17.9	17.1	16.3	15.5	23.2	23.1	22.9	22.8	22.7	22.6	18.4	20.4	19.6	18.8	18.1	17.3	27.4	27.3	27.2	27.1	27.0	26.9	Ss = 0.3	1.4	2.2	2.9	3.6	4.1	4.6	4.8	5.0	5.2	5.2	5.2	5.2	Ss = 0.3	0.6
ht = 151 <sup>250</sup>	-50.2	-46.6	-46.6	-46.6	-46.7	-20.9	-21.0	-21.0	-21.1	-21.1	-21.1	-61.3	-56.8	-56.9	-56.9	-56.9	-57.0	-25.7	-25.7	-25.8	-25.8	-25.8	-25.9	-74.6	-69.2	-69.2	-69.2	-69.2	-69.3	-31.4	-31.4	-31.4	-31.5	-31.5	-31.6	Ss = 0.2	1.2	2.1	2.9	3.6	4.1	4.6	4.8	5.0	5.2	5.2	5.2	5.2	Ss = 0.2	0.4
dg. Heig Pressures (1	-31.8	-30.0	-30.0	-30.0	-30.1	-20.9	-21.0	-21.0	-21.1	-21.1	-21.1	-38.9	-36.7	-36.7	-36.7	-36.8	-36.8	-25.7	-25.7	-25.8	-25.8	-25.8	-25.9	-47.4	-44.7	-44.8	-44.8	-44.8	-44.9	-31.4	-31.4	-31.4	-31.5	-31.5	-31.6	Ss = 0.1	1.1	2.1	2.9	3.6	4.1	4.6	4.8	5.0	5.2	5.2	5.2	5.2	Ss = 0.1	0.2
BI Up	-17.1	-15.2	-15.3	-15.3	-15.4	-17.2	-17.3	-17.3	-17.4	-17.4	-17.5	-21.0	-18.8	-18.8	-18.8	-18.9	-18.9	-21.2	-21.2	-21.3	-21.3	-21.4	-21.4	-25.7	-23.1	-23.1	-23.1	-23.1	-23.2	-25.9	-26.0	-26.0	-26.1	-26.1	-26.1	Ss = 0.0	1.1	2.1	2.9	3.6	4.1	4.6	4.8	5.0	5.2	5.2	5.2	5.2	Ss = 0.0	0.0
Boof Ditch	1:12	2:12	3:12	4:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12		
L		1	Exp	osu	ire (	Cat	eg	ory	/ B				E	Хp	os	ure	e C	ate	ego	ory	С				6	Exp	os	sure	e C	ate	ego	ory	D							Do	wr	n S	lop	e		_				
												1.1		an	d I	De		n (	'n (	~f)																		0	2id	~		220	a (	ne	۰ <b>f</b> )				Late	ral

Up and Down (psf)

10 psf

PAGE B7



115 mph

# APPENDIX B Pressure Lookup Tables

7-05 ASCE

New Jersey (Typical)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

				<u>u</u> 0	pe	eu									10%		Jac			_					_	_	_		_						_			_	_		_								_	<b></b>
t. Down (Dsf)	25.9	26.2	24.7	23.2	21.7	20.3	26.4	25.2	24.8	24.7	24.6	24.5	25.9	29.2	27.7	26.2	24.7	23.3	32.3	32.2	32.1	32.0	31.8	31.7	26.9	31.2	29.7	28.2	26.7	25.3	36.9	36.8	36.7	36.6	36.5	36.4	Ss = 3.1	4.6	6.0	7.1	8.0	8.6	9.1	9.4	9.5	9.6	9.5	9.4	9.2	Ss = 3.1 4.0
ht = 60 f sf) zone 3	-67.1	-62.2	-62.3	-62.3	-62.3	-62.4	-28.2	-28.2	-28.3	-28.3	-28.3	-28.4	-89.7	-83.2	-83.2	-83.2	-83.3	-83.3	-37.8	-37.9	-37.9	-38.0	-38.0	-38.0	-104.2	-96.7	-96.7	-96.7	-96.7	-96.8	-44.1	-44.1	-44.1	-44.2	-44.2	-44.3	Ss = 2.5	4.0	5.4	6.5	7.4	8.0	8.5	8.8	9.0	9.0	9.0	8.9	8.7	Ss = 2.5 <b>3.3</b>
dg. Heig Pressures (p Zone 2	-42.7	-40.2	-40.2	-40.3	-40.3	-40.4	-28.2	-28.2	-28.3	-28.3	-28.3	-28.4	-57.2	-53.9	-53.9	-54.0	-54.0	-54.1	-37.8	-37.9	-37.9	-38.0	-38.0	-38.0	-66.5	-62.7	-62.8	-62.8	-62.8	-62.9	-44.1	-44.1	-44.1	-44.2	-44.2	-44.3	Ss = 2.0	3.5	4.9	6.0	6.9	7.5	8.0	8.3	8.5	8.5	8.5	8.4	8.3	Ss = 2.0 <b>2.6</b>
BI Up1 Zone 1	-23.1	-20.7	-20.7	-20.7	-20.7	-20.8	-23.3	-23.3	-23.4	-23.4	-23.4	-23.5	-31.1	-27.9	-27.9	-28.0	-28.0	-28.0	-31.3	-31.4	-31.4	-31.5	-31.5	-31.5	-36.3	-32.6	-32.6	-32.6	-32.7	-32.7	-36.5	-36.6	-36.6	-36.6	-36.7	-36.7	Ss = 1.5	3.0	4.4	5.5	6.4	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 1.5 2.0
t. Down (psf)	25.9	24.6	23.1	21.6	20.1	18.7	23.5	22.3	21.3	20.8	20.7	20.6	25.9	27.6	26.1	24.6	23.1	21.7	28.9	28.3	28.2	28.1	28.0	27.9	25.9	29.6	28.1	26.5	25.1	23.7	33.1	33.0	32.8	32.7	32.6	32.5	Ss = 1.25	2.8	4.1	5.2	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 1.25 1.6
ht = 30 f sf) <sup>zone 3</sup>	-55.0	-51.0	-51.0	-51.1	-51.1	-51.1	-23.0	-23.0	-23.1	-23.1	-23.2	-23.2	-77.6	-72.0	-72.0	-72.0	-72.1	-72.1	-32.7	-32.7	-32.7	-32.8	-32.8	-32.9	-92.1	-85.4	-85.5	-85.5	-85.5	-85.6	-38.9	-38.9	-39.0	-39.0	-39.0	-39.1	Ss = 1.0	2.6	4.0	5.1	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 1.0 1.4
dg. Heig Pressures (p Zone 2	-34.9	-32.9	-32.9	-32.9	-33.0	-33.0	-23.0	-23.0	-23.1	-23.1	-23.2	-23.2	-49.4	-46.6	-46.6	-46.6	-46.7	-46.7	-32.7	-32.7	-32.7	-32.8	-32.8	-32.9	-58.7	-55.4	-55.4	-55.4	-55.5	-55.5	-38.9	-38.9	-39.0	-39.0	-39.0	-39.1	Ss = 0.5	2.2	3.6	5.0	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 0.5 <b>0.9</b>
BI Up Zone 1	-18.8	-16.8	-16.8	-16.8	-16.9	-16.9	-19.0	-19.0	-19.0	-19.1	-19.1	-19.2	-26.8	-24.0	-24.0	-24.1	-24.1	-24.2	-27.0	-27.1	-27.1	-27.1	-27.2	-27.2	-32.0	-28.7	-28.7	-28.7	-28.8	-28.8	-32.2	-32.2	-32.3	-32.3	-32.4	-32.4	Ss = 0.4	2.1	3.6	5.0	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 0.4 <b>0.8</b>
ft. Down (psf)	25.9	24.6	23.1	21.6	20.1	18.7	23.5	22.3	21.3	20.8	20.7	20.6	25.9	26.2	24.7	23.2	21.7	20.3	26.4	25.2	24.8	24.7	24.6	24.5	25.9	28.2	26.7	25.1	23.7	22.3	29.9	29.6	29.5	29.4	29.3	29.1	Ss = 0.3	2.0	3.6	5.0	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 0.3 <b>0.6</b>
ht = 15 f sef) zone 3	-55.0	-51.0	-51.0	-51.1	-51.1	-51.1	-23.0	-23.0	-23.1	-23.1	-23.2	-23.2	-67.1	-62.2	-62.3	-62.3	-62.3	-62.4	-28.2	-28.2	-28.3	-28.3	-28.3	-28.4	-81.6	-75.7	-75.7	-75.8	-75.8	-75.8	-34.4	-34.4	-34.5	-34.5	-34.6	-34.6	Ss = 0.2	2.0	3.6	5.0	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 0.2 0.4
dg. Heig Pressures (1 Zone 2	-34.9	-32.9	-32.9	-32.9	-33.0	-33.0	-23.0	-23.0	-23.1	-23.1	-23.2	-23.2	-42.7	-40.2	-40.2	-40.3	-40.3	-40.4	-28.2	-28.2	-28.3	-28.3	-28.3	-28.4	-52.0	-49.0	-49.1	-49.1	-49.1	-49.2	-34.4	-34.4	-34.5	-34.5	-34.6	-34.6	Ss = 0.1	2.0	3.6	5.0	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 0.1 0.2
BI Up Zone 1	-18.8	-16.8	-16.8	-16.8	-16.9	-16.9	-19.0	-19.0	-19.0	-19.1	-19.1	-19.2	-23.1	-20.7	-20.7	-20.7	-20.7	-20.8	-23.3	-23.3	-23.4	-23.4	-23.4	-23.5	-28.3	-25.3	-25.3	-25.4	-25.4	-25.4	-28.5	-28.5	-28.5	-28.6	-28.6	-28.7	Ss = 0.0	2.0	3.6	5.0	6.1	7.0	7.5	7.9	8.1	8.2	8.2	8.1	7.9	Ss = 0.0 0.0
Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	
			Exp	oos	ure	e C	ate	eg	ory	/ B				E	Exp	os	ure	e C	ate	ego	ory	С					Exp	00	sur	e C	Cat	eg	ory	D							Do	wr	n S	lop	be					
													11		20	d	De		n (	'n	~f)																		c	Sid		1.0	22	a (	'n	- f)				Latera

Up and Down (psf)

25 psf





## APPENDIX B Pressure Lookup Tables

7.05 ASCE

Louisiana (Typical)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems **120 mph** Basic Wind Speed

Ground Snow Load

0 psf

Model         Teame (a)         Model	L		8	ldg. Heig	ht = 15 f	ن بر	8	ldg. Heig	tht = 30 f	نۍ	8	dg. Heig	ht = 60 f	نہ
112         206         381         600         381         600         381         600         573         143         226         493         673         153           312         184         560         557         144         226         493         600         160	1	Roof Pitch	Up Zone 1	Pressures ( Zone 2	ost) Zone 3	(psf)	Up Zone 1	Pressures ( Zone 2	pst) Zone 3	Down (psf)	Up Zone 1	Pressures ( Zone 2	ost) Zone 3	(psf)
212         184         359         557         144         125         540         557         144         257         440         560         557         144         257         440         560         557         144         257         440         560         557         144         257         440         560         557         143         257         440         560         557         144         257         440         660         157         440         660         157         440         660         157         440         660         157         440         660         157         440         660         157         440         660         157         440         660         157         440         660         157         150         253 <td></td> <td>1:12</td> <td>-20.6</td> <td>-38.1</td> <td>-60.0</td> <td>13.5</td> <td>-20.6</td> <td>-38.1</td> <td>-60.0</td> <td>13.5</td> <td>-25.3</td> <td>-46.6</td> <td>-73.2</td> <td>13.5</td>		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
312         184         360         557         144         126         550         557         143         250         557         143         250         551         251 <td>F</td> <td>2:12</td> <td>-18.4</td> <td>-35.9</td> <td>-55.7</td> <td>14.4</td> <td>-18.4</td> <td>-35.9</td> <td>-55.7</td> <td>14.4</td> <td>-22.6</td> <td>-43.9</td> <td>-67.9</td> <td>16.8</td>	F	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
412         184         360         557         143         185         360         558         141         277         440         670         186         670         186 <td>- xn</td> <td>3:12</td> <td>-18.4</td> <td>-36.0</td> <td>-55.7</td> <td>14.4</td> <td>-18.4</td> <td>-36.0</td> <td>-55.7</td> <td>14.4</td> <td>-22.6</td> <td>-43.9</td> <td>-67.9</td> <td>16.7</td>	- xn	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
01         01         01         01         01         01         02 <th02< th="">         02         02         02<!--</td--><td>os</td><td>4:12</td><td>-18.4</td><td>-36.0</td><td>-55.7</td><td>14.3</td><td>-18.4</td><td>-36.0</td><td>-55.7</td><td>14.3</td><td>-22.7</td><td>-44.0</td><td>-67.9</td><td>16.6</td></th02<>	os	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
612         105         614         505         505         505         505         505         506         500 <td>ure</td> <td>5:12</td> <td>-18.5</td> <td>-36.0</td> <td>-55.8</td> <td>14.2</td> <td>-18.5</td> <td>-36.0</td> <td>-55.8</td> <td>14.2</td> <td>-22.7</td> <td>-44.0</td> <td>-68.0</td> <td>16.5</td>	ure	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
712         201         251         521         521         521         521         525         530         308         203         508         503 <td>e (</td> <td>6:12</td> <td>-18.5</td> <td>-36.1</td> <td>-55.8</td> <td>14.1</td> <td>-18.5</td> <td>-36.1</td> <td>-55.8</td> <td>14.1</td> <td>-22.7</td> <td>-44.0</td> <td>-68.0</td> <td>16.4</td>	e (	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
Bit         Cold	Cat	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
0         0         0         2         2         3	ea	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
D         1011         203         253         223         223         223         223         223         231	or	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
1111         210         253 <td>/ B</td> <td>10:12</td> <td>-20.9</td> <td>-25.3</td> <td>-25.3</td> <td>22.4</td> <td>-20.9</td> <td>-25.3</td> <td>-25.3</td> <td>22.4</td> <td>-25.6</td> <td>-30.9</td> <td>-30.9</td> <td>26.7</td>	/ B	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
121         210         233         233         233         233         233         231 <td></td> <td>11:12</td> <td>-20.9</td> <td>-25.3</td> <td>-25.3</td> <td>22.3</td> <td>-20.9</td> <td>-25.3</td> <td>-25.3</td> <td>22.3</td> <td>-25.6</td> <td>-30.9</td> <td>-30.9</td> <td>26.5</td>		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
IIII         -353         466         732         135         -393         579         168         736         188         305         583         907         211           2112         -225         439         6779         165         563         509         785         187         306         583         907         211           5112         -227         440         660         165         -263         509         786         187         306         589         907         213           5112         -227         440         660         165         -264         507         332         41.1         341         343           6112         -255         309         307         547         307         343         41.3         341 <td< td=""><td></td><td>12:12</td><td>-21.0</td><td>-25.3</td><td>-25.3</td><td>22.2</td><td>-21.0</td><td>-25.3</td><td>-25.3</td><td>22.2</td><td>-25.7</td><td>-31.0</td><td>-31.0</td><td>26.4</td></td<>		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
2:12         2:26         433         67:9         16.8         26.3         50.9         7.85         18.7         30.5         58.9         90.7         21.1           3:12         2:27         440         68.0         16.4         26.4         50.9         16.7         25.3         50.9         78.6         18.7         30.6         58.9         90.8         20.8           7:12         2:27         440         68.0         16.4         26.4         50.7         35.7         30.5         30.3         34.4         41.3         31.3         34.5           7:12         2:55         30.9         20.0         25.6         35.7         35.7         30.5         30.3         34.4         41.4         31.3           111:12         2:55         30.9         20.6         25.7         35.7         30.5         30.3         34.4         41.4         34.6         34.6         34.6         34.6         34.6         34.6         34.6         36.7         35.7         35.7         35.7         36.6         30.8         36.7         35.7         36.6         36.7         35.7         35.7         36.6         36.7         36.7         35.7         35.7		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
3:12         2:26         439         67:9         16.7         26.3         509         785         187         305         58.9         907         211           4:12         -227         440         67.9         16.6         -26.3         509         786         18.6         306         59.9         90.8         201           7:12         -227         440         68.0         16.4         -26.4         509         785         38.7         30.7         34.2         41.3         41.3         34.3           8:12         -255         -309         20.9         26.6         -357         -357         30.7         34.4         41.4         41.4         34.3           11:12         -255         -309         20.9         26.6         -357         -357         30.4         34.13	-	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
4:12         2:2.7         440         6.79         166         2.63         5.09         7.85         18.7         -306         -58.9         -90.8         2.03           6:12         -2.2.7         -440         -68.0         16.5         -56.4         -50.0         -78.6         18.6         -90.6         -58.9         -90.8         20.8           7:12         -2.55         -309         -308         2.06         -55.7         -55.7         35.7         35.7         35.7         30.7         -41.3         41.3         34.1           9:12         -2.55         -309         -30.8         2.66         -30.7         35.8         35.8         30.7         -41.3         41.3         34.1           9:11         -2.55         -309         -30.8         2.57         -35.7         35.7         35.7         35.7         35.7         35.7         35.7         31.4         41.4         41.4         41.4         41.4         34.1           111.12         -35.7         -35.7         -35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7         35.7	Fx	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
S:12         2.2.7         440         68.0         16.5         2.6.4         5.0.9         7.8.6         18.5         30.6         -90.8         20.8           6:112         -2.2.7         440         68.0         16.4         -5.6.4         -51.0         7.8.5         35.7         35.7         35.7         35.7         35.7         35.7         36.4         -41.3         41.3         34.1           8:12         -25.5         -30.9         30.8         2.6.7         35.7         35.7         30.7         34.4         41.4         34.1         34.1           9:12         -25.5         -30.9         26.8         -30.9         26.6         35.7         35.7         30.7         34.4         41.4         34.1           11:12         -55.6         -30.9         26.8         25.0         53.7         55.7         35.7         32.6         64.1         40.1         41.4         41.4         34.1         34.1           11:12         -55.6         -30.9         20.8         55.7         35.7         32.6         65.6         40.1         41.4         41.4         41.4         34.1           21:12         -57.1         53.1         53.1	00	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
6:12         2:2.7         440         6:80         16.4         2.64         5:10         736         357         307         342         41.3         41.3         34.3           7:12         -255         -308         203         255         -303         206         -55.7         357         357         357         303         -41.4         41.4         34.3           9:12         -255         -309         266         -557         358         358         353         30.3         -41.4         41.4         34.3           11:12         -255         -309         265         -29.7         358         35.8         30.3         34.4         -41.5         41.5         34.5           11:12         -257         -31.0         201         26.5         -30.7         35.7         35.7         35.7         35.7         31.5         34.4         41.4         41.4         34.3           11:12         -255         -309         25.5         -31.4         60.5         93.2         21.6         35.7         31.5         31.5         31.5         32.5           2112         -211         -314         60.5         93.2         21.4         40	sur	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
7:12         2:54         -308         2:00         2:90         -3:95         -3:57         3:05         -3:43         -41:3         41:3         3:13         3:14           8:112         -2:55         -309         -309         5:69         -29:6         -5:57         -3:57         3:05         -3:44         41:4         41:4         3:41         3:41           11:12         -2:55         -309         -309         5:67         -3:91         3:55         3:53         3:01         -3:44         -4:15         4:13         3:41           11:12         -2:57         -310         -310         2:10         2:14         -6:67         -3:93         3:55         3:50         3:51	e (	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
8:12         -255         -308         -308         256         -305         -306         -305         -306	Cat	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
0         0         1	ea	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
1012         256         309         300         267         297         358         303         344         41.4         41.4         344           11112         255         309         300         2657         297         358         302         344         41.5         41.5         344           11112         255         310         310         311         357         586         41.5         41.5         344         41.5         41.5         345           1112         2577         535         82.6         135         314         605         332         225         135         135         235         232         135         232         235         232         135         235         232         135         357         68.4         40.5         235	on	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
11:12         25.6         30.9         30.0         26.5         29.7         35.8         35.0         34.4         41.5         41.5         34.3           11:12         25.7         31.0         31.0         31.0         31.0         31.0         31.0         31.0         31.0         31.5         35.0         55.0         55.0         55.0         55.0         30.1         34.4         41.5         41.5         31.5           21:12         230.9         56.7         39.0         13.5         55.0         51.4         60.5         33.2         21.5         35.6         42.4         23.7         25.7         2		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
12:12         2:57         3:10         3:10         2:64         2:97         3:55         3:64         4:15         4:15         3:15           1:12         3:09         5:67         :80         13:5         :55.         :64.1         :10.6         14.4         :39.7         :72.5         :113.6         15.5           2:12         :27.7         :53.5         :82.6         19.5         :31.4         :60.5         :93.2         21.6         :35.6         :68.5         :105.4         24.6           3:12         :27.7         :33.6         :82.6         19.5         :31.4         :60.5         :93.2         21.6         :35.6         :68.5         :105.4         24.6           5:12         :27.8         :53.6         :93.7         :31.5         :37.6         :38.7         :39.9         :48.1         40.1           5:12         :31.1         :37.6         :37.6         :37.6         :37.6         :38.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7         :39.7		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
11:1         309         56.7         89.0         13.5         -3.50         64.1         -100.4         14.4         -39.7         -7.5.5         -113.6         15.6           21:12         27.7         53.5         82.6         19.6         31.4         -60.5         -93.1         21.6         35.6         -68.4         -105.4         24.0           31:12         27.7         53.5         82.6         19.5         -31.4         -60.5         -93.2         21.6         -35.6         -68.5         -105.4         23.0           5:12         27.7         33.5         68.5         10.4         -37.6         -88.5         105.5         23.0           6:12         27.13         37.6         37.6         37.6         46.0         48.1         30.5           6:12         -37.6         31.6         37.5         42.6         42.6         35.7         49.0         48.1         30.5           9:12         31.1         37.6         37.6         42.6         35.3         40.0         48.1         30.5           9:12         31.1         37.6         37.6         42.6         35.3         40.0         48.1         30.5           <		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
2:12         2:77         -535         -82.6         19.6         -31.4         -60.4         -93.1         21.6         -35.6         -68.4         -105.4         24.7           3:12         2:77         535         82.6         19.5         31.4         -60.5         -93.2         21.5         -35.6         -68.4         -105.4         23.5           5:12         2:77         53.6         82.6         19.4         -31.4         -60.5         -93.2         21.4         -35.7         -68.5         -105.4         24.5           5:12         2:78         53.56         -82.7         19.3         -31.5         -60.6         -93.3         21.3         -35.7         -68.5         -105.5         23.3           66:12         -31.6         -37.6         31.8         -35.2         -42.5         42.5         35.5         -39.9         -48.1         40.0           7:12         -31.1         -37.6         31.6         -37.6         31.6         -37.5         32.1         32.5         -42.5         35.5         -48.1         48.1         48.1         48.1         30.5           91.11         -31.3         -37.6         31.6         35.5         -35.2	_	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
3:12         -277         -535         -82.6         19.5         -31.4         -60.5         -93.2         21.6         -35.6         -68.5         -105.4         23.5           5:12         -277         -53.6         82.6         19.5         -31.4         -60.5         -93.2         21.3         -35.7         -68.5         -105.4         23.5           5:12         -278         -33.6         82.7         19.3         -31.5         -60.5         -33.2         23.5         -68.5         -105.5         23.5           6:12         -278         -37.5         -37.5         -37.5         -37.5         32.1         -35.7         -48.1         48.1         40.1           7:12         -31.1         -37.5         -37.7         31.6         -35.2         42.5         42.5         35.5         48.2         39.1           9:12         -31.1         -37.6         31.5         -35.3         42.6         42.6         35.3         48.2         48.2         39.1           9:10         55=0.0         55=0.1         55=0.1         55=0.1         55=0.1         48.2         55=0.5         55=0.5         55=0.5         55=0.5         55=0.5         55=0.5         55=	F	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
4:12         -277         -536         -82.6         19.5         -31.4         -60.5         -93.2         21.4         -35.7         -68.5         -105.5         23.8           5:12         -278         -33.6         -82.6         19.4         -31.4         -60.5         -93.2         21.4         -35.7         -68.5         -105.5         23.8           6:12         -278         -33.6         -82.7         19.3         -31.5         -37.5         -37.5         -37.5         -37.5         -37.5         -37.5         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.7		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
5:12         27.8         -53.6         92.6         19.4         -31.4         -60.5         93.3         21.3         -35.7         -68.5         -105.5         23.8           7:12         -31.1         -37.5         -37.5         -37.5         37.1         -35.2         42.4         35.7         -68.6         -105.5         23.3           7:12         -31.1         -37.5         -37.6         37.1         -35.2         42.5         42.5         35.7         -68.6         -105.5         23.3           8:12         -31.1         -37.6         -37.6         31.8         -35.2         42.6         35.5         35.9         -48.1         48.1         40.1           9:12         -31.3         -37.7         37.7         31.7         35.2         42.6         35.2         40.0         -48.2         39.5           11:12         31.3         -37.7         31.7         31.7         31.4         42.6         35.2         40.0         -48.2         48.1         48.1         48.1         30.5           11:12         0.3         0.5         0.3         32.4         42.6         35.4         40.0         48.2         48.2         53.3         42.6 <td>05</td> <td>4:12</td> <td>-27.7</td> <td>-53.6</td> <td>-82.6</td> <td>19.5</td> <td>-31.4</td> <td>-60.5</td> <td>-93.2</td> <td>21.5</td> <td>-35.6</td> <td>-68.5</td> <td>-105.4</td> <td>23.8</td>	05	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
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         -37.6         -37.6         32.0         -35.2         -42.5         35.5         -39.9         -48.1         48.1         40.1           8:12         -31.1         -37.6         -37.6         31.8         -35.2         -42.5         35.5         -39.9         -48.1         39.2           9:12         -31.1         -37.6         -37.7         31.7         -35.3         -42.6         35.5         -49.0         -48.2         39.1           11:12         -31.3         -37.7         -31.7         -35.3         -42.6         42.6         35.5         -40.0         -48.2         39.2           11:12         -31.3         -37.7         -31.6         -31.7         -37.7         31.1         1.2         1.8         42.6         45.5         55.= 1.2         39.2           11:12         -31.3         -37.7         -31.6         1.6         1.8         2.0         2.3         2.9         47.2         39.2           11:12         0.3	ure	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
7:12         -31.1         -37.5         -32.1         -35.2         -42.4         35.7         -39.9         -48.1         48.1         40.1           8:12         -31.1         -37.6         -37.6         32.0         -35.2         -42.5         35.5         -39.9         -48.1         48.1         39.2           9:12         -31.1         -37.6         -37.6         31.8         -35.2         -42.5         35.5         -39.9         -48.1         48.1         39.2           111:12         -31.3         -37.7         31.7         -37.7         31.6         -35.3         42.6         35.5         -40.0         -48.2         39.2         39.2           111:12         -31.3         -37.7         31.6         -35.3         42.6         35.5         40.0         -48.2         39.2           111:12         -31.3         -37.8         -31.5         31.5         1.4         1.2         2.1         2.3         2.9         34.3         39.5         39.4         47         55.5         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55 = 2.0         55	C	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
8:12         -31.1         -37.6         32.0         -35.2         -42.5         -42.5         35.6         -39.9         -48.1         48.1         39.2           9:12         -31.2         -37.6         37.6         37.7         31.3         -35.2         -42.5         42.5         35.5         -39.9         -48.2         39.2         39.2           11:12         -31.3         -37.7         -37.7         31.6         -35.3         -42.6         35.3         -40.0         -48.2         48.2         39.2           11:12         -31.3         -37.8         31.5         31.5         -35.3         42.6         42.6         35.3         -40.1         -48.2         48.2         39.2           11:12         -31.3         -37.8         31.5         1.1         1.2         1.2         -48.2         39.2         49.0         -48.2         39.2         39.2           12:12         0.6         0.8         1.0         1.2         1.4         1.5         1.1         1.2         1.4         1.5         2.1         2.3         2.9         37.2         39.2         47.3         36.3         47.4         47.3         55.5         55.3         55.1         <	ate	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
9:12         -31.2         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.6         -37.7         -38.2         -38.2         -38.2         -38.2         -38.2	an	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
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	rv	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
41.1.2         -31.3         -37.4         31.5         -35.3         -42.6         35.3         -40.0         -46.2         -46.3         39.6           12:12         -31.3         -37.8         -37.8         31.5         -35.4         42.6         35.2         40.1         -48.3         39.3         39.4           11:12         0.3         0.5         0.7         0.9         11.1         1.2         1.8         2.0         2.3         2.9         36.         44.3           2:12         0.6         0.8         1.0         1.2         1.4         1.5         2.1         2.3         2.9         35.5         43.3         39.9         47.7           3:12         0.8         1.1         1.3         1.5         1.6         1.8         2.0         2.3         2.9         35.5         5.5 <td>D</td> <td>21.11</td> <td>2'TC-</td> <td>1.10-</td> <td>1.16-</td> <td>21 C</td> <td>0.00-</td> <td>0.24-</td> <td>0.24-</td> <td>4.00 0 7 0</td> <td></td> <td>7.04-</td> <td>7.01-</td> <td>0.00</td>	D	21.11	2'TC-	1.10-	1.16-	21 C	0.00-	0.24-	0.24-	4.00 0 7 0		7.04-	7.01-	0.00
Roof Pitch         Ss = 0.0         Ss = 0.1         Ss = 0.2         Ss = 0.3         Ss = 0.1         Ss = 0.2         Ss = 0.3         Ss = 0.1         Ss = 0.2         Ss = 0.3         Ss = 0.1         Ss = 0.2         Ss = 0.3         Ss = 2.5		12:12	-313	-37.8	-37.8	31.5	-35.4	42.6	42.6	35.2	40.1	-48.3	48.3	39.4
1:12       0.3       0.5       0.7       0.9       1.1       1.2       1.8       2.0       2.3       2.9       3.6       44         2:12       0.6       0.8       1.0       1.2       1.4       1.5       2.1       2.3       2.9       3.6       44         3:12       0.6       0.8       1.0       1.2       1.4       1.5       2.1       2.3       2.9       3.5       4.2       55         4:12       1.1       1.3       1.5       1.7       1.9       2.0       2.6       2.3       3.9       4.7       55       53         5:12       1.3       1.6       1.8       2.0       2.1       2.3       2.8       3.1       3.8       4.5       55       53       56       56         7:12       1.8       2.0       2.2       2.3       2.3       3.2       3.3       4.0       4.7       55       59       56       58       56       58       56       58       56       58       56       58       56       56       58       56       51       59       56       51       59       56       51       59       51       59       51	11	Roof Pitch	Se = 0.0	Se = 0.1	Se = 0.2	Sc = 0.3	Se = 0.4	Se = 0.5	Sc = 1.0	Se = 1.25	Sc= 1.5	Se = 2.0	Sc= 2.5	Sc = 3.1
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         3.5         4.2         5.0           5:12         1.1         1.3         1.6         1.8         2.0         2.1         2.3         3.2         4.0         4.7         5.5           6:12         1.6         1.8         2.0         2.1         2.3         3.2         3.3         4.0         4.7         5.5           7:12         1.8         2.0         2.2         2.3         2.3         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         3.4         4.7         5.6           9:12         2.1         2.3         2.5         2.7		1:12	0.3	0.5	0.7	<u>6.0</u>	1.1	1.2	1.8	2.0	2.3	2.9	3.6	4.4
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           6:12         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         2.1         2.3         3.2         3.3         4.0         4.7         5.5           7:12         1.6         1.8         2.0         2.2         2.3         2.3         3.3         3.4         4.3         5.0         5.8           7:12         1.8         2.0         2.2         2.3         2.3         3.3         3.3         3.3         5.0         5.3         5.0         5.8         5.0         5.8         5.0         5.9         5.0         5.9         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0		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
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		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
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         1.6         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         3.8         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         4.5         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           9:12         2.1         2.3         3.1         3.6         3.7         3.8         4.1         4.7         5.3         60           11:1:12	Do	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
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         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           9:12         2.1         2.3         2.5         2.7         2.8         3.0         3.5         3.6         4.1         4.7         5.3         6.0           10:12         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         2.8         3.0         3.1         3.6         3.8         4.1         4.7         5.3         6.0 <td>wn</td> <td>5:12</td> <td>1.3</td> <td>1.6</td> <td>1.8</td> <td>2.0</td> <td>2.1</td> <td>2.3</td> <td>2.8</td> <td>3.0</td> <td>3.3</td> <td>4.0</td> <td>4.7</td> <td>5.5</td>	wn	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
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         5.8           9:12         2.1         2.3         2.5         2.7         2.8         3.0         3.5         3.6         4.0         4.6         5.1         5.9           9:12         2.1         2.3         2.5         2.7         2.8         3.0         3.5         3.6         4.1         4.7         5.3         6.0           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         2.8         3.0         3.1         3.6         3.7         3.8         4.1         4.7         5.3         6.0           11:12         2.5         2.5         3.3         3.7         3.8         4.1         4.7         5.3         6.0           5s=0.0 <td>S</td> <td>6:12</td> <td>1.6</td> <td>1.8</td> <td>2.0</td> <td>2.2</td> <td>2.3</td> <td>2.5</td> <td>3.0</td> <td>3.2</td> <td>3.5</td> <td>4.2</td> <td>4.8</td> <td>5.6</td>	S	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
0         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         2.1         2.3         2.5         2.7         2.8         3.0         3.1         3.6         4.1         4.7         5.3         60           11:12         2.4         2.6         2.8         3.0         3.1         3.5         3.8         4.1         4.7         5.3         60           11:12         2.4         2.6         2.7         2.9         3.1         3.2         3.7         3.8         4.1         4.7         5.3         60           11:12         2.4         2.5         2.3         3.3         3.7         3.9         4.1         4.7         5.3         60           12:12         2.5         2.5=0.1         55=0.3         55=0.4         55=0.4         55=1.5         55=2.5         55=2.5         55=2.5         55=2.5         55=3.7         55=3.3	op	7:12	1.8	2:0	2.2	2.4	2.5	2.7	3.2	3.4	3.7	4.3	5.0	2.8
3:12         2:1         2:3         2:0         3:0         3:1         3:5         3:0         4:0         4:0         4:0         5:3         5:0 </td <td>e</td> <td>8:12</td> <td>1.9</td> <td>1.2</td> <td>2.3</td> <td>52</td> <td>7.7</td> <td>2.8</td> <td>с. С. С</td> <td>3.5</td> <td>x, x</td> <td>4 i 5</td> <td>5.1</td> <td>5.9 5.9</td>	e	8:12	1.9	1.2	2.3	52	7.7	2.8	с. С. С	3.5	x, x	4 i 5	5.1	5.9 5.9
10:12       2:4       2:6       2:0       5:0       5:1       3:1       3:2       3:7       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         55=0.0       55=0.1       55=0.3       55=0.4       55=0.4       55=1.0       55=1.25       55=1.5       55=2.0       55=2.5       55=3       4.0         0:0       0.2       0.4       0.6       0.8       0.9       1.4       1.6       2.0       2.5       55=2.5		21.5	1.2	5.7 V C	0.7	0.0	Q.7	0.0	0.5 9 0	0.0	0.4	4.0	7.0	ר ה ע
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           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           55 = 0.0         55 = 0.1         55 = 0.3         55 = 0.4         55 = 0.5         55 = 1.0         55 = 1.5         55 = 2.5         55 = 3.3         4.0           0.0         0.2         0.4         0.6         0.8         0.9         1.4         1.6         2.0         2.6         3.3         4.0		11:12	2.4	2.6	2.7	2.9	3.1	3.2	3.7	3.8	4.1	4.7	3 2	90
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		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
0.0 0.2 0.4 0.6 0.8 0.9 1.4 1.6 2.0 2.6 3.3 4.0	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
			0.0	0.2	0.4	0.6	0.8	0.9	1.4	1.6	2.0	2.6	3.3	4.0

Up and Down (psf)

Lateral PAGE B9



140 mph

0 psf

## APPENDIX B Pressure Lookup Tables

7-05 ASCE

Florida (Typical)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

	Bas	ic \	Win	d S	pee	d					G	rou	Ind	Sr	10%	/ Lo	bad	1																															
t. Down (psf)	14.4	21.6	21.5	21.4	21.4	21.3	0.00 7 T	35.5	35.4	35.3	35.2	35.1	17.9	27.5	27.5	27.4	27.3	27.2	46.4	46.3	46.2	46.1	46.0	45.8	20.2	31.4	31.3	31.3	31.2	31.1	53.3	53.2	53.1	53.0	52.9	52.8	Ss = 3.1	4.4	4.7	0.0	n u	0.0	0.0	0.0	0 5	6.0	6.0	6.1	Ss = 3.1 <b>4.0</b>
nt = 60 fl sf) zone 3	-100.1	-92.9	-92.9	-93.0	-93.0	-93.0	47.0	47.4	-42.4	-42.4	-42.5	-42.5	-133.6	-123.9	-124.0	-124.0	-124.0	-124.1	-56.6	-56.7	-56.7	-56.8	-56.8	-56.9	-155.1	-143.9	-143.9	-144.0	-144.0	-144.0	-65.9	-65.9	-65.9	-66.0	-66.0	-66.1	Ss = 2.5	3.6	5. v	7.4	0.4	2.4 V	0 4	0.0	5.2	20	5.3	5.4	Ss = 2.5 <b>3.3</b>
dg. Heigh Pressures (p Zone 2	-63.9	-60.3	-60.3	-60.3	-60.4	-60.4	4 24	-42.4	-42.4	-42.4	-42.5	-42.5	-85.4	-80.6	-80.6	-80.6	-80.7	-80.7	-56.6	-56.7	-56.7	-56.8	-56.8	-56.9	-99.2	-93.6	-93.6	-93.7	-93.7	-93.8	-65.9	-65.9	-65.9	-66.0	-66.0	-66.1	Ss = 2.0	2.9		n 0	0.0	2.5	4.4	4.5	46	4.7	4.7	4.8	Ss = 2.0 2.6
BI0 Up1 Zone 1	-34.9	-31.3	-31.3	-31.3	-31.4	-31.4	1.00-	-35.1	-35.2	-35.2	-35.2	-35.3	-46.8	-42.0	-42.0	-42.1	-42.1	-42.1	-47.0	-47.0	-47.1	-47.1	-47.2	-47.2	-54.5	-48.9	-48.9	-49.0	-49.0	-49.1	-54.7	-54.7	-54.8	-54.8	-54.9	-54.9	Ss = 1.5	2.3	2.6 2	2 r c	1.0	0 c	0.0	3.8	40	4.1	4.1	4.2	Ss = 1.5 2.0
t. Down (psf)	13.5	18.4	18.3	18.2	18.2	18.1	2000	29.8	29.7	29.6	29.4	29.3	16.0	24.3	24.3	24.2	24.1	24.0	40.6	40.5	40.4	40.3	40.2	40.1	18.3	28.2	28.1	28.1	28.0	27.9	47.5	47.4	47.3	47.2	47.1	47.0	Ss = 1.25	2.0	2.3	0.7	0.2	0.0	3.4	9.5 7.5	3.6	8.8	3.8	3.9	Ss = 1.25 1.6
ht = 30 f ssf) zone 3	-82.2	-76.3	-76.3	-76.3	-76.4	-/6.4	0.45-	-34./	-34.7	-34.8	-34.8	-34.9	-115.7	-107.3	-107.3	-107.4	-107.4	-107.4	-49.0	-49.0	-49.1	-49.1	-49.1	-49.2	-137.2	-127.3	-127.3	-127.3	-127.4	-127.4	-58.2	-58.2	-58.3	-58.3	-58.4	-58.4	Ss = 1.0	1.8	1.2	2.2	0.2	0.7	0.5	3.3	2 2	3.6	3.7	3.7	Ss = 1.0 1.4
dg. Heig Pressures (r Zone 2	-52.4	-49.4	-49.4	-49.4	-49.5	-49.5	0.45-	-34./	-34.7	-34.8	-34.8	-34.9	-73.9	-69.7	-69.7	-69.7	-69.8	-69.8	-49.0	-49.0	-49.1	-49.1	-49.1	-49.2	-87.7	-82.7	-82.8	-82.8	-82.8	-82.9	-58.2	-58.2	-58.3	-58.3	-58.4	-58.4	Ss = 0.5	1.2	1.5	x 1	0.2	0.1 1	C'7	2.8	0 8	3.1	3.2	3.3	Ss = 0.5 0.9
BI Up Zone 1	-28.5	-25.5	-25.5	-25.6	-25.6	-25.6	1.02-	-28.7	-28.8	-28.8	-28.8	-28.9	-40.4	-36.3	-36.3	-36.3	-36.3	-36.4	-40.6	-40.7	-40.7	-40.7	-40.8	-40.8	-48.1	-43.2	-43.2	-43.2	-43.3	-43.3	-48.3	-48.3	-48.4	-48.4	48.5	-48.5	Ss = 0.4		1.4	0 F	0 T	1.7	71	3 5	2.8	3.0	3.1	3.2	Ss = 0.4 0.8
t. Down (psf)	13.5	18.4	18.3	18.2	18.2	18.1	27.0	29.8	29.7	29.6	29.4	29.3	14.4	21.6	21.5	21.4	21.4	21.3	35.6	35.5	35.4	35.3	35.2	35.1	16.7	25.4	25.4	25.3	25.2	25.1	42.6	42.4	42.3	42.2	42.1	42.0	Ss = 0.3	6.0	1.2	1 ;	) T	2.2	7.2	2.5	2.7	2.8	2.9	3.0	Ss = 0.3 0.6
ht = 15 f st) zone 3	-82.2	-76.3	-76.3	-76.3	-76.4	- /6.4	0.40	-34./	-34.7	-34.8	-34.8	-34.9	-100.1	-92.9	-92.9	-93.0	-93.0	-93.0	-42.3	-42.4	-42.4	-42.4	-42.5	-42.5	-121.6	-112.9	-112.9	-112.9	-112.9	-113.0	-51.5	-51.6	-51.6	-51.7	-51.7	-51./	Ss = 0.2	0.7	1.0	<u>,</u>	1°1	0.1	0.2 C C	2.2	2.5	2.6	2.7	2.8	Ss = 0.2 0.4
dg. Heig Pressures (1 Zone 2	-52.4	-49.4	-49.4	-49.4	-49.5	-49.5	0.45-	-34./	-34.7	-34.8	-34.8	-34.9	-63.9	-60.3	-60.3	-60.3	-60.4	-60.4	-42.3	-42.4	-42.4	-42.4	-42.5	-42.5	<u> 7.7.7</u>	-73.3	-73.3	-73.4	-73.4	-73.4	-51.5	-51.6	-51.6	-51.7	-51.7	-51./	Ss = 0.1	0.5	8.0	1	1 P	0.1	0.1	2.1	23	2.4	2.6	2.7	Ss = 0.1 0.2
BI Up Zone 1	-28.5	-25.5	-25.5	-25.6	-25.6	0.62-	1.02-	-28./	-28.8	-28.8	-28.8	-28.9	-34.9	-31.3	-31.3	-31.3	-31.4	-31.4	-35.1	-35.1	-35.2	-35.2	-35.2	-35.3	-42.6	-38.2	-38.2	-38.2	-38.3	-38.3	-42.7	-42.8	-42.8	-42.9	-42.9	-43.0	Ss = 0.0	0.3	0.0	0.8	1.1	0.T	0.1	1.0	2.1	2.2	2.4	2.5	Ss = 0.0 0.0
Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	21:/	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	2115	4:12	21.0	21:0	8:12	9.12	10:12	11:12	12:12	
		(	Exp	os	ure	Са	ate	go	ory	В				E	Exp	005	ure	e C	ate	ego	ory	C					Exp	008	sur	ə C	ate	ego	ory	D						C	)ov	vn	Slo	ope	;		_		
													U	D	an	d	Do	w	n (	a'	sf)															I			S	ide	εL	0	ad	(p	sf	)			Latera

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## APPENDIX B Pressure Lookup Tables

7:10 ASCE **110 mph** Basic Wind Speed 5 psf Ground Snow Load

Height = 31 rres (psf) = 2 Zone 3	.6 -29.7	.5 -27.5	-27.5 27.5 27.5	.0 -27.6	.7 -27.6	.2 -12.2	.2 -12.2	-12.2 -12.3	.3 -12.3	.4 -12.4	.6 -42.1	.1 -39.0	.1 -39.0	.1 -39.0	1.0c C		-17.5	.6 -17.6	.6 -17.6	.6 -17.6	.7 -17.7	.7 -50.0	-46.4	-46.4	.0 -46.5	.0 -46.5	-20.9 -20.9	.0 -21.0	.0 -21.0	.0 -21.0	.1 -21.1	0.5 Ss = 1.	4 1.9	2.4	2.4	0 3.3	3./	3.9	8 4.3	9 4.4	0 4.4	1 4.5
Bldg. F Up Pressu Zone 1 Zon	-9.8 -18	-8.7 -17	-8./ -1/	-8.8 -17	-8.8 -17	-9.9 -12	-10.0 -12	-10.0 -12	-10.1 -12	-10.2 -12	-14.2 -26	-12.7 -25	-12.7 -25	-12.7 -25	27- 1.21-	-14.4 -17 -17.4 -17	-14.4 -17	-14.5 -17	-14.5 -17	-14.5 -17	-14.6 -17	-17.0 -31	-15.2 -29	-15.3 -29	-15.3 -30	-15.3 -30	-17.3 -20	-17.3 -21	-17.3 -21	-17.4 -21	-17.4 -21	s = 0.4 Ss =	1.3	1.9	2.4	2.8 2.9	3.1	3.4 3.	3.7 3.	3.8	3.9 4.	4.0 4.
t. Down (psf)	14.8	14.4	14.0	13.2	13.0	13.3	13.2	13.0	12.8	12.7	14.8	14.4	14.0	13.5	13.0	15.4	15.3	15.2	15.0	14.9	14.8	14.8	14.4	13.5	13.2	13.0	18.0	17.7	17.6	17.5	17.4	Ss = 0.3 S	1.1	1.7	7.2	2.6	3.0	3.2	3.6	3.7	3.8	3.8
nt = 15 ft sf) zone 3	- 29.7	-27.5	-2/.5	-27.6	-27.6	-12.2	-12.2	-12.2	-12.3	-12.4	-36.3	-33.6	-33.7	-33.7	-33.7	-15.0	-15.0	-15.1	-15.1	-15.2	-15.2	-44.3	-41.0	-41.1	-41.1	-41.2	-18.5	-18.5	-18.5	-18.6	-18.6	Ss = 0.2	10	1.6	2.0	2.5	Q:7	3.1	3.4	3.6	3.6	3.7
lg. Heigh ressures (ps zone 2	-18.6	-17.5	-17.6	-17.6	-17.7	-12.2	-12.2	-12.2	-12.3	-12.4	-22.9	-21.6	-21.6	-21.6	0'T7-	-15.0	-15.0	-15.1	-15.1	-15.2	-15.2	-28.0	-26.4	-26.4	-26.5	-26.5	-18.5	-18.5	-18.5	-18.6	-18.6	Ss = 0.1	0.8	1:4	۲.I	2.4	Q.2	3.1	3.4	3.5	3.6	3.7
BId Up Pr		-			_	_	0	0 -		2	F.	∞	~	6	סת	n a	2 4	4	4	5	ς.	0	4 4	t 4	S	5	2 2	2	m	m	4	0.										

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## APPENDIX B Pressure Lookup Tables

7:10 ASCE

Southwest (Typical)\*

115 mph

Basic Wind Speed

Ground Snow Load

5 psf

-10.8 $-20.5$ $-32.6$ $-32.6$ $-32.6$ $-32.6$ $-30.2$ $-9.6$ $-9.7$ $-19.3$ $-30.2$ $-30.2$ $-30.2$ $-9.7$ $-9.7$ $-19.3$ $-30.2$ $-30.2$ $-9.7$ $-19.3$ $-30.2$ $-30.2$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-30.2$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-30.2$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-30.2$ $-30.2$ $-111.0$ $-13.4$ $-13.4$ $-13.6$ $-30.2$ $-111.1$ $-13.5$ $-13.6$ $-13.6$ $-30.2$ $-111.1$ $-13.6$ $-13.6$ $-13.6$ $-13.6$ $-111.2$ $-13.16$ $-16.7$ $-30.2$ $-30.2$ $-111.2$ $-13.6$ $-16.7$ $-30.6$ $-13.6$ $-111.2$ $-13.6$ $-16.7$ $-30.6$ $-13.6$ $-111.2$ $-13.6$ $-16.7$	14.8     -       14.4     -       14.4     -       13.5     -       13.5     -       13.5     -       13.5     -       14.1     -       14.2     -       13.2     -       14.1     -       14.2     -       14.1     -       13.2     -       13.6     -       13.7     -       13.6     -       13.7     -       13.6     -       13.7     -       13.6     -       13.7     -       13.6     -       13.6     -       13.6     -       14.0     -       15.1     -       16.3     -       15.9     -       15.9     -       15.9     -	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	32.6         32.6           30.2         30.2           30.2         30.2           30.2         30.2           30.2         30.2           30.2         30.3           30.3         30.3           30.4         30.3           30.5 <th>14.8 14.4 14.0 13.5 13.5</th> <th>-13.4</th> <th>5</th> <th>-39.8 -36.9 -36.9</th> <th>(psf</th>	14.8 14.4 14.0 13.5 13.5	-13.4	5	-39.8 -36.9 -36.9	(psf
9.6. $-9.6.$ $-9.0.2$ $-9.7$ $-9.7$ $-9.0.2$ $-9.7$ $-19.3$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-11.0$ $-13.4$ $-13.4$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-16.7$ $-16.7$ $-11.2$ $-13.6$ $-16.7$	14.4       14.6       13.5       13.5       13.2       13.2       13.2       13.2       14.1       14.2       14.1       14.2       14.1       14.2       14.1       14.2       14.1       14.2       14.1       13.6       13.6       13.6       13.7       13.6       13.6       13.6       13.6       13.7       13.6       14.4       13.5       13.6       14.4       15.5       16.3       15.9       15.9       15.0       15.0       15.1       15.3       14.8       15.9 <th><math display="block">\begin{array}{cccccccccccccccccccccccccccccccccccc</math></th> <th>-30.2           -30.2           -30.2           -30.2           -30.2           -30.2           -13.4           -13.4           -13.5</th> <th>14.4 14.0 13.5</th> <th></th> <th>1.0-</th> <th>-36.9</th> <th>14</th>	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-30.2           -30.2           -30.2           -30.2           -30.2           -30.2           -13.4           -13.4           -13.5	14.4 14.0 13.5		1.0-	-36.9	14
-3.6 $-1.9.3$ $-30.4$ $-9.7$ $-19.3$ $-30.2$ $-9.7$ $-19.3$ $-30.2$ $-9.7$ $-19.3$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-9.7$ $-19.4$ $-30.2$ $-11.0$ $-13.4$ $-13.4$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-13.6$ $-16.7$ $-11.2$ $-13.6$ $-16.7$ $-13.6$ $-16.7$ $-36.9$ $-13.6$ $-16.7$ $-16$	13.5       13.5       13.5       13.5       13.6       14.1       14.2       14.1       14.2       14.1       14.2       13.6       14.1       14.2       13.6       13.6       13.6       13.6       13.6       13.6       13.7       13.6       13.7       13.6       13.7       13.5       13.5       13.5       13.5       13.5       13.5       13.5       14.0       13.5       13.5       14.0       15.1       15.1       16.3       15.9       15.9       15.9       15.9       15.9       15.9       15.9       15.9	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		13.5 13.5	-11.9	- 23.7	-20.4	14
-3.7 $-13.3$ $-30.2$ $-9.7$ $-13.4$ $-30.2$ $-9.7$ $-13.4$ $-30.2$ $-9.7$ $-13.4$ $-30.2$ $-11.0$ $-13.4$ $-30.2$ $-11.0$ $-13.4$ $-30.2$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.5$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.1$ $-13.6$ $-13.6$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-12.0$ $-23.7$ $-36.9$ $-11.2$ $-23.7$ $-36.9$ $-13.6$ $-16.7$ $-36.9$ $-13.6$ $-16.7$ $-36.9$ $-13.6$ $-16.7$ $-$	13.2       13.2       14.2       14.1       14.2       14.1       14.2       13.3       14.1       14.2       13.4       13.5       13.6       13.6       13.6       13.6       13.6       13.6       13.6       13.6       13.5       13.6       13.5       13.5       13.5       13.5       13.5       13.5       13.5       13.5       13.5       14.0       13.5       13.6       14.0       15.1       15.2       16.3       15.9       15.9       14.8       15.9       15.9       15.9       15.9       15.9       15.9	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		13.0	0.21-	1.62-	0.00	4 C
-9.7         -19.4         -30.3           -11.0         -13.4         -13.4           -11.1         -13.4         -13.4           -11.1         -13.5         -13.5           -11.1         -13.5         -13.6           -11.1         -13.5         -13.6           2         -11.1         -13.5         -13.6           2         -11.1         -13.6         -13.6           2         -11.1         -13.6         -13.6           2         -11.1         -13.6         -13.6           2         -11.1         -13.6         -13.6           2         -11.1         -13.6         -13.6           2         -11.2         -13.6         -30.3           2         -11.2         -23.7         -36.9           2         -11.3         -13.6         -16.7           2         -13.7         -16.7         -16.7           2         -13.7         -16.7         -16.7           2         -13.7         -16.7         -16.7           2         -13.7         -16.7         -16.7           2         -13.7         -16.7         -16.7           <	13.0       14.2       14.1       14.1       14.1       13.7       13.6       13.7       13.8       13.6       13.7       13.8       13.6       13.7       13.6       13.7       13.6       13.7       13.6       13.7       13.6       13.7       13.6       13.7       13.6       13.7       13.8       13.0       13.0       13.1       14.0       13.2       13.2       14.4       13.5       14.4       15.9       15.9       15.9       15.9       15.9       14.8	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1 -30.3 -30.3 -30.3 -30.3 -30.3 -13.4 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.5 -13.4 -13.5 -13.4 -13.5 -13.4 -13.5 -13.	10.4	-12.0	-23.8	-37.0	1 1
-11.0 $-13.4$ $-13.4$ $-13.4$ $-11.1.0$ $-13.4$ $-13.4$ $-13.4$ $-11.1.1$ $-13.5$ $-13.5$ $-13.5$ $-11.1.1$ $-13.5$ $-13.6$ $-13.6$ $-11.1.1$ $-13.5$ $-13.6$ $-13.6$ $-11.1.1$ $-13.5$ $-13.6$ $-13.6$ $-11.1.2$ $-13.6$ $-13.6$ $-36.9$ $-11.1.2$ $-13.6$ $-13.6$ $-36.9$ $-11.1.2$ $-13.6$ $-36.9$ $-36.9$ $-11.2.0$ $-23.7$ $-36.9$ $-36.9$ $-11.2.0$ $-23.7$ $-36.9$ $-37.0$ $-11.2.0$ $-23.8$ $-37.0$ $-36.9$ $-11.2.0$ $-23.7$ $-36.9$ $-16.7$ $-11.2.0$ $-23.8$ $-37.0$ $-36.9$ $-11.2.0$ $-23.8$ $-37.0$ $-37.0$ $-11.2.0$ $-16.7$ $-16.7$ $-16.7$ $-11.2.0$ $-16.7$ $-16.7$ $-16.7$ <td>14.2     -       14.1     -       14.1     -       14.0     -       13.8     -       13.6     -       13.7     -       13.8     -       13.6     -       13.7     -       13.6     -       13.6     -       13.7     -       13.6     -       13.6     -       13.5     -       13.5     -       13.5     -       13.5     -       16.5     -       16.3     -       16.3     -       15.9     -       14.8     -</td> <td><math display="block">\begin{array}{cccccccccccccccccccccccccccccccccccc</math></td> <td>1 -13.4 -13.4 -13.5 -13.5 -13.5 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.5 -13.5 -13.5 -13.7 -13.7 -13.4 -13.4 -13.4 -13.4 -13.4 -13.5 -13.</td> <td>13.0</td> <td>-12.1</td> <td>-23.8</td> <td>-37.0</td> <td>13</td>	14.2     -       14.1     -       14.1     -       14.0     -       13.8     -       13.6     -       13.7     -       13.8     -       13.6     -       13.7     -       13.6     -       13.6     -       13.7     -       13.6     -       13.6     -       13.5     -       13.5     -       13.5     -       13.5     -       16.5     -       16.3     -       16.3     -       15.9     -       14.8     -	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1 -13.4 -13.4 -13.5 -13.5 -13.5 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.5 -13.5 -13.5 -13.7 -13.7 -13.4 -13.4 -13.4 -13.4 -13.4 -13.5 -13.	13.0	-12.1	-23.8	-37.0	13
-11.0 $-13.4$ $-13.4$ $-11.11$ $-13.5$ $-13.6$ $-11.11$ $-13.5$ $-13.6$ $-11.11$ $-13.5$ $-13.6$ $-11.11$ $-13.6$ $-13.6$ $-11.11$ $-13.6$ $-13.6$ $-11.11$ $-13.6$ $-13.6$ $-11.12$ $-13.6$ $-13.6$ $-11.12$ $-23.7$ $-36.9$ $-11.12$ $-23.7$ $-36.9$ $-11.12$ $-23.7$ $-36.9$ $-11.12$ $-23.7$ $-36.9$ $-11.12$ $-23.7$ $-36.9$ $-11.20$ $-23.7$ $-36.9$ $-12.01$ $-23.7$ $-36.9$ $-12.01$ $-23.7$ $-36.9$ $-12.01$ $-12.01$ $-16.7$ $-13.6$ $-16.7$ $-16.7$ $-13.6$ $-16.7$ $-16.7$ $-13.6$ $-16.7$ $-16.7$ $-13.6$ $-16.7$ $-16.7$ $-13.6$ $-16.7$	14.1     -       14.0     -       13.7     -       13.7     -       13.7     -       13.7     -       13.7     -       13.6     -       13.7     -       13.6     -       13.6     -       13.6     -       13.6     -       13.6     -       13.5     -       13.5     -       13.5     -       13.5     -       13.5     -       13.5     -       15.9     -       16.3     -       16.3     -       15.9     -       16.3     -       16.3     -       15.9     -       15.9     -	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1 -13.4 -13.5 -13.5 -13.5 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6 -13.6	14.2	-13.6	-16.5	-16.5	16
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	13.7     -       13.6     -       14.8     -       14.4     -       14.4     -       13.5     -       13.5     -       13.5     -       13.5     -       13.6     -       13.2     -       13.2     -       13.5     -       13.6     -       16.3     -       16.3     -       15.9     -       15.9     -       14.8     -	11.1 -13.6 11.2 -13.6 15.6 -29.2 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 15.9 -19.2 15.9 -19.2 15.5 -19.2	-13.6 -13.6 -13.6 -46.1 -42.7	13.8	-13.7	-16.6	-16.6	H
	13.6     -       14.8     -       14.4     -       14.4     -       14.0     -       13.5     -       13.5     -       13.6     -       13.7     -       13.8     -       13.0     -       13.2     -       13.5     -       16.5     -       16.3     -       15.9     -       15.9     -       14.8     -	11.2 -13.6 15.6 -29.2 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 15.9 -19.2 15.9 -19.2 15.9 -19.2	-13.6 -46.1 -42.7	13.7	-13.7	-16.7	-16.7	ä
-13.4         -25.1         -30.8           -11.9         -23.7         -36.9           -11.0         -23.7         -36.9           -12.0         -23.7         -36.9           -12.0         -23.7         -36.9           -12.0         -23.7         -36.9           -12.0         -23.8         -37.0           -12.0         -23.8         -37.0           -12.0         -23.8         -37.0           -12.0         -23.8         -37.0           -12.0         -23.8         -37.0           -13.6         -16.5         -16.5           -13.5         -16.6         -16.5           -13.7         -16.7         -16.7           -13.7         -16.7         -16.7           -13.8         -16.7         -16.7           -13.7         -16.7         -16.7           -13.8         -16.7         -16.7           -14.8         -29.0         -48.1           -14.8         -29.0         -45.0           -14.8         -29.0         -45.1           -16.8         -20.4         -20.4           -16.8         -20.4         -20.4 <t< td=""><td>14.8         -           14.4         -           14.0         -           14.0         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.6         -           16.5         -           16.3         -           16.3         -           15.9         -           14.8         -</td><td>15.6 -29.2 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 15.9 -19.2 15.9 -19.2 15.9 -19.2</td><td>-46.1</td><td>13.6</td><td>-13.8</td><td>-16.7</td><td>-16.7</td><td>5</td></t<>	14.8         -           14.4         -           14.0         -           14.0         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.6         -           16.5         -           16.3         -           16.3         -           15.9         -           14.8         -	15.6 -29.2 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 15.9 -19.2 15.9 -19.2 15.9 -19.2	-46.1	13.6	-13.8	-16.7	-16.7	5
-11.9 $-23.7$ $-36.9$ $-12.0$ $-23.7$ $-36.9$ $-12.0$ $-23.7$ $-36.9$ $-12.0$ $-23.7$ $-36.9$ $-12.0$ $-23.7$ $-36.9$ $-12.0$ $-23.8$ $-37.0$ $-12.0$ $-23.8$ $-37.0$ $-12.1$ $-23.8$ $-37.0$ $-12.6$ $-16.5$ $-16.5$ $-13.6$ $-16.5$ $-16.6$ $-13.6$ $-16.7$ $-16.7$ $-13.7$ $-16.7$ $-16.7$ $-13.7$ $-16.7$ $-16.7$ $-13.7$ $-16.7$ $-16.7$ $-13.7$ $-16.7$ $-16.7$ $-13.8$ $-16.7$ $-20.0$ $-14.8$ $-29.0$ $-48.5$ $-14.8$ $-29.0$ $-45.0$ $-14.8$ $-29.0$ $-46.5$ $-14.8$ $-29.0$ $-45.0$ $-14.8$ $-29.0$ $-46.5$ $-16.6$ $-20.4$ <t< td=""><td>14.4         -           14.0         -           14.0         -           13.5         -           13.5         -           13.2         -           13.2         -           13.2         -           13.2         -           13.2         -           13.2         -           13.2         -           16.5         -           16.2         -           16.3         -           15.9         -           14.8         -</td><td>14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.2 -19.2 15.9 -19.2 15.9 -19.3</td><td>42.7</td><td>14.8</td><td>-18.2</td><td>-33.8</td><td>-53.4</td><td>12</td></t<>	14.4         -           14.0         -           14.0         -           13.5         -           13.5         -           13.2         -           13.2         -           13.2         -           13.2         -           13.2         -           13.2         -           13.2         -           16.5         -           16.2         -           16.3         -           15.9         -           14.8         -	14.0 -27.5 14.0 -27.5 14.0 -27.5 14.0 -27.5 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.1 -27.6 14.2 -19.2 15.9 -19.2 15.9 -19.3	42.7	14.8	-18.2	-33.8	-53.4	12
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-12.0       -23.7       -36.9         -12.1       -23.8       -37.0         -12.1       -23.8       -37.0         -12.1       -23.8       -37.0         -13.6       -16.5       -16.5         -13.6       -16.5       -16.6         -13.6       -16.6       -16.7         2       -13.7       -16.7       -16.7         2       -13.7       -16.7       -16.7         2       -13.7       -16.7       -16.7         2       -13.7       -16.7       -16.7         2       -13.7       -16.7       -16.7         2       -13.7       -16.7       -16.7         2       -13.8       -16.7       -16.7         2       -13.8       -16.7       -16.7         2       -13.8       -16.7       -20.0         2       -14.8       -29.0       -48.5         2       -14.8       -29.0       -45.0         2       -14.8       -20.0       -45.0         2       -16.8       -20.4       -20.4         2       -16.8       -20.4       -20.4         2       -16.8       -20.4	13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           13.5         -           16.5         -           16.4         -           16.3         -           16.3         -           16.0         -           15.9         -           14.8         -	14.0         -27.5           14.0         -27.6           14.1         -27.6           15.8         -19.2           15.9         -19.2           15.9         -19.3           15.9         -19.3	47.1	14.0	-16.3	-31.9	-49.5	12
-12.0 $-23.8$ $-37.0$ $-12.1$ $-23.8$ $-37.0$ $-12.1$ $-23.8$ $-37.0$ $-13.6$ $-16.5$ $-16.5$ $-13.6$ $-16.5$ $-16.6$ $-13.6$ $-16.6$ $-16.6$ $2$ $-13.6$ $-16.7$ $-16.7$ $2$ $-13.7$ $-16.7$ $-16.7$ $2$ $-13.7$ $-16.7$ $-16.7$ $2$ $-13.7$ $-16.7$ $-16.7$ $2$ $-13.7$ $-16.7$ $-16.7$ $2$ $-13.7$ $-16.7$ $-16.7$ $2$ $-13.8$ $-16.7$ $-20.0$ $2$ $-13.8$ $-16.7$ $-20.0$ $2$ $-14.8$ $-29.0$ $-48.5$ $2$ $-14.8$ $-29.0$ $-48.5$ $2$ $-14.8$ $-29.0$ $-48.6$ $2$ $-14.8$ $-29.0$ $-48.5$ $2$ $-14.8$ $-29.0$ $-48.5$ $2$ $-14.8$ $-29.0$ $-48.5$ <tr< td=""><td>13.2 - 13.2 - 13.2 - 16.5 - 16.4 - 16.3 - 16.3 - 16.3 - 16.3 - 16.2 - 15.9 - 15.9 - 14.8 - 14</td><td>14.0 -27.6 14.1 -27.6 15.8 -19.2 15.9 -19.3 15.9 -19.3</td><td>-42.8</td><td>13.5</td><td>-16.3</td><td>-32.0</td><td>49.5</td><td>-</td></tr<>	13.2 - 13.2 - 13.2 - 16.5 - 16.4 - 16.3 - 16.3 - 16.3 - 16.3 - 16.2 - 15.9 - 15.9 - 14.8 - 14	14.0 -27.6 14.1 -27.6 15.8 -19.2 15.9 -19.3 15.9 -19.3	-42.8	13.5	-16.3	-32.0	49.5	-
-12.1     -23.8     -37.0       -12.1     -23.8     -37.0       -13.6     -16.5     -16.5       -13.6     -16.5     -16.6       2     -13.6     -16.5     -16.6       2     -13.6     -16.6     -16.6       2     -13.7     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -20.0       2     -14.7     -29.0     -45.0       2     -14.8     -29.0     -45.1       2     -14.8     -29.0     -45.1       2     -14.8     -20.1     -45.1       2     -16.7     -20.2     -20.3       2     -16.8     -20.4     -20.4       2     -16.8     -20.4     -20.4       2     -16.9     -20.4     -20.4       2     -16.9     -20.4     -20.4       2     -16.9     -20.4     -20.4       2	13.0 - 16.5 - 16.4 - 16.3 - 16.2 - 15.9 - 15.9 - 14.8 -	14.1 -27.6 15.8 -19.2 15.9 -19.2 15.9 -19.3	42.8	13.2	-16.4	-32.0	-49.5	-
13.6     -16.5     -16.5       -13.6     -16.5     -16.5       2     -13.6     -16.5     -16.5       2     -13.7     -16.6     -16.6       2     -13.7     -16.7     -16.7       2     -13.7     -16.7     -16.7       2     -13.7     -16.7     -16.7       2     -13.7     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -14.7     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -20.4     -20.4       2     -16.8     -20.4     -20.4       2     -16.8     -20.4     -20.4       2     -16.9     -20.4     -20.4       2     1.6     1.6     -10.1       2     1.6     1.4     1.4       1.4     1.4     1.4     2.5	16.5 - 16.4 - 16.3 - 16.2 - 16.0 - 15.9 - 14.8 -	15.8 -19.2 15.9 -19.2 15.9 -19.3	-42.8	13.0	-16.4	-32.0	-49.6	-
-13.6     -16.5     -16.5       2     -13.7     -16.6     -16.5       2     -13.7     -16.6     -16.7       2     -13.7     -16.7     -16.7       2     -13.3     -16.7     -16.7       2     -13.3     -16.7     -16.7       2     -13.3     -16.7     -16.7       2     -13.3     -16.7     -16.7       2     -13.8     -16.7     -16.7       2     -13.8     -29.0     -45.0       2     -14.3     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -29.0     -45.0       2     -14.8     -20.4     -20.4       2     -16.7     -20.3     -20.3       2     -16.8     -20.4     -20.4       2     -16.8     -20.4     -20.4       2     -16.9     -20.4     -20.4       2     -16.9     -20.4     -20.4       2     -16.9     -20.4     -20.4       2     -16.9     -20.4 <td>16.4 - 16.3 - 16.2 - 16.0 - 15.9 - 14.8 -</td> <td>15.9 -19.2 15.9 -19.3</td> <td>-19.2</td> <td>18.6</td> <td>-18.4</td> <td>-22.3</td> <td>-22.3</td> <td></td>	16.4 - 16.3 - 16.2 - 16.0 - 15.9 - 14.8 -	15.9 -19.2 15.9 -19.3	-19.2	18.6	-18.4	-22.3	-22.3	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16.3 - 16.2 - 16.0 - 15.9 - 14.8 -	15.9 -19.3	-19.2	18.4	-18.4	-22.3	-22.3	2
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16.0 - 15.9 - 14.8 -	15.9 -19.5 -	-19.3	18.2	-18.5	-22.4	-22.4	2
2         -13.8         -16.7         -16.7         -16.7           2         -13.8         -16.5         -30.7         -48.5           2         -14.7         -29.0         -46.0         -46.0           2         -14.8         -29.0         -45.0         -46.0           2         -14.8         -29.0         -45.0         -45.0           2         -14.8         -29.0         -45.1         -45.1           2         -14.8         -29.0         -45.1         -45.1           2         -14.8         -29.0         -45.1         -45.1           2         -14.8         -29.0         -45.1         -45.1           2         -14.8         -29.0         -45.1         -45.1           2         -14.8         -29.0         -45.0         -45.1           2         -16.7         -20.2         -20.2         -20.2           2         -16.8         -20.4         -20.4         -20.4           2         -16.8         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4 <td>15.9 -</td> <td>16.0 -19.4</td> <td>-19.4</td> <td>18.1</td> <td>-18.6</td> <td>-22.5</td> <td>-22.5</td> <td>2</td>	15.9 -	16.0 -19.4	-19.4	18.1	-18.6	-22.5	-22.5	2
-16.5         -30.7         -48.5           -14.7         -29.0         -45.0           -14.8         -29.0         -45.0           -14.8         -29.0         -45.0           -14.8         -29.0         -45.0           -14.8         -29.0         -45.0           -14.8         -29.0         -45.1           -14.8         -29.0         -45.1           -14.8         -29.0         -45.1           -14.9         -29.1         -45.1           -14.9         -29.1         -45.1           -14.9         -29.1         -45.1           -16.7         -20.3         -20.2           -16.8         -20.4         -20.4           -16.8         -20.3         -20.4           -16.8         -20.4         -20.4           -16.8         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4 <td< td=""><td>14.8 -</td><td>16.0 -19.4</td><td>-19.4</td><td>17.9</td><td>-18.6</td><td>-22.5</td><td>-22.5</td><td>2</td></td<>	14.8 -	16.0 -19.4	-19.4	17.9	-18.6	-22.5	-22.5	2
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		18.7 -34.8	-54.8	14.8	-21.3	-39.4	-62.1	-
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-14.8         -29.0         -45.1           -14.9         -29.1         -45.1           -16.7         -20.2         20.2           -16.7         -20.3         20.3           -16.7         -20.3         20.3           -16.8         -20.4         -20.3           -16.8         -20.4         -20.4           -16.8         -20.4         -20.4           -16.8         -20.4         -20.4           -16.8         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4           -16.9         -20.4         -20.4           -20.4         -20.4         -20.4           -20.4         -20.4         -20.4           -16.9         -20.4         -20.4           -20.10         55 = 0.1         55 = 0.2           2         1.4         1.6           2         1.9         2.6           2         2.4         2.4         2.5           2         2.8         2.8         2.8	13.5 -	16.8 -32.8	-50.9	13.8	-19.1	-37.2	-57.6	-
·         -14.9         -29.1         -45.1           ·         -16.7         -20.2         -20.2           ·         -16.7         -20.3         -20.3           ·         -16.8         -20.3         -20.3           ·         -16.8         -20.4         -20.4           ·         -16.8         -20.4         -20.4           ·         -16.8         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         -16.9         -20.4         -20.4           ·         0.7         0.8         1.0           ·         1.4         1.4         1.6           ·         1.9         2.4         2.5           ·         2.8         2.8         2.8	13.2 -	16.8 -32.9	-50.9	13.6	-19.2	-37.3	-57.6	-
:         -16.7         -20.2         -20.2           :         -16.7         -20.3         -20.3           :         -16.8         -20.3         -20.3           2         -16.8         -20.4         -20.4           2         -16.8         -20.4         -20.4           2         -16.8         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         0.8         1.4         1.6           2         1.9         1.9         2.0           2         2.8         2.8         2.8           2	13.0 -	16.9 -32.9	-50.9	13.5	-19.2	-37.3	-57.7	-
·         -16.7         -20.3         -20.3         -20.3           ·         -16.8         -20.3         -20.3         -20.3           2         -16.8         -20.4         -20.4         -20.4           2         -16.8         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         -16.9         -20.4         -20.4         -20.4           2         0.7         0.8         1.0         -20.4           2         1.4         1.4         1.6         -20.4           2         2.8         2.8         2.8         2.8           2         2.8         2.8         2.8         2.8	- 19.3	18.9 -22.9	-22.9	21.3	-21.5	-26.0	-26.0	
:         -16.8         -20.3         -20.3           2         -16.8         -20.4         -20.4           2         -16.8         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         0.7         0.8         1.0           2         1.9         1.9         2.0           2         2.8         2.8         2.8           2         2.8         2.8         2.8	19.2 -	19.0 -23.0	-23.0	21.2	-21.6	-26.1	-26.1	2
2         -16.8         -20.4         -20.4           2         -16.8         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         -16.9         -20.4         -20.4           2         14.0         1.5         1.0           2         1.9         1.9         2.0           2         1.9         1.9         2.0           2         2.8         2.8         2.8           2.4         2.8         2.8         2.8           2.3         2.8         2.8         2.8	- 1.01	19.0 -23.0	-23.0	21.1	-21.6	-26.1	-26.1	2
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	- 19.0	19.0 -23.0	-23.0	21.0	-21.6	-26.2	-26.2	2
z         -10-3         -20.4         -20.4           kth         5s = 0.0         Ss = 0.1         Ss = 0.2         S           2         0.7         0.8         1.0         S         S           2         1.4         1.4         1.6         S	18.8	19.1 -23.1	-23.1	20.9	-21.7	-26.2	-26.2	
cm         55 = 0.0         55 = 0.1         55 = 0.2         5           c         0.7         0.8         1.0           c         1.4         1.4         1.6           p         1.9         2.0           p         2.4         2.5           p         2.8         2.8           p         2.8         2.8	- /.01	T27 - 72'	1.62-	20.7	/	- 20.2		4
0.7         0.0         1.0           1.4         1.4         1.4         1.6           2         1.9         1.9         2.0           2         2.4         2.4         2.5           2         2.8         2.8         2.8           2         2.8         2.8         2.8	55 U.3 26	1 2 1 35 = U.	0 T = SC _ C	C2.1 = 2C	C.L = 2C	0.2 = 20	C.2 = 20	8
2.1.9         1.9         2.0           2.4         2.4         2.5           2.8         2.8         2.8	1.7	1.9 2.0	4.0	2.6	0.0	3.6	4.3	
2.4 2.4 2.5 2.8 2.8 2.8 2.8	2.2	2.4 2.5	2.9	3.1	3.4	3.9	4.6	1
2.8 2.8 2.8	2.6	2.8 2.9	3.3	3.5	3.8	43	4.9	
	3.0	3.1 3.2	3.7	3.8	4.1	4.6	5.2	ľ
3.1 3.1 3.1	3.2	3.4 3.5	3.9	4.1	4.3	4.9	5.4	Ĩ
2.3 3.3 3.3	3.4	3.6 3.7	4.1	4.3	4.5	5.1	5.6	۳ <b>۳</b>
2. 3.4 3.4 3.4	3.6	3.7 3.8	4.3	4.4	4.7	5.2	5.7	Ű
3.5 3.5 3.6	3.7	3.8 3.9	4.4	4.5	4.8	5.3	5.8	<u> </u>
2 3.6 3.6 3.6	3.8	3.9 4.0	4.4	4.6	4.8	5.3	5.8	-
2 3.7 3.7 3.7	3.8	4.0 4.1	4.5	4.6	4.9	5.3	5.9	-
2 3.7 3.7 3.7	3.9	4.0 4.1	4.5	4.6	4.9	5.3	5.9	-
Ss = 0.0 Ss = 0.1 Ss = 0.2 S	Sc = 0.3 Sc	:= 0.4 Ss = 0.	5 Ss = 1.0	Ss = 1.25	Ss = 1.5	Ss = 2.0	Ss = 2.5	18

Up and Down (psf)

Lateral PAGE B12



115 mph

## APPENDIX B Pressure Lookup Tables

\* 7:10 IIIS ASCE

Mid US (Medium Snow)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

t	Jas	SIC	Win	dS	spe	ed					(	iro	und	Sr	101	V LO	bac	1																																
Lown (psf)	25.9	24.6	23.1	21.6	20.1	18.7	20.1	18.9	17.9	17.0	16.2	15.9	25.9	24.7	23.2	21.7	20.2	18.8	23.3	22.2	21.1	20.5	20.4	20.3	25.9	25.9	24.4	22.8	21.4	19.9	25.4	24.3	23.4	23.2	23.1	Ss = 3.1	5.0	6.3	7.4	8.2	8.8	9.1	9.2	9.2	9.2	9.0	8.8	8.6	Ss = 3.1	4.5
sf) Zone 3	-39.8	-36.9	-36.9	-36.9	-37.0	-37.0	-16.5	-16.5	-16.6	-16.6	-16.7	-16.7	-53.4	-49.5	-49.5	-49.5	-49.5	-49.6	-22.3	-22.3	-22.4	-22.4	-22.5	-22.5	-62.1	-57.5	-57.6	-57.6	-57.6	-57.7	-26.0	-26.1	-26.1	-26.2	-26.2	Ss = 2.5	4.3	5.7	6.7	7.6	8.1	8.4	8.6	8.6	8.5	8.4	8.2	8.0	Ss = 2.5	3.6
ressures (p Zone 2	-25.1	-23.7	-23.7	-23.7	-23.8	-23.8	-16.5	-16.5	-16.6	-16.6	-16.7	-16.7	-33.8	-31.9	-31.9	-32.0	-32.0	-32.0	-22.3	-22.3	-22.4	-22.4	-22.5	-22.5	-39.4	-37.2	-37.2	-37.2	-37.3	-37.3	-26.0	-26.1	- 26.1	- 26.2	-26.2	Ss = 2.0	3.8	5.1	6.2	7.0	7.6	7.9	8.1	8.1	8.0	7.9	7.7	7.5	Ss = 2.0	2.9
Up F Zone 1	-13.4	-11.9	-12.0	-12.0	-12.0	-12.1	-13.6	-13.6	-13.6	-13.7	-13.7	-13.8	-18.2	-16.3	-16.3	-16.3	-16.4	-16.4	-18.4	-18.4	-18.5	-18.5	-18.6	-18.6	-21.3	-19.1	-19.1	-19.1	-19.2	-19.2	-21.5	-21.6	-21.6	-21.7	-21.7	Ss = 1.5	3.2	4.6	5.6	6.4	7.0	7.4	7.5	7.6	7.5	7.4	7.2	7.0	Ss = 1.5	2.2
L Down (psf)	25.9	24.6	23.1	21.6	20.1	18.7	18.3	17.2	16.1	15.2	14.4	13.8	25.9	24.6	23.1	21.6	20.1	18.7	21.6	20.4	19.4	18.5	18.1	17.9	25.9	24.9	23.4	21.9	20.4	19.0	23.7	22.5	21.5	20.9	20.7	Ss = 1.25	2.9	4.3	5.4	6.2	6.7	7.1	7.3	7.3	7.3	7.1	7.0	6.8	Ss = 1.25	1.8
sf) Zone 3	-32.6	-30.2	-30.2	-30.2	-30.2	-30.3	-13.4	-13.4	-13.5	-13.5	-13.6	-13.6	-46.1	-42.7	-42.7	-42.8	-42.8	-42.8	-19.2	-19.2	-19.3	-19.3	-19.4	-19.4	-54.8	-50.8	-50.8	-50.9	-50.9	-50.9	-22.9	-23.0	-23.0	-23.1	-23.1	Ss = 1.0	2.8	4.1	5.2	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.7	Ss = 1.0	1.6
Pressures (p Zone 2	-20.5	-19.3	-19.3	-19.3	-19.4	-19.4	-13.4	-13.4	-13.5	-13.5	-13.6	-13.6	-29.2	-27.5	-27.5	-27.5	-27.6	-27.6	-19.2	-19.2	-19.3	-19.3	-19.4	-19.4	-34.8	-32.8	-32.8	-32.8	-32.9	-32.9	-22.9	-23.0	-23.0	-23.1	-23.1	Ss = 0.5	2.3	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.5	1.0
Up F Zone 1	-10.8	-9.6	-9.6	-9.7	-9.7	-9.7	-11.0	-11.0	-11.1	-11.1	-11.1	-11.2	-15.6	-14.0	-14.0	-14.0	-14.0	-14.1	-15.8	-15.9	-15.9	-15.9	-16.0	-16.0	-18.7	-16.8	-16.8	-16.8	-16.8	-16.9	-18.9	-19.0	-19.0	-19.1	-19.1	Ss = 0.4	2.2	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	9.9	Ss = 0.4	6.0
Down (psf)	25.9	24.6	23.1	21.6	20.1	18.7	18.3	17.2	16.1	15.2	14.4	13.8	25.9	24.6	23.1	21.6	20.1	18.7	20.1	18.9	17.9	17.0	16.2	15.9	25.9	24.6	23.1	21.6	20.1	18.7	22.2	21.0	20.0	13.1	18.7	Ss = 0.3	2.1	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	9.9	Ss = 0.3	0.7
sf) Zone 3	-32.6	-30.2	-30.2	-30.2	-30.2	-30.3	-13.4	-13.4	-13.5	-13.5	-13.6	-13.6	-39.8	-36.9	-36.9	-36.9	-37.0	-37.0	-16.5	-16.5	-16.6	-16.6	-16.7	-16.7	-48.5	-45.0	-45.0	-45.0	-45.1	-45.1	-20.2	-20.3	- 20.3	- 20.4	-20.4	Ss = 0.2	2.0	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	9.9	Ss = 0.2	0.5
Pressures (p Zone 2	-20.5	-19.3	-19.3	-19.3	-19.4	-19.4	-13.4	-13.4	-13.5	-13.5	-13.6	-13.6	-25.1	-23.7	-23.7	-23.7	-23.8	-23.8	-16.5	-16.5	-16.6	-16.6	-16.7	-16.7	-30.7	-29.0	-29.0	-29.0	-29.0	-29.1	-20.2	-20.3	-20.3	-20.4	-20.4	Ss = 0.1	2.0	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	9.9	Ss = 0.1	0.2
Up I Zone 1	-10.8	-9.6	-9.6	-9.7	-9.7	-9.7	-11.0	-11.0	-11.1	-11.1	-11.1	-11.2	-13.4	-11.9	-12.0	-12.0	-12.0	-12.1	-13.6	-13.6	-13.6	-13.7	-13.7	-13.8	-16.5	-14.7	-14.8	-14.8	-14.8	-14.9	-16.7	-16.7	-16.8	-16.8	-16.9	Ss = 0.0	2.0	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	9.9	Ss = 0.0	0.0
Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12		
			l Exp	oos	ure	ə C	at	eg	l IOF	y B				6	Exp	005	sur	e C	Cat	eg	ory	C				E	I Exp	bos	ure	ə C	ate	ego	ory	D						Do	w	n S	lop	be						

Up and Down (psf)

25 psf

Lateral PAGE B13



## APPENDIX B Pressure Lookup Tables

7:10 ASCE 115 mph

Basic Wind Speed

40 psf

Image         Teneral parts         Teneral parts <th>-90</th> <th>Heig</th> <th>ht = 15 f</th> <th>ا نړ</th> <th>8</th> <th>dg. Heig</th> <th>ht = 30 f</th> <th>ہ۔ ہے</th> <th>8</th> <th>ldg. Heig</th> <th>ght = 60 f</th> <th>، نہ</th>	-90	Heig	ht = 15 f	ا نړ	8	dg. Heig	ht = 30 f	ہ۔ ہے	8	ldg. Heig	ght = 60 f	، نہ
0         1	Pressures (psr) Zone 2 Z	<u> </u>	one 3	(psf)	up Zone 1	Pressures ( Zone 2	zone 3	(psf)	up Zone 1	Pressures ( Zone 2	psr) Zone 3	(psf)
-2 $-300$ $-90$ $-193$ $-300$ $-104$ $-105$ $-105$ $-105$ $-105$ $-105$ $-205$ <th>-20.5</th> <th></th> <th>32.6</th> <th>31.9</th> <th>-10.8</th> <th>-20.5</th> <th>-32.6</th> <th>31.9</th> <th>-13.4</th> <th>-25.1</th> <th>-39.8</th> <th>31.9</th>	-20.5		32.6	31.9	-10.8	-20.5	-32.6	31.9	-13.4	-25.1	-39.8	31.9
2         5.8         -9.7         -19.3         -30.2         2.58         -1.0         -3.83         -1.0         -3.83         -3.0         2.38         -3.7         2.38         -3.7         2.38         -3.7         2.38         -3.7         2.38         -3.7         2.38         -3.7         2.38         -3.7         2.55         -1.55         -2.55         -2.55         -2.55         -2.55         -2.55         -2.55         -2.55         -2.55          10         213	-19.3 -3	ဂုက္	0.2	27.9	0.6- 9.6	-19.3	-30.2	27.9	-11.9	-23.7	-36.9	27.9
2         238         -9.7         -19.4         -30.2         238         -7.0         238         -3.70         238           3         11.1         11.3         -13.4         13.4         13.4         13.6         -16.5         -16.5         -16.5         -15.5         -13.8         -3.30         21.9         -17.1         17.6         16.6         19.8         -17.1         13.6         13.4         13.6         13.7         16.6         16.6         13.6         13.7         16.7	-19.3 -3	ę	0.2	25.8	-9.7	-19.3	-30.2	25.8	-12.0	-23.7	-36.9	25.8
3         219         -9.7         -19.4         -303         219         -11.1         -13.3         -11.5         -15.6         -16.5         -16.5         -16.5         -16.5         -16.5         -16.5         -13.5         -13.5         -13.5         -13.5         -13.5         -13.5         -13.5         -15.7         -16.7         -17.5         -23.3 <td>-19.4 -3</td> <td>٣</td> <td>0.2</td> <td>23.8</td> <td>-9.7</td> <td>-19.4</td> <td>-30.2</td> <td>23.8</td> <td>-12.0</td> <td>-23.8</td> <td>-37.0</td> <td>23.8</td>	-19.4 -3	٣	0.2	23.8	-9.7	-19.4	-30.2	23.8	-12.0	-23.8	-37.0	23.8
4         6.1.1         -1.1.4         -1.3.4         -1.3.4         1.3.4 <th< td=""><td>-19.4 -3</td><td>٩ŀ</td><td>0.3</td><td>21.9</td><td>-9.7</td><td>-19.4</td><td>-30.3</td><td>21.9</td><td>-12.1</td><td>-23.8</td><td>-37.0</td><td>21.9</td></th<>	-19.4 -3	٩ŀ	0.3	21.9	-9.7	-19.4	-30.3	21.9	-12.1	-23.8	-37.0	21.9
a         a	-12.4 -12	7	4. 4	10 5	-11 0	4707-	-12 A	105	-13.6	2 91-	16.5	0.12
0         1         1         13.5 <td>-13.5 -13</td> <td>17</td> <td>t ur</td> <td>18.1</td> <td>-11.1</td> <td>-13.5</td> <td>-13.5</td> <td>18.1</td> <td>-13.6</td> <td>-16.6</td> <td>-16.6</td> <td>19.8</td>	-13.5 -13	17	t ur	18.1	-11.1	-13.5	-13.5	18.1	-13.6	-16.6	-16.6	19.8
6         15.8         -11.1         -13.6         -13.6         13.6         13.6         13.6         13.6         13.6         13.6         13.6         13.6         13.6         14.7         16.7 <th< td=""><td>-13.5 -13</td><td>1 <del>1</del></td><td>5</td><td>16.9</td><td>-11.1</td><td>-13.5</td><td>-13.5</td><td>16.9</td><td>-13.7</td><td>-16.6</td><td>-16.6</td><td>18.6</td></th<>	-13.5 -13	1 <del>1</del>	5	16.9	-11.1	-13.5	-13.5	16.9	-13.7	-16.6	-16.6	18.6
6         14.9         -11.2         -13.6         -13.6         13.6         13.6         -16.7         21.6         23.2         23.13         23.14         23.13         23.13         23.14         23.13         23.14         23.13         23.14         23.13         23.14         23.13         23.14         23.13         23.14         23.13         23.14         23.13         23.14         23.13         23.14         23.13	-13.6 -13	-13	9	15.8	-11.1	-13.6	-13.6	15.8	-13.7	-16.7	-16.7	17.6
8         31.0         -15.6         -29.2         -46.1         31.0         -15.6         -29.2         -46.1         31.0         -49.5         30.1           9         30.0         -14.0         -77.5         -42.7         30.0         -14.0         27.5         -42.7         30.0         -49.5         28.0           9         20.2         -14.0         -77.5         -42.8         23.8         -14.6         -27.5         -49.5         28.0         249.5         28.0           0         23.8         -14.0         -77.5         -42.8         23.8         -14.9         27.0         249.5         28.0           0         23.18         -13.5         -19.3         -19.2         21.9         -19.3         22.1         22.1         22.1         23.1	-13.6 -13	Ξ.	Ģ	14.9	-11.2	-13.6	-13.6	14.9	-13.8	-16.7	-16.7	16.7
9         30.0         -14.0         27.5         42.7         30.0         -16.3         -31.9         49.5         30.1           9         27.9         -14.0         27.5         42.7         27.9         -16.3         -31.9         49.5         281.1           9         27.8         -14.0         27.5         42.8         23.8         -14.0         27.5         28.2	-25.1 -39	66-	~	31.9	-15.6	-29.2	-46.1	31.9	-18.2	-33.8	-53.4	31.9
9         27.9         -14.0         27.5         42.7         27.9         -16.3         -32.0         49.5         28.1           9         25.8         -14.0         27.5         42.8         25.8         -16.6         -32.0         49.5         25.0           0         233.8         -14.0         27.5         42.8         23.3         -16.4         -32.0         49.5         25.0           5         212.3         -15.9         -19.3         -19.3         21.9         -14.1         27.4         21.3         22.3         24.3	-23.7 -36.	-36	<del>م</del>	30.0	-14.0	-27.5	-42.7	30.0	-16.3	-31.9	-49.5	30.1
9         25.8         -14.0         -27.5         -42.8         23.8         -16.4         -32.0         -49.5         23.0           0         23.8         -14.0         -77.6         -42.8         23.8         -16.4         -32.0         -49.5         23.0           5         21.9         -14.1         -77.6         -42.8         21.9         -16.4         -32.0         -49.5         23.0           5         21.2.8         -19.2         -19.2         13.2         -18.4         -22.4         22.1         24.0         23.0           5         21.12         -15.9         -19.3         -19.3         20.1         18.6         -22.4         22.1         23.0         23.0           6         18.6         -15.9         -19.3         19.1         18.7         -18.8         23.0 <td< td=""><td>-23.7 -36.</td><td>-36.</td><td>6</td><td>27.9</td><td>-14.0</td><td>-27.5</td><td>-42.7</td><td>27.9</td><td>-16.3</td><td>-31.9</td><td>-49.5</td><td>28.1</td></td<>	-23.7 -36.	-36.	6	27.9	-14.0	-27.5	-42.7	27.9	-16.3	-31.9	-49.5	28.1
0         23.8         -14.0         -27.6         -42.8         23.3         -16.4         -32.0         -49.5         23.3           0         21.9         -14.1         -27.6         -42.8         21.9         -16.4         -22.0         -49.5         22.0           5         22.18         -15.8         -19.2         -19.2         22.1         -18.4         -22.3         -22.3         23.1           6         19.8         -15.9         -19.3         -19.1         19.1         -18.6         -22.4         21.0         29.0           7         17.6         -16.0         -19.4         -19.4         19.1         18.6         -22.5         20.3         23.2           7         16.7         -16.0         -19.4         19.1         18.6         -22.5         20.3         23.2           7         16.7         -16.0         -19.4         19.1         18.2         -22.4         21.1         29.2           0         28.1         18.8         28.4         19.1         18.2         24.5         20.3           1         16.7         -16.0         -19.4         18.2         28.4         29.1         24.5         22.4	-23.7 -36.	-36.	б	25.8	-14.0	-27.5	-42.8	25.8	-16.3	-32.0	-49.5	26.0
0         21.9         -14.1         -27.6         -42.8         21.9         -16.4         -32.0         -49.6         22.0           5         22.8         -15.8         -19.2         -19.2         23.3         -12.3         -27.3         24.5         22.3         23.3	-23.8 -37.	-37.	0	23.8	-14.0	-27.6	-42.8	23.8	-16.4	-32.0	-49.5	23.9
5         22.8         -15.8         -19.2         -19.2         24.3         -18.4         -22.3         24.5           6         19.8         -15.9         -19.3         -19.3         219.3         -19.3         219.3	-23.8 -37.	-37.(	0	21.9	-14.1	-27.6	-42.8	21.9	-16.4	-32.0	-49.6	22.0
2         21.1.2         -15.9         -19.2.3         -19.2.3         21.2.7         -18.4         -22.3.3         -23.3.3         24.5           5         11.6         -15.9         -19.3         -19.3         21.9         11.8.5         -22.4         22.4         23.1           7         11.7.6         -15.0         -19.4         -19.4         19.1         -18.5         -22.4         22.9.2         20.3           7         16.7         -16.0         -19.4         -19.4         18.2         -18.6         -22.5         -22.3         23.0           6         22.9.1         -16.0         -19.4         -19.4         18.2         -18.4         -22.5         22.5         22.0         23.0           7         26.1         -16.8         -32.8         -50.9         22.4         -13.1         -37.2         57.5         23.0           1         22.1         -16.8         -32.8         -50.9         23.1         -37.2         57.6         23.5           1         2.2.5         -16.9         -22.9         23.0         -21.1         -37.2         57.6         23.6           2         2.0.1         -21.9         -22.1         22.0 <td>-16.5 -16.9</td> <td>-16.</td> <td></td> <td>22.8</td> <td>-15.8</td> <td>-19.2</td> <td>-19.2</td> <td>24.3</td> <td>-18.4</td> <td>-22.3</td> <td>-22.3</td> <td>26.1</td>	-16.5 -16.9	-16.		22.8	-15.8	-19.2	-19.2	24.3	-18.4	-22.3	-22.3	26.1
19.8         -15.9         -19.3         -19.3         -19.3         -19.3         -19.3         -19.3         -19.3         21.4         -18.5         -22.4         22.4         21.3           7         116.7         -16.0         -19.4         -19.4         19.1         -18.5         -22.5         20.3           7         16.7         -16.0         -19.4         -19.4         18.2         -18.5         -22.5         20.3           0         28.1         -16.8         -32.8         -50.8         28.4         -19.1         -37.2         57.5         29.4           1         22.5         -16.8         -32.8         50.9         28.4         -19.1         -37.2         57.5         29.3           2         24.3         -16.8         -32.8         50.9         23.1         -37.2         57.6         25.5           2         24.0         -18.9         -26.9         23.1         -19.1         27.1         29.3           2         2.10.         -23.1         23.1         -23.1         20.2         25.2         23.2           2         2.10.         -28.1         2.21.5         27.1         27.6         27.5         23.	-16.5 -16.5	-16.5		21.2	-15.9	-19.2	-19.2	22.7	-18.4	-22.3	-22.3	24.5
-10.0 $-10.0$ $-22.5$ $-22.5$ $-22.0$ $20.0$	-16.6 -16.6	-16.0	0 10	19.8 19.6	-15.9	-10.2	-19.3	21.4	-18.5	-22.4	-22.4	23.1
1         1.0.0         1.0.1         2.0.1 <th2.0< th="">         2.0.1         2.0.1</th2.0<>	-16.7 -16.7	-16		17.6	-16.0	-19.4	19.4	10.1	-18.6	-22.5	-22.5	20.8
5         29.8         -18.7         -34.8         -54.8         29.8         -21.3         -37.2         -57.5         29.4           0         28.1         -16.8         -32.8         -50.8         28.4         -19.1         -37.2         -57.5         29.4           0         26.2         -16.8         -32.8         -50.8         28.4         -19.1         -37.2         -57.5         29.4           1         20.7         -16.8         -32.8         -50.9         24.7         -19.1         -37.2         57.6         23.8           1         20.7         -16.9         -32.9         -50.9         23.1         -19.2         -37.3         57.7         23.0           2         24.0         -18.9         -22.9         -22.9         23.0         23.1         24.9         24.9           3         21.2         -19.0         -23.0         -23.0         23.1         24.5         23.3           3         21.2         -19.0         -23.1         -23.1         24.5         24.5         23.3           3         21.2         -19.1         -23.1         -23.1         23.1         24.5         24.5         24.5         24.5	-16.7 -16.7	-16.		16.7	-16.0	-19.4	-19.4	18.2	-18.6	-22.5	-22.5	20.3
0         28.1         -16.8         -32.8         -50.8         26.6         -19.1         -37.2         -57.6         27.5           0         26.2         -16.8         -32.8         -50.8         26.6         -19.1         -37.2         -57.6         27.5           1         20.7         -16.8         -32.8         -50.9         24.7         -19.1         -37.2         -57.6         27.5           1         20.7         -16.8         -32.9         -50.9         24.7         -19.1         -37.2         -57.6         23.8           2         24.1         -19.2         -32.9         -50.9         23.1         -19.2         -37.3         -57.6         23.7           3         22.15         -19.0         -23.0         -23.0         23.1         20.1         -26.1         24.5           4         19.2         -19.1         -23.1         23.1         20.1         24.5         25.2         23.4           3         21.2         -19.1         -23.1         23.1         20.1         24.5         26.2         25.1         24.5           4         19.7         19.1         23.1         23.1         20.1         24.5	-30.7 -48.	8	6	29.8	-18.7	-34.8	-54.8	29.8	-21.3	-39.4	-62.1	29.8
D         26.2         -16.8         -32.8         -50.9         24.7         -19.1         -37.2         -57.6         25.5           D         24.3         -16.8         -32.8         -50.9         24.7         -19.1         -37.2         -57.6         25.5           1         22.5         -16.8         -32.9         -50.9         22.8         -19.2         -37.3         -57.6         23.8           2         20.7         -16.9         -32.9         -50.9         22.8         -19.2         -37.3         -57.7         22.0           2         20.4         -18.9         -22.9         -23.0         23.0         23.1         21.1         -19.2         -37.3         -57.7         22.0           3         22.12         -19.0         -23.0         -23.0         23.0         23.1         20.1         24.5         24.5         24.2         24.5         <	-29.0 -45.(	-45.(		28.1	-16.8	-32.8	-50.8	28.4	-19.1	-37.2	-57.5	29.4
D         24.3         -16.8         -32.8         -50.9         24.7         -19.1         -37.2         -57.6         25.6           1         22.5         -16.8         -32.9         -50.9         22.8         -19.2         -37.3         -57.6         23.8           1         22.5         -16.9         -32.9         -50.9         22.9         -26.0         26.0         27.2           2         24.0         -18.9         -22.9         -22.9         22.5         -21.0         25.0         27.2           3         22.5         -19.0         -23.0         23.0         23.17         21.16         -26.1         24.5           4         19.2         -19.1         -23.1         23.1         20.7         25.2         23.3           4         19.2         -19.1         -23.1         23.1         20.7         25.1         24.5           4         19.2         -19.1         -23.1         23.1         20.7         25.2         23.1           5         5         -19.1         23.1         23.1         20.7         26.2         23.1           4         19.2         -19.1         23.1         23.1         20.	-29.0 -45.0	-45.(		26.2	-16.8	-32.8	-50.8	26.6	-19.1	-37.2	-57.6	27.5
1         22.5         -16.8         -32.9         -50.9         22.8         -19.2         -37.3         -57.6         23.8           1         20.7         -16.9         -32.9         -50.9         21.1         -19.2         -37.3         -57.7         22.0           2         24.0         -18.9         -22.9         -23.0         23.0         23.0         24.0         26.1         26.1         26.1         25.1         22.0           3         22.5         -19.0         -23.0         -23.0         23.0         21.7         26.1         26.1         26.1         25.1           4         20.1         -19.0         -23.0         -23.0         23.0         21.7         26.1         26.1         26.1         26.1         26.2         23.4           4         20.1         -19.0         -23.1         23.1         20.7         26.2         24.5         25.3         23.3           4         20.1         -19.1         -23.1         -23.1         20.7         26.2         26.2         23.4           5         5         5         5         5         5         5         5         5         5         2         2 </td <td>-29.0 -45.(</td> <td>-45.(</td> <td>0</td> <td>24.3</td> <td>-16.8</td> <td>-32.8</td> <td>-50.9</td> <td>24.7</td> <td>-19.1</td> <td>-37.2</td> <td>-57.6</td> <td>25.6</td>	-29.0 -45.(	-45.(	0	24.3	-16.8	-32.8	-50.9	24.7	-19.1	-37.2	-57.6	25.6
1 $20.7$ $-16.9$ $-32.9$ $50.9$ $21.1$ $-19.2$ $-37.3$ $57.7$ $22.0$ 2 $24.0$ $-18.9$ $-22.9$ $25.5$ $-21.6$ $-26.0$ $25.6$ 3 $22.5$ $-19.0$ $-23.0$ $-23.0$ $23.0$ $24.0$ $-26.1$ $26.1$ $25.3$ 4 $20.1$ $-19.0$ $-23.0$ $-23.0$ $23.0$ $21.7$ $-26.2$ $26.2$ $23.3$ 4 $20.1$ $-19.0$ $-23.0$ $-23.0$ $23.0$ $21.7$ $-26.2$ $26.2$ $23.3$ 4 $18.7$ $-19.1$ $-23.1$ $23.1.7$ $20.7$ $26.2$ $23.3$ 5 $5=0.3$ $5=0.5$ $5=1.1$ $23.1.7$ $26.2$ $26.2$ $23.1.7$ 0 $49.9$ $4.9$ $5=0.7$ $23.1.7$ $26.2$ $26.2$ $23.1.7$ 0 $4.9$ $5=0.3$ $5=1.7$ $26.2$ $26.2$ $23.1.7$	-29.0 -45.	45.	-	22.5	-16.8	-32.9	-50.9	22.8	-19.2	-37.3	-57.6	23.8
2         24.0         -18.9         -22.9         -25.5         -21.5         -26.0         27.2           3         21.2         -19.0         -23.0         -23.0         23.0         23.1         20.1         26.1         26.1         25.8           4         19.2         -19.0         -23.0         -23.0         23.3         21.7         -21.6         -26.1         24.5           4         19.2         -19.1         -23.0         -23.0         23.3         21.7         -21.6         -26.2         23.3           4         19.2         -19.1         -23.1         -23.1         20.9         -21.7         -26.2         26.2         23.3           6         6.6         6.6         6.6         6.6         6.6         6.6         6.6         7.3           7.9         7.9         7.9         7.9         7.9         7.9         7.9         7.9           6         6.6         6.6         6.6         6.6         6.6         7.4         8.0         8.6           7.9         7.9         7.9         7.9         7.9         7.9         7.9         7.9         7.2           6         6.6	-29.1 -45	-45	-	20.7	-16.9	-32.9	-50.9	21.1	-19.2	-37.3	-57.7	22.0
2-2.0 $-2.0.0$ $-2.0.0$ $-2.0.0$ $-2.0.0$ $-2.0.1$ $-20.2$ $-24.2$ $23.3$ $23.1$ $20.1$ $20.2$ $23.3$ $23.1$ $20.1$ $20.12$ $23.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$ $20.1$	-20.2 -20	8	0 0	24.0	-10.0	-22.9	-22.9	25.5	-21.5	-26.0	-26.0	27.2
4         20.1         -19.0 $-23.0$ $21.7$ $-21.6$ $-26.2$ $226.2$ $233.3$ 4         19.2 $-19.1$ $-23.1$ $23.31$ $20.9$ $-21.7$ $-26.2$ $226.2$ $233.3$ 6         19.2 $-19.1$ $-23.1$ $-23.1$ $20.9$ $-21.7$ $-26.2$ $26.2$ $23.33.3$ 0.2 $5s=0.3$ $5s=0.4$ $5s=1.0$ $5s=1.10$ $5s=1.12$ $5s=2.0$ $5s=2.5$ $5s=3.3$ $23.3$ $23.7$ $42.2$ $4.8$ $5.5$ $5s=3.3$ $23.7$ $21.7$ $26.2$ $25.2$ $5s=3.3$ $23.3$ $33.7$ $4.2$ $4.8$ $5.5$ $5s=3.3$ $5s=3.3$ $5s=3.3$ $34.7$ $37.7$ $4.2$ $4.8$ $5.5$ $5s=3.5$ $5s=3.5$ $5s=3.5$ $5s=3.5$ $5s=2.5$ $5s=2.5$ $5s=2.5$ $5s=3.5$ $5s=3.5$ 7.9 $7.9$ $7.9$ $7.9$ $7.9$ $7.9$ $7.7$ $7.9$ $7.2$ $7.2$	-20.3 -20	8	i u	21.2	-19.0	-23.0	-23.0	22.8	-21.6	-26.1	-26.1	24.5
4         19.2         -19.1         -23.1         20.9         -21.7         -26.2         25.2         23.1         23.1           4         18.7         -19.1         -23.1         -23.1         20.7         -21.7         -26.2         26.2         23.1         23.1           0.0         5 = 0.3         5 = 0.3         5 = 0.5         5 = 1.0         5 = 1.25         5 = 1.5         5 = 2.6         5 = 2.5         5 = 2.6         5 = 3.3         3.4         3.7         4.2         4.8         5 = 5.5         5 = 3.3         5 = 3.5	-20.4 -20	-20	4	20.1	-19.0	-23.0	-23.0	21.7	-21.6	-26.2	-26.2	23.4
4         18.7         -19.1         -23.1 $20.7$ $21.7$ $-26.2$ $26.2$ $23.1$ $20.7$ $21.7$ $-26.2$ $23.2$ $23.1$ $20.7$ $21.7$ $-26.2$ $23.1$ $25.2$ $23.1$ $25.2$ $23.1$ $25.2$ $25.3$ $33.4$ $3.7$ $4.2$ $4.8$ $5.5$ $55.2$ $55.2$ $55.3$ $55.2$ $53.2$ $55.2$ $53.2$ $55.2$ $53.2$ $55.2$	-20.4 -20.	-20	4	19.2	-19.1	-23.1	-23.1	20.9	-21.7	-26.2	-26.2	23.2
0.2 $5s = 0.4$ $5s = 0.6$ $5s = 1.0$ $5s = 1.2$ $5s = 2.0$ <	-20.4 -20.	-20.	4	18.7	-19.1	-23.1	-23.1	20.7	-21.7	-26.2	-26.2	23.1
2.6         2.7         2.8         3.3         3.4         3.7         4.2         4.8         5.5           6.6         6.6         6.6         6.6         6.6         6.6         6.6         7.4         8.0         8.6           7.9         7.9         7.9         7.9         7.9         7.9         7.4         8.0         8.6           7.9         7.9         7.9         7.9         7.9         7.9         7.9         9.1         9.7         10.3           8.7         8.7         8.7         8.7         8.7         8.7         9.1         9.7         10.3           9.2         9.2         9.2         9.2         9.2         9.1         10.7         10.3           9.4         9.4         9.4         9.4         9.4         9.4         9.7         10.3           9.2         9.2         9.2         9.2         9.2         10.0         10.7           9.4         9.4         9.4         9.4         9.4         9.7         10.3           9.4         9.4         9.4         9.4         9.4         9.7         10.3           9.4         9.4         9.4	Ss = 0.1 Ss = 0	Ss = (	).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         4.9         4.9         5.0         5.2         5.5         6.0         6.6         7.3           0         6.6         6.6         6.6         6.6         6.9         7.4         8.0         8.6           0         7.9         7.9         7.9         7.9         7.9         7.9         8.7         8.0         8.6           0         7.9         7.9         7.9         7.9         7.9         8.7         8.0         8.6           10         8.7         8.7         8.7         8.7         8.7         9.1         9.7         10.3           10         9.4         9.4         9.4         9.4         9.4         9.7         10.0         10.7           10         9.4         9.4         9.4         9.4         9.4         9.7         10.0         10.7           10         9.4         9.4         9.4         9.4         9.4         9.0         10.3           10         9.4         9.4         9.4         9.4         9.4         10.2         10.3           10         9.4         9.4         9.4         9.4         9.4         9.6         10.2         10.3 <td>2.6 2.6</td> <td>2.6</td> <td></td> <td>2.6</td> <td>2.7</td> <td>2.8</td> <td>3.3</td> <td>3.4</td> <td>3.7</td> <td>4.2</td> <td>4.8</td> <td>5.5</td>	2.6 2.6	2.6		2.6	2.7	2.8	3.3	3.4	3.7	4.2	4.8	5.5
6.6 $6.6$ $6.6$ $6.6$ $6.6$ $6.6$ $6.6$ $6.9$ $7.4$ $8.0$ $8.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ $9.6$ $9.0$ <t< td=""><td>4.9 4.9</td><td>4</td><td></td><td>4.9</td><td>4.9</td><td>4.9</td><td>5.0</td><td>5.2</td><td>5.5</td><td>6.0</td><td>6.6</td><td>7.2</td></t<>	4.9 4.9	4		4.9	4.9	4.9	5.0	5.2	5.5	6.0	6.6	7.2
7.9 $7.9$ $7.9$ $7.9$ $7.9$ $7.9$ $8.7$ $8.7$ $8.7$ $8.7$ $9.0$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.6$ $9.7$ $10.3$ $7$ $8.7$ $8.7$ $8.7$ $8.7$ $8.7$ $8.7$ $9.1$ $9.7$ $10.3$ $7$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.7$ $10.2$ $10.8$ $1$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.6$ $10.2$ $10.8$ $1$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.6$ $10.2$ $10.8$ $1$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.6$ $10.2$ $10.8$ $2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $10.8$ $10.8$ $2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $10.6$ $10.6$ $10.6$ $10.6$	6.6	9.6		6.6	9.9	6.6	6.6	9.9	6.9	7.4	8.0	8.6
7 $8.7$ $8.7$ $8.7$ $8.7$ $8.7$ $9.1$ $9.7$ $10.3$ $7$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.5$ $10.0$ $10.7$ $4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.7$ $10.2$ $10.3$ $4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.6$ $10.2$ $10.8$ $4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.4$ $9.6$ $10.2$ $10.8$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $10.2$ $10.8$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $10.2$ $10.8$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $9.2$ $10.2$ $10.6$ $9.2$ $8.2$ $8.2$ $8.2$ $8.2$ $9.2$ $9.2$ $10.2$ $10.6$ $10.6$ <td< td=""><td>7.9 7.</td><td>~</td><td>6</td><td>7.9</td><td>7.9</td><td>7.9</td><td>7.9</td><td>7.9</td><td>7.9</td><td>8.4</td><td>9.0</td><td>9.6</td></td<>	7.9 7.	~	6	7.9	7.9	7.9	7.9	7.9	7.9	8.4	9.0	9.6
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	8.7 8.	×.	2	8.7	8.7	8.7	8.7	8.7	8.7	9.1	9.7	10.3
1         9.4         9.5         10.2         10.8           2         9.2         9.2         9.2         9.2         9.2         9.2         10.0         10.6           3         8.9         8.9         8.9         8.9         8.9         8.9         9.3         9.8         10.4           6         8.1         8.1         8.1         8.1         8.1         8.2         8.7         9.1         9.7           1         8.1         8.1         8.1         8.1         8.1         8.7         9.1         9.7           0.2         55=0.3         55=1.0         55=2.0         55=2.5         55=2.5         55=2.5         55<	9.2 9.	9.	2	9.2	9.2	9.2	9.2	9.2	9.2	9.5	10.0	10.7
1         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.4         9.6         10.2         10.2         10.8           2         9.2         9.2         9.2         9.2         9.2         9.2         9.5         10.0         10.6           9         8.9         8.9         8.9         8.9         8.9         9.3         9.8         10.4           6         8.5         8.5         8.5         8.5         8.5         9.0         9.5         10.0           7         8.1         8.1         8.1         8.1         8.1         8.1         9.0         9.5         10.0           1         8.1         8.1         8.1         8.1         8.2         9.0         9.5         10.0           1         8.1         8.1         8.1         8.1         8.2         5.5         2.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5         5.5	9.4	б	4	9.4	9.4	9.4	9.4	9.4	9.4	9.7	10.2	10.8
?         9.2         9.2         9.2         9.2         9.2         9.2         9.2         9.2         9.2         10.0         10.6           9         8.9         8.9         8.9         8.9         8.9         8.9         9.3         9.8         10.4           5         8.5         8.5         8.5         8.5         8.5         8.5         9.0         9.5         10.0           6         8.5         8.5         8.5         8.5         8.5         8.5         9.0         9.5         10.0           1         8.1         8.1         8.1         8.1         8.2         8.7         9.1         9.7           0.2         5s=0.3         5s=1.0         5s=1.0         5s=2.0         5s=2.5         5s=2.5         5s=3.5           0.2         5s=0.3         5s=1.0         1.0         1.6         1.8         2.7         2.5         5s=3.5	9.4	°,	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.6	10.2	10.8
3         8.9         8.9         8.9         8.9         8.9         8.9         9.3         9.8         10.4           5         8.5         8.5         8.5         8.5         8.5         8.5         8.5         10.0           6         8.5         8.5         8.5         8.5         8.5         8.5         9.0         9.5         10.0           1         8.1         8.1         8.1         8.1         8.1         8.1         9.3         9.1         9.7           1         8.1         8.1         8.1         8.1         8.1         9.2         9.1         9.7           0.2         5s=0.3         5s=1.0         5s=1.0         5s=2.0         5s=2.5         5s=3.5           0.2         5s=0.4         1.0         1.6         1.8         2.7         2.9         3.6         4.5	9.2		9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.5	10.0	10.6
5         8.5         8.5         8.5         8.5         8.5         8.5         8.5         10.0           1         8.1         8.1         8.1         8.1         8.1         8.1         8.1         9.1         9.7           1         8.1         8.1         8.1         8.1         8.1         8.1         9.1         9.7           0.2         5s=0.3         5s=0.4         5s=1.0         5s=1.0         5s=2.5         5s=2.5         5s=3.5           0.2         5s=0.3         0.0         1.0         1.6         1.6         2         2         3.6         4.5	8.9		6.8	8.9	8.9	8.9	8.9	8.9	8.9	9.3	9.8	10.4
0.2 5s=0.3 5s=0.4 5s=0.5 5s=1.0 5s=1.25 5s=1.5 5s=2.0 5s=2.5 5s=3.	8.5 2 1 8		5.2	8.5 8.1	8.5 8.1	8.5 8.1	8.5 8.1	8.5 8.1	8.5 2 2	9.0 8.7	9.5 a 1	10.0
	Ss = 0.1 Se :	S S	- 0.2	Se = 0.3	Sc = 0.4	Se = 0.5	Se = 1.0	Sc= 1.25	Se = 1.5	Se = 2.0	Sc= 2.5	Se = 3.1
	0.2 0	0	5	0.7	0.9	1.0	1.6	1.8	2.2	2.9	3.6	4.5

Up and Down (psf)

Lateral PAGE B14



## APPENDIX B Pressure Lookup Tables

7-10 ASCE

Mid US (High Snow)\*

115 mph

Basic Wind Speed

Ground Snow Load

60 psf

111         108         205         325         405         305         413         410         410         430 <th>Roof Pitch</th> <th>B, Up Zone 1</th> <th>Idg. Heig Pressures ( Zone 2</th> <th>ght = 15 ( psf) zone 3</th> <th>ft. Down (psf)</th> <th>BI Up Zone 1</th> <th>dg. Heig Pressures ( Zone 2</th> <th>tht = 301 sf) zone 3</th> <th>ft. Down (psf)</th> <th>BI Up Zone 1</th> <th>ldg. Heig Pressures (p Zone 2</th> <th>ht = 60 f <sup>sf)</sup> <sup>zone 3</sup></th> <th>t. Down (psf)</th>	Roof Pitch	B, Up Zone 1	Idg. Heig Pressures ( Zone 2	ght = 15 ( psf) zone 3	ft. Down (psf)	BI Up Zone 1	dg. Heig Pressures ( Zone 2	tht = 301 sf) zone 3	ft. Down (psf)	BI Up Zone 1	ldg. Heig Pressures (p Zone 2	ht = 60 f <sup>sf)</sup> <sup>zone 3</sup>	t. Down (psf)
211         96         193         302         419         103         302         318         1103         323 <th>1:12</th> <th>-10.8</th> <th>-20.5</th> <th>-32.6</th> <th>45.5</th> <th>-10.8</th> <th>-20.5</th> <th>-32.6</th> <th>45.5</th> <th>-13.4</th> <th>-25.1</th> <th>-39.8</th> <th>45.5</th>	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
311         9.6         -193         302         316         -103         302         316         -103         302         316         103         3011         301         301         301	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
411         9.7         1.93         3.02         3.03         1.93         3.02         3.03         1.93         3.01         3	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
5:12         9:7         -9:4         -30:2         30:3         -1:5         1:1         -1:3         -1:4         2:3         -1:1         -1:3         -1:4         2:3         -1:1         2:3         -1:3         -1:6         2:7         -1:6         2:6         2:7         2:7         2:1         2:3         3:1         2:1         2:3         3:1         2:6         1:6         2:7         2:6         2:7         2:7         2:8         2:7         2:7         2:8         2:7         2:7         2:8         2:7         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:6         2:7         2:8         2:7         2:8         2:7         2:8         2:7         2:8         2:7         2:8         2:7         2:7         2:7         2:7         2:7         2:7         2:7         2:7         2:7         2:7         2:7         2:7         2:7	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
6         03         -03         275         04         -03         275         04         -03         275         04         -03         275         -104         -036         -105	5:12	-9.7	-19.4	-30.2	30.3	-9.7	-19.4	-30.2	30.3	-12.0	-23.8	-37.0	8
712         110         -134         -134         -134         -134         -134         -134         -134         -135         -	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.
8112         1110         -134         134         134         134         134         134         136         166         166         157           9112         111         135         135         135         135         135         137         166         166         137           1111         135         136         136         136         131         136         167         137         167 <td>7:12</td> <td>-11.0</td> <td>-13.4</td> <td>-13.4</td> <td>25.9</td> <td>-11.0</td> <td>-13.4</td> <td>-13.4</td> <td>25.9</td> <td>-13.6</td> <td>-16.5</td> <td>-16.5</td> <td>27.6</td>	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
9112         111         135 <td>8:12</td> <td>-11.0</td> <td>-13.4</td> <td>-13.4</td> <td>23.5</td> <td>-11.0</td> <td>-13.4</td> <td>-13.4</td> <td>23.5</td> <td>-13.6</td> <td>-16.5</td> <td>-16.5</td> <td>25.3</td>	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
Int:         111         135 <td>9:12</td> <td>-11.1</td> <td>-13.5</td> <td>-13.5</td> <td>21.5</td> <td>-11.1</td> <td>-13.5</td> <td>-13.5</td> <td>21.5</td> <td>-13.6</td> <td>-16.6</td> <td>-16.6</td> <td>23.3</td>	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
111.1         11.1         13.6         13.7         13.6         13.7         13.6         13.7         13.6         13.7         13.6         13.7         13.7         13.6         13.7 <t< td=""><td>10:12</td><td>-11.1</td><td>-13.5</td><td>-13.5</td><td>19.7</td><td>-11.1</td><td>-13.5</td><td>-13.5</td><td>19.7</td><td>-13.7</td><td>-16.6</td><td>-16.6</td><td>21.5</td></t<>	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
112         113         136 <td>11:12</td> <td>-11.1</td> <td>-13.6</td> <td>-13.6</td> <td>18.2</td> <td>-11.1</td> <td>-13.6</td> <td>-13.6</td> <td>18.2</td> <td>-13.7</td> <td>-16.7</td> <td>-16.7</td> <td>20.0</td>	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
1:12         1:34         25.1         -39.8         45.5         -15.6         -39.2         46.1         45.5         41.8         -32.8         -32.9         -30.8         -32.8<	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
2112         -119         237         36.6         41.9         -14.0         -27.5         42.7         41.9         -16.3         -31.9         49.5         31.7           3112         -120         -337         -36.9         37.8         -14.0         -77.5         -42.7         33.8         -51.0         -33.7         -36.9         33.6         -14.0         -77.5         -42.8         33.8         -16.7         -30.0         -49.5         33.7         -41.6         -32.0         -49.5         33.7           7121         -115.         -15.6         53.3         -15.9         -19.2         -23.8         -32.0         -49.5         33.7           7112         -13.6         -16.5         53.3         -15.9         -19.3         -19.3         23.0         -39.5         23.2         33.3         33.9         -12.1         -23.7         23.7	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
3:12         -120         -337         -36.9         33.6         -14.0         -27.5         -42.8         33.6         -16.3         -31.0         -95.5         33           4:12         -120         -337         -36.9         33.6         -14.0         -77.5         -42.8         33.6         -16.5         -32.0         -49.5         33           5:11         -13.8         -16.5         -16.5         75.3         -15.9         -19.2         -19.2         29.1         -18.4         -27.3         -22.3         30	2:12	-11.9	-23.7	-36.9	41.9	-14.0	-27.5	-42.7	41.9	-16.3	-31.9	-49.5	41.0
4:12         1:20         2:31         5.60         3:46         1:40         2:75         4:28         3:36         1:64         3:20         4:95         3:36           5:12         1:20         2:38         3:70         3:35         1:40         2:75         1:41         2:75         1:64         3:20         49:5         3:30           5:12         1:36         1:65         1:65         5:75         1:93         2:93         1:93         2:84         2:23         2:23         2:33         3:35           5:12         1:36         1:66         1:66         2:33         1:59         1:93         2:48         2:23         2:24         2:24         2:34         3:4           1:11:12         1:37         1:66         1:66         2:15         1:93         2:34         4:14         2:13         3:14         2:13         3:14         2:14         2:13         3:16         2:14         2:13         3:14         2:14         2:14         2:14         2:13         2:14         2:13         2:14         2:13         2:14         2:13         2:16         2:13         2:13         2:14         2:13         2:14         2:13         2:14         2:13	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.
5:12         1:20         2:38         37.0         0.33         1.4.0         2.7.6         4.2.8         30.3         1.6.4         32.0         40.5         21.5           7:12         -136         -165         -165         -16.5         21.5         1.4.1         27.6         4.2.8         27.5         1.4.0         27.5         1.4.0         27.5         1.4.0         27.5         1.4.0         27.3         2.2.3         2.3.3	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.
512         12.1         23.8         37.0         75.5         14.1         27.6         42.8         27.5         16.4         22.3         22.3         23.3 <th2< td=""><td>5:12</td><td>-12.0</td><td>-23.8</td><td>-37.0</td><td>30.3</td><td>-14.0</td><td>-27.6</td><td>-42.8</td><td>30.3</td><td>-16.4</td><td>-32.0</td><td>-49.5</td><td>30</td></th2<>	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
7:12         1:36         1:65         1:65         1:53 <th< td=""><td>6:12</td><td>-12.1</td><td>-23.8</td><td>-37.0</td><td>27.5</td><td>-14.1</td><td>-27.6</td><td>-42.8</td><td>27.5</td><td>-16.4</td><td>-32.0</td><td>-49.6</td><td>27.</td></th<>	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.
8:12         -136         -165         -165         253         -159         -193         -193         248         -185         -22.4         -22.4         22.4 <th< td=""><td>7:12</td><td>-13.6</td><td>-16.5</td><td>-16.5</td><td>27.6</td><td>-15.8</td><td>-19.2</td><td>-19.2</td><td>29.1</td><td>-18.4</td><td>-22.3</td><td>-22.3</td><td>30.</td></th<>	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.
9:12         -13.6         -16.6         -16.6         21.5         -15.3         -15.9         -19.3         -19.3         23.0         -18.5         -2.2.4         2.3.4         2.3           11112         -13.7         -16.6         -16.6         21.5         -15.7         15.0         -19.4         -19.4         21.5         -20.5         -22.5         2.2.5	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.
1012         137         -166         -167         20.0         -16.0         -19.4         -19.3         21.5         -1.8         -2.2.5         2.2.5 <th2.2.5< th=""> <th2.2.5< th=""> <th2.2.5< td="" ty<=""><td>9:12</td><td>-13.6</td><td>-16.6</td><td>-16.6</td><td>23.3</td><td>-15.9</td><td>-19.3</td><td>-19.3</td><td>24.8</td><td>-18.5</td><td>-22.4</td><td>-22.4</td><td>26.</td></th2.2.5<></th2.2.5<></th2.2.5<>	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.
11:12         -13.7         -16.8         -32.8         -50.8         38.0         -19.1         -37.2         -57.5         38.3           3:112         -14.8         -290         -45.0         31.1         -16.8         -32.8         -50.9         31.4         -19.1         -37.2         57.5         33.3         57.5         33.3         57.5         37.5         57.5         33.3         57.5         33.3         57.5         37.5         57.5         37.5         57.5         37.5         57.5         37.5         57.5         37.5         57.5         37.5         57.5         37.5         57.5         37.5         57.5         37.5         57.5         57.5         57.5         57.5         57.5         57.5         57.5         57.5 <t< td=""><td>10:12</td><td>-13.7</td><td>-16.6</td><td>-16.6</td><td>21.5</td><td>-15.9</td><td>-19.3</td><td>-19.3</td><td>23.0</td><td>-18.5</td><td>-22.4</td><td>-22.4</td><td>24.</td></t<>	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.
12.12         -1.38         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -1.67         -2.55 <t< td=""><td>11:12</td><td>-13.7</td><td>-16.7</td><td>-16.7</td><td>20.0</td><td>-16.0</td><td>-19.4</td><td>-19.4</td><td>21.5</td><td>-18.6</td><td>-22.5</td><td>-22.5</td><td>33.</td></t<>	11:12	-13.7	-16.7	-16.7	20.0	-16.0	-19.4	-19.4	21.5	-18.6	-22.5	-22.5	33.
1:12         1:65         -307         -48.5         41.4         -18.7         -34.8         -54.8         38.0         -19.1         -37.2         -57.5         38           2:12         -14.7         -29.0         -45.0         38.0         -16.8         -32.8         -50.8         38.0         -19.1         -37.2         -57.6         35           3:12         -14.8         -29.0         -45.0         38.1         -16.8         -32.8         -50.9         31.4         -19.1         -37.2         -57.6         35           5:12         -14.8         -29.0         -45.1         28.4         -16.8         -32.9         -50.9         31.4         -19.1         -37.2         -57.6         35           5:12         -14.8         -29.0         -45.1         28.4         -16.8         -32.9         -29.9         27.7         -37.2         57.6         29.7         27.7         27.7         27.7         27.7         27.7         27.7         27.7         27.6         29.0         29.0         29.1         29.7         27.7         25.7         27.7         25.7         27.7         25.7         27.7         25.1         27.7         25.1         27.7 <td< td=""><td>12:12</td><td>-13.8</td><td>-16.7</td><td>-16.7</td><td>18.7</td><td>-16.0</td><td>-19.4</td><td>-19.4</td><td>20.2</td><td>-18.6</td><td>-22.5</td><td>-22.5</td><td>21.</td></td<>	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.
-1.02 $-2.03$ $-4.04$ $-4.03$ <	511	16.6	202	10 E	11 1	10.7	0 10	EA 0	41.4	01.0	1 00	1 53	1
3:12         14.0         2.0.0         4.0.0         16.8         3.2.8         5.0.8         3.0.4         1.0.1         3.7.2         5.7.6         3.7.           3:12         -14.8         -29.0         -45.0         34.4         -16.8         -32.9         50.9         31.4         -19.1         -37.2         57.6         37.3           5:12         -14.8         -29.0         -45.1         28.4         -16.8         -32.9         50.9         31.4         -19.1         -37.2         57.6         37.3           5:12         -14.9         -29.1         -45.1         28.8         -16.9         -20.1         28.1         -31.9         -37.3         57.6         37.3         57.6         37.3           7:12         -16.7         -20.3         -45.1         28.8         -19.0         -32.0         20.3         24.3         -19.0         -37.3         57.6         37.3           8:12         -16.7         -20.3         -20.3         -20.3         20.3         20.3         20.3         20.3         20.3         26.2         -19.0         -37.3         57.6         27.2         25.1         27.7         27.7         27.7         27.7         27.7	21.1	L V L-	1.00-	10.31	28.0	16.9	37.8	0.4.C	28.0	101-	C 12	-1.20	200
3.12         1.410         2.50         4.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.4         1.0.0         3.4.7         5.1.0         3.7.2         5.7.0         3.7.3         5.7.6         3.2.3           5:11         14.8         2.90         45.0         31.1         1.6.8         3.2.9         5.0.9         31.1         -1.0.3         5.7.7         2.7.7         2.7.7         2.6         2.6         2.6         2.6         2.6         2.6         2.6         2.6         2.6         2.6         2.6         2.6         2.6 <t< td=""><td>21.2</td><td>1.41</td><td>0.62-</td><td>45.0</td><td>0.00</td><td>0.01-</td><td>0.20-</td><td>0.00-</td><td>0.00</td><td>101</td><td>71/0-</td><td>0.10-</td><td></td></t<>	21.2	1.41	0.62-	45.0	0.00	0.01-	0.20-	0.00-	0.00	101	71/0-	0.10-	
Title         Title <t< td=""><td>21.5</td><td>-14.8</td><td>0.62-</td><td>45.0</td><td>31.1</td><td>-16.8</td><td>0.2C-</td><td>0.00-</td><td>31.4</td><td>-101</td><td>27.7</td><td>0.75</td><td>20.0</td></t<>	21.5	-14.8	0.62-	45.0	31.1	-16.8	0.2C-	0.00-	31.4	-101	27.7	0.75	20.0
-1410 $-250$ $-40.4$ $-20.4$ $-40.4$ $-20.4$ <t< td=""><td>5-12</td><td>14.0</td><td>0.02</td><td>46.1</td><td>1.10</td><td>16.0</td><td>0.20</td><td></td><td>7.90</td><td>10.7</td><td>27.2</td><td>57.6</td><td>200</td></t<>	5-12	14.0	0.02	46.1	1.10	16.0	0.20		7.90	10.7	27.2	57.6	200
0.01         1.01         2.03         2.04         2.04 <t< td=""><td>6:12</td><td>-14.9</td><td>1.00-</td><td>-45.1</td><td>25.8</td><td>-16.9</td><td>9 02-</td><td>-50.9</td><td>26.1</td><td>-19.2</td><td>-37.3</td><td>-57.7</td><td>10</td></t<>	6:12	-14.9	1.00-	-45.1	25.8	-16.9	9 02-	-50.9	26.1	-19.2	-37.3	-57.7	10
8:12         16.7         -20.3         26.2         -19.0         -23.0         -27.7         -21.6         -26.1         -26.1         27.7           9:12         -16.8         -20.3         20.3         24.3         -19.0         -23.0         -23.0         25.8         -21.6         -26.1         -26.1         27.7           9:12         -16.8         -20.4         20.4         21.4         -19.1         -23.1         -23.1         23.1         -21.6         -26.2         -26.2         26.	7:12	-16.7	-20.2	-20.2	28.3	-18.9	-22.9	-22.9	29.8	-21.5	-26.0	-26.0	5
9:12         1-16.8         -20.3         -20.4         22.7         -19.0         -23.0         -23.0         23.0         23.0         24.2         21.6         -26.1         26.1	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.
10:12         -16.8         -20.4         -20.4         22.7         -19.0         -23.0         23.1         23.1         23.1         26.2	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.
11:12         -16.8         -20.4         21.4         -19.1         -23.1         -23.1         23.1         -23.1         23.1         -26.2         26.2	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.
12:12         -16.9         -20.4         20.2         -19.1         -23.1         -23.1         21.7         -26.2         26.2         26.2         23.8           Roof Pitch         Ss=0.0         Ss=0.1         Ss=0.1         Ss=0.1         Ss=0.1         Ss=0.1         Ss=0.2         Ss=2.5	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.
Roof Pitch         Ss=0.0         Ss=0.1         Ss=0.2         Ss=0.4         Ss=0.5         Ss=1.5         Ss=2.5         Ss=	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.
1:12         3.8         4.0         4.6         5.0         5.4         6.8         7.3         8.2         9.9         11.9         14           2:12         7.0         7.0         7.0         7.0         7.0         7.0         7.0         7.1         13.8         15.3 <t< td=""><td>Roof Pitch</td><td>Ss = 0.0</td><td>Ss = 0.1</td><td>Ss = 0.2</td><td>Ss = 0.3</td><td>Ss = 0.4</td><td>Ss = 0.5</td><td>Ss = 1.0</td><td>Ss = 1.25</td><td>Ss = 1.5</td><td>Ss = 2.0</td><td>Ss = 2.5</td><td>Ss =</td></t<>	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 =
2:12         7.0         7.1         13.3         13.4         15.3         13.3 <td>1:12</td> <td>3.8</td> <td>3.8</td> <td>4.0</td> <td>4.6</td> <td>5.0</td> <td>5.4</td> <td>6.8</td> <td>7.3</td> <td>8.2</td> <td>6.6</td> <td>11.9</td> <td>14.</td>	1:12	3.8	3.8	4.0	4.6	5.0	5.4	6.8	7.3	8.2	6.6	11.9	14.
3:12       9.4       9.4       9.4       9.4       9.4       9.4       9.4       9.4       9.4       9.4       9.4       9.4       9.5       10.8       11.3       12.1       13.7       15.3       15.3       13.1         4:12       11.2       11.2       11.2       11.2       11.2       11.2       11.2       11.2       16.7       18       16.3       18         5:12       12.3       12.3       12.3       12.3       12.3       12.3       12.3       16.7       18         6:12       12.9       12.9       12.9       12.9       12.9       12.9       12.9       13.1       13.1       13.5       14.1       15.5       16.8       18         7:12       13.1       13.1       13.1       13.1       13.1       13.1       13.1       13.1       14.1       15.5       16.8       18         7:12       13.1       13.1       13.1       13.1       13.1       13.1       13.1       14.1       15.3       16.5       18         8:12       13.0       13.0       13.0       13.0       13.0       13.0       13.2       14.1       17       17         9:12.	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.
4:12       11.2       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       13.1       13.1       13.1       13.1       13.5       14.1       15.5       16.8       18         7:12       13.1       13.1       13.1       13.1       13.1       13.1       13.1       13.1       14.1       15.5       16.8       18         7:12       13.1       13.1       13.1       13.1       13.1       13.1       13.1       13.1       14.1       17       17         8:12       12.6       12.6       12.6       12.6       12.6       12.6       12.6       18       16.1       17         9:12       12.1       12.1       12.1       12.1       12.1	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.
5:12       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.3       12.4       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.7       18.6       18         7:12       13.1       13.1       13.1       13.1       13.1       13.1       13.1       13.7       14.1       15.5       16.8       18         7:12       13.1       13.1       13.1       13.1       13.1       13.1       13.1       13.7       14.1       15.3       16.5       18         8:12       13.0       13.0       13.0       13.0       13.0       13.0       13.2       13.7       14.1       17       17       17       17       17       17       17       17       16.1       17       16.1       17       16.1       17       16.1       17       17       17       17       17       17       17       17       17       16.1       17       16.1       16.1       17       16.1       16.1       17       16.1       17       16.1	4:12	11.2	11.2	11.2	11.2	11.2	11.2	12.0	12.5	13.3	14.8	16.3	128
6:12         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         12.9         13.1         14.1         16.1         17.1           9:12         12.6         12.6         12.6         12.6         12.6         12.6         12.7         13.3         14.3         15.4         16           10:12         11.4         11.4         11.2.1         12.1         12.1         12.1         13.7         14.7         15.4         16           11:12         11.4         11.4         11.4         11.4         11.4         11.6 <td>5:12</td> <td>12.3</td> <td>12.3</td> <td>12.3</td> <td>12.3</td> <td>12.3</td> <td>12.3</td> <td>12.8</td> <td>13.2</td> <td>13.9</td> <td>5.51</td> <td>10.7</td> <td>2i s</td>	5:12	12.3	12.3	12.3	12.3	12.3	12.3	12.8	13.2	13.9	5.51	10.7	2i s
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	21:0	12.4	12.4	12.Y	1.21	12.Y	5.21	13.1	C.51	14.1	0.01	10.0	10 10
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	21.1	120	1.01	1.01	1.01	1.01	1.01	1.01	10.01	101	14.0	1.51	1 10
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	21.0	10.61	12.0	0.CT	10.61	12.6	12.6	12.6	7.01	13.2	14.2	15.4	10
11:12         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.6         12.1         13.0         13.9         15.           11:12         10.8         10.8         10.8         10.8         10.8         10.8         10.8         10.8         13.2         14.9         15.1         13.0         13.9         15.           12:12         10.8         10.8         10.8         10.8         10.8         10.8         13.2         14.9         15.3         13.2         14.5         15.5         14.5         15.5         14.5         15.5         15.5         15.5         55.5	10:12	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.2	12.7	13.7	14.7	15.0
12:12         10.8         10.8         10.8         10.8         10.8         10.8         10.8         10.8         10.8         13.2         14         12.3         13.2         14           5s = 0.0         Ss = 0.1         Ss = 0.2         Ss = 0.4         Ss = 0.5         Ss = 1.0         Ss = 2.0	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.
Ss = 0.0         Ss = 0.1         Ss = 0.3         Ss = 0.4         Ss = 0.5         Ss = 1.0         Ss = 1.5         Ss = 2.0         Ss = 2.5	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.

Up and Down (psf)

Lateral PAGE B15



120 mph

# APPENDIX B Pressure Lookup Tables

ASCE 7:10

APPENDIX - Pressure Tables for Flush Mounted Roof Systems East Coast (Medium Snow)\*

	Bas	sic	Win	id S	pee	d					G	irou	und	Sr	10%	/ Lo	bad									_																								<u> </u>	_
t. Down	25.0	24.6	23.1	21.6	20.1	18./	21.0	19.8	18.8	17.9	17.2	17.1	25.9	25.4	23.9	22.3	20.8	19.4	24.5	23.3	22.3	22.1	22.0	21.8	25.9	26.6	25.1	23.6	22.1	20.7	26.8	25.6	25.2	25.1	25.0	24.9	Ss = 3.1	5.0	6.3	7.4	8.2	8.8	9.1	9.2	9.2	9.2	9.0	8.8	8.6	Ss = 3.1	6.4
nt = 60 f	-43.5	40.3	40.3	-40.3	-40.4	40.4	-18.1	-18.1	-18.1	-18.2	-18.2	-18.3	-58.2	-54.0	-54.0	-54.0	-54.1	-54.1	-24.4	-24.4	-24.5	-24.5	-24.5	-24.6	-67.7	-62.8	-62.8	-62.8	-62.8	-62.9	-28.4	-28.5	-28.5	-28.6	-28.6	-28.6	Ss = 2.5	4.3	5.7	6.7	7.6	8.1	8.4	8.6	8.6	8.5	8.4	8.2	8.0	Ss = 2.5	3.0
Ig. Heigh ressures (p	- 27 5	0 30-	-25.9	-25.9	-26.0	- 20.0	-18.1	-18.1	-18.1	-18.2	-18.2	-18.3	-37.0	-34.8	-34.9	-34.9	-34.9	-35.0	-24.4	-24.4	-24.5	-24.5	-24.5	-24.6	-43.1	-40.6	-40.6	-40.7	-40.7	-40.7	-28.4	-28.5	-28.5	-28.6	-28.6	-28.6	Ss = 2.0	3.8	5.1	6.2	7.0	7.6	7.9	8.1	8.1	8.0	7.9	7.7	7.5	Ss = 2.0	67
ng d	-14.7	-13.1	-13.1	-13.2	-13.2	-13.2	-14.9	-14.9	-15.0	-15.0	-15.0	-15.1	-20.0	-17.9	-17.9	-17.9	-17.9	-18.0	-20.1	-20.2	-20.2	-20.3	-20.3	-20.3	-23.3	-20.9	-20.9	-20.9	-21.0	-21.0	-23.5	-23.6	-23.6	-23.6	-23.7	-23.7	Ss = 1.5	3.2	4.6	5.6	6.4	7.0	7.4	7.5	7.6	7.5	7.4	7.2	7.0	Ss = 1.5	2.2
t. Down	25.9	24.6	23.1	21.6	20.1	18./	19.0	17.9	16.9	16.0	15.2	14.6	25.9	24.6	23.1	21.6	20.1	18.7	22.6	21.4	20.4	19.5	19.4	19.3	25.9	25.6	24.1	22.5	21.0	19.6	24.9	23.7	22.7	22.6	22.5	22.3	Ss = 1.25	2.9	4.3	5.4	6.2	6.7	7.1	7.3	7.3	7.3	7.1	7.0	6.8	Ss = 1.25	1.8
ht = 30 f در	-35.6	-33.0	-33.0	-33.0	-33.0	-33.1	-14.7	-14.7	-14.8	-14.8	-14.8	-14.9	-50.3	-46.6	-46.7	-46.7	-46.7	-46.8	-21.0	-21.0	-21.1	-21.1	-21.2	-21.2	-59.8	-55.4	-55.5	-55.5	-55.5	-55.6	-25.1	-25.1	-25.1	-25.2	-25.2	-25.3	Ss = 1.0	2.8	4.1	5.2	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.7	Ss = 1.0	I.b
dg. Heig Pressures (p	-22 4	-110-	-21.1	-21.2	-21.2	-21.2	-14.7	-14.7	-14.8	-14.8	-14.8	-14.9	-31.9	-30.1	-30.1	-30.1	-30.1	-30.2	-21.0	-21.0	-21.1	-21.1	-21.2	-21.2	-38.0	-35.8	-35.8	-35.9	-35.9	-35.9	-25.1	-25.1	-25.1	-25.2	-25.2	-25.3	Ss = 0.5	2.3	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.5	T.U
B 0,	-11.9	-10.6	-10.6	-10.6	-10.7	-10./	-12.1	-12.1	-12.1	-12.2	-12.2	-12.3	-17.1	-15.3	-15.3	-15.4	-15.4	-15.4	-17.3	-17.4	-17.4	-17.4	-17.5	-17.5	-20.5	-18.4	-18.4	-18.4	-18.4	-18.5	-20.7	-20.7	-20.8	-20.8	-20.9	-20.9	Ss = 0.4	2.2	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.4	<b>F.</b> 0
t. Down	25.0	24.6	23.1	21.6	20.1	18./	19.0	17.9	16.9	16.0	15.2	14.6	25.9	24.6	23.1	21.6	20.1	18.7	21.0	19.8	18.8	17.9	17.2	17.1	25.9	24.6	23.1	21.6	20.1	18.7	23.2	22.1	21.0	20.4	20.3	20.1	Ss = 0.3	2.1	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.3	0./
ht = 15 f ها	-35.6	-33.0	-33.0	-33.0	-33.0	-33.1	-14.7	-14.7	-14.8	-14.8	-14.8	-14.9	-43.5	-40.3	-40.3	-40.3	-40.4	-40.4	-18.1	-18.1	-18.1	-18.2	-18.2	-18.3	-52.9	-49.1	-49.1	-49.1	-49.2	-49.2	-22.1	-22.2	-22.2	-22.3	-22.3	-22.3	Ss = 0.2	2.0	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.2	C.U
dg. Heig Pressures (p	2 2 CC-	1 1 1 -	-21.1	-21.2	-21.2	7.12-	-14.7	-14.7	-14.8	-14.8	-14.8	-14.9	-27.5	-25.9	-25.9	-25.9	-26.0	-26.0	-18.1	-18.1	-18.1	-18.2	-18.2	-18.3	-33.6	-31.7	-31.7	-31.7	-31.7	-31.8	-22.1	-22.2	-22.2	-22.3	-22.3	-22.3	Ss = 0.1	2.0	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.1	2.0
B d	-11 9	-10.6	-10.6	-10.6	-10.7	-10./	-12.1	-12.1	-12.1	-12.2	-12.2	-12.3	-14.7	-13.1	-13.1	-13.2	-13.2	-13.2	-14.9	-14.9	-15.0	-15.0	-15.0	-15.1	-18.1	-16.2	-16.2	-16.2	-16.2	-16.3	-18.3	-18.3	-18.3	-18.4	-18.4	-18.5	Ss = 0.0	2.0	3.7	5.0	6.0	6.7	7.1	7.3	7.3	7.2	7.0	6.8	6.6	Ss = 0.0	0.0
4-10 J-10	1-12	2.1.0	3:12	4:12	5:12	0:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12		a se a se la
	Ľ		Exp	oos	ure	C	ate	go	ory	В				E	xp	os	ure	эC	ate	ego	ory	С				(	Exp	os	sure	эC	ate	ego	ory	D							Do	wr	n S	Slop	oe			_			the Hand
													11		an	d	De		n (	'n	~f)																		C	Sid			201	d (	(ne	cf)				Later	ral

Up and Down (psf)

25 psf

PAGE B16



130 mph

# APPENDIX B Pressure Lookup Tables

East Coast (Low Snow)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

7:10 ASCE

	Ba	sic	Win	id S	pe	ed					G	àrou	und	Sr	IOW	/ Lo	oad	1																																
t. Down	(DST) 10 E	17.8	17.0	16.2	15.4	14.7	20.2	20.1	20.0	19.8	19.7	19.6	18.5	19.9	19.2	18.4	17.6	16.8	25.8	25.6	25.5	25.4	25.3	25.2	18.5	21.4	20.6	19.8	19.0	18.3	29.3	29.2	29.1	29.0	6.82	7.07	55 = 3.1	5.2	5.9	6.4	6.8	7.1	7.2	7.3	7.3	7.3	7.2	7.1	Ss = 3.1	
ht = 60 f	Zone 3	3 27-	-47.5	-47.5	-47.6	-47.6	-21.4	-21.4	-21.5	-21.5	-21.6	-21.6	-68.5	-63.6	-63.6	-63.6	-63.6	-63.7	-28.8	-28.9	-28.9	-28.9	-29.0	-29.0	-79.7	-73.9	-73.9	-73.9	-74.0	-74.0	-33.6	-33.6	-33.7	-33.7	-33./	0.00-	55 = 2.5 <b>4.0</b>	4.5	5.2	5.8	6.2	6.4	6.6	6.7	6.7	6.7	9.9	6.5	Ss = 2.5	0
dg. Heig	Zone Z	9.05-	-30.6	-30.7	-30.7	-30.7	-21.4	-21.4	-21.5	-21.5	-21.6	-21.6	-43.6	-41.1	-41.1	-41.2	-41.2	-41.2	-28.8	-28.9	-28.9	-28.9	-29.0	-29.0	-50.7	-47.9	-47.9	-47.9	-48.0	-48.0	-33.6	-33.6	-33.7	-33.7	-33./	0.05-	55 = 2.0	4.0	4.7	5.2	5.6	5.9	6.1	6.2	6.2	6.2	6.1	6.1	Ss = 2.0	0
18 d	Zone 1	15.6	-15.6	-15.7	-15.7	-15.7	-17.6	-17.7	-17.7	-17.8	-17.8	-17.8	-23.7	-21.2	-21.2	-21.2	-21.3	-21.3	-23.8	-23.9	-23.9	-23.9	-24.0	-24.0	-27.6	-24.7	-24.8	-24.8	-24.8	-24.9	-27.8	-27.8	-27.9	-27.9	0.82-	0.02-	55 = 1.5	3.4	4.1	4.7	5.1	5.4	5.5	5.6	5.7	5.7	5.6	5.6	Ss = 1.5	0
t. Down	(pst)	17.8	17.0	16.2	15.4	14.7	17.2	17.1	17.0	16.9	16.7	16.6	18.5	18.7	17.9	17.1	16.3	15.6	22.8	22.7	22.5	22.4	22.3	22.2	18.5	20.2	19.4	18.6	17.8	17.0	26.4	26.2	26.1	26.0	25.9 2F 0	0.02	55 = 1.25	3.1	3.8	4.4	4.8	5.1	5.3	5.4	5.4	5.4	5.4	5.4	Ss = 1.25	0
ht = 30 f	Zone3	-38.0	-38.9	-38.9	-39.0	-39.0	-17.4	-17.5	-17.5	-17.5	-17.6	-17.6	-59.3	-55.0	-55.0	-55.0	-55.0	-55.1	-24.8	-24.9	-24.9	-25.0	-25.0	-25.0	-70.4	-65.3	-65.3	-65.3	-65.4	-65.4	-29.6	-29.6	-29.7	-29.7	8'67-	0.62-	Ss = 1.0	3.0	3.7	4.2	4.6	4.9	5.1	5.2	5.3	5.3	5.3	5.2	Ss = 1.0	
dg. Heig	Zone Z	0.02-	-25.0	-25.0	-25.1	-25.1	-17.4	-17.5	-17.5	-17.5	-17.6	-17.6	-37.6	-35.5	-35.5	-35.5	-35.6	-35.6	-24.8	-24.9	-24.9	-25.0	-25.0	-25.0	-44.8	-42.2	-42.3	-42.3	-42.3	-42.4	-29.6	-29.6	-29.7	-29.7	8.62-	0.62-	Ss = 0.5	2.5	3.2	3.8	4.2	4.5	4.7	4.8	4.9	4.9	4.9	4.8	Ss = 0.5	,
4n 18	Zone 1	-12.6	-12.7	-12.7	-12.7	-12.8	-14.3	-14.4	-14.4	-14.5	-14.5	-14.5	-20.3	-18.2	-18.2	-18.2	-18.3	-18.3	-20.5	-20.6	-20.6	-20.6	-20.7	-20.7	-24.3	-21.8	-21.8	-21.8	-21.9	-21.9	-24.5	-24.5	-24.6	-24.6	- 24.0	-24.1	5s = 0.4	2.4	3.1	3.7	4.1	4.4	4.6	4.7	4.8	4.8	4.8	4.7	Ss = 0.4	0
t. Down	(pst) 10 E	C.01	17.0	16.2	15.4	14.7	17.2	17.1	17.0	16.9	16.7	16.6	18.5	17.8	17.0	16.2	15.4	14.7	20.2	20.1	20.0	19.8	19.7	19.6	18.5	19.1	18.3	17.5	16.7	16.0	23.8	23.7	23.5	23.4	23.3	7.62	5s = 0.3	2.3	3.0	3.6	4.1	4.4	4.6	4.7	4.8	4.7	4.7	4.6	Ss = 0.3	r
ht = 15 1 st)	Zone 3	-38.0	-38.9	-38.9	-39.0	-39.0	-17.4	-17.5	-17.5	-17.5	-17.6	-17.6	-51.2	-47.5	-47.5	-47.5	-47.6	-47.6	-21.4	-21.4	-21.5	-21.5	-21.6	-21.6	-62.4	-57.8	-57.8	-57.9	-57.9	-57.9	-26.2	-26.2	-26.2	-26.3	- 20.3	- 20.4	55 = 0.2	2.1	3.0	3.6	4.1	4.4	4.6	4.7	4.8	4.7	4.7	4.6	Ss = 0.2	L C
dg. Heig Pressures (	Zone Z	0 30-	-25.0	-25.0	-25.1	-25.1	-17.4	-17.5	-17.5	-17.5	-17.6	-17.6	-32.5	-30.6	-30.6	-30.7	-30.7	-30.7	-21.4	-21.4	-21.5	-21.5	-21.6	-21.6	-39.6	-37.4	-37.4	-37.4	-37.4	-37.5	-26.2	-26.2	-26.2	-26.3	-26.4	-20.4	55 = 0.1	2.1	3.0	3.6	4.1	4.4	4.6	4.7	4.8	4.7	4.7	4.6	Ss = 0.1	0
dn 18	Zone 1	-17.6	-12.7	-12.7	-12.7	-12.8	-14.3	-14.4	-14.4	-14.5	-14.5	-14.5	-17.5	-15.6	-15.6	-15.7	-15.7	-15.7	-17.6	-17.7	-17.7	-17.8	-17.8	-17.8	-21.4	-19.2	-19.2	-19.2	-19.3	-19.3	-21.6	-21.7	-21.7	-21.7	o 1.0 9'17-	0.12-	5s = 0.0	2.1	3.0	3.6	4.1	4.4	4.6	4.7	4.8	4.7	4.7	4.6	Ss = 0.0	0
	1.10	2112	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	21:11	71:71	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12		
	Ĺ		Exp	oos	ure	e C	ate	eg	ory	/ B				E	xp	os	sur	e C	Cat	eg	ory	С				E	Exp	os	ure	e C	Cate	ego	ory	D						D	ow	n S	Slop	pe						

Up and Down (psf)

10 psf

Side Load (psf)

PAGE B17

Lateral



## APPENDIX B Pressure Lookup Tables

7:10 ASCE

New Jersey (Typical)\*

130 mph

Basic Wind Speed

Ground Snow Load

25 psf

1:12         -14.2           2:12         -12.6           3:12         -12.7           3:12         -12.7           4:12         -12.7           5:12         -12.7           5:12         -12.7           5:12         -12.7           5:12         -12.7           5:12         -12.7           5:12         -12.7           5:12         -12.8           6:12         -14.3           8:12         -14.4           9:12         -14.4           9:12         -14.5           10:12         -14.5           11:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5	Zone 2	psf) Zone 3	Down (psf)	Up I Zone 1	dg. Heig Pressures (p Zone 2	ht = 30 sf) <sup>zone 3</sup>	t. Down (psf)	Up Zone 1	dg. Heig Pressures (r Zone 2	ht = 60 1 psf) Zone 3	t. Down (psf)
2:12         -12.6           3:12         -12.7           3:12         -12.7           4:12         -12.7           5:12         -12.7           6:12         -12.8           6:12         -12.8           7:12         -14.3           8:12         -14.4           9:12         -14.5           10:12         -14.5           11:12         -14.5           12:12         -14.5           11:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5           12:12         -14.5	-26.5	-42.0	25.9	-14.2	-26.5	-42.0	25.9	-17.5	-32.5	-51.2	25.9
3:12         -12.7           4:12         -12.7           5:12         -12.7           5:12         -12.8           6:12         -12.8           7:12         -14.3           8:12         -14.4           9:12         -14.5           10:12         -14.5           11:12         -14.5           12:12         -14.5	-25.0	-38.9	24.6	-12.6	-25.0	-38.9	24.6	-15.6	-30.6	-47.5	24.6
4:12         -12.7           5:12         -12.7           6:12         -12.8           6:12         -12.8           7:12         -14.4           8:12         -14.4           9:12         -14.5           10:12         -14.5           11:12         -14.5           12:12         -14.5           11:12         -14.5           12:12         -14.5	-25.0	-38.9	23.1	-12.7	-25.0	-38.9	23.1	-15.6	-30.6	-47.5	23.1
5:12         -12.7           6:12         -12.8           7:12         -14.3           8:12         -14.4           9:12         -14.4           10:12         -14.5           11:12         -14.5           12:12         -14.5	-25.0	-38.9	21.6	-12.7	-25.0	-38.9	21.6	-15.7	-30.7	-47.5	21.6
6:12         -12.8           7:12         -14.4           8:12         -14.4           9:12         -14.4           10:12         -14.5           11:12         -14.5           11:12         -14.5           12:12         -14.5	-25.1	-39.0	20.1	-12.7	-25.1	-39.0	20.1	-15.7	-30.7	-47.6	20.1
7:12         -14.3           8:12         -14.4           9:12         -14.5           10:12         -14.5           11:12         -14.5           11:12         -14.5           12:12         -14.5	-25.1	-39.0	18.7	-12.8	-25.1	-39.0	18.7	-15.7	-30.7	-47.6	18.7
8:12 -14.4 9:12 -14.4 10:12 -14.5 11:12 -14.5 12:12 -14.5	-17.4	-17.4	20.6	-14.3	-17.4	-17.4	20.6	-17.6	-21.4	-21.4	22.8
9:12 -14.4 10:12 -14.5 11:12 -14.5 12:12 -14.5	-17.5	-17.5	19.4	-14.4	-17.5	-17.5	19.4	-17.7	-21.4	-21.4	21.7
10:12 -14.5 11:12 -14.5 12:12 -14.5	-17.5	-17.5	18.4	-14.4	-17.5	-17.5	18.4	-17.7	-21.5	-21.5	20.6
11:12 -14.5 12:12 -14.5	-17.5	-17.5	17.5	-14.5	-17.5	-17.5	17.5	-17.8	-21.5	-21.5	19.8
12:12 -14.5	-17.6	-17.6	16.7	-14.5	-17.6	-17.6	16.7	-17.8	-21.6	-21.6	19.7
	-17.6	-17.6	16.6	-14.5	-17.6	-17.6	16.6	-17.8	-21.6	-21.6	19.6
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
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	29.3
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.(
11:12 -21.8	-26.3	-26.3	23.3	-24.6	-29.8	-29.8	25.9	-28.0	-33.7	-33.7	28.0
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
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
1:12 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	× ×
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	80
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
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 =

Up and Down (psf)

Lateral PAGE B18



160 mph

# APPENDIX B Pressure Lookup Tables

7-10 ASCE

Florida (Typical)\* APPENDIX - Pressure Tables for Flush Mounted Roof Systems

				u 0	Jee	u					Gr	Jui	iu ,	SH			au				_	_			_											_,					_								_	·
t. Down (psf)	13.4	18.0	17.9	17.9	17.8	0.00	C.02	0.02	70.6	C.82	1.02	5.02	15.2	22.7	22.6	22.5	22.4	22.3	37.3	37.2	37.1	36.9	36.8	36.7	17.0	25.7	25.6	25.5	25.4	25.3	42.7	42.6	42.5	42.4	42.2	42.1	Ss = 3.1	4.8	5.2	5.5	5.8	9.0	6.2	6.3	6.5	6.5	6.6	9.9	6.7	Ss = 3.1 <b>4.5</b>
ht = 60 f sf) zone 3	-78.3	-72.6	-72.6	-72.6	-72.7	1.21-	0.00-	-33.0	-33.1	-33.1	1.00-	-33.4	-104.5	-96.9	-97.0	-97.0	-97.0	-97.0	-44.2	-44.3	44.3	-44.3	-44.4	-44.4	-121.3	-112.6	-112.6	-112.6	-112.7	-112.7	-51.4	-51.5	-51.5	-51.6	-51.6	-51.6	Ss = 2.5	4.0	4.3	4.6	4.9	5.1	5.3	5.5	5.6	5.7	5.8	5.9	5.9	Ss = 2.5 <b>3.6</b>
dg. Heig Pressures (p Zone 2	-49.9	-47.0	-47.1	-47.1	-47.1	1./4-	0.00-	- 33.0	- 33.1	-33.1	1.00-	-33.2	-66.7	-62.9	-63.0	-63.0	-63.0	-63.1	-44.2	-44.3	-44.3	-44.3	-44.4	-44.4	-77.5	-73.2	-73.2	-73.2	-73.2	-73.3	-51.4	-51.5	-51.5	-51.6	-51.6	-51.6	Ss = 2.0	3.2	3.6	3.9	4.2	4.4	4.6	4.8	4.9	5.0	5.1	5.2	5.3	Ss = 2.0 2.9
BI Up Zone 1	-27.1	-24.3	-24.3	-24.4	-24.4	4.42-	C.12-	5.12-	4.72-	-27.6	3 2 2 2	C.12-	-36.5	-32.7	-32.7	-32.8	-32.8	-32.8	-36.7	-36.7	-36.7	-36.8	-36.8	-36.9	-42.5	-38.1	-38.2	-38.2	-38.2	-38.3	-42.7	-42.7	-42.8	-42.8	-42.8	-42.9	Ss = 1.5	2.5	2.8	3.2	3.4	3.7	3.9	4.1	4.2	4.4	4.5	4.6	4.6	Ss = 1.5 2.2
t. Down (psf)	13.4	15.5	15.4	15.3	15.2	1.01	24.9	24.3	24.1	24.0	0.00	73.8	13.7	20.2	20.1	20.0	19.9	19.8	32.8	32.7	32.6	32.4	32.3	32.2	15.5	23.2	23.1	23.0	22.9	22.8	38.2	38.1	38.0	37.8	37.7	37.6	Ss = 1.25	2.1	2.5	2.8	3.1	3.3	3.5	3.7	3.9	4.0	4.1	4.2	4.3	Ss = 1.25 1.8
ht = 30 f ssf) zone 3	-64.2	-59.6	-59.6	-59.6	-59.6	1.80-	0.72-	0.72-	0.12-	1.12-	11/7-	7.12-	-90.4	-83.9	-83.9	-83.9	-84.0	-84.0	-38.2	-38.2	-38.3	-38.3	-38.4	-38.4	-107.3	-99.5	-99.6	-99.6	-99.66	-99.7	-45.4	-45.5	-45.5	-45.5	-45.6	-45.6	Ss = 1.0	1.9	2.3	2.6	2.8	3.1	3.3	3.5	3.7	3.8	3.9	4.0	4.1	Ss = 1.0 <b>1.6</b>
dg. Heig Pressures (r Zone 2	40.8	-38.5	-38.5	-38.6	-38.6	0.00-	0.12-	0.72-	0.12-	1.12-	11/7-	7.12-	-57.7	-54.4	-54.4	-54.5	-54.5	-54.5	-38.2	-38.2	-38.3	-38.3	-38.4	-38.4	-68.5	-64.6	-64.7	-64.7	-64.7	-64.8	-45.4	-45.5	-45.5	-45.5	-45.6	-45.6	Ss = 0.5	1.3	1.7	2.0	2.3	2.5	2.7	2.9	3.1	3.3	3.4	3.5	3.6	Ss = 0.5 <b>1.0</b>
BI Up Zone 1	-22.1	-19.8	-19.8	-19.8	-19.9	5.5L-	C.22-	-22.3	4.22-	22.4	1.22-	C'77-	-31.5	-28.2	-28.2	-28.3	-28.3	-28.3	-31.6	-31.7	-31.7	-31.8	-31.8	-31.8	-37.5	-33.6	-33.6	-33.7	-33.7	-33.7	-37.7	-37.7	-37.7	-37.8	-37.8	-37.9	Ss = 0.4	1.2	1.5	1.8	2.1	2.3	2.6	2.8	3.0	3.1	3.3	3.4	3.5	Ss = 0.4 0.9
ft. Down (psf)	13.4	15.5	15.4	15.3	15.2	T CT	24.4	24.3	24.1	24.0	0 00	73.8	13.4	18.0	17.9	17.9	17.8	17.6	28.9	28.8	28.6	28.5	28.4	28.3	14.2	21.0	20.9	20.9	20.8	20.7	34.3	34.2	34.1	33.9	33.8	33.7	Ss = 0.3	1.0	1.3	1.6	1.9	2.2	2.4	2.6	2.8	2.9	3.1	3.2	3.3	Ss = 0.3 0.7
ht = 15 psf) Zone 3	-64.2	-59.6	-59.6	-59.6	-59.6	1.60-	0.12-	0.12-	0.12-	1.12-	1.12-	7.12-	- 78.3	-72.6	-72.6	-72.6	-72.7	-72.7	-33.0	-33.0	-33.1	-33.1	-33.1	-33.2	-95.1	-88.2	-88.3	-88.3	-88.3	-88.4	-40.2	-40.2	-40.3	-40.3	-40.4	-40.4	Ss = 0.2	0.8	1.1	1.4	1.7	1.9	2.2	2.4	2.6	2.7	2.9	3.0	3.1	Ss = 0.2 0.5
dg. Heig Pressures ( Zone 2	40.8	-38.5	-38.5	-38.6	-38.6	0.00-	0.12-	0.12-	0.12-	1.12-	11/7-	7.12-	-49.9	-47.0	-47.1	-47.1	-47.1	-47.1	-33.0	-33.0	-33.1	-33.1	-33.1	-33.2	-60.7	-57.3	-57.3	-57.3	-57.3	-57.4	-40.2	-40.2	-40.3	-40.3	40.4	-40.4	Ss = 0.1	0.6	6.0	1.2	1.5	1.7	2.0	2.2	2.4	2.5	2.7	2.8	2.9	Ss = 0.1 0.2
BI Up Zone 1	-22.1	-19.8	-19.8	-19.8	-19.9	5'6T-	C:77-	5.22-	+77-	-22.4	4:77-	C'77-	-27.1	-24.3	-24.3	-24.4	-24.4	-24.4	-27.3	-27.3	-27.4	-27.4	-27.5	-27.5	-33.1	-29.7	-29.7	-29.8	-29.8	-29.8	-33.3	-33.4	-33.4	-33.4	-33.5	-33.5	Ss = 0.0	0.3	0.6	0.9	1.2	1.5	1.7	1.9	2.1	2.3	2.5	2.6	2.7	Ss = 0.0 0.0
Roof Pitch	1:12	2:12	3:12	4:12	5:12	71:0	71.1	2112	9:12	11.12	21.11	71:71	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12	
			Exp	osi	Jre	Са	ate	go	ry	В		L	- 1	E	xp	osi	ure	e C	ate	go	ory	С				E	Exp	os	ure	e C	ate	ego	ory	D							Do	wr	۱S	lor	be					
													In		no	4 F			- (		f)																		c	2id	0			d (	n	-f)				Latera

Up and Down (psf)

0 psf

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## APPENDIX B Pressure Lookup Tables

7.10 ASCE 170 mph

Basic Wind Speed

Ground Snow Load

0 psf

= 60 ft. Down	8.5 13.5	2.1 19.8	2.1 19.8	2.2 19.7	2.2 19.6	2.2 19.5	7.4 32.2	7.4 32.1	7.5 31.9	7.5 31.8	7.5 31.7	1.0 31.0	18.1 16.6	1.02 0.60	1.62 0.60	09.7 24.9	09.7 24.8	0.1 41.7	0.1 41.6	0.1 41.5	0.2 41.3	0.3 41.1	37.1 18.7	27.2 28.5	27.3 28.4	27.3 28.4	27.3 28.3	27.4 28.2	8.2 47.7	8.3 47.6	8.3 47.4	8.4 47.3	0.4 4/.2	T'C = SC C'7 =	13 5.2	1.6 5.5	1.9 5.8	0.0	6.2 6.2	6.5	6.5	00	0.0
Height = mes(psf) e 2 Zo	4	9 %	۹۹ ۳	۹ 8	۹ 8	4.	4.	4.	ς.	ъ. Ч	υ Ω	<b>0</b>		7. C	7. 6		.3 -1(	.1	.1			4 m	-1-	8 1-	8.	80 1		6.0	4 C	с. 2	<u>د</u> .	4 2	4. C	- sc 0.7	9	9	2 .	4			0		-
Bldg. H	-56	3 <u>5</u>	-23	-23	-23	-23	-37	-37	-37	-37	-37	- - -	5 5		1 1	- 12-	-71	5	-20	នុ	S S	5 2	6	-8	-82	-82	8	8 2	° S	-58	-58	ې ۲	°,	- <b>c</b>	i ri	'n	4.	4	4 4	4	s.		S.
L and T	-30.8	-27.6	-27.6	-27.6	-27.7	-27.7	-31.0	-31.0	-31.0	-31.1	-31.1	-31.2	41.4	-37.1	1./6-	-37.2	-37.2	-41.5	-41.6	-41.6	-41.7	41.7	-48.1	-43.2	-43.2	-43.3	-43.3	-43.3	48.4	-48.4	-48.4	-48.5	C.04-		2.8	3.2	3.4	3.7	3.9	4.2	4.4		4.5
t. Down (psf)	13.4	17.0	16.9	16.9	16.8	16.6	27.1	27.0	26.8	26.7	26.6	5.02	14.9	5.22	7.77	22.0	21.9	36.6	36.5	36.4	36.2	36.0	17.0	25.7	25.6	25.5	25.4	25.3	42.6	42.5	42.3	42.2	1.24 L.24	C7'T = SC	2.5	2.8	3.1	5.5	3.5	3.9	4.0		4.1
ht = 30 f sf) <sup>zone 3</sup>	-72.7	-67.4	-67.4	-67.5	-67.5	-67.5	-30.6	-30.6	-30.7	-30.7	-30.7	-30.8	-102.3	94.9	040	-95.0	-95.0	-43.3	-43.3	-43.3	43.4	43.5	-121.3	-112.5	-112.6	-112.6	-112.6	-112.7	-51.5	-51.5	-51.5	-51.6	0.10-	1.0	2.3	2.6	2.8	3.1	3.3	3.7	3.8		3.9
Ig. Heigl ressures (p Zone 2	-46,3	-43.6	-43.7	-43.7	-43.7	-43.8	-30.6	-30.6	-30.7	-30.7	-30.7	-30.8	-65.3	-01.6	01.0	-01.7	-61.7	-43.3	-43.3	-43.3	43.4	43.5	-77.5	-73.1	-73.2	-73.2	-73.2	-73.3	-51.5	-51.5	-51.5	-51.6	0'TC-	0.0 = 00.0	1.7	2.0	2.3	2:5	2.7	3.1	3.3		3.4
Up F Zone 1	-25.1	-22.5	-22.5	-22.6	-22.6	-22.6	-25.3	-25.3	-25.4	-25.4	-25.5	C.C2-	-35.7	-32.0	-32.0	-32.1	-32.1	-35.9	-35.9	-35.9	-36.0	-36.1	42.5	-38.1	-38.1	-38.2	-38.2	-38.2	42.7	-42.7	-42.8	-42.8	6.24-	1.0	15	1.8	2.1	2:3	2.6	3.0	3.1		3.3
t. Down (psf)	13.4	17.0	16.9	16.9	16.8	16.6	27.1	27.0	26.8	26.7	26.6	5.02	13.5	19.8	10.7	19.6	19.5	32.2	32.1	31.9	31.8	31.6	15.5	23.2	23.2	23.1	23.0	22.9	38.2	38.1	37.9	37.8	3/./	1.0	13	1.6	1.9	2:2	2.4	2.8	2.9		3.1
ht = 15 f sf) <sup>zone 3</sup>	-72.7	-67.4	-67.4	-67.5	-67.5	-67.5	-30.6	-30.6	-30.7	-30.7	-30.7	-30.8	-88.5	-82.1	1.20-	-82.2	-82.2	-37.4	-37.4	-37.5	-37.5	-37.6	-107.5	-99.8	-99.8	-99.8	6.66-	-99.9	-45.6	-45.6	-45.6	-45.7	/.04-	20 = 0.2	11	1.4	1.7	5 I	2.2	2.6	2.7		2.9
dg. Heigl Pressures (p Zone 2	-46.3	-43.6	-43.7	-43.7	-43.7	-43.8	-30.6	-30.6	-30.7	-30.7	-30.7	-30.8	-56.4	53.3	52.2	-53.3	-53.4	-37.4	-37.4	-37.5	-37.5	-37.6	-68.7	-64.8	-64.8	-64.9	-64.9	-64.9 AFF	45.6	-45.6	-45.6	45.7	1.04-	T'D = 90	60	1.2	1.5	1./	2.0	2.4	2.5		2.7
BI Up1 Zone 1	-25.1	-22.5	-22.5	-22.6	-22.6	-22.6	-25.3	-25.3	-25.4	-25.4	-25.5	C.C2-	-30.8	9.12-	0.12-	-27.7	-27.7	-31.0	-31.0	-31.0	-31.1	-31.2	-37.6	-33.7	-33.7	-33.8	-33.8	-33.8	-37.8	-37.8	-37.9	-37.9	-38.0	0.3 = 0.0	0.6	0.9	1.2	<u>.</u>	1.7	2.1	2.3		2.5
Roof Pitch	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	71:71	1:12	21:2	3:12	5:12	6:12	7:12	8:12	9:12	10:12	12:12	1:12	2:12	3:12	4:12	5:12	6:12	8:12	9:12	10:12	11:12	Doof Ditch	1.12	2:12	3:12	4:12	5:12	6:12 7:12	8:12	9:12		10:12
		E	Ехр	oos	sure	e C	ate	ego	ory	В		Ē		Ex	po	sur	e (	Cat	ego	ory	С		Ē		Ехр	osi	ure	Са	iteg	ory	D		╢				Dov	٧n	Slo	pe			

Up and Down (psf)

Side Load (psf)

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Lateral

# APPENDIX C Downward & Upward Span Length Tables

SOLARMOUNT	Standard					Downf	orce Span L	ength				
Rail		20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
	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
Horizontal Load	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					Unli	ift Snan I en	ath				
Rail		20 nlf	30 nlf	40 nlf	50 nlf	60 nlf	70 nlf	80 nlf	100 plf	120 plf	150 nlf	180 nlf
Kan	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	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	4.0 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	5.0 ft	4.0 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	4.0 ft
Horizontal Load	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
Note: No	Example:	60 nlf	Downward L	and (strong av	vis)	8.0.ft	Max Span for	Downforce				
Internolation	Example.	50 ptf	Lipward Load	(strong axis)		8.5 ft	May Span for	Unlift				
					,	0.0 ft			1			
Permittea.		10 plf	Horizontal Lo	oad (weak axis	S)	8.0 ft	Max Span =	min (downfe	orce, uplift)			

with SOLARMOUNT Standard Rail

# APPENDIX C Downward & Upward Span Length Tables

SOLARMOUNT	_ight (LT)					Down	force Span L	.ength				
Rail		20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
	0 plf	8.0 ft	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft	4.0 ft	3.5 ft	3.5 ft	3.0 ft
	5 plf	8.0 ft	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft	4.0 ft	3.5 ft	3.5 ft	3.0 ft
	10 plf	7.5 ft	7.0 ft	6.0 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.0 ft	3.5 ft	3.5 ft	3.0 ft
	15 plf	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	3.0 ft
	20 plf	6.0 ft	5.5 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	3.0 ft
Horizontal Load	25 plf	5.5 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.5 ft	4.0 ft	4.0 ft	3.5 ft	3.0 ft	3.0 ft
	30 plf	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.0 ft	4.0 ft	3.5 ft	3.5 ft	3.0 ft	3.0 ft
	35 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	3.0 ft	3.0 ft
	40 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
	50 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
	60 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
	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	iaht (LT)					Unl	ift Snan I en	ath				
Rail	5 ( )	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
Ran	0 plf	8.0 ft	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	2.5 ft
	5 plf	8.0 ft	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	2.5 ft
	10 plf	7.5 ft	7.0 ft	6.0 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	2.5 ft
	15 plf	7.0 ft	6.5 ft	6.0 ft	5.5 ft	5.0 ft	4.5 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	2.5 ft
	20 plf	6.0 ft	5.5 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.5 ft	4.0 ft	3.5 ft	3.0 ft	2.5 ft
Lavizontal Lond	25 plf	5.5 ft	5.5 ft	5.0 ft	5.0 ft	4.5 ft	4.5 ft	4.0 ft	4.0 ft	3.5 ft	3.0 ft	2.5 ft
Horizontal Load	30 plf	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.5 ft	4.0 ft	4.0 ft	3.5 ft	3.5 ft	3.0 ft	2.5 ft
	35 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	3.0 ft	2.5 ft
	40 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	2.5 ft
	50 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
	60 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
	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
Note: No	Fyample	60 plf	Downward L	nad (strong av	(is)	5 0 ft	Max Span for	Downforce				
Internelation	Example.	50 pt	Lloward Load	(strong axis)		5.5 ft	Max Span for					
					,	5.5 10		• • • •	1			
Permitted.		10 plf	Horizontal Lo	oad (weak axis	5)	5.0 ft	Max Span =	min (downf	orce, uplift)			

10 plf Horizontal Load (weak axis)

Max Span = min (downforce, uplift) with SOLARMOUNT Light (LT) Rail

# APPENDIX C Downward & Upward Span Length Tables

SOLARMOUNT H	eavy Duty					Downf	orce Span L	.ength				
(HD) Ra	il	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
	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
Horizontal Load	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 H	eavy Duty					Upl	ift Span Ler	ath				
(HD) Ra	il	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf	100 plf	120 plf	150 plf	180 plf
	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	11.5 ft	11.5 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	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	9.0 ft	7.5 ft	6.0 ft	5.0 ft	4.0 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	6.0 ft	5.0 ft	4.0 ft
Horizontal Load	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	4.0 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
Note: No	Example:	60 plf	Downward Lo	oad (strong ax	(is)	11.5 ft	Max Span for	Downforce				
Interpolation	····· F · · · ·	50 nlf	Upward Load	(strong axis)	-/	13.0 ft	Max Span for	Unlift				
Permitted.		10 ptf	Horizontal L	ad (weak axis	5)	11 5 ft	Max Span =	min (downf	orce unlift)			

10 plf Horizontal Load (weak axis)

11.5 ft Max Span = min (downforce, uplift)

with SOLARMOUNT Heavy Duty (HD) Rail



APPENDIX C Downward & Upward Span Length Tables

#### SOLARMOUNT FRONT TRIM

SOLARMOUNT Front Trim should not be installed in areas where the wind load exceeds 100 psf, where the distance from clamp to clamp (span) exceeds 52 inches, or where the cantilever (overhang) is greater than 66% of the span length.





#### Roof Pitch to Angle Conversion:

<i>12:12</i> = 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





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 connections, and the weight of the module.

To calculate the dead load of your system, please refer to Appendix G - 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

system can be utilized to clear a 20A fault condition occurring on the metallic racking or module frames Enphase Energy is looking to perform fault testing to verify that our microinverter enclosure and cabling components. These bonding devices can be either WEEB grounding clips or UL-2703 listed bonding within a system in which all of the metallic equipment is bonded using devices listed for bonding the 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 dips 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 United U-SMR Rail
- Flat-lid microinverter (M215 and/or M250 acceptable)
- WEEB-DMC grounding dips between metal components and installed as per Burndy installation requirements
- WEEB Grounding Lug for bonding of fault to 2<sup>rd</sup> 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
  - of #10 CU conductors 8
- 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/kR / 240V
    - One Way Distance of #10CU = 133 ft
      - Fault applied to 2<sup>nd</sup> rail
- Bonding of modules to rail with 1 WEEB dip per mid clamp
- Bonding of microinverter to rail with 1 WEEB clip 1 A

6/9/2014

# Conceptual Drawing

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# 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 1<sup>st</sup> 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 .

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# Equipment Grounding in an Enphase System

# Overview

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

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 and when properly bonded to racking and to modules frames provides for robust equipment grounding to Each and every microinverter in an Enphase system is bonded to ground through the Enphase Engage The Enphase Engage cable provides for a robust grounding path to each microinverter cost savings to the labor and balance of system costs in an Enphase Microinverter system. cabling 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 Systems that meet the 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 requirements of NEC 690.35 are exempt from the requirements of NEC 690.41 System Grounding

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

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



\*\*Aways check with your Authority Having Junisdiction about your proposed grounding methodology prior to the installation of the system

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

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.
- 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 8
- ground fault protection is provided by a ground fault sensing circuit. The DC conductors must be PV Wire. The DC conductors in an Enphase Microinverter are PV provided in the microinverter. In the Enphase microinverters with integrated grounding, the 690.9(A) Exception (b), overcurrent protection is not required on the DC conductors. Ground Fault Protection. In an Enphase microinverter system, ground fault protection is Q
- Wire ē
- - (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.

APPENDIX Enphase Energy Microinverter Testi ł

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Midclamp and Endclamp Loads per Module



#### Module Condition Definitions:

**END-END**: The END-END module shown above, correlating with the loads below, indicates a module that is secured by 4 Endclamps on 2 rails. **END-MID/MID-END**: The END-MID and MID-END modules shown above, correlating with the loads below, indicate modules that are secured by 2 Endclamps and 2 Midclamps on 2 rails.

MID-MID: The MID-MID module shown above, correlating with the loads below, indicate a module that is properly secured by 4 Midclamps on 2 rails.

			Mi	dclamp an	d Endclam	p Loads per	Module						
				Allowable	Load (lbs	)				Design L	.oad (lbs)		
	Loading Condition (with	St	andard Clam	ps	Pro	o-Series Clan	nps	Sta	andard Clam	nps	Pro	o-Series Clar	nps
Rail	Respect to Rail)	End-End	End-Mid & Mid-End	Mid-Mid	End-End	End-Mid & Mid-End	Mid-Mid	End-End	End-Mid & Mid-End	Mid-Mid	End-End	End-Mid & Mid-End	Mid-Mid
	Z+, Tension	1836	1751	1666	1064	1235	1406	2780	2726	2672	1064	1595	2126
см/см нр	Y±, Transverse*	178*	315*	428	288	258	468	269*	476*	647	436	392	708
טוו ויוכ וייוכ	X±, Sliding	244	244	850	2074	172	710	368	368	1286	3136	518	1074
	Y±, Transverse w/33mm Module	67	248	428	288	258	648	102	373	647	436	392	708
	Z+, Tension	1260	1234	1208	1064	1235	1406	1908	1867	1826	1064	1595	2126
SMIT	Y±, Transverse*	139*	225*	419	288	258	468	211*	340*	634	436	392	708
5141 61	X±, Sliding	266	266	840	2074	172	710	402	402	1270	3136	518	1074
	Y±, Transverse w/33mm Module	67	225	419	288	258	648	340	340	634	436	392	708

\*For transverse loads associated with using "C" Endclamps and 33 mm Modules, please see "Y±, Transverse w/33mm Module"

<u>Midclamp</u>: Part No. - 302030M, 302030D. Material - 6000 Series Aluminum Alloys. Ultimate Tensile Strength - 38 ksi. Yield Strength - 35 ksi. Finish - Black Anodize or Mill. Weight ~ 0.097 lbs (50 g)

Endclamp: Part No. - 302040M. Material - 6000 Series Aluminum Alloys. Ultimate Tensile Strength - 38 ksi. Yield Strength - 35 ksi. Finish - Mill. Weight ~ 0.124 lbs (57 g)

\*\*\*NOTE: See NOTES on Page G2.





#### SOLARMOUNT L-FOOT



L-Foot with 3/8" T-Bolt					
Direction	Allowable Load (lbs)		Design Load (lbs)		
Direction	SM/SM HD	SM LT	SM/SM HD	SM LT	
X±, Sliding	565 594		854	898	
Y ±, Transverse	146	172	220	261	
Z +, Tension	nsion 938 603 1419		911		
Z -, Compression	1357 1297 2052 19			1962	

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)

#### SOLARMOUNT BOTTOM MOUNTING CLIP (SM HD ONLY)



Bottom Mounting Clip (SM HD Only)			
	Allowable	Design	
Direction	Load (lbs)	Load (lbs)	
	SM HD	SM HD	
X±, Sliding	27	41	
Y ±, Transverse	329	497	
Z +, Tension	686	746	

Part No. 302000C

Bottom Mounting Clip Material: 6000 Series Aluminum Alloys Ultimate Tensile Strength: 38 ksi, Yield Strength: 35 ksi Finish: Clear Anodized

#### NOTES:

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

For the beam to L-Foot connection: Assemble with one Unirac <sup>3</sup>/<sub>8</sub>"-20 T-Bolt and one <sup>3</sup>/<sub>8</sub>"-20 ASTM F594 serrated flange nut.

Use anti-seize and torque the Midclamp, Endclamp, and Bottom Mounting Clip to 10 ft-lbs. Use anti-seize and torque the L-Foot to 30 ft-lbs.

Values for the L-Foot and Bottom Mounting Clip represent the capacity of a single part when used with a SOLARMOUNT series rail to retain a module in the direction indicated.

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Assemble Midclamp and Endclamp with one Unirac 14"-20 T-Bolt and one 14"-20 ASTM F594 serrated flange nut. SM = SOLARMOUNT Standard Rail, SM HD = SOLARMOUNT Heavy Duty Rail, SM LT = SOLARMOUNT Light Rail



#### **FLASHKIT PRO L-FOOT**



L-foot with 3/8" T-Bolt					
Direction	Allowable Load (lbs)		Design Load (lbs)		
Direction	SM/SM HD	SM LT	SM/SM HD	SM LT	
X±, Sliding	589 419		892	634	
Y±, Transverse	175	208	266	209	
Z+, Tension	ו 824 650		1246	983	
Z-, Compression	1540	1525	2330	2307	

Part no. 004055M, 004055D

Flashkit Pro L-Foot Material: 6000 Series Aluminum Alloys Ultimate Tensile Strength: 38 ksi, Yield Strength: 35 ksi Finish: Mill or Dark Anodized Weight: 0.215 lbs (98 g)

### APPENDIX G Technical Data Sheets

#### FLASHLOC COMP MOUNT



Flashloc Comp Mount with 3/8" T-Bolt					
Direction	Allowable Load (lbs)		Design Load (lbs)		
Direction	SM/SM HD	SM LT	SM/SM HD	SM LT	
X±, Sliding	584 573 884 86				
Y±, Transverse	162 172		246	261	
Z+, Tension 483 420 483 420					
Z-, Compression 629 468 629 4				468	

Part no. 004085M, 004085D

Flashloc Comp Mount Material: A380 Cast Aluminum Ultimate Tensile Strength: 46 ksi, Yield Strength: 23 ksi Finish: Mill or Black E-coat Weight: 0.295 lbs (134 g)

#### NOTES:

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

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

Use anti-seize and torque the Midclamp, Endclamp, and Bottom Mounting Clip to 10 ft-lbs. Use anti-seize and torque the L-Foot to 30 ft-lbs.

Values for the L-Foot and Bottom Mounting Clip represent the capacity of a single part when used with a SOLARMOUNT series rail to retain a module in the direction indicated.

Assemble Midclamp and Endclamp with one Unirac 1/4"-20 T-Bolt and one 1/4"-20 ASTM F594 serrated flange nut.

SM = SOLARMOUNT Standard Rail, SM HD = SOLARMOUNT Heavy Duty Rail, SM LT = SOLARMOUNT Light Rail

APPENDIX H SOLARMOUNT HD Rail

The SOLARMOUNT Installation Guide and system certifications are equally applicable to SOLARMOUNT HD and Light 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 and Light rail, 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 or Light rail, however, SOLARMOUNT HD still accommodates this mounting method. Should you elect to use bottom mounting clips to secure modules, please refer to the procedure below. NOTE: Bottom mounting of modules does not provide module bonding through clips and is not covered under the current UL 2703 certification.

	Wrench size	* Recommended torque (ft-lbs)	$\wedge$
¼″ hardware	1/16"	10	
¾″ hardware	%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.



Flashkit Pro L-Foot

	Maximum Continuous Spliced Rail Length for SM Standard (ft.)/Maximum Reaction Force (lbs)		
	At	tachment Spaci	ng
ΔT (°F)	24"	48"	72"
40	59/133	86/193	105/236
50	55/155	70/197	93/262
60	47/159	70/236	81/274
70	43/169	62/244	69/272
80	43/193	54/243	69/311
90	39/197	54/289	69/350
100	35/197	54/304	57/321
120	35/236	46/311	57/385
140	31/244	38/299	45/355

			Maximum Continuous Spliced Rail Length for SM Standard (ft.)/Maximum Reaction Force (lbs)				
	ġ		At	Attachment Spacing			
		<b>ΔΤ (°</b> F)	24"	48"	72"		
X	5	40	51/155	70/213	81/277		
Ĕ	ĕ	50	47/179	62/236	69/262		
2	2	60	43/196	54/246	69/315		
З С	D	70	39/208	54/288	57/304		
	2	80	35/213	46/280	57/347		
	2	90	35/240	46/333	57/390		
	ŭ	100	31/236	46/350	45/342		
	•	120	27/246	38/347	45/411		
		140	27/288	38/405	45/480		

	Maximum Continuous Spliced Rail Length for SM Light (ft.)/Maximum Reaction Force (lbs)		
	At	tachment Spaci	ng
ΔT (°F)	24"	48"	72"
40	51/115	70/157	81/182
50	47/132	62/174	81/228
60	43/145	54/182	69/233
70	39/153	54/213	69/272
80	35/157	46/207	57/257
90	35/177	46/233	57/289
100	31/174	46/259	57/321
120	27/182	38/257	45/304
140	27/213	38/299	45/355

	Maximum Continuous Spliced Rail Length for SM Light (ft.)/Maximum Reaction Force (lbs)			
	At	tachment Spaci	ng	
ΔT (°F)	24"	48"	72"	
40	43/131	62/188	69/236	
50	39/148	54/205	69/262	
60	35/160	46/210	57/260	
70	31/165	46/245	57/304	
80	31/188	38/231	45/274	
90	27/185	38/260	45/308	
100	27/205	38/289	45/342	
120	23/210	30/274	33/301	
140	23/245	30/320	33/352	

#### NOTES:

The values displayed are the maximum allowed rail length, in feet, without a thermal break.

The installer is responsible for determining the maximum temperature difference (ΔT) used to establish the maximum rail length, without expansion joint, at the install location.

As spans increase, so does the maximum reaction force that the rail exerts on the L-foot. It is the responsibility of the installer to ensure that Maximum Reaction Force does not exceed the shear capacity of the roof connection.

ΔT refers to the maximum difference in the temperature of the rail between installation and the extreme high or low temperature. The Extreme Annual Design Conditions table at the following url can be used as a reference when determining ΔT.

http://ashrae-meteo.info/

