



SnapNrack™

PV MOUNTING SYSTEM
GROUND MOUNT



CODE COMPLIANT
INSTALLATION
MANUAL | 2010

Published March 2010
Rev. 1.1

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1. Introduction

1.1 Overview of the Ground Mount System

The SnapNrack Ground Mount System, is a low profile, visually appealing, photovoltaic (PV) module installation system. This innovative suite of racking components simplifies the process of installing solar modules and shortens install times, which lowers installation costs.



SnapNrack systems, when installed in accordance with this manual, will be structurally adequate for the specific installation site and will meet the 2006 International Building Code, as well as local building codes.


The SnapNrack installation system is a set of engineered components that can be assembled into a wide variety of PV mounting structures. It is designed to be installed by qualified solar installation technicians. With SnapNrack you will be able to solve virtually any PV module mounting challenge.

1.2 Overview of this Manual

This manual describes the installation procedures for ground mounting with the use of 1.5-inch Schedule 40 and Schedule 80 steel pipe for AEE Solar photovoltaic (PV) arrays.

Review this entire manual before installing the SnapNrack system.

Throughout this manual you will see highlighted notes which will provide you with different types of information:

 **NOTICE** – indicates important information to help with the installation or to avoid potential damage to the structure or components.


 **CAUTION** – indicates a potential for property damage, personal injury, or death.

For questions call the SnapNrack technical support team. Find contact information at www.snapnrack.com. This manual is available in PDF form at www.snapnrack.com

1.3 Your Responsibility as Installer

Comply with all applicable local or national building codes, including any that may supersede this manual.

- Make sure that the SnapNrack components and other products are appropriate for the particular installation and the installation environment.
- Use only SnapNrack supplied parts for the rail system.
- Ensure safe installation of all electrical aspects of the PV array.

 **If it is raining, or if you anticipate any potentially dangerous conditions, do not proceed with the installation.**

1.4 Support

For help with your installation, contact the nearest SnapNrack engineering support office. You can find contact information for SnapNrack support by visiting www.snapnrack.com and clicking on Contact Us.

2. Prepare for the Installation

2.1 Introduction

The SnapNrack system is designed to be installed with a minimum number of footings resulting in a significant labor savings over traditional installation methods. The system integrates with ordinary 1-1/2 inch Schedule 40 or Schedule 80 galvanized pipes. This ground mount solution includes everything needed to install modules on pipe with vertical posts up to 8 feet from grade. You will only need the pipe, pipe fittings, concrete and the basic construction skills to complete the installation. This fully engineered system utilizes industrial-grade SnapNrack support rails and module clamps.

2.2 Identify SnapNrack components

Make sure you have all the necessary SnapNrack system components (see photos) needed to complete the installation.



Ground rail



Snap-in channel nut



SnapNrack pipe to rail clamp assembly



Universal end clamp

2.3 Obtain installer supplied tools and materials

Make sure you have all the necessary additional hardware components, tools, and other material that are needed to complete the installation.

These should include:

- Post hole digger
- Wheelbarrow and shovel
- String line
- Line level or builder's level
- Framing square
- Tape measure
- Pipe cutter
- 2 pipe wrenches
- Mallet or large hammer
- Drill
- Felt-tip marking pen
- Half-inch box/open end wrench
- 3/8-inch ratchet wrench with half-inch socket and torque wrench
- Tools for attaching grounding hardware
- Reciprocating saw or chop saw with a nonferrous metal blade for trimming the rails
- Metal file for finishing trimmed rails



Standard module end clamp assembly



Module mid clamp assembly

2.4 Survey the site

Measure the installation area and develop an accurate drawing identifying any obstacles such as buildings, ditches and trees.

If plans are available, check to make sure that the plans match the layout.

Review the shading pattern across the installation area from nearby structures, trees, etc. It is wise to perform a shade analysis prior to the design as part of a standard site analysis.

Identify any restricted access areas as required by the local jurisdiction usually referred to as offsets from other structures.

X **BEFORE YOU DIG ANY HOLES, contact all utilities in the area to locate any underground lines, pipes, and wiring.**

Determine the design wind speed and specific conditions for the site and reference the Rail Span Calculation table in section 7 to determine the maximum allowable rail span and footing spacing for this site.

If you are unsure about the local design wind speed, consult with the local building jurisdiction.

2.5 Lay out system on the ground

Using the information collected in the site survey, complete a system layout showing array location and distances from key features. Include any information necessary for the permitting process.

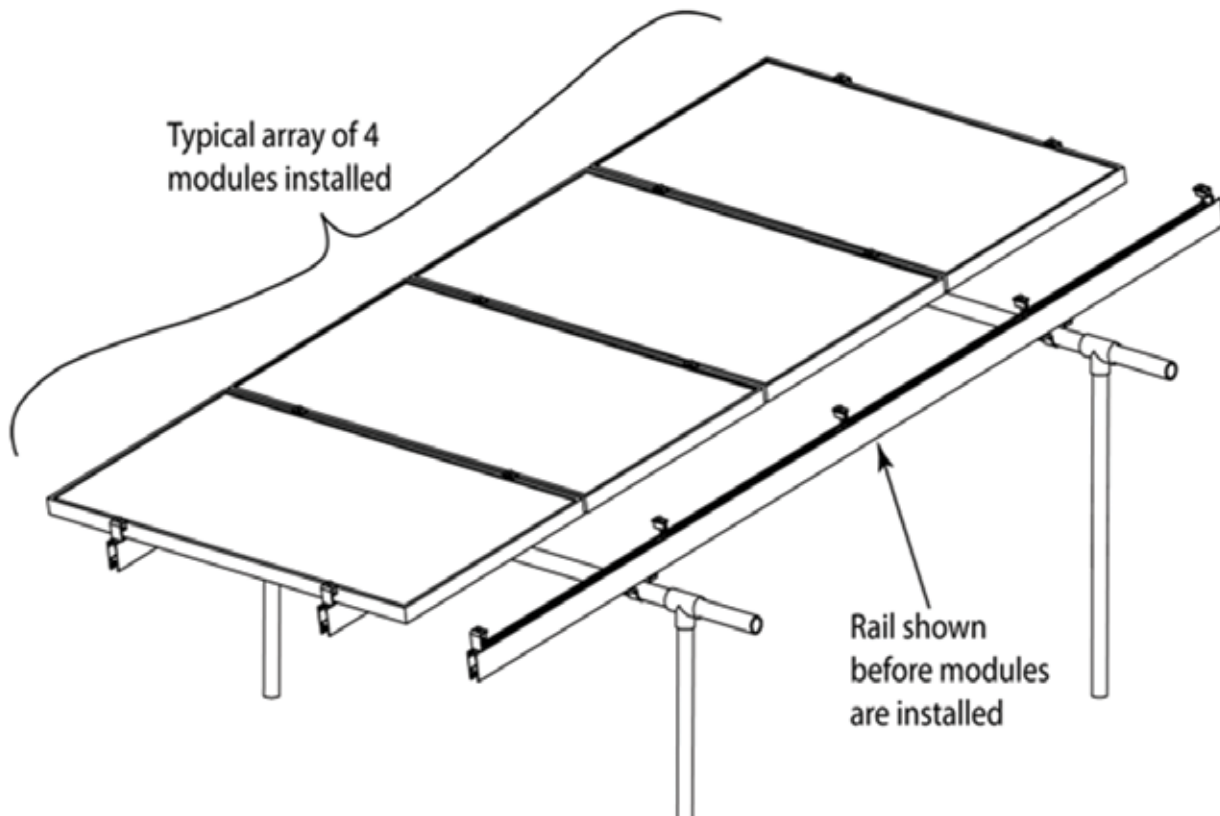
The following definitions are used to describe array layout designs:

- **Module length**—the measurement along the longer side of the module frame
- **Module width**—the measurement along the shorter side of the module frame
- **Module thickness**—the measurement of the thickness of the module

Typically, most ground-mounted arrays are installed in a landscape configuration, with the long side of the PV modules horizontal and the rails running up the slope. This is different from roof mount installations which typically are in a portrait configuration with the long side of the module running up slope and the rails running horizontally.

When laying out the array, be sure to leave space for the module clamps on the rails.

Module mid clamps (see photo on page 5) are installed between modules in a row and require a half inch of space between the modules.



Array installation in landscape orientation.

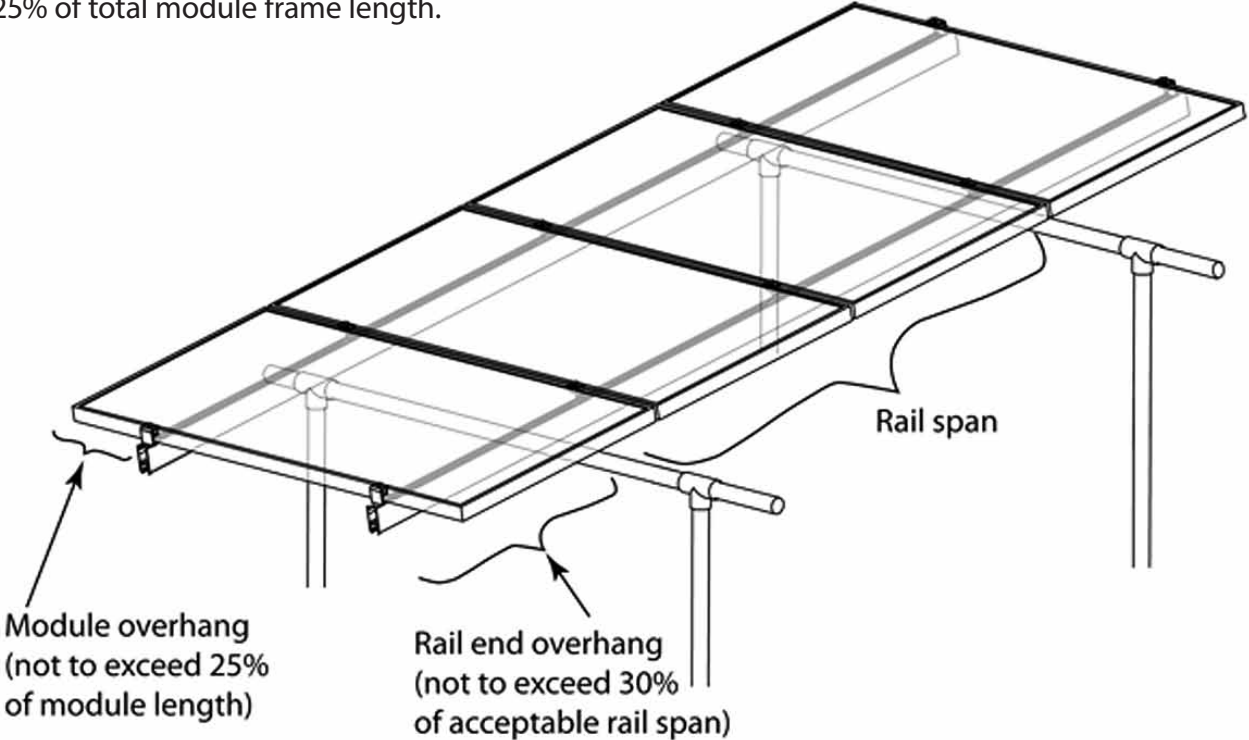
Standard module end clamps (see photo on page 5) require 1.5 inches of extra rail to extend past the end of the module frame. If you are using universal end clamps (see photo on page 4) the rail can be trimmed flush with the module frame. The space between rows of modules is not critical, but it is a good practice to leave a small gap (1/8 inch) between rows of modules to be installed so that the modules are not in contact with each other.

Layout rails so that module frame ends do not overhang mounting rails by more than 25% of total module frame length.

Verify that mounting rail spans are in accordance with the Rail Span Calculations table in the section 7 at the back of this manual.

Verify that rail ends do not overhang by a distance greater than 30% of the acceptable rail span specified in the same table.

Submit array plans to local permitting jurisdiction and proceed with the layout only when all permits for the project have been granted by the authority having jurisdiction.



Locations of rail end and module overhang

3. Install pipe frame

3.1 Excavation of the footings

Excavate core footings – 12 inches in diameter and typically 36 to 60 inches deep. See engineering design plans in the back of this manual for recommended depth of footing.

Footing size may vary depending on job-specific conditions. All conditions should be reviewed by customer's site engineer.

✓ To speed up installation, it is recommended to use a 12-inch power auger to dig the footings.

✗ Before you dig any holes, make certain all utilities in the area have been clearly marked including underground lines, pipes, and wiring.

3.2 Set grade stakes for vertical pipe

Determine the proper angle for the module array and install grade stakes. Do not exceed 8 feet of vertical post length from grade for rear post.

Install supports braces to hold the pipe at the proper fixed angle until the footings are poured.



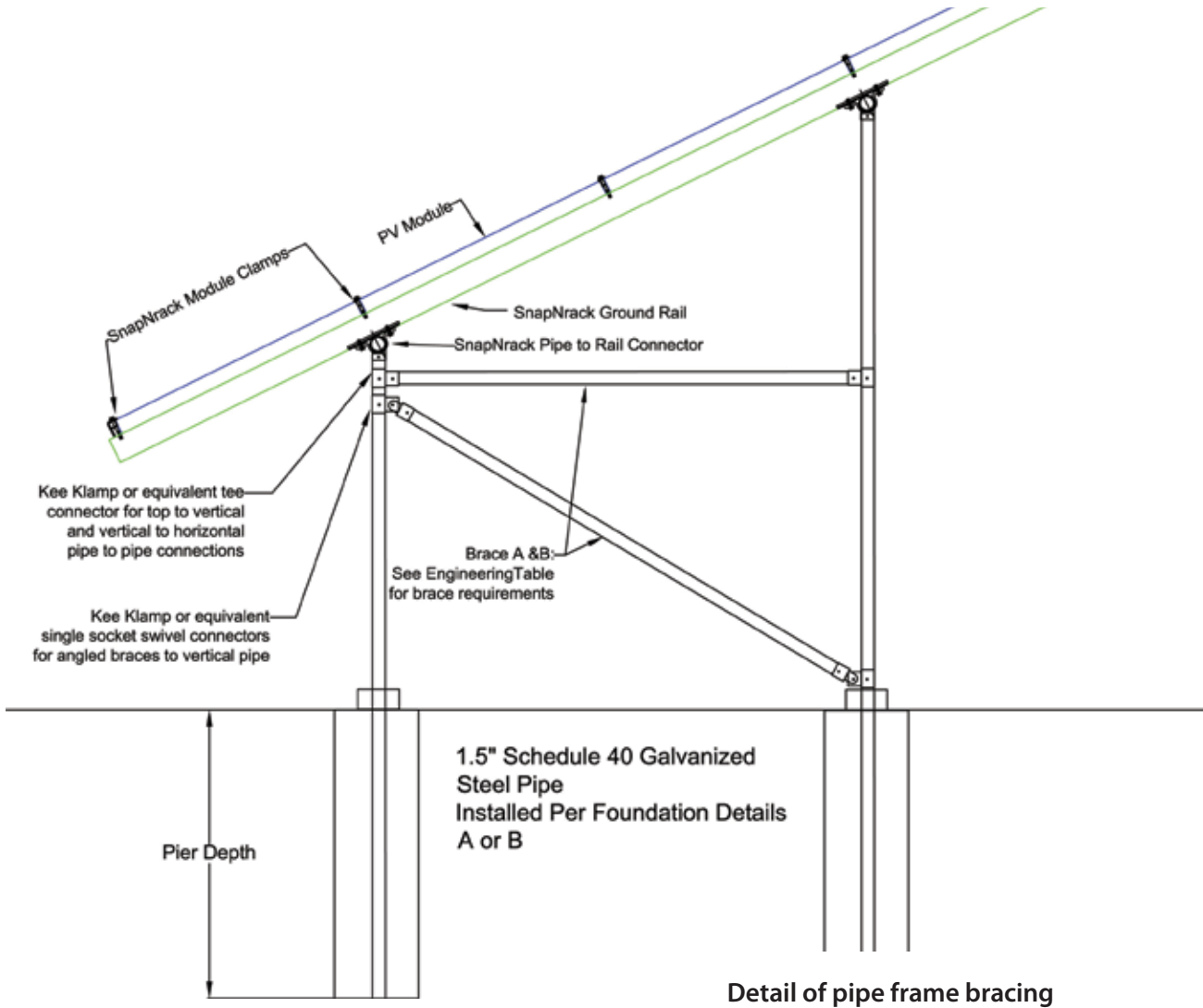
Digging holes with power auger



Install vertical pipes in concrete footings



Check pipe frame levels



Detail of pipe frame bracing

We recommend the use of a horizontal brace until the concrete sets. Install the end braces and then set up a string line to insure alignment. Place supports at a distance that will allow the pipe beam to be supported without sagging.

3.3 Install pipe

Pipe support beams and vertical post supports can now be assembled and rest on the support bracing. Using two pipe wrenches and 3/16-inch hex wrench, the pipe and support legs can be assembled.



Poured concrete footings

3.4 Set concrete footings

Align the end of the channel using a string line. Tighten all the pipe connections and

cross brace hardware and re-check alignment of the vertical pipe supports.

Pour concrete into the footings. Tamp the concrete to ensure contact with the vertical pipe support. Remove the support bracing after the concrete sets. Concrete requires 28 days to reach full strength or rated PSI. See the requirement in the back for PSI rating.

3.5 Pipe couplers and fittings

The pipe should be assembled with Kee Klamp style pipe couplers or equivalent. The couplers and connectors should be installed to the manufacturer's specifications.



Tee installed



Kee Klamp TEE



Kee Klamp Swivel



Swivel installed

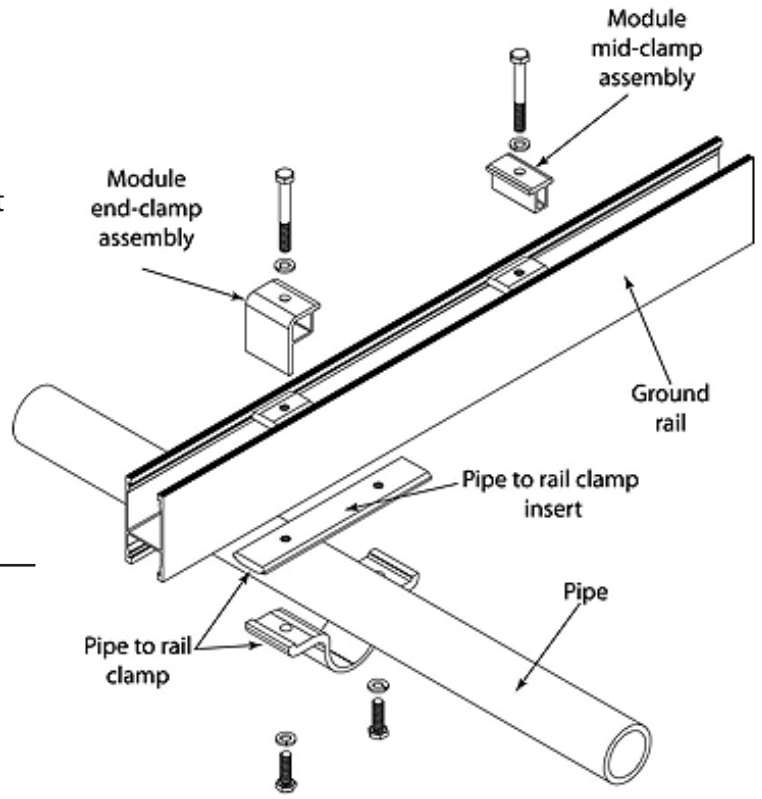
4. Install rails

4.1 Attach pipe clamps

Snap in SnapNrack pipe-to-rail clamp insert and attach rails to pipe frame as shown in the detail diagram.

Inserts are designed to snap in and out of rail channels. This enables you to quickly assemble systems without having to slide inserts from the end of the rail.

✘ Always cut rails to the required length. **Never use a rail splice to join two shorter rails in a ground mount installation.**



Detail of pipe-to-rail connection



Attach rails to pipe frame



Attach rails using SnapNrack pipe clamps

5. Install modules on rails

5.1 Prepare clamping hardware

Preassemble module clamping hardware. Each standard end clamp assembly and mid clamp consists of a module clamp, a channel nut, and a 5/16-inch bolt and split lock washer.

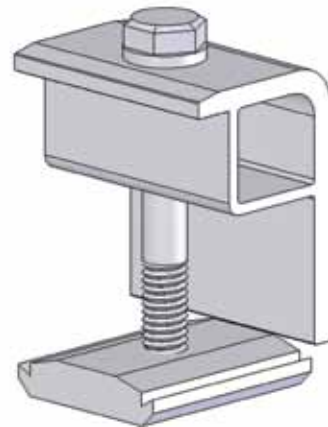
The end clamp size and bolt length are specific to the thickness of the module if you are using the standard end clamp. Make sure you have the right size of each of these components for the modules being installed.

To speed the installation, measure out the location of mid-clamps and end clamps on rails with a tape measure.

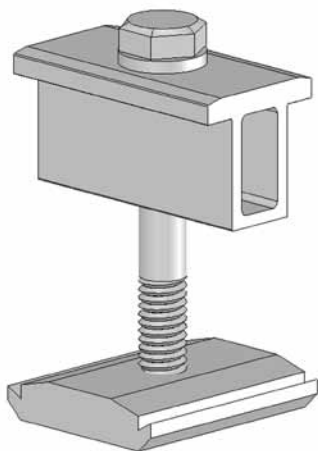
Snap in clamps on all the rails so the clamps will be ready when you place the modules.



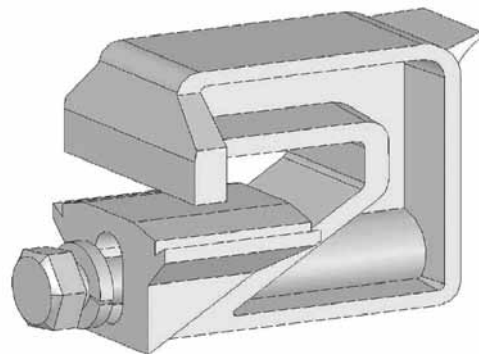
SnapNrack ground mount rail and module clamps



Standard module and clamp



Module mid clamp



Universal end clamp

5.2 Set first module

Place the first module, taking care to line the module up to the rails.

-
- ✓ **The rest of the installation will go more smoothly if you take the time to get the first module lined up properly.**
-

Tighten the two end clamps on the first module and snap in the next two clamps, which will typically be mid clamps, to prepare to receive the next module.

Place all the bottom modules first and align them with a string line or laser. We recommend you leave a 1/8-inch gap between the rows of modules to allow for thermal expansion and to help dissipate heat.

Proceed to the next row and work your way up.

When you place the last module in the row, secure it with end clamps to finish the row and repeat the process for the next row of modules.



Aligning first row of modules



First row of modules installed



Three rows of modules installed

5.3 Connect wiring

Connect module leads and train the wires into the rail channels as the modules are being installed. This will ensure a clean electrical installation with no dangling wires. Use module lead clips as necessary to insure that module leads are secured to module frames until they drop into the rail channel. You can also use the SnapNrack channel cover to help retain wires.

5.4 Connect grounding

Install grounding hardware per PV module manufacturer’s specifications and NEC code requirements.

It is often convenient to install grounding hardware as modules are being installed but this will vary with the type of PV modules used.

The Wiley Electronics WEEB is an acceptable grounding method. The SnapNrack rail requires the WEEB-PMC washer, only on the mid clamps.

5.5 Trim rails

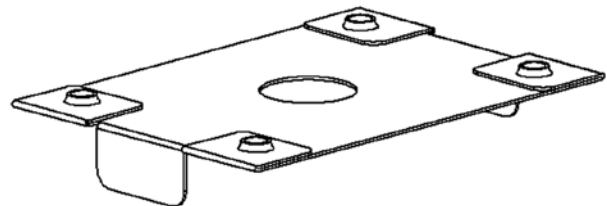
If you are using standard end clamps, trim rail ends to leave about 1.5 inches of extra rail extending past the end of the module frame. If you are using universal end clamps, the rail can be trimmed flush with the module frame.

File off any sharp edges from the rail ends with a hand file and clean up metal shavings. Install the rubber rail end covers.

✓ Careful array layout planning will enable you to cut rails to the correct length before they are installed and eliminate the need for trimming.



Grounding with lay-in style lugs



WEEB PMC grounding washer



WEEB on mid clamp

6. Final check

6.1 Structural inspection

Grab module frames and gently push up and down in various locations around the array to ensure that nothing moves.

6.2 Check all fasteners

Check all bolts with the torque wrench to ensure that all 5/16-inch hardware is tightened to 10 to 15 ft-lbs.

6.3 Check wires

Check under the array to ensure all wires are attached properly with module clips along the module frames and trained into the cable channels in the rails and that all channel covering is snug.

-
- ✔ It is a good practice to look for areas where the PV wires or cables could potentially get damaged due to contact with the module frames, rails or other sharp metal objects. This is a common cause for ground fault in PV installations.
-



Check all bolts



Check under the array for loose wires.

7. Appendix

7.1 Engineering Letter



Central Coast:

684 Clarion Court
San Luis Obispo, California 93401
805.547.2000 800.617.2235 fax

Southern California:

1276 E. Colorado Blvd, Suite 201
Pasadena, California 91106
626.793.7438 626.793.7439 fax

STRUCTURAL CALCULATIONS

PREPARED FOR:

SYSTEM:

SnapNrack Ground Mount Racking System

DESIGNER OF RECORD:

AEE Solar, Inc.
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San Luis Obispo, CA 93401

PROJECT ENGINEERS:

Matthew Gilliss, LEED AP
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Valid Through December 31, 2010
Subject to Annual Review & Reissuance



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SnapNrack Ground Mount System

Date: January 29, 2010
To: Tim Vaughn
AEE Solar
From: Matthew Gilliss
Taylor & Syfan Consulting Engineers
Project: SnapNrack Ground Mount System
T&S Job No.: 8445
Subject: Summary Letter for SnapNrack

INTRODUCTION

This Project Summary Letter is in reference to the Structural Calculation Packet for the AEE Solar Ground Mount Racking System "SnapNrack", dated December 2009. The calculations have been performed in accordance with the 2007 California Building Code (CBC), the governing structural code in California, which is based on the 2006 International Building Code (IBC). Several factors contained within this code govern the overall design of the racking system. The racking system has been designed to withstand code-prescribed forces due to the racking system's own weight, the weight of the solar panels, snow loads, and wind forces.

RAIL SPANS

In terms of variable conditions for the racking system, the follow pages contain charts that can be used to determine maximum spans and spacings based on the solar array's overall size and tilt angle. This chart is a summary of the following pages which include the calculations for each component under each condition.

SITE-SPECIFIC ANALYSIS

Every possible racking configuration labeled in the following chart has been analyzed and is summarized within this chart. Because there are so many different possible configurations, (2) of the most common cases have been provided in this report as example calculations.



Central Coast

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 (805)547.2001 fax
 (800)579.3881

Southern California

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 Pasadena, CA 91106
 (626)793.7438
 (626)793.7439 fax

SnapNrack Ground Mount System

UNIVERSAL END CLAMP

AEE Solar has also developed a "Universal End Clamp" which is used to connect individual solar panels to the rails (see AEE Solar's drawing "UEC INSTALL"). These have been developed and tested by AEE Solar, and they are adequate to resist the maximum uplift and shear forces generated by code prescribed wind forces when installed as specified. The testing results may be submitted upon request.

FOUNDATION OPTIONS

- Pier Foundations: Piers shall be 12" in diameter and shall be the depth required in the following charts based on wind speed, panel tilt, and snow load. Concrete shall conform to the attached concrete specifications.
- Grade Beam Option: A grade beam may be used in place of the pier foundations. See AEE's drawing S200 D04 for grade beam configuration. Grade beam shall be a minimum of 12" wide, 18" deep and shall run the width of the array a minimum of 12" beyond each vertical post. (2) #4 Bars Shall be used at BOTH the top and bottom of the grade beam, one on each side of the vertical pipe. These shall have a minimum of 3" clear of concrete cover and shall conform to the attached specifications. Concrete shall conform to the attached concrete specifications.

Please note that all sizes, material specifications, and weights have been provided by AEE Solar. AEE Solar has also provided estimated soil values used to calculate the size and depths of the footings. It is the responsibility of AEE Solar's customer, otherwise known as the contractor or professional solar installer, to verify that the site specific soil conditions match or exceed the estimated values given within this report.

Please feel free to contact me with any questions or concerns. Thank you.

Sincerely,

Matthew B. Gilliss
 Project Engineer
 Taylor & Syfan Consulting Engineers

GROUND SNOW LOAD = 0 PSF
85 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace E&F	Braced (E&F)	No Brace E&F	Braced (E&F)				
0-15 Deg.	7'-6"	8'-0"	15'	15'	(3) / (3)	(2) / (4)	(2) / (4)	(2) / (4)	NO	NO	EVERY 3RD BAY	NO
16-30 Deg.	6'-6"	7'-7"	13'	15'	(3) / (4)	(2) / (4)	(2) / (4)	(2) / (4)	YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*
31-45 Deg.	5'-6"	6'-0"	8'	8'	(3) / (4-1/2)	(2) / (5)	(2) / (5)	(2) / (5)	YES	NO	EVERY 2ND BAY	EVERY 3RD BAY*

*Brace D is not required when Brace E is used.

90 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace E&F	Braced (E&F)	No Brace E&F	Braced (E&F)				
0-15 Deg.	6'-9"	7'-6"	15'	15'	(3) / (4)	(2) / (4)	(2) / (4)	(2) / (4)	NO	NO	EVERY 3RD BAY	NO
16-30 Deg.	5'-10"	6'-4"	12'	13'	(3) / (4-1/2)	(2) / (4)	(2) / (4)	(2) / (4)	YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*
31-45 Deg.	5'-0"	5'-8"	8'	7'	(3) / (5)	(2) / (6)	(2) / (6)	(2) / (6)	YES	NO	EVERY 2ND BAY	EVERY 3RD BAY*

*Brace D is not required when Brace E is used.

105 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace E&F	Braced (E&F)	No Brace E&F	Braced (E&F)				
0-15 Deg.	5'-3"	6'-4"	12'	13'	(3-1/2) / (5)	(2) / (4-1/2)	(2) / (4-1/2)	(2) / (4-1/2)	YES	NO	EVERY 3RD BAY	NO
16-30 Deg.	4'-0"	5'-6"	10'	11'	(4) / (5-1/2)	(2) / (5-1/2)	(2) / (5-1/2)	(2) / (5-1/2)	YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*
31-45 Deg.	-	-	7'	7'	-	(2) / (6-1/2)	(2) / (6-1/2)	(2) / (6-1/2)	YES	NO	N/A	N/A

*Brace D is not required when Brace E is used.

120 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace E&F	Braced (E&F)	No Brace E&F	Braced (E&F)				
0-15 Deg.	4'-0"	5'-0"	9'	11'	(4) / (6)	(2) / (5)	(2) / (5)	(2) / (5)	YES	NO	EVERY 3RD BAY	NO
16-30 Deg.	-	-	7'	8'	-	(2) / (6-1/2)	(2) / (6-1/2)	(2) / (6-1/2)	YES	NO	N/A	N/A
31-45 Deg.	-	-	-	5'	-	(2) / (7)	(2) / (7)	(2) / (7)	YES	NO	N/A	N/A

** Actual Outer Diameter of Sch. 40/80 1-1/2" Nominal Diameter Pipe is 1.9"

GROUND SNOW LOAD = 1-10 PSF
85 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace	E&F	Braced (E&F)					
0-15 Deg.	6'-0"	7'-3"	15'	15'	(3) / (3)	(2) / (4)		NO	NO	EVERY 3RD BAY	NO	
16-30 Deg.	5'-0"	6'-7"	12'	14'	(3) / (4)	(2) / (4)		YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*	
31-45 Deg.	-	5'-4"	7'	7'	(3) / (4-1/2)	(2) / (5)		YES	NO	EVERY 2ND BAY	EVERY 3RD BAY*	

*Brace D is not required when Brace E is used.

90 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace	E&F	Braced (E&F)					
0-15 Deg.	5'-9"	6'-6"	14'	15'	(3) / (4)	(2) / (4)		NO	NO	EVERY 3RD BAY	NO	
16-30 Deg.	4'-8"	5'-9"	10'	12'	(3) / (4-1/2)	(2) / (4)		YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*	
31-45 Deg.	4'-0"	4'-8"	7'	7'	(3) / (5)	(2) / (6)		YES	NO	EVERY 2ND BAY	EVERY 3RD BAY*	

*Brace D is not required when Brace E is used.

105 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace	E&F	Braced (E&F)					
0-15 Deg.	4'-0"	5'-0"	10'	12'	(3-1/2) / (5)	(2) / (4-1/2)		YES	NO	EVERY 3RD BAY	NO	
16-30 Deg.	-	4'-0"	8'	9'	(4) / (5-1/2)	(2) / (5-1/2)		YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*	
31-45 Deg.	-	-	6'	6'	-	(2) / (6-1/2)		YES	NO	N/A	N/A	

*Brace D is not required when Brace E is used.

120 MPH DESIGN WIND SPEED – 1-1/2" NOMINAL DIAMETER PIPE – 12" DIAMETER PIERS**

Tilt Angle	Max PS (ft.)				Pier Depth				Required Braces			
	No Brace E & F		Braced (E & F)		Short/Tall Leg (ft.)		Braced (E&F)		A	B	C	D
	Sch. 40	Sch. 80	Sch. 40	Sch. 80	No Brace	E&F	Braced (E&F)					
0-15 Deg.	-	4'-0"	8'	10'	(4) / (6)	(2) / (5)		YES	NO	EVERY 3RD BAY	NO	
16-30 Deg.	-	-	6'	7'	-	(2) / (6-1/2)		YES	NO	N/A	N/A	
31-45 Deg.	-	-	-	4'	-	(2) / (7)		YES	NO	N/A	N/A	

**Actual Outer Diameter of Sch. 40/80 1-1/2" Nominal Diameter Pipe is 1.9"

GROUND SNOW LOAD = 11-20 PSF

85 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE** – 12” DIAMETER PIERS

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F		Braced (E & F)	Short/Tail Leg		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80	Sch. 80	No Brace E&F	Braced (E&F)					
0-15 Deg.	5'-3"	6'-6"	11'	13'	(3) / (3)	(2) / (4)	NO	NO	EVERY 3RD BAY	NO
16-30 Deg.	4'-0"	5'-6"	10'	12'	(3) / (4)	(2) / (4)	YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*
31-45 Deg.	-	4'-0"	6'	6'	(3) / (4-1/2)	(2) / (5)	YES	NO	EVERY 2ND BAY	EVERY 3RD BAY*

*Brace D is not required when Brace E is used.

90 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE** – 12” DIAMETER PIERS

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F		Braced (E & F)	Short/Tail Leg		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80	Sch. 80	No Brace E&F	Braced (E&F)					
0-15 Deg.	4'-0"	5'-0"	10'	12'	(3) / (4)	(2) / (4)	NO	NO	EVERY 3RD BAY	NO
16-30 Deg.	-	4'-0"	8'	10'	(3) / (4-1/2)	(2) / (4)	YES	NO	EVERY 3RD BAY	EVERY 3RD BAY*
31-45 Deg.	-	-	6'	6'	(3) / (5)	(2) / (6)	YES	NO	N/A	N/A

*Brace D is not required when Brace E is used.

105 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE** – 12” DIAMETER PIERS

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F		Braced (E & F)	Short/Tail Leg		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80	Sch. 80	No Brace E&F	Braced (E&F)					
0-15 Deg.	-	4'-0"	9'	10'	(3-1/2) / (5)	(2) / (4-1/2)	YES	NO	EVERY 3RD BAY	NO
16-30 Deg.	-	-	7'	8'	(4) / (5-1/2)	(2) / (5-1/2)	YES	NO	N/A	N/A
31-45 Deg.	-	-	5'	5'	-	(2) / (6-1/2)	YES	NO	N/A	N/A

*Brace D is not required when Brace E is used.

120 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE** – 12” DIAMETER PIERS

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F		Braced (E & F)	Short/Tail Leg		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80	Sch. 80	No Brace E&F	Braced (E&F)					
0-15 Deg.	-	-	7'	9'	(4) / (6)	(2) / (5)	YES	NO	EVERY 3RD BAY	N/A
16-30 Deg.	-	-	5'	8'	-	(2) / (6-1/2)	YES	NO	N/A	N/A
31-45 Deg.	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A

**Actual Outer Diameter of Sch. 40/80 1-1/2” Nominal Diameter Pipe is 1.9”

GROUND SNOW LOAD = 21-40 PSF
85 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE – 12” DIAMETER PIERS**

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F Braced (E & F)		Sch. 80	Short/Tall Leg (ft.)		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80		No Brace E&F	Braced (E&F)					
0-15 Deg.	-	4'-0"	8'	10'	(4) / (4)	(3) / (5)	NO	NO	EVERY 3RD BAY	NO
16-30 Deg.	-	-	8'	10'	(4) / (5)	(3) / (5)	YES	NO	N/A	EVERY 3RD BAY*
31-45 Deg.	-	-	6'	6'	(4) / (5-1/2)	(3) / (6)	YES	NO	N/A	EVERY 3RD BAY*

*Brace D is not required when Brace E is used.

90 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE – 12” DIAMETER PIERS**

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F Braced (E & F)		Sch. 80	Short/Tall Leg (ft.)		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80		No Brace E&F	Braced (E&F)					
0-15 Deg.	-	-	8'	9'	(4) / (4)	(3) / (5)	NO	NO	N/A	N/A
16-30 Deg.	-	-	8'	9'	(4) / (5-1/2)	(3) / (5)	YES	NO	N/A	N/A
31-45 Deg.	-	-	6'	6'	(4) / (6)	(2) / (6)	YES	NO	N/A	N/A

105 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE – 12” DIAMETER PIERS**

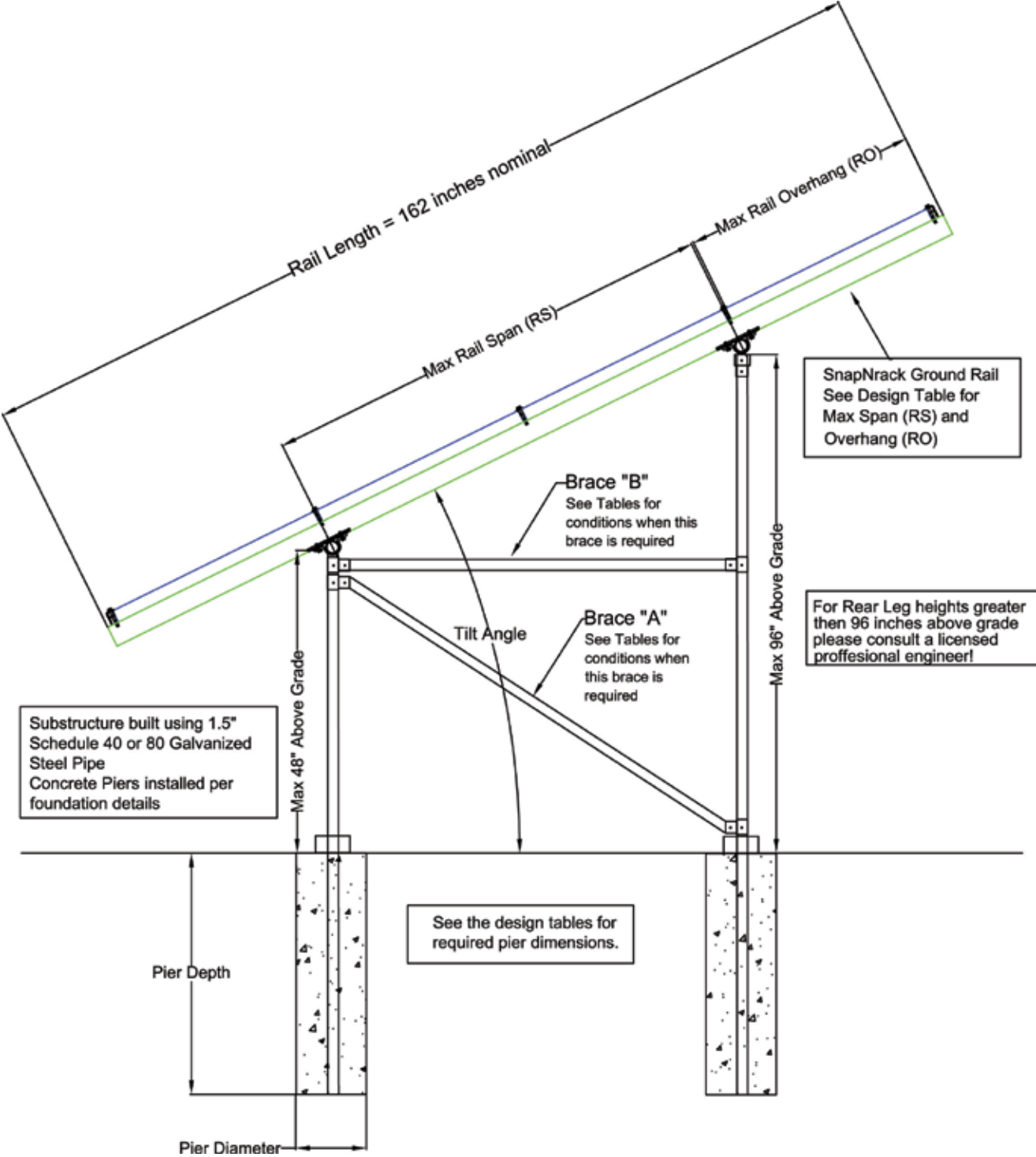
Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F Braced (E & F)		Sch. 80	Short/Tall Leg (ft.)		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80		No Brace E&F	Braced (E&F)					
0-15 Deg.	-	-	8'	9'	(4-1/2) / (6)	(3) / (5)	YES	NO	EVERY 3RD BAY	NO
16-30 Deg.	-	-	6'	7'	(5) / (6-1/2)	(3) / (6)	YES	NO	N/A	N/A
31-45 Deg.	-	-	5'	5'	-	(3) / (7)	YES	NO	N/A	N/A

*Brace D is not required when Brace E is used.

120 MPH DESIGN WIND SPEED – 1-1/2” NOMINAL DIAMETER PIPE – 12” DIAMETER PIERS**

Tilt Angle	Max PS (ft.)			Pier Depth			Required Braces			
	No Brace E & F Braced (E & F)		Sch. 80	Short/Tall Leg (ft.)		Braced (E&F)	A	B	C	D
	Sch. 40	Sch. 80		No Brace E&F	Braced (E&F)					
0-15 Deg.	-	-	6'	8'	(5) / (7)	(3) / (6)	YES	NO	EVERY 3RD BAY	N/A
16-30 Deg.	-	-	4'	6'	-	(3) / (7)	YES	NO	N/A	N/A
31-45 Deg.	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A

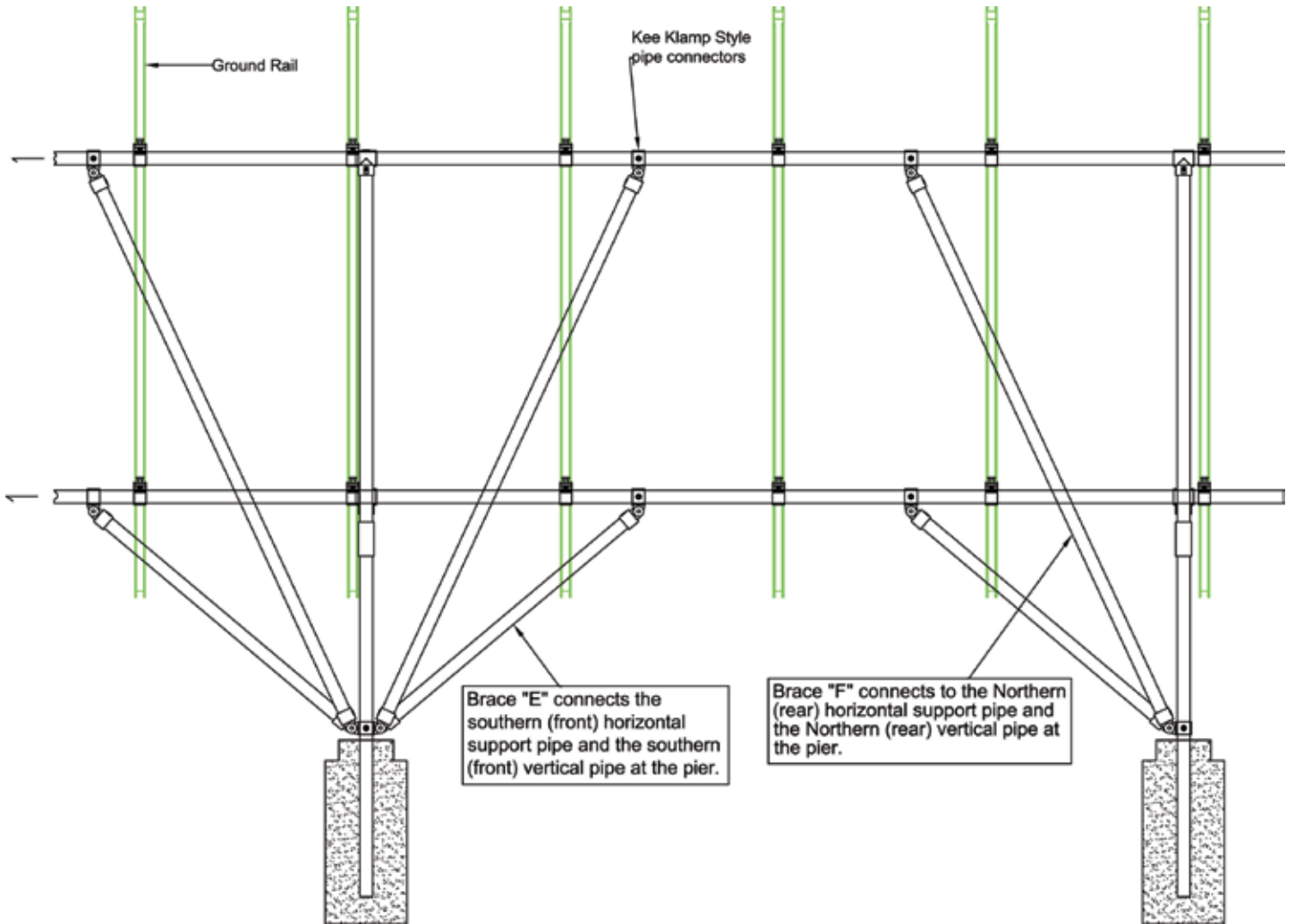
**Actual Outer Diameter of Sch. 40/80 1-1/2” Nominal Diameter Pipe is 1.9”



East view of the array

Bracing "C" when required is installed between the northern (rear) legs east to west, but if "E" and "F" are used as in the illustration below, then "C" or "D" is not required.

All cross bracing should be 1.5" Schedule 40 pipe similar to brace "A"



North view of the array

Warranty Document

SnapNrack™

10 year Limited Product Warranty and 5 year Limited Finish Warranty

Limited Warranties: AEE Solar, Inc., ("AEE Solar") warrants to the original end-user of the Product ("Purchaser") at the original installation site ("Site") that the SnapNrack® PV module mounting system (the "Product") shall be free from defects in materials and workmanship for a period of **ten (10) years** (the "Limited Product Warranty"), and the Product's anodized finish shall be free from visible peeling, cracking or chalking under normal atmospheric conditions for a period of **five (5) years** (the "Limited Finish Warranty") (collectively, the "Limited Warranties"). The Limited Warranties shall commence on the earlier of 1) the date the installation of the Product as part of the original solar electric system (the "System") is complete, or 2) thirty (30) days after AEE Solar ships the Product to the authorized distributor or retailer. If within the warranted period the Product is determined by AEE Solar, based on reasonable evidence of a defect provided by Purchaser, AEE Solar will, at its sole option, (a) repair the Product or replace it with an equivalent product, or (b) take back the Product and refund the purchase price to the Purchaser.

Conditions, Limitations and Exclusions: AEE Solar is not responsible for, and Purchaser hereby agrees to bear, the costs of any on-site labor and any costs associated with the installation, removal, reinstallation, shipping or transportation of the Product or any components thereof for replacement or service. (Note: the foregoing may not be applicable to consumer sales in certain jurisdictions.) AEE Solar may, at its sole discretion, use new, remanufactured or refurbished parts or products when repairing or replacing your Product under this warranty. Any exchanged or replaced parts or products will become the property of AEE Solar. This warranty is extended only to the original end-user purchaser and is not transferable, provided that as long as the System has not been physically moved or altered, any subsequent owner of the System shall have the same Limited Warranty rights as the original Purchaser.

The Limited Warranties do not apply to Products installed (a) outside the U.S.A. or Canada, or (b) in corrosive atmospheric conditions, including, but not limited to chemical fumes, salt spray, acidic rain or surface temperatures which exceed 200 degrees Fahrenheit. The Limited Warranties do not cover damage to the Product's anodized finish caused by moisture, condensation, or other contamination resulting from improper storage, packing or handling. The Limited Warranties do not cover damage to the Product that occurs during shipment or prior to or during installation. The Limited Warranties shall be void if the Product is not installed in accordance with AEE Solar's written installation instructions for the Product, or if the Product has been modified, repaired, or reworked in a manner not previously authorized by AEE Solar in writing, or if

the Product is installed in an environment for which it was not designed. As used herein, the term "chalking" refers to the powdery residue formed by the breakdown of the anodized finish, and excludes any foreign residue deposited on the finish by the surrounding atmosphere, including, but not limited to, soot, dust, plaster, cement, etc. The Limited Finish Warranty is void if normal maintenance and cleaning practices are not followed by Purchaser as specified by AAMA 609 & 610-02 – "Cleaning and Maintenance for Architecturally Finished Aluminum," a copy of which is available from AEE Solar or from www.aamanet.org.

AEE SOLAR MAKES NO WARRANTIES, EXPRESS OR IMPLIED, OTHER THAN THE LIMITED WARRANTIES MADE HEREIN. AEE SOLAR EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, TO THE FULLEST EXTENT PERMITTED BY LAW. TO THE EXTENT THAT ANY SUCH IMPLIED WARRANTIES CANNOT BE FULLY DISCLAIMED AS A MATTER OF LAW, THEY ARE LIMITED IN DURATION TO TEN (10) YEARS FROM THE DATE OF ORIGINAL PURCHASE.

TO THE FULLEST EXTENT PERMITTED BY LAW, AEE SOLAR DISCLAIMS ANY LIABILITY WHATSOEVER FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES ARISING FROM THE USE OF THE PRODUCT, OR FOR OTHER LOSS OR INJURY RESULTING FROM ANY CAUSE OF WHATSOEVER ARISING OUT OF OR RELATED TO THE PRODUCT, INCLUDING BUT NOT LIMITED TO DAMAGE OR INJURY TO PERSONS OR PROPERTY, DAMAGES FOR LOST SERVICES, COST OF SUBSTITUTE SERVICES, LOST PROFITS OR SAVINGS, AND EXPENSES ARISING OUT OF THIRD PARTY CLAIMS.

AEE SOLAR'S MAXIMUM LIABILITY UNDER ANY THEORY OF LIABILITY, WHETHER EXPRESS, IMPLIED OR STATUTORY, OR FOR ANY MANUFACTURING OR DESIGN DEFECTS, IS LIMITED TO THE ORIGINAL PURCHASE PRICE OF THE PRODUCT.

To the fullest extent permitted by law, Purchaser's remedies for breach of warranty, or for manufacturing or design defects, shall be only as stated herein. AEE Solar's Limited Warranty covers only the Product, and not related items such as PV modules, roof flashings and specialized clamps. Manufacturers of such related items typically provide written warranties of their own.

Warranty Procedure: Purchaser should contact the distributor or retailer where the Product was purchased, or if unable to do so, contact AEE Solar at: (800) 777-6609, customerservice@eesolar.com or AEE Solar, Inc., 775 Fiero Lane Suite 200, San Luis Obispo, CA 93401.



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