



SunEarth

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Figure 1: RexRack System on Slab Roof

RexRacking Base Structure Design Guide

SunEarth's RexRack is the premier, engineered solution for mounting SunEarth's Solar Thermal Collectors. It has been designed to meet challenging wind and snow conditions, constructed from corrosion resistant 6063-T6 anodized aluminum, it is built to last.

In order to take full advantage of RexRack strength, care must be taken when connecting to roof structures. A base structure should be implemented. Appropriate weather proofing will ensure system longevity.

Some common base structures will be explored in this product guide.

Base Structures Background

Base structures include any intermediate connections between the roof structure and the RexRacking as shown in **Figure 2** below. SunEarth does not recommend affixing the RexRack feet directly to the roof structure.

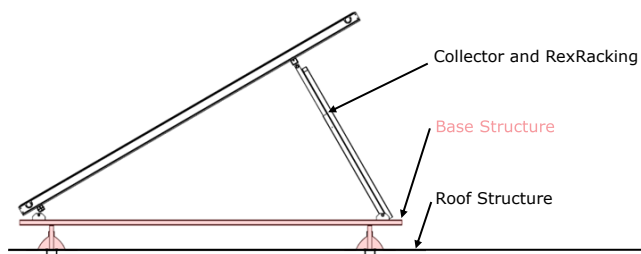


Figure 2: Racking System

Due to SunEarth's policy of continuous product improvement, design guides are subject to change without notice.

Standoff General Information

Implementing a proper base structure begins with a means to connect to the roof. Although there are many methods which may work, standoffs are presented here in **Figure 3** and in this guide.

Lag Bolts or equivalent fasteners (1) are used to fasten each standoff (2) to roof framing

members or roof structure. Flashing (3) and roof sealant are used to weather proof the assembly. Strut bolts (4) fasten solar strut (5) to the tops of the appropriate standoffs.

Size and spacing of roof connections are subject to roof structure, roof material, loading conditions, and building code requirements. Please consult authority having jurisdiction (AHJ) for more information regarding requirements in specific locales.

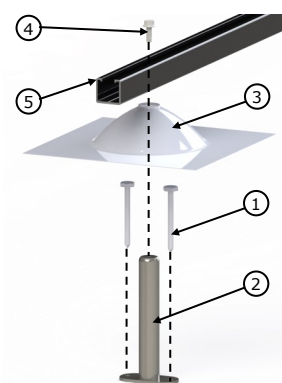


Figure 3: Standoff Anatomy



RexRacking Base Structure Design Guide

Example 1: Base Structure Layout on N-S Framed, Low Slope Roof

In this example, 3 SunEarth Collectors are being plumbed together with unions on RexRacking facing Geographic South with a tilt angle of 30° on a low slope roof with North-South framing members spaced at 24 inches on center.

Bill of Materials

- 3 SunEarth TRB-40 Collectors with 1" Headers
- 12 C-SSN-BA Mounting Clip Assemblies
- 4, 1" Unions
- 30° Rex Racking
 - * Rear Leg Telescoping Leg Assembly
 - * Front Foot Assembly
 - * Support Strut
 - * 20, #12x3/4" Self-Drilling Screws
- 8, 8" Stand-Offs and Hardware
- 8 Flashing Covers and Sealant
- Intermediate Base Strut

Stand-Offs and Flashing Layout

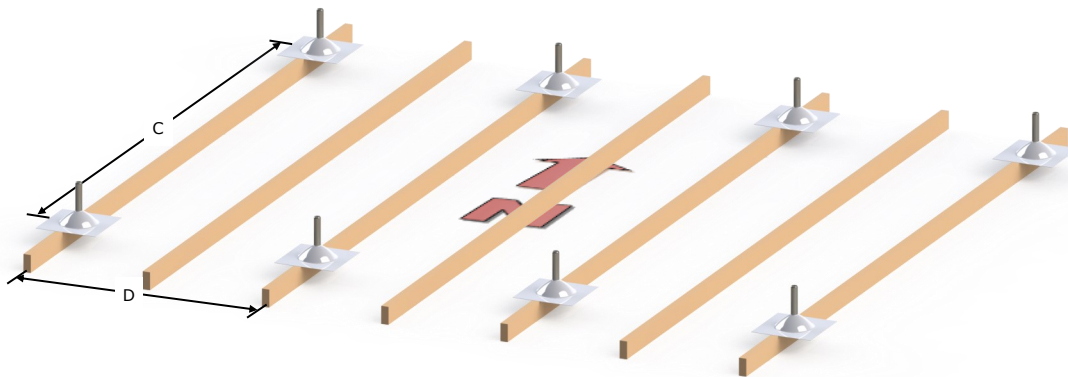


Figure 1.1: Stand-Offs and Flashing Layout on North South Framing

In **Figure 1.1** the stand-off layout "C" dimension is along Geographic North-South. The dimension "D" which corresponds to framing member spacing is along Geographic East-West.

"C": Dimension

Using the Table 6 on page 10 of our RexRack manual pictured in **Figure 1.2** on the following page, find the "C" dimension corresponding to the use of TRB-40s at a 30° tilt. Although, rear leg angle can vary between 70° and 90° , a rear leg tilt of 90° from the collector was chosen. In this case, dimension "C" is 105.9 inches on center.

"D": Dimension

Dimension D should fall on framing members. Since framing members are spaced 24 inches on center, dimension "D" was chosen to be 48 inches.



RexRacking Base Structure Design Guide

RexRack Layout Dimensions

EC/EP/SB/TRB/IS/IC—40					Rafter Spacing	
Tilt Angle (B)	Leg 90° from Collector		Leg 70° from Collector		Leg Spacing (E)	
	Leg Length (A)	Foot Spacing (C)	Leg Length (A)	Foot Spacing (D)	16"	24"
20	33.4	97.6	31.4	86.2	48	48
25	42.8	101.2	38.9	86.5	48	48
30	52.9	105.9	46.6	87.5	48	48
35	64.2	111.9	54.5	89.2	48	48
40	76.9	119.7	62.7	91.7	48	48
45	91.7	129.7	71.5	95.1	48	48
50	-	-	81.1	99.5	48	48
55	-	-	91.7	105.2	48	48
60	-	-	103.7	112.5	48	48

Table 6

Figure 1.2: RexRack Application Table for EC/EP/SB-40

The number of required standoffs in this case is 8, or 2 per each RexRack support leg.

If the roof surface is uneven, shimming should be done to ensure all standoffs are planar.

Base Strut Intermediate Connection



Figure 1.3: Base Strut, Intermediate Framing North-South

North-South Base Strut:

To achieve full rigidity of the RexRacking an intermediate framing member is used. In this case 1-5/8 inch solar strut is used as seen in **Figure 1.3**.

The length of North South Base Strut required is found using dimension "C" in **Figure 1.2**. Length must be added to accommodate the RexRack feet. Since the feet are 4 inches long, at least an additional 2 inches on each end, is required. In this example, 6 inches was added to provide ample space for the RexRack feet. Length "L" is the "C" dimension plus 6 inches or 111.9 inches.

The North-South Base Strut connects Stand-Offs along North-South by drilling holes in the appropriate locations and using hardware per AHJ.



RexRacking Base Structure Design Guide

Positioning the Collectors

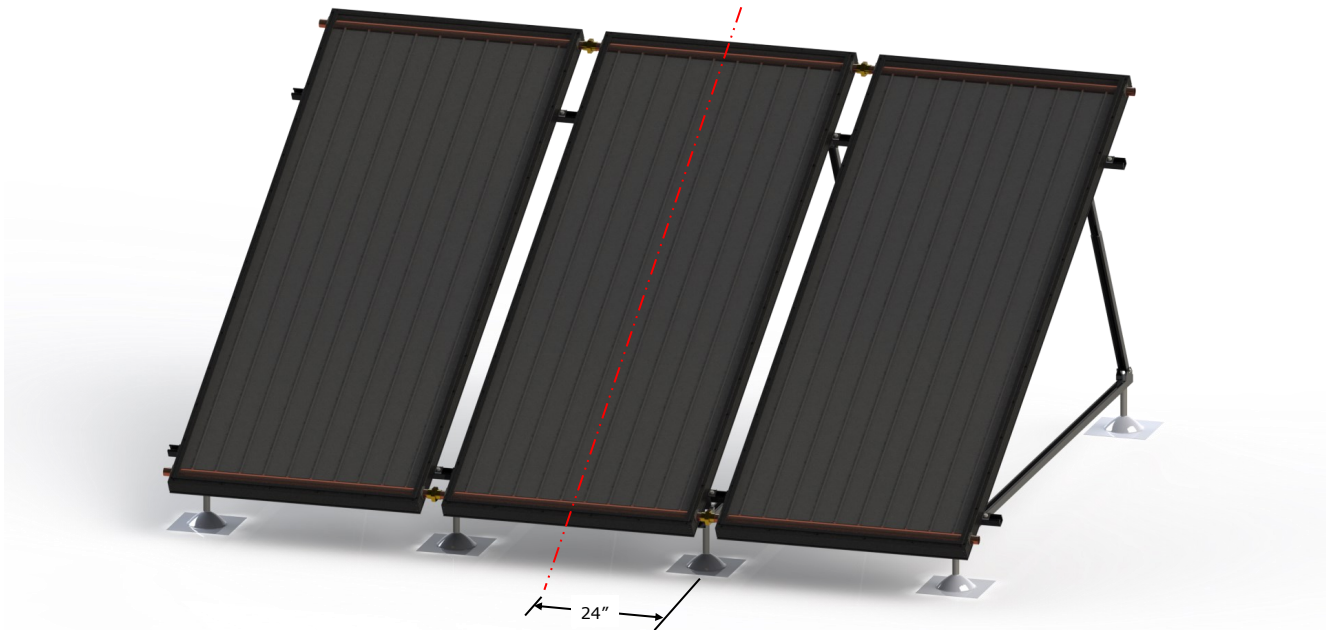


Figure 1.4: Completed RexRack on Framed Low Slope Roof

Since the RexRack leg spacing and header widths are often different, care should be taken to center the collectors on the racking. *In this example, the center line of the first collector should be installed 24 inches from a central post as shown in Figure 1.4.*

In general, if you are mounting an even number of collectors, the first collector should be installed with the left side of the header aligned with the RexRack's center leg. If you are mounting an odd number of collectors, the first collector should be installed with its center line centered on the racking as shown in **Figure 1.4**. This will ensure an even amount of overhang on each end which should not exceed 12 inches.

*RexRack installation procedure to follow per manual which can be located through the following link: <http://sunearthinc.com/thermal-mounting/rexrack/>.

Disclaimer: Roof penetrations, hardware, number of standoffs, and sub structure may differ per AHJ.



RexRacking Base Structure Design Guide

Example 2: Base Structure Layout on E-W Framing, Low Slope Roof

In this example, 3 SunEarth Collectors are being plumbed together with couplings on RexRacking facing Geographic South with a tilt angle of 30° on a low slope roof with East-West framing members spaced at 24 inches on center. This installation requires several stand offs to distribute the load.

Bill of Materials

- 3 SunEarth EP-40 Collectors with 1" Headers
- 12 C-SSN-BA Mounting Clip Assemblies
- 4, 1" couplings
- 30° Rex Racking
 - * Rear Leg Telescoping Leg Assembly
 - * Front Foot Assembly
 - * Support Strut
 - * 20, #12x3/4" Self-Drilling Screws
- 16, 8" Stand-Offs and Hardware
- 16 Flashing Covers and Sealant
- Intermediate Base Strut

Stand-Offs and Flashing Layout

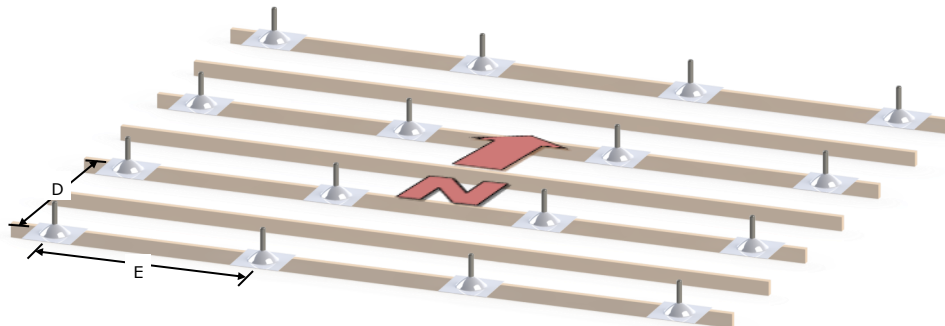


Figure 2.1: Stand-Offs and Flashing Layout on East West Framing

In **Figure 2.1** the stand-off layout "D" dimension corresponding to rafter spacing is along Geographic North-South. The dimension "E" leg spacing between collectors is along Geographic East-West. Multiple standoffs are installed along North-South to transfer collector load to multiple rafters.

"D": Dimension

Dimension D should fall on framing members. Since framing members are spaced 24 inches on center, dimension "D" is 48 inches.

"E": Dimension

Dimension "E" is 48 inches on center which corresponds to RexRack leg spacing.



RexRacking Base Structure Design Guide

RexRack Layout Dimensions

Tilt Angle (B)	EC/EP/SB/TRB/IS/IC—40				Rafter Spacing	
	Leg 90° from Collector		Leg 70° from Collector		Leg Spacing (E)	
	Leg Length (A)	Foot Spacing (C)	Leg Length (A)	Foot Spacing (D)	16"	24"
20	33.4	97.6	31.4	86.2	48	48
25	42.8	101.2	38.9	86.5	48	48
30	52.9	105.9	46.6	87.5	48	48
35	64.2	111.9	54.5	89.2	48	48
40	76.9	119.7	62.7	91.7	48	48
45	91.7	129.7	71.5	95.1	48	48
50	-	-	81.1	99.5	48	48
55	-	-	91.7	105.2	48	48
60	-	-	103.7	112.5	48	48

Table 6

Figure 2.2: RexRack Application Table for EC/EP/SB-40

In this case 4 standoffs were used for each RexRack leg along North-South to distribute the load and ensure enough strut was available to accommodate RexRack foot spacing "C." In order to properly support the load the number of required standoffs will depend on AHJ.

If the roof surface is uneven, shimming should be done to ensure all standoffs are planar.

Base Strut Intermediate Connection

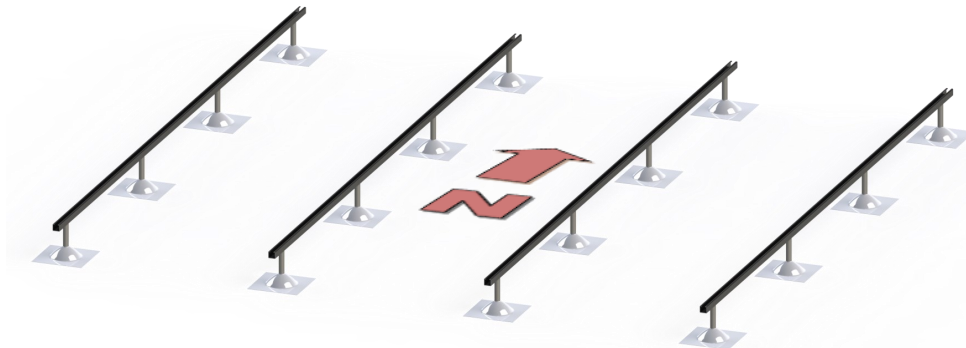


Figure 2.3: Base Strut, Intermediate Connection

To attach RexRacking to the standoffs, an intermediate framing member is required as pictured in **Figure 2.3**. Here, 1-5/8 inch base strut is used between Stand-Offs along Geographic North-South.

The RexRack chart in **Figure 2.2** provides on center dimensions for "C," length must be added to accommodate the RexRack feet. Since the feet are 4 inches long, at least an additional 2 inches on each end, is required. In this example, 6" was added to provide ample space for the RexRack feet.

The North-South Base Strut connects Stand-Offs along North-South by drilling holes in the appropriate locations and using hardware per AHJ.



RexRacking Base Structure Design Guide

Positioning the Collectors

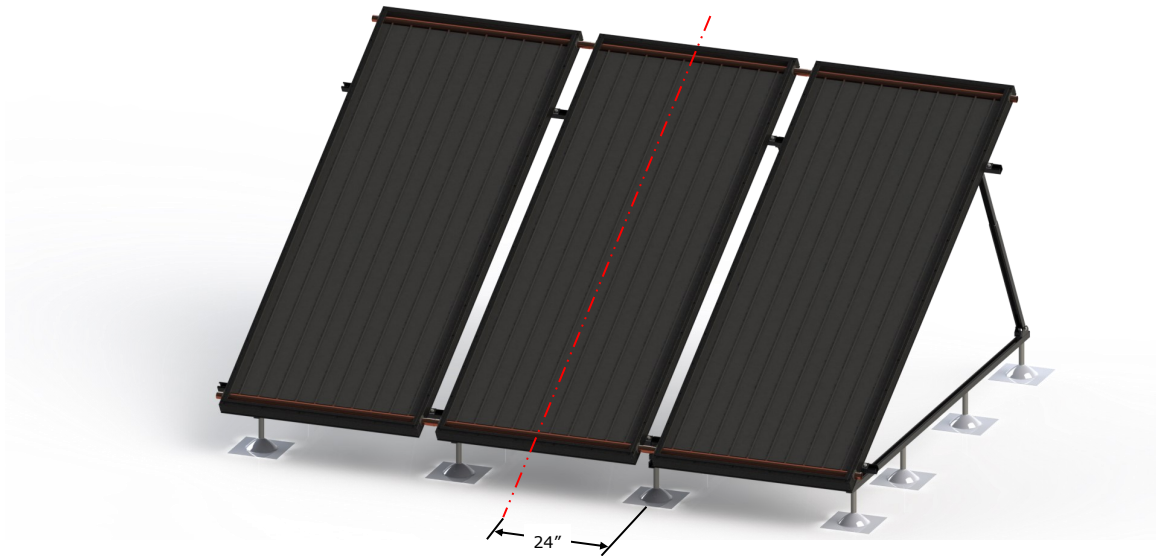


Figure 2.4: Completed RexRack on Framed Low Slop Roof

Since the RexRack leg spacing and header widths are often different, care should be taken to center the collectors on the racking. In this example, the center line of the first collector should be installed 24 inches from a central post as shown in **Figure 2.4**.

In general, if you are mounting an even number of collectors, the first collector should be installed with the left side of the header aligned with the RexRack's center leg. If you are mounting an odd number of collectors, the first collector should be installed with its center line centered on the racking as shown in **Figure 2.4**. This will ensure an even amount of overhang on each end which should not exceed 12 inches.

*RexRack installation procedure to follow per manual which can be located through the following link: <http://sunearthinc.com/thermal-mounting/rexrack/>.

Disclaimer: Roof penetrations, hardware, number of standoffs, and sub structure may differ per AHJ.



RexRacking Base Structure Design Guide

Example 3: Base Structure Layout on Concrete Slab Roof

In this example, 4 SunEarth Collectors are being plumbed together with unions on RexRacking facing Geographic South with a tilt angle of 45° on a concrete slab roof.

Bill of Materials

- 4 SunEarth TRB-40 Collectors with 1" Headers
- 16 C-SSN-BA Mounting Clip Assemblies
- 6, 1" Unions
- 45° Rex Racking
 - * Rear Leg Telescoping Leg Assembly
 - * Front Foot Assembly
 - * Support Strut
 - * 25, #12x3/4" Self-Drilling Screws
- 10, 8" Stand-Offs and Hardware
- 10 Flashing Covers and Sealant
- Intermediate Base Strut

Stand-Offs and Flashing Layout

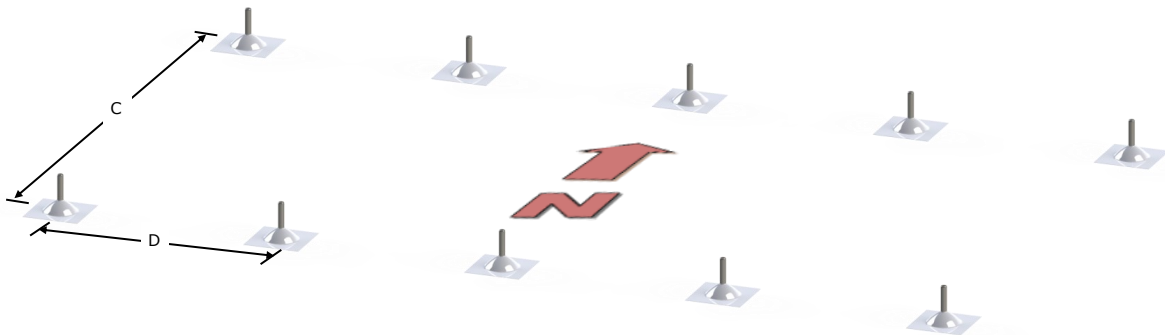


Figure 3.1: Stand-Offs and Flashing Layout on Concrete Slab Roof

In **Figure 3.1** the stand-off layout "C" dimension is along Geographic North-South. The dimension "D" which corresponds RexRack leg spacing is along Geographic East-West.

"C": Dimension

Using the Table 6 on page 10 of our RexRack manual pictured in **Figure 3.2** on the following page, find the "C" dimension corresponding to the use of TRB-40s at a 45° tilt. Although, rear leg angle can vary between 70° and 90° , a rear leg tilt of 90° from the collector was chosen. In this case, dimension "C" is 119.7 inches on center.

"D": Dimension

Dimension D is 48 inches on center, which corresponds to RexRack leg spacing.



RexRacking Base Structure Design Guide

RexRack Layout Dimensions

Tilt Angle (B)	EC/EP/SB/TRB/IS/IC—40				Rafter Spacing	
	Leg 90° from Collector		Leg 70° from Collector		Leg Spacing (E)	
	Leg Length (A)	Foot Spacing (C)	Leg Length (A)	Foot Spacing (D)	16"	24"
20	33.4	97.6	31.4	86.2	48	48
25	42.8	101.2	38.9	86.5	48	48
30	52.9	105.9	46.6	87.5	48	48
35	64.2	111.9	54.5	89.2	48	48
40	76.9	119.7	62.7	91.7	48	48
45	91.7	129.7	71.5	95.1	48	48
50	-	-	81.1	99.5	48	48
55	-	-	91.7	105.2	48	48
60	-	-	103.7	112.5	48	48

Table 6

Figure 3.2: RexRack Application Table for EC/EP/SB-40

The number of required standoffs in this case is 10, or 2 per each RexRack support leg.

If the roof surface is uneven, shimming should be done to ensure all standoffs are planar.

Base Strut Intermediate Connection

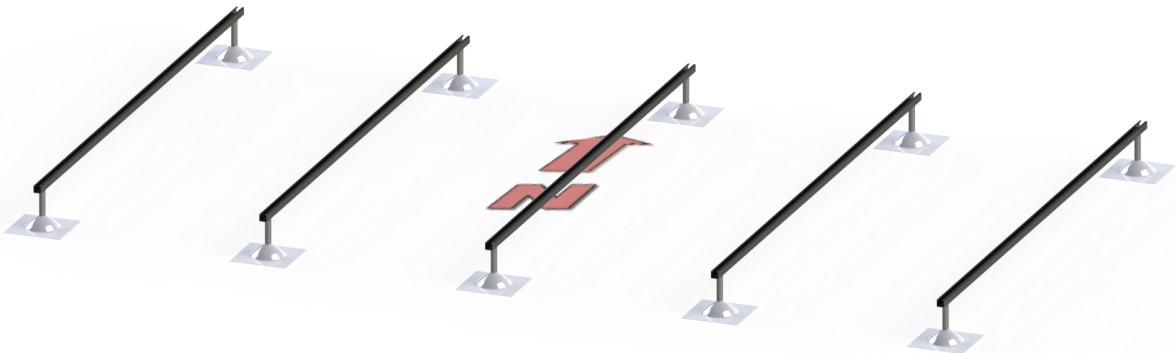


Figure 3.3: Base Strut, Intermediate Framing North-South

North-South Base Strut:

To achieve full rigidity of the RexRacking an intermediate framing member is used. In this case 1-5/8 inch solar strut is used as seen in **Figure 3.3**.

The length of North South Base Strut required is found using dimension "C" in **Figure 3.2**. Length must be added to accommodate the RexRack feet. Since the feet are 4 inches long, at least an additional 2 inches on each end, is required. In this example, 6 inches was added to provide ample space for the RexRack feet. Length "L" is the "C" dimension plus 6 inches or 125.7 inches.

The North-South Base Strut connects Stand-Offs along North-South by drilling holes in the appropriate locations and using hardware per AHJ.



RexRacking Base Structure Design Guide

Positioning the Collectors

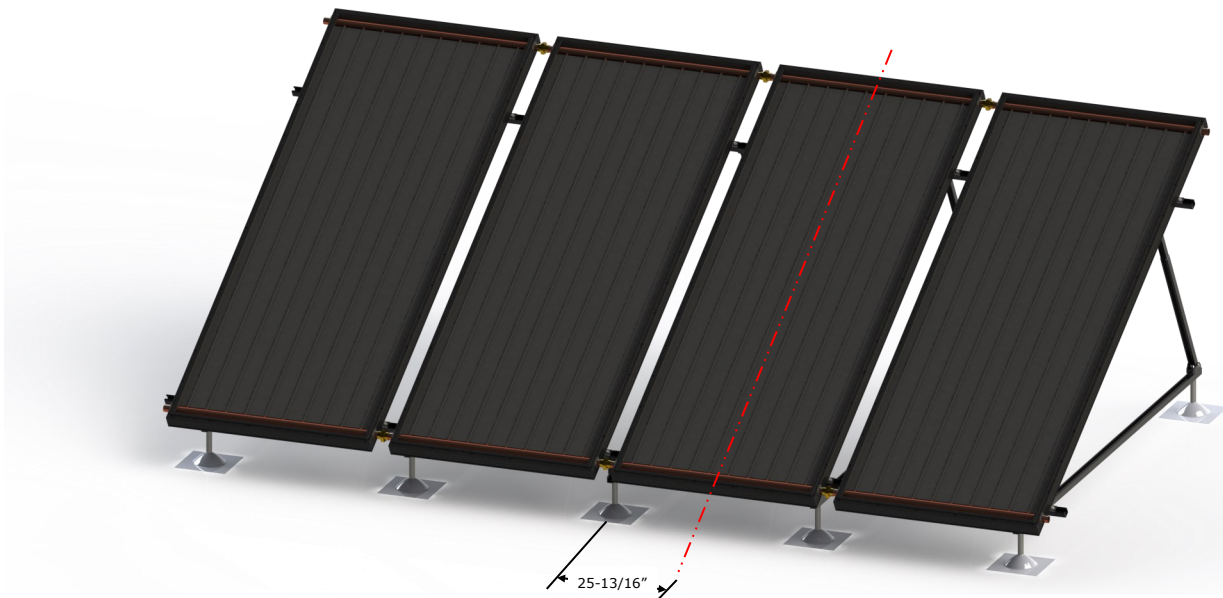


Figure 3.4: Completed RexRack on Concrete Slab Roof

Since the RexRack leg spacing and header widths are often different, care should be taken to center the collectors on the racking. In this example, the effective header width is $51.375 + 0.25$ inches when utilizing unions. Accordingly, the center line of the first collector should be installed 25-13/16 inches from a central post as shown in **Figure 3.4**.

In general, if you are mounting an odd number of collectors, the first collector should be installed with its center line centered on the racking. If you are mounting an even number of collectors, the first collector should be installed with the left side of the header aligned with the RexRack's center leg as shown in **Figure 3.4**. This will ensure an even amount of overhang on each end which should not exceed 12 inches.

*RexRack installation procedure to follow per manual which can be located at the following link:
<http://sunearthinc.com/thermal-mounting/rexrack/>.

Disclaimer: Roof penetrations, hardware, number of standoffs, and sub structure may differ per AHJ.