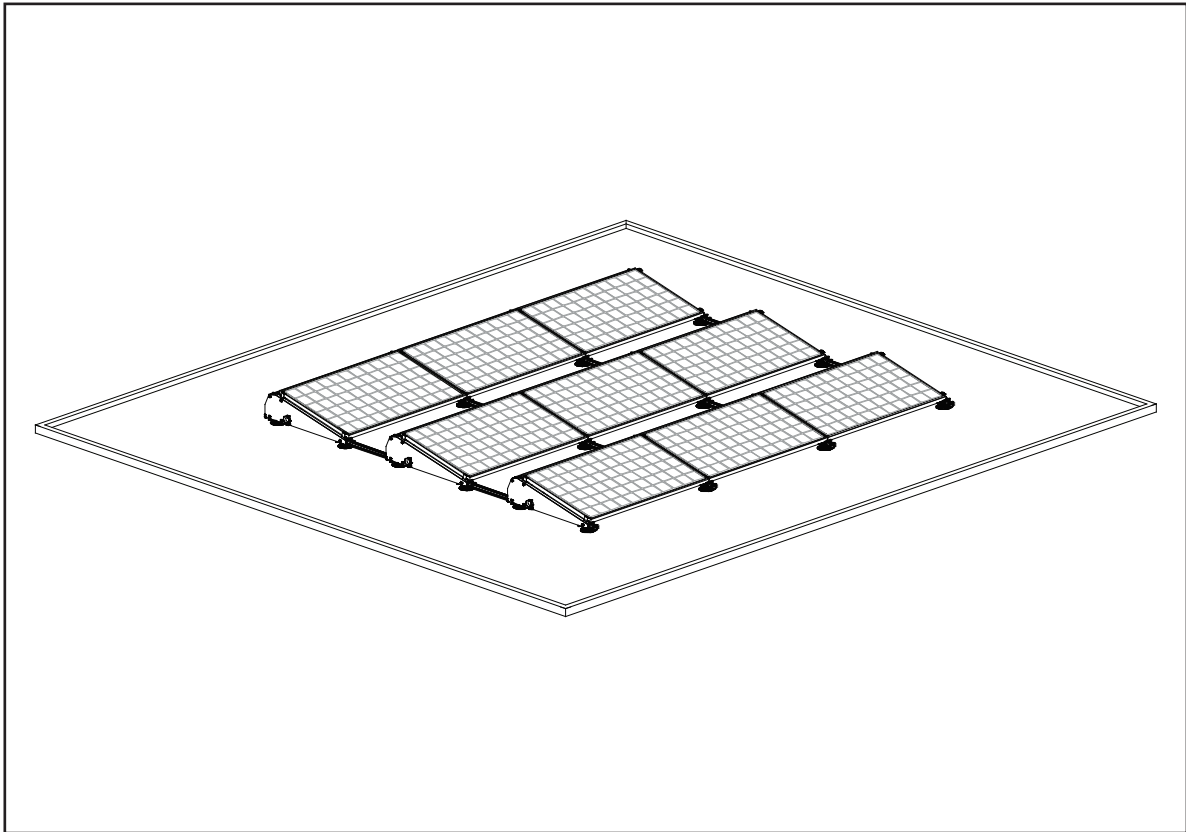




MANUAL

FLATFIX MOUNTING SYSTEM FOR FLAT ROOFS



FlatFix
mounting system for flat roofs
for solar modules in a single
landscape arrangement



CONTENT

	page
1. Introduction and Project Specifications	1
2. UL Compliance	1
3. General installation conditions	2
4. Product description	4
5. Components overview	4
5.1 Exploded-view	4
5.2 List of parts	5
6. Assembling preparation	6
6.1 Control tools and accessories	6
7. Installation	7
7.1 Mounting of base plate to bases	7
7.2 Assembly of base connectors to bases	8
7.3 Positioning of mounting structures	9
7.4 Mounting of ballast trays	9
7.5 Additional assembly only if using side deflectors	10
7.6 Module ballast anchoring detail	13
7.7 Mounting and bonding of first solar module	14
7.8 Mounting and bonding of other solar modules	15
7.9 Wire management of solar module wires	16
7.10 Grounding of multiple rows (option)	17
7.11 Placement of ballast	18
7.12 Mounting of rear wind deflector or stabilizer	19
7.13 Mounting of wind deflector left/right (If required)	21
7.14 Several rows behind one another	22
8. Annex	23
9. Appendix A	25
9.1 Anchor Bar installation instructions	25
10. Appendix B	27
10.1 Bonding path – Option 1	27
10.2 Bonding path – Option 2	27

Refer to our General Sales and Delivery Terms and Conditions that are available on request.
As a result of constantly striving to improve, it may be possible that the product differs slightly from what is described in this manual.
For this reason, the instructions given serve only as a guideline for installing the product.

1. Introduction and Project Specifications

This manual describes the installation of the FlatFix mounting system for flat roofs (for solar modules in landscape arrangement). Follow the instructions in the manual carefully. Always perform the operations in the correct order. Before installing any FlatFix project, the installer must have a copy of the FlatFix Project Specifications which describes the details needed to install a project on a specific rooftop. Contact EcoFasten Solar Inc. to obtain a copy of the Project Specifications.

For anchor bar application additional installation instructions are available in Appendix A.

2. UL Compliance

Manufacturer: Esdec Inc.
Londenstraat 16
7418 EE Deventer
The Netherlands
Tel: +31 850 70 20 00

Distributed by: EcoFasten Solar, Inc.
4141 W Van Buren St,
Suite 2
Phoenix, AZ 85009
844-357-5645
info@ecofastensolar.com

Declares under our responsibility that the FlatFix mounting systems is tested and approved by UL (Underwriters Laboratories) in compliance with the following norms:

UL (Underwriters Laboratory) Standard 2703:

- Grounding and Bonding
- Mechanical Loading

Intertek 2703 Fire Testing

- Class A fire rating, Type 1 PV modules
- Class A fire rating, Type 2 PV modules

Certification Marking:

The system will be clearly marked with the appropriate certification markings.

3. General installation conditions

General

The information, comments and advice in this document are binding and must be complied with.

The non-compliance with the requirements specified in this document will void all warranty and product liability claims.

EcoFasten Solar Inc. reserves the right to amend this document without further notice.

Standards, prescriptions and regulations

Upon installation of the mounting system, it is important to follow the installation manual and the associated standards and codes to prevent accidents. Keep in mind the following applicable codes including, but not limited to:

- IBC (International Building Code)
- IRC (International Residential Code)
- SBC (State Building Codes)
- NFPA (National Fire Protection Association)
- NEC (National Electrical Code)
- UL/ANSI 2703, 1st Edition, dated January 28, 2015 (American National Standards Institute)
- ASCE/SEI-7 (American Society of Civil Engineers)

FlatFix Mounting and Bonding systems are UL 2703 listed with the following photovoltaic modules:

Canadian Solar -CS6K-XXX-M where XXX is 275 to 285.

Silfab -SIL-320 NL and SIL-330 BL

FlatFix Mounting System was evaluated assuming a 15 Amp maximum series fuse size.

This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. The system has been fire tested by Intertek and carries a Class A Fire Rating under UL 1703 on low-sloped roofs when used with all Type 1 and Type 2 modules. However, there are no claims that the presence of the PV system on a roof does not change the fire dynamics.

These systems have been evaluated for module-to-system bonding and mechanical load to the requirements of UL/ANSI 2703.

The system's fault current ground path components are: PV module, Module Clamp, End Clamp, Module Clamp Bonding Clip, End Clamp Bonding Clip and Grounding Lugs.

The system is a non-separately derived system. The following components have been evaluated for bonding as the fault current ground path: PV module, Module Clamp, End Clamp, Module Clamp Bonding Clip, End Clamp Bonding Clip and Grounding Lugs.

Stability and the condition of the roof

The roof must be in good condition and sufficiently strong to carry the weight of the solar modules, the mounting system, etc. including additional weight during installation, additional materials, wind and snow loads according to applicable codes, standards and guidelines. The customer should seek the services of a Structural Engineer to confirm the roof's structural capacity. Check the stability and condition of the roof and the roofing membrane and adjust or replace the roof/structure/membrane where necessary.

Insulation/roofing

The continuous pressure load (point load) of the insulation and the roofing must be checked and approved before the assembly. The suitability of the base plates combined with the roofing should be checked and found to be in order; engage a roofing contractor when in doubt.

Application

- Roof height: 10-40 feet. If your roof is higher, please contact EcoFasten Solar Inc. directly or your local dealer/distributor.
- Types of roofing: Concrete, bitumen, EPDM , PVC , TPO.
- Roof slope: Maximum 5°.
- Arrangement: Landscape installation.

Edge zone

Some building codes and fire codes require different clearances from the edge of the building to the array and around the array. The installer should check local building code requirements for compliance.

Ballast

The required ballast can be calculated by using the FlatFix Project Specifications.

The use of standard 4 x 8 x 16" solid concrete blocks are recommended. Always verify the actual ballast block weight compared to the block weight listed on the Project Specifications. Contact EcoFasten Solar Inc. in cases where there is a difference.

Weather tightness of the roof

- Install all components as specified within this installation manual to ensure weather tightness of the roof.
- Refer the roof/roofing manufacturer in regards to the suitability and compatibility of the system.

Maintenance

The installation shall be periodically re-inspected for loose components, loose fasteners and corrosion, such that if found, the affected components are to be immediately replaced. When performing routine maintenance ensure not to break or disturb the bonding path of the system.

The following points need to be checked on a yearly basis:

- The torque value of all screws, bolts, nuts and clamp connections should also be checked for tightness.
 - o Action if required: Tighten or replace all bolts, nuts and clamps where necessary according to the installation manual and report it to EcoFasten Solar Inc. including photographs.
- Overall visual control of the system (corrosion of components, etc.).
 - o Action if required: replace all bolts and clamps where necessary according to the installation manual and report it to EcoFasten Solar Inc. including photographs of the fault.

Warranty

EcoFasten Solar Inc. warrants each new FlatFix mounting system to be free from defects in material and workmanship under normal use and service for a period of 25 year from date of original sale. Please refer to the EcoFasten Solar general terms and conditions for full details.

Liability

The manufacturer accepts no liability for damage or injury caused by not (strictly) adhering to the safety prescription and instructions contained in this manual, or by carelessness during installation of the product specified in this document and the eventual related accessories. Please refer to the EcoFasten Solar general terms and conditions for full details on liabilities.

Support

For technical or customer support please contact:

4141 W Van Buren St, Suite 2
Phoenix, AZ 85009
844-357-5645
info@ecofastensolar.com

4. Product description

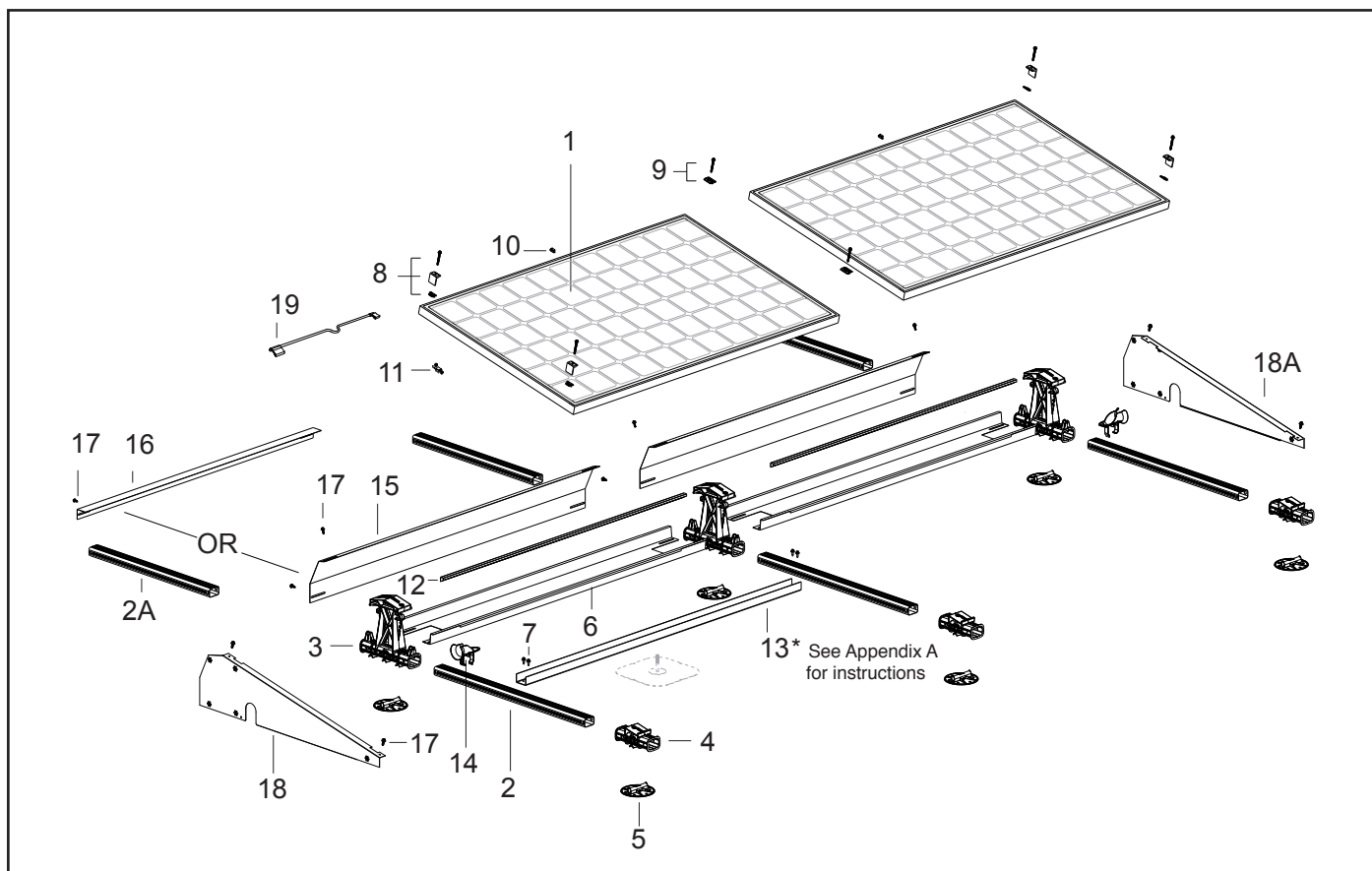
The FlatFix mounting system is constructed of highly engineered polymers, aluminum, carbon steel, and stainless steel. The system can be used for all types of roofing materials. The wind deflectors, if required, are electrically isolated from the array and therefore do not need equipotential bonding.

Using roof anchors

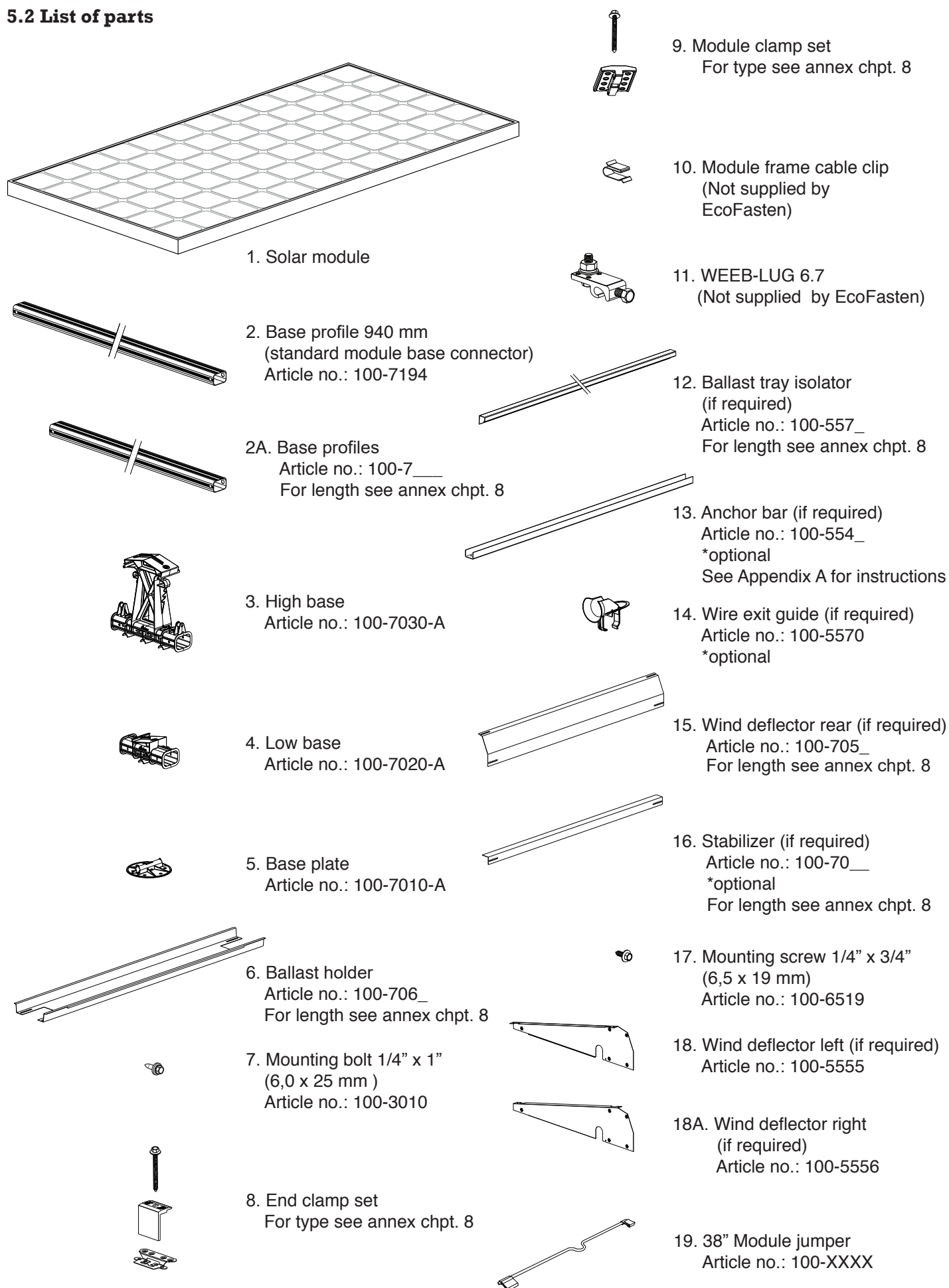
Refer to the Project Specifications to determine if anchors are required. If required, refer to Appendix A for installation instructions.

5. Components overview

5.1 Exploded-view



5.2 List of parts

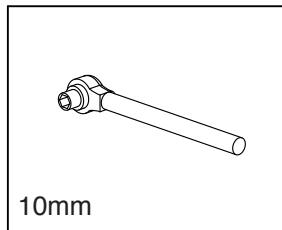


6. Assembling preparation

6.1 Control tools and accessories

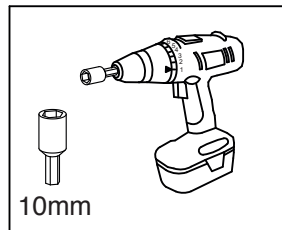
The following is a list of the required tools/accessories:

Ratchet with hexagon
Cap



or

Battery-operated
impact driver



Tightening moments

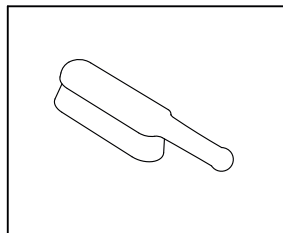
Mounting screws to fasten the end clamp and module clamp: (See page 14/15) 108 in-lbs / 12 Nm

Mounting screws to fasten the wind deflectors and stabilizers: (See page 19/20/21) 40 in-lbs / 4.5 Nm

Grounding lug: (See page 17) 120 in-lbs / 13.5 Nm

Grounding wire: (See page 17) 90 in-lbs / 10 Nm

Brush



Clean the roof with a brush.

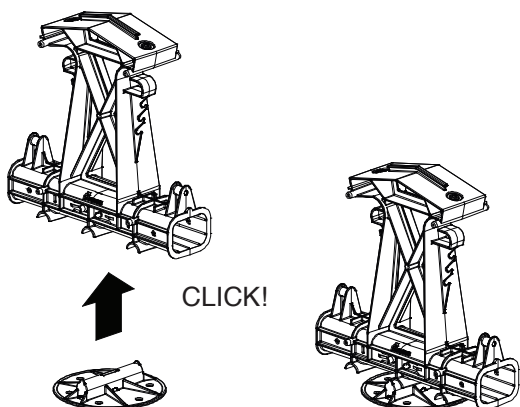
Ensure that the place where the solar modules are to be placed on the roof is clean, dry and flat. The presence of gravel, sand, stones, algae, dust, etc. can lead to instability of the system and/or can cause damage to the roof.

7. Installation

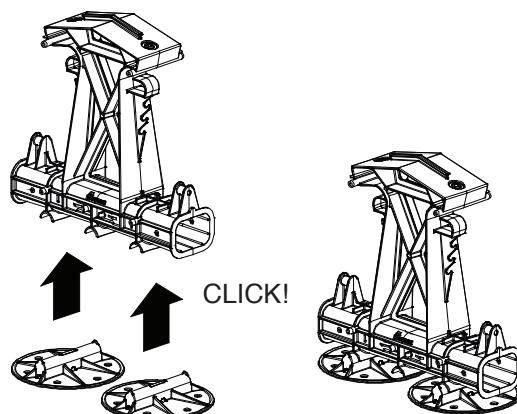
7.1 Mounting of base plate to base

Attach the base plate to the high base as shown below:

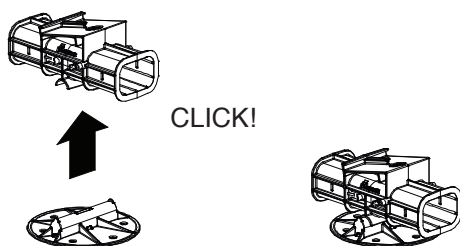
1. High base should have one base plate where there is no ballast tray or anchor.



1A. High base should have two base plates where there is a ballast tray.

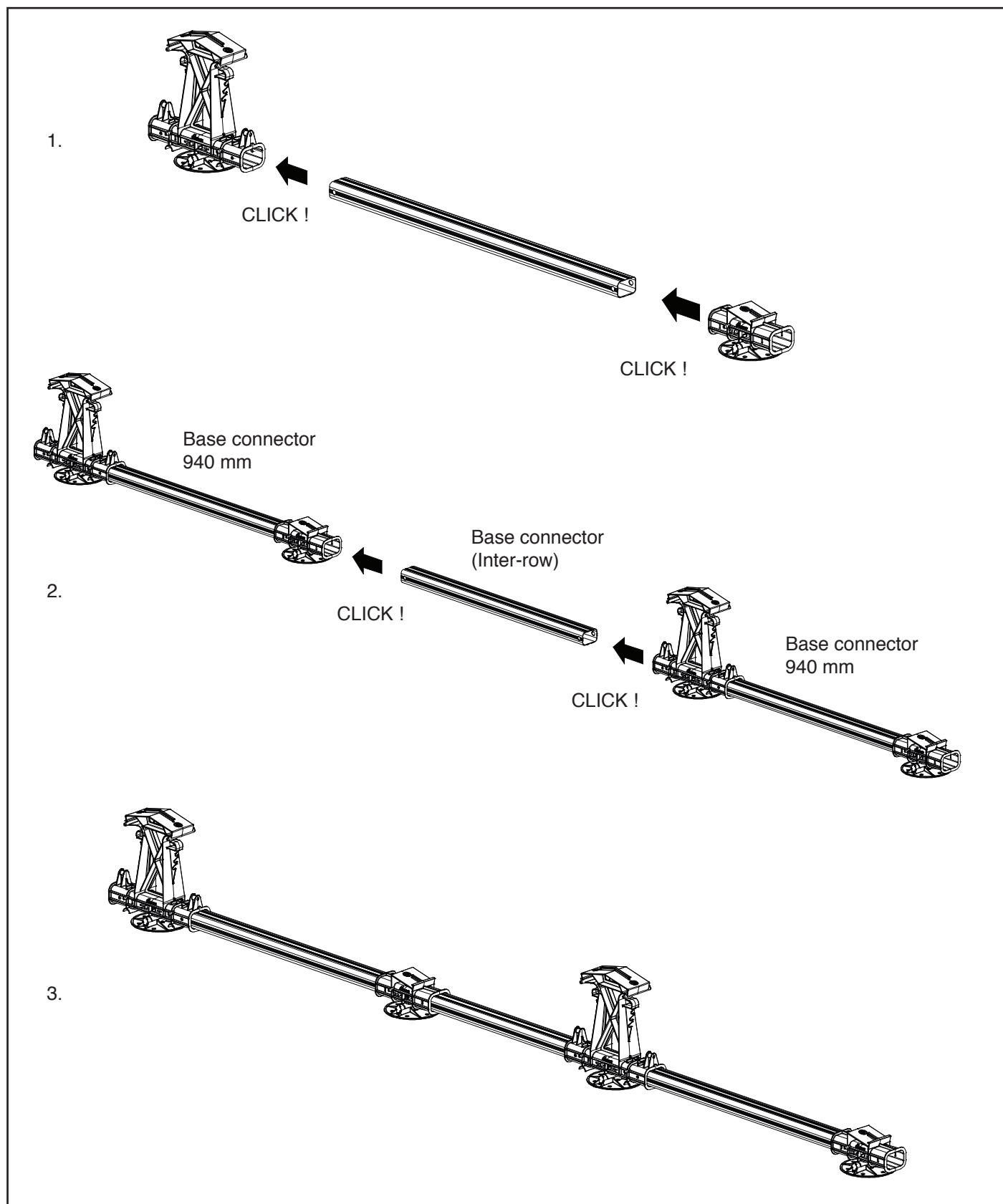


2. Low base should have one base plate.



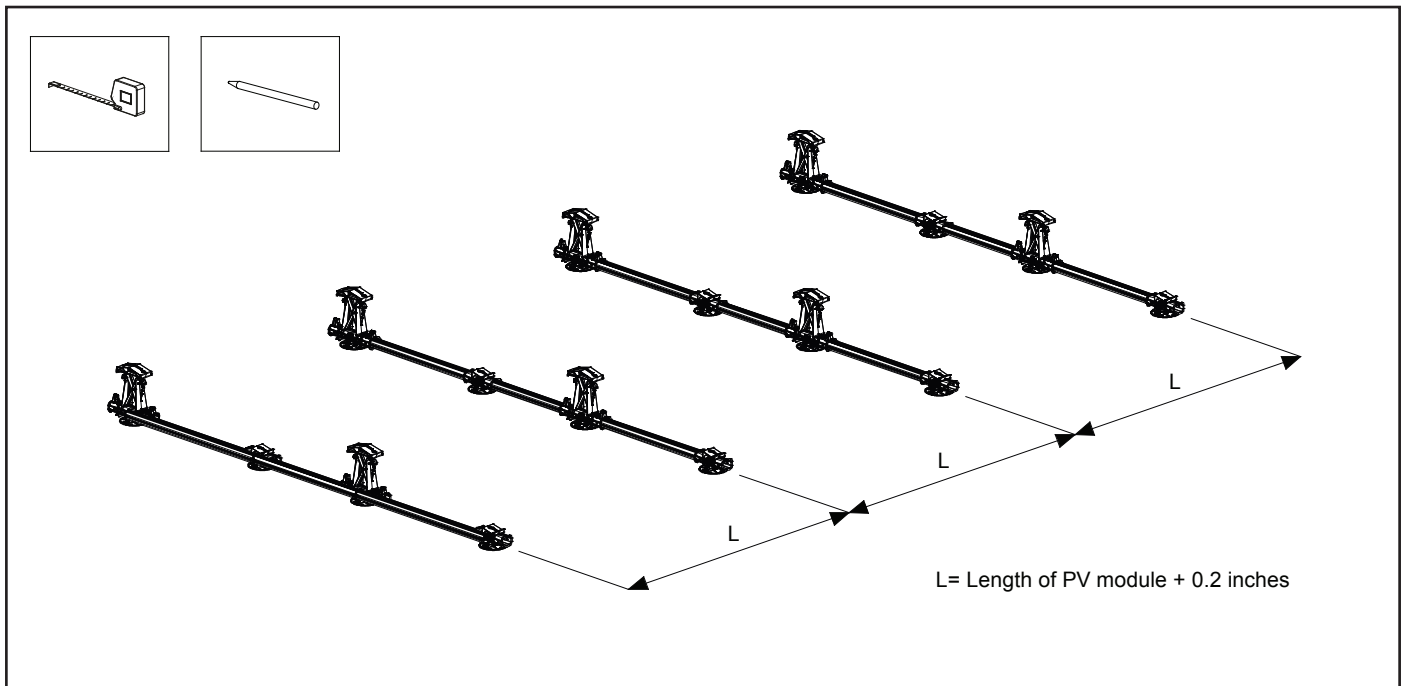
7.2 Assembly of base connectors to bases

1. For underneath PV modules slide the ends of the base connector 940 mm into the openings of the high and low base until it clicks, as shown below.
2. For between rows of PV modules slide the ends of the base connectors (either 370, 550, 750 or 940 mm) into the openings of the high and low bases as inter-row spacer as shown below.
3. Repeat the steps until you have enough mounting structures to place the first two rows of solar modules.



7.3 Positioning of mounting structures

Determine the position of the mounting structures based on the position of the solar modules on the roof.

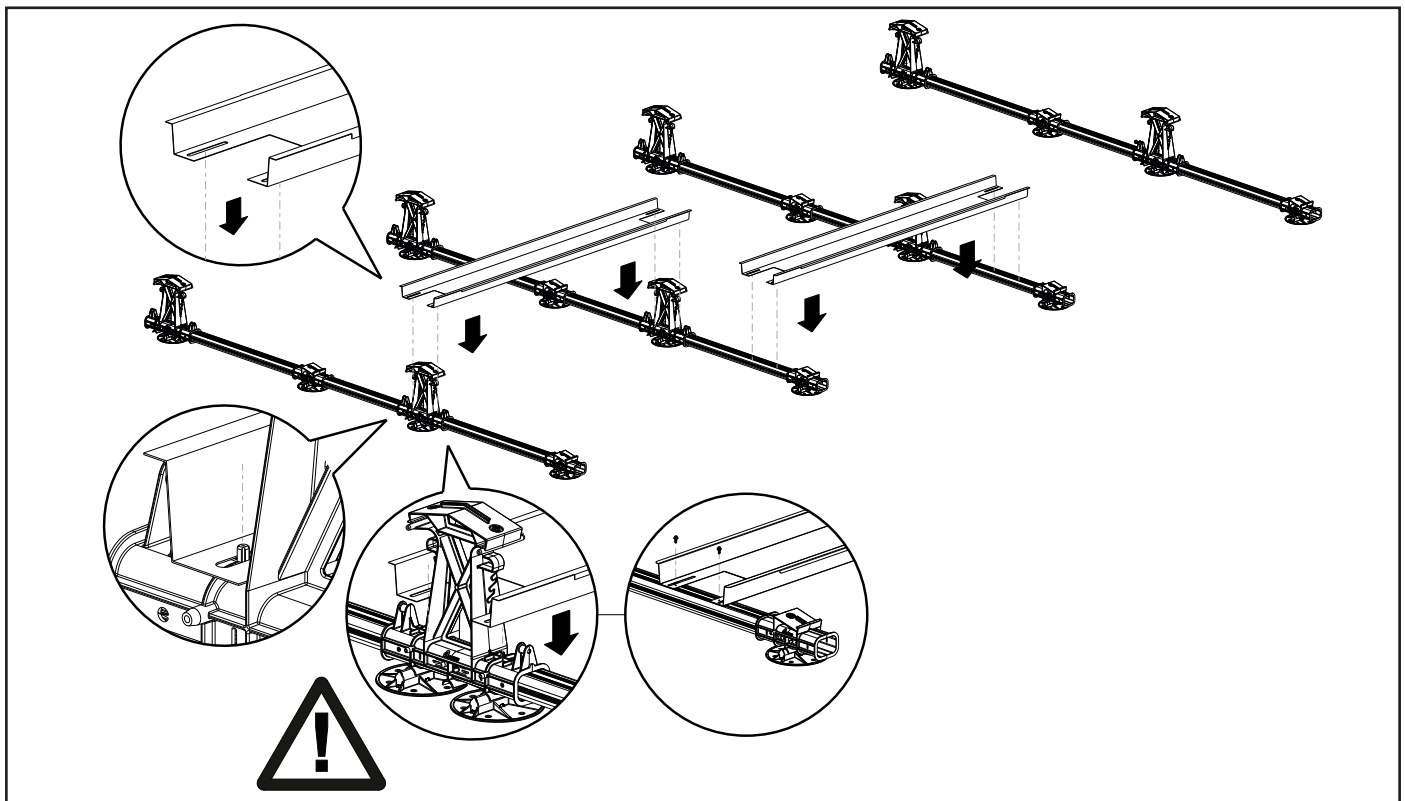


7.4 Mounting of ballast trays

Place ballast trays in the locations shown in the Project Specifications. **ATTENTION!** Make sure the high bases at the location of the ballast trays always provided with two roof supports!

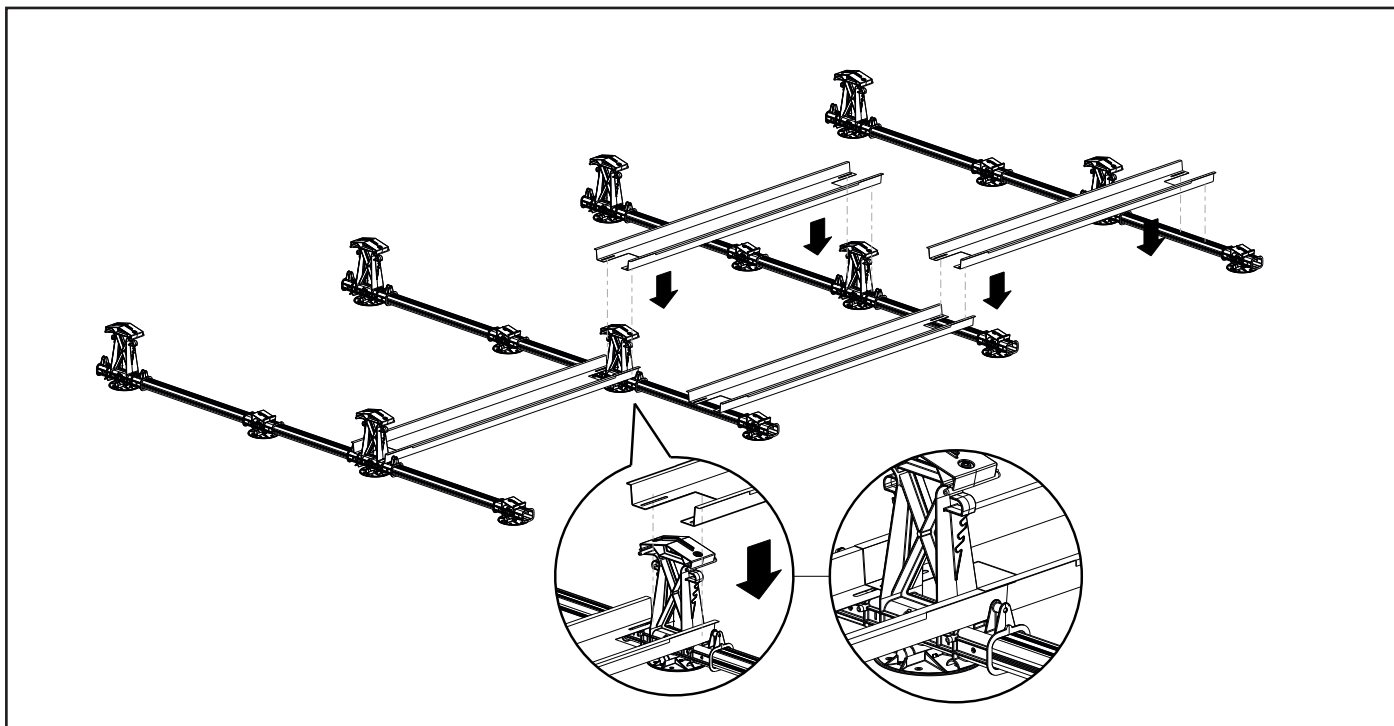
Place the ballast trays over the high bases so that the long slots are over the pins in the high bases.

Southern ballast tray: In the situation the ballast tray is placed below the solar module, attach the ballast tray to the mounting structures by using 2 mounting bolts 1/4" x 1" (6.0 x 25 mm) per side. **ATTENTION!** All modules in the southern most row of a subarray require a southern ballast tray.



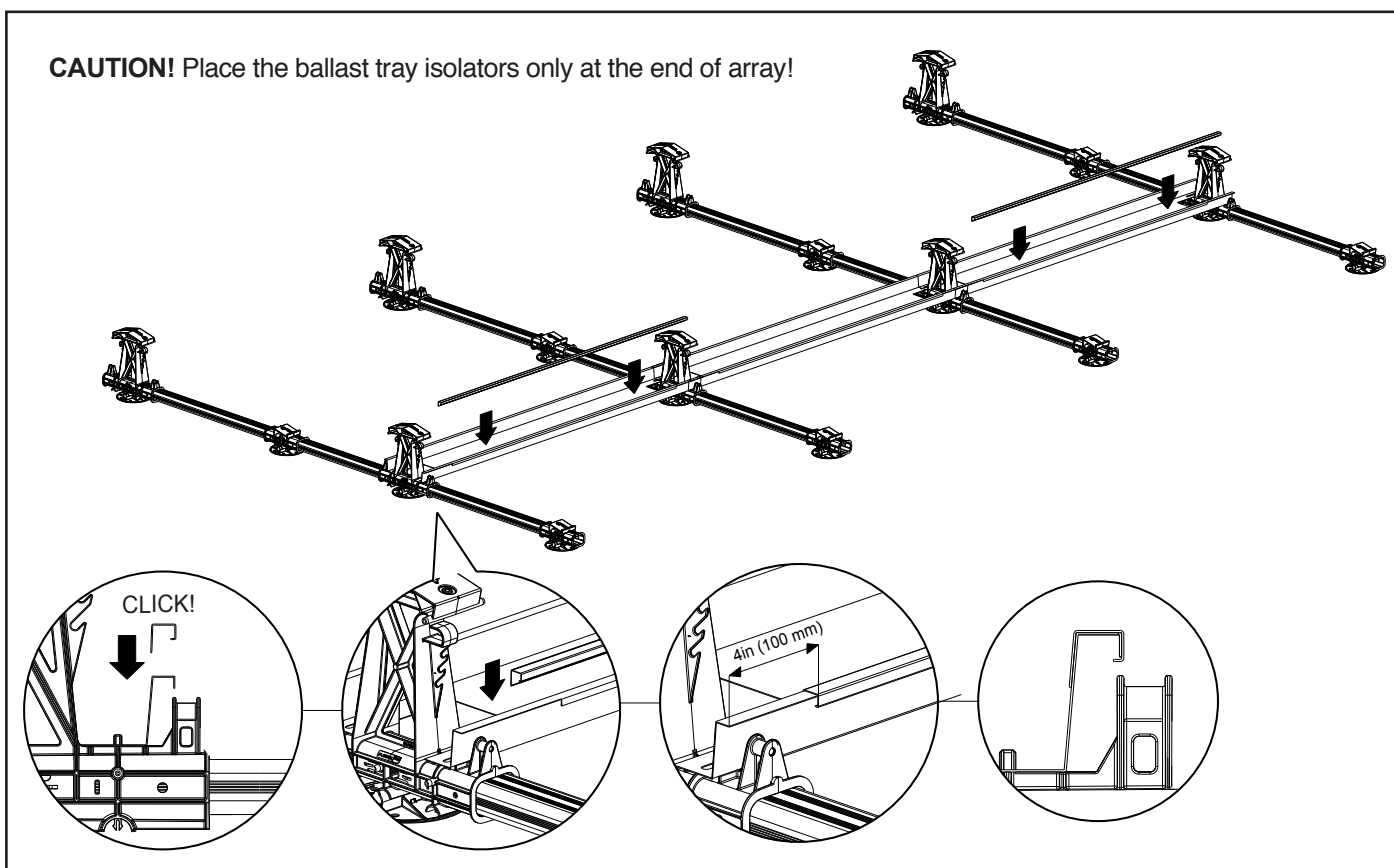
7.4 (continued)

Place the second ballast tray in such a way that it overlaps the first ballast tray and that the elongated holes are over the pins on the high bases. Repeat these steps until all ballast trays are placed.



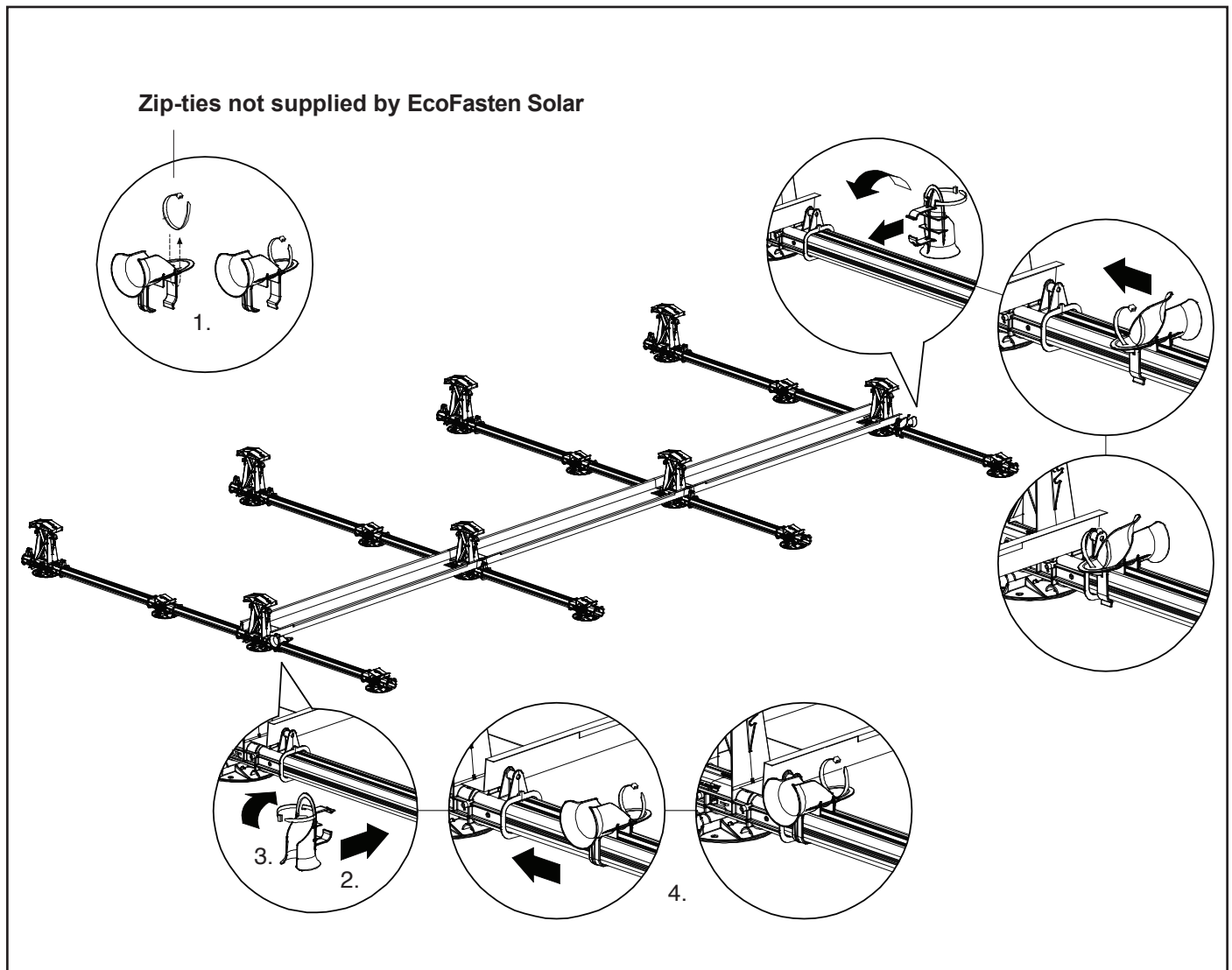
7.5 Additional assembly only if using side deflectors

Snap the ballast tray isolators on the first and last ballast tray as shown below. (on the side where the string wires will be situated). **CAUTION!** Ensure that each end of the isolator will be at 4.0in (100mm) from the end of the ballast tray.



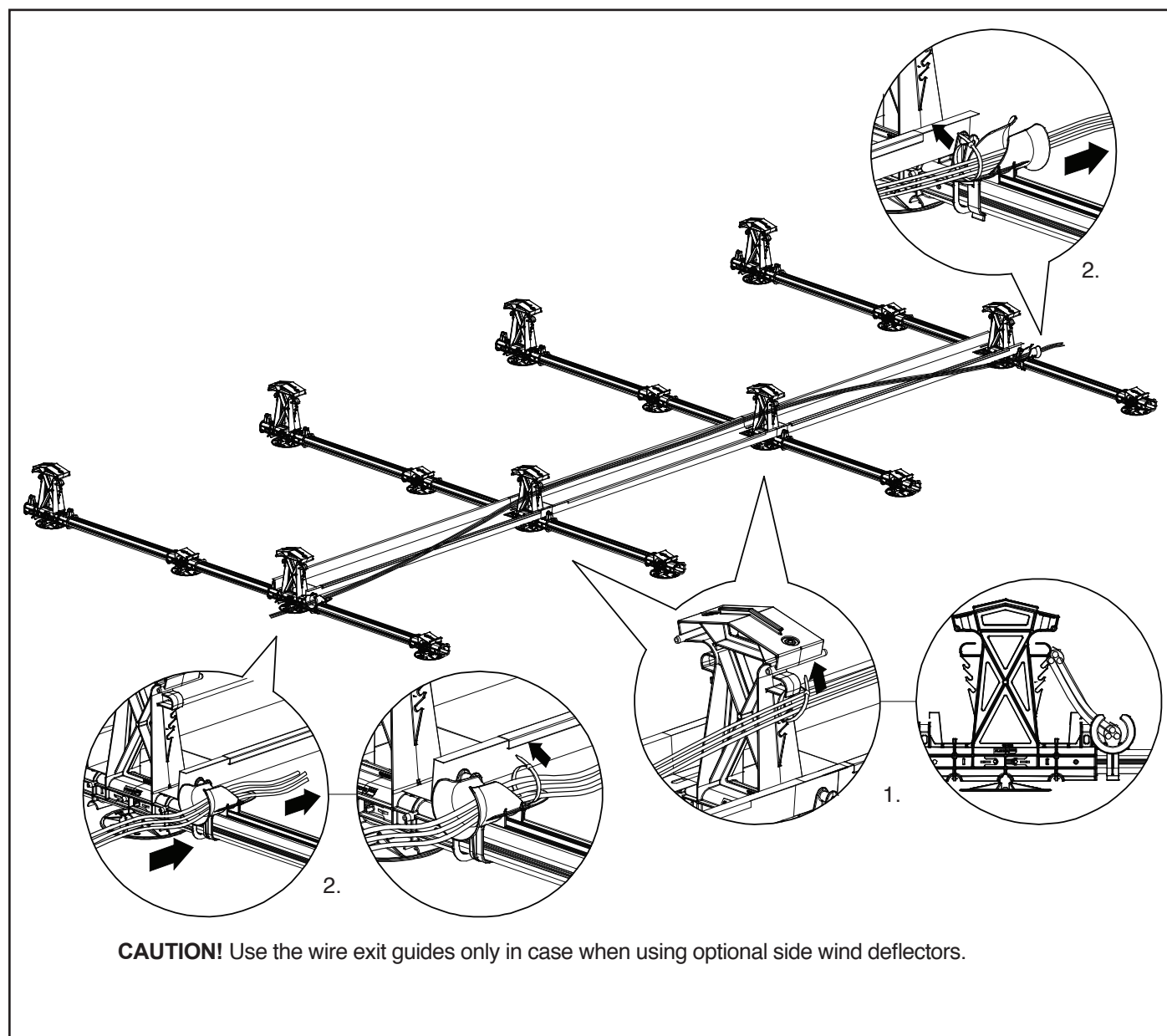
7.5 (continued)

Place the wire exit guide on the first and last module connectors as shown below. Use zipties (not supplied by EcoFasten) to secure wires.




7.5 (continued)

1. Fix the wires to the top wire connector of the second high base using standard wire ties. Repeat this step until the wires are fixed to all except the last high base. Make sure to limit the amount of wire slack as much as possible.
2. For projects using end defectors, feed all wires through the wire exit guide at the first and last high base. Attach all wires to the wire exit guide using wire ties to eliminate any wire slack. **CAUTION!** Ensure to tie down the wire properly to prevent any wire shift.



7.6 Module ballast anchoring detail

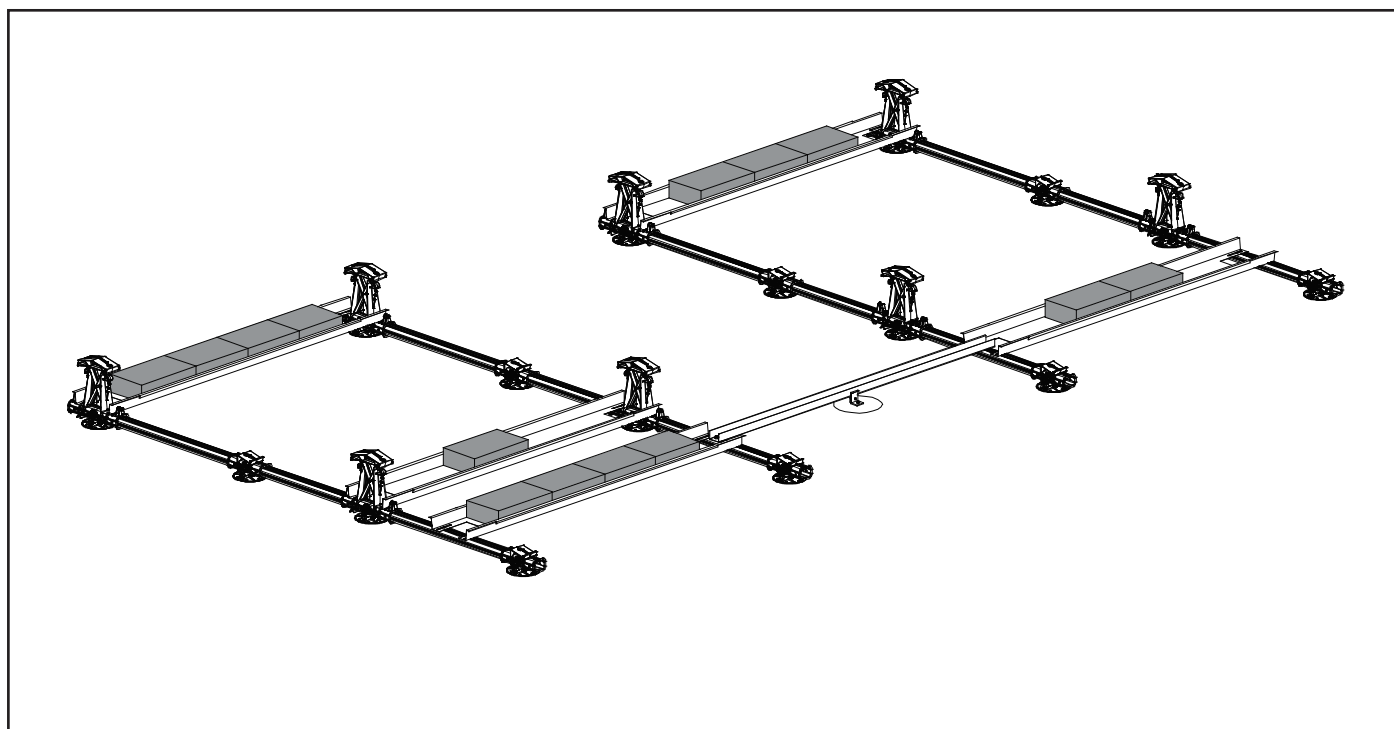
The Project Specifications provided by EcoFasten for a specific project will show the details of where ballast trays need to be placed, how many ballast blocks are needed in each tray and where anchors are needed. These details will be shown in rectangular black representing the top view of the PV module layout. See the key below:

	No ballast blocks or anchor
#	The quantity of # of blocks in a ballast tray under the high bases
#/Ω	The Quantity of # of blocks in a ballast tray under the high bases and Ω in a tray under the module on the base connectors
X	A single anchor and anchor bar assembly

Example:

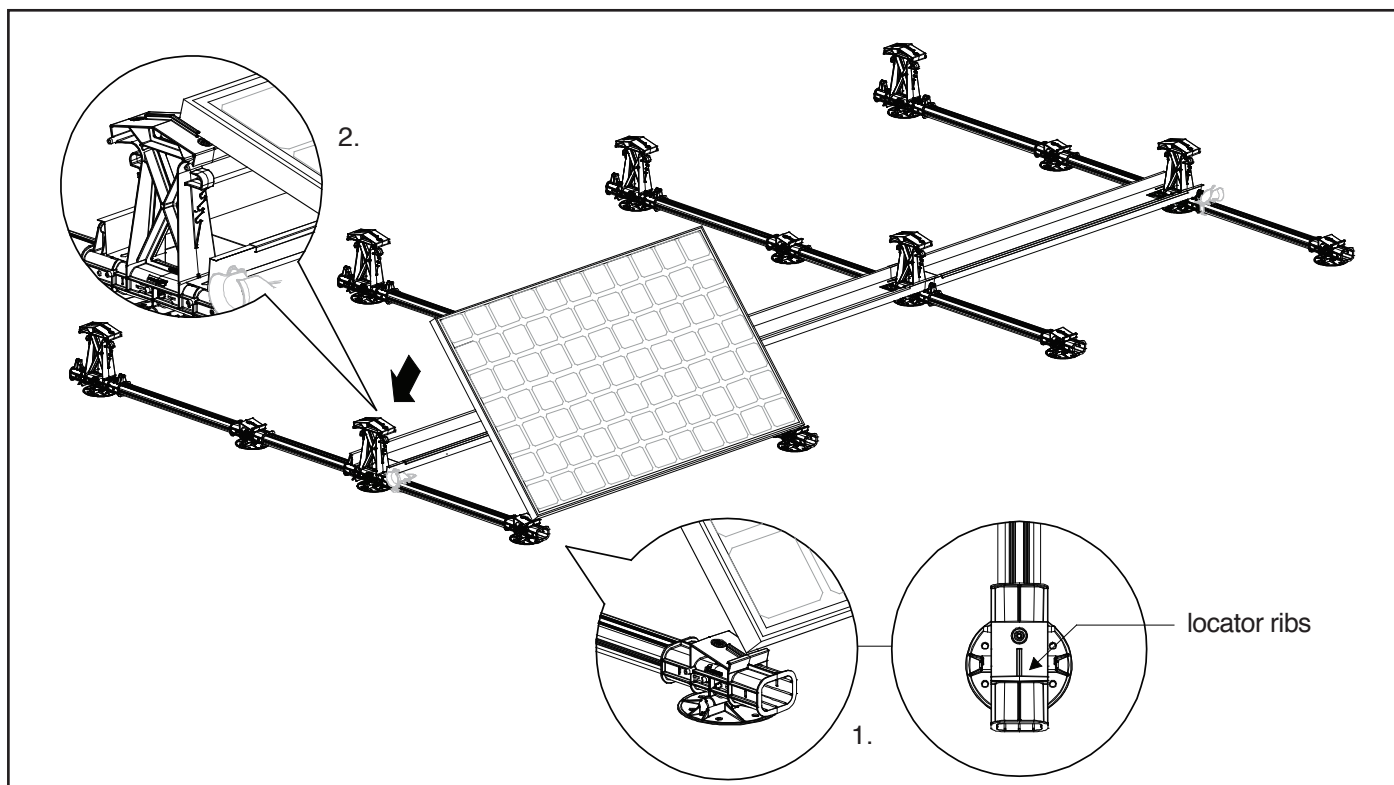
See the example 2 x 3 module array below.

4		3
1/4	X	0/2

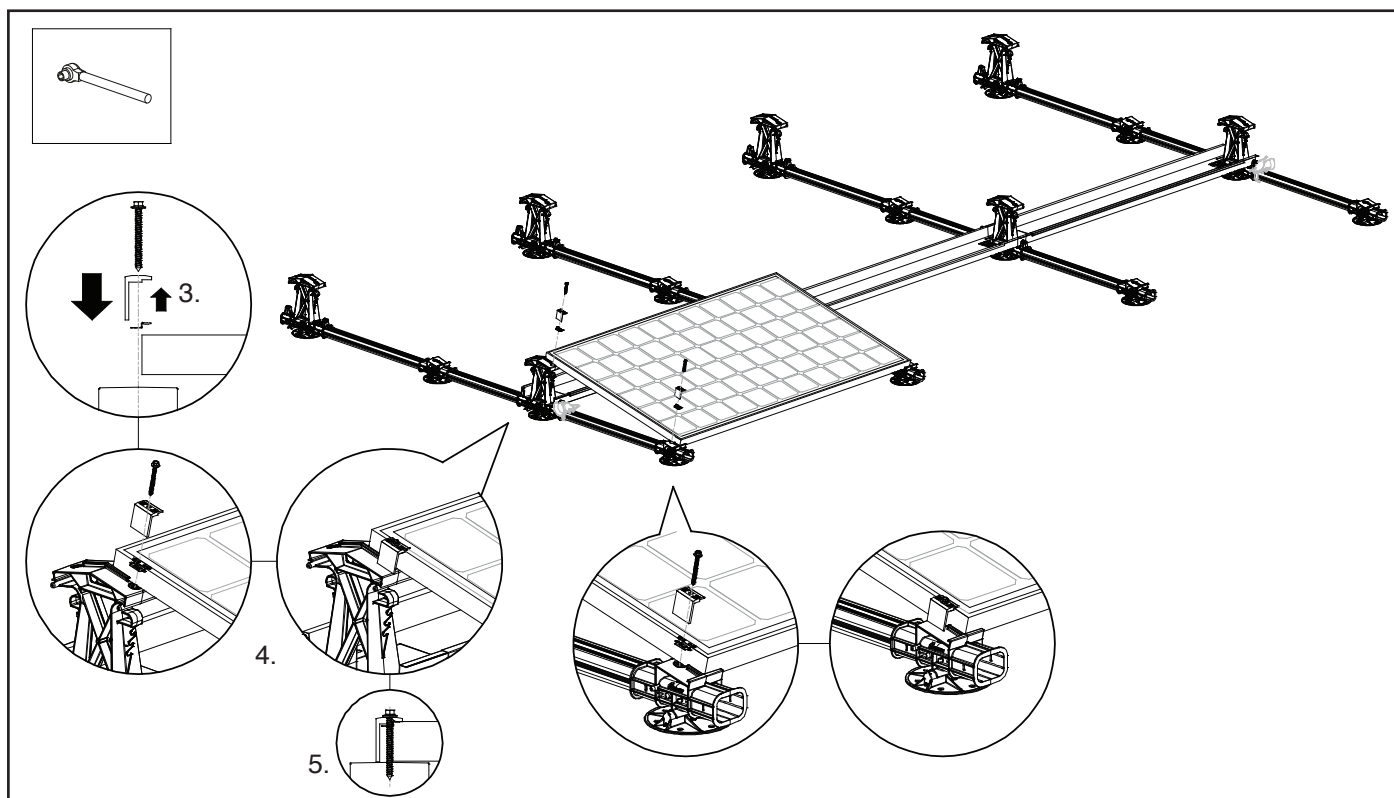


7.7 Mounting and bonding of first solar module

1. Place the lower side of the first solar module between the locator ribs on the low bases as shown below.
2. Place the higher side of the module between the locator ribs on the high bases.

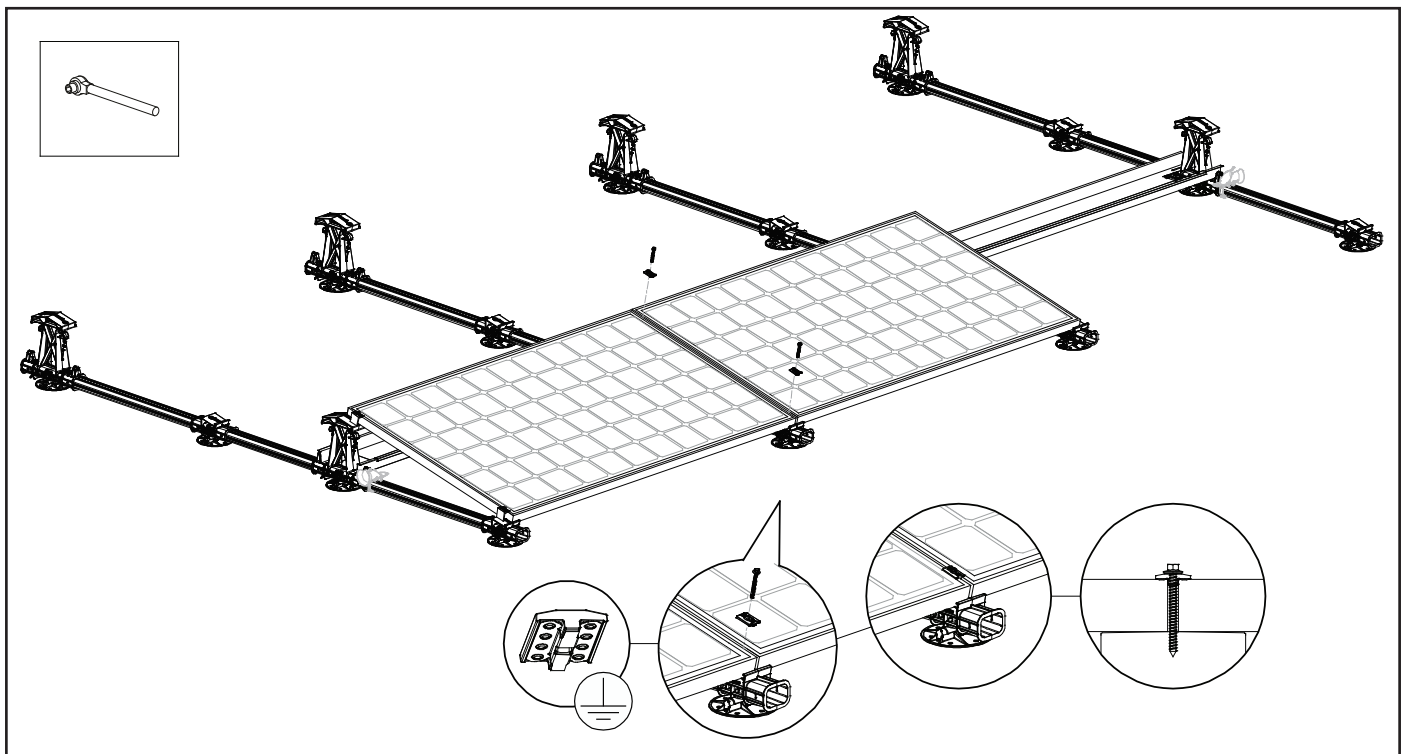


3. Assemble two mounting screws, end clamps, and end clamp bonding clips. Place these assemblies into the holes in the high and low bases. Be sure the module is positioned against the locator ribs.
4. Tighten the mounting screws to 108 in-lbs.



7.8 Mounting and bonding of other solar modules

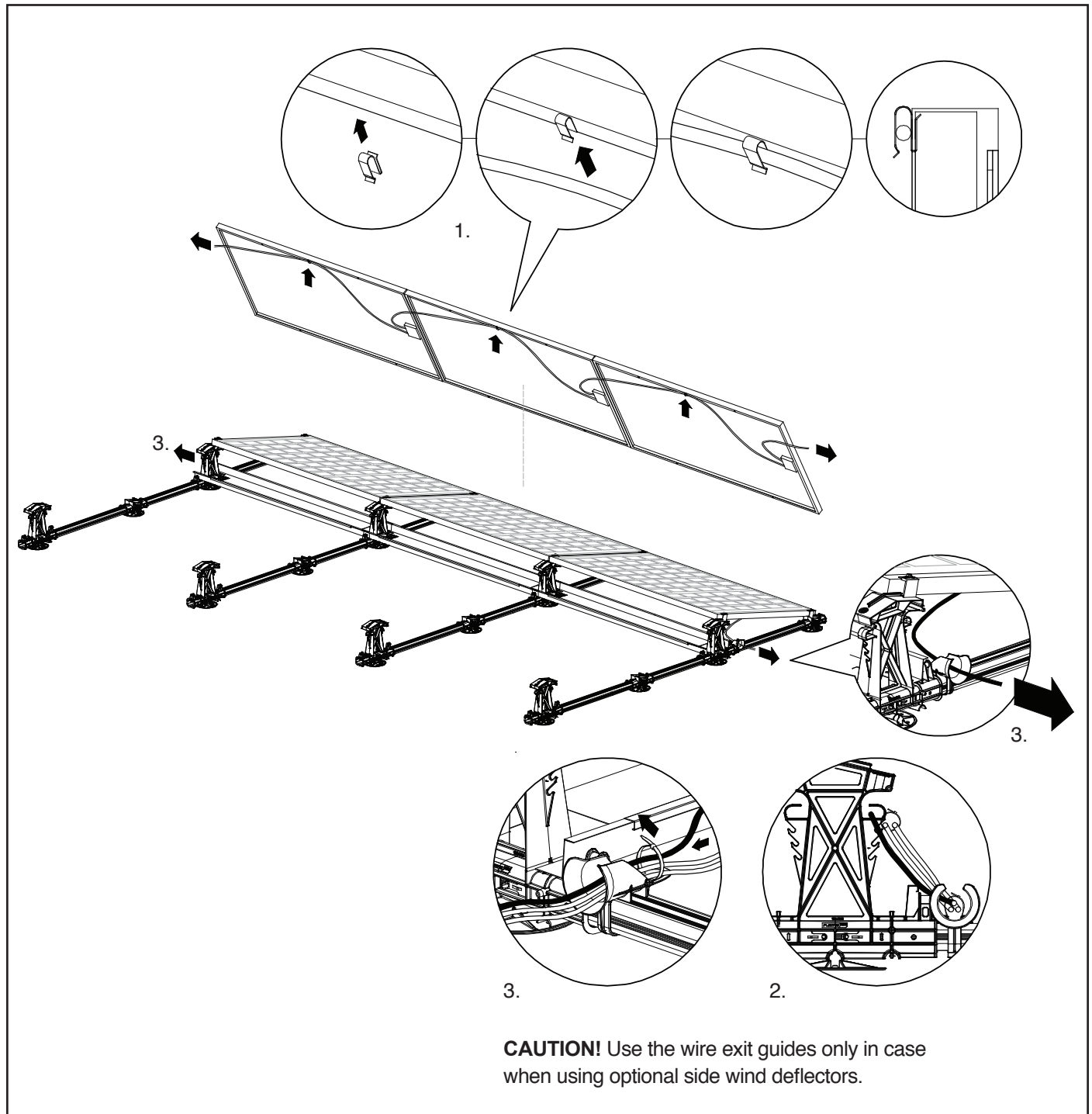
1. Place the second solar module between the locator ribs of the bases.
2. Assemble two mounting screws and integrated bonding mid clamps. Place these assemblies into the holes in the high and low bases.
3. Tighten the mounting screws to 108 in-lbs.
4. Repeat the above steps for the remaining modules.
5. Install two end clamp assemblies at the end of the row as shown in step 7.7.



7.9 Wire management of solar modules wires

After mounting the solar modules the solar module wires must be routed to remove excessive wire slack. To do so follow these steps:

1. Install the module frame cable clips.
2. Clip-in the solar module wires into the preassembled module frame cable clip.
3. Route any remaining wire slack between two adjacent solar modules by using the top wire connectors of the high base. Secure with UV stable wire ties.
4. When using optional side deflectors, feed the first and last solar module wires of the row through the wire exit guides and secure with UV stable wire ties.



7.10 Grounding of multiple rows (option)

When the PV system is built in multiple rows these can easily be grounded by using a grounding lug on the first and last solar module in a row. See Appendix B for alternative bonding between rows.

Esdec FlatFix has been UL 2703 listed using the following UL listed (E9999.KDER) grounding lug:

Type: WEEB-LUG-6.7 (incl. 1/4" mounting kit)

Manufacturer: Burndy / Wiley

1. The grounding lug must positioned on the bottom side of the module frame, close to the high base.

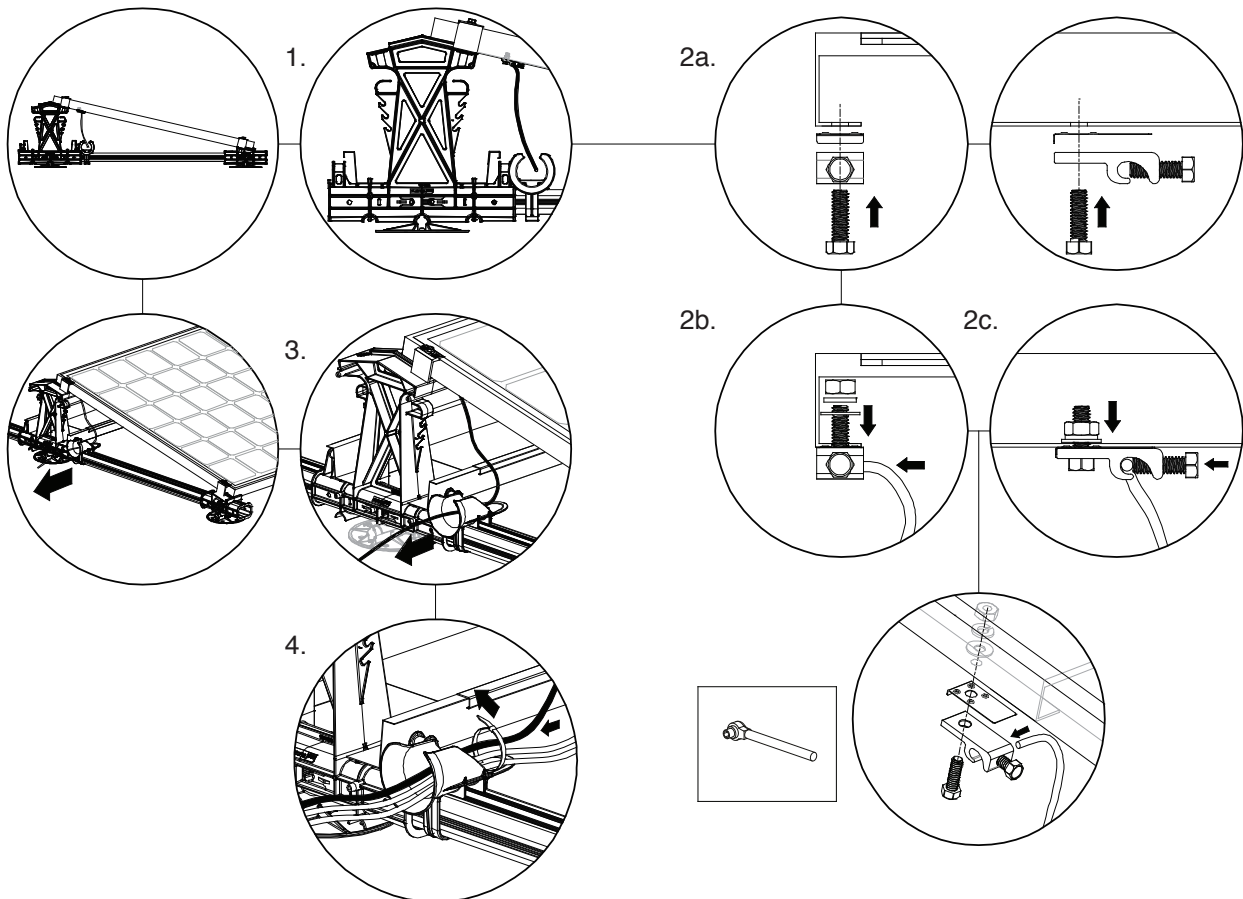
CAUTION! Ensure to use 2 grounding lugs for one row (first and last solar module).

2. Install grounding lug according to manufacturer's installation manual:

- Insert 1/4" bolt through grounding lug assembly and module frame.
- Attach 1/4" washers and nut on the inside of the module frame. Torque setting 120 in-lbs.
- Attach grounding wire to assembly and torque the wire clamp bolt to 90 in-lbs (grounding wire size and type to be in accordance with the array short-circuit current and the National Electric Code and/or local jurisdiction).

3. Route the grounding wire through the wire exit guide (if being used). Remove excessive cable slack by fixing the grounding wire to the wire exit guide using a standard wire tie. **CAUTION!** Ensure to tie down the wire properly to prevent any wire shift.

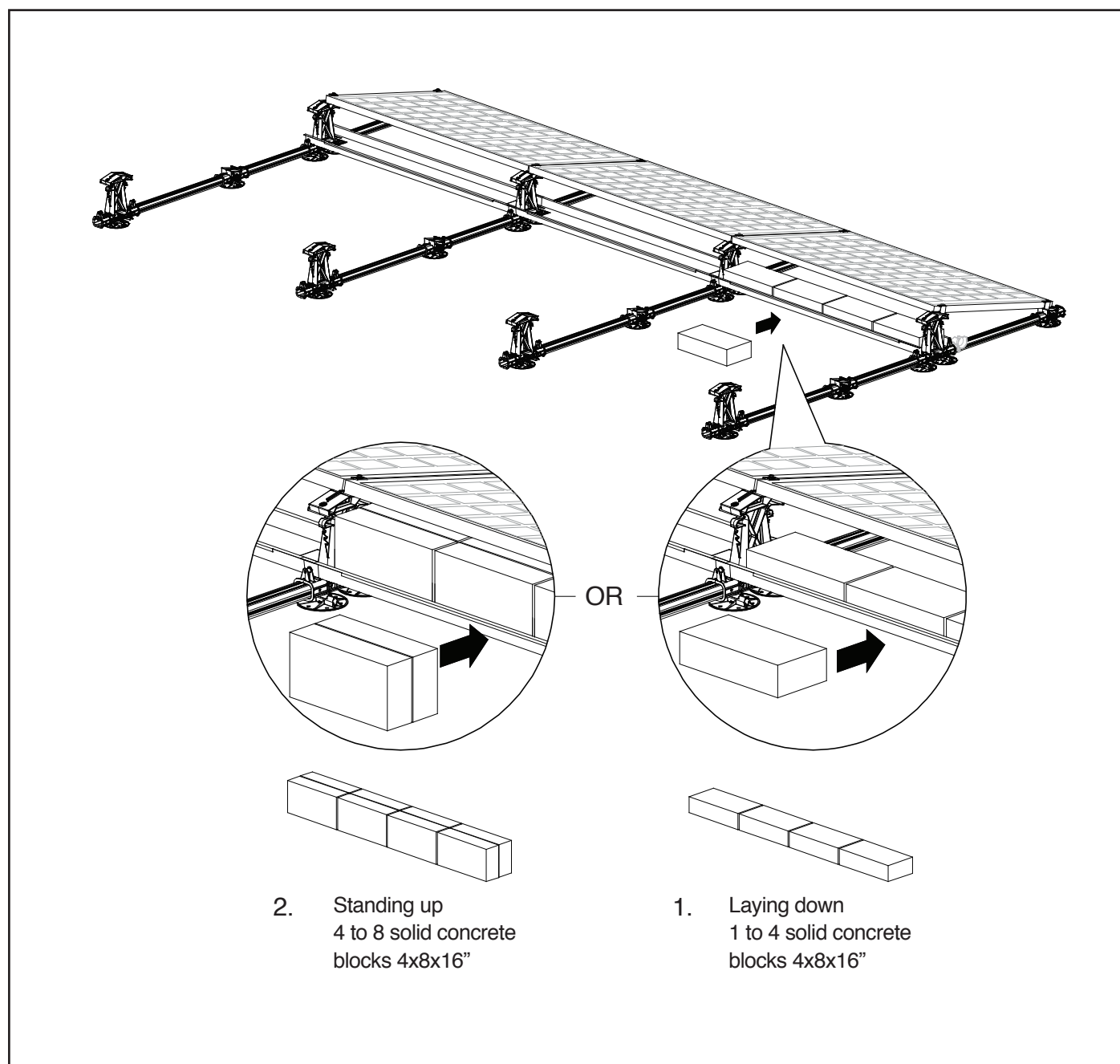
4. To ground additional rows repeat steps 1 through 3 above. Alternatively, ground additional rows using two 38 in module jumpers per row as shown in Appendix B.



CAUTION! Use the wire exit guides only in case when using optional side wind deflectors.

7.11 Placement of ballast

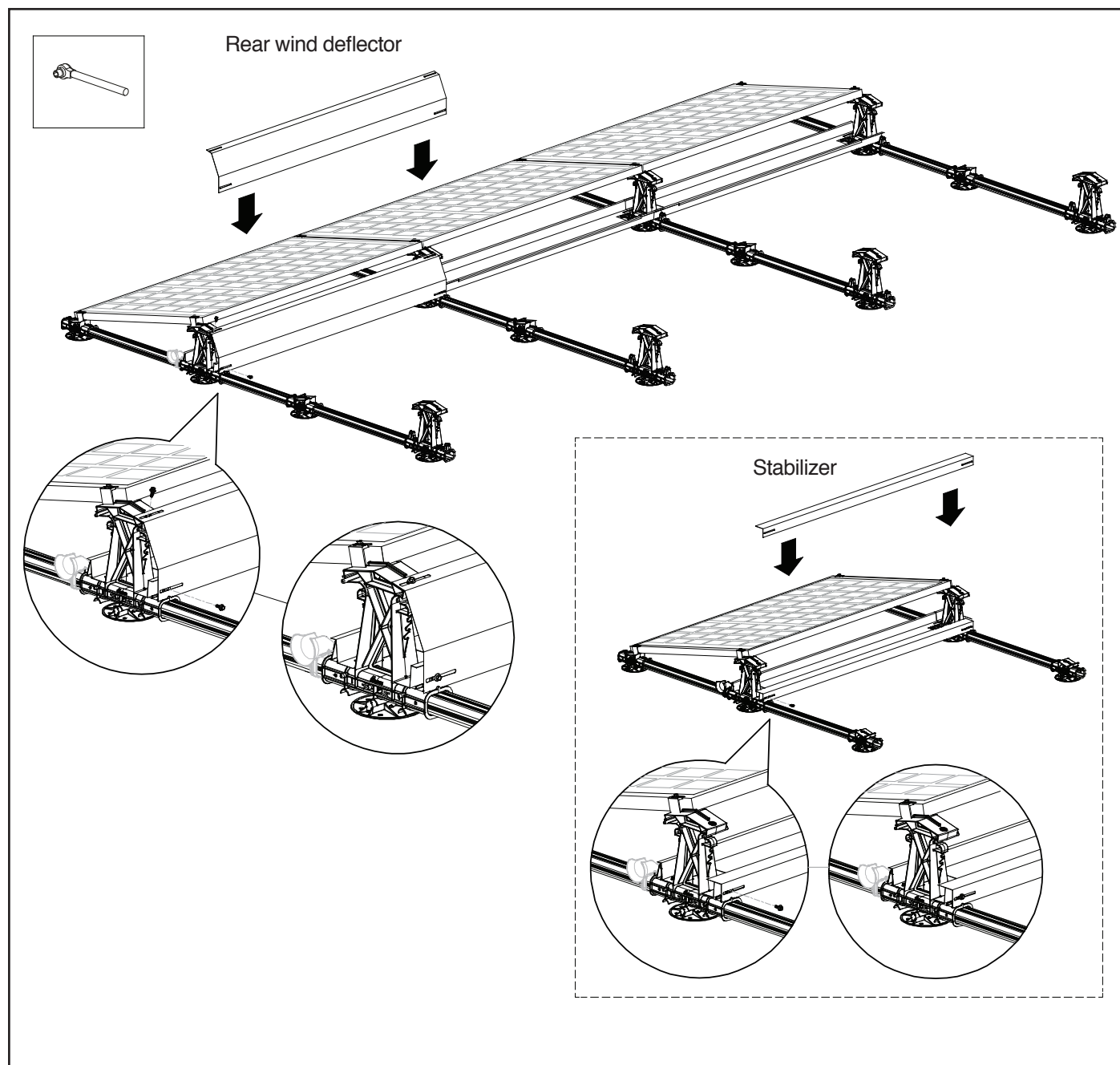
Refer to the Project Specifications for the amount of ballast to use. If it calls for more than four of the 4x8x16" solid concrete blocks, stand the blocks on their long edge as shown below. Do not stack blocks on top of each other if above the height of the ballast tray.



7.12 Mounting of rear wind deflector or stabilizer

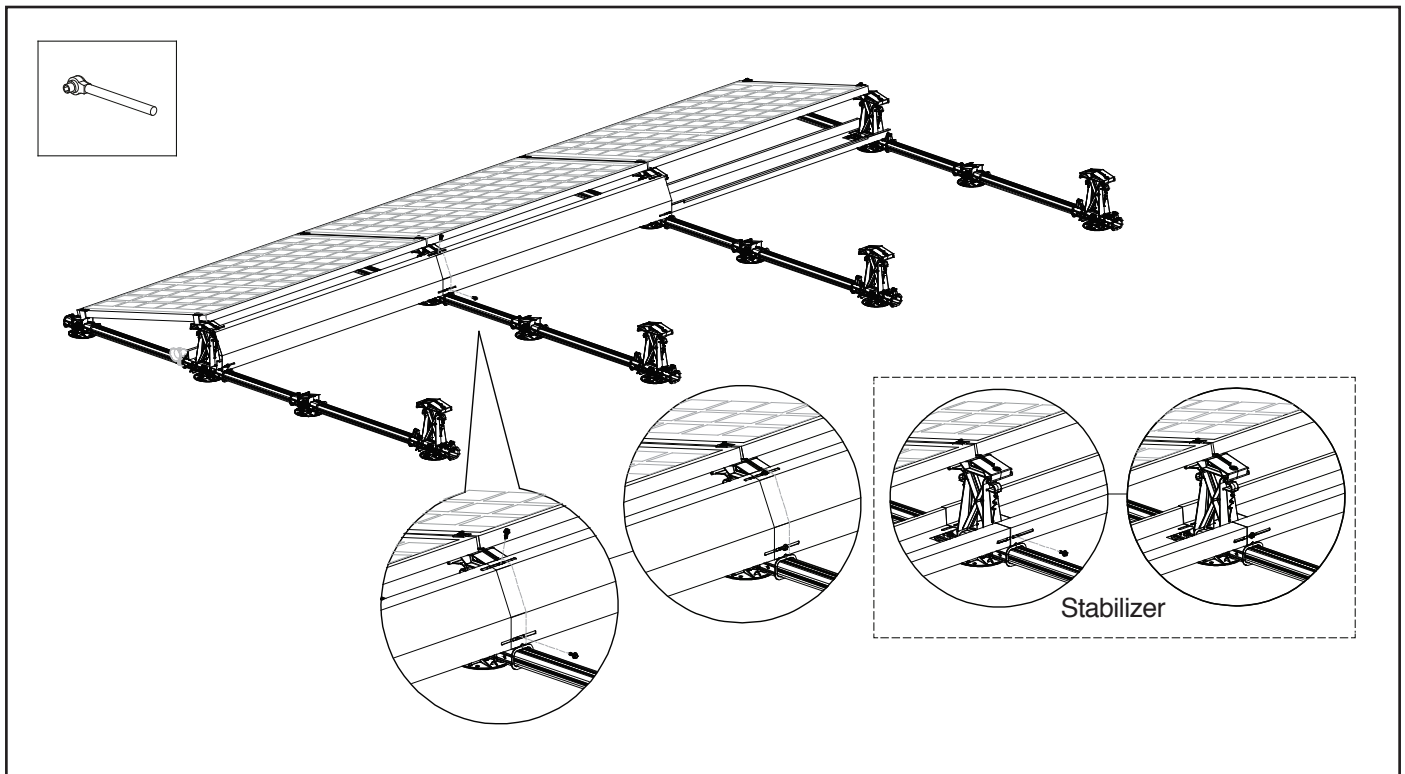
All high bases must be connected with either a wind deflector or stabilizer.

1. Place the first wind deflector (or stabilizer) on the rear side of the solar modules so that the slots in the deflector align with the holes in the high base as shown below.
2. Fasten only the east side of the wind deflector (or stabilizer) to the high base by placing the mounting screw (6.5 x 19 mm) in the two slotted holes of the wind deflector (or in the slotted hole of the stabilizer) and drive it into the mounting holes of the high base. **CAUTION!** The tightening torque of the mounting screw is 40 in-lbs.

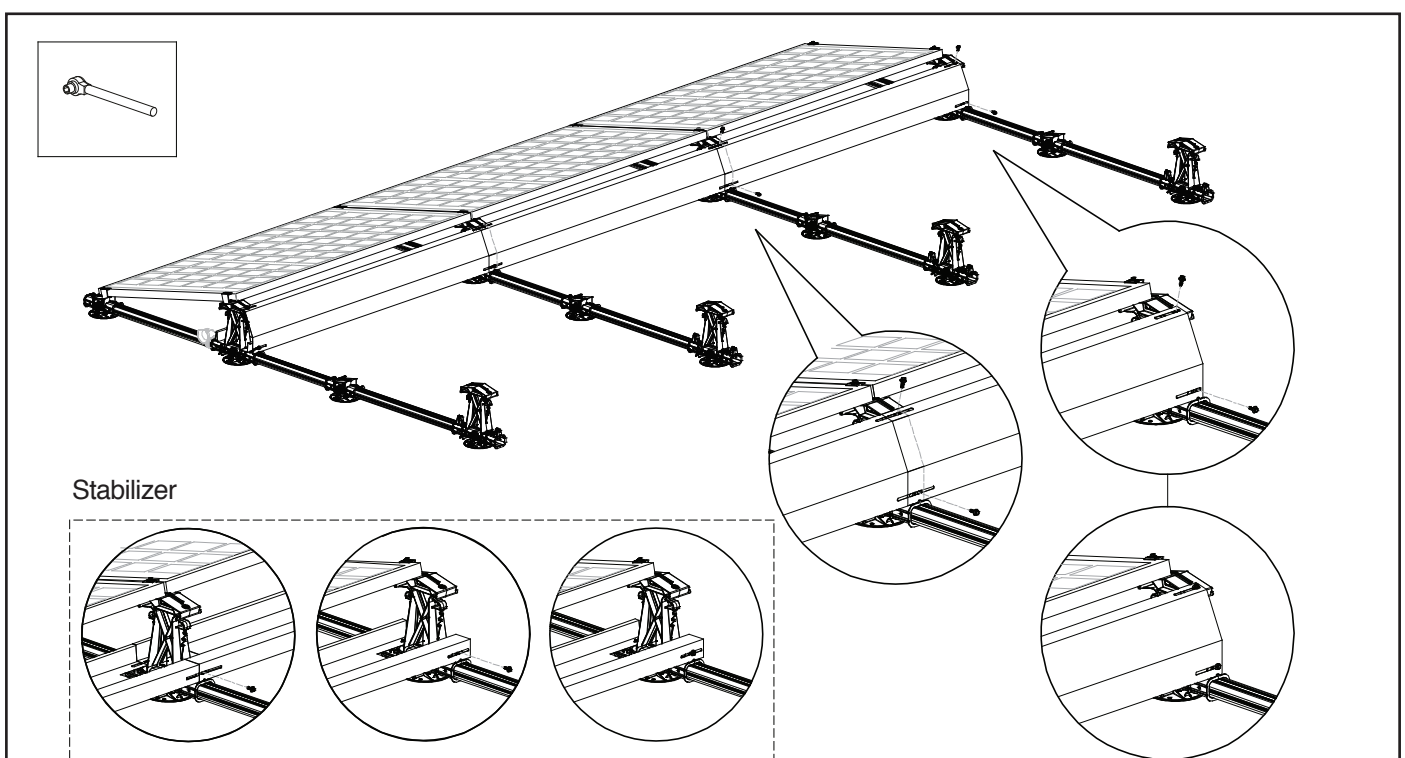


7.12 (continued)

3. Place the 2nd wind deflector (or stabilizer) as shown below with a small overlap with the first wind deflector (or stabilizer).
4. Fasten only the east of the deflector (or stabilizer) by placing the mounting screw (6.5 x 19 mm) in the two slotted holes of the 2 wind deflectors (or in the slotted hole of the 2 stabilizers) and drive it into the mounting holes of the high base.
CAUTION! The tightening torque of the mounting screw is 40 in-lbs. Check that the mounting screws are not over-tightened in the base.
5. Repeat the previous step for the other wind deflectors (or stabilizers).

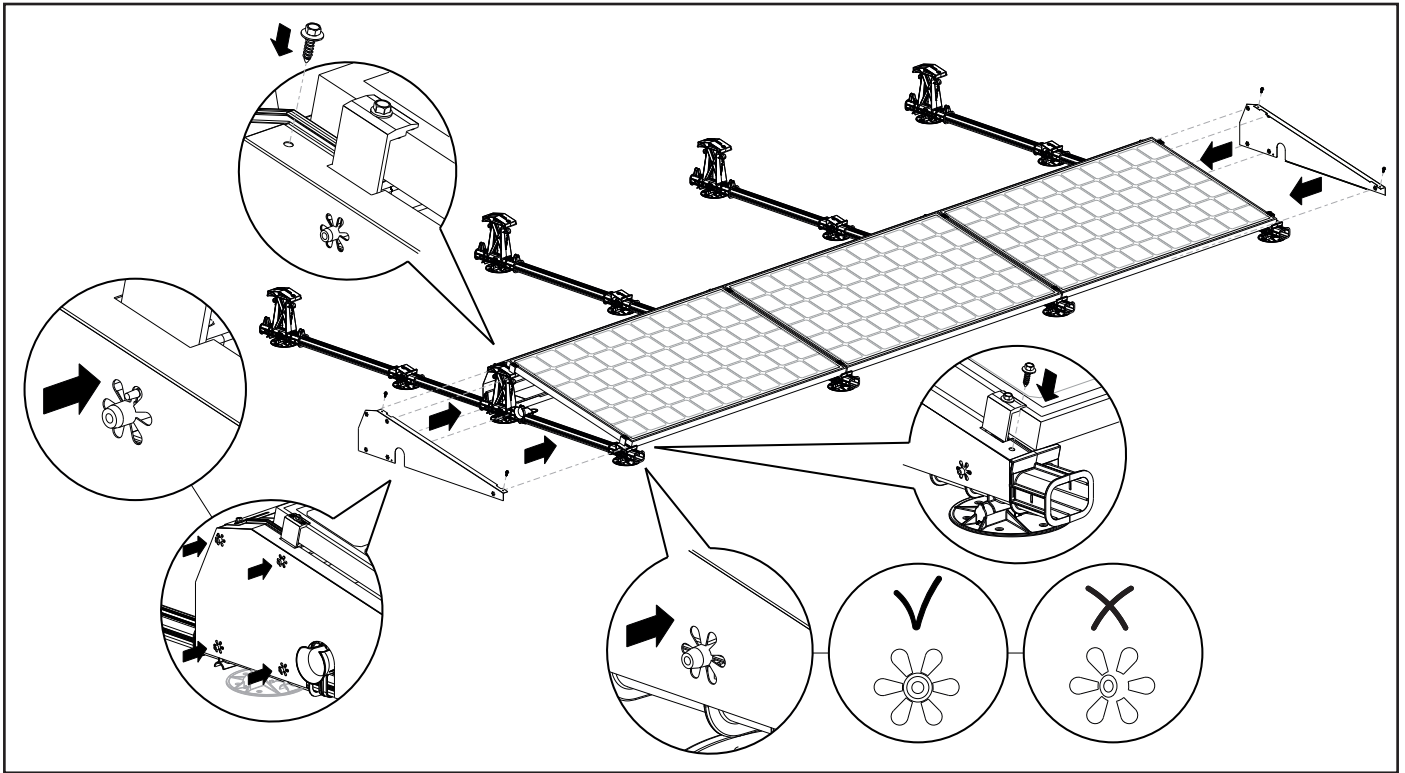


6. For the last rear wind deflector (or stabilizer) on the row, place additional fasteners in the far west side as shown below.
CAUTION! The tightening torque of the mounting screw is 40 in-lbs.

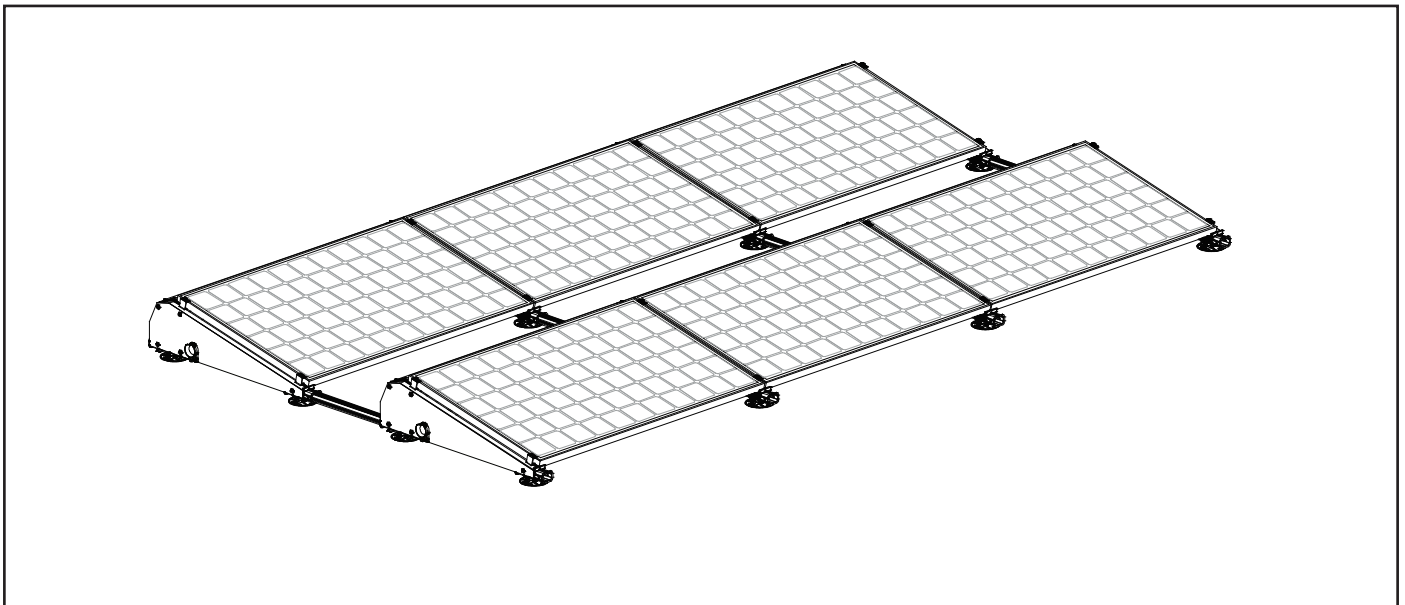


7.13 Mounting of wind deflector left/right (If Required)

1. Place the left wind deflector next to the left side of the module row and the right wind deflector next to the right side.
CAUTION! The flange of the wind deflector must always face the module field.
2. Carefully install the two wind deflectors (left and right) by fully pressing the Sunlock in the wind deflectors over the pins on the base.
3. Drive two mounting screws (6.5 x 19 mm) through the two top holes into the high base and low base until the washer is flush with the top of the wind deflector.

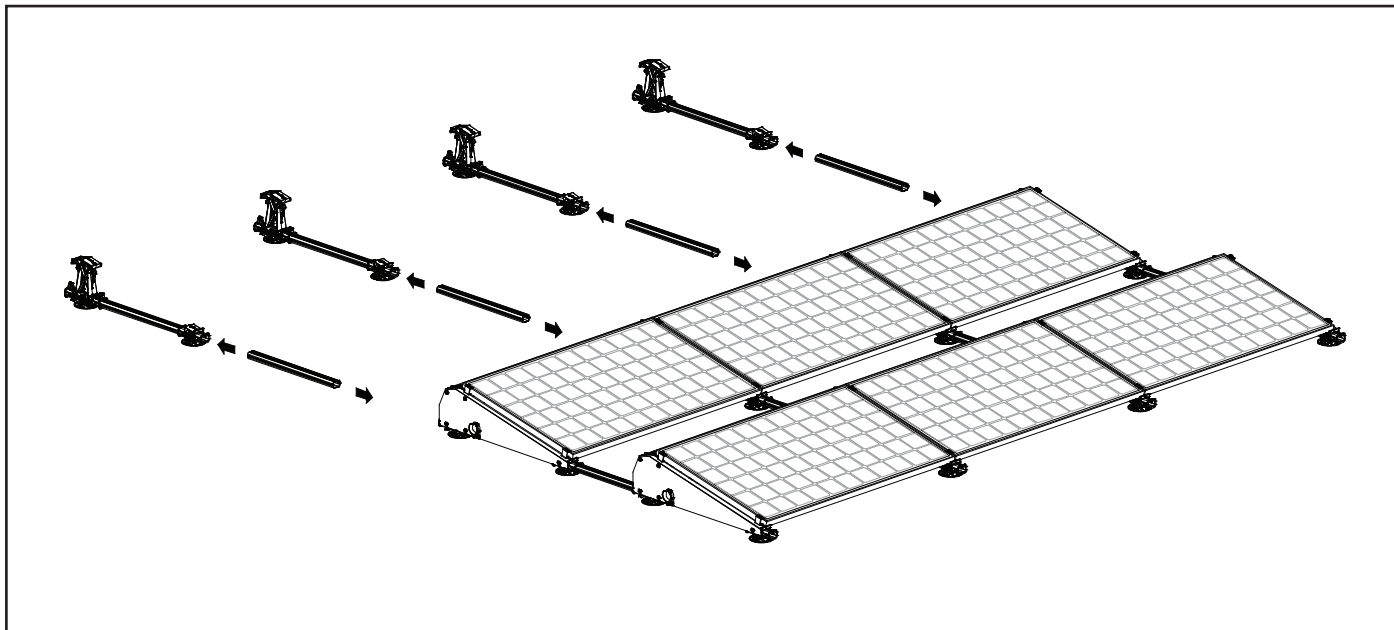


You can now mount the 2nd solar modules row. To do this, follow the steps from Chapter 7.4 to 7.13.

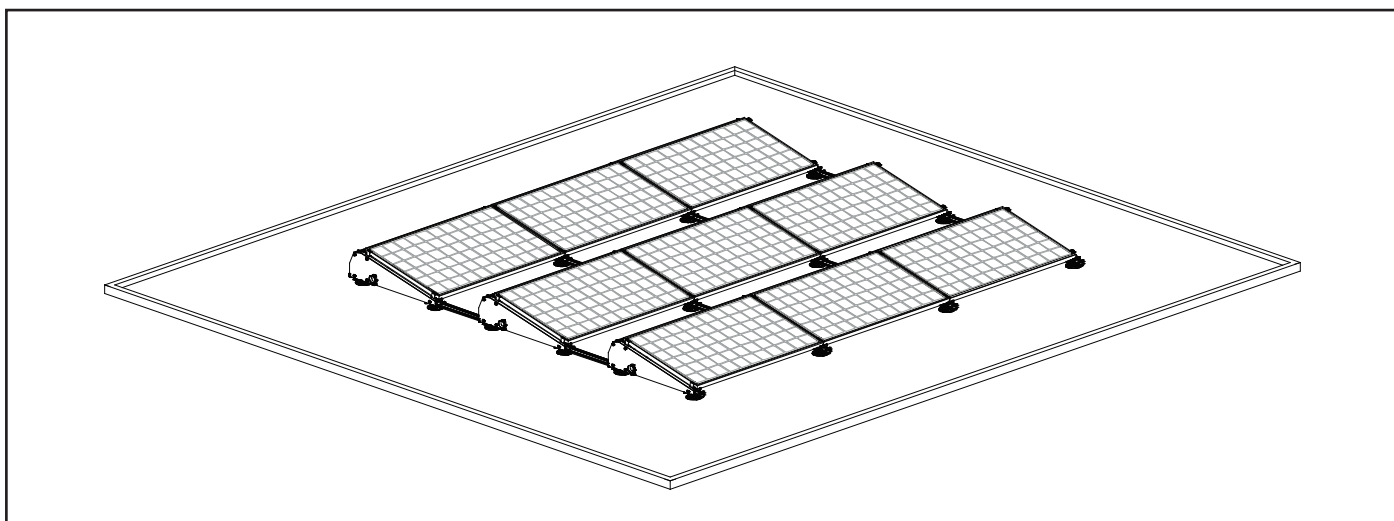


7.14 Several rows behind one another

If you want to mount more rows of solar modules one behind the other, then you must first create the mounting structures again (see section 7.1) and connect them to the inter-row base connector to the already mounted module field.



The module array is now ready!



8. Annex

End clamp sets		
	Article no.	
Frame thickness	Grey	Black
29mm ($\approx 1 \frac{5}{32}$ "		
30mm ($\approx 1 \frac{6}{32}$ "	103-7230	103-7330
31mm ($\approx 1 \frac{7}{32}$ "	103-7231	103-7331
32mm ($\approx 1 \frac{8}{32}$ "	103-7232	103-7332
33mm ($\approx 1 \frac{10}{32}$ "	103-7233	103-7333
34mm ($\approx 1 \frac{11}{32}$ "	103-7234	103-7334
35mm ($\approx 1 \frac{12}{32}$ "	103-7235	103-7335
36mm ($\approx 1 \frac{13}{32}$ "	103-7236	103-7336
37mm ($\approx 1 \frac{15}{32}$ "	103-7237	103-7337
38mm ($\approx 1 \frac{16}{32}$ "	103-7238	103-7338
39mm ($\approx 1 \frac{17}{32}$ "	103-7239	103-7339
40mm ($\approx 1 \frac{18}{32}$ "	103-7240	103-7340
41mm ($\approx 1 \frac{20}{32}$ "	103-7241	103-7341
42mm ($\approx 1 \frac{21}{32}$ "	103-7242	103-7342
43mm ($\approx 1 \frac{22}{32}$ "	103-7243	103-7343
44mm ($\approx 1 \frac{23}{32}$ "	103-7244	103-7344
45mm ($\approx 1 \frac{25}{32}$ "	103-7245	103-7345
46mm ($\approx 1 \frac{26}{32}$ "	103-7246	103-7346
47mm ($\approx 1 \frac{27}{32}$ "	103-7247	103-7347
48mm ($\approx 1 \frac{28}{32}$ "		
49mm ($\approx 1 \frac{30}{32}$ "		
50mm ($\approx 1 \frac{31}{32}$ "	103-7250	103-7350

Mid clamp sets		
	Article no.	
Frame thickness	Grey	Black
26 - 30mm	103-2630	103-2630-B
31 - 34mm	103-3134	103-3134-B
35 - 39mm	103-3539	103-3539-B
40 - 45mm	103-4045	103-4045-B
46 - 50mm	103-4650	103-4650-B

2A. Available base connectors

Article no.		Description	Inter-row spacing
Grey	Black		
100-7121	100-7621	Base connector 210 mm	2110 mm ($\approx 83''$)
100-7137	100-7637	Base connector 370 mm	2270mm ($\approx 89 \frac{3}{8}''$)
100-7155	100-7655	Base connector 550 mm	2450mm ($\approx 96 \frac{3}{8}''$)
100-7175	100-7675	Base connector 750mm*	2650mm ($\approx 104 \frac{2}{8}''$)
100-7194	100-7694	Base connector 940 mm	2840mm ($\approx 111 \frac{6}{8}''$)
* Default length in FlatFix Fusion Project Specifications			

6. Available ballast trays

Article no.	Description	Module length	
		Min	Max
100-7060	Ballast tray 1600	1550mm ($\approx 61''$)	1690mm ($\approx 66 \frac{4}{8}''$)
100-7098	Ballast tray 1700	1680mm ($\approx 66''$)	1775mm ($\approx 70''$)
100-7062	Ballast tray 1900	1830mm ($\approx 72''$)	1970mm ($\approx 77 \frac{4}{8}''$)

15. Available Wind deflectors rear

Article no.		Description	Module length	
Grey	Black		Min	Max
100-7050	100-7550	Wind deflector rear 1600	1550mm ($\approx 61''$)	1690mm ($\approx 66 \frac{4}{8}''$)
100-7052	100-7552	Wind deflector rear 1900	1830mm ($\approx 72''$)	1970mm ($\approx 77 \frac{4}{8}''$)

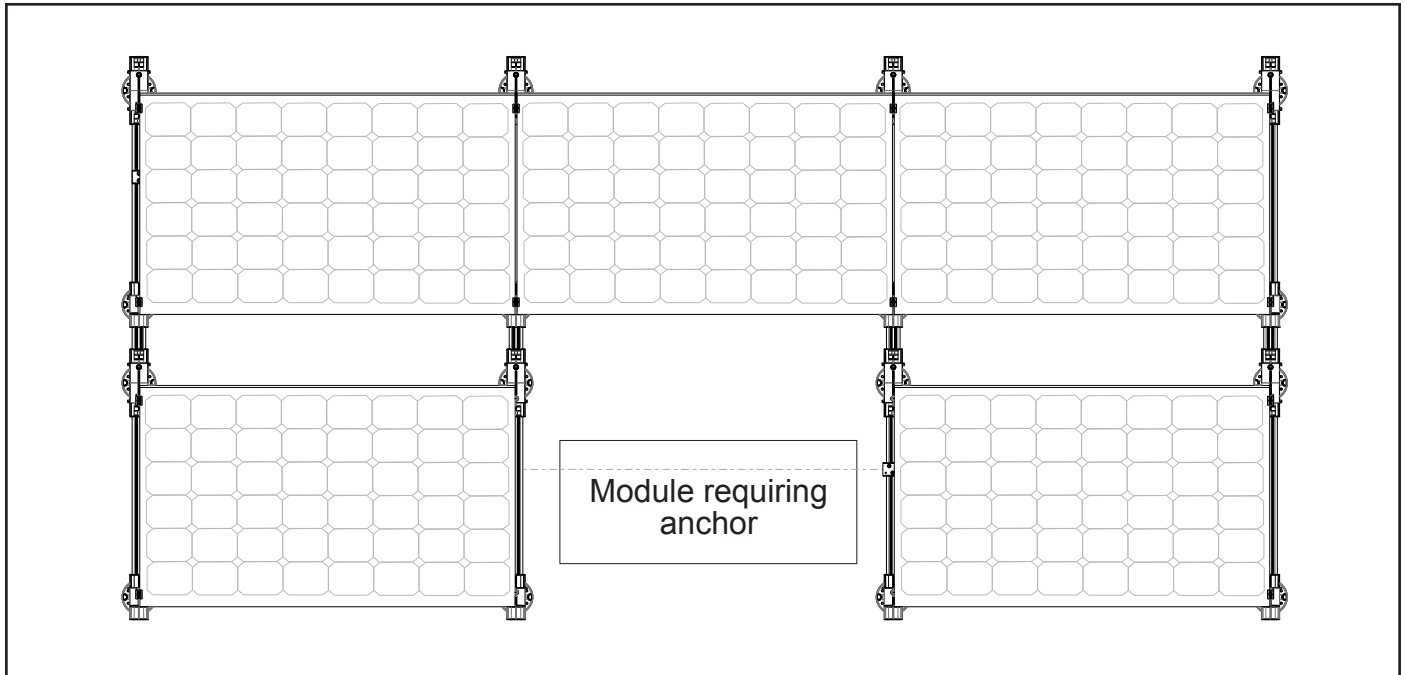
16. Available Stabilizers

Article no.	Description	Module length	
		Min	Max
100-7070	Stabilizer 1600	1550mm ($\approx 61''$)	1690mm ($\approx 66 \frac{4}{8}''$)
100-7099	Stabilizer 1700	1680mm ($\approx 66''$)	1775mm ($\approx 70''$)
100-7072	Stabilizer 1900	1830mm ($\approx 72''$)	1970mm ($\approx 77 \frac{4}{8}''$)

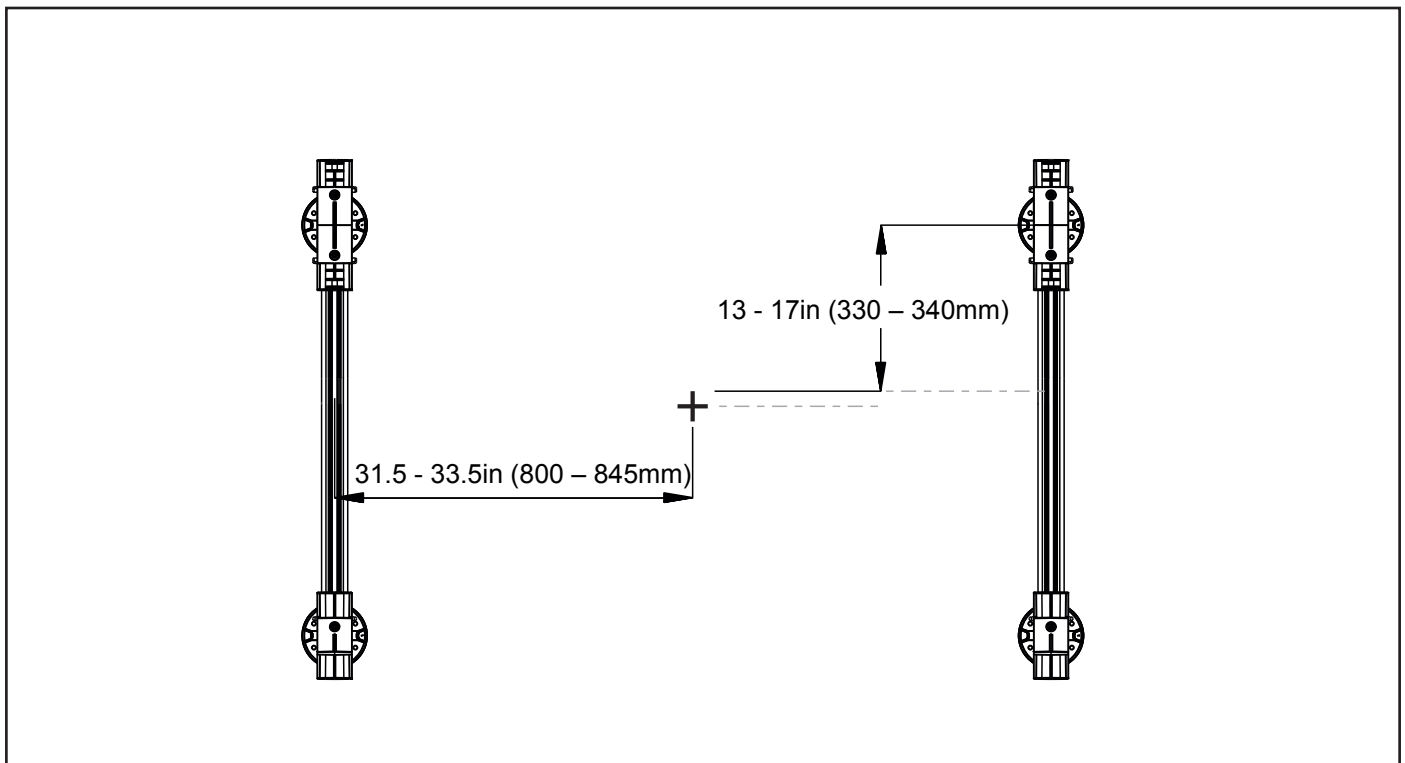
9. Appendix A

9.1 Anchor Bar installation instructions

1. Install complete mounting system and all modules that do not require anchors as seen below.



2. Mark the install location of the anchor per the dimensions shown below

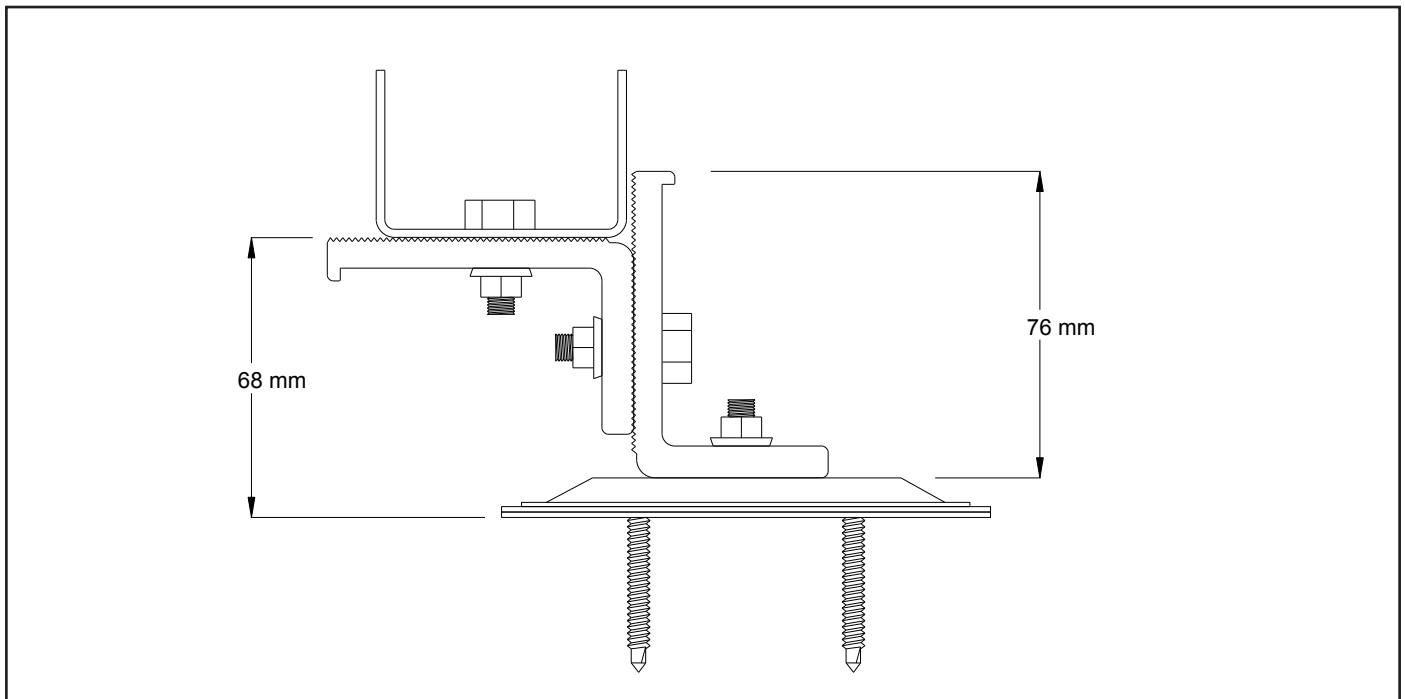


9.1 (continued)

3. Assemble and install the L-foot assembly onto the anchor as seen below. Tighten the assembly to the anchor per the anchor manufacturer's specifications.*

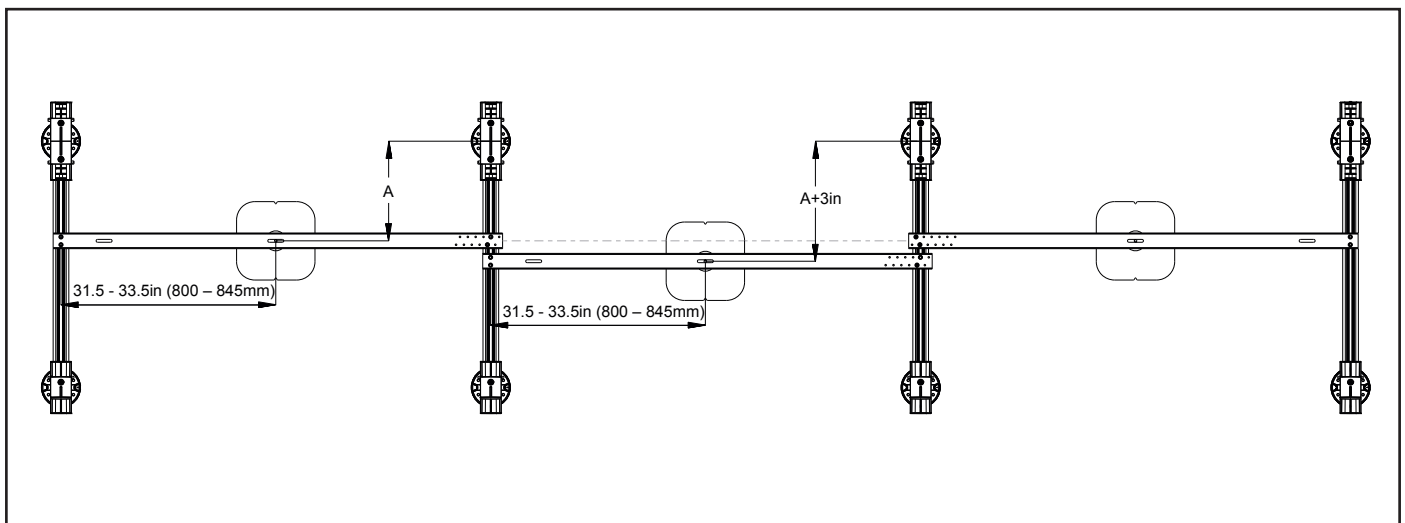
*Compatible anchors include but are not limited to EcoFasten Simplegrip-SG, Sustainable Technologies FACET Anchor, and the OMG PowerGrip

4. Install the anchor bar so that the middle slot is over the second L-foot. Attach the anchor bar to the second L-foot of the L-foot assembly by adjusting the height of the second Lfoot to be flush with the bottom of the anchor bar. Tighten the entire assembly to the correct torque values.



5. For adjacent modules that require anchors, the anchor and anchor bar positioning must be adjusted slightly. When placing an adjacent anchor, shift the position of the anchor from the center of the high base element by 3in. Follow steps 3 and 4 to attach the anchor bracket and anchor bar.

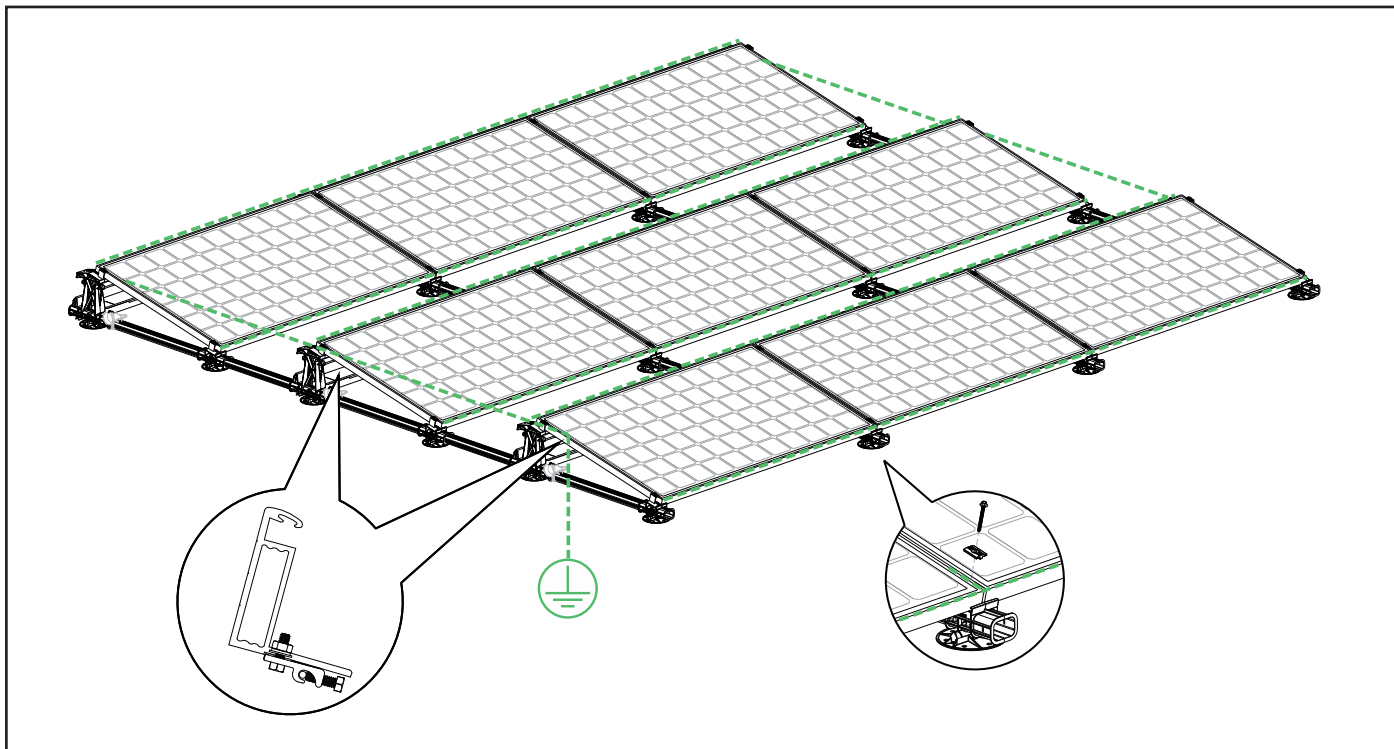
6. Alternate between these two positions for further adjacent anchors.



10. Appendix B

10.1 Bonding path – Option 1

Mid clamp with bonding plate bonds module to module within a row.
WEEB lugs and copper wire bond row to row.



10.2 Bonding path – Option 2

Mid clamp with bonding plate bonds module to module within a row.
Module jumpers bond row to row.

