

# Installation Manual for Solpod v4

SP-028 Version 1.8, October 2023



*Solpod v4 (patent pending)*



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# Introduction

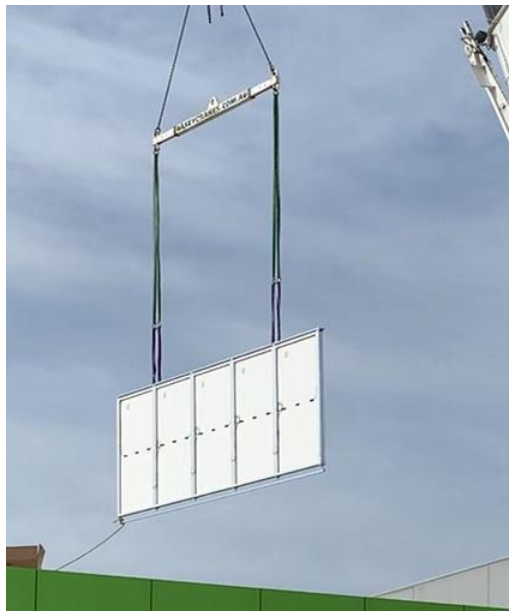
Thank you for choosing the Solpod v4 solar frame from Solpod Pty Ltd. Made from custom-designed aluminium extrusions and components, Solpod's streamlined design and improved frame strength greatly simplifies solar panel installation. Solpod is backed by a 10-year warranty and is compliant with the AS/NZS 1170.2:2021 on wind actions and AS/NZS 16641.1:1997 on aluminium structures.

## Overview

Solpod solar PV arrays are built using pre-assembled frames (solar pods or Solpods) of solar PV modules. Each Solpod is lifted to the roof using a crane. The spine of the Solpod is fixed to the roof, then the wings of the Solpod unfold into place. Solpods are transported to site on container bases, which are lifted off the delivery truck using the same crane that is used to lift the Solpods up to the roof.



*Container base being lifted off truck*



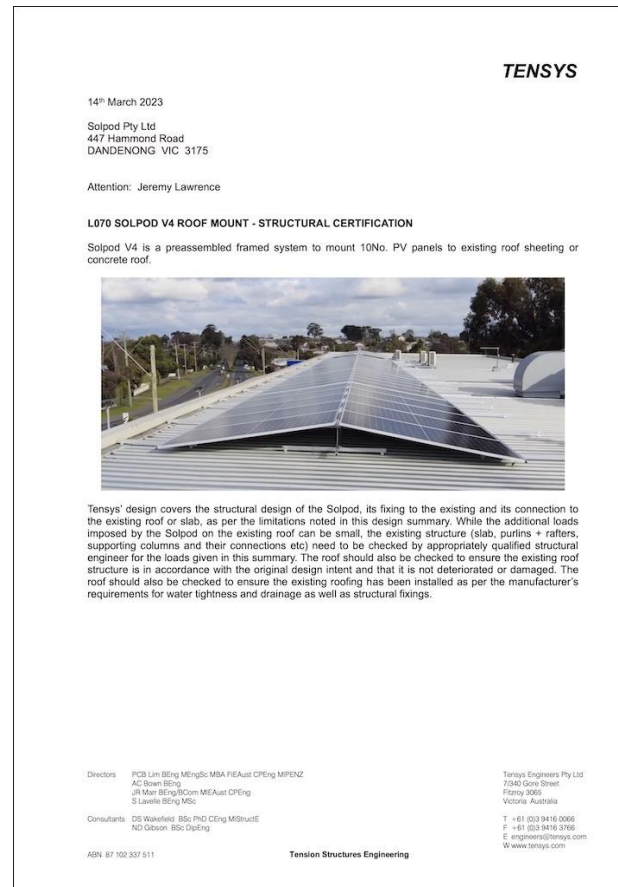
*Solpod being lifted to roof*



*Solpod being unfolded on roof*

## Compliance and certification

Solpod v4 is supplied with a certification that suits most buildings, covering wind regions A & B, terrain category 2 & 3. Custom certification is also available for sites that aren't covered by the generic certification, including an assessment of the site wind speed and the as-built conditions of the roof sheet and roof frame. Certification is provided by Tensys Engineering. If the roof is exposed to higher wind loads, such as near open water, please contact Solpod for guidance.

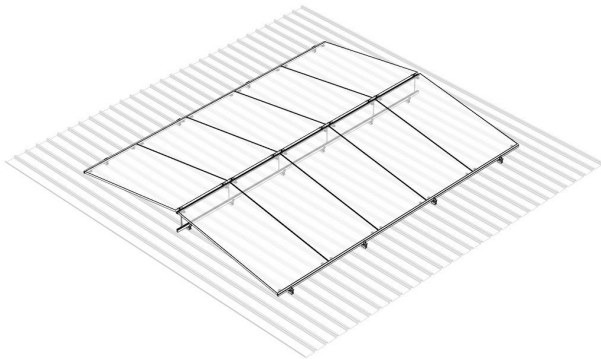


*Certification from Tensys Engineering*

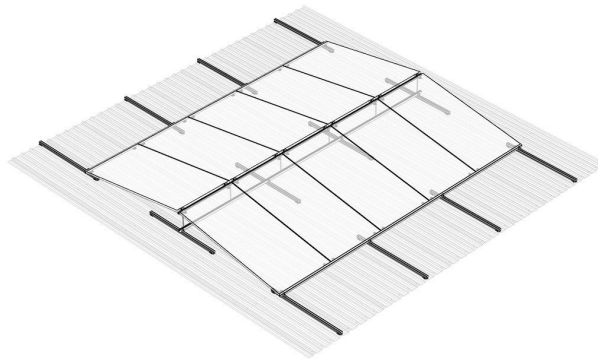
## Types of roofs and roof fixings

Solpods can be fixed to a variety of roof types:

- Klip-Lok roofs: using roof clamps with EPDM rubber sheets,
- Screw-fixed roofs: using short lengths of rail on L-feet,
- Concrete roofs: using longer lengths of rail on concrete anchors.



*Solpod on roof clamps*



*Solpod on screw-fixed rails*



*Solpod on rails on concrete anchors*

## Site preparation

Prior to installation, the site needs to be inspected and prepared, including a weather assessment, roof access plan, crane plan, material handling plan and traffic plan.

### **Weather assessment**

Solpod installation is sensitive to wind, rain and debris, particularly high winds which can affect the crane. Installation should occur when the weather is forecast to be still and dry. After rainfall, use a soft bristled broom to remove excess water from the roof crests, prior to continuing with the installation. If adhesive tape is used, winds should be forecast to remain moderate for at least three days after installation, enabling the adhesive tape to cure to full bonding strength prior to being exposed to maximum design wind actions.

### **Roof access plan and crane plan**

Each site requires access to the roof for people and materials, independent of the crane. A typical 100 kW solar array consists of 21 Solpods covering a roof area of over 500 m<sup>2</sup>. Depending on the maximum extension crane, one or more crane locations may be required.

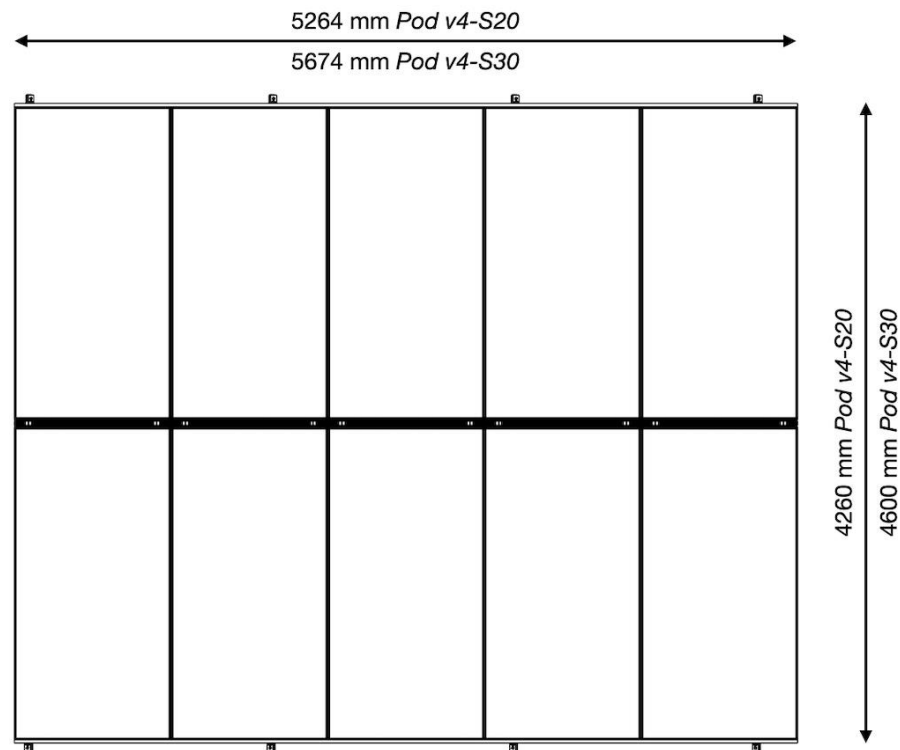
### **Traffic plan and material handling plan**

Depending upon the roof access plan, crane plan and material handling plan; an overall traffic plan may be required. Traffic plans are usually generated by a traffic management subcontractor. Depending upon the number of crane locations required, material handling may need to be considered.

- Where will the Solpod delivery (truck, trailer or container) be located?
- Where will ancillary components (inverters, cabling, trunking) be located?
- Where will waste be stored prior to removal?

## Array mark out

Each array consists of multiple Solpods, and space needs to be allocated for access walkways, inverters and cable trays. The location of each Solpod needs to be marked on the roof, including the location of roof fixings. Each Solpod comprises two wings of each five modules, pre-assembled into strings of five. Typically, Solpods are laid out sets of three, to enable DC strings of fifteen modules, to suit the DC input range of inverters. Dimensions are shown in the diagram for two module sizes: 2112x1052 mm (Pod v4-S20) and 2278x1134 mm (Pod v4-S30). Add 110 mm to the total width to include space for L-brackets and roof clamps. Lengthways, Solpods can be installed with a 10 mm gap between them (-5 / +20 mm) to minimise the need for extra hardware for DC cable protection. For further guidance refer to *SP-008 Solpod Roof Layout Guide*.



*Solpod v4 Tilt plan dimensions (to outside of edge beams, add 110 mm to the width to include roof clamps)*



## Lifting to the roof

### Lifting from the truck to the ground

Solpods are delivered to site on container bases carried by a flat-bed semi-trailer. Two container bases can fit on a 14 metre long flat-bed. Bases are lifted off the truck using the same crane that lifts the Solpods to the roof. Bases can be lifted with chains to lifting lugs that fit the corners of the container base, or with chains through the tyne pockets.



*Container base being lifted off truck using a 3 metre spreader bar, hired with crane*



*Lifting lugs to connect to corners of container base*

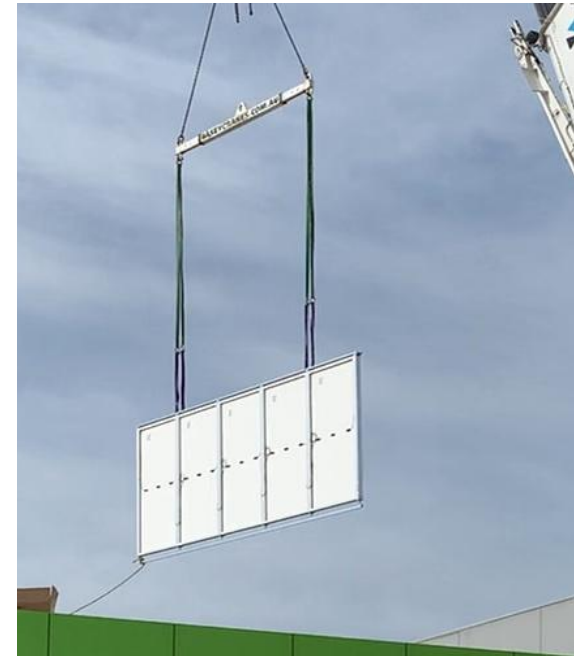


### Lifting from the ground to the roof

Solpods are lifted to the roof using a crane and four chains. Optionally, a 3 metre spreader bar can be used to better spread the chains. During craning, workers do not stand under the Solpod; they stand to the sides, and guide the Solpod using the attached guide-lines. This allows the Solpod to be rotated and translated into the desired position.



*Solpod being lifted and unfolded without a spreader bar*



*With a spreader bar*

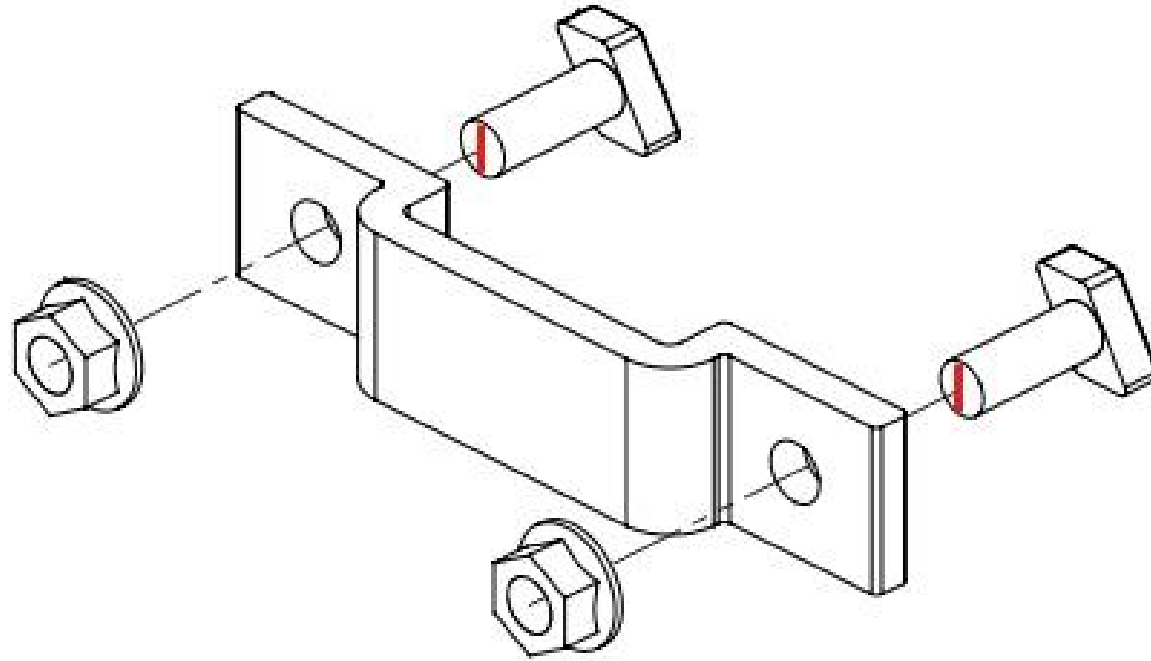
Each delivery of Solpods is supplied with three sets of slings brackets. Each sling bracket set consists of four sling brackets, eight T-headed fasteners, eight flanged nuts, and four 1 metre slings. The T-headed fasteners allow the sling brackets to be easily attached to or removed from the slot on the edge beam of the Solpod. Each T-headed fastener has a marked line to indicate the angle of rotation. When fitted and rotated correctly into position, the marked line is vertical. The sling brackets are fitted at one metre in from the ends of the Solpods.



*1 metre sling and sling bracket  
Fasteners about to be tightened*



*Sling brackets are offset  
Sling brackets are on on different edge beams (upper and lower)*



*Solpod sling bracket - note the rhomboid head fasteners and the marker line (marked in red in this image) at the tip of the fasteners.  
When correctly rotated, the marker line is vertical.*

Lifting a Solpod off the top of the stack of Solpods:

1. Use the crane to lift the edge beams approximately 100 mm
2. Stand at the spine and push the Solpod toward the edge beams approximately 40 mm, so the hinge brackets slide off the ones below them, then pull the Solpod back slightly until it rests against the lower Solpod
3. Continue to lift the Solpod up via the edge beams, it will rotate slowly up to vertical
4. Once it's vertical, it can be lifted and slewed (to the roof) at a faster pace



*Solpod v4-Tilt, after step (2) above*

## Unfolding on the roof

The Solpod is held by the crane and guided into position, then the central spine is lowered onto the pre-installed centre row of F-brackets (which are fixed to rails or roof clamps). Workers fix the central spine to the F-brackets, before the crane lowers the Solpod further, allowing the two wings to unfold. The edge beams of each wing rests on edge Solpod feet (or roof clamps). Workers fix the edge beams down using L-brackets. Workers detach the chains and the crane can start to slew back to the container base. Workers detach the sling brackets (and 1 metre slings) from the Solpod. These can be placed in a bag and attached to a shackle on the next lift, to be brought down for the next Solpod.

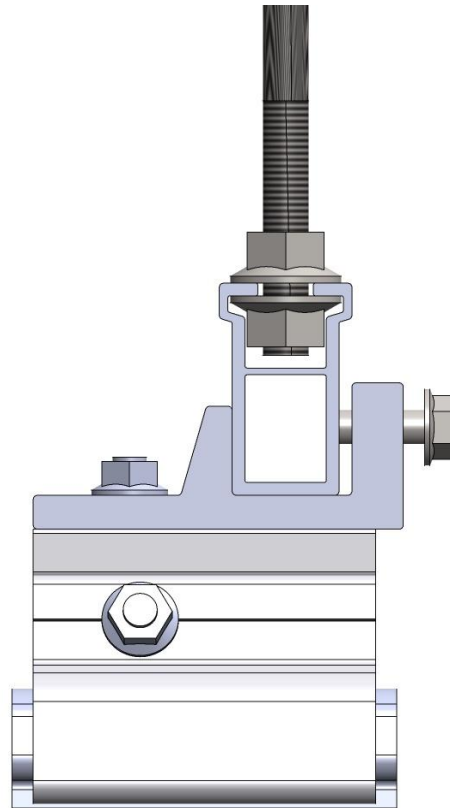


*Solpod being unfolded*

## Fixing to brackets



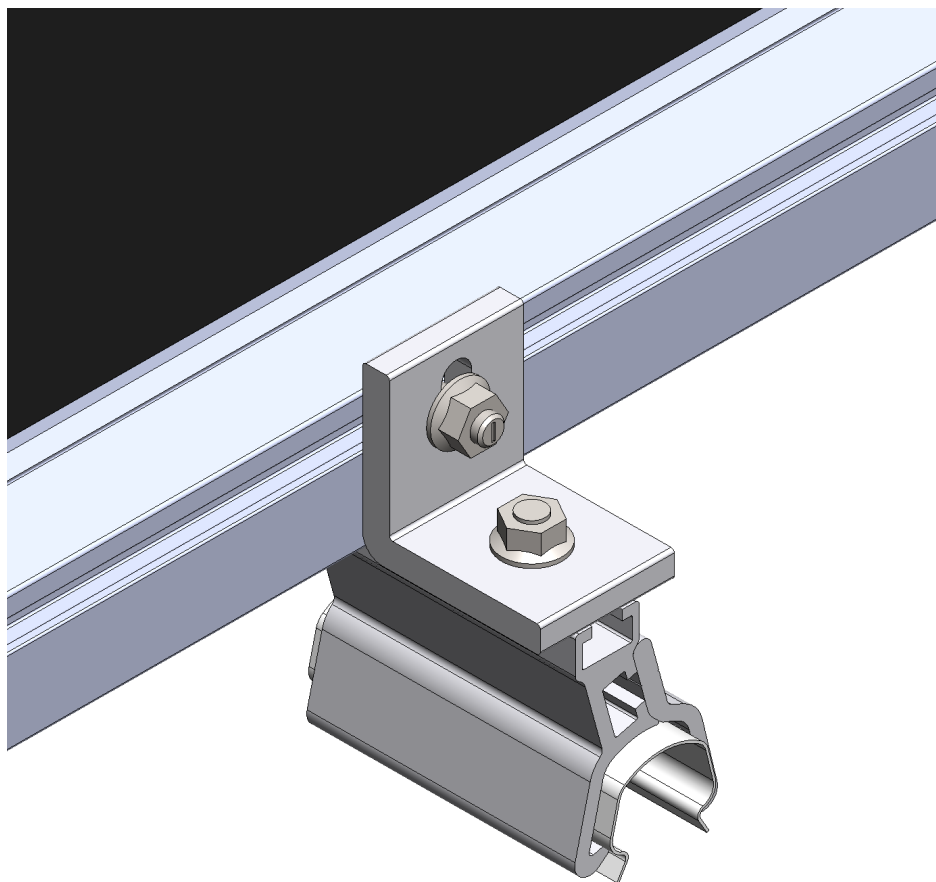
Each Solpod contacts the roof via three extruded aluminium beams - the spine lower beam and the two edge beams. Solpod beams are fixed in place using brackets, which in turn are fixed to Solpod feet or roof clamps.. F-brackets hold the spine lower beam, and L-brackets hold the edge beams. Because roofs aren't perfectly flat and even, the brackets have an auto-levelling feature. The straight beams will find their own position within each bracket. The F-bracket uses a standard fastener that is tightened to 10-20 N.m to create a 1 mm embedment into the spine lower beam.



*F-bracket holds the spine beam and allows the roof to be up to 10 mm out of flat*



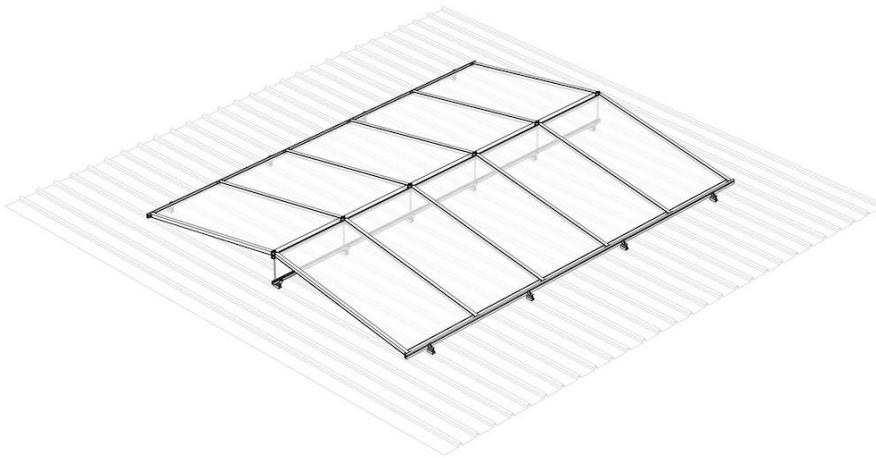
The L-bracket uses a customer T-headed fastener that is inserted into the slot on the edge beam, then rotated into position before tightening, also to 10 N.m. The T-headed fastener has a marker line to indicate the degree of rotation. When properly inserted and rotated, the marker line is vertical.



*L-brackets hold the edge beams; a slot allows the roof to be up to 10 mm out of flat.  
The marker line on the tip of the T-headed fastener should be vertical.*

## Installing Solpods using roof clamps

Solpods can be installed onto Klip-Lok roofs using roof clamps. The table (on next page) shows the number of clamps required. Note that the spine of the Solpod is perpendicular to the roof sheeting.



*Solpod on 14 roof clamps (low wind regions)*



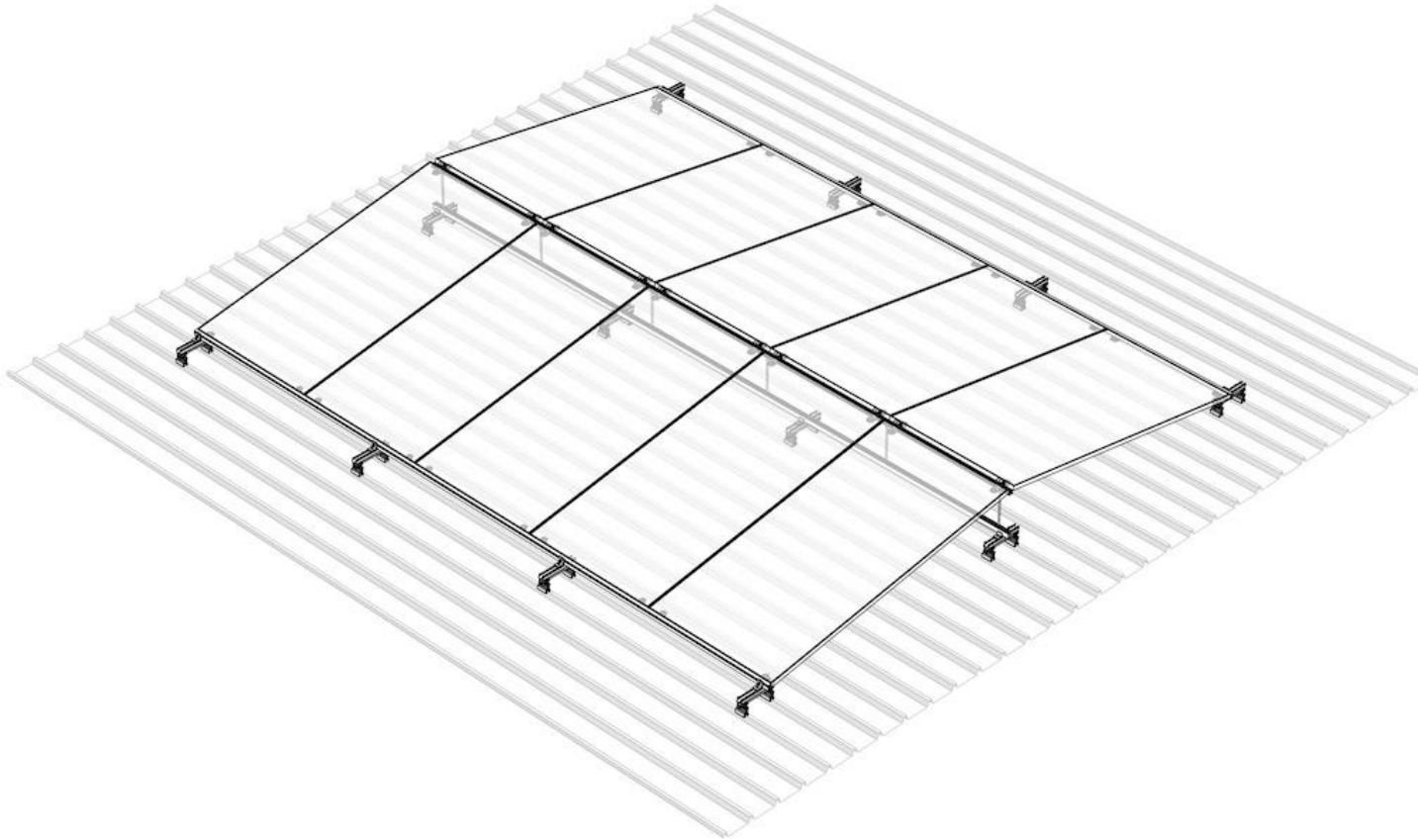
*Solpod on 22 roof clamps (high wind regions)*

Wind Region	Roof height	Number of roof clamps along spine		Number of roof clamps along edge	
		Solpod v4-S20	Solpod v4-S30	Solpod v4-S20	Solpod v4-S30
Wind Region A	Up to 10 m	6	6	4	4
Wind Region A	Up to 20 m	10	10	4	6
Wind Region A	Up to 30 m	10	10	6	6
Wind Region B	Up to 10 m	10	10	6	6

Notes:

- Spine fixings (roof clamps) can be either clustered near the spine legs, or equally spaced along the length of Solpod
- Edge fixings (roof clamps) should be a maximum of 250 mm from the end of the Solpod (i.e. locate the roof clamp on the first available roof sheet rib) and then reasonably equally spaced along the edge beam

Solpods can also be rotated 90 degrees on the roof. In this orientation, Solpod beams are supported on 'catamarans', each comprising a short length of Solpod channel on two Solpod roof clamps. The total number of roof clamps is 24, adequate for all conditions shown in the table above.

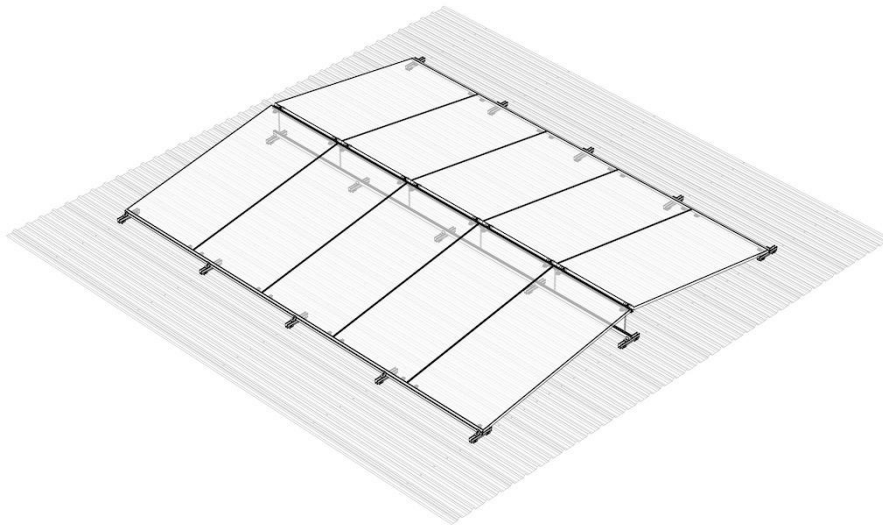


*Solpod rotated 90 degrees on the roof, fixed to catamarans*

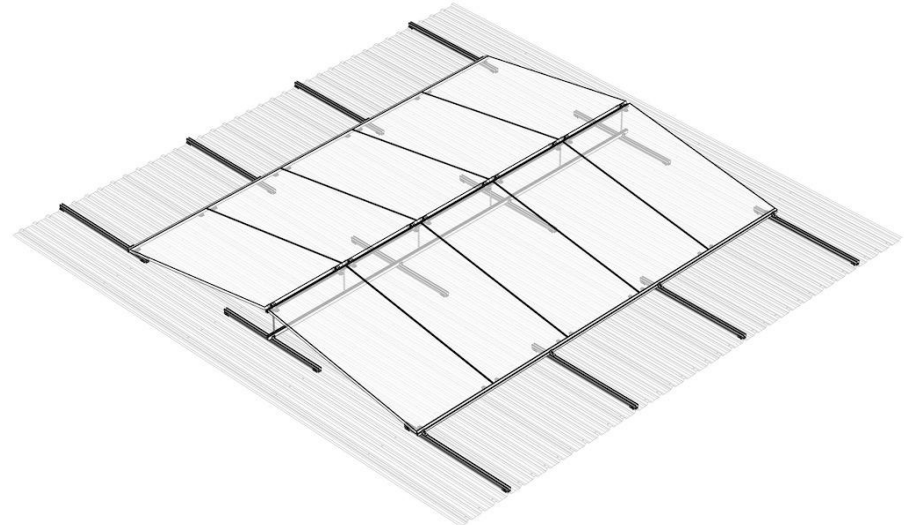
## Installing Solpod using roof screws

Solpods can be installed in two orientations on a screw-fixed roof such as Lysaght Trimdek.

- Spine of Solpods is parallel with the roof sheeting, on short rails
- Spine of Solpod is perpendicular to roof sheeting, on longer rails

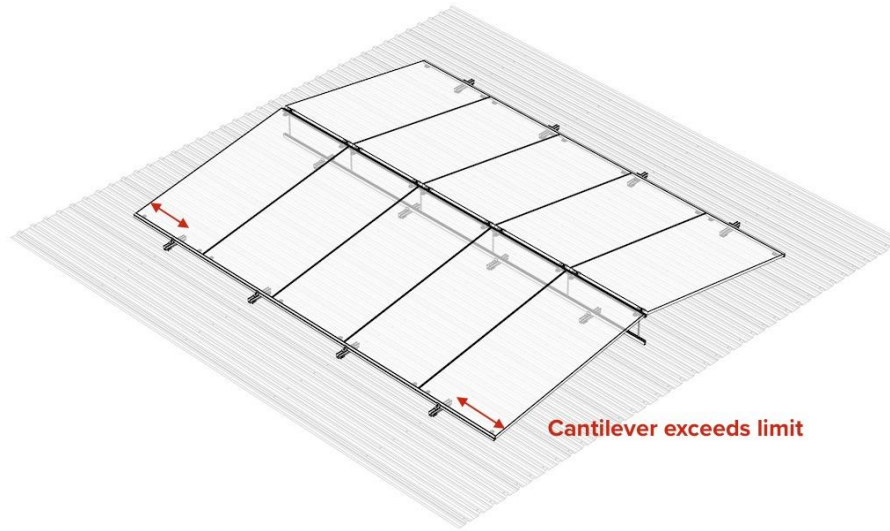


*Spine of Solpod parallel with roof sheeting, on short rails  
(minimum 24 roof screws)*



*Spine of Solpod perpendicular to roof sheeting, on longer rails  
(total of 24 roof screws)*

## Solpod parallel with roof sheeting



*Solpod is installed on short rails (or ‘catamarans’) which bridge between two roof ribs. Place a short rail wherever a Solpod spine beam or edge beam crosses a purlin.*

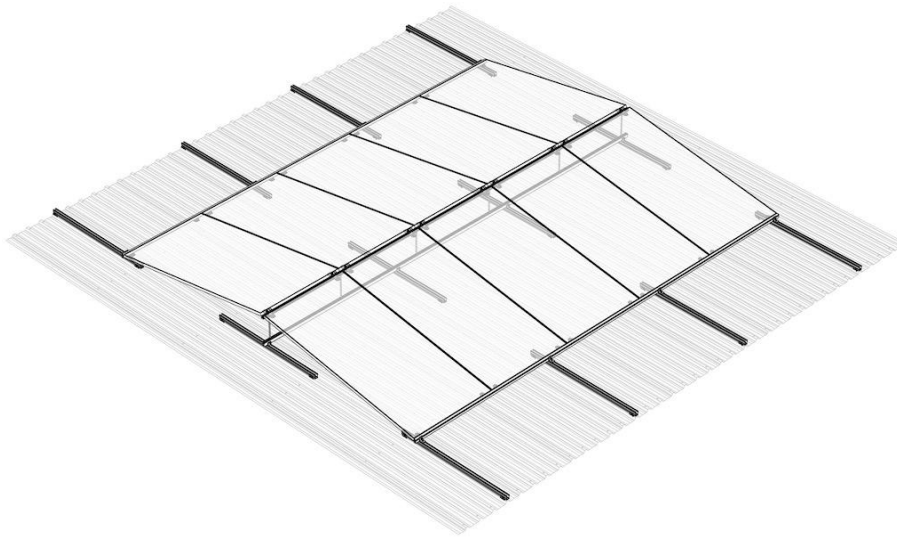
*Locate the F-brackets so that the spine beam ends up centred between the two roof ribs, to spread the load evenly to both roof clamps.*

*Ensure the cantilever (past the catamaran) does not exceed the limit; of the lesser of half the purlin spacing, or half the module width.*

Wind Region	Roof height	Maximum purlin spacing		Maximum overhang (cantilever) at ends	
		Solpod v4-S20	Solpod v4-S30	Solpod v4-S20	Solpod v4-S30
Wind Region A	Up to 10 m	1600	1500	520	560
Wind Region A	Up to 20 m	1300	1200	520	560
Wind Region A	Up to 30 m	1200	1100	520	500
Wind Region B	Up to 10 m	1100	1050	470	450

## Solpod perpendicular to roof sheeting





*Solpod on longer rails to bridge between two purlins.*

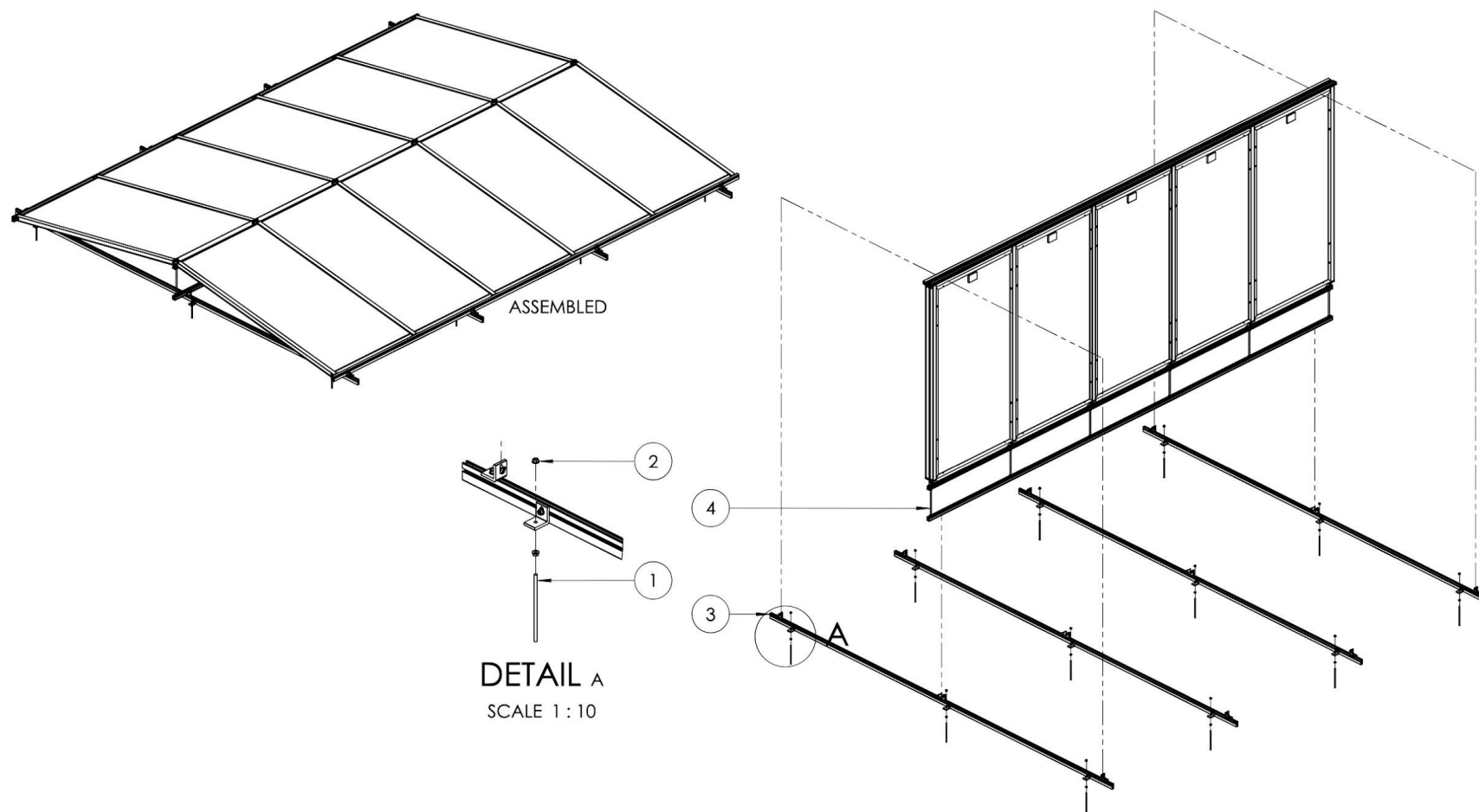
*For Wind Region A up to 20 m, use four rails.*

*For Wind Region A up to 30 m, or Wind Region B up to 10 m, use six rails, and contact Solpod to review based on purlin spacings.*

*Rails can be three separate sections, or a single continuous piece, as preferred by the installer.*

## Installing Solpod using concrete anchors

Solpods can be installed on rails that are fixed to the roof using M12 concrete anchors.



*Overview of Solpod on a concrete roof*

**Solpod V4 with M12 post anchors on long foot on concrete roof**

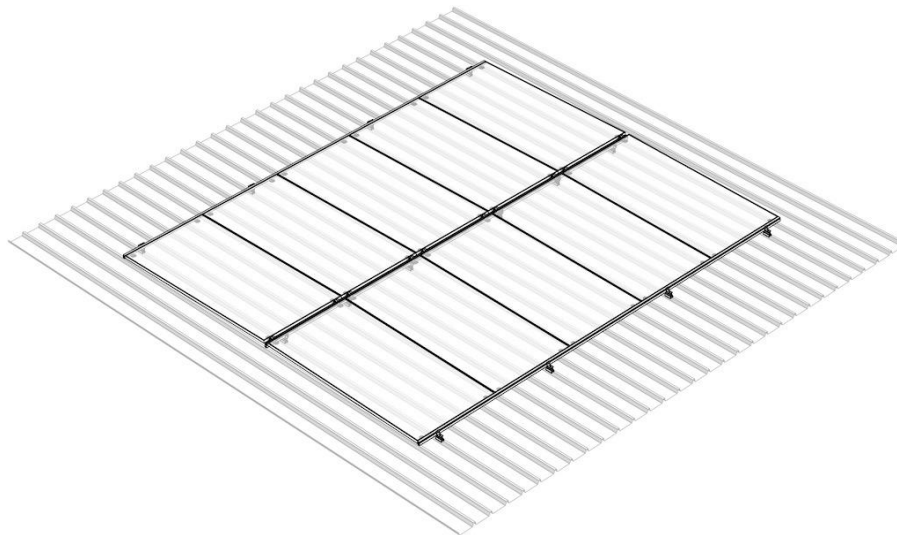
Wind Design Region	Building Height	No. Anchors per spine		No. Anchors per edge	
		<i>Small</i>	<i>Large</i>	<i>Small</i>	<i>Large</i>
Region A	$H \leq 10$	6	6	4	4
Region A	$10 < H \leq 20$	6	6	4	6
Region A	$20 \leq H < 30$	6	6	6	6
Region B	$H \leq 10$	10	10	6	6

*Number of concrete anchors required, for either small (2112 x 1052 mm) or large (2278 x 1134 mm) modules*

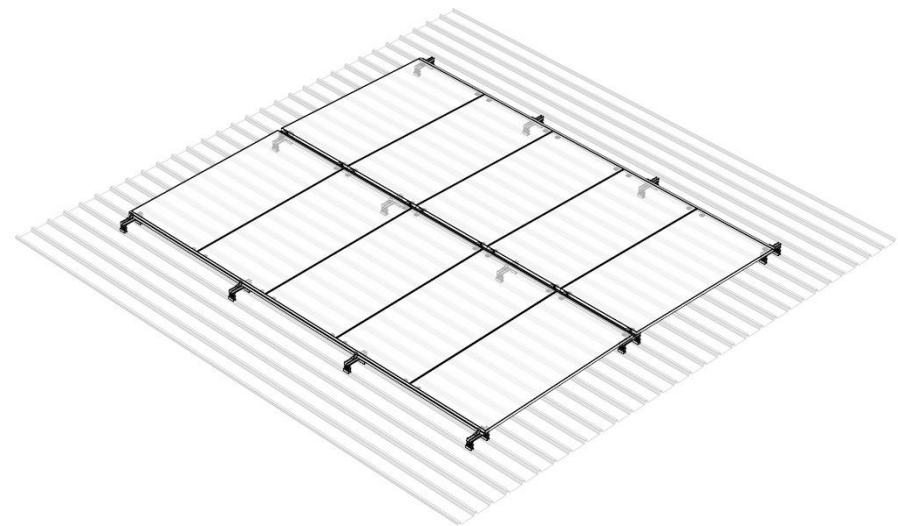
## Roof slope

*If the roof has a low slope, i.e. up to approximately 6 degrees, Solpod is best installed in the default 'dual-tilt' configuration with the solar panels tilted at 10 degrees on each side. In this configuration, Solpods can be installed in either the default orientation (the spine of the Solpod is parallel with the purlins) or in the 'rotated' orientation (the spine of the Solpod is perpendicular to the purlins).*

*If the roof is more steeply sloped, i.e. above 6 degrees, Solpod is best installed in the optional 'flush' configuration, with the solar panels titled at 1.3 degrees on each side. In this format, the spine assembly (spine upper beam, spine lower beam and spine legs) is replaced with a single spine flush beam. In this configuration, Solpods can be installed in either the default orientation (the spine of the Solpod is parallel with the purlins) or in the 'rotated' orientation (the spine of the Solpod is perpendicular to the purlins).*



*Solpod Flush in default orientation*



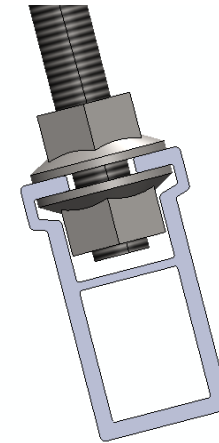
*Solpod Flush in 'rotated' orientation*

## Installing spine legs

When Solpod v4-S20-Tilt is folded and stacked on a container base for transport, the bottom four Solpods have their spine legs and spine lower beams removed for transport. These need to be assembled on-site, prior to lifting to the roof.



*Side elevation of Solpod v4-S20-Tilt stacked on a container base  
Note that the spine legs and spine lower beam are missing from the bottom four units*

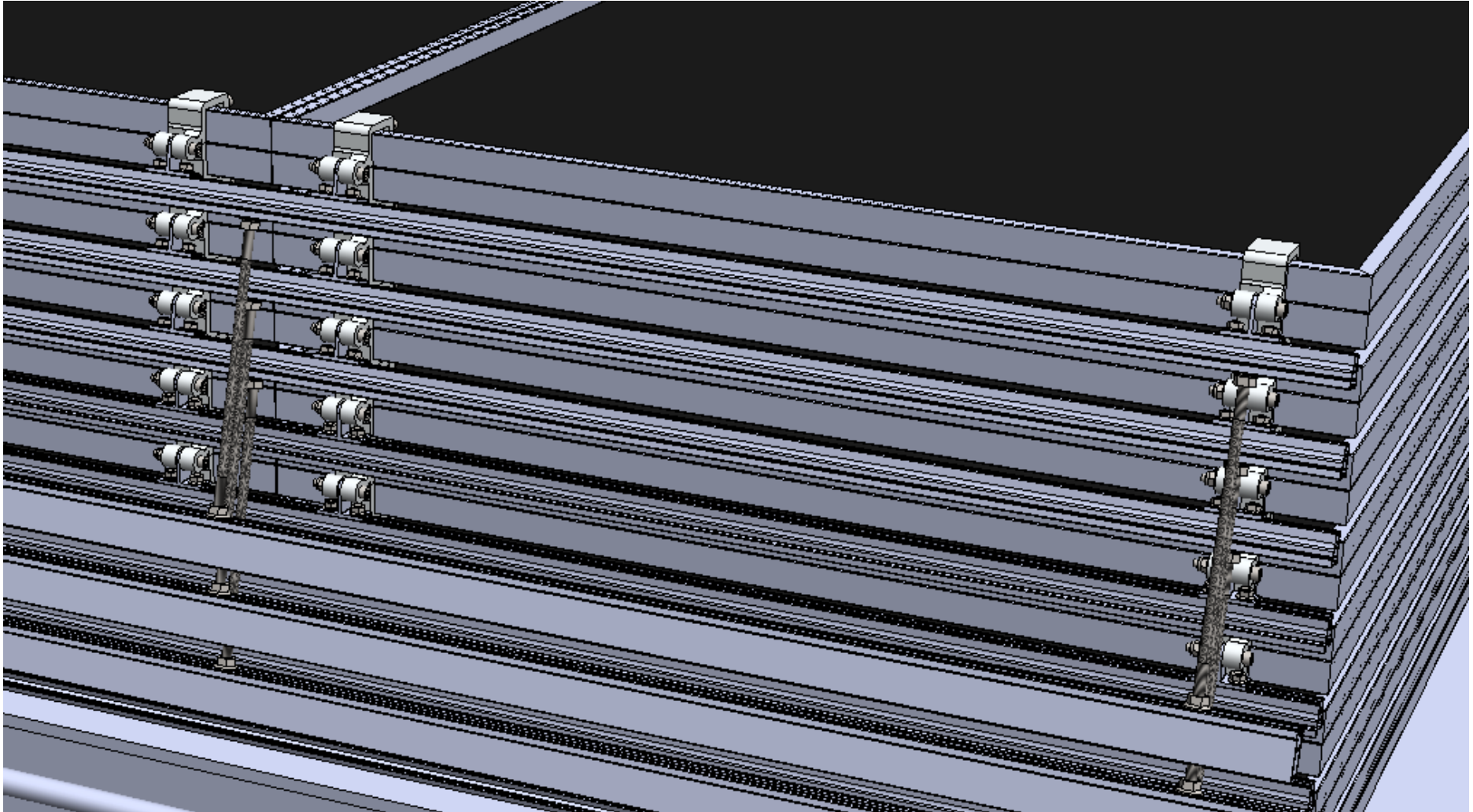


*Close up of spine lower beam*

To fit the spine legs and spine lower beams:

- Slide four inner spine legs along the spine upper beam (ignore the two ends at this stage) and tighten the upper nuts against the spine upper beam using an 18 mm spanner; the process of tightening will cause the spine leg to rotate slightly
- Use a spanner on the lowest (welded) nut on the spine leg to adjust the rotation of each spine leg, so the 'flats' on the nut are correctly aligned to allow the spine lower beam to slide on easily
- Slide the spine lower beam onto the spine legs, and then tighten the lower nuts
- Slide the two outer spine legs into position and tighten both upper and lower nuts

For Solpod v4-S30-Tilt, the modules are longer and only just fit on the container base, so all Solpod are transported without spine legs or spine lower beams. These are assembled on-site, prior to lifting to the roof. The assembly process is the same as described above. The two outer spine legs are aligned with the brackets. The four inner spine legs are centred between pairs of brackets.



*Location of inner and outer spine legs*



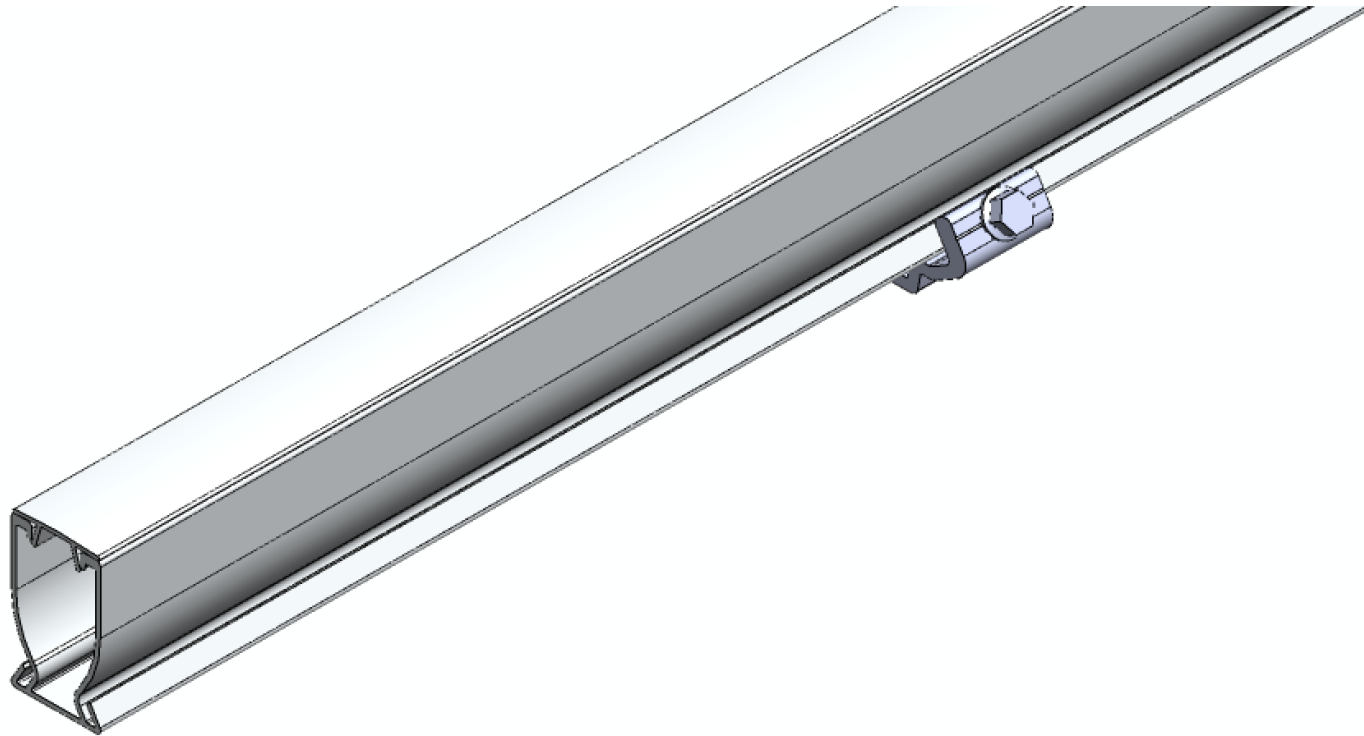


*Stack of Solpod v4-S30-Tilt ready for lifting to the roof*

## Cable trays

### Cable trays on a sheet metal roof

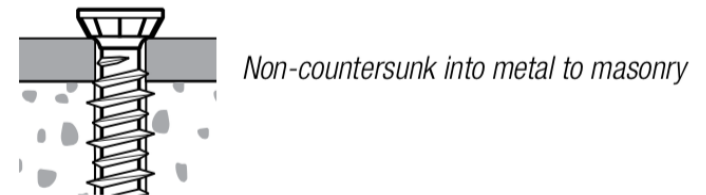
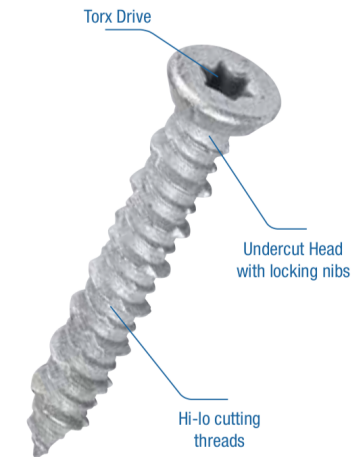
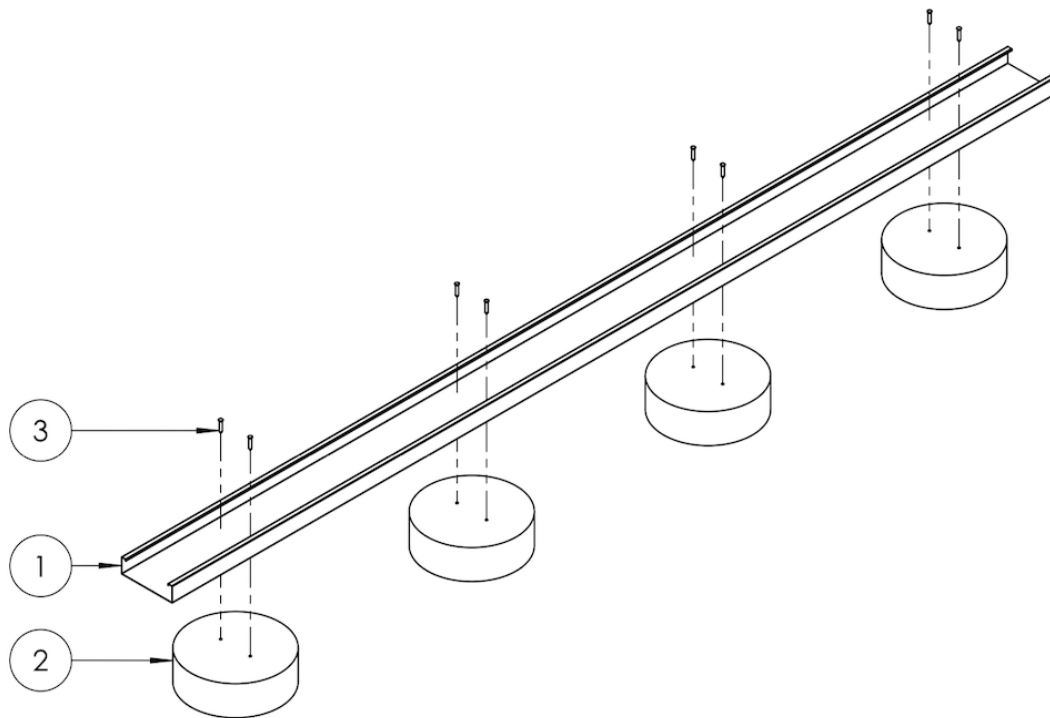
Solpod can offer aluminium channel, channel lid and channel feet as an alternative to galvanised steel cable tray. Solpod channel can be supported on Solpod feet, roof clamps, or concrete plates (for a concrete roof).



*Solpod channel, channel lid and channel feet*

## Cable trays on a concrete roof

Cable trays can be installed on a concrete roof by fixing to a row of concrete sole plates, 300 mm diameter x 100mm high. The sole plates can be spaced up to 1200mm apart. A sole plate can support a join between two sections of cable tray. Fasteners are Masonry Torx Screw 7.5 mm diameter x 40 mm length, part 1CCT1C407.5040, into a pre-drilled 6 mm diameter hole.

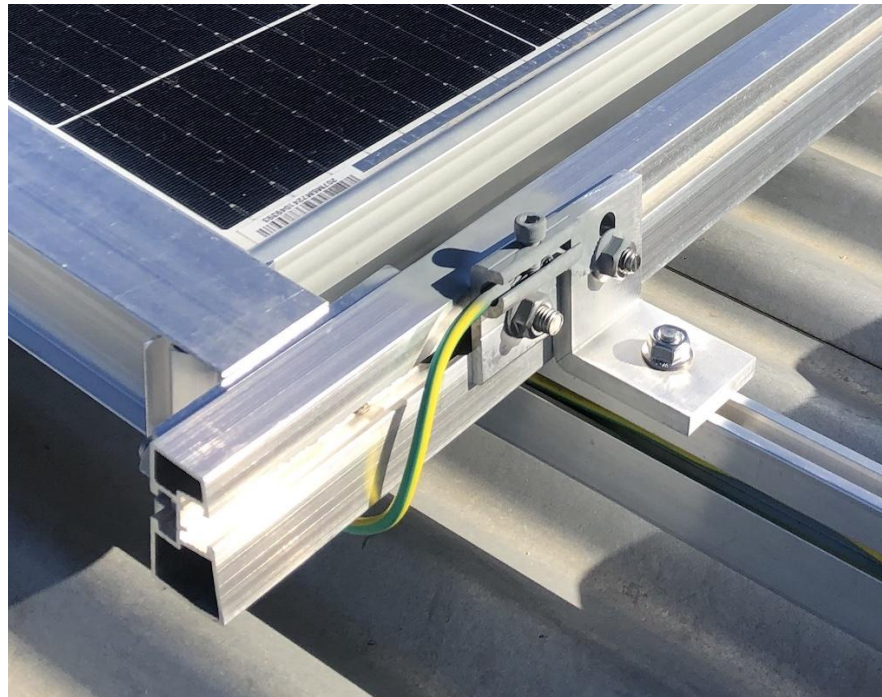


*Cable tray fixed to concrete sole plates*

## Electrical installation

Each Solpod consists of 10 solar PV modules. The modules are electrically connected to form two separate strings of 5 modules, owing to the different orientation (and solar insolation) of each Solpod wing. Three groups of 5 modules (that all have the same orientation) are electrically connected to form strings of 15 modules, suitable for connection to the solar inverter.

The remaining electrical installation, including DC cabling, DC isolators, inverter and AC cabling; is conducted using standard solar PV installation methods and procedures. The Solpod frame is fabricated from mill-finish aluminium, requiring only a single earthing attachment per Solpod wing.



*Earth cable attached to earth lug (SPEL-GB37) that fixes to slot in edge beam, with zinc spray*



Solpods can be located on the roof, with a gap of 10 mm (-5 mm, +20 mm) between the ends to minimise the cable protection requirements for the DC cables between wings.



*Small gap between Solpods to simplify DC cable connections between Solpods*

## Maintenance

The mill-finish aluminium used in Solpod is largely maintenance free. Only in highly polluted or marine conditions is rinsing with clean water required, during scheduled panel cleaning.

If adhesive tape is used to fix the Solpods to the roof, the installation should be visually inspected each year.