

<b>SUNLOCK</b>		<b>Roof Clamps</b>	created	JL
Tech. Bulletin	Rev. Nr.		checked	TN
	<b>2.0</b>		valid from	26.05.2014

## INTRODUCTION

The SunLock SLRC305, SLRC406 and SLRC700 roof clamps allow solar PV frames to be attached to roofs with concealed fixings (e.g. KlipLok). Note that the 406 model has a scribe mark on the small arm, distinguishing it from the 700 model.

The clamps are fabricated from 6106-T6 aluminium and are fastened using a 304 A2-70 series M8 stainless steel fastener.



SLRC305



SLRC406



SLRC700

The clamping bolts are angled to allow the cordless drill to easily clear the next roof crest, making installation simple and fast.



The roof clamp has been proof load tested and certified for assembly on the following roofing profiles:

- Lysaght Longline 305
- Lysaght KlipLok 406 and 700 HS
- Stramit Speed Deck Ultra 700
- Metroll Metlok 700

## GUIDE TO USE

### Confirm that the clamp fits the roof sheet

Every roof sheet has a different geometry. The make and model of roof sheet must be identified prior to sourcing the correct clamps. If the wrong clamp is used it either won't fit or will crush or tear the roof sheet as it is tightened up. The simplest way of determining the best fit is to provide installers with a sample of each clamp, so it can be tested during a site inspection.

If in doubt, please contact SunLock for advice on selecting the correct clamp for your roof sheet.

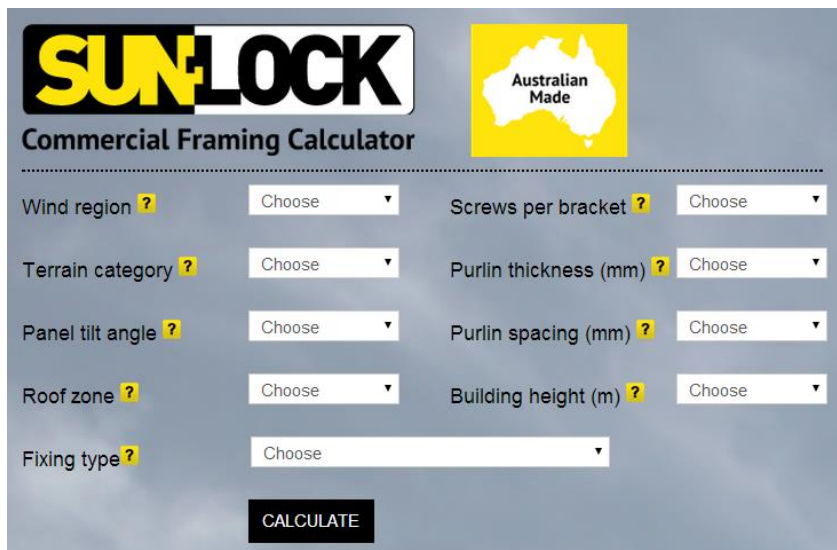
### Use the SunLock framing calculator (commercial framing)

The SunLock commercial framing calculator can be used to design a fully compliant framing solution for just about any concealed fixing roof.

Simply input the details of the site and the roof frame, and the framing calculator will determine the number of channels required per "column" of PV modules, and also state whether roof clamps can be used.

The SunLock commercial framing calculator has been certified by Partridge Structural.

Visit <http://sunlock.com.au/commercial.php#> for details.



The screenshot shows the SunLock Commercial Framing Calculator interface. At the top left is the SunLock logo, and to its right is a yellow map of Australia with the text "Australian Made". Below the logo is the title "Commercial Framing Calculator". The form contains several input fields, each with a dropdown menu labeled "Choose" and a question mark icon. The fields are arranged in two columns: "Wind region", "Terrain category", "Panel tilt angle", "Roof zone", and "Fixing type" on the left; "Screws per bracket", "Purlin thickness (mm)", "Purlin spacing (mm)", and "Building height (m)" on the right. At the bottom center is a black button with the word "CALCULATE" in white capital letters.

## Use a reduction factor to determine fixing spacing (domestic framing)

The SunLock installation manual provides fixing spacing tables that are based upon a 14 gauge roofing screw embedded 35 mm into a timber batten or through a 0.75 mm steel batten. However, the roof clamp is only as strong as the screw(s) used to hold the concealed clip to the batten. These screws can be 12 gauge in diameter.

Therefore, a reduction factor must be applied to the spacing tables to determine the required roof clamp spacing.

Reduction factors:

Roof sheet	J4 timber battens	0.75 mm steel batten
Lysaght KlipLok 700 HS	0.89	0.92
Lysaght KlipLok 406	0.89	0.92
Stramit Speed Deck Ultra 700	0.89	0.92
Metroll Metlok 700	0.89	0.92

For the SLRC305 roof clamp:

For 1.0mm thick purlins (G550): 1.14 kN

For 1.2mm thick purlins (G500): 1.24 kN

For 1.5mm thick purlins (G450): 1.40 kN

For 1.9mm thick purlins (G450): 1.77 kN

For 2.4mm thick purlins (G450): 2.24 kN

For 3.0mm thick purlins (G450): 2.80 kN

Worked example – a tilt array to be installed on a roof with 0.75 mm steel battens in wind region A, terrain category 3, has L-foot spacing as follows:

TERRAIN CATEGORY 3 (20 - 40 DEG. TILT UP SYSTEM)					
MAXIMUM L-FOOT SPACING IN mm FOR STEEL BATTENS/PURLINS					
WIND REGIONS		A	B	C	D
INTERNAL ZONE	SHORT LEG	1800	1800	1330	810
	LONG LEG	1620	1130	665	405
INTERMEDIATE ZONE	SHORT LEG	1800	1500	880	530
	LONG LEG	1080	750	440	265
EDGE ZONE	SHORT LEG	1620	1130	650	410
	LONG LEG	810	565	325	205

The required clamp spacing will be 1656 mm for the front leg (1800 mm x 0.92) and 994 mm for the rear legs (1080 mm x 0.92). NOTE: roof clamp spacing should never exceed 1800 mm.

### Install the clamps directly over the concealed clip

Concealed fixings can be located by either looking for a slight bump in the roof sheet or by gently pressing a boot down on the roof sheet whilst sliding the boot back and forth. The roof sheet has some give while the concealed clip is stiff.

Check that the clamp is located directly over the clip (centre of clamp within  $\pm 20$  mm of centre of clip). This ensures that the load is transferred directly into the purlin and that the thin roof sheet is not used as a structural component.

Using a 6 mm driver bit and a soft clutch setting, tighten the clamp to 12 – 14 N·m and ensure that the clamp cannot move up & down or slide along the roof crest.

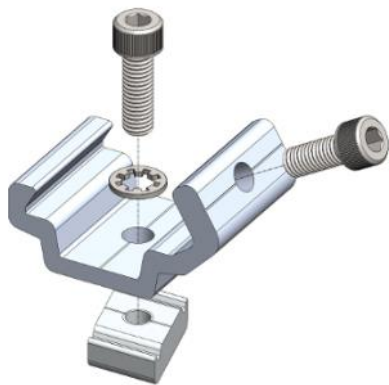
SLRC305 – note that the M8 screw has an oval point to prevent the tip of the screw cutting into the roof sheeting or damaging the coating on the roof sheet.

SLRC406 and SLRC700 - if necessary fit the optional thin EPDM rubber pad between the clamp and the roof sheet.

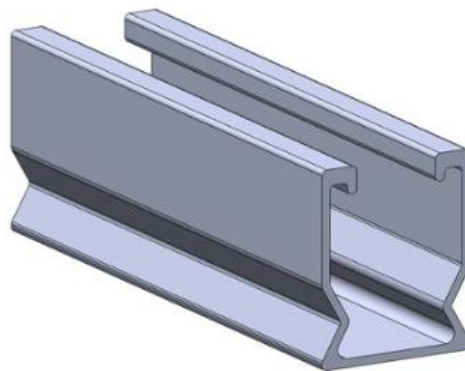
Never install a clamp in between two battens / purlins. The roof sheet is not a structural component and is not strong enough to transfer the extra load of the solar PV array sideways to the next batten. The roof sheet is only strong enough to withstand its own wind loads.

### Join several clamps with a rail / channel

Use SunLock channel and channel feet (or L-feet and rail) to join multiple clamps together to form one assembly. This prevents individual clamps from rotating or rocking on the roof sheet.

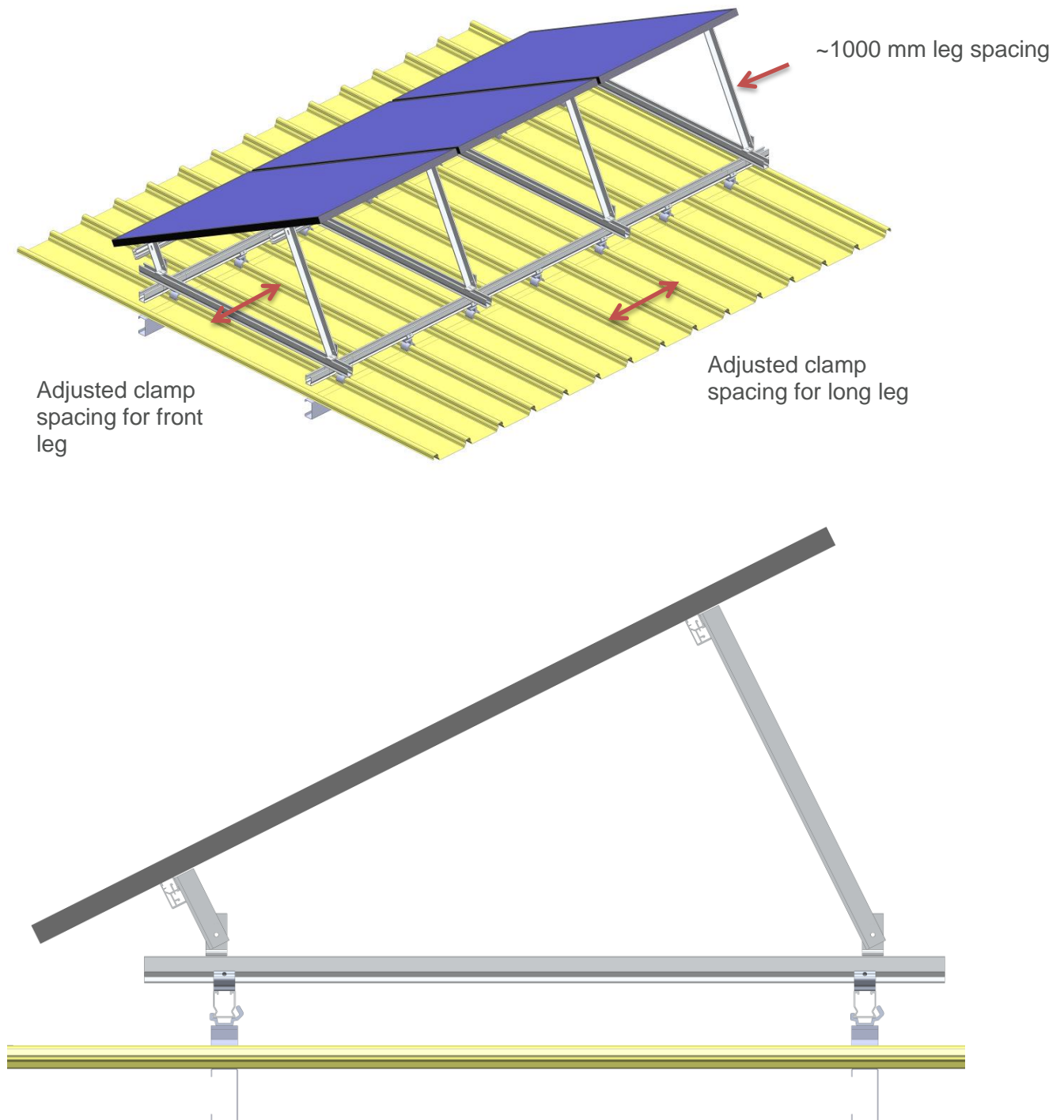


SLCF02



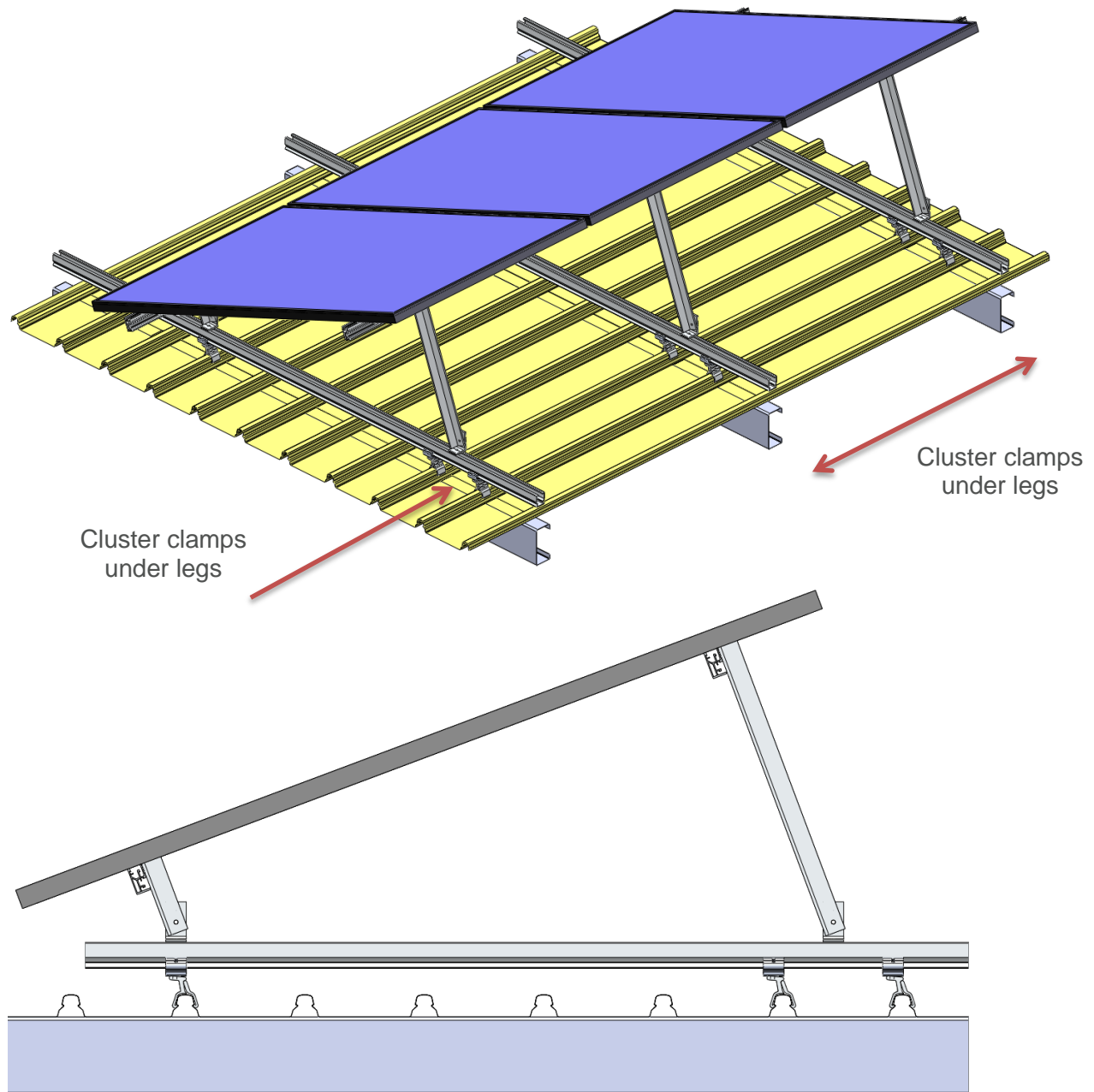
SL2C

## Traditional tilt legs - row parallel with purlins



Locate the clamps directly over the purlins and concealed fixings. Join multiple clamps using a sub-frame of SunLock channel. The clamp spacing should be equal to or smaller than the spacing shown for either the front or rear leg in the SunLock installation manual. Install a tilt leg pair (front & rear & channel) on the sub-frame at a spacing of ~ 1000 mm.

## Traditional tilt legs - row perpendicular with purlins



Locate the clamps directly over the purlins and concealed fixings. Join multiple clamps using SunLock channel. Install a tilt leg pair (front & rear) onto each channel. Cluster multiple clamps underneath each leg (especially the rear leg). Work out the number of clamps to use under each leg as follows:

Number of clamps under each leg = length of the row (e.g. 6000 mm for 6 modules)  $\div$  adjusted spacing from SunLock manual (e.g. 994 mm for a rear leg)  $\div$  number of purlins crossed (e.g. 4) =  $6000 \div 994 \div 4 = 1.51$  (round this value up to get 2 clamps per rear leg).



## PROOF LOAD TESTING

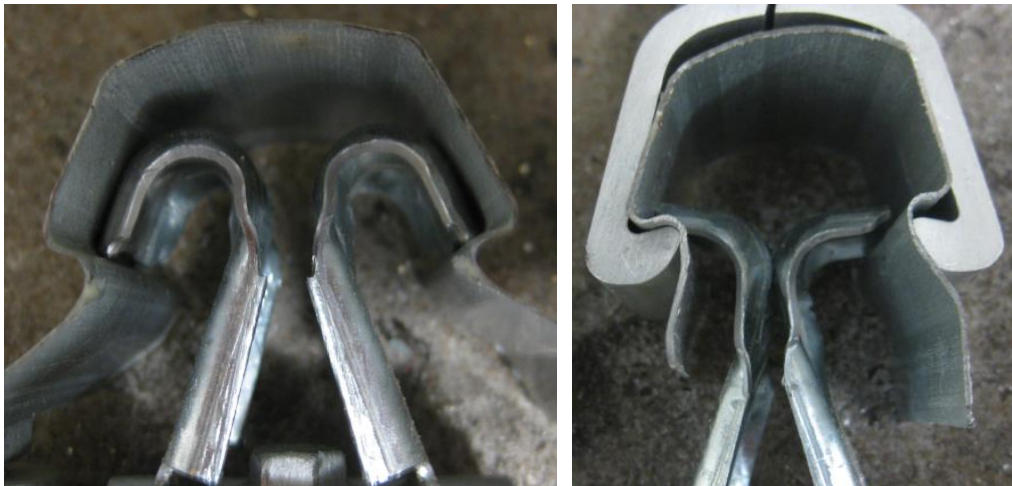
SunLock roof clamps have been tested by a NATA accredited laboratory and certified by Partridge Structural, a registered Australian structural engineer. The tests measured the load capacity of the concealed clip, roof sheet and clamp. They did not measure the load capacity of the roof screw used to fix the concealed clip to the purlin.

The maximum tension fixing capacity of the clamp is certified as:

- |                                   |        |
|-----------------------------------|--------|
| • Lysaght Longline 305            | 2.8 kN |
| • Lysaght KlipLok Hi-Strength 700 | 1.6 kN |
| • Lysaght KlipLok 406             | 1.6 kN |
| • Stramit Speed Deck Ultra 700    | 1.9 kN |
| • Metroll Metlok 700              | 2.0 kN |

In practice, the clamps must be de-rated to match the capacity of the screw used to fix the concealed clip to the purlin. If in doubt, refer to the roof sheet / clip installation manual.

The tests showed that the primary failure mode of the system is deformation of the concealed clip underneath the roof sheet (see images over page). In real life this will not occur – the failure will instead be the concealed roof screw pulling out of the batten / purlin.



Lysaght KlipLock 700HS – before and after testing

## CORROSION AND DISSIMILAR METALS

The SunLock roof clamp is fabricated from aluminium. The Bluescope Steel technical bulletin on dissimilar metals states that aluminium is permitted to be in direct contact with Colorbond or Zinalume roof sheets.

<http://steelproducts.bluescopesteel.com.au/files/CTB-12.PDF>

Figure 2: Compatibility of Direct Contact between Metals or Alloys

Cladding Material	Accessory/Fastener Material							
	Stainless Steel (300 Series)	Zinc-Coated Steel and Zinc	Zinc/aluminium coated steel	Aluminium	Copper & Brass	Lead	Monel	Carbon Black***
Zinc-coated steel & zinc	No	Yes	Yes*	Yes*	No	Yes**	No	No
Zinc/aluminium - coated steel	No	Yes*	Yes	Yes	No	No	No	No
COLORBOND®	No	Yes*	Yes	Yes	No	No	No	No
COLORBOND® METALLIC	No	Yes*	Yes	Yes	No	No	No	No
COLORBOND® ULTRA	No	Yes*	Yes	Yes	No	No	No	No
COLORBOND® STAINLESS	Yes	No	No	No	No	No	No	No

Furthermore, Australian corrosion consultant, CMET Pty Ltd stated that ... *the service life of extruded 6106-T6 aluminium brackets bolted to galvanised, Zinalume or Colourbond roof sheeting..... with or without an EPDM washer..... will satisfy the 25 year design life in all environments.....*

A summary of the report can be found at [http://sunlock.com.au/pdf/TechBulletin\\_Corrosion\\_2.1.pdf](http://sunlock.com.au/pdf/TechBulletin_Corrosion_2.1.pdf)



## OPTIONAL ACCESSORIES

A thin rubber pad (SLRP700) is also available. This can be fitted between the clamp and the roof sheet and can assist to prevent movement and can further decrease the risk of corrosion.

Each rubber pad is supplied loose.

## TECHNICAL INFORMATION

Sales code	SLRC305, SLRC406, SLRC700
Material	Aluminium 6106-T6, with a stainless steel fastener.
Australian Standard Certification	Certificate of structural adequacy from Partridge Structural

Sales code	SLRP700
Material	0.7 mm thick potable grade EPDM
Australian Standard Certification	n/a

## FURTHER INFORMATION

For further information contact Apollo Energy on 1300 855 484 or [sunlock@apolloenergy.com.au](mailto:sunlock@apolloenergy.com.au).

## STRUCTURAL DESIGN CERTIFICATES

24<sup>th</sup> April 2014

Energy Matters Pty Ltd  
359-361 City Road  
Southbank VIC 3006



**Attention: Mr Jeremy Lawrence**

### STRUCTURAL DESIGN CERTIFICATE

**Project Description: Sunlock SLRC305 Roof Clamp**

We, Partridge Structural Pty Limited, being Professional Structural Engineers, within the meaning of the Building Code of Australia, hereby certify that we have carried out a design review of the proof load testing carried out on the Sunlock SLRC305 Roof Clamp, report ref. MT-14/217, and recommend that the following approach to determining the load capacity of the clamp be followed.

There are three potential modes of failure for the connection of the clamp to the roof structure:

1. Detachment of the clamp from the seam of the roof sheet
2. Pull-out of the roof screw which attaches the roof sheet clip to the roof framing member
3. Pull-over of the roof sheet clip over the head of the roof screw attaching the clip to the roof framing member

According to the referenced testing, the mode of failure was pull-over of the clip over the head of the screw (or bolt in this case). Therefore the load capacity of the clamp on the roof sheet seam is not considered to govern. Therefore, with a clamp located directly above a clip location, the lesser of the pull-over capacity of the clip or the pull-out capacity of the screw will govern. In accordance with Clause 5.4.3.2 of AS/NZS 4600:2005, the pull-out capacity of the screw (10G) will typically govern, which is in turn dependent on the thickness of the roof framing member which it attaches the clip to.

Therefore we recommend that the following load capacities for the SLRC305 clamp be utilised:

For 1.0mm thick purlins (G550): 1.14 kN  
For 1.2mm thick purlins (G500): 1.24 kN  
For 1.5mm thick purlins (G450): 1.40 kN  
For 1.9mm thick purlins (G450): 1.77 kN  
For 2.4mm thick purlins (G450): 2.24 kN  
For 3.0mm thick purlins (G450): 2.80 kN

If the thickness of the purlin cannot be determined on site then the values for a 1.0mm thick purlin should be used.

Level 5, 1 Chandos Street, St Leonards NSW 2065 Australia  
t 612 9460 9000 f 612 9460 9090 e partridge@partridge.com.au  
[www.partridge.com.au](http://www.partridge.com.au)  
Partridge Structural Pty Ltd – 73 002 451 925  
Partridge Event Pty Ltd – 50 139 601 433  
Partridge Remedial Pty Ltd – 89 145 990 521

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**PARTRIDGE**  
STRUCTURAL | REMEDIAL | EVENT

Sunlock SLRC305

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Assumptions:

- The clamps are assumed to be located directly above the point where the roof sheet clips are fixed to the supporting structure.
- Existing roof clips nominally 1.2mm thick and screwed with 2-10G self-tapping screws (one adjacent to each seam/clamp) into minimum 1.0mm thick (G550) steel purlin.
- This certification is to only be read in conjunction with all relevant Sunlock drawings, manuals and technical bulletins and the abovementioned Load Test Report.
- Wind Regions A & B only

Signed,



**Rob O'Reilly**  
BE(Hons) MIEAust CPEng NPER(Structural) RPEQ  
For and on behalf of:  
**Partridge Structural Pty Ltd**

27<sup>th</sup> February 2014

Energy Matters Pty Ltd  
359-361 City Road  
Southbank VIC 3006



**Attention: Mr Jeremy Lawrence**

### **STRUCTURAL DESIGN CERTIFICATE**

**Project Description: Sunlock SLRC406 Roof Clamp**

We, Partridge Structural Pty Limited, being Professional Structural Engineers, within the meaning of the Building Code of Australia, hereby certify that we have carried out a design review of the proof load testing carried out on the Sunlock SLRC406 Roof Clamp and confirm that the following load capacity may be assumed:

Lysaght Kliplok 406: 1.6kN

**Assumptions:**

- The values are based on the Load Test Report provided by Melbourne Testing Services Pty Ltd, ref. MT-13/836.
- Three load tests were performed on the roof clamp assembly. The capacity was derived by manipulating the results in accordance with the guidelines outlined in Appendix B of AS/NZS 1170.0. A coefficient of variation of 20% was assumed, allowing for variability in the strength of the clamps (evident from the testing) and variability arising from their installation.
- The clamps are assumed to be located directly above the point where the roof sheet clips are fixed to the supporting structure.
- This certification is to only be read in conjunction with all relevant Sunlock drawings, manuals and technical bulletins and the abovementioned Load Test Report.

Signed,

A handwritten signature in black ink, appearing to read 'Rob O'Reilly', written over a light purple abstract background.

Rob O'Reilly  
BE(Hons) MIEAust CPEng NPER(Structural) RPEQ

For and on behalf of:

**Partridge Structural Pty Ltd**

Level 5, 1 Chandos Street, St Leonards NSW 2065 Australia  
t 612 9460 9000 f 612 9460 9090 e partridge@partridge.com.au  
[www.partridge.com.au](http://www.partridge.com.au)  
Partridge Structural Pty Ltd – 73 002 451 925  
Partridge Event Pty Ltd – 50 139 601 433  
Partridge Remedial Pty Ltd – 89 145 990 521

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October 10<sup>th</sup> 2013

Energy Matters Pty Ltd  
359-361 City Road  
Southbank VIC 3006



**Attention: Mr Jeremy Lawrence**

## **STRUCTURAL DESIGN CERTIFICATE**

**Project Description: Sunlock SLRC700 Roof Clamp**

We, Partridge Structural Pty Limited, being Professional Structural Engineers, within the meaning of the Building Code of Australia, hereby certify that we have carried out a design review of the proof load testing carried out on the Sunlock SLRC700 Roof Clamp and confirm that the following load capacities may be assumed:

Lysaght 700HS:	1.6kN
Stramit Speed Deck Ultra:	1.9kN
Metroll Metlok 700:	2.0kN

### **Assumptions:**

- The values are based on the Load Test Report provided by Victorian Testing & Inspection Services Pty Ltd, ref. VTS13-635(LT).
- Two tests per roof sheet were carried out. The results have been averaged and a variability factor of 1.5 applied.
- The clamps are assumed to be located directly above the point where the roof sheet clips are fixed to the supporting structure.
- This certification to only be read in conjunction with all relevant Sunlock drawings, manuals and technical bulletins and the abovementioned Load Test Report.

A handwritten signature in black ink, appearing to read 'Rob O'Reilly'.

**Rob O'Reilly**  
BE(Hons) MIEAust CPEng NPER(Structural) RPEQ

For and on behalf of:  
**Partridge Structural Pty Ltd**

Level 5, 1 Chandos Street, St Leonards NSW 2065 Australia  
t 612 9460 9000 f 612 9460 9090 e partridge@partridge.com.au  
[www.partridge.com.au](http://www.partridge.com.au)  
Partridge Structural Pty Ltd – 73 002 451 925  
Partridge Event Pty Ltd – 50 139 601 433  
Partridge Remedial Pty Ltd – 89 145 990 521

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