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Array Frame Engineering Certification

For: ANTAI SOLAR AUSTRALIA
PTY LTD
Level 1 suite 1.02/309 Pitt
St, Sydney NSW 2000

Job No.: 10166
Date: 24/08/2021

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Approval			
Author Signature		Approver Signature	
Name	Yesim Kocabalkan	Name	L. Van Spaandonk
Title	Structural Engineer	Title	Principal Engineer

Our Ref: 10166-07-01 /YK
24 August 2021

ANTAI SOLAR AUSTRALIA PTY LTD
Level 1 suite 1.02/309 Pitt St
Sydney NSW 2000

PV Array Frame Engineering Certification

RE: AS/NZ 1170.2 Certification for Flush Mounted System on Lysaght Klip Lok 700 High strength (Concealed Fix Roof)

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of Flush Mounted System on Lysaght Klip Lok 700 High strength (Concealed Fix Roof) within Australia. The design check is based on the information and test reports provided by ANTAI SOLAR AUSTRALIA PTY LTD.

For the indicative location of **full rib** in the roof sheeting, please see **Figure 1**.

Components of the system covered in this certificate shown in the table below:

Component	Part No
Rail	ATL-TYN-355A(ATL-DR-355A); ATL-TYN-355B (ATL-DR-355B)
Rail Splice	ATL-TYN-304/54 (ATL-DR-JOINER)
Roof Clamp	ATL-TYN-25/26 (ATL-IK-700)
Inter Clamp Kit	ATL-GN-003 (ATL-IC-30/35, ATL-IC-35/40)
End Clamp Kit	ATL-CG-018 (ATL-EC-30/35, ATL-EC-35/40)

This certificate is **only valid** for Flush Mounted System on Lysaght Klip Lok 700 High strength (Concealed Fix Roof) itself. The roof structure or the building structure and PV panels shall be assessed separately and accordingly.

This certificate is **only valid** when roof clamp fixing to the **full rib** of roof sheeting on the top of the purlins. If the fixing condition is different from those conditions, interface spacing shall be reviewed and validated.

This certificate is **only valid** as a whole. Any information extracted from this certificate is not valid if standing alone.

We find the Installation of Flush Mounted System on Lysaght Klip Lok 700 High strength (Concealed Fix Roof) for Australian use to be structurally sufficient based on the following conditions:

- Wind loads to AS/NZ1170.2:2011(R2016) Wind actions
- Wind region **A, B, C, D**
- Wind terrain category **2 & 3**
- Wind average recurrence interval of **200 years**
- Maximum building height **20m**
- The maximum assessed PV panel dimensions are **2300mm x 1200mm**
- Weight of the PV panel and array frame to be 15 kg/m²
- Material of Rails to be **AL6005-T6**
- Each PV panel to be installed using **2 rails** minimum in all circumstances
- Roof clamps to be fixed only to the **full rib** of roof sheeting on the top of the purlins (See **Figure 1**)
- No PV panel to be installed within 2xs from edges and ridge. "s" is the maximum gap between the underside of the panel and the roof surface when installed on the roof ($50\text{mm} \leq s \leq 300\text{mm}$)
- Installation of PV panels to be done in accordance with the PV panels installation manual
- The certification **excludes** assessment of roof structure and PV panels
- For Corrosivity Category C4, decrease the spacing to 92%
- For Corrosivity Category C5, decrease the spacing to 84%

Refer to attached summary table for interface spacing (Unit: mm)

NOTES:

- **The recommended spacing nominated in this certification is based on the capacity of the array frame and the fixing of array frames to the roof, not the roof structure and PV panels. It is the responsibility of the installer to adopt the most critical spacing.**
- **If any of the above conditions cannot be met, the structural engineer must be notified immediately.**
- **The capacity of rail was obtained from test report no. 20-0249- A and 20-0249- B, dated 27th May 2020 and provided by Melbourne Testing Services.**
- **The capacity of roof clamp was obtained from test report no. MT-15/317, dated 26th May 2015 and provided by Melbourne Testing Services.**
- **The spacing shown in the interface tables shall be adjusted based on the assessment and requirement of the roof structures.**

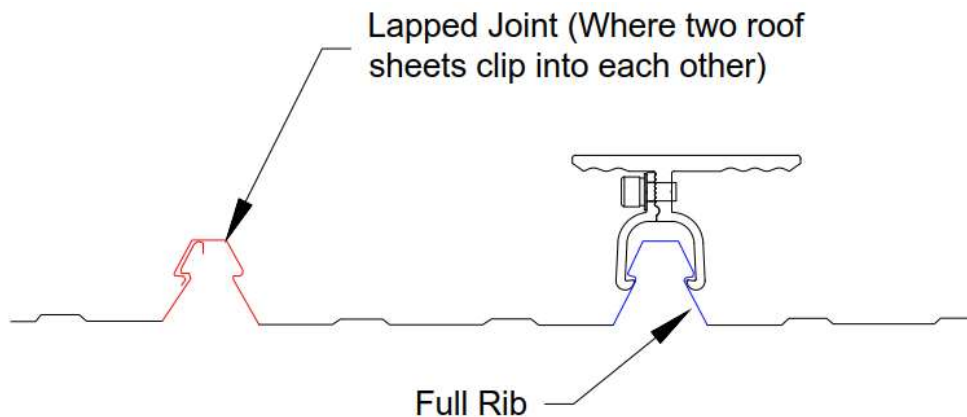


Figure 1 – Full Rib Location For Indicative

Construction is to be carried out strictly in accordance with the manufacturers instructions. This work was designed by **Yesim Kocabalkan** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles. This certificate is only valid till 24/08/2023. Gamcorp should be contacted for future validation. Contact Gamcorp for customised system or if the site conditions are not covered by this assessment.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd



L. Van Spaandonk
Principal Engineer
FIEAust CPEng NER 5038980
NT Registration: 244137ES
QLD Registration: 18703
VIC Registration: PE0001956
TAS Registration: CC7366

Attachments:

- Summary table for interface spacing, Flush mount - Lysaght Klip Lok 700 High strength(Concealed Fix Roof)



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Structural Design Documentation

**Flush Array Frame System Spacing Table For Concealed Fix Roof
– Lysaght Klip-Lok 700 High Strength roof sheeting
According to AS/NZS 1170.2-2011 (R2016)
with Rail ATL-TYN-355A (ATL-DR-355A)
within Australia
Terrain Category 2 & 3**

For: ANTAI SOLAR AUSTRALIA PTY LTD
Level 1 suite 1.02/309 Pitt St
Sydney NSW 2000

Job Number: 9670 – 07-01
Date: 7 May 2021



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ISO 9001:2015 Registered Firm
Certificate No: AU1222

Job No: 9670 – 07-01
Client: ANTAI SOLAR AUSTRALIA PTY LTD
Project: Flush Array Frame System Spacing Table For Concealed Fix Roof – Lysaght Klip-Lok
700 High Strength roof sheeting
with Rail ATL-TYN-355A (ATL-DR-355A)
Address: within Australia

Australian Standards

AS/NZS 1170.0:2002 – Structural design actions, Part 0: General principles
AS/NZS 1170.1:2002 (R2016) – Structural design actions, Part 1: Permanent, imposed
and other actions
AS/NZS 1170.2:2011 (R2016) – Structural design actions, Part 2: Wind actions
AS/NZS 1664.1:1997 – Aluminium structures - Limit state design
AS 4100: 2020 – Steel Structures
AS/NZS 4600:2018 – Cold-formed Steel Structures

Wind Terrain Category: WTC 2 & 3

Designed: JD
Checked: AA
Date: May-21

Client: **ANTAI SOLAR AUSTRALIA PTY LTD**
 Project: **Solar Array Interface Spacing Table**
 Address: **within Australia**
 Designed: **JD**

Job: **9670 – 07-01**
 Date: **May-21**

Checked: **AA**

**Flush Array Frame System Spacing Table for
 LYSAGHT Klip-Lok 700 High Strength roof sheeting – mm**

Type of Rail: ATL-TYN-355A(ATL-DR-355A)
 Type of Interface: Roof Clamp
 Solar Panel Dimension: 2.3mx1.2m
 Terrain category: **2**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1010	1255	735	1015	665	910	630	785
B	670	825	550	675	495	605	460	570
C	315	530	--	315	--	--	--	--
D	--	--	--	--	--	--	--	--

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1010	1490	735	1205	665	1080	630	1020
B	670	975	550	795	495	715	460	675
C	315	625	--	510	--	460	--	315
D	--	400	--	--	--	--	--	--

Roof Angle (Φ) – $30^\circ \leq \Phi \leq 60^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal
A	1305	1785	1055	1670	945	1490	845	1400
B	860	1345	700	1085	630	975	595	915
C	550	850	450	695	270	625	--	590
D	--	540	--	445	--	400	--	--

Client: **ANTAI SOLAR AUSTRALIA PTY LTD**
 Project: **Solar Array Interface Spacing Table**
 Address: **within Australia**
 Designed: **JD**

Job: **9670 – 07-01**
 Date: **May-21**

Checked: **AA**

**Flush Array Frame System Spacing Table for
 LYSAGHT Klip-Lok 700 High Strength roof sheeting – mm**

Type of Rail: ATL-TYN-355A(ATL-DR-355A)
 Type of Interface: Roof Clamp
 Solar Panel Dimension: 2.3mx1.2m
 Terrain category: **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1235	1540	1235	1540	1060	1315	940	1165
B	815	1005	815	1005	700	865	625	770
C	525	645	525	645	450	555	270	495
D	--	415	--	415	--	245	--	--

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1235	1725	1235	1725	1060	1565	940	1385
B	815	1190	815	1190	700	1025	625	905
C	525	760	525	760	450	655	270	580
D	--	485	--	485	--	420	--	365

Roof Angle (Φ) – $30^\circ \leq \Phi \leq 60^\circ$

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal
A	1605	1900	1605	1900	1370	1810	1215	1745
B	1045	1650	1045	1650	900	1410	800	1245
C	670	1035	670	1035	575	890	515	790
D	430	655	430	655	--	565	--	505

General Notes

Note 1 Following components are satisfied to use according to AS/NZS 1170.2-2011(R2016)

Components	Part Number	Description
Rail	ATL-TYN-355A	As per drawing& test report provided by client
Splice	ATL-TYN-304/54	
Roof clamp	ATL-TYN-25/26	

Note 2 Maximum uplift wind pressure is limited to 5 kPa. "--" states more uplift pressure.

Note 3 Deflection is limited to Minimum of L/120 and 15mm

Note 4 For definition of (End/Central) roof zones, Refer Figure D9 of AS/NZS 1170.2:2011 (R2016) or Figure A as below
For definition of intermediate and internal roof zones, Refer Figure B as below

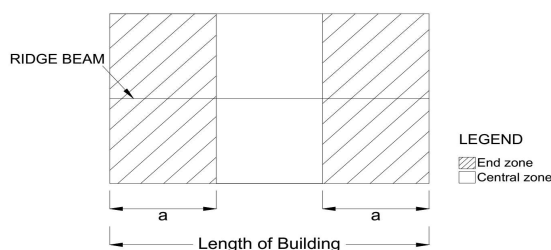


Figure A

In Figure A, the value of dimension "a" is 1/3 of the length of building

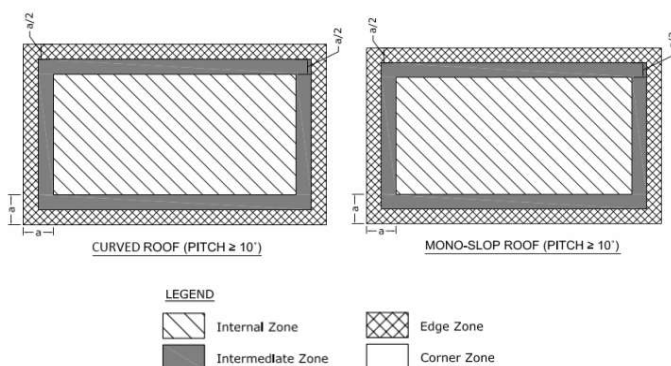


Figure B

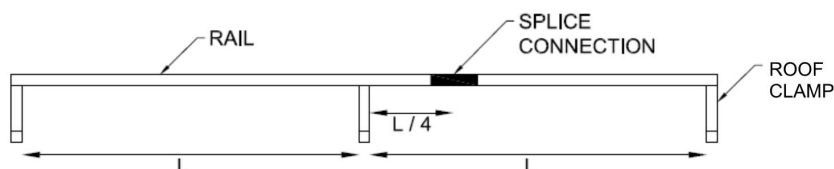
In Figure B, the value of dimension "a" is the minimum of 0.2b, 0.2d and h. (b & d are building dimensions and h is its height)

Note 5

Terrain Category 2 (TC2) refers to open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.
Terrain Category 3 (TC3) refers to terrain with numerous closely spaced obstructions having heights generally from 3 m to 10 m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare, e.g. suburban housing, light industrial estates or dense forests.

Note 6

The optimised location of rail splice connection is at quarter length of the spacing of the interface. No Splice connection should be placed at the centre of spacing or over the interface.





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Structural Design Documentation

**Flush Array Frame System Spacing Table For Concealed Fix Roof
– Lysaght Klip-Lok 700 High Strength roof sheeting
According to AS/NZS 1170.2-2011 (R2016)
with Rail ATL-TYN-355B(ATL-DR-355B)
within Australia
Terrain Category 2 & 3**

For: ANTAI SOLAR AUSTRALIA PTY LTD
Level 1 suite 1.02/309 Pitt St
Sydney NSW 2000

Job Number: 9670 – 07-01
Date: 7 May 2021



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Client: ANTAI SOLAR AUSTRALIA PTY LTD
Project: Flush Array Frame System Spacing Table For Concealed Fix Roof – Lysaght Klip-Lok
700 High Strength roof sheeting
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AS/NZS 1664.1:1997 – Aluminium structures - Limit state design
AS 4100: 2020 – Steel Structures
AS/NZS 4600:2018 – Cold-formed Steel Structures

Wind Terrain Category: WTC 2 & 3

Designed: JD
Checked: AA
Date: May-21

Client: **ANTAI SOLAR AUSTRALIA PTY LTD**
 Project: **Solar Array Interface Spacing Table**
 Address: **within Australia**
 Designed: **JD**

Job: **9670 – 07-01**
 Date: **May-21**

Checked: **AA**

**Flush Array Frame System Spacing Table for
 LYSAGHT Klip-Lok 700 High Strength roof sheeting – mm**

Type of Rail: ATL-TYN-355B(ATL-DR-355B)
 Type of Interface: Roof Clamp
 Solar Panel Dimension: 2.3mx1.2m
 Terrain category: **2**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	800	1255	620	830	515	680	425	645
B	670	825	435	670	280	605	--	570
C	--	410	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	800	1490	620	1205	515	1080	425	830
B	670	975	435	795	280	715	--	670
C	--	625	--	395	--	245	--	--
D	--	270	--	--	--	--	--	--

Roof Angle (Φ) – $30^\circ \leq \Phi \leq 60^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal
A	1305	1700	1055	1570	710	1490	670	1400
B	860	1345	700	1085	630	975	595	915
C	550	850	--	695	--	625	--	590
D	--	540	--	435	--	270	--	--

Client: **ANTAI SOLAR AUSTRALIA PTY LTD**
 Project: **Solar Array Interface Spacing Table**
 Address: **within Australia**
 Designed: **JD**

Job: **9670 – 07-01**
 Date: **May-21**

Checked: **AA**

**Flush Array Frame System Spacing Table for
 LYSAGHT Klip-Lok 700 High Strength roof sheeting – mm**

Type of Rail: ATL-TYN-355B(ATL-DR-355B)
 Type of Interface: Roof Clamp
 Solar Panel Dimension: 2.3mx1.2m
 Terrain category: **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1235	1525	1235	1525	1060	1315	700	1165
B	815	1005	815	1005	700	865	625	765
C	410	645	410	645	--	550	--	355
D	--	300	--	300	--	--	--	--

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1235	1625	1235	1625	1060	1535	700	1385
B	815	1190	815	1190	700	1025	625	905
C	410	760	410	760	--	655	--	580
D	--	485	--	485	--	300	--	--

Roof Angle (Φ) – $30^\circ \leq \Phi \leq 60^\circ$

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal
A	1550	1815	1550	1815	1370	1730	1215	1650
B	1045	1650	1045	1650	900	1410	800	1245
C	670	1035	670	1035	575	890	395	790
D	315	655	315	655	--	565	--	505

General Notes

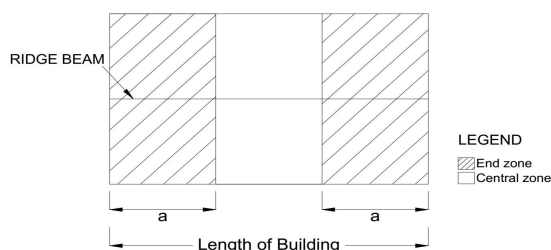
Note 1 Following components are satisfied to use according to AS/NZS 1170.2-2011(R2016)

Components	Part Number	Description
Rail	ATL-TYN-355B	As per drawing& test report provided by client
Splice	ATL-TYN-304/54	
Roof clamp	ATL-TYN-25/26	

Note 2 Maximum uplift wind pressure is limited to 5 kPa. "--" states more uplift pressure.

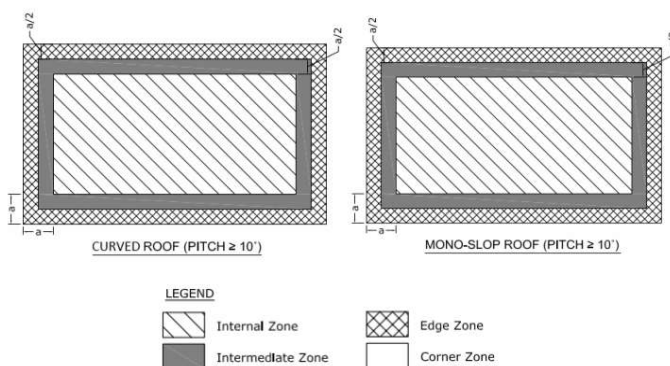
Note 3 Deflection is limited to Minimum of L/120 and 15mm

Note 4 For definition of (End/Central) roof zones, Refer Figure D9 of AS/NZS 1170.2:2011 (R2016) or Figure A as below
For definition of intermediate and internal roof zones, Refer Figure B as below



In Figure A, the value of dimension "a" is 1/3 of the length of building

Figure A



In Figure B, the value of dimension "a" is the minimum of 0.2b, 0.2d and h. (b & d are building dimensions and h is its height)

Figure B

Note 5

Terrain Category 2 (TC2) refers to open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.
Terrain Category 3 (TC3) refers to terrain with numerous closely spaced obstructions having heights generally from 3 m to 10 m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare, e.g. suburban housing, light industrial estates or dense forests.

Note 6

The optimised location of rail splice connection is at quarter length of the spacing of the interface. No Splice connection should be placed at the centre of spacing or over the interface.

