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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: 10166-07-03 /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 Longline 305 (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 Longline 305 (Concealed Fix Roof) within Australia. The design check is based on the information and test reports provided by ANTAI SOLAR AUSTRALIA PTY LTD.

For a definition of a **lapped joint** 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-307/ 308(ATL-IC-305)
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 Longline 305(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 **lapped joints** of roof sheeting on 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 Longline 305 (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 **lapped joints** of roof sheeting on 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. 20-0250, dated 22th June 2020 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.**

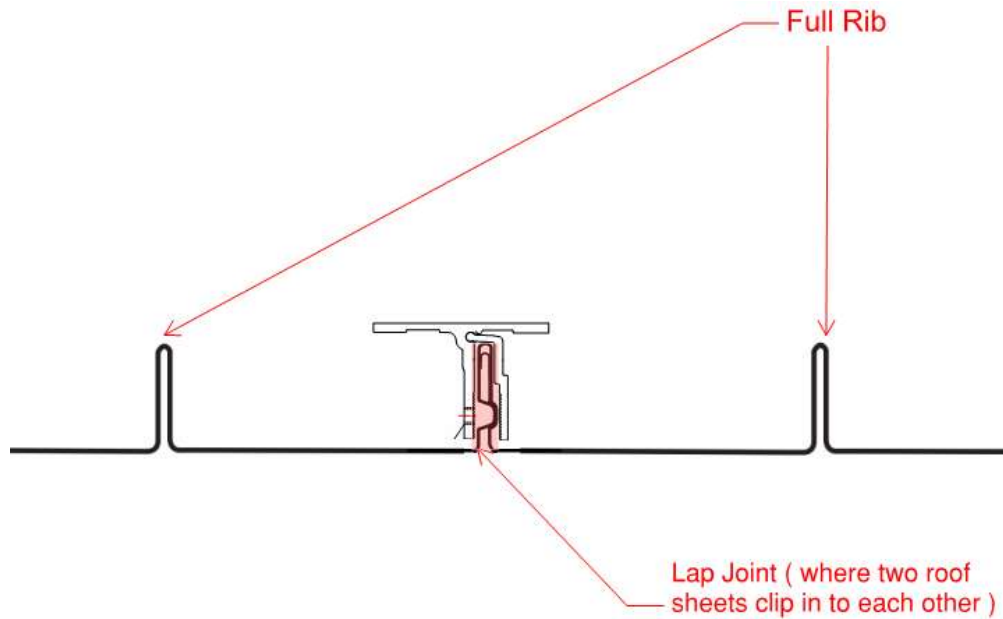


Figure 1 - Lapped Joint Definition

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 Longline 305(Concealed Fix Roof)



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Structural Design Documentation

**Flush Array Frame System Spacing Table For Concealed Fix Roof
– Lysaght Longline 305 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 – 07-03
Date: 7 May 2021



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ISO 9001:2015 Registered Firm
Certificate No: AU1222

Job No: 9670 – 07-03
Client: ANTAI SOLAR AUSTRALIA PTY LTD
Project: Flush Array Frame System Spacing Table For Concealed Fix Roof – Lysaght Longline
305 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 – 07-03**
 Date: **May-21**

Checked: **AA**

Flush Array Frame System Spacing Table for LYSAGHT Longline 305 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	1395	1505	1300	1400	1250	1345	1205	1315
B	1155	1420	665	1160	605	770	530	690
C	500	665	--	515	--	--	--	--
D	--	380	--	--	--	--	--	--

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	1395	1600	1300	1485	1250	1425	1205	1395
B	1155	1535	665	1370	605	1235	530	1160
C	500	1075	--	645	--	595	--	515
D	--	615	--	--	--	--	--	--

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	1525	1785	1415	1670	1365	1600	1335	1565
B	1465	1725	1205	1595	1085	1535	730	1500
C	690	1465	590	1195	--	1075	--	760
D	475	930	--	675	--	620	--	595

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

Job: **9670 – 07-03**
 Date: **May-21**

Checked: **AA**

Flush Array Frame System Spacing Table for LYSAGHT Longline 305 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	1500	1620	1500	1620	1420	1530	1360	1465
B	1400	1550	1400	1550	1210	1470	1075	1325
C	665	1110	665	1110	590	700	--	630
D	365	630	365	630	--	490	--	--

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	1500	1725	1500	1725	1420	1630	1360	1560
B	1400	1650	1400	1650	1210	1560	1075	1495
C	665	1310	665	1310	590	1125	--	740
D	365	720	365	720	--	635	--	585

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	1645	1900	1645	1900	1555	1810	1485	1745
B	1575	1830	1575	1830	1490	1750	1375	1680
C	1155	1595	1155	1595	735	1510	645	1360
D	650	1135	650	1135	505	980	--	785

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-307/308	

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

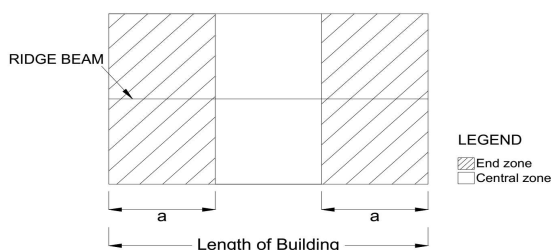


Figure A

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

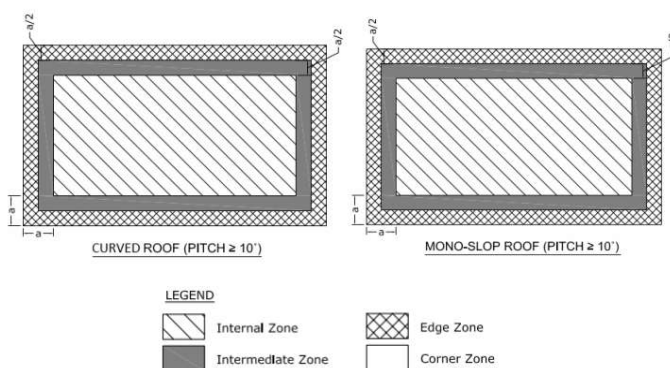


Figure B

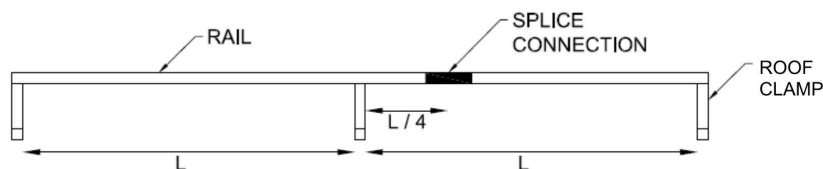
In Figure B, the value of dimension "a" is the minimum of 0.2b, 0.2d and h. (b & d are building dimensions and h is its height)

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 Longline 305 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 – 07-03
Date: 7 May 2021



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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 – 07-03**
 Date: **May-21**

Checked: **AA**

Flush Array Frame System Spacing Table for LYSAGHT Longline 305 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	1310	1415	1220	1315	575	1265	505	1240
B	1150	1355	540	1160	--	620	--	595
C	--	540	--	--	--	--	--	--
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	1310	1505	1220	1395	575	1340	505	1315
B	1150	1440	540	1340	--	1235	--	1160
C	--	670	--	525	--	--	--	--
D	--	--	--	--	--	--	--	--

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	1435	1700	1330	1570	1285	1505	1255	1470
B	1375	1625	1205	1500	640	1440	610	1410
C	595	1395	--	1195	--	670	--	630
D	--	690	--	580	--	--	--	--

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

Job: **9670 – 07-03**
 Date: **May-21**

Checked: **AA**

Flush Array Frame System Spacing Table for LYSAGHT Longline 305 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	1410	1525	1410	1525	1335	1440	1280	1380
B	1350	1460	1350	1460	1210	1380	640	1315
C	530	--	530	--	--	605	--	--
D	--	450	--	450	--	--	--	--

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	1410	1625	1410	1625	1335	1535	1280	1465
B	1350	1555	1350	1555	1210	1470	640	1405
C	530	1310	530	1310	--	1105	--	620
D	--	630	--	630	--	475	--	--

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	1460	1730	1400	1650
B	1480	1750	1480	1750	1400	1655	1340	1580
C	1155	1500	1155	1500	620	1420	525	1360
D	500	1135	500	1135	--	725	--	645

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-307/308	

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

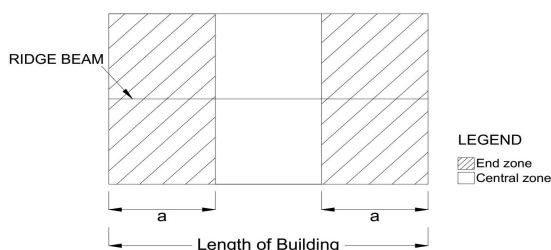


Figure A

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

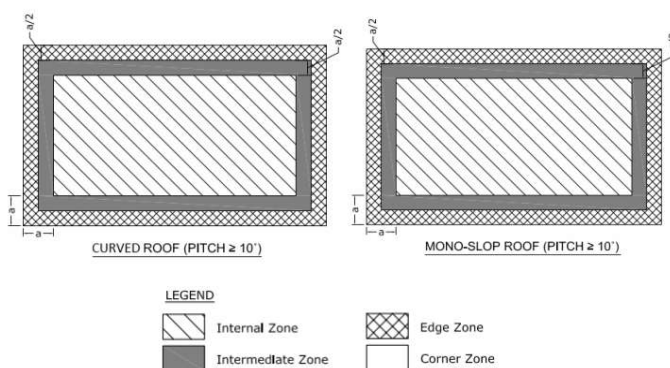


Figure B

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.
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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.

