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Proud Member of: CONSULT AUSTRALIA Representing Engineering Excellence

Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
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Suite 4, 346 Ferntree Gully Rd, Notting Hill VIC 3149. Tel: 03 9543 2211 Fax: 03 9543 4046

Our Ref: 5879-B/AA

21 December 2018

Allstar Solutions Pty Ltd
Zhiqian Town Jintan
Changzhou Jiangsu
China

PV Array Frame Engineering Certification

Installation of Roof Mount Flush Array Frame System

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of Tin Roof Mount Flush Array Frame System installation within Australia. The design check has been based on the drawings of the system and test report provided by Allstar Solutions Pty Ltd.

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

Component	Part No
Rail	03-ASL01
Rail Splicer	03-ASL16
Tin Feet Set	03-ASL18

This certificate is only valid for the Tin roof, Allstar Flush Solar Roof Mounted system. The roof structure or the building structure shall be assessed separately and accordingly.

This certificate is only valid when fixing into minimum 1.9mm thick steel purlin or JD4 seasoned timber. If the fixing condition is different from this conditions, interface spacing shall be reviewed and validated.

This certificate is only valid when the roof zone definition falls into D6 of AS1170.2-2011(R2016).

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 Allstar Tin Roof Mount Flush Array Frame System for Australian use to be structurally sufficient based on the following conditions:

- Wind loads to AS/NZS1170.2:2011 (R2016)
- Wind region A, B, C, D
- Wind terrain category 2 & 3
- Wind average recurrence interval of 200 years

ISO 9001:2008 Registered Firm
Certificate No: AU1222

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- Maximum building height 20m
- The PV panel dimensions to be 1700mm x 1100mm or 2100mm x 1100mm
- Maximum weight of the PV panel and array frame to be 15 kg/m^2
- Material of array frame members to be AL/6005-T5 UNO
- Each PV panel to be installed using 2 rails minimum in all circumstances
- Installation of PV array to be done in accordance with the PV installation manual
- The certification **excludes** assessment of roof structure and PV panels

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 array frame fixing to the roof, not the roof structure and PV panel. 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 splicer was obtained from test report no. WX181106-008-03 dated 23/11/2018 provided by Allstar Solutions Pty Ltd.**

Construction is to be carried out strictly in accordance with the manufacturers instructions. This work was designed by **Ali Askari** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles.

This certification is applicable for Allstar Tin Roof Mount Flush System with components as specified in this letter and is only valid till 21/12/2020. 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

Jianzeng Geng

Principal Engineer

MIEAust CPEng NER 3108316

NT Registration: 239858ES
QLD Registration: 18455
VIC Registration: EC 39483
TAS Registration: CC7263

Gamcorp (Melbourne) Pty Ltd
Consulting Structural & Civil Engineers
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Structural Design Documentation

Flush Array Frame System Spacing Table - Tin Roof

According to AS/NZS 1170.2-2011 (R2016)

within Australia
Terrain Category 2 & 3

For: Allstar Solutions Pty Ltd
Zhiqian Town Jintan
Changzhou Jiangsu
China

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Certificate No: AU1222

Job No: **5879**

Client: **Allstar Solutions Pty Ltd**

Project: **Flush Array Frame System Spacing Table – Tin Roof**

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 1252:1996 – High strength steel bolts
AS/NZS 1664.1:1997 – Aluminium structures - Limit state design
AS 4100:1998 (R2016) – Steel Structures
AS/NZS 4600:2005 – Cold-Formed Steel Structures

Wind Terrain Category: WTC 2 & 3

Designed: **AA**
Checked: HS

Date: **Dec-18**

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Client:	**Allstar Solutions Pty Ltd**	Job:	**5879**
Project:	**Solar Array Interface Spacing Table**	Date:	**Dec-18**
Address:	**within Australia**		
Designed:	**AA**	Checked:	**HS**

Flush Array Frame System Spacing Table for Tin Roof (mm)

Type of Rail	03-ASL01
Type of Interface	Tin Roof L Feet
Solar Panel Dimension	1.7mx1.1m
Terrain category	**2**

Roof Angle (Φ) – Φ < 5°

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	**1480**	**1645**	**1335**	**1480**	**1260**	**1400**	**1230**	**1365**
B	**1190**	**1335**	**965**	**1200**	**865**	**1080**	**805**	**1005**
C	**590**	**735**	**485**	**590**	**435**	**535**	**410**	**505**
D	**--**	**465**	**--**	**--**	**--**	**--**	**--**	**--**

Roof Angle (Φ) – 5°≤Φ ≤ 30

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	**1480**	**1795**	**1335**	**1610**	**1260**	**1525**	**1230**	**1480**
B	**1190**	**1450**	**965**	**1310**	**865**	**1245**	**805**	**1195**
C	**590**	**870**	**485**	**700**	**435**	**630**	**410**	**590**
D	**--**	**545**	**--**	**445**	**--**	**405**	**--**	**--**

General Notes

Note 1 Spacing calculated based on 1.9mm steel purlin or 35mm screw embedment length into timber.

Note 2 Recommended screws

Metal Purlins/Battens	**Fasteners to use**
1.9 mm	M6-11 TPI RoofZips or 14g-10 TPI Teks screws
2.4 mm and Above	14g-10 TPI Teks screws
Timber Purlins/Battens	**Fasteners to use**
Softwood / Hardwood (35mm embedment and above)	14g-10 TPI T17 screws

Note 3 "--" states NOT SUITABLE FOR INSTALLATION.

Note 4 Maximum uplift wind pressure is limited to 5 kPa.

Note 5 Deflection is limited to Minimum of L/120 and 15mm

Note 6 Refer Figure D9 of AS/NZS 1170.2:2011 (R2016) for definition of (End/Central) roof zones.

Note 7 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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Designed:	**AA**	Checked:	**HS**

Flush Array Frame System Spacing Table for Tin Roof (mm)

Type of Rail	03-ASL01
Type of Interface	Tin Roof L Feet
Solar Panel Dimension	1.7mx1.1m
Terrain category	**3**

Roof Angle (Φ) – Φ < 5°

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	**1635**	**1825**	**1635**	**1825**	**1510**	**1685**	**1425**	**1585**
B	**1325**	**1475**	**1325**	**1475**	**1230**	**1365**	**1110**	**1290**
C	**725**	**900**	**725**	**900**	**620**	**765**	**550**	**675**
D	**460**	**560**	**460**	**560**	**--**	**485**	**--**	**435**

Roof Angle (Φ) – 5°≤Φ ≤ 30

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	**1635**	**1995**	**1635**	**1995**	**1510**	**1835**	**1425**	**1730**
B	**1325**	**1605**	**1325**	**1605**	**1230**	**1485**	**1110**	**1400**
C	**725**	**1080**	**725**	**1080**	**620**	**910**	**550**	**805**
D	**460**	**665**	**460**	**665**	**--**	**570**	**--**	**510**

General Notes

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Note 2 Recommended screws

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1.9 mm	M6-11 TPI RoofZips or 14g-10 TPI Teks screws
2.4 mm and Above	14g-10 TPI Teks screws
Timber Purlins/Battens	**Fasteners to use**
Softwood / Hardwood (35mm embedment and above)	14g-10 TPI T17 screws

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Note 6 Refer Figure D9 of AS/NZS 1170.2:2011 (R2016) for definition of (End/Central) roof zones.

Note 7 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.

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Project:	**Solar Array Interface Spacing Table**	Date:	**Dec-18**
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Designed:	**AA**	Checked:	**HS**

Flush Array Frame System Spacing Table for Tin Roof (mm)

Type of Rail	03-ASL01
Type of Interface	Tin Roof L Feet
Solar Panel Dimension	2.1mx1.1m
Terrain category	**2**

Roof Angle (Φ) – Φ < 5°

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	**1330**	**1480**	**1185**	**1330**	**1065**	**1260**	**995**	**1225**
B	**955**	**1190**	**765**	**960**	**685**	**860**	**645**	**800**
C	**475**	**585**	**390**	**480**	**255**	**430**	**--**	**405**
D	**--**	**375**	**--**	**--**	**--**	**--**	**--**	**--**

Roof Angle (Φ) – 5°≤Φ ≤ 30

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	**1330**	**1615**	**1185**	**1450**	**1065**	**1370**	**995**	**1335**
B	**955**	**1305**	**765**	**1145**	**685**	**1020**	**645**	**960**
C	**475**	**690**	**390**	**560**	**255**	**505**	**--**	**480**
D	**--**	**440**	**--**	**360**	**--**	**--**	**--**	**--**

General Notes

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1.9 mm	M6-11 TPI RoofZips or 14g-10 TPI Teks screws
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Flush Array Frame System Spacing Table for Tin Roof (mm)

Type of Rail	03-ASL01
Type of Interface	Tin Roof L Feet
Solar Panel Dimension	2.1mx1.1m
Terrain category	**3**

Roof Angle (Φ) – Φ < 5°

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	**1470**	**1640**	**1470**	**1640**	**1360**	**1515**	**1285**	**1425**
B	**1170**	**1325**	**1170**	**1325**	**1000**	**1230**	**880**	**1105**
C	**575**	**720**	**575**	**720**	**495**	**615**	**445**	**545**
D	**370**	**455**	**370**	**455**	**--**	**395**	**--**	**250**

Roof Angle (Φ) – 5°≤Φ ≤ 30

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	**1470**	**1795**	**1470**	**1795**	**1360**	**1650**	**1285**	**1555**
B	**1170**	**1445**	**1170**	**1445**	**1000**	**1340**	**880**	**1260**
C	**575**	**860**	**575**	**860**	**495**	**730**	**445**	**645**
D	**370**	**535**	**370**	**535**	**--**	**460**	**--**	**410**

General Notes

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Note 2 Recommended screws

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1.9 mm	M6-11 TPI RoofZips or 14g-10 TPI Teks screws
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