

General Certification for Grace Solar Flush Mounted System on Tin and Tile Roof with GS-DR Rail

For: XIAMEN GRACE SOLAR NEW
ENERGY TECHNOLOGY CO.LTD

(BYMEA Group) Building C/D, Vanke Yunxi
Huli Dist, Xiamen, Fujian Province
China

Job No.: 15158
Date: 02/08/2024

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Current Revision		0				

Approval			
Author Signature	<i>baincaliu</i>	Approver Signature	
Name	Bianca Liu	Name	L. Van Spaandonk
Title	Structural Engineer	Title	Principal Engineer

Our Ref: 15158-GS-DR/BL
02 August 2024

XIAMEN GRACE SOLAR NEW ENERGY TECHNOLOGY CO. LTD

(BYMEA Group) Building C/D, Vanke Yunxi
Huli Dist, Xiamen, Fujian Province
China

RE: General Certification for Grace Solar Flush Mounted System on Tin and Tile Roof with B-DR Rail

Gamcorp Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of Tin and Tile Roof Mount Flush Array Frame System installation within Australia. The design check has been based on the information and test reports provided by XIAMEN GRACE SOLAR NEW ENERGY TECHNOLOGY Co. Ltd.

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

Component	Part No.
GS Rail	GS-DR
Tin Interface Kit 5#	GS-IK-LD05
Stainless Steel Hook 1#	GS-IK-01
Rail Splice Kit	GS-DR-SP-GW
Inter Clamp Kit	GS-IC-F40; GS-IC-F32.5; GS-IC-F37.5; GS-IC-F30;
End Clamp Kit	GS-EC-F35/40/46; GS-EC-A02; GS-EC-F30; GS-EC-F32;

This certificate is **only valid** for Grace Solar Flush Mounted System on the Tin & Tile roof with B-DR rail. 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** as a whole. Any information extracted from this certificate is not valid if standing alone.

We find the Installation of Flush Mounted System on Tin and Tile Roof for Australian use to be structurally sufficient based on the following conditions:

Wind loads to **AS/NZS1170.2:2021**

Wind region **A, B1, B2, C & D**

Wind terrain category **1,2 & 3**

Wind average recurrence interval of **200 years**

Maximum building height **20m**

The PV panel dimensions to be **1700mm x 1000mm , 2300mm x 1200mm**

Maximum weight of the PV panel and array frame to be **15 kg/m²**

Rails to be **GS-DR** rails

Material of rails and other components to be **AL/6005-T5 UNO**

- The spacings are determined based on fixings into minimum JD4 seasoned timber and 1.9mm thick steel purlins
- Each PV panel to be installed using **2 rails** minimum in all circumstances
- 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

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.**
- **Tile hook uplift capacity has been based on test report No. 291-050 dated 18 November 2013 by Building Research Establishment Ltd.**
- **The spacing shown in the interface tables shall be adjusted based on the assessment and requirement of the roof structures.**

Construction is to be carried out strictly in accordance with the manufacturer's instructions. This work was designed by **Bianca Liu** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles.

This certification is only valid till **01/11/2026**. Gamcorp should be contacted for future validation. Contact Gamcorp for a customised system or if the site conditions are not covered by this assessment.

Yours faithfully,
Gamcorp 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 installation on tin roof with GS-DR rail

Summary table for interface spacing - flush mount installation on tile roof with GS-DR rail

General Certification for Grace Solar Flush Mounted System on Tin and Tile Roof with GS-DR Rail

For: XIAMEN GRACE SOLAR TECHNOLOGY CO.LTD
(BYMEA Group) Building C/D, Vanke Yunxi
Huli Dist, Xiamen, Fujian Province
China

Job No.: 11277
Date: 06/06/2022

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Current Revision		0				

Approval			
Author Signature	<i>baincaliu</i>	Approver Signature	
Name	Bianca Liu	Name	L. Van Spaandonk
Title	Structural Engineer	Title	Principal Engineer

Our Ref: 11277-GS-DR/BL
06 June 2022

XIAMEN GRACE SOLAR TECHNOLOGY CO.LTD

(BYMEA Group) Building C/D, Vanke Yunxi
Huli Dist, Xiamen, Fujian Province
China

RE: General Certification for Grace Solar Flush Mounted System on Tin and Tile Roof with GS-DR Rail

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of Grace Solar GS-PR-01 Roof Mount Solar System installation on tin and tile roof within Australia. The design check has been based on the information and test reports provided by XIAMEN GRACE SOLAR TECHNOLOGY Co. Ltd.

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

Component	Part No.
GS Rail	GS-DR
Tin Interface Kit 5#	GS-IK-LD05
Stainless Steel Hook 1#	GS-IK-01
Rail Splice Kit	GS-DR-SP-GW
Inter Clamp Kit	GS-IC-F35; GS-IC-F40
End Clamp Kit	GS-EC-F35/40/46; GS01-EC-F35/F40-F35; GS01-EC-F35/F40-F40; GS-EC-F38

This certificate is **only valid** for Grace Solar Flush Mounted System on the Tin & Tile roof with GS-DR rail. 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** as a whole. Any information extracted from this certificate is not valid if standing alone.

We find the Installation of Flush Mounted System on Tin and Tile Roof for Australian use to be structurally sufficient based on the following conditions:

- Wind loads to **AS/NZS1170.2:2021**
- Wind region **A, B1, B2, C & D**
- Wind terrain category **2 & 3**
- Wind average recurrence interval of **200 years**
- Maximum building height **20m**
- The PV panel dimensions to be **1700mm x 1000mm, 2300mm x 1200mm**
- Maximum weight of the PV panel and array frame to be **15 kg/m²**
- Rails to be **GS-DR** rails
- Material of rails and other components to be **AL/6005-T5 UNO**
- The spacings are determined based on fixings into minimum JD4 seasoned timber and 1.9mm thick steel purlins
- Each PV panel to be installed using **2 rails** minimum in all circumstances
- 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

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.**
- **Tile hook (GS-IK-01) is considered reaching its serviceability limit when 3° rotation of the middle plate is observed.**
- **The spacing shown in the interface tables shall be adjusted based on the assessment and requirement of the roof structures.**

Construction is to be carried out strictly in accordance with the manufacturer's instructions. This work was designed by **Bianca Liu** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles.

This certification is only valid till **06/06/2024**. Gamcorp should be contacted for future validation. Contact Gamcorp for a 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 installation on tin roof with GS-DR rail
- Summary table for interface spacing - flush mount installation on tile roof with GS-DR rail

Structural Design Documentation

Flush Array Frame System Spacing Table

According to AS/NZS 1170.2-2021
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
PV Panel Sizes - 1.7mx1m, 2.3mx1.2m
within Australia
Terrain Category 2 & 3

For: XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.
(BYMEA Group) Building C/D, Vanke Yunxi
Huli Dist, Xiamen, Fujian Province
China

Job Number: 11277
Date: 2 June 2022



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Job No: 11277
Client: XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.
Project: Flush Array Frame System Spacing Table
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
Address: within Australia
Wind Terrain Category: Terrain Category 2 & 3

Australian/New Zealand 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 1170.2:2021	Structural design actions Part 2: Wind actions
AS/NZS 1664.1:1997 (R2020)	Aluminium structures Part 1: Limit state design
AS/NZS 4600:2018	Cold-formed steel structures
AS 4100:2020	Steel structures

Designed: BL
Checked: AA
Date: Jun-22

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
Address: **within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 1.7mx1m
Terrain category: 3

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	1265	1750	1920	2000	1265	1750	1920	2000	1090	1660	1840	2000	975	1500	1775	2000
B1	945	1455	1915	2000	945	1455	1915	2000	815	1250	1705	2000	730	1115	1520	2000
B2	765	1175	1600	2000	765	1175	1600	2000	660	1010	1375	1960	590	900	1225	1895
C	440	670	905	1405	440	670	905	1405	--	580	780	1210	--	515	695	1075
D	--	475	640	985	--	475	640	985	--	410	550	845	--	--	495	755

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	860	1320	1695	1945	860	1320	1695	1945	740	1135	1545	1860	665	1015	1375	1800
B1	640	980	1335	1940	640	980	1335	1940	555	845	1145	1780	--	755	1025	1585
B2	525	795	1080	1670	525	795	1080	1670	--	685	930	1430	--	615	830	1275
C	--	455	615	945	--	455	615	945	--	--	530	815	--	--	475	725
D	--	--	435	665	--	--	435	665	--	--	--	575	--	--	--	510

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
Address: **within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 1.7mx1m
Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	1045	1610	1815	2000	855	1315	1690	1940	770	1180	1610	1880	730	1115	1520	1850
B1	775	1190	1625	2000	640	975	1325	1935	575	880	1195	1855	545	830	1125	1740
B2	630	965	1310	1930	520	790	1070	1655	--	715	970	1495	--	675	910	1400
C	--	550	745	1150	--	455	610	940	--	410	550	845	--	--	520	795
D	--	--	525	805	--	--	435	660	--	--	--	595	--	--	--	565

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	710	1085	1480	1835	580	890	1205	1715	525	800	1085	1650	--	755	1025	1585
B1	530	810	1095	1695	--	665	900	1385	--	600	810	1245	--	565	765	1170
B2	--	655	885	1365	--	540	730	1115	--	--	660	1005	--	--	620	945
C	--	--	510	775	--	--	415	635	--	--	--	575	--	--	--	540
D	--	--	--	550	--	--	--	450	--	--	--	405	--	--	--	--

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
Address: **within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 2.3mx1.2m
Terrain category: 3

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	935	1455	1775	2000	935	1455	1775	2000	805	1245	1675	1940	720	1110	1520	1870
B1	695	1075	1475	2000	695	1075	1475	2000	600	925	1260	1935	540	825	1125	1760
B2	565	870	1185	1860	565	870	1185	1860	490	745	1015	1585	435	665	905	1405
C	--	495	670	1035	--	495	670	1035	--	425	580	890	--	--	515	795
D	--	--	475	725	--	--	475	725	--	--	410	625	--	--	--	555

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	635	975	1335	1800	635	975	1335	1800	545	840	1145	1705	490	750	1020	1590
B1	475	725	985	1535	475	725	985	1535	410	625	845	1315	--	560	755	1170
B2	--	590	795	1230	--	590	795	1230	--	510	685	1060	--	455	615	940
C	--	--	455	695	--	--	455	695	--	--	390	600	--	--	--	535
D	--	--	--	490	--	--	--	490	--	--	--	425	--	--	--	--

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
Address: **within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 2.3mx1.2m
Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	770	1190	1640	1910	630	970	1325	1800	570	870	1190	1725	540	825	1125	1685
B1	575	880	1200	1885	470	720	980	1530	425	650	880	1370	400	610	830	1285
B2	465	710	970	1505	--	585	790	1225	--	530	715	1105	--	495	670	1035
C	--	405	550	850	--	--	450	690	--	--	410	625	--	--	--	590
D	--	--	340	595	--	--	--	490	--	--	--	440	--	--	--	415

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	525	800	1090	1670	430	655	890	1385	--	590	800	1240	--	560	755	1170
B1	365	595	810	1250	--	490	665	1020	--	445	600	920	--	420	565	865
B2	--	485	655	1010	--	395	540	825	--	--	485	745	--	--	455	700
C	--	--	--	575	--	--	--	470	--	--	--	425	--	--	--	400
D	--	--	--	405	--	--	--	--	--	--	--	--	--	--	--	--

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
with **GS-DR Rail - Tin Roof (Pierced Fix Roof)**
Address: **within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

General Notes

Note 1 Following components are satisfied to use according to AS/NZS 1170.2:2021

Components	Part Number	Description
GD-Rail	GS-DR	As per drawing or test report provided by client
Rail Splice Kit	GS-DR-SP-GW	
Tin Interface Kit 5#	GS-IC-LD05	
Inter Clamp Kit	GS-IC-F40; GS-IC-F35	
End Clamp Kit	GS-EC-F35/40/46; GS01-EC-F35/F40-F35; GS01-EC-F35/F40-F40; GS-EC-F38	

Note 2 Spacing calculated based on 1.9mm steel purlin or 35mm screw embedment length into timber (JD4 seasoned timber).

Recommended screws

Metal Purlins/Battens	Fasteners to use
1.9mm and above	14g-10 TPI Tek screws or approved equivalent
Timber Purlins/Battens/Rafters	Fasteners to use
Softwood / Hardwood (35mm embedment and above)	14g-10 TPI T17 screws or approved equivalent

Note 3 Maximum uplift wind pressure is limited to 5kPa.

Note 4 Deflection is limited to Minimum of L/120 and 15mm.

Note 5 Panels to be installed parallel to roof surface.

Note 6 "--" states NOT SUITABLE FOR INSTALLATION.

Note 7 Refer section 4.2.1 of AS/NZS 1170.2:2021 for terrain category definition.

Note 8 Wind regions are shown in Figure 3.1(A) of AS/NZS 1170.2:2021.

Note 9 Building height is average roof height of structure above ground. Refer Figure 1 for definition of h, d and b.

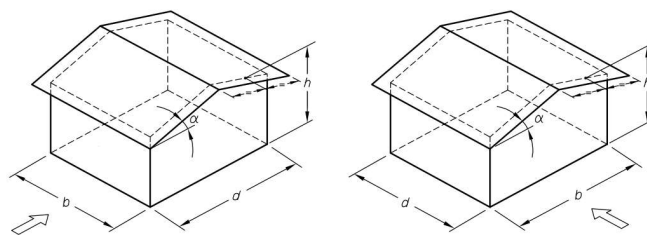
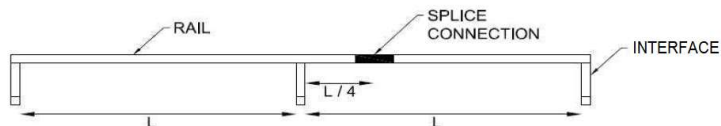


Figure 1 – h, d and b definition

Note 10 Rail splice connection must be placed a quarter length of the spacing of interface. No Splice connection should be placed at the centre of spacing or over the interface.





Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table
with GS-DR Rail - Tin Roof (Pierced Fix Roof)
within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

Note 11 Refer Figure 2 for definition of roof zones.

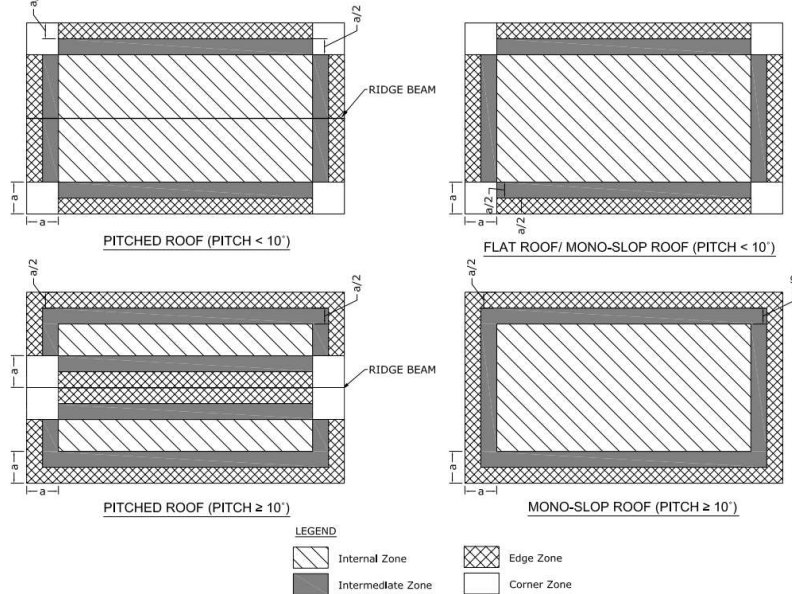


Figure2- Roof Zones Definition

In Figure 2, the value of dimension "a" is the minimum of 0.2b or 0.2d, if $(h/b) \text{ or } (h/d) \geq 0.2$; or 2h if both $(h/b) \text{ and } (h/d) < 0.2$ (b & d are building dimensions and h is average roof height, see Figure 1)

Structural Design Documentation

Flush Array Frame System Spacing Table

According to AS/NZS 1170.2-2021

with GS-DR Rail – Tile Roof

PV Panel Sizes - 1.7mx1m, 2.3mx1.2m

within Australia

Terrain Category 2 & 3

For: XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.
(BYMEA Group) Building C/D, Vanke Yunxi
Huli Dist, Xiamen, Fujian Province
China

Job Number: 11277
Date: 2 June 2022



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Job No: 11277
Client: XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.
Project: Flush Array Frame System Spacing Table
with GS-DR Rail – Tile Roof
Address: within Australia
Wind Terrain Category: Terrain Category 2 & 3

Australian/New Zealand 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 1170.2:2021	Structural design actions Part 2: Wind actions
AS/NZS 1664.1:1997 (R2020)	Aluminium structures Part 1: Limit state design
AS/NZS 4600:2018	Cold-formed steel structures
AS 4100:2020	Steel structures

Designed: BL
Checked: AA
Date: Jun-22

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
with **GS-DR Rail – Tile Roof**
Address: **within Australia**

Job: **11277**
Date: **Jun-22**
Designed: **BL**
Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tile Roof Tile Hook
Solar Panel Dimension: 1.7mx1m
Terrain category: 3

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	610	970	1375	2000	610	970	1375	2000	525	825	1160	1940	465	730	1015	1675
B1	605	965	1365	2000	605	965	1365	2000	520	820	1155	1930	465	730	1015	1675
B2	490	770	1075	1780	490	770	1075	1780	420	655	915	1495	375	580	800	1295
C	325	505	695	1115	325	505	695	1115	--	435	595	945	--	385	530	830
D	--	390	535	840	--	390	535	840	--	335	460	720	--	--	405	635

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	410	640	885	1445	410	640	885	1445	350	545	755	1215	--	485	665	1060
B1	405	635	880	1430	405	635	880	1430	350	545	750	1205	--	485	665	1060
B2	325	510	700	1120	325	510	700	1120	--	440	600	955	--	390	530	840
C	--	340	465	725	--	340	465	725	--	--	400	625	--	--	355	550
D	--	--	360	555	--	--	360	555	--	--	--	480	--	--	--	425

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
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Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tile Roof Tile Hook
Solar Panel Dimension: 1.7mx1m
Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	500	785	1095	1820	405	635	880	1430	365	570	785	1265	345	535	735	1180
B1	500	785	1095	1820	405	630	875	1425	365	570	785	1265	345	535	735	1180
B2	400	625	865	1405	325	505	695	1115	--	455	625	995	--	430	590	930
C	--	415	570	900	--	340	460	720	--	--	415	650	--	--	390	610
D	--	--	435	685	--	--	355	550	--	--	--	495	--	--	--	465

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	335	520	715	1145	--	425	580	920	--	380	520	820	--	360	490	770
B1	335	520	715	1145	--	420	575	915	--	380	520	820	--	360	490	770
B2	--	415	570	900	--	340	465	725	--	--	420	650	--	--	395	615
C	--	--	380	590	--	--	--	480	--	--	--	435	--	--	--	405
D	--	--	--	455	--	--	--	370	--	--	--	335	--	--	--	--

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
Project: **Flush Array Frame System Spacing Table**
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Date: **Jun-22**
Designed: **BL**
Checked: **AA**

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

Type of Rail: GS-DR
Type of Interface: Tile Roof Tile Hook
Solar Panel Dimension: 2.3mx1.2m
Terrain category: 3

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	450	720	1015	1735	450	720	1015	1735	--	610	855	1435	--	535	750	1235
B1	450	710	1010	1725	450	710	1010	1725	--	605	850	1425	--	535	750	1235
B2	--	565	790	1315	--	565	790	1315	--	485	675	1105	--	430	590	960
C	--	--	515	820	--	--	515	820	--	--	440	700	--	--	340	615
D	--	--	390	620	--	--	390	620	--	--	--	530	--	--	--	470

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	--	470	655	1065	--	470	655	1065	--	405	560	900	--	--	490	785
B1	--	465	650	1055	--	465	650	1055	--	400	555	890	--	--	490	785
B2	--	--	515	830	--	--	515	830	--	--	445	705	--	--	390	620
C	--	--	--	535	--	--	--	535	--	--	--	460	--	--	--	405
D	--	--	--	410	--	--	--	410	--	--	--	--	--	--	--	--

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

Client: **XIAMEN GRACE SOLAR TECHNOLOGY CO. LTD.**
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Flush Array Frame System Spacing Table for Tile Roof (mm)

Type of Rail: GS-DR
Type of Interface: Tile Roof Tile Hook
Solar Panel Dimension: 2.3mx1.2m
Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	--	580	810	1350	--	470	650	1060	--	420	580	935	--	390	545	875
B1	--	580	810	1350	--	465	645	1050	--	420	580	935	--	390	545	875
B2	--	460	635	1035	--	--	515	820	--	--	460	735	--	--	435	690
C	--	--	420	665	--	--	--	535	--	--	--	480	--	--	--	450
D	--	--	--	505	--	--	--	405	--	--	--	--	--	--	--	--

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	--	--	530	845	--	--	430	680	--	--	--	605	--	--	--	565
B1	--	--	530	845	--	--	425	675	--	--	--	605	--	--	--	565
B2	--	--	420	665	--	--	--	535	--	--	--	480	--	--	--	455
C	--	--	--	435	--	--	--	--	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

* For intermediate values of h/d ratios, linear interpolation shall be used. Refer Note 9 for definition h and d.

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General Notes

Note 1 Following components are satisfied to use according to AS/NZS 1170.2:2021

Components	Part Number	Description
GD-Rail	GS-DR	As per drawing or test report provided by client
Rail Splice Kit	GS-DR-SP-GW	
Stainless Steel Hook 1#	GS-IC-01	
Inter Clamp Kit	GS-IC-F40; GS-IC-F35	
End Clamp Kit	GS-EC-F35/40/46; GS01-EC-F35/F40-F35; GS01-EC-F35/F40-F40; GS-EC-F38	

Note 2 Spacing calculated based on 1.9mm steel purlin or 35mm screw embedment length into timber (JD4 seasoned timber).

Recommended screws

Metal Purlins/Battens	Fasteners to use
1.9mm and above	14g-10 TPI Tek screws or approved equivalent
Timber Purlins/Battens/Rafters	Fasteners to use
Softwood / Hardwood (35mm embedment and above)	14g-10 TPI T17 screws or approved equivalent

Note 3 Maximum uplift wind pressure is limited to 5kPa.

Note 4 Deflection is limited to Minimum of L/120 and 15mm.

Note 5 Panels to be installed parallel to roof surface.

Note 6 "--" states NOT SUITABLE FOR INSTALLATION.

Note 7 Refer section 4.2.1 of AS/NZS 1170.2:2021 for terrain category definition.

Note 8 Wind regions are shown in Figure 3.1(A) of AS/NZS 1170.2:2021.

Note 9 Building height is average roof height of structure above ground. Refer Figure 1 for definition of h, d and b.

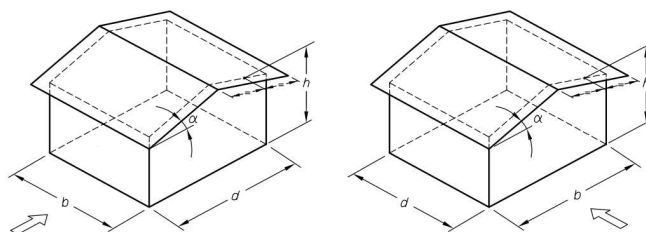
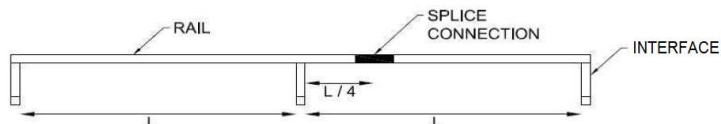


Figure 1 – h, d and b definition

Note 10 Rail splice connection must be placed a quarter length of the spacing of interface. No Splice connection should be placed at the centre of spacing or over the interface.





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Note 11 Refer Figure 2 for definition of roof zones.

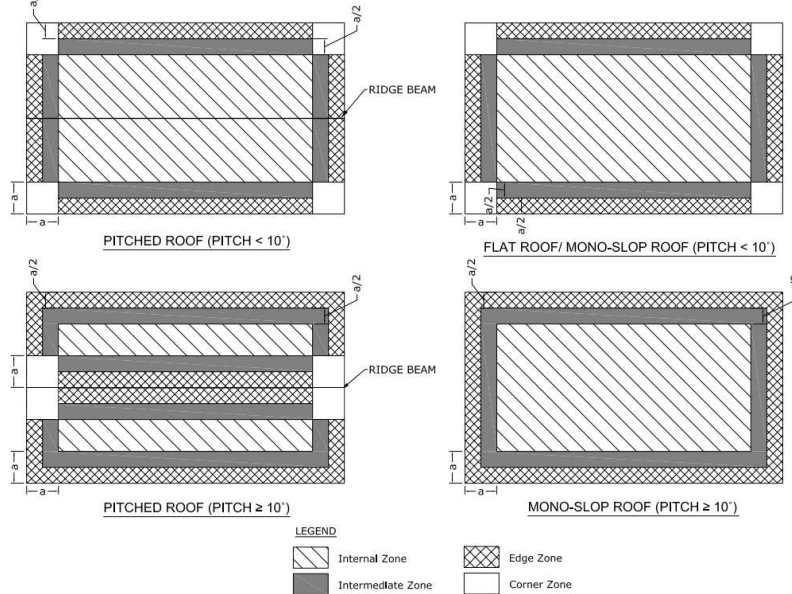


Figure2- Roof Zones Definition

In Figure 2, the value of dimension "a" is the minimum of 0.2b or 0.2d, if $(h/b) \text{ or } (h/d) \geq 0.2$; or 2h if both $(h/b) \text{ and } (h/d) < 0.2$ (b & d are building dimensions and h is average roof height, see Figure 1)