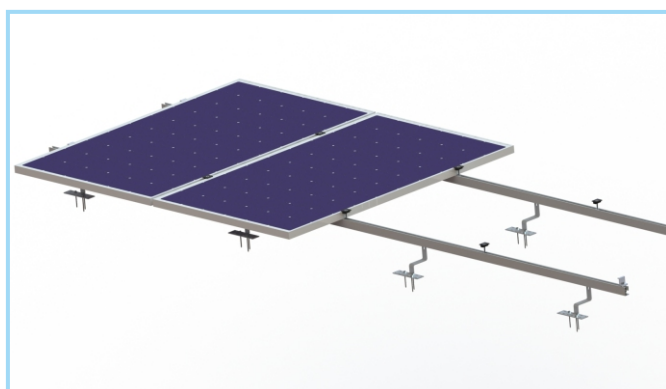


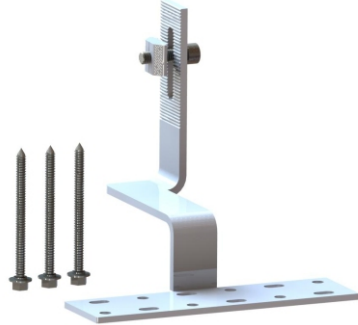
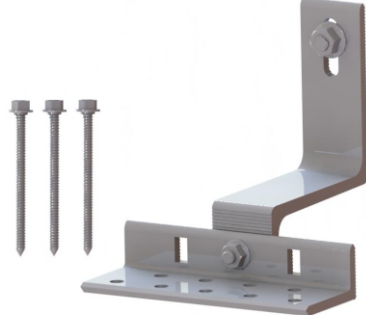
SOLAR ROOF MOUNTING SYSTEM INSTALLATION MANUAL

>>> **MODEL NAME: TTS TILE ROOF HOOK**

JIANGYIN TITANERGY CO.,LTD.
Model Name:TTS TILE ROOF HOOK

Phone:0086-510-86610879
Fax:0086-510-86610877

Web:www.titanergy.com
Mail:info@titanergy.com

	
Tile Roof Hook 01 TTS-IK-01	Tile Roof Hook 01 TTS-IK-01AD
	
Tile Roof Hook 02 TTS-IK-02	Tile Roof Hook 03 TTS-IK-03
	
Tile Roof Hook 04 TTS-IK-04	Tile Roof Hook 06 TTS-IK-06
	
Tile Roof Hook 12 TTS-IK-12	Lengthening Tile Roof Hook 17cm TTS-IK-17

Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
www.gamcorp.com.au Email: melbourne@gamcorp.com.au
35 Butler Street, Richmond VIC 3121 Tel: 03 9543 2211

Our Ref: 10038-03-TTS/BL
12 August 2021

JIANGYIN TITANERGY CO. LTD
No.11 Wuxiang Road
Yunting Street, Jiangyin
China 214422

PV Array Frame Engineering Certification

RE: AS/N Z 1170.2 Certification for Titanergy Flush Mounted System on Tile Roof with TTS Rails

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of Titanergy Flush Mounted System on TILE Roof (Penetrative Fix Roof) with TTS rails within Australia. The design check is based on the information and test reports provided by Jiangyin Titanergy Co. LTD.

This certificate is **only valid** for Titanergy Flush Mounted System themselves. The roof structure or the building structure and PV panels shall be assessed separately and accordingly.

This certificate is **only valid** when fixing into minimum 1.9mm BMT steel or minimum JD4 seasoned timber. 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 these Penetrative 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 **1800mm x 1100mm, 2000mm x 1100mm, 2200mm x 1200mm, 2400mm x 1200mm**
- Weight of the PV panel and array frame to be 15 kg/m²
- Rails to be **TTS Rail**
- Material of Rails to be **AL6005-T5**
- The spacing are determined based on fixing into minimum JD4 seasoned timber with 35mm screw embedment length 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 (50mm≤s≤300mm)

ISO 9001:2015 Registered Firm
Certificate No: AU1222

10038-03-TTS General Certificate - Flush Mount Solar System on TILE Roof (Penetrative Fix Roof) with TTS rails.odt

Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
www.gamcorp.com.au Email: melbourne@gamcorp.com.au
35 Butler Street, Richmond VIC 3121 Tel: 03 9543 2211

- 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.**
- **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 manufacturers 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 certificate is only valid till 15/08/2023. 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:

- Titanergy Flush Array Frame System Spacing Tables on Tile Roof with TTS rail

ISO 9001:2015 Registered Firm
Certificate No: AU1222

10038-03-TTS General Certificate - Flush Mount Solar System on TILE Roof (Penetrative Fix Roof) with TTS rails.odt



gamcorp

Relationships built on trust

Gamcorp (Melbourne) Pty Ltd
Consulting Structural & Civil Engineers
A.C.N 141 076 904
A.B.N 73 015 060 240
www.gamcorp.com.au
melbourne@gamcorp.com.au

Structural Design Documentation

Titanergy Flush Array Frame System Spacing Table
According to AS/NZS 1170.2-2011 (R2016)
with TTS Rail – TILE Roof
within Australia
Terrain Category 2 & 3

For: JIANGYIN TITANERGY CO.,LTD
No.11 Wuxiang Road
Yunting Street, Jiangyin
China 214422



Job Number: 10038-03-TTS
Date: Aug-21

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35 Butler Street
Richmond VIC 3121
Tel: 03 9543 2211
melbourne@gamcorp.com.au
www.gamcorp.com.au
ISO 9001:2015 Registered Firm
Certificate No: AU1222

Job No: 10038-03-TTS
Client: JIANGYIN TITANERGY CO.,LTD
Project: Titanergy Flush Array Frame System Spacing Table
with TTS Rail – TILE 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 4100:2020 – Steel Structures
AS/NZS 4600:2018 – Cold-Formed Steel Structures

Wind Terrain Category: WTC2 & 3

Designed: BL
Checked: AA

Date: Aug-21

Flush Array Frame System Spacing Table for TILE Roof – mm

Type of Roof: TILE Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: TILE Roof Hook
Solar Panel Dimension: 1800x1100
Terrain category: 2

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	700	1095	1500	1780	570	890	1230	1640	510	795	1100	1575	--	750	1030	1540
B	625	975	1355	1700	510	790	1090	1575	--	710	975	1510	--	670	915	1465
C	--	575	775	1195	--	--	635	975	--	--	575	880	--	--	540	830
D	--	--	--	760	--	--	--	625	--	--	--	565	--	--	--	535

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	725	1000	1525	--	595	810	1285	--	535	730	1145	--	--	685	1075
B	--	650	890	1420	--	530	725	1140	--	--	650	1015	--	--	615	960
C	--	--	530	810	--	--	--	660	--	--	--	595	--	--	--	565
D	--	--	--	520	--	--	--	--	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.
*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for TILE Roof – mm

Type of Roof: TILE Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: TILE Roof Hook
Solar Panel Dimension: 1800x1100
Terrain category: 3

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	855	1360	1620	1900	855	1360	1620	1900	735	1160	1530	1810	650	1020	1420	1730
B	760	1200	1550	1830	760	1200	1550	1830	655	1025	1430	1735	580	905	1255	1655
C	--	695	945	1460	--	695	945	1460	--	600	810	1250	--	535	725	1110
D	--	--	605	925	--	--	605	925	--	--	525	800	--	--	--	710

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	575	895	1240	1645	575	895	1240	1645	--	765	1060	1555	--	680	930	1485
B	510	795	1095	1575	510	795	1095	1575	--	685	940	1490	--	605	830	1310
C	--	--	640	980	--	--	640	980	--	--	550	845	--	--	--	750
D	--	--	--	630	--	--	--	630	--	--	--	545	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.
*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for Tile Roof – mm

Type of Roof: Tile Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: Tile Roof Hook
Solar Panel Dimension: 2000x1100
Terrain category: 2

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	585	915	1285	1675	--	745	1030	1550	--	665	920	1480	--	625	860	1385
B	520	815	1135	1600	--	660	915	1470	--	590	815	1305	--	560	770	1225
C	--	--	650	1000	--	--	530	815	--	--	--	735	--	--	--	695
D	--	--	--	635	--	--	--	525	--	--	--	--	--	--	--	--

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	610	840	1345	--	--	680	1075	--	--	610	960	--	--	575	900
B	--	545	745	1185	--	--	605	955	--	--	545	850	--	--	510	800
C	--	--	--	675	--	--	--	555	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.
*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for Tile Roof – mm

Type of Roof: Tile Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: Tile Roof Hook
Solar Panel Dimension: 2000x1100
Terrain category: 3

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	715	1140	1525	1820	715	1140	1525	1820	615	970	1360	1710	545	855	1190	1630
B	635	1005	1410	1735	635	1005	1410	1735	550	860	1195	1635	--	755	1050	1560
C	--	580	790	1220	--	580	790	1220	--	--	680	1045	--	--	605	930
D	--	--	505	775	--	--	505	775	--	--	--	670	--	--	--	595

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	750	1035	1550	--	750	1035	1550	--	640	885	1425	--	565	780	1245
B	--	665	915	1475	--	665	915	1475	--	570	785	1255	--	505	690	1095
C	--	--	535	820	--	--	535	820	--	--	--	705	--	--	--	630
D	--	--	--	525	--	--	--	525	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.
*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for TILE Roof – mm

Type of Roof: TILE Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: TILE Roof Hook
Solar Panel Dimension: 2200x1200
Terrain category: 2

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	505	795	1115	1600	--	645	895	1460	--	575	795	1290	--	545	750	1205
B	--	710	985	1530	--	575	795	1280	--	515	710	1135	--	--	665	1065
C	--	--	565	870	--	--	--	710	--	--	--	640	--	--	--	600
D	--	--	--	555	--	--	--	--	--	--	--	--	--	--	--	--

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	530	725	1165	--	--	590	935	--	--	530	835	--	--	--	780
B	--	--	650	1030	--	--	525	830	--	--	--	740	--	--	--	695
C	--	--	--	585	--	--	--	--	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.

*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for TILE Roof – mm

Type of Roof: TILE Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: TILE Roof Hook
Solar Panel Dimension: 2200x1200
Terrain category: 3

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	625	990	1400	1740	625	990	1400	1740	535	840	1180	1635	--	740	1035	1555
B	550	870	1225	1655	550	870	1225	1655	--	745	1040	1560	--	655	910	1485
C	--	505	685	1060	--	505	685	1060	--	--	590	910	--	--	525	810
D	--	--	--	670	--	--	--	670	--	--	--	580	--	--	--	515

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	650	900	1470	--	650	900	1470	--	555	770	1235	--	--	675	1080
B	--	575	795	1285	--	575	795	1285	--	--	680	1090	--	--	600	955
C	--	--	--	715	--	--	--	715	--	--	--	615	--	--	--	545
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.

*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for TILE Roof – mm

Type of Roof: TILE Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: TILE Roof Hook
Solar Panel Dimension: 2400x1200
Terrain category: 2

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	755	1055	1570	--	610	845	1380	--	545	755	1220	--	515	710	1140
B	--	665	855	1500	--	545	715	1210	--	--	665	1035	--	--	630	930
C	--	--	535	820	--	--	--	670	--	--	--	605	--	--	--	570
D	--	--	--	525	--	--	--	--	--	--	--	--	--	--	--	--

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	--	690	1105	--	--	560	885	--	--	--	790	--	--	--	740
B	--	--	615	905	--	--	--	740	--	--	--	685	--	--	--	655
C	--	--	--	555	--	--	--	--	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.
*Refer to Note 8- Figure 2 for roof zone definition.

Flush Array Frame System Spacing Table for TILE Roof – mm

Type of Roof: TILE Roof
Type of Rail: Titanergy TTS Rail
Type of Interface: TILE Roof Hook
Solar Panel Dimension: 2400x1200
Terrain category: 3

h/d≤0.5* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	590	935	1325	1710	590	935	1325	1710	505	795	1115	1605	--	700	975	1525
B	525	775	1160	1625	525	775	1160	1625	--	685	905	1530	--	620	800	1410
C	--	--	650	1005	--	--	650	1005	--	--	555	860	--	--	--	765
D	--	--	--	635	--	--	--	635	--	--	--	550	--	--	--	--

h/d≥1* - Refer to Note 6 for definition of h and d

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal	Corner	Edge	Intermedate	Internal
A	--	615	850	1390	--	615	850	1390	--	525	725	1170	--	--	640	1020
B	--	545	720	1215	--	545	720	1215	--	--	645	960	--	--	570	830
C	--	--	--	675	--	--	--	675	--	--	--	580	--	--	--	515
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

*For intermediate values of h/d ratios, linear interpolation shall be used.
*Refer to Note 8- Figure 2 for roof zone definition.

General Notes

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

Components	Part number	Comments
Inter Clamp Kit	Inter Clamp Kit 20-50mm	as per drawing provided by client
End Clamp Kit	End Clamp Kit 20-50mm	as per drawing provided by client
TILE Hook	Tile Roof Hook	as per drawing provided by client
TTS Rail	TTS Rail	as per drawing provided by client

Note 2 Maximum uplift wind pressure is limited to 5.0 KPa for panels of 1800x1100mm and 2000x1100mm
Maximum uplift wind pressure is limited to 4.37KPa for panel of 2200x1200mm
Maximum uplift wind pressure is limited to 3.6KPa for panel of 2400x1200mm

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

Note 4 Spacing calculated based on at least 1.5mm thick steel purlin or 35mm screw embedment length into timber.

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 Refer to Figure 1 for definition of h and d.

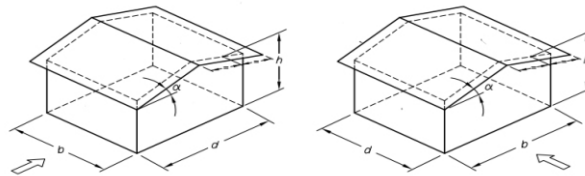
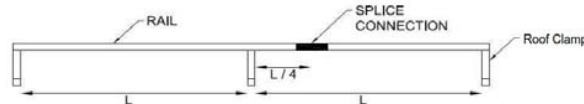


Figure 1 – h and d definition

Note 7 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.



Note 8 Refer Figure 2 for definition of roof zones.

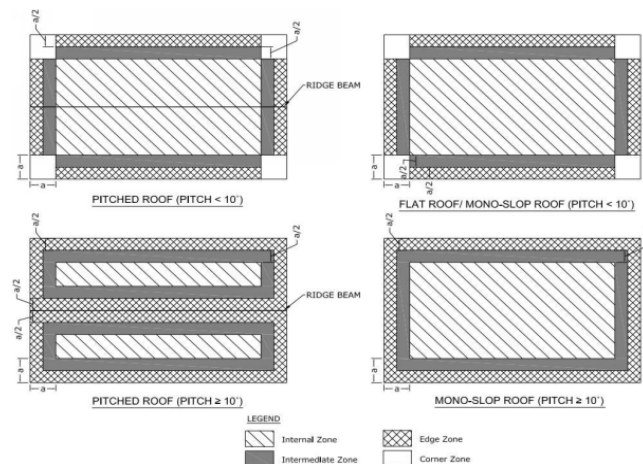


Figure 2 - Roof Zones Definition

In Figure 2, 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)