

General Certification

Flush Mounted System on Tin (Penetrative) Roof
with Titan Solar TTV2 Rail

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

Job No.: 14690-RM04
Date: 30/05/2024
Revision: Rev 0

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Client		JIANGYIN TITANERGY CO. LTD		Client Contact	Tina Nie	
Rev	Date	Revision Details	Prepared By	Author	Verifier	Approver
0	30/05/2024	Certificate date updated of 11323 - RM04	BL	BL	LvS	LvS
Current Revision		0				

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

Our Ref: 14690-RM04/BL
30 May 2024

JIANGYIN TITANERGY CO. LTD

No.11 Wuxiang Road
Yunting Street, Jiangyin
China 214422

RE: General Certification for Titanergy Solar Flush Mounted System on Tin (Penetrative) Roof with Titan Solar TTV2 Rail

Gamcorp Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of Tin (Penetrative) Roof Mount Flush Array Frame System installation within Australia. The design check has been based on the information and test reports provided by JIANGYIN TITANERGY ENERGY CO. LTD.

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

Component	Part No.
Rail	Titan Solar TTV2 Rail
L-Feet	Titan Solar L-Feet set
Mid Clamp	Titan Solar Mid Clamp Kit 40mm
End Clamp	Titan Solar End Clamp Kit 40mm

This certificate is **only valid** for Titanergy Solar Flush Mounted System on the Tin (Penetrative) Roof with Titan Solar TTV2 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 (Penetrative) 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 **1800mm x 1100mm, 2000mm x 1100mm, 2200mm x 1200mm, 2400mm x 1200mm**
- Maximum weight of the PV panel and array frame to be **15 kg/m²**
- Rails to be **Titan Solar TTV2** 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.**
- **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 **30/06/2026**. 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 (penetrative) roof with Titan Solar TTV2 rail

Structural Design Documentation

Flush Array Frame System Spacing Table

According to AS/NZS 1170.2-2021

with Titan Solar TTV2 Rail – Tin (Penetrative) Roof

within Australia

Terrain Category 2 & 3

For: Jiangyin Titanergy Co. Ltd
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Job Number: 14690 - RM04
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Job No: 14690 - RM04
Client: Jiangyin Titanergy Co. Ltd
Project: Flush Array Frame System Spacing Table
with Titan Solar TTV2 Rail – Tin (Penetrative) 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: LvS
Date: May-24



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Relationships built on trust

Client: **Jiangyin Titanergy Co. Ltd**
Project: **Flush Array Frame System Spacing Table**
with Titan Solar TTV2 Rail – Tin (Penetrative) Roof
Address: **within Australia**

Job: **14690 - RM04**
Date: **May-24**
Designed: **BL**
Checked: **LvS**

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 1.8mx1.1m
Terrain category: 3

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	1195	1400	1570	1860	1195	1400	1570	1860	1030	1325	1485	1760	920	1270	1420	1675
B1	890	1375	1565	1855	890	1375	1565	1855	765	1180	1480	1760	685	1055	1420	1675
B2	710	1110	1445	1710	710	1110	1445	1710	625	955	1300	1615	560	850	1155	1540
C	415	630	855	1325	415	630	855	1325	--	545	740	1140	--	485	660	1015
D	--	450	605	930	--	450	605	930	--	385	520	800	--	--	465	710

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	810	1215	1355	1595	810	1215	1355	1595	690	1070	1285	1505	625	955	1235	1440
B1	605	930	1260	1590	605	930	1260	1590	525	800	1085	1505	--	710	970	1440
B2	495	745	1020	1465	495	745	1020	1465	--	645	880	1355	--	580	780	1205
C	--	430	580	890	--	430	580	890	--	--	505	770	--	--	450	685
D	--	--	410	630	--	--	410	630	--	--	--	540	--	--	--	485

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



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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 1.8mx1.1m
Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	985	1300	1455	1725	805	1215	1355	1590	720	1115	1300	1530	685	1055	1275	1495
B1	730	1125	1455	1725	605	920	1255	1590	545	830	1130	1530	515	780	1060	1495
B2	595	910	1235	1580	490	745	1010	1465	--	675	915	1410	--	635	860	1325
C	--	520	705	1085	--	430	575	885	--	385	520	800	--	--	490	755
D	--	--	500	760	--	--	410	625	--	--	--	565	--	--	--	530

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	665	1025	1265	1480	550	840	1140	1375	495	750	1025	1320	--	710	970	1295
B1	500	755	1035	1480	--	625	850	1305	--	565	765	1175	--	535	710	1105
B2	--	620	835	1290	--	510	685	1055	--	--	620	950	--	--	585	895
C	--	--	480	735	--	--	395	600	--	--	--	540	--	--	--	510
D	--	--	--	520	--	--	--	425	--	--	--	385	--	--	--	--

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

Relationships built on trust

Client: **Jiangyin Titanergy Co. Ltd**
 Project: **Flush Array Frame System Spacing Table**
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Flush Array Frame System Spacing Table for Tin (Penetrative) Roof (mm)

Type of Rail: Titan Solar TTV2 Rail
 Type of Interface: Tin Roof L Feet
 Solar Panel Dimension: 2mx1.1m
 Terrain category: **3**

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	1075	1350	1515	1810	1075	1350	1515	1810	925	1280	1435	1700	825	1225	1370	1620
B1	800	1235	1515	1805	800	1235	1515	1805	690	1060	1430	1695	620	950	1290	1620
B2	645	1000	1360	1655	645	1000	1360	1655	560	860	1170	1560	500	765	1040	1485
C	370	570	770	1195	370	570	770	1195	--	490	665	1025	--	440	590	910
D	--	405	545	835	--	405	545	835	--	--	470	720	--	--	420	640

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	720	1120	1310	1540	720	1120	1310	1540	630	965	1240	1455	565	860	1170	1390
B1	545	835	1135	1535	545	835	1135	1535	470	710	975	1450	--	645	870	1345
B2	445	675	915	1415	445	675	915	1415	--	585	790	1215	--	520	700	1085
C	--	385	520	800	--	385	520	800	--	--	450	690	--	--	405	615
D	--	--	370	565	--	--	370	565	--	--	--	490	--	--	--	435

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

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 2mx1.1m
Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	885	1255	1405	1665	720	1115	1305	1535	655	1005	1255	1475	620	950	1230	1440
B1	655	1010	1380	1665	545	830	1130	1535	490	745	1015	1475	460	700	955	1440
B2	535	820	1115	1525	440	670	910	1410	--	610	820	1270	--	570	765	1190
C	--	470	635	975	--	385	520	795	--	--	470	720	--	--	445	675
D	--	--	450	685	--	--	370	560	--	--	--	505	--	--	--	480

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	605	925	1220	1425	495	750	1025	1325	445	675	920	1275	--	645	870	1250
B1	450	685	930	1425	--	565	760	1175	--	510	685	1055	--	480	645	995
B2	--	560	745	1160	--	460	620	950	--	--	560	855	--	--	525	805
C	--	--	430	660	--	--	--	540	--	--	--	490	--	--	--	460
D	--	--	--	465	--	--	--	385	--	--	--	--	--	--	--	--

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

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

Type of Rail: Titan Solar TTV2 Rail
 Type of Interface: Tin Roof L Feet
 Solar Panel Dimension: 2.2mx1.2m
 Terrain category: **3**

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	915	1310	1470	1755	915	1310	1470	1755	760	1240	1390	1645	690	1160	1325	1570
B1	670	1125	1465	1750	670	1125	1465	1750	600	895	1320	1645	545	775	1175	1570
B2	570	820	1235	1600	570	820	1235	1600	495	710	1060	1510	440	650	870	1440
C	--	515	700	1085	--	515	700	1085	--	445	605	935	--	395	540	830
D	--	--	495	760	--	--	495	760	--	--	425	655	--	--	--	580

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	625	1015	1270	1490	625	1015	1270	1490	550	790	1195	1410	500	715	1065	1345
B1	485	695	1030	1490	485	695	1030	1490	415	620	800	1375	--	560	715	1225
B2	395	595	750	1290	395	595	750	1290	--	510	665	1105	--	460	610	930
C	--	--	475	730	--	--	475	730	--	--	410	630	--	--	--	560
D	--	--	--	515	--	--	--	515	--	--	--	445	--	--	--	390

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

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Client: **Jiangyin Titanergy Co. Ltd**
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 Address: **within Australia**

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

Type of Rail: Titan Solar TTV2 Rail
 Type of Interface: Tin Roof L Feet
 Solar Panel Dimension: 2.2mx1.2m
 Terrain category: 2

$h/d \leq 0.5$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	730	1215	1360	1615	620	1015	1265	1490	570	830	1215	1430	545	775	1175	1395
B1	580	835	1255	1615	475	690	1025	1485	435	635	835	1430	410	610	785	1345
B2	475	680	1010	1480	390	585	750	1280	--	535	690	1155	--	500	650	1080
C	--	425	575	890	--	--	470	725	--	--	425	655	--	--	400	615
D	--	--	405	625	--	--	--	510	--	--	--	460	--	--	--	435

$h/d \geq 1.0$ *

Wind Region	Building Height – h (m)															
	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	530	760	1140	1380	440	645	845	1285	395	595	760	1235	--	560	715	1210
B1	400	595	765	1305	--	500	645	1070	--	450	595	885	--	425	570	820
B2	--	490	640	1055	--	405	545	775	--	--	490	705	--	--	465	670
C	--	--	390	600	--	--	--	490	--	--	--	445	--	--	--	420
D	--	--	--	425	--	--	--	--	--	--	--	--	--	--	--	--

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



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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 2.4mx1.2m
Terrain category: 3

$h/d \leq 0.5$ *

Building Height – h (m)

Wind Region	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	810	1270	1425	1705	810	1270	1425	1705	705	1195	1350	1600	645	1065	1290	1525
B1	630	1030	1410	1700	630	1030	1410	1700	555	800	1210	1595	500	715	1075	1525
B2	525	750	1135	1555	525	750	1135	1555	450	660	905	1465	405	605	785	1345
C	--	475	640	995	--	475	640	995	--	410	555	855	--	--	495	760
D	--	--	455	695	--	--	455	695	--	--	365	600	--	--	--	535

$h/d \geq 1.0$ *

Building Height – h (m)

Wind Region	h≤5				5<h≤10				10<h≤15				15<h≤20			
	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal	Corner	Edge	Intermed iate	Internal
A	585	855	1230	1450	585	855	1230	1450	510	730	1095	1370	455	665	905	1310
B1	440	645	870	1445	440	645	870	1445	390	580	740	1260	--	520	670	1120
B2	--	545	695	1180	--	545	695	1180	--	475	620	1015	--	425	560	820
C	--	--	435	665	--	--	435	665	--	--	--	575	--	--	--	515
D	--	--	--	470	--	--	--	470	--	--	--	405	--	--	--	--

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



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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tin Roof L Feet
Solar Panel Dimension: 2.4mx1.2m
Terrain category: 2

$h/d \leq 0.5$ *

Building Height – h (m)

Wind Region	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	680	1140	1320	1565	580	845	1230	1445	525	755	1140	1390	500	715	1075	1355
B1	535	765	1150	1565	440	645	860	1445	400	595	765	1310	--	560	725	1230
B2	440	640	845	1435	--	540	695	1175	--	490	640	1055	--	465	610	940
C	--	365	530	815	--	--	430	665	--	--	365	600	--	--	--	565
D	--	--	--	570	--	--	--	470	--	--	--	420	--	--	--	395

$h/d \geq 1.0$ *

Building Height – h (m)

Wind Region	$h \leq 5$				$5 < h \leq 10$				$10 < h \leq 15$				$15 < h \leq 20$			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	485	700	1045	1345	405	600	770	1245	--	545	700	1185	--	520	670	1120
B1	--	550	705	1200	--	460	605	915	--	415	550	795	--	390	520	750
B2	--	450	600	895	--	--	500	715	--	--	450	655	--	--	425	630
C	--	--	--	550	--	--	--	450	--	--	--	405	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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

Relationships built on trust

Client: **Jiangyin Titanergy Co. Ltd**
Project: **Flush Array Frame System Spacing Table**
with Titan Solar TTV2 Rail – Tin (Penetrative) Roof
within Australia

Job: **14690 - RM04**
Date: **May-24**
Designed: **BL**
Checked: **LvS**

General Notes

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

Components	Part Number	Description
Rail	Titan Solar TTV2 Rail	As per drawing or test report provided by client
Mid Clamp	Mid Clamp Kit 40mm	
End Clamp	End Clamp Kit 40mm	
L-Feet	Titan Solar L-Feet set	

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 Teks 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.

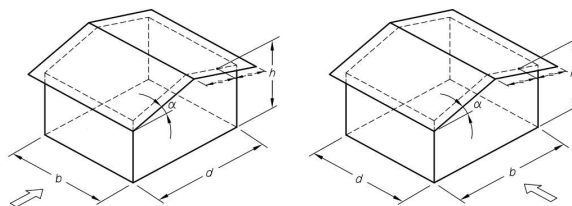
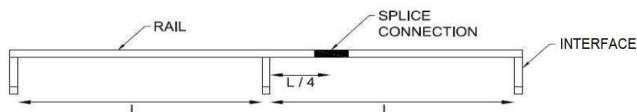


Figure 1 – h, d and b definition

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.



Note 11 Refer Figure 2 for definition of roof zones.

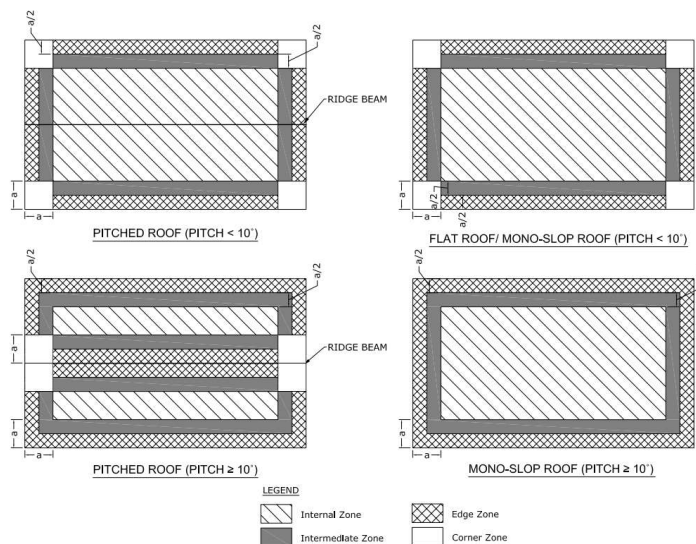


Figure2- Roof Zones Definition

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)