

General Certification

Flush Mounted System on Tile Roof
with Titan Solar TTV2 Rail

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

Job No.: 14690-RM06
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 - RM06	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-RM06/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 Tile 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 Tile 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 CO. LTD.

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

Component	Part No.
Rail	Titan Solar TTV2 Rail
Tile Roof Hook	Titan Solar Standard Tile Roof Hook
Mid Clamp	Titan Solar Mid Clamp Kit 40mm
End Clamp	Titan Solar End Clamp Kit 40mm

This certificate is **only valid** for Titanergy Flush Mounted System on the Tile 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 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 **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.**
- **Standard Tile Interface is considered reaching its serviceability limit when 3° rotation of the middle plate is observed.**

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 tile roof with Titan Solar TTV2 rail



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Gamcorp Pty Ltd
A.C.N 665 643 658 A.B.N 86 665 643 658
www.gamcorp.com.au solar@gamcorp.com.au
Tel: +61 3 9543 2211



Structural Design Documentation

Flush Array Frame System Spacing Table

According to AS/NZS 1170.2-2021

with Titan Solar TTV2 Rail – Tile Roof

within Australia

Terrain Category 2 & 3

For: Jiangyin Titanergy Co. Ltd
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www.gamcorp.com.au solar@gamcorp.com.au
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Job No: 14690 - RM06
Client: Jiangyin Titanergy Co. Ltd
Project: Flush Array Frame System Spacing Table
with Titan Solar TTV2 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: LvS
Date: May-24



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A.C.N 665 643 658 A.B.N 86 665 643 658
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Client: **Jiangyin Titanergy Co. Ltd**
Project: **Flush Array Frame System Spacing Table**
with Titan Solar TTV2 Rail – Tile Roof
Address: **within Australia**

Job: **14690 - RM06**
Date: **May-24**
Designed: **BL**
Checked: **LvS**

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tile Roof Tile Hook
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	785	1245	1570	1860	785	1245	1570	1860	670	1060	1485	1760	595	930	1300	1675
B1	775	1230	1565	1855	775	1230	1565	1855	665	1050	1475	1760	595	930	1300	1675
B2	625	985	1375	1710	625	985	1375	1710	540	840	1170	1615	480	745	1025	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	525	815	1130	1595	525	815	1130	1595	450	700	965	1505	400	620	850	1355
B1	520	810	1125	1590	520	810	1125	1590	450	695	960	1505	--	620	850	1355
B2	420	650	895	1435	420	650	895	1435	--	560	770	1220	--	500	680	1075
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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A.C.N 665 643 658 A.B.N 86 665 643 658
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with Titan Solar TTV2 Rail – Tile Roof
Address: **within Australia**

Job: **14690 - RM06**
Date: **May-24**
Designed: **BL**
Checked: **LvS**

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tile Roof Tile Hook
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	640	1000	1400	1725	520	810	1125	1590	470	725	1005	1530	440	685	940	1495
B1	640	1000	1400	1725	520	805	1115	1590	470	725	1005	1530	440	685	940	1495
B2	510	795	1105	1580	420	645	890	1425	--	585	800	1275	--	550	755	1190
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	430	665	915	1465	--	540	740	1175	--	485	665	1045	--	460	625	985
B1	430	665	915	1465	--	540	740	1165	--	485	665	1045	--	460	625	985
B2	--	535	730	1155	--	435	595	930	--	--	535	835	--	--	505	785
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.

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

Job: **14690 - RM06**
 Date: **May-24**
 Designed: **BL**
 Checked: **LvS**

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

Type of Rail: Titan Solar TTV2 Rail
 Type of Interface: Tile Roof Tile Hook
 Solar Panel Dimension: 2mx1.1m
 Terrain category: 2

h/d ≤ 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	575	900	1260	1665	470	730	1010	1535	420	655	900	1455	395	615	845	1360
B1	575	900	1260	1665	465	725	1005	1535	420	655	900	1455	395	615	845	1360
B2	460	715	995	1525	375	580	800	1280	--	525	720	1145	--	495	675	1075
C	--	470	635	975	--	385	520	795	--	--	470	720	--	--	445	675
D	--	--	450	685	--	--	370	560	--	--	--	505	--	--	--	480

h/d ≥ 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	385	600	825	1320	--	490	670	1060	--	440	600	940	--	415	565	885
B1	385	600	825	1320	--	485	665	1050	--	440	600	940	--	415	565	885
B2	--	480	655	1040	--	390	535	835	--	--	480	750	--	--	455	705
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.

Client: **Jiangyin Titanergy Co. Ltd**
 Project: **Flush Array Frame System Spacing Table**
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 Address: **within Australia**

Job: **14690 - RM06**
 Date: **May-24**
 Designed: **BL**
 Checked: **LvS**

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

Type of Rail: Titan Solar TTV2 Rail
 Type of Interface: Tile Roof Tile Hook
 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	640	1015	1440	1755	640	1015	1440	1755	550	865	1215	1645	485	760	1060	1570
B1	635	1010	1430	1750	635	1010	1430	1750	545	860	1205	1645	485	760	1060	1570
B2	510	805	1125	1600	510	805	1125	1600	440	690	955	1510	365	605	840	1360
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	430	670	925	1490	430	670	925	1490	--	575	790	1275	--	505	695	1110
B1	425	665	920	1490	425	665	920	1490	--	570	785	1265	--	505	695	1110
B2	--	535	735	1175	--	535	735	1175	--	460	630	1000	--	405	555	875
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.

Relationships built on trust

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

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tile Roof Tile Hook
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	520	820	1145	1615	425	665	920	1490	--	595	820	1325	--	560	770	1235
B1	520	820	1145	1615	425	660	915	1485	--	595	820	1325	--	560	770	1235
B2	420	650	905	1470	--	530	730	1165	--	475	655	1040	--	450	615	975
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	--	545	750	1200	--	445	605	960	--	395	545	855	--	--	510	805
B1	--	545	750	1200	--	440	605	955	--	395	545	855	--	--	510	805
B2	--	435	595	945	--	--	485	760	--	--	435	685	--	--	410	640
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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A.C.N 665 643 658 A.B.N 86 665 643 658
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Project: **Flush Array Frame System Spacing Table**
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Address: **within Australia**

Job: **14690 - RM06**
Date: **May-24**
Designed: **BL**
Checked: **LvS**

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tile Roof Tile Hook
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	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	585	930	1320	1705	585	930	1320	1705	505	795	1115	1600	445	700	975	1525
B1	585	925	1310	1700	585	925	1310	1700	500	790	1105	1595	445	700	975	1525
B2	470	735	1030	1555	470	735	1030	1555	405	630	875	1435	--	555	770	1245
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	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	390	610	850	1385	390	610	850	1385	--	525	725	1165	--	465	640	1020
B1	340	605	840	1370	340	605	840	1370	--	520	720	1155	--	465	640	1020
B2	--	490	670	1075	--	490	670	1075	--	420	575	915	--	--	510	805
C	--	--	435	665	--	--	435	665	--	--	--	575	--	--	--	515
D	--	--	--	470	--	--	--	470	--	--	--	405	--	--	--	--

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

Type of Rail: Titan Solar TTV2 Rail
Type of Interface: Tile Roof Tile Hook
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	480	750	1050	1565	340	610	845	1375	--	545	750	1215	--	510	705	1135
B1	480	750	1050	1565	--	605	840	1365	--	545	750	1215	--	510	705	1135
B2	--	595	830	1345	--	485	665	1065	--	435	600	955	--	410	565	895
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	--	500	685	1100	--	405	555	880	--	--	500	785	--	--	470	735
B1	--	500	685	1100	--	405	555	875	--	--	500	785	--	--	470	735
B2	--	395	545	865	--	--	445	695	--	--	400	625	--	--	--	590
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.

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Job: **14690 - RM06**
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	
Tile Hook	Titan Solar Tile Roof Hook	

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.

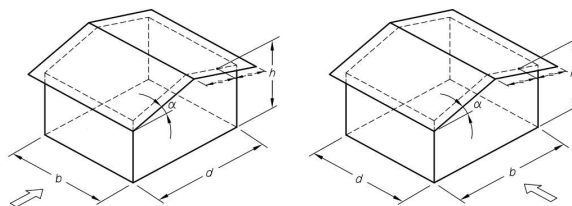
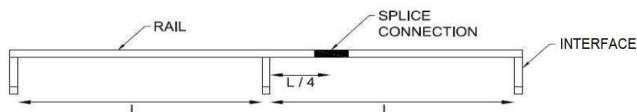


Figure 1 – h, d and b definition

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.

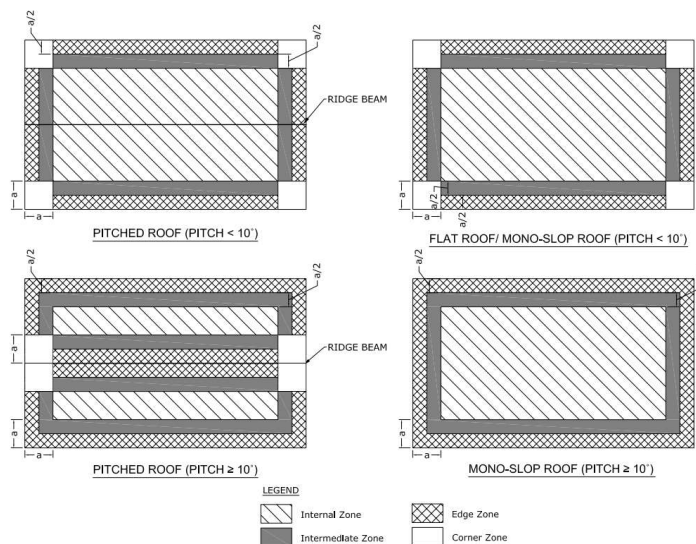


Figure2- Roof Zones Definition

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)