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Structural Design Documentation

**Flush Array Frame System Spacing Table For Tin Roof
(Pierced Fix Roof)
According to AS/NZS 1170.2-2011 (R2016)
with GM-R01-light – PV panel dimension 1.67mx1m / 2mx1m
within Australia
Terrain Category 2 & 3**

For: Xiamen Goomax Energy Technology Co., Ltd
Suit 905, Jordan Building A, High-tech Park
Huli District, Xiamen, 361000
China

Job Number: 8387 – 01
Date: 12 June 2020



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Job No: 8387 - 01
Client: Xiamen Goomax Energy Technology Co., Ltd
Project: Flush Array Frame System Spacing Table For Tin Roof
(Pierced Fix Roof)
with GM-R01-light - PV panel dimension 1.67mx1m / 2mx1m
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 1664.1:1997 – Aluminium structures - Limit state design
AS 4100:1998 (R2016) – Steel Structures
AS/NZS 4600:2018 – Cold-formed Steel Structures

Wind Terrain Category: WTC 2 & 3

Designed: JD
Checked: AA

Date: Jun-20

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 Client: **Xiamen Goomax Energy Technology Co., Ltd**
 Project: **Solar Array Interface Spacing Table**
 Address: **within Australia**
 Designed: **JD**

Job: **8387 – 01**
 Date: **Jun-20**
 Checked: **AA**

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

Type of Rail GM-R01-Light
 Type of Interface L-Feet
 Solar Panel Dimension 1.67m x 1m
 Terrain category 2

Roof Angle (Φ) – $\Phi < 5^\circ$

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	1510	1630	1410	1515	1275	1460	1205	1430
B	1160	1425	950	1165	855	1050	805	985
C	600	735	490	600	445	545	420	515

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

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	1510	1730	1410	1610	1275	1545	1205	1515
B	1160	1665	950	1375	855	1235	805	1165
C	600	865	490	705	445	640	420	600

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

Type of Rail GM-R01-Light
 Type of Interface L-Feet
 Solar Panel Dimension 1.67m x 1m
 Terrain category **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1625	1745	1625	1745	1540	1660	1475	1590
B	1405	1680	1405	1680	1215	1495	1080	1330
C	725	890	725	890	625	765	560	685

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1625	1830	1625	1830	1540	1755	1475	1690
B	1405	1770	1405	1770	1215	1695	1080	1570
C	725	1050	725	1050	625	905	560	805

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

Type of Rail: GM-R01-Light
 Type of Interface: L-Feet
 Solar Panel Dimension: 2m x 1m
 Terrain category: **2**

Roof Angle (Φ) – $\Phi < 5^\circ$

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	1425	1535	1185	1425	1065	1315	1010	1240
B	965	1190	790	975	715	875	670	825
C	500	615	410	500	370	455	350	425

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

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	1425	1630	1185	1515	1065	1455	1010	1425
B	965	1410	790	1145	715	1035	670	970
C	500	720	410	590	370	535	350	500

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Type of Rail GM-R01-Light
 Type of Interface L-Feet
 Solar Panel Dimension 2m x 1m
 Terrain category **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

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	1530	1655	1530	1655	1450	1565	1360	1495
B	1175	1450	1175	1450	1010	1245	900	1110
C	605	745	605	745	520	640	465	570

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

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	1530	1750	1530	1750	1450	1665	1360	1590
B	1175	1685	1175	1685	1010	1475	900	1310
C	605	875	605	875	520	755	465	670

General Notes

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

Components	Part Number	Description
Rail	GM-R01-Light	As per drawing provided by client
Splice	GM-RS-51-AZ GM-RS-51-AZ-1 GM-RS-56-AZ	
L Feet	GM-MRH-LDS-AZ GM-MRH-L5-AZ	
Mid clamp	GM-MC-30-AZ GM-MC-35-AZ GM-MC-40-AZ GM-MC-45-AZ GM-MC-50-AZ	
Adjustable Mid/End Clamp	GM-EC-35(40)-AZ GM-MC-35(40)-AZ GM-MC-35(40)-AZ-2 GM-MC-35(40)-AZ-1	
Thin Film Mid / End Clamp	GM-MC-60-TF2-AZ GM-EC-60-TF2-AZ	
End Clamp	GM-EC-30-AZ GM-EC-35-AZ GM-EC-40-AZ GM-EC-45-AZ GM-EC-50-AZ	
Earthing Clip	GM-E-EL-AZ GM-E-EL-12	
Grounding Lug	GM-EK-AZ	
Cable Clip / Cable Tie	GM-XJ-AZ; GM-SL-XJ-AZ GM-CT-AZ	
Earthing Clip / T Nut	GM-BR-02-AZ GM-BN-25-AZ	

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

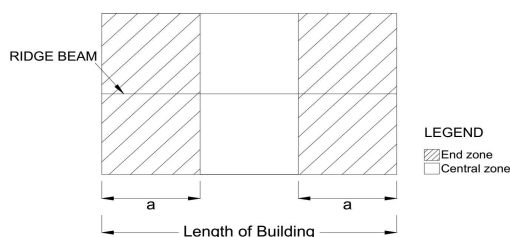
Note 3 Recommended screws

Metal Purlins/Battens	14g-10 TPI Tek screws or approved equivalent
Timber Purlins/Battens	14g-10 TPI T17 screws or approved equivalent

Note 4 Maximum uplift wind pressure is limited to 5 kPa. "--" states more uplift pressure.

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.



The value of dimension "a" is 1/3 of the length of building

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Project: **Solar Array Interface Spacing Table**
Address: **within Australia**
Designed: **JD**

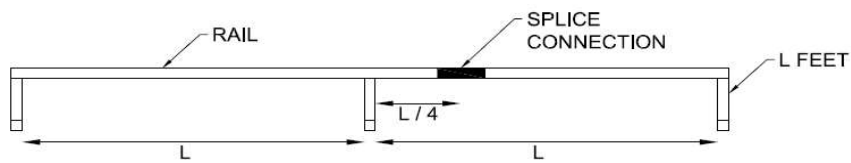
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Note 7

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.
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 8 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.





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Flush Array Frame System Spacing Table For Tin Roof (Pierced Fix Roof)

According to AS/NZS 1170.2-2011 (R2016)

with GM-R56 – PV panel dimension 1.67mx1m / 2mx1m

within Australia

Terrain Category 2 & 3

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Wind Terrain Category: WTC 2 & 3

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

Type of Rail: GM-R56
 Type of Interface: L-Feet
 Solar Panel Dimension: 1.67m x 1m
 Terrain category: 2

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1565	1685	1420	1565	1275	1510	1205	1475
B	1160	1425	950	1165	855	1050	805	985
C	600	735	490	600	445	545	420	515

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1565	1770	1420	1665	1275	1600	1205	1565
B	1160	1685	950	1375	855	1235	805	1165
C	600	865	490	705	445	640	420	600

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

Type of Rail GM-R56
 Type of Interface L-Feet
 Solar Panel Dimension 1.67m x 1m
 Terrain category **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1680	1790	1680	1790	1590	1715	1525	1645
B	1405	1730	1405	1730	1215	1495	1080	1330
C	725	890	725	890	625	765	560	685

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1680	1880	1680	1880	1590	1800	1525	1740
B	1405	1815	1405	1815	1215	1740	1080	1570
C	725	1050	725	1050	625	905	560	805

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

Type of Rail GM-R56
 Type of Interface L-Feet
 Solar Panel Dimension 2m x 1m
 Terrain category 2

Roof Angle (Φ) - $\Phi < 5^\circ$

Wind Region	Building Height - H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1460	1585	1185	1465	1065	1315	1010	1240
B	965	1190	790	975	715	875	670	825
C	500	615	410	500	370	455	350	425

Roof Angle (Φ) - $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height - H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1460	1690	1185	1565	1065	1505	1010	1470
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C	500	720	410	590	370	535	350	500

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Type of Rail: GM-R56
 Type of Interface: L-Feet
 Solar Panel Dimension: 2m x 1m
 Terrain category: **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1580	1710	1580	1710	1500	1615	1360	1550
B	1175	1450	1175	1450	1010	1245	900	1110
C	605	745	605	745	520	640	465	570

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1580	1795	1580	1795	1500	1720	1360	1645
B	1175	1720	1175	1720	1010	1475	900	1310
C	605	875	605	875	520	755	465	670

General Notes

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

Components	Part Number	Description
Rail	GM-R56	As per drawing provided by client
Splice	GM-RS-51-AZ	
	GM-RS-51-AZ-1 GM-RS-56-AZ	
L Feet	GM-MRH-LDS-AZ	
	GM-MRH-L5-AZ	
Mid clamp	GM-MC-30-AZ	
	GM-MC-35-AZ	
	GM-MC-40-AZ	
	GM-MC-45-AZ GM-MC-50-AZ	
Adjustable Mid / End Clamp	GM-EC-35(40)-AZ	
	GM-MC-35(40)-AZ	
	GM-MC-35(40)-AZ-2	
	GM-MC-35(40)-AZ-1	
Thin Film Mid/ End Clamp	GM-MC-60-TF2-AZ	
	GM-EC-60-TF2-AZ	
End Clamp	GM-EC-30-AZ	
	GM-EC-35-AZ	
	GM-EC-40-AZ	
	GM-EC-45-AZ	
	GM-EC-50-AZ	
Earthing Clip	GM-E-EL-AZ	
	GM-E-EL-12	
Grounding Lug	GM-EK-AZ	
Cable Clip / Cable Tie	GM-XJ-AZ	
	GM-SL-XJ-AZ	
	GM-CT-AZ	
Earthing Clip / T Nut	GM-BR-02-AZ	
	GM-BN-25-AZ	

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

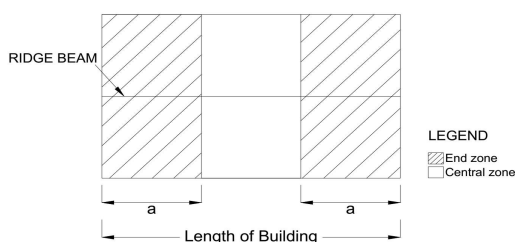
Note 3 Recommended screws

Metal Purlins/Battens	14g-10 TPI Teks screws or approved equivalent
Timber Purlins/Battens	14g-10 TPI T17 screws or approved equivalent

Note 4 Maximum uplift wind pressure is limited to 5 kPa. "--" states more uplift pressure.

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.



The value of dimension "a" is 1/3 of the length of building

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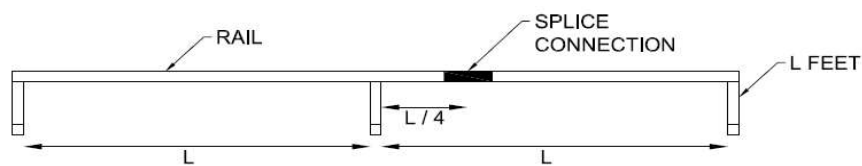
Note 7

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.

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 8

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.





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Flush Array Frame System Spacing Table For Tin Roof (Pierced Fix Roof)

According to AS/NZS 1170.2-2011 (R2016)

with GM-R69 – PV panel dimension 1.67mx1m / 2mx1m

within Australia

Terrain Category 2 & 3

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

Type of Rail: GM-R69
 Type of Interface: L-Feet
 Solar Panel Dimension: 1.67m x 1m
 Terrain category: 2

Roof Angle (Φ) – $\Phi < 5^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1470	1585	1370	1475	1275	1420	1205	1390
B	1160	1425	950	1165	855	1050	805	985
C	600	735	490	600	445	545	420	515

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

Wind Region	Building Height – H (m)							
	H \leq 5		5<H \leq 10		10<H \leq 15		15<H \leq 20	
	End	Central	End	Central	End	Central	End	Central
A	1470	1690	1370	1565	1275	1505	1205	1475
B	1160	1620	950	1375	855	1235	805	1165
C	600	865	490	705	445	640	420	600

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

Type of Rail: GM-R69
 Type of Interface: L-Feet
 Solar Panel Dimension: 1.67m x 1m
 Terrain category: **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

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	1580	1710	1580	1710	1500	1615	1435	1550
B	1405	1635	1405	1635	1215	1495	1080	1330
C	725	890	725	890	625	765	560	685

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

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	1580	1795	1580	1795	1500	1720	1435	1645
B	1405	1735	1405	1735	1215	1650	1080	1570
C	725	1050	725	1050	625	905	560	805

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

Type of Rail GM-R69
 Type of Interface L-Feet
 Solar Panel Dimension 2m x 1m
 Terrain category **2**

Roof Angle (Φ) – $\Phi < 5^\circ$

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	1385	1495	1185	1390	1065	1315	1010	1240
B	965	1190	790	975	715	875	670	825
C	500	615	410	500	370	455	350	425

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

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	1385	1590	1185	1475	1065	1420	1010	1390
B	965	1410	790	1145	715	1035	670	970
C	500	720	410	590	370	535	350	500

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

Type of Rail GM-R69
 Type of Interface L-Feet
 Solar Panel Dimension 2m x 1m
 Terrain category **3**

Roof Angle (Φ) – $\Phi < 5^\circ$

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	1490	1610	1490	1610	1410	1525	1350	1455
B	1175	1450	1175	1450	1010	1245	900	1110
C	605	745	605	745	520	640	465	570

Roof Angle (Φ) – $5^\circ \leq \Phi \leq 30^\circ$

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	1490	1715	1490	1715	1410	1620	1350	1550
B	1175	1640	1175	1640	1010	1475	900	1310
C	605	875	605	875	520	755	465	670

General Notes

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

Components	Part Number	Description
Rail	GM-R69	As per drawing provided by client
Splice	GM-RS-51-AZ	
	GM-RS-51-AZ-1	
	GM-RS-56-AZ	
L Feet	GM-MRH-LDS-AZ	
	GM-MRH-L5-AZ	
Mid clamp	GM-MC-30-AZ	
	GM-MC-35-AZ	
	GM-MC-40-AZ	
	GM-MC-45-AZ	
	GM-MC-50-AZ	
Adjustable Mid/End Clamp	GM-EC-35(40)-AZ	
	GM-MC-35(40)-AZ	
	GM-MC-35(40)-AZ-2	
	GM-MC-35(40)-AZ-1	
Thin Film Mid/ End Clamp	GM-MC-60-TF2-AZ	
	GM-EC-60-TF2-AZ	
End Clamp	GM-EC-30-AZ	
	GM-EC-35-AZ	
	GM-EC-40-AZ	
	GM-EC-45-AZ	
	GM-EC-50-AZ	
Earthing Clip	GM-E-EL-AZ	
	GM-E-EL-12	
Grounding Lug	GM-EK-AZ	
Cable Clip / Cable Tie	GM-XJ-AZ	
	GM-SL-XJ-AZ	
	GM-CT-AZ	
Earthing Clip / T Nut	GM-BR-02-AZ	
	GM-BN-25-AZ	

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

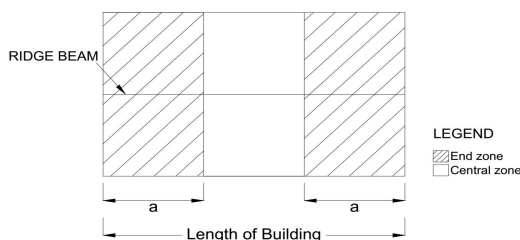
Note 3 Recommended screws

Metal Purlins/Battens	14g-10 TPI Tek screws or approved equivalent
Timber Purlins/Battens	14g-10 TPI T17 screws or approved equivalent

Note 4 Maximum uplift wind pressure is limited to 5 kPa. "--" states more uplift pressure.

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.



The value of dimension "a" is 1/3 of the length of building

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.

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 8

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.

