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Suite 4, 346 Ferntree Gully Rd, Notting Hill VIC 3149. Tel: 03 9543 2211 Fax: 03 9543 4046

Our Ref: 7258/AA

13 August 2019

Xiamen Mibet New Energy Co. LTD  
No.69 Xintian Road,  
Jimei District, Xiamen City,  
Fujian Province,  
China

### **PV Array Frame Engineering Certification**

#### **RE: Installation of MRac Roof Mount Solar System on Tin and Tile Roof with MC Rails**

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of MRac Roof Mount Solar System installation on tin and tile roof within Australia. The design check is based on the information and test reports provided by Xiamen Mibet New Energy Co. LTD.

This certificate is **only valid** for the Mrac Roof Mount Solar System itself. 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 1.9BMT 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** when the roof zone definition falls into D6 of AS1170.2-2011(R2016).

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 MRac Roof Mount Solar System on tin and tile 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 **2100mm x 1050mm**
- Weight of the PV panel and array frame to be 15 kg/m<sup>2</sup>
- Rails to be **MC Rails**
- Material to be **AL6005-T5**
- The spacings are determined based on fixings into minimum JD4 seasoned timber and 1.9mm thick steel purlins

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- 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.**
- **Standard Tile Interface 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 manufacturers instructions. This work was designed by **Ali Askari** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles. This certificate is only valid till 12/08/2021. 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



Jianzeng Geng  
Principal Engineer  
FIEAust CPEng NER 3108316  
NT Registration: 239858ES  
QLD Registration: 18455  
VIC Registration: EC 39483  
TAS Registration: CC7263

## Structural Design Documentation

### **MRac Flush Array Frame System Spacing Table**

#### **According to AS/NZS 1170.2-2011 (R2016)**

with MC Rail – Tile Roof

**within Australia**

Terrain Category 2 & 3

For: XIAMEN MIBET NEW ENERGY CO., LTD.  
No.69 Xintian Road, Jimei District  
Xiamen City, Fujian Province  
China

Job Number: 7258-Tile  
Date: 12 August 2019



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ISO 9001:2008 Registered Firm  
Certificate No: AU1222

**Job No:** 7258-Tile  
**Client:** XIAMEN MIBET NEW ENERGY CO., LTD.  
**Project:** MRac Flush Array Frame System Spacing Table  
with MC 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 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:** AA  
**Checked:** HS

**Date:** Aug-19

Relationships built on trust  
 Client: **XIAMEN MIBET NEW ENERGY CO., LTD.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **within Australia**  
 Designed: **AA**

Job: **7258-Tile**  
 Date: **Aug-19**

Checked: **HS**

**MRac Flush Array Frame System Spacing Table for Tiled Roof (mm)**

Type of Rail: MC Rail  
 Type of Interface: Standard Tile Interface  
 Solar Panel Dimension: 2.1mx1.05m  
 Terrain category: **3**

Roof Angle ( $\Phi$ ) -  $\Phi < 5^\circ$

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
<b>A</b>	<b>800</b>	<b>1010</b>	<b>800</b>	<b>1010</b>	<b>680</b>	<b>855</b>	<b>595</b>	<b>745</b>
<b>B</b>	<b>705</b>	<b>885</b>	<b>705</b>	<b>885</b>	<b>600</b>	<b>755</b>	<b>530</b>	<b>660</b>
<b>C</b>	<b>460</b>	<b>575</b>	<b>460</b>	<b>575</b>	<b>395</b>	<b>490</b>	<b>350</b>	<b>435</b>
<b>D</b>	<b>355</b>	<b>440</b>	<b>355</b>	<b>440</b>	--	<b>375</b>	--	<b>335</b>

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

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
<b>A</b>	<b>800</b>	<b>1225</b>	<b>800</b>	<b>1225</b>	<b>680</b>	<b>1030</b>	<b>595</b>	<b>895</b>
<b>B</b>	<b>705</b>	<b>1070</b>	<b>705</b>	<b>1070</b>	<b>600</b>	<b>905</b>	<b>530</b>	<b>790</b>
<b>C</b>	<b>460</b>	<b>685</b>	<b>460</b>	<b>685</b>	<b>395</b>	<b>585</b>	<b>350</b>	<b>515</b>
<b>D</b>	<b>355</b>	<b>520</b>	<b>355</b>	<b>520</b>	--	<b>445</b>	--	<b>395</b>

Relationships built on trust  
 Client: **XIAMEN MIBET NEW ENERGY CO., LTD.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **within Australia**  
 Designed: **AA**

Job: **7258-Tile**  
 Date: **Aug-19**

Checked: **HS**

**MRac Flush Array Frame System Spacing Table for Tiled Roof (mm)**

Type of Rail: MC Rail  
 Type of Interface: Standard Tile Interface  
 Solar Panel Dimension: 2.1mx1.05m  
 Terrain category: 2

Roof Angle ( $\Phi$ ) -  $\Phi < 5^\circ$

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
<b>A</b>	<b>645</b>	<b>805</b>	<b>520</b>	<b>645</b>	<b>465</b>	<b>575</b>	<b>435</b>	<b>540</b>
<b>B</b>	<b>570</b>	<b>715</b>	<b>460</b>	<b>575</b>	<b>415</b>	<b>515</b>	<b>390</b>	<b>485</b>
<b>C</b>	<b>375</b>	<b>465</b>	<b>305</b>	<b>380</b>	<b>275</b>	<b>340</b>	<b>260</b>	<b>320</b>
<b>D</b>	--	<b>360</b>	--	--	--	--	--	--

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

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
<b>A</b>	<b>645</b>	<b>970</b>	<b>520</b>	<b>775</b>	<b>465</b>	<b>690</b>	<b>435</b>	<b>645</b>
<b>B</b>	<b>570</b>	<b>855</b>	<b>460</b>	<b>685</b>	<b>415</b>	<b>610</b>	<b>390</b>	<b>575</b>
<b>C</b>	<b>375</b>	<b>555</b>	<b>305</b>	<b>450</b>	<b>275</b>	<b>405</b>	<b>260</b>	<b>380</b>
<b>D</b>	--	<b>425</b>	--	<b>345</b>	--	<b>310</b>	--	--

Client: **Relationships built on trust**  
**XIAMEN MIBET NEW ENERGY CO., LTD.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **within Australia**  
 Designed: **AA**

Job: **7258-Tile**  
 Date: **Aug-19**  
 Checked: **HS**

**General Notes**

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

Components	Part Number	Description
MC Rail	MC Rail	as per drawing provided by client
Splice for MC Rail	Splice for MC Rail	as per drawing provided by client
Inter Clamp Kit (MC)	Inter Clamp Kit (MC)	as per drawing provided by client
End Clamp Kit(MC)	End Clamp Kit(MC)	as per drawing provided by client
Standard Tile Interface	Standard Tile Interface	as per drawing provided by client
L Feet Set	L Feet Set	as per drawing provided by client

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

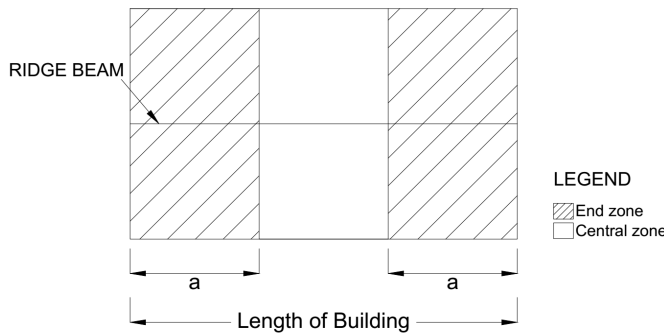
Note 3 Recommended screws

Metal Purlins/Battens	Fasteners to use
1.9 mm	M6-11 TPI RoofZips or 14g-10 TPI Tek screws
2.4 mm and Above	14g-10 TPI Tek screws
Timber Purlins/Battens	Fasteners to use
Softwood / Hardwood (35mm embedment and above)	14g-10 TPI T17 screws

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

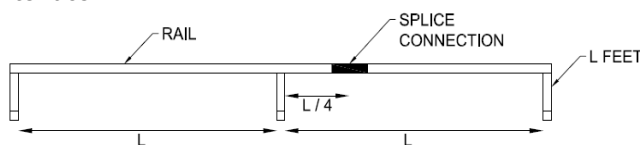
Note 6 Refer Figure D9 of AS/NZS 1170.2:2011 (R2016) for definition of (End/Central) roof zones.



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.



## Structural Design Documentation

### **MRac Flush Array Frame System Spacing Table**

#### **According to AS/NZS 1170.2-2011 (R2016)**

with MC Rail – Tin Roof

**within Australia**

Terrain Category 2 & 3

For: XIAMEN MIBET NEW ENERGY CO., LTD.  
No.69 Xintian Road, Jimei District  
Xiamen City, Fujian Province  
China

Job Number: 7258-Tin  
Date: 12 August 2019



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Certificate No: AU1222

**Job No:** 7258-Tin  
**Client:** XIAMEN MIBET NEW ENERGY CO., LTD.  
**Project:** MRac Flush Array Frame System Spacing Table  
with MC Rail – Tin 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 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:** AA  
**Checked:** HS

**Date:** Aug-19

Relationships built on trust  
 Client: **XIAMEN MIBET NEW ENERGY CO., LTD.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **within Australia**  
 Designed: **AA**

Job: **7258-Tin**  
 Date: **Aug-19**

Checked: **HS**

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

Type of Rail: MC Rail  
 Type of Interface: L Feet Set  
 Solar Panel Dimension: 2.1mx1.05m  
 Terrain category: **3**

Roof Angle ( $\Phi$ ) -  $\Phi < 5^\circ$

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
<b>A</b>	<b>1530</b>	<b>1655</b>	<b>1530</b>	<b>1655</b>	<b>1450</b>	<b>1565</b>	<b>1295</b>	<b>1495</b>
<b>B</b>	<b>1120</b>	<b>1380</b>	<b>1120</b>	<b>1380</b>	<b>965</b>	<b>1190</b>	<b>860</b>	<b>1055</b>
<b>C</b>	<b>430</b>	<b>530</b>	<b>430</b>	<b>530</b>	<b>375</b>	<b>455</b>	<b>330</b>	<b>405</b>
<b>D</b>	<b>280</b>	<b>340</b>	<b>280</b>	<b>340</b>	--	<b>295</b>	--	<b>265</b>

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

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
<b>A</b>	<b>1530</b>	<b>1750</b>	<b>1530</b>	<b>1750</b>	<b>1450</b>	<b>1665</b>	<b>1295</b>	<b>1590</b>
<b>B</b>	<b>1120</b>	<b>1640</b>	<b>1120</b>	<b>1640</b>	<b>965</b>	<b>1405</b>	<b>860</b>	<b>1245</b>
<b>C</b>	<b>430</b>	<b>625</b>	<b>430</b>	<b>625</b>	<b>375</b>	<b>540</b>	<b>330</b>	<b>480</b>
<b>D</b>	<b>280</b>	<b>400</b>	<b>280</b>	<b>400</b>	--	<b>345</b>	--	<b>310</b>

Client: **Relationships built on trust**  
**XIAMEN MIBET NEW ENERGY CO., LTD.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **within Australia**  
 Designed: **AA**

Job: **7258-Tin**  
 Date: **Aug-19**

Checked: **HS**

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

Type of Rail: MC Rail  
 Type of Interface: L Feet Set  
 Solar Panel Dimension: 2.1mx1.05m  
 Terrain category: **2**

Roof Angle ( $\Phi$ ) -  $\Phi < 5^\circ$

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
<b>A</b>	<b>1390</b>	<b>1535</b>	<b>1130</b>	<b>1395</b>	<b>1015</b>	<b>1250</b>	<b>960</b>	<b>1185</b>
<b>B</b>	<b>920</b>	<b>1135</b>	<b>755</b>	<b>925</b>	<b>680</b>	<b>835</b>	<b>640</b>	<b>785</b>
<b>C</b>	<b>355</b>	<b>435</b>	<b>295</b>	<b>360</b>	<b>265</b>	<b>325</b>	<b>245</b>	<b>305</b>
<b>D</b>	--	<b>280</b>	--	--	--	--	--	--

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

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
<b>A</b>	<b>1390</b>	<b>1635</b>	<b>1130</b>	<b>1515</b>	<b>1015</b>	<b>1455</b>	<b>960</b>	<b>1400</b>
<b>B</b>	<b>920</b>	<b>1340</b>	<b>755</b>	<b>1090</b>	<b>680</b>	<b>985</b>	<b>640</b>	<b>925</b>
<b>C</b>	<b>355</b>	<b>515</b>	<b>295</b>	<b>420</b>	<b>265</b>	<b>380</b>	<b>245</b>	<b>360</b>
<b>D</b>	--	<b>330</b>	--	<b>270</b>	--	<b>240</b>	--	--

Client: **Relationships built on trust**  
**XIAMEN MIBET NEW ENERGY CO., LTD.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **within Australia**  
 Designed: **AA**

Job: **7258-Tin**  
 Date: **Aug-19**  
 Checked: **HS**

**General Notes**

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

Components	Part Number	Description
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End Clamp Kit(MC)	End Clamp Kit(MC)	as per drawing provided by client
Standard Tile Interface	Standard Tile Interface	as per drawing provided by client
L Feet Set	L Feet Set	as per drawing provided by client

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

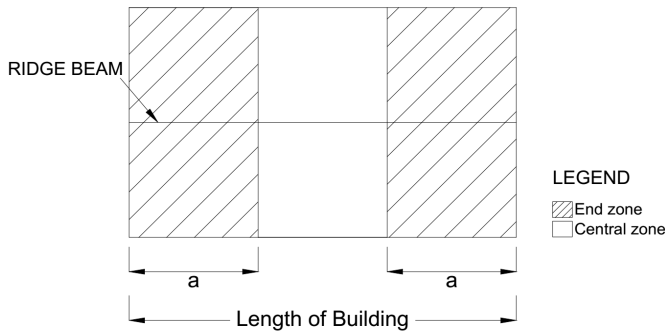
Note 3 Recommended screws

Metal Purlins/Battens	Fasteners to use
1.9 mm	M6-11 TPI RoofZips or 14g-10 TPI Teks screws
2.4 mm and Above	14g-10 TPI Teks screws
Timber Purlins/Battens	Fasteners to use
Softwood / Hardwood (35mm embedment and above)	14g-10 TPI T17 screws

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.



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.

