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Our Ref: 5172/JZ

5 June 2018

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

PV Array Frame Engineering Certification

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 **1670mm x 1000mm**
- Weight of the PV panel and array frame to be 15 kg/m²
- Rails to be **MC Rails**
- Refer to Note 1 for the assessed components and test reports provided

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- The spacings are determined based on fixings into minimum 1.9BMT steel or JD4 seasoned timber
- 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 array to be done in accordance with the PV installation manual
- The certification **excludes** assessment of roof structure and PV panels

Refer to attached summary table for interface spacing

NOTES:

- **The recommended spacing nominated in this certification is based on the capacity of the array frame, not the roof structure and PV panel. 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 **John Zhang** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles. This certificate is only valid till 30/06/2020. Gamcorp should be contacted for future validation.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd



Jianzeng Geng

Principal Engineer

MIEAust CPEng NER 3108316

NT Registration: 239858ES

QLD Registration: 18455

VIC Registration: EC 39483

TAS Registration: CC7263

Structural Design Documentation

**MRac L Feet System on Tin Roof
Interface Spacing Table
According to AS/NZS 1170.2-2011(R2016)
with MC Rail
within Australia
Terrain Category 2 & 3**

For: XIAMEN MIBET NEW ENERGY CO.LTD

Job Number: 5172
Date: 22 May 2018



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ISO 9001:2008 Registered Firm
Certificate No: AU1222

Job No: 5172

Client: XIAMEN MIBET NEW ENERGY CO.LTD

Project: MRac L Feet System on Tin Roof

Address: within Australia

Australian Standards

- AS/NZS 1170 – Structural Design Actions
 - Part 0 -2002 – General Principles
 - Part 1 -2002 – Permanent imposed and other actions
 - Part 2 -2011(R2016) – Wind Actions
- AS 4055 -2012 – Wind Loads for Housing
- AS/NZS 1664 -1997 – Aluminium Structures
- AS 4100 -1998(R2016) – Steel Structures
- AS/NZS 4600 -2005 – Cold-Formed Steel Structures

Wind Terrain Category: WTC 2 & 3

Designed: JZ

Date: May-18

Client: **XIAMEN MIBET NEW ENERGY CO.LTD**
 Project: **MRac L Feet System on Tin Roof**
 Address: **within Australia**
 Designed: **JZ**

Job: **5172**
 Date: **May-18**
 Checked: **JG**

MRac L Feet System on Tin Roof

Type of Rail: MC Rail
 Type of Interface: L Feet Set
 Solar Panel Dimension: 1.67m x 1.0m
Terrain category: 3

Roof Angle (Φ) - $0^\circ \leq \Phi < 5^\circ$

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
A	1677	1811	1590	1713	1526	1642		
B	1412	1687	1216	1498	1083	1331		
C	544	668	470	576	420	514		
D	350	428	303	370	271	331		

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

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
A	1677	1929	1590	1821	1526	1744		
B	1412	1817	1216	1747	1083	1572		
C	544	787	470	678	420	604		
D	350	502	303	434	271	388		

D.W & U.W - Downwind and Upwind refer to note 3.

Client: **XIAMEN MIBET NEW ENERGY CO.LTD**
 Project: **MRac L Feet System on Tin Roof**
 Address: **within Australia**
 Designed: **JZ**

Job: **5172**
 Date: **May-18**
 Checked: **JG**

MRac L Feet System on Tin Roof

Type of Rail MC Rail
 Type of Interface L Feet Set
 Solar Panel Dimension 1.67m x 1.0m
Terrain category 2

Roof Angle (Φ) - $0^\circ \leq \Phi < 5^\circ$

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1423	1567		1282	1510		1207	1479
B	950	1167		858	1052		809	991
C	369	452		334	408		315	385
D	239	291		216	264		204	249

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

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1423	1662		1282	1601		1207	1567
B	950	1376		858	1239		809	1167
C	369	531		334	479		315	452
D	239	341		216	309		204	291

D.W & U.W - Downwind and Upwind refer to note 3.

Client: **XIAMEN MIBET NEW ENERGY CO.LTD**
 Project: **MRac L Feet System on Tin Roof**
 Address: **within Australia**
 Designed: **JZ**

Job: **5172**
 Date: **May-18**
 Checked: **JG**

General Notes

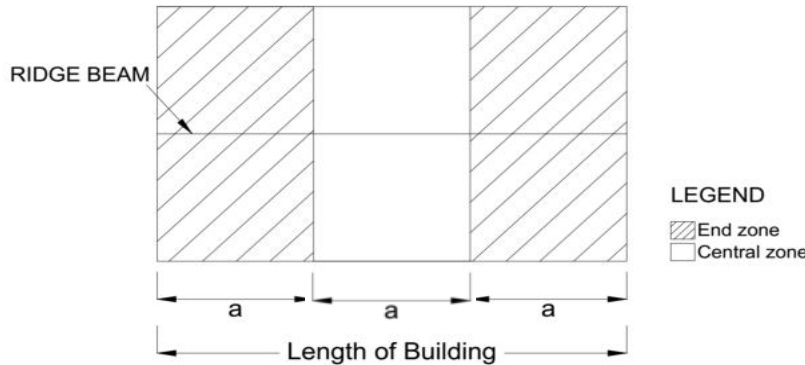
Note 1 Following components are satisfied to use according to AS/NZS 1170.2-2011(R2016)

Components	Part Number	Description
MC Rail	MC Rail	as per drawing provided by XIAMEN MIBET NEW ENERGY CO.LTD
Splice for MC Rail	Splice for MC Rail	as per drawing provided by XIAMEN MIBET NEW ENERGY CO.LTD
Inter Clamp Kit (MC)	Inter Clamp Kit (MC)	as per drawing provided by XIAMEN MIBET NEW ENERGY CO.LTD
End Clamp Kit(MC)	End Clamp Kit(MC)	as per drawing provided by XIAMEN MIBET NEW ENERGY CO.LTD
Standard Tile Interface	Standard Tile Interface	as per drawing provided by XIAMEN MIBET NEW ENERGY CO.LTD
L Feet Set	L Feet Set	as per drawing provided by XIAMEN MIBET NEW ENERGY CO.LTD

Note 2 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 obstruction per obstructions per hectare.

Terrain category 3(TC3) refers to numerous closely spaced obstructions having heights generally from 3 m to 10 m. For example suburban housing or light industrial estates. Refer clause 4.2.1 of AS/NZS 1170.2-2011(R2016) for definition of Terrain category 3.

Note 3 For the definition of Downwind, Upwind end and central, refer figure D9 from AS/NZS 1170.2-2011(R2016).



Note 4 Screw embedment is minimum 35 mm into timber.

Note 5 Recommended Screws

Metal Purlin/Batten

Non-cyclonic Region
 Cyclonic Region

Timber Rafter & Purlin/Batten

Softwood and Hardwood (35mm embedment depth or more)

Note: The spacing tables are only applicable to minimum 1.9mm BMT steel purlin and JD4 seasoned timber.

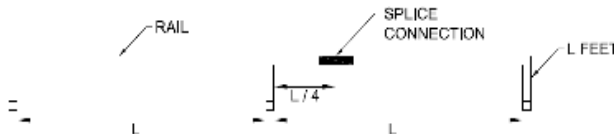
Fasteners to Use

Buildex 14g-10 TPI Tek screws
 Buildex M6 RoofZips screws

Fasteners to Use

Buildex 14g-10 TPI (T17s) screws

Note 6 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 7 Number of Inter Clamp Kit (MC) required per panel

Wind Region	TC1.5	TC2	TC2.5	TC3
A	4	4	4	4
B	4	4	4	4
C	6	6	6	4
D	8	8	8	6

Structural Design Documentation

**MRac Tile Roof System on Tile Roof
Interface Spacing Table
According to AS/NZS 1170.2-2011(R2016)
with MC Rail
within Australia
Terrain Category 2 & 3**

For: XIAMEN MIBET NEW ENERGY CO.LTD

Job Number: 5172
Date: 22 May 2018



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ISO 9001:2008 Registered Firm
Certificate No: AU1222

Job No: 5172

Client: XIAMEN MIBET NEW ENERGY CO.LTD

Project: MRac Tile Roof System on Tile Roof

Address: within Australia

Australian Standards

AS/NZS 1170 – Structural Design Actions

Part 0 -2002 – General Principles

Part 1 -2002 – Permanent imposed and other actions

Part 2 -2011(R2016) – Wind Actions

AS 4055 -2012 – Wind Loads for Housing

AS/NZS 1664 -1997 – Aluminium Structures

AS 4100 -1998(R2016) – Steel Structures

AS/NZS 4600 -2005 – Cold-Formed Steel Structures

Wind Terrain Category:

WTC 2 & 3

Designed: JZ

Date: May-18

Client: **XIAMEN MIBET NEW ENERGY CO.LTD**
 Project: **MRac Tile Roof System on Tile Roof**
 Address: **within Australia**
 Designed: **JZ**

Job: **5172**
 Date: **May-18**
 Checked: **JG**

MRac Tile Roof System on Tile Roof

Type of Rail: MC Rail
 Type of Interface: Standard Tile Interface
 Solar Panel Dimension: 1.67m x 1.0m
 Terrain category: **3**

Roof Angle (Φ) - $0^\circ \leq \Phi < 5^\circ$

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central		
A	987	1242	841	1052	743	927		
B	874	1096	746	931	661	822		
C	586	727	503	622	448	552		
D	443	546	381	469	340	417		

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

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central		
A	987	1501	841	1264	743	1110		
B	874	1318	746	1115	661	981		
C	586	865	503	739	448	654		
D	443	647	381	555	340	493		

D.W & U.W - Downwind and Upwind refer to note 3.

Client: **XIAMEN MIBET NEW ENERGY CO.LTD**
 Project: **MRac Tile Roof System on Tile Roof**
 Address: **within Australia**
 Designed: **JZ**

Job: **5172**
 Date: **May-18**
 Checked: **JG**

MRac Tile Roof System on Tile Roof

Type of Rail: MC Rail
 Type of Interface: Standard Tile Interface
 Solar Panel Dimension: 1.67m x 1.0m
Terrain category: 2

Roof Angle (Φ) - $0^\circ \leq \Phi < 5^\circ$

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
A	647	805	581	721	547	677		
B	576	715	518	641	488	603		
C	392	483	353	435	333	409		
D	298	366	269	330	254	311		

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

Wind Region	Building Height - H (m)							
	H \leq 10		10<H \leq 15		15<H \leq 20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
A	647	960	581	858	547	805		
B	576	850	518	761	488	715		
C	392	571	353	513	333	483		
D	298	431	269	389	254	366		

D.W & U.W - Downwind and Upwind refer to note 3.

Client: **XIAMEN MIBET NEW ENERGY CO.LTD**
 Project: **MRac Tile Roof System on Tile Roof**
 Address: **within Australia**
 Designed: **JZ**

Job: **5172**
 Date: **May-18**
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General Notes

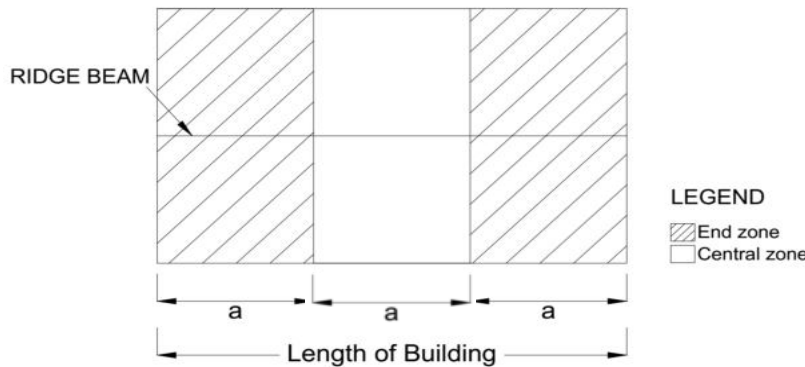
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Note 4 Screw embedment is minimum 35 mm into timber.

Note 5 Recommended Screws

Metal Purlin/Batten

Non-cyclonic Region
 Cyclonic Region

Fasteners to Use

Buildex 14g-10 TPI Tek screws
 Buildex M6 RoofZips screws

Timber Rafter & Purlin/Batten

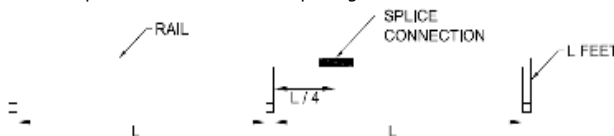
Softwood and Hardwood (35mm embedment depth or more)

Fasteners to Use

Buildex 14g-10 TPI (T17s) screws

Note: The spacing tables are only applicable to minimum 1.9mm BMT steel purlin and JD4 seasoned timber.

Note 6 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 7 Number of Inter Clamp Kit (MC) required per panel

Wind Region	TC1.5	TC2	TC2.5	TC3
A	4	4	4	4
B	4	4	4	4
C	6	6	6	4
D	8	8	8	6