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**SOLAR PV ROOF-MOUNT RACKING FRAME
ENGINEERING CERTIFICATE**

GOOMAX FLUSH-MOUNT SYSTEM WITH ROOF CLAMPS

Prepared for:

Xiamen Goomax Energy Technology Co., Ltd.

Suite 905, Jordan Building A, High-tech Park, Huli District

Xiamen, China

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Ref: E20100154

OVERVIEW

This structural engineering certificate is issued for Goomax Roof Flush-mount racking system with Roof Clamp fixings, which has been assessed against relevant Australian Standards and regulations. The assessment is carried out based on sound engineering methodologies. Assessment specifications and findings are given in the following sections.

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 1664:1997 – Aluminum Structures

ASSESSED PV RACKING FRAME COMPONENTS

The following products by Xiamen Goomax Energy Technology Co., Ltd. are assessed against relevant Australian Standards and building regulations based on the specified conditions.

Assessed Components	Component Number	Material
Goomax Rail 1	GM-R56	AL 6005-T5
Goomax Rail 2	GM-R69	AL 6005-T5
Goomax Rail 3	GM-R01-Light	AL 6005-T5
Goomax Rail Joiner 1	GM-RS-51-AZ	AL 6005-T5
Goomax Rail Joiner 2	GM-RS-51-AZ-1	AL 6005-T5
Goomax Rail Joiner 3	GM-RS-56-AZ	AL6005-T5
Goomax Rail Connector	GM-BR-02-AZ	AL 6005-T5
Goomax Middle Panel Clamp	GM-MC-30/35/40/45/50-AZ	AL 6005-T5
Goomax End Panel Clamp	GM-EC-30/35/40/45/50-AZ	AL 6005-T5
Goomax Adjustable Middle Panel Clamp	GM-MC-30(35)-AZ, GM-MC-30(40)-AZ, GM-MC-35(40)-AZ, GM-MC-35(40)-AZ-1, GM-MC-35(40)-AZ-2, GM-MC-35/50-D	AL 6005-T5
Goomax Adjustable End Panel Clamp	GM-EC-30(35)-AZ, GM-EC-30(40)-AZ, GM-EC-35(40)-AZ, GM-EC-35/50-D	AL 6005-T5
Goomax Thin Film Panel Middle Clamp	GM-MC-60-TF2-AZ	AL 6005-T5
Goomax Thin Film Panel End Clamp	GM-EC-60-TF2-AZ	AL 6005-T5
Goomax T-nut	GM-BN-25-AZ	AL 6005-T5

Goomax Clamp 1	GM-MRH-06-AZ	AL 6005-T5
Goomax Clamp 2	GM-MRH-07-AZ, GM-MRH-07L-AZ	AL 6005-T5
Goomax Clamp 3	GM-MRH-18-AZ	AL 6005-T5
Goomax Clamp 4	GM-MRH-19-AZ	AL 6005-T5
Goomax Clamp 5	GM-MRH-20-AZ	AL 6005-T5
Goomax Clamp 6	GM-MRH-T4-AZ	AL 6005-T5
Other Required but Non-structural Components	GM-E-EL-AZ, GM-EK-AZ, GM-SL-XJ-AZ, GM-XJ-AZ, GM-E-EL-12, GM-CT-AZ	SS 304

ASSESSMENT CONDITIONS

- Solar PV system design life of 25 years
- Wind region A, B, C, D
- Terrain category 2 & 3
- Ultimate wind recurrence interval of 200 years
- Maximum average roof height of 20m
- Maximum panel tilt angle to roof surface is 30°
- Solar PV panel assessed: 2250mm x 1200mm
- Self-weight of solar PV panel and racking frame is 0.15kPa-0.19kPa
- Solar PV panel is supported by 2 rails minimum
- The clamps capacities are taken from testing report No.20-0948 by Melbourne Testing Services Pty Ltd, dated 15 Oct 2020
- The clamps must mount over roof purlins
- The clamps must not mount on lapped roof sheeting ribs
- Product details are taken from the drawing set provided by Xiamen Goomax Energy Technology Co., Ltd. as listed in the above component table
- Installation to be carried out strictly in accordance with the manufacturer's installation guidelines

IMPORTANT NOTES

- ***This certification is issued based on assessments of solar PV racking frame system and its fixing connection to building roof. It does not take the structural capacity of building structure and solar PV panel into account because of the nature of generic application. The installer must choose the fixing spacing using the given spacing as references only.***
- ***The attached spacing tables must be read in conjunction with foot notes and general notes.***
- ***The non-structural components are only certified structurally using the deem-to-comply method as they do not contribute to the system's structural capacity.***
- ***This certification shall be reviewed and revalidated by the structural engineer in every two years from the date of issue.***



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CONCLUSION

The above-mentioned solar PV roof-mount racking frame system by Xiamen Goomax Energy Technology Co., Ltd. is found structurally sound against relevant Australian Standards given installation fixing spacing as per the attached tables. Installation shall be conducted following the manufacturer's guidelines.

Certified by:

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MIEAust, NER, RPEQ, RBP

Interface Spacing Table for Terrain Category 3 (Unit: mm)							
Wind Region	Roof Height & Pitch Roof Zone	H ≤ 10m		10m < H ≤ 15m		15m < H ≤ 20m	
		0° ≤ Φ < 5°	5° ≤ Φ ≤ 30°	0° ≤ Φ < 5°	5° ≤ Φ ≤ 30°	0° ≤ Φ < 5°	5° ≤ Φ ≤ 30°
A	End Zone	1041	1041	891	891	791	791
	Central Zone	1296	1549	1106	1318	979	1164
B	End Zone	686	686	591	591	526	526
	Central Zone	847	1004	728	861	647	764
C	End Zone	441	441	381	381	340	340
	Central Zone	541	638	467	549	416	489
D	End Zone	283	283	245	245	219*	219*
	Central Zone	346	407	300	352	268	314

NOTES:

- The interface spacings are applicable to all nominated roof clamps except GM-MRH-18-AZ. Reduce the spacing by 34% for GM-MRH-18-AZ.
- * denotes the situations where the wind load is more than 5KPa and the installation safety is compromised.
- Definition of Terrain Category is given in General Note 1.
- Notion of Roof Zone is given in General Note 2.
- Roof pitch angle is given in reference to horizontal.
- The spacing table is based on the fixing condition specified in General Note 3.

Interface Spacing Table for Terrain Category 2 (Unit: mm)							
Wind Region	Roof Height & Pitch Roof Zone	H ≤ 10m		10m < H ≤ 15m		15m < H ≤ 20m	
		0° ≤ Φ < 5°	5° ≤ Φ ≤ 30°	0° ≤ Φ < 5°	5° ≤ Φ ≤ 30°	0° ≤ Φ < 5°	5° ≤ Φ ≤ 30°
A	End Zone	692	692	623	623	587	587
	Central Zone	854	1013	768	909	722	854
B	End Zone	462	462	417	417	393	393
	Central Zone	567	668	511	602	482	567
C	End Zone	299	299	270	270	255	255
	Central Zone	366	430	330	388	312	366
D	End Zone	193*	193*	175*	175*	165*	165*
	Central Zone	236*	276	213*	250	201*	236*

NOTES:

- The interface spacings are applicable to all nominated roof clamps except GM-MRH-18-AZ. Reduce the spacing by 34% for GM-MRH-18-AZ.
- * denotes the situations where the wind load is more than 5KPa and the installation safety is compromised.
- Definition of Terrain Category is given in General Note 1.
- Notion of Roof Zone is given in General Note 2.
- Roof pitch angle is given in reference to horizontal.
- The spacing table is based on the fixing condition specified in General Note 3.

General Notes

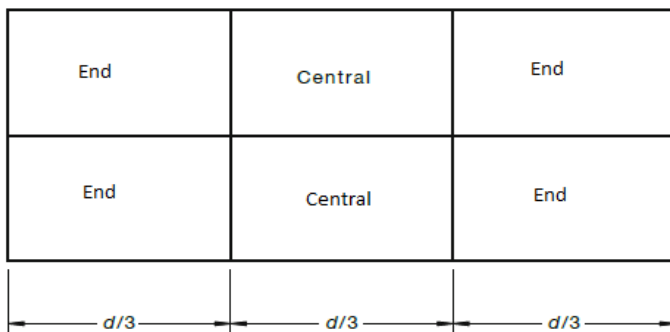
Note 1 Terrain Category 3 (TC 3) denotes terrain with numerous closely spaced obstructions having heights generally from 3m to 10m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare.

Terrain Category 2 (TC 2) denotes open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5m to 5m, with no more than two obstructions per hectare.

Refer to AS/NZS1170.2-2011(R2016) Chapter 4.2.1 for Terrain Category definitions.

Note 2 A roof is divided into 3 equal length zones about the long side of the building. The zone boundary lines are perpendicular to the building's length axis line and roof ridge line and parallel to the roof end edge line. The two zones close to the two building ends are defined as End Zone. The middle zone is defined as Central Zone.

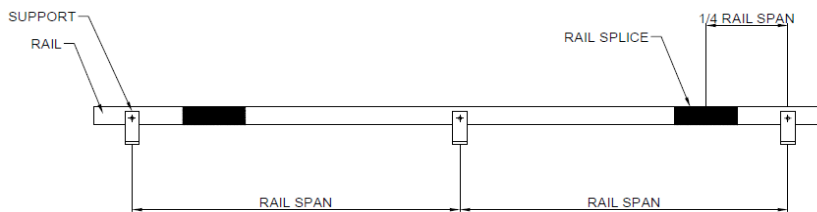
Refer to AS/NZS1170.2-2011(R2016) Appendix D6 for Roof Zone notion.



Note 3 The clamps capacities are taken from testing report No.20-0948 by Melbourne Testing Services Pty Ltd, dated 15 Oct 2020. Tests were carried out using the following roof sheeting products. Other roof sheeting products are not covered in this assessment.

- | | |
|--|----------------------|
| GM-MRH-07/07L-AZ, GM-MRH-19-AZ, GM-MRH-20-AZ | Lysaght Kliplik 700 |
| GM-MRH-06-AZ, GM-MRH-19-AZ, GM-MRH-20-AZ | Lysaght Kliplik 406 |
| GM-MRH-18-AZ | Lysaght Longline 305 |
| GM-MRH-T4-AZ | Lysaght Trimdek |

Note 4 To ensure the given fixing spacing tables are valid, rail splice connectors must not be installed at the support point or at the middle span point between two adjacent supports. It is recommended to install the connector at 1/4 span points from the supports.



Note 5 Number of panel clamps required per panel for installation:

		TC3			TC2		
		H≤10m	10m<H≤15m	15m<H≤20m	H≤10m	10m<H≤15m	15m<H≤20m
Region A	End	4	4	4	4	4	4
	Central	4	4	4	4	4	4
Region B	End	4	4	4	4	4	6
	Central	4	4	4	4	4	4
Region C	End	4	6	6	6	8	8
	Central	4	4	4	6	6	6
Region D	End	6	8	8	10	10	10
	Central	6	6	8	8	8	10