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QAS INTERNATIONAL
ISO 9001:2008
REGISTERED FIRM
Certificate No. AU1222

Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
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Our Ref: 23939

18 February 2013

Clenergy Australia
18/20 Duerdin Street
Clayton North VIC 3168

Array Frame Engineering Certificate

Installation of PV-ezRack® SolarRoof Adjustable Tilt Legs

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of PV-eZRack® SolarRoof Adjustable Tilt Legs installation within Australia. The design check has been based on the information in the PV-ezRack SolarRoof Adjustable Tilt Legs_Code Compilant Installation Guide_AU_V3.2 and schematic drawings of the system components by Clenergy (Xiamen) Technology Co. Ltd, provided by Clenergy Australia.

We find the Installation of PV-ezRack® SolarRoof Adjustable Tilt Legs installation to be structurally sufficient for Australian use based on the following conditions:

- Wind Loads to AS/NZ1170.2:2011 Admt 2-2012
- Wind Region A, B, C, D
- Wind Terrain Category 2 & 3
- Wind average recurrence interval of 100 years
- Maximum Building height 20 m
- Max. Solar Panel Dimensions 2000x1000

Refer to attached summary table for interface spacing.

Construction is to be carried out strictly in accordance with the manufacturers instructions. This work was designed in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd

Martin Gamble
Managing Director
MAICD

Milan Bjelobrk
MIEAust, CPEng, NPER 2210984,
RPEQ 12090, RBP EC-38461, NT BPB 139671ES

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Structural Design Documentation

PV-ezRack® SolarRoof Adjustable Tilt Legs Spacing Table According to AS 1170.2011 for all wind region Within Australia Terrain Category 2

For: Clenergy Australia

Job Number: 23939
Date: 18 February 2013

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Certificate No: AU1222

Job No: **23939**
Client: **Clenergy Australia**
Project: **PV-ezRack® SolarRoof Adjustable Tilt Legs Spacing Table**

Address: **Within Australia**

Australian Standards

AS 1170. 2011 – Structural Design Actions
- Part 0 – General Principles
- Part 1 – Permanent imposed and other actions
- Part 2 – Wind Actions
- Part 3 – Snow and Ice Actions

AS 1252 – High Strength Structural Bolting
AS 3600 – Concrete Structures
AS 4055 – Wind Loads for Housing
AS 4100 – Steel Structures
AS 4600 – Cold-Formed Steel Structures

Wind Terrain Category: WTC 2

Designed: **M.S**

Date: **Feb-13**

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Client: **Clenergy Australia** Job: **23939**
Project: **PV-ezRack® SolarRoof Adjust. Tilt Legs Spacing Table** Date: **Feb-13**
Address: **Within Australia**
Designed: **M.S** REV K

PV-ezRack® SolarRoof Frame spacing Table for Adjustable Tilt Leg

Type of Rail ER-R-ST
Solar Panel Dimension 2mx1m
Terrain category 2

Type of Interface 10°-15° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1575**	**1825**	**1500**	**1700**	**1450**	**1650**	**1425**	**1625**		
B	**1550**	**1775**	**1475**	**1675**	**1425**	**1625**	**1375**	**1600**		
C	**1300**	**1600**	**1075**	**1500**	**950**	**1425**	**900**	**1375**		
D	**825**	**1275**	**675**	**1050**	**625**	**950**	**575**	**900**		

Type of Interface 15°-30° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1325**	**1500**	**1025**	**1425**	**1100**	**1375**	**1050**	**1350**		
B	**1075**	**1475**	**875**	**1350**	**800**	**1225**	**750**	**1150**		
C	**700**	**1075**	**575**	**875**	**525**	**800**	**500**	**750**		
D	**450**	**675**	**375**	**575**	**325**	**500**	**325**	**475**		

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1225**	**1425**	**1000**	**1350**	**900**	**1300**	**850**	**1275**		
B	**875**	**1350**	**700**	**1100**	**650**	**975**	**600**	**925**		
C	**575**	**875**	**475**	**700**	**425**	**650**	**400**	**600**		
D	**375**	**550**	**300**	**450**	**275**	**425**	**250**	**400**		

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Client: **Clenergy Australia** Job: **23939**
Project: **PV-ezRack® SolarRoof Adjust. Tilt Legs Spacing Table** Date: **Feb-13**
Address: **Within Australia**
Designed: **M.S** REV K

PV-ezRack® SolarRoof Frame spacing Table for Adjustable Reverse Tilt Leg

Type of Rail ER-R-ST
Solar Panel Dimension 2mx1m
Terrain category 2

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1200**	**1400**	**1000**	**1350**	**900**	**1300**	**850**	**1275**		
B	**875**	**1325**	**700**	**1100**	**650**	**975**	**600**	**925**		
C	**575**	**875**	**475**	**700**	**425**	**650**	**400**	**600**		
D	**375**	**550**	**300**	**450**	**275**	**425**	**250**	**400**		

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤20°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1325**	**1500**	**1225**	**1425**	**1100**	**1375**	**1025**	**1350**		
B	**1075**	**1475**	**875**	**1350**	**800**	**1225**	**750**	**1150**		
C	**700**	**1075**	**575**	**875**	**525**	**800**	**500**	**750**		
D	**450**	**675**	**375**	**575**	**325**	**500**	**325**	**475**		

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤30°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1575**	**1800**	**1475**	**1675**	**1450**	**1625**	**1425**	**1600**		
B	**1550**	**1750**	**1475**	**1650**	**1400**	**1600**	**1375**	**1575**		
C	**1300**	**1575**	**1050**	**1475**	**950**	**1400**	**900**	**1375**		
D	**825**	**1275**	**675**	**1025**	**625**	**925**	**575**	**875**		

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Client: **Clenergy Australia** Job: **23939**
Project: **PV-ezRack® SolarRoof Adjust. Tilt Legs Spacing Table** Date: **Feb-13**
Address: **Within Australia**
Designed: **M.S** REV K

General Notes

Note 1 Screws minimum embedment length into timber 35 mm

Note 2 Recommended screws

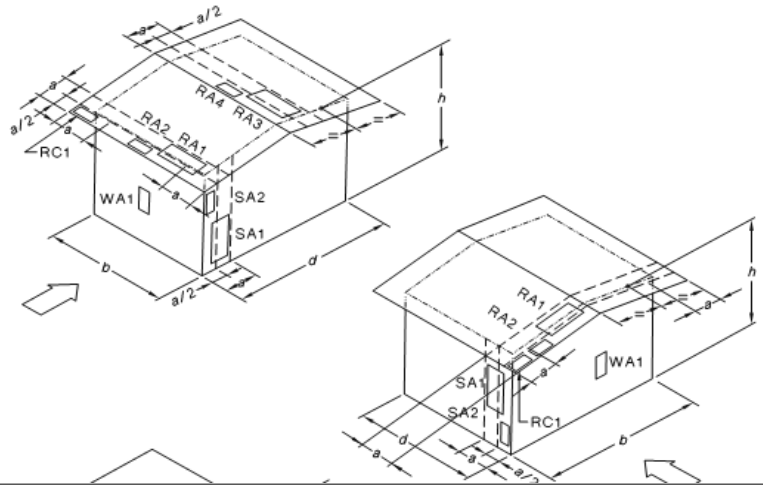
Metal Purlins/Battens	**Fasteners to use**
0.55 mm – 1.5 mm	M6-11 TPI RoofZips
1.9 mm	M6-11 TPI RoofZips OR 12g-14 TPI Teks screws
2.4 mm and Above	12g-24 TPI Teks screws
Wood purlins and Rafter	**Fasteners to use**
Pine and Hardwood (35mm embedment and above)	M6 (12g) with 10 TPI

Note 3 Following components are satisfied to use according to AS1170.2011

Components	**Part Number**	**Description**
MT-base Rail	ER-R-MT2560	MT-Rail 2560 mm
Corrugated Adapter	ER-AD-C110	Adapter for corrugated iron roof
Tilt Legs	ER-TL-30	Tilt Legs Kit fixed 30° (front and back leg)
Hanger Bolt	ER-HB-200/WOMP	Hanger Bolt without mounting plate M10x200. Fixed to timber purlin only
Roof extender	ER-RE-200	Roof Hook Extender 200mm

Note 4 For adjustable tilting leg,
Maximum back leg angle to horizontal - 90°
Minimum back leg angle to horizontal - 30°

Note 5 Refer Figure 5.3 of AS/NZS 1170.2:2012 for definition of roof edge and middle zones.



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Structural Design Documentation

PV-ezRack® SolarRoof Adjustable Tilt Legs Spacing Table According to AS 1170.2011 for all wind region Within Australia Terrain Category 3

For: Clenergy Australia

Job Number: 23939
Date: 18 February 2013

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Certificate No: AU1222

Job No: **23939**
Client: **Clenergy Australia**
Project: **PV-ezRack® SolarRoof Adjustable Tilt Legs Spacing Table**

Address: **Within Australia**

Australian Standards

AS 1170. 2011 – Structural Design Actions
- Part 0 – General Principles
- Part 1 – Permanent imposed and other actions
- Part 2 – Wind Actions
- Part 3 – Snow and Ice Actions

AS 1252 – High Strength Structural Bolting
AS 3600 – Concrete Structures
AS 4055 – Wind Loads for Housing
AS 4100 – Steel Structures
AS 4600 – Cold-Formed Steel Structures

Wind Terrain Category: WTC 3

Designed: **M.S**

Date: **Feb-13**

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Client: **Clenergy Australia** Job: **23939**
Project: **PV-ezRack® SolarRoof Adjust. Tilt Legs Spacing Table** Date: **Feb-13**
Address: **Within Australia**
Designed: **M.S** REV K

PV-ezRack® SolarRoof Frame spacing Table for Adjustable Tilt Leg

Type of Rail ER-R-ST
Solar Panel Dimension 2mx1m
Terrain category 3

Type of Interface 10°-15° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1675**	**1950**	**1675**	**1950**	**1600**	**1850**	**1550**	**1775**		
B	**1650**	**1900**	**1650**	**1900**	**1575**	**1800**	**1525**	**1750**		
C	**1475**	**1700**	**1475**	**1700**	**1350**	**1625**	**1225**	**1550**		
D	**1000**	**1450**	**1000**	**1450**	**875**	**1350**	**775**	**1200**		

Type of Interface 15°-30° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1400**	**1575**	**1400**	**1575**	**1350**	**1525**	**1300**	**1475**		
B	**1300**	**1550**	**1300**	**1550**	**1125**	**1500**	**1450**	**1000**		
C	**850**	**1300**	**850**	**1300**	**725**	**1125**	**650**	**1000**		
D	**550**	**825**	**550**	**825**	**475**	**725**	**425**	**650**		

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1325**	**1500**	**1325**	**1500**	**1275**	**1425**	**1125**	**1375**		
B	**1050**	**1475**	**1050**	**1475**	**900**	**1375**	**800**	**1250**		
C	**675**	**1050**	**675**	**1050**	**600**	**900**	**525**	**800**		
D	**450**	**675**	**450**	**675**	**375**	**575**	**350**	**525**		

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Client: **Clenergy Australia** Job: **23939**
Project: **PV-ezRack® SolarRoof Adjust. Tilt Legs Spacing Table** Date: **Feb-13**
Address: **Within Australia**
Designed: **M.S** REV K

PV-ezRack® SolarRoof Frame spacing Table for Adjustable Reverse Tilt Leg

Type of Rail ER-R-ST
Solar Panel Dimension 2mx1m
Terrain category 3

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤10°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1325**	**1500**	**1325**	**1500**	**1275**	**1425**	**1125**	**1375**		
B	**1050**	**1475**	**1050**	**1475**	**900**	**1375**	**800**	**1250**		
C	**675**	**1050**	**675**	**1050**	**600**	**900**	**525**	**800**		
D	**450**	**675**	**450**	**675**	**375**	**575**	**350**	**525**		

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤20°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1400**	**1575**	**1400**	**1575**	**1350**	**1525**	**1300**	**1475**		
B	**1300**	**1550**	**1300**	**1550**	**1125**	**1500**	**1000**	**1450**		
C	**850**	**1300**	**850**	**1300**	**725**	**1125**	**650**	**1000**		
D	**550**	**825**	**550**	**825**	**475**	**725**	**425**	**650**		

Type of Interface 30°-60° Adjustable Tilt Leg
Roof Angle (Φ) – ≤30°

Wind Region	Building Height – H (m)									
	H≤5		5<H≤10		10<H≤15		15<H≤20			
	Edge	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**	**Edge**	**Middle**		
A	**1675**	**1900**	**1675**	**1900**	**1600**	**1825**	**1550**	**1750**		
B	**1625**	**1875**	**1625**	**1875**	**1575**	**1775**	**1525**	**1725**		
C	**1450**	**1675**	**1450**	**1675**	**1350**	**1600**	**1200**	**1550**		
D	**1000**	**1450**	**1000**	**1450**	**875**	**1325**	**775**	**1175**		

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Client: **Clenergy Australia** Job: **23939**
Project: **PV-ezRack® SolarRoof Adjust. Tilt Legs Spacing Table** Date: **Feb-13**
Address: **Within Australia**
Designed: **M.S** REV K

General Notes

Note 1 Screws minimum embedment length into timber 35 mm

Note 2 Recommended screws

Metal Purlins/Battens	**Fasteners to use**
0.55 mm – 1.5 mm	M6-11 TPI RoofZips
1.9 mm	M6-11 TPI RoofZips OR 12g-14 TPI Teks screws
2.4 mm and Above	12g-24 TPI Teks screws
Wood purlins and Rafter	**Fasteners to use**
Pine and Hardwood (35mm embedment and above)	M6 (12g) with 10 TPI

Note 3 Following components are satisfied to use according to AS1170.2011

Components	**Part Number**	**Description**
MT-base Rail	ER-R-MT2560	MT-Rail 2560 mm
Corrugated Adapter	ER-AD-C110	Adapter for corrugated iron roof
Tilt Legs	ER-TL-30	Tilt Legs Kit fixed 30° (front and back leg)
Hanger Bolt	ER-HB-200/WOMP	Hanger Bolt without mounting plate M10x200. Fixed to timber purlin only
Roof extender	ER-RE-200	Roof Hook Extender 200mm

Note 4 For adjustable tilting leg,
Maximum back leg angle to horizontal - 90°
Minimum back leg angle to horizontal - 30°

Note 5 Refer Figure 5.3 of AS/NZS 1170.2:2012 for definition of roof edge and middle zones.