



innovation in design and construction

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

www.gamcorp.com.au melbourne@gamcorp.com.au

Suite 4, 346 Ferntree Gully Rd, Notting Hill VIC 3168 Tel: 03 9543 2211 Fax: 03 9543 4046



Ref No: 25269

15th May 2014

Clenergy Australia
11/20 Duerdin Street
Clayton North VIC 3168

RE: PV-ezRack Single/Double Adjustable Solar Tripod

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Regulations, have carried out a structural design check of the PV-ezRack solar tripod and solar adjustable tripod for installation within Australia. The design check has been based on the information provided by Clenergy Australia and schematic drawings of the system components by Clenergy International.

Component	Part No
PV-ezRack Support Double Tripod 30 degrees	ER-S-TRI/D30
PV-ezRack Support Single Tripod 30 degrees	ER-S-TRI/S30
PV-ezRack T Rail 50 2560-4200mm	ER-R-T50(2560-4200)
PV-ezRack Solar Single Tripod	ER-S-TRI/S15-30
PV-ezRack Splice for T-50 Rail	ER-SP-T50
PV-ezRack Rail Clamp for T-Rail	ER-RC-T
PV-ezRack Inter Clamp, Standard 28-57mm	ER-IC-ST(28-57)
PV-ezRack End Clamp, Standard 28-57mm	ER-EC-ST(28-57)

We find the PV-ezRack solar tripod and solar adjustable tripod to be structurally sufficient for Australian use based on the following conditions:

- Wind Loads to AS/NZS 1170.2:2011 Amdt 3:2012
- Wind Terrain Categories 2 and 3
- Max building height 20 meters
- Panel size 1.7 x 1 meters
- Wind average recurrence interval of 100 years region A and B.
- Wind average recurrence interval of 500 years region C and D.

Structural Design Documentation

PV-ezRack® Solar Tripod and Solar Adjustable Tripod Spacing Tables According to AS/NZS 1170.2-2011 Amdt 3-2013 Within Australia

Terrain Category 2

For:

Clenergy Australia



Job Number: 25269

Date: 23 April 2013

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Suite 4/ 346 Ferntree Gully Rd
Notting Hill VIC 3168
Tel: 03 9543 2211
Fax: 03 9543 4046
melbourne@gamcorp.com.au
www.gamcorp.com.au

ISO 9001:2008 Registered Firm
Certificate No: AU1222

Job No: 24888

Client: Clenergy Australia

Project: PV-ezRack® Solar Tripod and Solar Adjustable Tripod Interface 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

AS 4600 – Cold-Formed Steel Structures

Wind Terrain Category:

WTC2

Designed: B.C

Date: Apr-13

Client: **Clenergy Australia**
 Project: **PV-ezRack Solar Tripod and Solar Adjustable Tripod**
 Address: **Within Australia**
 Designed: **B.C**

Job: **25269**
 Date: **Sep-13**

PV-ezRack Solar Tripod and Solar Adjustable Tripod

Type of Rail ER-R-T50
 Solar Panel Maximum length 1700 m
 Terrain category 2
 Maximum Roof Pitch 10 Degrees

Roof Angle (Φ) -		Solar panel angle to the horizontal 15-20 degrees				
Wind Region		Building Height - H 10m				
		(m/s)	Single panel		Double panel	
			Edge	Middle	Edge	Middle
A		41	770	880	650	910
B		48	576	744	[480]	700
C		69.4	[271]	410	[230]	345
D		88	[156]	[236]	[140]	[213]

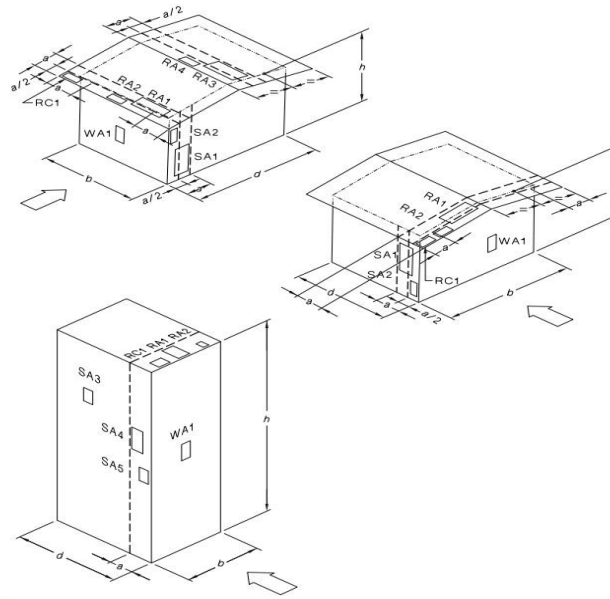
Roof Angle (Φ) -		Solar panel angle to the horizontal 21-25 degrees				
Wind Region		Building Height - H 10m				
		(m/s)	Single panel		Double panel	
			Edge	Middle	Edge	Middle
A		41	715	825	585	845
B		48	528	696	[450]	650
C		69.4	[257]	[381]	[215]	[320]
D		88	[150]	[223]	[125]	[200]

Roof Angle (Φ) -		Solar panel angle to the horizontal 26-30 degrees				
Wind Region		Building Height - H 10m				
		(m/s)	Single panel		Double panel	
			Edge	Middle	Edge	Middle
A		41	660	770	520	780
B		48	[480]	[624]	[400]	[600]
C		69.4	[220]	[340]	[190]	[290]
D		88	[141]	[215]	[120]	[187]

Roof Angle (Φ) -		Solar panel angle to the horizontal 15-20 degrees				
Wind Region	Building Height - H 20m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	676	780	567	820	
B	48	550	728	410	624	
C	69.4	520	770	[200]	[300]	
D	88	[320]	[470]	[120]	[175]	
Roof Angle (Φ) -		Solar panel angle to the horizontal 21-25 degrees				
Wind Region	Building Height - H 20m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	620	728	500	750	
B	48	520	676	385	572	
C	69.4	[250]	[374]	[190]	[275]	
D	88	[300]	[450]	[110]	[165]	
Roof Angle (Φ) -		Solar panel angle to the horizontal 26-30 degrees				
Wind Region	Building Height - H 20m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	570	676	440	690	
B	48	432	570	338	520	
C	69.4	[208]	[322]	[160]	[230]	
D	88	[140]	[220]	[105]	[150]	

General Notes																																																																																			
Note 1	Screws minimum embedment length into timber 35 mm																																																																																		
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Note 3	<p>The spacing above were calculated based on the 1.5 mm purlin. The following reduction factors should apply if the supporting member differ:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5">Number of fasteners per frame – Double Tripod</th> <th rowspan="3"></th> </tr> <tr> <th rowspan="2">Roof Frame Material</th> <th colspan="4">Region</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> </tr> </thead> <tbody> <tr> <td>1.2 Purlin</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td rowspan="5" style="vertical-align: middle;">Reduce spacing by 20%</td> </tr> <tr> <td>1.9 Purlin</td> <td>2</td> <td>3</td> <td>3</td> <td>3</td> </tr> <tr> <td>F7 Pine *</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> <tr> <td>F17 H'wood*</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> <tr> <td colspan="5" style="text-align: center;">* Minimum 35mm embedment For Timber</td> </tr> <tr> <th colspan="5">Number of fasteners per frame – single Tripod</th> <th rowspan="3"></th> </tr> <tr> <th rowspan="2">Roof Frame Material</th> <th colspan="4">Region</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> </tr> <tr> <td>1.2 Purlin</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td rowspan="5" style="vertical-align: middle;">Reduce spacing by 20%</td> </tr> <tr> <td>1.9 Purlin</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>F7 Pine *</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>F17 H'wood*</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td colspan="5" style="text-align: center;">* Minimum 35mm embedment For Timber</td> </tr> </tbody> </table>	Number of fasteners per frame – Double Tripod						Roof Frame Material	Region				A	B	C	D	1.2 Purlin	3	3	3	3	Reduce spacing by 20%	1.9 Purlin	2	3	3	3	F7 Pine *	3	3	3	3	F17 H'wood*	3	3	3	3	* Minimum 35mm embedment For Timber					Number of fasteners per frame – single Tripod						Roof Frame Material	Region				A	B	C	D	1.2 Purlin	2	2	2	2	Reduce spacing by 20%	1.9 Purlin	2	2	2	2	F7 Pine *	2	2	2	2	F17 H'wood*	2	2	2	2	* Minimum 35mm embedment For Timber				
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Note 4	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 hectare.																																																																																		
Note 5	If the angle between the panel to the horizontal exceeds 30 degrees, use roof angle 26-30 degrees.																																																																																		
Note 6	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>FIXING ZONE</p> <p>225 MAX. 900 MIN. 1200 MAX. 225 MAX.</p> </div> <div style="text-align: center;"> <p>FIXING ZONE</p> <p>500 MAX. = = 500 MAX.</p> </div> </div> <p>Note: Fixing should be placed at the centre of the member</p>																																																																																		

Note 7 Figure 1: Shows building dimensions (b,h,d), where the minimum 0.2b, 0.2d, h indicates the edge zone.



- NOTES:
- 1 The value of dimension a is the minimum of $0.2b$, $0.2d$ and h .
 - 2 The side ratio of any local pressure factor area on the roof shall not exceed 4.

Figure 1

Note 8 This certification only applies to the supporting frame. A roof assessment is strongly recommended. Based on the large uplift forces, additional roof supports maybe be required.

Structural Design Documentation

PV-ezRack® Solar Tripod and Solar Adjustable Tripod Spacing Tables According to AS/NZS 1170.2-2011 Amdt 3-2013 Within Australia

Terrain Category 3

For:

Clenergy Australia



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Tel: 03 9543 2211
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melbourne@gamcorp.com.au
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ISO 9001:2008 Registered Firm
Certificate No: AU1222

Job No: 24888

Client: Clenergy Australia

Project: PV-ezRack® Solar Tripod and Solar adjustable Tripod Interface 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

AS 4600 – Cold-Formed Steel Structures

Wind Terrain Category:

WTC3

Designed: B.C

Date: Apr-13

Client: **Clenergy Australia**
 Project: **PV-ezRack Solar Tripod and Solar Adjustable Tripod**
 Address: **Within Australia**
 Designed: **B.C**

Job: **25269**
 Date: **Sep-13**

PV-ezRack Solar Tripod and Solar Adjustable Tripod

Type of Rail ER-R-T50
 Solar Panel Maximum Length 1700m
 Terrain category 3
 Maximum Roof Pitch 10 Degrees

Roof Angle (Φ) – Solar panel angle to the horizontal 15-20 degrees

Wind Region	Building Height – H 10m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	1116	1296	940	1343	
B	48	784	952	630	945	
C	69.4	[410]	550	[365]	545	
D	88	[243]	[368]	[204]	[306]	

Roof Angle (Φ) – Solar panel angle to the horizontal 21-25 degrees

Wind Region	Building Height – H 10m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	1044	1224	869	1264	
B	48	728	896	630	882	
C	69.4	[400]	500	[313]	[485]	
D	88	[230]	[322]	[190]	[285]	

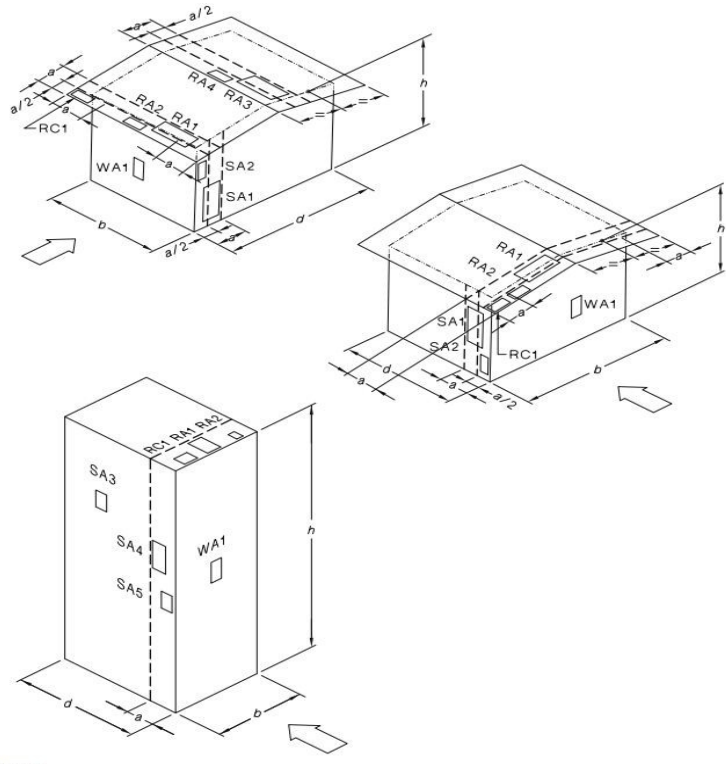
Roof Angle (Φ) – Solar panel angle to the horizontal 26-30 degrees

Wind Region	Building Height – H 10m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	972	1152	790	1185	
B	48	672	840	567	820	
C	69.4	[300]	[450]	[256]	[428]	
D	88	[184]	[322]	[173]	[255]	

		Roof Angle (Φ) – Solar panel angle to the horizontal 15-20 degrees				
Wind Region	Building Height – H 20m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	990	1160	740	1110	
B	48	680	845	540	840	
C	69.4	[340]	[480]	[260]	[390]	
D	88	[176]	[264]	[151]	[230]	
		Roof Angle (Φ) – Solar panel angle to the horizontal 21-25 degrees				
Wind Region	Building Height – H 20m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	925	1092	666	1000	
B	48	630	795	480	780	
C	69.4	[315]	[460]	[244]	[364]	
D	88	[163]	[243]	[142]	[215]	
		Roof Angle (Φ) – Solar panel angle to the horizontal 26-30 degrees				
Wind Region	Building Height – H 20m					
	(m/s)	Single panel		Double panel		
		Edge	Middle	Edge	Middle	
A	41	857	1025	592	692	
B	48	577	738	420	720	
C	69.4	[270]	[415]	[208]	[312]	
D	88	[134]	[226]	[137]	[400]	

General Notes						
Note 1	Screws minimum embedment length into timber 35 mm					
Note 2	Recommended screws					
	Metal Purlins/Battens/Rafters	Fasteners to use				
	1.2 mm – 1.5 mm	M6 RoofZips/14g-10TPI				
	1.9 mm					
	2.4 mm and Above					
	Wood purlins and Rafter					
Pine and Hardwood (35mm embedment and above)						
Note 3	The spacing above were calculated based on the 1.5 mm purlin. The following reduction factors should apply if the supporting member differ:					
	Number of fasteners per frame – Double Panel					
	Roof Frame Material	Region				Reduce spacing by 20%
		A	B	C	D	
	1.2 Purlin	3	3	3	3	
	1.9 Purlin	3	3	3	3	
	F7 Pine *	2	3	3	3	
	F17 H'wood*	3	3	3	3	
	* Minimum 35mm embedment For Timber					
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	Roof Frame Material	Region				Reduce spacing by 20%
		A	B	C	D	
	1.2 Purlin	2	2	2	2	
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	F7 Pine *	2	2	2	2	
	F17 H'wood*	2	2	2	2	
	* Minimum 35mm embedment For Timber					
Note 4	Terrain category 3 (TC3) 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, e.g. suburban housing or light industrial estates.					
Note 5	If the angle between the panel to the horizontal exceeds 30 degrees, use roof angle 26-30 degrees.					
Note 6	FIXING ZONE					
Note: Fixing should be placed at the centre of the member						

Note 7 Figure 1: Shows building dimensions (b,h,d), where the minimum 0.2b,0.2d, h indicates the edge zone.



- NOTES:
- 1 The value of dimension a is the minimum of $0.2b$, $0.2d$ and h .
 - 2 The side ratio of any local pressure factor area on the roof shall not exceed 4.

Figure 1

Note 8 This certification only applies to the supporting frame. A roof assessment is strongly recommended. Based on the large uplift forces, additional roof supports maybe be required.