

Our Ref: 1850

3 September 2015

Xiamen Antai New Energy Tech. Co., Ltd.  
Room 402, No.21 Wanghai Road, Software Park II  
Siming District, Xiamen, China 361008

### Array Frame Engineering Certificate

#### **Installation of flush mounted solar array frame on Tin Roof**

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of the Xiamen Antai New Energy Tech. Co., Ltd. solar flush mount frame for the use within Australia. The design check has been based on the information provided by Xiamen Antai New Energy Tech. Co., Ltd.

We find the Installation of flush mounted solar array frame on tin roof to be structurally sufficient for Australian use based on the following conditions:

- Wind Loads to AS/NZ1170.2:2011 Admt 3-2012
- Wind Region A, B, C, D
- Wind Terrain Category 2 & 3
- Wind average recurrence interval of 100 years region A and B
- Wind average recurrence interval of 500 years region C and D
- PV panels to be installed flat on the roof
- Timber with Joint Type classification J5 and J6 are excluded unless tested for Screw capacity
- Maximum Building height 20 m
- Max. Solar Panel Dimensions 2000×1000
- Regional Wind speed:

Wind Zone	A	B	C	D
Wind Speed (m/s)	41	48	69	88

#### ***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

### **Solar Roof Interface Spacing Table** **According to AS/NZS 1170.2-2011 Amdt 3-2012** **Within Australia** **Terrain Category 2**

For: Xiamen Antai New Energy Tech. Co., Ltd.



Job Number: 1850  
Date: September 3, 2015

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ISO 9001:2008 Registered Firm  
Certificate No: AU1222

**Job No: 1850**

**Client: Xiamen Antai New Energy Tech. Co., Ltd.**

**Project: Solar Roof 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 1664.1 – Aluminium structures - Limit state design

**Wind Terrain Category: WTC2**

**Designed: B.C**

**Date: Sep-15**

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

**Solar Array Interface spacing Table for Tin Roof**

Type of Rail Rail II  
 Type of Interface ATL-FWNY-05  
 Solar Panel Dimension 2mx1m  
 Terrain category 2

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

Wind Region	Building Height - H (m)							
	H $\leq$ 10		10<H $\leq$ 15		15<H $\leq$ 20			
	D.W & U.W	Middle		D.W & U.W	Middle		D.W & U.W	Middle
A	1125	1386		1014	1247		955	1174
B	806	989		728	892		686	841
C	226	276		205	250		193	236
D	142	174		129	157		122	148

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

Wind Region	Building Height - H (m)							
	H $\leq$ 10		10<H $\leq$ 15		15<H $\leq$ 20			
	D.W & U.W	Middle		D.W & U.W	Middle		D.W & U.W	Middle
A	1125	1640		1014	1474		955	1386
B	806	1165		728	1050		686	989
C	226	324		205	293		193	276
D	142	203		129	184		122	174

Note: The above spaces are based on 1.5mm purlin only

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

**Solar Array Interface spacing Table for Tin Roof**

Type of Rail Rail III  
 Type of Interface ATL-FWNY-05  
 Solar Panel Dimension 2mx1m  
 Terrain category 2

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

Wind Region	Building Height - H (m)							
	H≤10				10<H≤15		15<H≤20	
	D.W & U.W	Middle		D.W & U.W	Middle	D.W & U.W	Middle	
A	1125	1386		1014	1247		955	1174
B	806	989		728	892		686	841
C	226	276		205	250		193	236
D	142	174		129	157		122	148

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

Wind Region	Building Height - H (m)							
	H≤10				10<H≤15		15<H≤20	
	D.W & U.W	Middle		D.W & U.W	Middle	D.W & U.W	Middle	
A	1125	1640		1014	1474		955	1386
B	806	1165		728	1050		686	989
C	226	324		205	293		193	276
D	142	203		129	184		122	174

Note: The above spaces are based on 1.5mm purlin only

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

**Solar Array Interface spacing Table for Tin Roof**

Type of Rail Rail IV  
 Type of Interface ATL-FWNY-05  
 Solar Panel Dimension 2mx1m  
 Terrain category 2

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

Wind Region	Building Height – H (m)							
	H≤10			10<H≤15			15<H≤20	
	D.W & U.W	Middle		D.W & U.W	Middle		D.W & U.W	Middle
A	1125	1277		1014	1227		955	1174
B	806	989		728	892		686	841
C	226	276		205	250		193	236
D	142	174		129	157		122	148

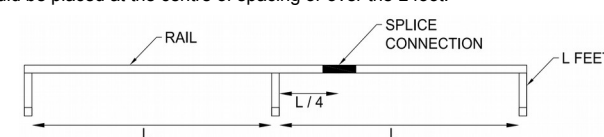
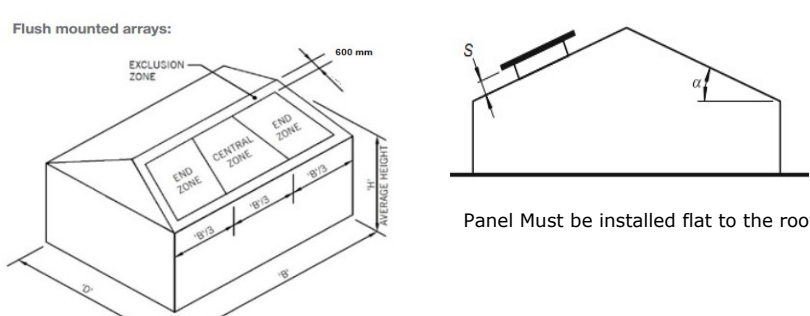
Roof Angle ( $\Phi$ ) –  $5^\circ \leq \Phi \leq 30$

Wind Region	Building Height – H (m)							
	H≤10			10<H≤15			15<H≤20	
	D.W & U.W	Middle		D.W & U.W	Middle		D.W & U.W	Middle
A	1125	1361		1014	1307		955	1277
B	806	1165		728	1050		686	989
C	226	324		205	293		193	276
D	142	203		129	184		122	174

Note: The above spaces are based on 1.5mm purlin only

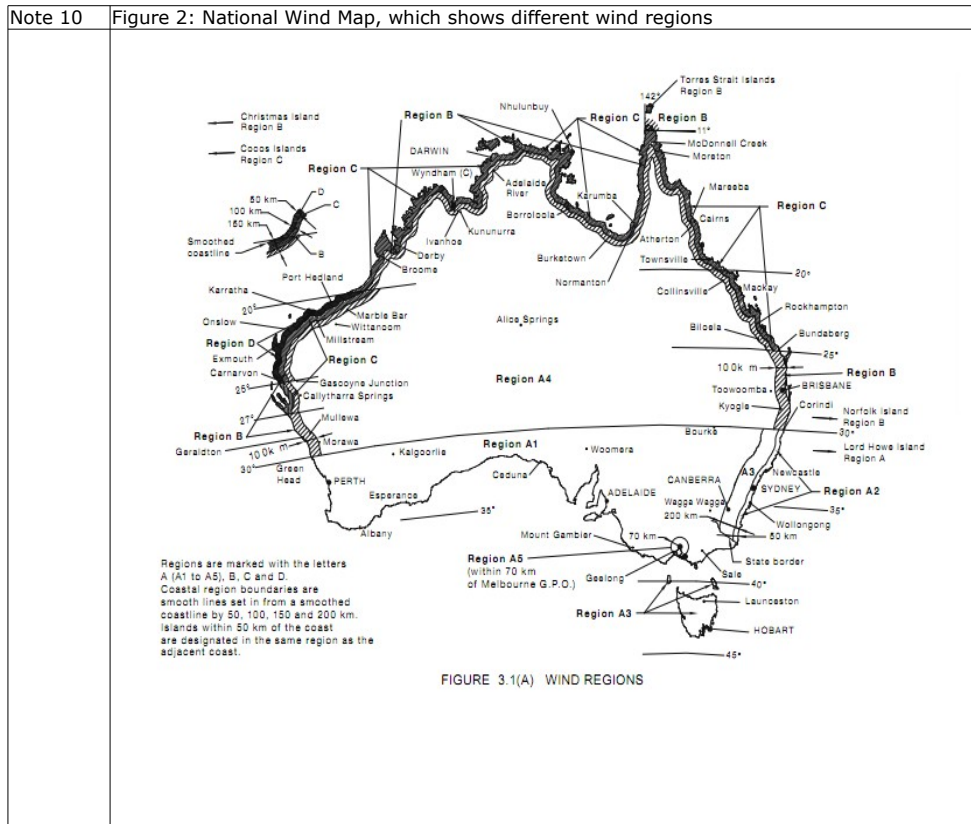
Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

<b>General Notes</b>										
Note 1	All holes must be pre drilled, with minimum screw embedment of 35 mm into timber.									
Note 2	Recommended screws									
	<b>Metal Purlins/Battens</b>			<b>Fasteners to use</b>						
	0.75 mm – 1.2 mm			14g-10 TPI Tek screws						
	1.5 mm			14g-10 TPI Tek screws						
	1.9 mm and Above			14g-10 TPI Tek screws						
Note 3	<b>Wood purlins and Batten</b>			<b>Fasteners to use</b>						
	embedment and above) Unseasoned Pine (Joint Group4)			14g-10 TPI						
Note 3	Above Spacing calculated based on 1.5 mm steel purlin. For material thickness of 0.55 mm to 1.2 mm and timber purlin, spacings should be reduced as follows:									
	<b>Material Thickness</b>									
			<b>Region A</b>		<b>Region B</b>		<b>Region C</b>		<b>Region D</b>	
			<b>Up/Down</b>	<b>Central</b>	<b>Up/Down</b>	<b>Central</b>	<b>Up/Down</b>	<b>Central</b>	<b>Up/Down</b>	<b>Central</b>
	<b>0.75 mm – 1.2 mm</b>		50%	50%	50%	50%	50%	50%	50%	50%
<b>0.55mm Batten</b>		64%	64%	64%	64%	64%	64%	64%	64%	
<b>Timber</b>		12%	12%	12%	12%	12%	12%	12%	12%	
Note 4	Following components are satisfied to use according to AS1170.2011									
	<b>Components</b>		<b>Part Number</b>		<b>Description</b>					
	L foot		ATL-FWNY-05		Tin Roof interface					
	Inter Clamp		ATL-FWNY-09		Internal fixing between rail and Solar Panel					
	End Clamp		ALT-TYN-14		End fixing between rail and Solar Panel					
	Splice		ATL-TYN-21		Rail Connection					
	Antai Rail II		ATL-TYN-28		Aluminium Rail (AL6005-T5)					
	T Module		ATL-TYN-29		Rail to bolt connector					
	Antai Rail III		ATL-TYN-53		Aluminium Rail (AL6005-T5)					
	Antai Rail IV		CG-010		Aluminium Rail (AL6005-T5)					
Note 5	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.									
Note 6	Splice connection must placed quarter length of the spacing of the L foot. No Splice connection should be placed at the centre of spacing or over the L foot.									
										
Note 7	For the definition of Downwind, Upwind end and central, refer attached figure D9 from AS/NZS 1170.2-2011 Amdt 2-2012.									
Note 9	Figure 1: Shows location of the Upwind/Central & Downwind end.									
	 <p>Panel Must be installed flat to the roof</p>									

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**





## Structural Design Documentation

### **Solar Roof Interface Spacing Table** **According to AS/NZS 1170.2-2011 Amdt 3-2012** **Within Australia** **Terrain Category 3**

For: Xiamen Antai New Energy Tech. Co., Ltd.



Job Number: 1850

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**Client: Xiamen Antai New Energy Tech. Co., Ltd.**

**Project: SolarRoof 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 1664.1 – Aluminium structures - Limit state design

**Wind Terrain Category:**

WTC 3

**Designed: B.C**

**Date: Sep-15**

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

**Solar Array Interface spacing Table for Tin Roof**

Type of Rail Rail II  
 Type of Interface ATL-FWNY-05  
 Solar Panel Dimension 2mx1m  
 Terrain category 3

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

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	1684	1780		1446	1680		1284	1586
B	1196	1475		1031	1268		918	1128
C	332	406		287	351		257	314
D	208	254		181	220		162	197

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

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	1684	1820		1446	1790		1284	1750
B	1196	1620		1031	1423		918	1331
C	332	477		287	412		257	368
D	208	297		181	258		162	230

**Note: The above spaces are based on 1.5mm purlin only**

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

**Solar Array Interface spacing Table for Tin Roof**

Type of Rail                      Rail III  
 Type of Interface              ATL-FWNY-05  
 Solar Panel Dimension        2mx1m  
 Terrain category                3

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

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	1650	1750		1446	1660		1284	1586
B	1196	1475		1031	1268		918	1128
C	332	406		287	351		257	314
D	208	254		181	220		162	197

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

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	1673	1853		1446	1772		1284	1750
B	1196	1610		1031	1423		918	1331
C	332	477		287	412		257	368
D	208	297		181	258		162	230

**Note: The above spaces are based on 1.5mm purlin only**

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 Project: **Solar Array Interface Spacing Table**  
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**Solar Array Interface spacing Table for Tin Roof**

Type of Rail Rail IV  
 Type of Interface ATL-FWNY-05  
 Solar Panel Dimension 2mx1m  
 Terrain category 3

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

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central		
A	1375	1493	1297	1407	1240	1344		
B	1196	1407	1031	1268	918	1128		
C	332	406	287	351	257	314		
D	208	254	181	220	162	197		

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

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central		
A	1375	1596	1297	1502	1240	1434		
B	1196	1503	1031	1416	918	1331		
C	332	477	287	412	257	368		
D	208	297	181	258	162	230		

**Note: The above spaces are based on 1.5mm purlin only**

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 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

Job: **1850**  
 Date: **Sep-15**

**General Notes**

Note 1 All holes must be pre drilled, with minimum screw embedment of 35 mm into timber.

Note 2 Recommended screws

Metal Purlins/Battens	Fasteners to use
0.75 mm – 1.2 mm	14g-10 TPI Tek screws
1.5 mm	14g-10 TPI Tek screws
1.9 mm and Above	14g-10 TPI Tek screws
Wood purlins and Batten	Fasteners to use
embedment and above)	
Unseasoned Pine (Joint Group4)	14g-10 TPI

Note 3 Above Spacing calculated based on 1.5 mm steel purlin. For material thickness of 0.55 mm to 1.2 mm and timber purlins, spacings should be reduced as follows,

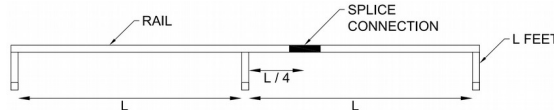
Material Thickness	Region A		Region B		Region C		Region D	
	Up/Down	Central	Up/Down	Central	Up/Down	Central	Up/Down	Central
<b>0.75 mm – 1.2 mm</b>	50%	50%	50%	50%	50%	50%	50%	50%
<b>0.55 mm Batten</b>	64%	64%	64%	64%	64%	64%	64%	64%
<b>Timber</b>	15%	15%	15%	15%	15%	15%	15%	15%

Note 4 Following components are satisfied to use according to AS1170.2011

Components	Part Number	Description
L foot	ATL-FWNY-05	Tin Roof interface
Inter Clamp	ATL-FWNY-09	Internal fixing between rail and Solar Panel
End Clamp	ALT-TYN-14	End fixing between rail and Solar Panel
Splice	ATL-TYN-21	Rail Connection
Antai Rail II	ATL-TYN-28	Aluminium Rail (AL6005-T5)
T Module	ATL-TYN-29	Rail to bolt connector
Antai Rail III	ATL-TYN-53	Aluminium Rail (AL6005-T5)
Antai Rail IV	CG-010	Aluminium Rail (AL6005-T5)

Note 5 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.

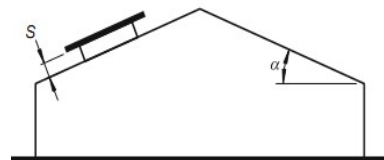
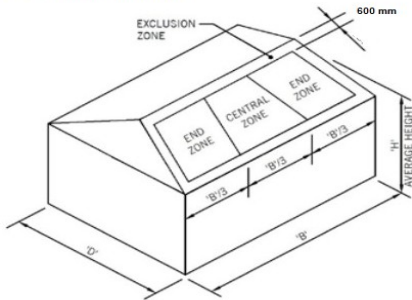
Note 6 Splice connection must placed quarter length of the spacing of the L foot. No Splice connection should be placed at the centre of spacing or over the L foot.



Note 7 For the definition of Downwind, Upwind end and middle, refer attached figure D9 from AS/NZS 1170.2-2011 Amdt 2-2012.

Note 8 Figure 1: Shows location of the Upwind/Central & Downwind end.

Flush mounted arrays:



Panel Must be installed flat to the roof

Client: **Xiamen Antai New Energy Tech. Co., Ltd.**  
 Project: **Solar Array Interface Spacing Table**  
 Address: **Within Australia**  
 Designed: **B.C**

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