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Our Ref: 2242/K.Z

28 July 2016

Xiamen Hopergy Photovoltaic Technology Co. Ltd.  
No.630, Tonghong Road  
Tongan District, Xiamen 361100  
China

### **PV Array Frame Engineering Certification**

#### **Installation of Hopergy Tile Roof Flush Mount Solar System with HOP-SLR02 Rails**

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian and New Zealand Building Regulations, have carried out a structural design check of Hopergy Tile Roof Flush Mount Solar System installation within Australia and New Zealand. The design check has been based on the information in the schematic drawings of the system components and test report provided by Hopergy Australia (IMSOLAR).

We find the Installation of Hopergy Tile Roof Flush Mount Solar System for Australian and New Zealand use to be structurally sufficient based on the following conditions:

- Wind loads to AS/NZ1170.2:2011 Admt 3-2013
- Wind region A, B, C, D, W
- Wind terrain category 2 & 3
- Wind average recurrence interval of 500 years
- Maximum building height 20m
- The PV panel dimensions to be 1640mm x 992mm and 2000mm x 1000mm
- Maximum weight of the PV panel and array frame to be 15 kg/m<sup>2</sup>
- Rails to be HOP-SLR02
- Tile roof interface to be #1 Tile Interface Bracket as per drawing HOP-TRH-1 and test report No.XMIN1603001560ML
- Each PV panel to be installed using 2 rails minimum in all circumstances
- 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.**
- **This is the up-to-date certification. All previous certifications for Hopergy products issued by Gamcorp Pty Ltd are no longer valid.**

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- **If any of the above conditions cannot be met, the structural engineer must be notified immediately.**

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

Yours faithfully,  
Gamcorp (Melbourne) Pty Ltd



Martin Gamble  
Managing Director  
MAICD



Mudi Ariyaratna  
B.Eng(Civil)(Hons)Monash, M.Eng&Mgt, MIEAust,  
CPEng, NPER, RBP EC-39699, RPEQ- 15899



**gamcorp**

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Gamcorp (Melbourne) Pty Ltd  
Consulting Structural & Civil Engineers  
A.C.N 141 076 904  
A.B.N 73 015 060 240

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

## Structural Design Documentation

**Tile Roof Flush Mount Racking System  
Interface Spacing Table  
According to AS/NZS 1170.2-2011 Amdt 3-2013  
with HOP-SLR02 Rails  
within Australia & New Zealand  
Terrain Category 2 & 3**

For: Xiamen Hopergy Photovoltaic  
Technology Co. Ltd.



Job Number: 2242  
Date: 27 July 2016

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ISO 9001:2008 Registered Firm  
Certificate No: AU1222

**Job No: 2242**

**Client: Xiamen Hopergy Photovoltaic Technology Co. Ltd.**

**Project: Flush Mount Interface Spacing Table for Tile Roof**

**Address: within Australia & New Zealand**

**Australian/New Zealand Standards**

AS/NZS 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/NZS 1252 – High Strength Structural Bolting

AS 4055 – Wind Loads for Housing

AS 4100 – Steel Structures

AS/NZS 4600 – Cold-Formed Steel Structures

**Wind Terrain Category:**

WTC 2 & 3

**Designed: K.Z**

**Date: Jul-16**

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**  
 Project: **Flush Mount Interface Spacing Table for Tile Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

Job: **2242**  
 Date: **Jul-16**

Checked: **M.A**

**Flush Mount Interface Spacing Table for Tile Roof**

Type of Rail HOP-SLR02  
 Type of Interface #1 Tile Interface Bracket  
 Solar Panel Dimension 1.64m x 0.99m  
**Terrain category 2**

Roof Angle ( $\Phi$ ) - 5° - 10°

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	1300	1529		1169	1487		1100	1464
B	782	1099		706	989		665	931
C	517	721		467	651		441	614
D	320	443		289	401		273	378
W	991	1401		893	1259		841	1184

Roof Angle ( $\Phi$ ) - 10° - 20°

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	1001	1436		902	1297		849	1219
B	607	865		548	780		517	735
C	403	571		365	516		344	487
D	250	352		226	319		214	301
W	767	1098		692	989		652	931

D.W & U.W - Downwind and Upwind refer to note 6.

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**  
 Project: **Flush Mount Interface Spacing Table for Tile Roof**  
 Address: **within Australia & New Zealand**  
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 Date: **Jul-16**

Checked: **M.A**

Roof Angle ( $\Phi$ ) –		20° - 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	1084	1300	976	1169	919	1100	
B	656	782	592	706	558	665	
C	435	517	393	467	371	441	
D	270	320	244	289	230	273	
W	829	991	748	893	705	841	

  

Roof Angle ( $\Phi$ ) –		30° - 60°					
Wind Region	Building Height – H (m)						
	H≤10		10<H≤15		15<H≤20		
	Intermedi ate	Internal	Intermedi ate	Internal	Intermedia te	Internal	
A	1326	1537	1192	1507	1122	1489	
B	797	1232	719	1108	678	1043	
C	527	806	476	727	449	686	
D	326	495	295	447	278	422	
W	1011	1459	910	1413	857	1328	

D.W & U.W – Downwind and Upwind refer to note 6.

Client: **Xiamen Hopenrgy Photovoltaic Technology Co. Ltd.**  
 Project: **Flush Mount Interface Spacing Table for Tile Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

Job: **2242**  
 Date: **Jul-16**

Checked: **M.A**

**Flush Mount Interface Spacing Table for Tile Roof**

Type of Rail HOP-SLR02  
 Type of Interface #1 Tile Interface Bracket  
 Solar Panel Dimension 1.64m x 0.99m  
**Terrain category 3**

Roof Angle ( $\Phi$ ) - 5° - 10°

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	1553	1705		1492	1635		1447	1584
B	1166	1486		1002	1418		892	1257
C	764	1073		660	924		588	822
D	469	653		406	565		363	504
W	1447	1583		1276	1521		1133	1475

Roof Angle ( $\Phi$ ) - 10° - 20°

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	1451	1596		1289	1533		1144	1486
B	899	1293		775	1111		691	987
C	593	845		513	729		458	650
D	366	518		317	448		284	400
W	1142	1486		982	1417		874	1256

D.W & U.W - Downwind and Upwind refer to note 6.

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Roof Angle ( $\Phi$ ) –		20° - 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		1481	1553	1398	1492	1240	1447		
B		973	1166	839	1002	747	892		
C		641	764	554	660	494	588		
D		395	469	342	406	306	363		
W		1238	1447	1064	1276	946	1133		

  

Roof Angle ( $\Phi$ ) –		30° - 60°							
Wind Region		Building Height – H (m)							
		H≤10		10<H≤15		15<H≤20			
		Intermedi ate	Internal	Intermedi ate	Internal	Intermedia te	Internal		
A		1527	1653	1483	1610	1450	1576		
B		1189	1506	1022	1462	909	1411		
C		779	1203	672	1034	600	920		
D		478	730	414	630	370	562		
W		1449	1575	1302	1532	1155	1498		

D.W & U.W – Downwind and Upwind refer to note 6.



Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**  
 Project: **Flush Mount Interface Spacing Table for Tile Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

Job: **2242**  
 Date: **Jul-16**

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<b>General Notes</b>				
Note 1	Screws minimum embedment length into timber 35 mm			
Note 2	Recommended screws			
	<b>Metal Purlins/Battens</b>	<b>Fasteners to use</b>		
	0.55 mm - 1.5 mm	M6-11 TPI RoofZips		
	1.9 mm	M6-11 TPI RoofZips OR 12g-14 TPI Tek screws		
	2.4 mm and Above	12g-24 TPI Tek screws		
	<b>Wood purlins and Rafter</b>	<b>Fasteners to use</b>		
	Pine and Hardwood (35mm embedment and above)	M6-11 TPI RoofZips OR 14g-10 TPI		
Note 3	Above Spacing calculated based on 1.9mm steel purlin OR F17 Hardwood For Wind region C & D spacing for Tin Roof should be reduced as follows,			
	<b>Material</b>	<b>Wind Region C</b>		<b>Wind Region D</b>
		<b>Central</b>	<b>D.W &amp; U.W</b>	<b>Central</b> <b>D.W &amp; U.W</b>
	0.55 mm steel Batten	22%	25%	30%      42%
	0.75 mm steel Batten	0%	0%	10%      5%
Note 4	Following components are satisfied to use according to AS/NZS 1170.2-2011 Amdt 3-2013			
	<b>Components</b>	<b>Part Number</b>	<b>Description</b>	
	HOP-SLR02 Rail	HOP-SLR02	HOP-SLR02 Rail	
	#1 Tile Interface Bracket	#1	Tile Hook	
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.  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 Amdt 3-2013 for definition of Terrain category 3.			
Note 6	For the definition of Downwind, Upwind end and central, refer figure D9 from AS/NZS 1170.2-2011 Amdt 3-2013.			

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**  
 Project: **Flush Mount Interface Spacing Table for Tile Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

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 Date: **Jul-16**

Checked: **M.A**

**Flush Mount Interface Spacing Table for Tile Roof**

Type of Rail HOP-SLR02  
 Type of Interface #1 Tile Interface Bracket  
 Solar Panel Dimension 2m x 1m  
**Terrain category 2**

Roof Angle ( $\Phi$ ) - 5° - 10°

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	1066	1455		958	1362		902	1279
B	641	901		579	811		545	764
C	424	592		383	534		362	503
D	262	364		237	329		224	310
W	813	1149		732	1032		690	971

Roof Angle ( $\Phi$ ) - 10° - 20°

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	821	1184		739	1063		696	1000
B	498	709		450	640		424	603
C	331	468		299	423		282	399
D	205	289		186	262		175	247
W	629	901		567	811		535	763

D.W & U.W - Downwind and Upwind refer to note 6.

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 Address: **within Australia & New Zealand**  
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Roof Angle ( $\Phi$ ) –		20° - 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		889	1066	800	958	753	902
B		538	641	486	579	458	545
C		357	424	323	383	304	362
D		221	262	200	237	189	224
W		680	813	613	732	578	690

  

Roof Angle ( $\Phi$ ) –		30° - 60°					
Wind Region		Building Height – H (m)					
		H≤10		10<H≤15		15<H≤20	
		Intermediate	Internal	Intermediate	Internal	Intermediate	Internal
A		1088	1463	978	1434	920	1369
B		654	1010	590	909	556	855
C		432	661	391	596	369	562
D		267	406	242	367	228	346
W		829	1262	747	1159	703	1089

D.W & U.W – Downwind and Upwind refer to note 6.

Client: **Xiamen Hopenrgy Photovoltaic Technology Co. Ltd.**  
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 Address: **within Australia & New Zealand**  
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**Flush Mount Interface Spacing Table for Tile Roof**

Type of Rail HOP-SLR02  
 Type of Interface #1 Tile Interface Bracket  
 Solar Panel Dimension 2m x 1m  
**Terrain category 3**

Roof Angle ( $\Phi$ ) - 5° - 10°

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	1477	1622		1381	1556		1222	1507
B	956	1358		822	1162		731	1031
C	626	880		541	757		482	674
D	385	536		333	463		298	413
W	1220	1507		1046	1448		929	1318

Roof Angle ( $\Phi$ ) - 10° - 20°

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	1232	1519		1057	1459		938	1359
B	737	1060		636	911		567	810
C	486	693		421	598		376	533
D	300	425		260	367		232	328
W	937	1357		806	1162		717	1030

D.W & U.W - Downwind and Upwind refer to note 6.

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**  
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Roof Angle ( $\Phi$ ) –		20° - 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		1339	1477	1146	1381	1017	1222		
B		798	956	688	822	613	731		
C		525	626	454	541	405	482		
D		324	385	280	333	251	298		
W		1015	1220	872	1046	776	929		

  

Roof Angle ( $\Phi$ ) –		30° - 60°							
Wind Region		Building Height – H (m)							
		H≤10		10<H≤15		15<H≤20			
		Intermedi ate	Internal	Intermedi ate	Internal	Intermedia te	Internal		
A		1453	1573	1348	1532	1229	1500		
B		975	1432	838	1274	746	1157		
C		639	986	551	848	492	754		
D		392	599	339	517	303	461		
W		1227	1499	1067	1458	947	1401		

D.W & U.W – Downwind and Upwind refer to note 6.

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<b>General Notes</b>				
Note 1	Screws minimum embedment length into timber 35 mm			
Note 2	Recommended screws			
	<b>Metal Purlins/Battens</b>	<b>Fasteners to use</b>		
	0.55 mm - 1.5 mm	M6-11 TPI RoofZips		
	1.9 mm	M6-11 TPI RoofZips OR 12g-14 TPI Tek screws		
	2.4 mm and Above	12g-24 TPI Tek screws		
	<b>Wood purlins and Rafter</b>	<b>Fasteners to use</b>		
	Pine and Hardwood (35mm embedment and above)	M6-11 TPI RoofZips OR 14g-10 TPI		
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	<b>Material</b>	<b>Wind Region C</b>		<b>Wind Region D</b>
		<b>Central</b>	<b>D.W &amp; U.W</b>	<b>Central</b> <b>D.W &amp; U.W</b>
	0.55 mm steel Batten	22%	25%	30%      42%
	0.75 mm steel Batten	0%	0%	10%      5%
Note 4	Following components are satisfied to use according to AS/NZS 1170.2-2011 Amdt 3-2013			
	<b>Components</b>	<b>Part Number</b>	<b>Description</b>	
	HOP-SLR02 Rail	HOP-SLR02	HOP-SLR02 Rail	
	#1 Tile Interface Bracket	#1	Tile Hook	
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.  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 Amdt 3-2013 for definition of Terrain category 3.			
Note 6	For the definition of Downwind, Upwind end and central, refer figure D9 from AS/NZS 1170.2-2011 Amdt 3-2013.			