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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 Tin 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 Tin 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 provided by Hopergy Australia (IMSOLAR).

We find the Installation of Hopergy Tin 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
- The tin roof interface to be L-feet bracket or T-feet bracket as per drawing HOP-TRB01-38
- The assessment is based on an assumption that the interface brackets meet the industrial standard requirements
- 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**

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**products issued by Gamcorp Pty Ltd are no longer valid.**

- **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



Relationships built on trust

Gamcorp (Melbourne) Pty Ltd  
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## Structural Design Documentation

### **Tin 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 Tin 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 Tin Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

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

Checked: **M.A**

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

Type of Rail: HOP-SLR02  
 Type of Interface: Tin 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	1399	1529		1362	1487		1341	1464
B	1232	1341		1201	1307		1183	1287
C	1111	1207		1083	1177		1068	1160
D	985	1069		961	1043		947	1028
W	1307	1425		1273	1388		1255	1366

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	1310	1436		1277	1398		1258	1377
B	1156	1263		1127	1231		1111	1213
C	1044	1139		1018	1110		1003	1094
D	926	1009		904	984		891	970
W	1226	1341		1195	1306		1177	1287

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 Tin 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	1337	1399	1302	1362	1283	1341	
B	1179	1232	1149	1201	1132	1183	
C	1064	1111	1038	1083	1023	1068	
D	944	985	921	961	908	947	
W	1250	1307	1218	1273	1200	1255	

  

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	1406	1537	1369	1507	1348	1489	
B	1238	1380	1206	1344	1189	1324	
C	1116	1241	1088	1210	1073	1192	
D	990	1099	965	1071	952	1056	
W	1314	1459	1280	1428	1261	1406	

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

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

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

Checked: **M.A**

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

Type of Rail: HOP-SLR02  
 Type of Interface: Tin 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	1361	1486		1311	1429		1273	1387
C	1225	1333		1181	1284		1147	1247
D	1084	1178		1046	1136		1017	1104
W	1447	1583		1392	1521		1351	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		1396	1533		1355	1486
B	1276	1397		1229	1345		1194	1306
C	1150	1256		1109	1211		1078	1176
D	1019	1111		983	1072		956	1042
W	1354	1486		1304	1429		1267	1387

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 Tin Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

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

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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	1424	1492	1382	1447
B		1301	1361	1254	1311	1218	1273
C		1172	1225	1130	1181	1099	1147
D		1038	1084	1002	1046	974	1017
W		1382	1447	1331	1392	1292	1351

  

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		1368	1506	1317	1462	1279	1428
C		1231	1372	1186	1321	1153	1283
D		1089	1211	1051	1167	1022	1134
W		1449	1575	1399	1532	1358	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 Tin Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

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

Checked: **M.A**

<b>General Notes</b>				
Note 1	Screws minimum embedment length into timber 35 mm. Holes must be pre-drilled.			
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	
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 Tin Roof**  
 Address: **within Australia & New Zealand**  
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 Date: **Jul-16**

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

Type of Rail HOP-SLR02  
 Type of Interface Tin 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	1331	1455		1296	1415		1277	1393
B	1172	1276		1143	1243		1126	1225
C	1057	1149		1031	1120		1016	1103
D	937	1017		914	992		901	978
W	1244	1356		1212	1320		1194	1300

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	1247	1367		1215	1330		1197	1310
B	1100	1202		1073	1172		1057	1154
C	993	1084		969	1057		955	1041
D	881	961		860	937		848	923
W	1167	1276		1137	1243		1120	1224

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	1272	1331	1239	1296	1221	1277	
B	1122	1172	1094	1143	1078	1126	
C	1012	1057	987	1031	973	1016	
D	898	937	876	914	864	901	
W	1190	1244	1159	1212	1142	1194	

  

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	1338	1463	1303	1434	1283	1417	
B	1178	1313	1148	1279	1131	1260	
C	1062	1181	1036	1151	1021	1134	
D	942	1045	919	1019	905	1005	
W	1250	1389	1218	1359	1200	1338	

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 Tin Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

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 Date: **Jul-16**

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

Type of Rail                      HOP-SLR02  
 Type of Interface                Tin 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		1420	1556		1377	1507
B	1295	1414		1247	1360		1211	1320
C	1165	1269		1123	1222		1092	1187
D	1032	1121		995	1081		968	1050
W	1377	1507		1325	1448		1286	1404

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	1380	1519		1328	1459		1289	1414
B	1214	1329		1170	1280		1137	1243
C	1094	1195		1055	1152		1026	1119
D	970	1057		935	1020		910	992
W	1289	1414		1241	1360		1205	1320

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 Tin Roof**  
 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		1409	1477	1356	1420	1315	1377		
B		1238	1295	1193	1247	1159	1211		
C		1115	1165	1075	1123	1045	1092		
D		988	1032	953	995	927	968		
W		1315	1377	1266	1325	1230	1286		

  

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	1412	1532	1379	1500		
B		1302	1433	1254	1392	1217	1359		
C		1171	1306	1129	1257	1097	1221		
D		1037	1152	1000	1111	972	1080		
W		1379	1499	1332	1458	1292	1425		

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 Tin Roof**  
 Address: **within Australia & New Zealand**  
 Designed: **K.Z**

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 Date: **Jul-16**

Checked: **M.A**

<b>General Notes</b>				
Note 1	Screws minimum embedment length into timber 35 mm. Holes must be pre-drilled.			
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	
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.			