Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
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Our Ref: 2242/K.Z

12 September 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-SLR03 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^2
- Rails to be HOP-SLR03
- Rails material to be aluminium graded AL6005-T5 or higher
- 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 capacity 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.**

ISO 9001:2008 Registered Firm
Certificate No: AU1222

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

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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-SLR03 Rails within Australia & New Zealand

Terrain Category 2 & 3

For: Xiamen Hopergy Photovoltaic Technology Co. Ltd.

Proud Member of: CONSULT AUSTRALIA Representing Engineering Excellence

Job Number: 2242
Date: 12 September 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: **Sep-16**

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**
Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**
Address: **within Australia & New Zealand**
Designe **K.Z** Checked: **M.A**

Flush Mount Interface Spacing Table for Tin Roof

Type of Rail HOP-SLR03
Type of Interface Tin Interface Bracket
Solar Panel Dimension 1.64m x 0.99m
Terrain category **2**

Roof Angle (Φ) – 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	**1531**	**1673**		**1491**	**1628**		**1468**	**1602**
B	**1348**	**1468**		**1314**	**1430**		**1295**	**1409**
C	**1216**	**1321**		**1186**	**1288**		**1168**	**1269**
D	**1078**	**1170**		**1052**	**1141**		**1037**	**1125**
W	**1431**	**1560**		**1394**	**1519**		**1373**	**1496**

Roof Angle (Φ) – 11° - 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	**1434**	**1572**		**1397**	**1530**		**1376**	**1507**
B	**1266**	**1383**		**1234**	**1348**		**1216**	**1328**
C	**1142**	**1246**		**1114**	**1215**		**1098**	**1198**
D	**1014**	**1105**		**989**	**1078**		**975**	**1062**
W	**1342**	**1468**		**1308**	**1430**		**1288**	**1408**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**

Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**

Address: **within Australia & New Zealand**

Designed: **K.Z** Checked: **M.A**

Roof Angle (Φ) – 21° - 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	**1463**	**1531**		**1425**	**1491**		**1404**	**1468**
B	**1290**	**1348**		**1258**	**1314**		**1239**	**1295**
C	**1164**	**1216**		**1136**	**1186**		**1119**	**1168**
D	**1033**	**1078**		**1008**	**1052**		**993**	**1037**
W	**1368**	**1431**		**1333**	**1394**		**1314**	**1373**

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15			15<H≤20		
	Intermediate	Internal		Intermediate	Internal		Intermediate	Internal
A	**1539**	**1682**		**1498**	**1649**		**1476**	**1630**
B	**1355**	**1511**		**1320**	**1471**		**1301**	**1449**
C	**1222**	**1359**		**1191**	**1324**		**1174**	**1305**
D	**1083**	**1202**		**1057**	**1172**		**1034**	**1156**
W	**1438**	**1597**		**1401**	**1563**		**1380**	**1539**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**
Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**
Address: **within Australia & New Zealand**
Designed: **K.Z** Checked: **M.A**

Flush Mount Interface Spacing Table for Tin Roof

Type of Rail	HOP-SLR03
Type of Interface	Tin Interface Bracket
Solar Panel Dimension	1.64m x 0.99m
Terrain category	**3**

Roof Angle (Φ) – 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	**1699**	**1866**		**1633**	**1790**		**1584**	**1734**
B	**1490**	**1627**		**1435**	**1565**		**1393**	**1518**
C	**1340**	**1459**		**1292**	**1406**		**1256**	**1365**
D	**1187**	**1289**		**1145**	**1243**		**1113**	**1208**
W	**1584**	**1733**		**1524**	**1665**		**1479**	**1615**

Roof Angle (Φ) – 11° - 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	**1588**	**1747**		**1528**	**1678**		**1483**	**1627**
B	**1396**	**1529**		**1345**	**1472**		**1307**	**1429**
C	**1258**	**1375**		**1213**	**1325**		**1179**	**1287**
D	**1115**	**1216**		**1076**	**1173**		**1046**	**1140**
W	**1482**	**1626**		**1427**	**1564**		**1386**	**1518**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**

Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**

Address: **within Australia & New Zealand**

Designed: **K.Z** Checked: **M.A**

Roof Angle (Φ) – 21° - 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	**1621**	**1699**	**1559**	**1633**	**1513**	**1584**		
B	**1424**	**1490**	**1372**	**1435**	**1333**	**1393**		
C	**1283**	**1340**	**1237**	**1292**	**1202**	**1256**		
D	**1137**	**1187**	**1097**	**1145**	**1066**	**1113**		
W	**1512**	**1584**	**1456**	**1524**	**1414**	**1479**		

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15		15<H≤20			
	Intermediate	Internal	Intermediate	Internal	Intermediate	Internal		
A	**1671**	**1810**	**1624**	**1762**	**1586**	**1725**		
B	**1497**	**1648**	**1442**	**1601**	**1400**	**1563**		
C	**1347**	**1502**	**1298**	**1446**	**1262**	**1404**		
D	**1192**	**1325**	**1150**	**1278**	**1118**	**1242**		
W	**1586**	**1724**	**1531**	**1676**	**1487**	**1639**		

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**
Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**
Address: **within Australia & New Zealand**
Designe **K.Z** Checked: **M.A**

Flush Mount Interface Spacing Table for Tin Roof

Type of Rail HOP-SLR03
Type of Interface Tin Interface Bracket
Solar Panel Dimension 2m x 1m
Terrain category **2**

Roof Angle (Φ) – 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	**1457**	**1592**		**1419**	**1549**		**1397**	**1525**
B	**1283**	**1397**		**1250**	**1361**		**1232**	**1340**
C	**1157**	**1257**		**1128**	**1226**		**1112**	**1208**
D	**1026**	**1113**		**1001**	**1086**		**986**	**1070**
W	**1361**	**1484**		**1326**	**1445**		**1307**	**1423**

Roof Angle (Φ) – 11° - 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	**1365**	**1496**		**1330**	**1456**		**1310**	**1434**
B	**1204**	**1316**		**1174**	**1282**		**1157**	**1263**
C	**1087**	**1186**		**1060**	**1156**		**1045**	**1140**
D	**965**	**1051**		**932**	**1025**		**906**	**1011**
W	**1277**	**1397**		**1244**	**1361**		**1226**	**1340**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**

Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**

Address: **within Australia & New Zealand**

Designed: **K.Z** Checked: **M.A**

Roof Angle (Φ) – 21° - 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	**1392**	**1457**		**1356**	**1419**		**1336**	**1397**
B	**1228**	**1283**		**1197**	**1250**		**1179**	**1232**
C	**1108**	**1157**		**1081**	**1128**		**1065**	**1112**
D	**983**	**1026**		**959**	**1001**		**941**	**986**
W	**1302**	**1361**		**1269**	**1326**		**1250**	**1307**

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15			15<H≤20		
	Intermediate	Internal		Intermediate	Internal		Intermediate	Internal
A	**1464**	**1601**		**1426**	**1569**		**1404**	**1551**
B	**1289**	**1438**		**1257**	**1400**		**1238**	**1379**
C	**1163**	**1293**		**1134**	**1260**		**1117**	**1242**
D	**1031**	**1144**		**1005**	**1116**		**991**	**1100**
W	**1368**	**1520**		**1333**	**1488**		**1313**	**1465**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**
Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**
Address: **within Australia & New Zealand**
Designed: **K.Z** Checked: **M.A**

Flush Mount Interface Spacing Table for Tin Roof

Type of Rail	HOP-SLR03
Type of Interface	Tin Interface Bracket
Solar Panel Dimension	2m x 1m
Terrain category	**3**

Roof Angle (Φ) – 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	**1617**	**1776**		**1554**	**1703**		**1507**	**1650**
B	**1418**	**1548**		**1365**	**1489**		**1326**	**1445**
C	**1276**	**1389**		**1230**	**1338**		**1195**	**1299**
D	**1129**	**1227**		**1089**	**1183**		**1059**	**1150**
W	**1507**	**1649**		**1450**	**1584**		**1408**	**1536**

Roof Angle (Φ) – 11° - 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	**1511**	**1662**		**1454**	**1597**		**1411**	**1548**
B	**1329**	**1455**		**1280**	**1401**		**1244**	**1360**
C	**1197**	**1308**		**1155**	**1261**		**1122**	**1225**
D	**1061**	**1157**		**1024**	**1116**		**996**	**1085**
W	**1410**	**1547**		**1358**	**1489**		**1319**	**1445**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**

Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**

Address: **within Australia & New Zealand**

Designed: **K.Z** Checked: **M.A**

Roof Angle (Φ) – 21° - 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	**1542**	**1617**		**1484**	**1554**		**1440**	**1507**
B	**1355**	**1418**		**1306**	**1365**		**1268**	**1326**
C	**1221**	**1276**		**1177**	**1230**		**1144**	**1195**
D	**1082**	**1129**		**1043**	**1089**		**1015**	**1059**
W	**1439**	**1507**		**1386**	**1450**		**1346**	**1408**

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15			15<H≤20		
	Intermediate	Internal		Intermediate	Internal		Intermediate	Internal
A	**1590**	**1722**		**1545**	**1677**		**1510**	**1641**
B	**1425**	**1568**		**1372**	**1523**		**1332**	**1487**
C	**1282**	**1429**		**1236**	**1376**		**1201**	**1336**
D	**1135**	**1261**		**1094**	**1216**		**1064**	**1182**
W	**1509**	**1641**		**1457**	**1595**		**1415**	**1560**

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

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2242**

Project: **Flush Mount Interface Spacing Table for Tin Roof** Date: **Sep-16**

Address: **within Australia & New Zealand**

Designe **K.Z** Checked: **M.A**

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 14g-10 TPI Teks screws
2.4 mm and Above	14g-10 TPI Teks screws
Wood purlins and Rafter	**Fasteners to use**
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,

Material	**Wind Region C**		**Wind Region D**	
	Central	**D.W & U.W**	**Central**	**D.W & U.W**
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

Components	**Part Number**	**Description**
HOP-SLR03 Rail	HOP-SLR03	HOP-SLR03 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.