

27 February 2017

Project number: R045_02A

All Star Systems Co. Ltd
No. 2 Sunjia Village
Shetou Village Zhiqian Town
Jintan, Changzhou Jiangsu China

Attention: Michael Wang.

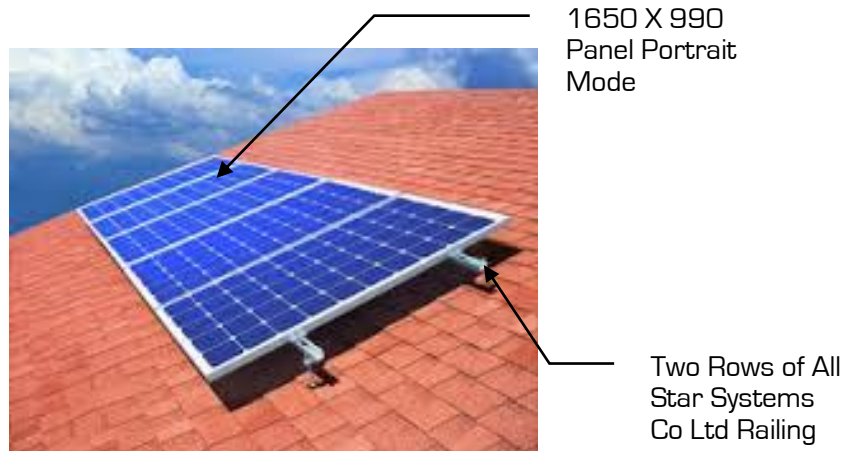
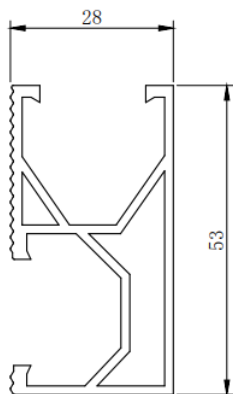
Dear Sir,

RE: ALL STAR SYSTEMS CO. LTD SOLAR PANEL SUPPORT FRAME
STANDARD KIT FOR TILED AND METAL CLAD PITCHED ROOF

As requested, we have reviewed the structural adequacy of the Aluminum support framing components as detailed in the drawings issued by All Star Systems Co Ltd. We have design investigated for the Aluminum Railing as shown below. The section of the railing is shown below.

The panels are supported by two rows of railing. The railings are fixed directly to the rafters or to the purlins.

The spacing of the fixing of the Railing to the rafter/purlin shall be limited as tabulated below in tables 1 & 2. Refer to Figure A for wind regions as shown in AS1170.2. The zones referred to in the tables are depicted in figures B on the following pages



**Railing: All Star Systems
53x28**

Table 1.1 METAL ROOF.		Roof Slope: 0 to 15 deg						
Maximum spacing (mm) of the fixing of the railing to Pitched METAL roof								
	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2030	1830	1660	1500	1110	910	700	580
10m	1830	1650	1500	1260	1000	820	630	520
15m	1740	1570	1430	1140	870	710	550	450
20m	1690	1530	1390	1070	780	640	490	400
Panel size 1650 Long								

Table 1.2 METAL & TILED ROOF		Roof Slope: 15 to 45 deg.						
Maximum spacing (mm) of the fixing of the railing to Pitched METAL roof								
	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2210	1830	1800	1500	1310	910	820	580
10m	1990	1650	1630	1260	1180	820	740	520
15m	1890	1570	1550	1140	1020	710	650	450
20m	1830	1530	1500	1070	910	640	580	400
Panel size 1650 Long								

Table 2.1 METAL ROOF.		Roof Slope: 0 to 15 deg.						
Maximum spacing (mm) of the fixing of the railing to Pitched METAL roof								
	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	1860	1670	1520	1370	930	760	590	480
10m	1680	1510	1370	1050	840	690	530	430
15m	1590	1440	1300	950	730	600	460	380
20m	1550	1400	1270	900	650	530	410	340
Panel size 1970 Long								

Table 2.2 METAL & TILED ROOF.		Roof Slope: 15 to 45 deg.						
Maximum spacing (mm) of the fixing of the railing to Pitched METAL roof								
	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2020	1670	1640	1370	1090	760	690	480
10m	1820	1510	1490	1050	980	690	620	430
15m	1730	1440	1410	950	860	600	540	380
20m	1680	1400	1370	900	760	530	480	340
Panel size 1970 Long								

Our design investigation is based on the following Australian Standards and sections of Building Code of Australia relevant to structural issues.

- AS1170.0-2002 Structural design Actions Part 0: General principles.
- AS1170.2-2002 Structural design Actions Part 2: Wind actions.
- AS 1664.1-1997 Aluminum structures Part 1: Limit state design.
- AS 4673-2001 Cold Formed Stainless Steel.
- AS 1684.1-1999 Residential timber-framed construction - Design criteria.
- AS 1684.2-2010 Residential timber-framed construction - Non-cyclonic areas.

- AS 1684.3-2010 Residential timber-framed construction - Cyclonic areas.
- AS 1720.1-2010 Timber structures - Design methods.pdf.
- AS 3566.1-2002 Self-drilling screws for the building and construction industries.
- AS 3566.1-2002 Self-drilling screws for the building and construction industries.
- AS3566.2 – 2002 Part 2: Corrosion resistance requirements.
- ISO3506:1-2009 Mechanical Properties of Corrosion-Resistance Stainless Steel Fasteners.

Following design criteria has been used for the structural verification.

- Design Life 25 years
- Importance Level Type 2: Ordinary
- Annual Probability of exceedance 1/200
- Terrain Category to AS1170.2 2
- Service Deflection Not limited
- Snow loading Not considered
- Earthquake Loading Not considered
- Maximum Roof Pitch 45 degrees
- Minimum pitch for Tiled Roof 15 degrees
- Aluminum Rails 6005 - T5
- Maximum dimensions & Minimum weight of Solar panels.
 - 16 Kg panel 1650x990
 - 23 Kg panel 1970X990

27 February 2017

Project No. R045_02A

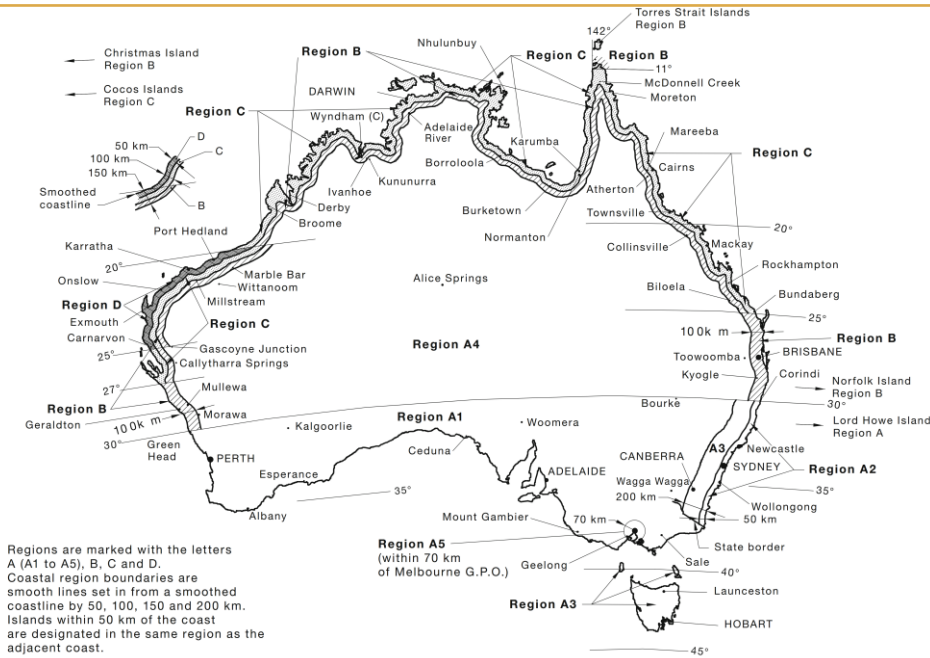


Figure A.

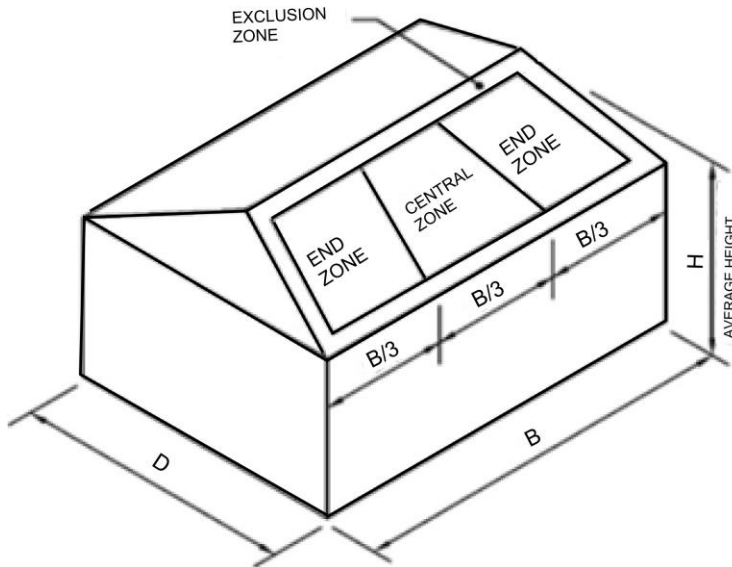
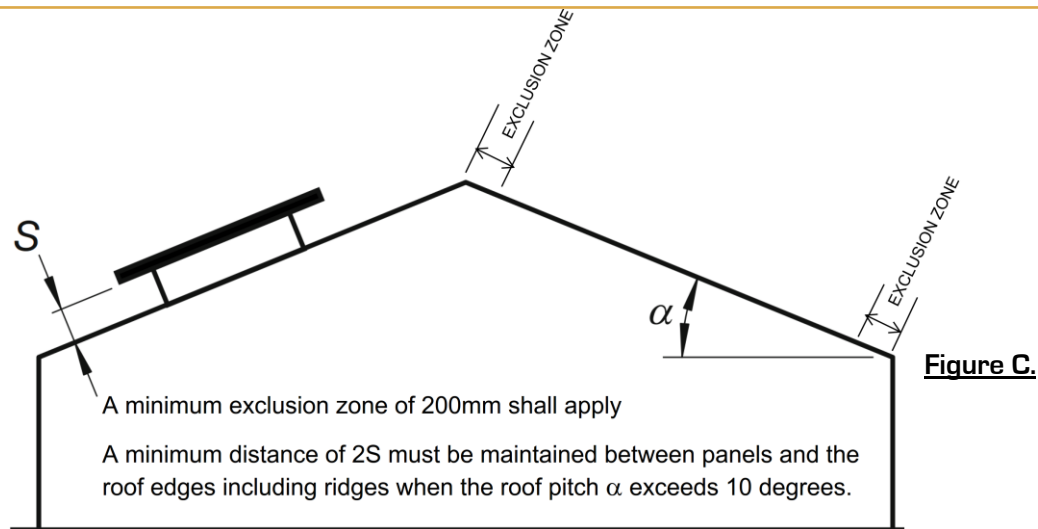


Figure B.



Subject to the following qualifications we certify that the above mentioned frames are structurally adequate and conform to the above Australian standards.

1. The gap between the underside of the solar panels and the roof shall be between 50mm minimum and 300mm maximum. Nominate the actual gap as "S" mm.
2. The solar panels shall be installed 2xS mm or 200 mm (whichever is greater) away from the roof edges and the ridge. Example: If the gap below the panel is 150mm then the panels shall be located 300mm away from the roof edge and the ridge. See Figure C above.
3. Each row of 1650 long solar panels shall have a minimum of two rows of railing fixed to the roof framing.
4. The connections between the solar panels shall be flexible to accommodate deflection of the railing.
5. The deflection of the railing has not been controlled in the design. If deflection has to be limited then spacing shall be reduced as advised by a practicing structural engineer.
6. The roofing to which the panels are to be installed shall conform to the relevant Australian Standards including AS1684, AS4440, AS1720, AS4100 and AS4600.
7. The buildings to which the panels are to be installed shall be of approved construction and conform to BCA and the relevant Australian Standards. The roof framing and the building shall be regularly maintained as required.
8. The existing framing shall be verified for compliance to Clause D6, of AS1170.2.
9. The installation of the framing shall conform to relevant Australian Standards, Manufacturer's specifications and good building practice.

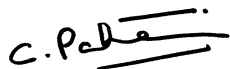
27 February 2017

Project No. **R045_02A**

10. The spacing of the rail fixings shall not exceed the recommended spacing, and shall be reduced to match the location of the roof rafters.
11. The cantilever span of the panel shall not exceed 25% of panel length (i.e. 412mm for 1650 long).
12. The cantilever span of the railing shall not exceed 33% of the adjacent spacing of the installed fixings.
13. Each fixing shall have a minimum of two gauge 14 screws.
14. The screws used to attach the railing to the roof framing shall conform to AS3566, ISO 3506.1.
15. The cold formed steel purlins shall have a minimum base material thickness of 1.2mm in Regions A & B and 1.9mm in Regions C & D.
16. Timber with Joint Type classification J4 to J6 are excluded unless tested for Screw capacity. i.e. minimum joint strength requirement shall be J3. Please refer Table AS1720.1.
17. Predrilled holes shall be used for all screw fixings into timber. The width of Timber purlins shall not be less than 35mm. The minimum embedment for each screw shall be 50mm. Minimum edge distance for screws shall be 17mm.
18. Dissimilar metals shall be separated with a suitable inert material to prevent galvanic corrosion.
19. The installation and fixings shall be periodically inspected and maintained.
20. The following are excluded from this certification.
 - x Framing of the solar panel assembly.
 - x Material Testing and or Verification of test certificates for the materials and components.

Should you have any queries, please feel free to call Paheer on 9565-5558.

Yours faithfully,
SPAD PTY LTD



Paheer C Paheerathan
BScEng, MEngSc, FIEAust, CPEng, NPER (Civil & Structural) 142156; RPEQ-09066, NTBPB 216724ES
Director