

03 May 2017

Project number: R140_02A

Red Dot Rack Pty Ltd.
Level 19, 144 Edward Street
Brisbane Qld 4000

Attention : Peter Secombe.

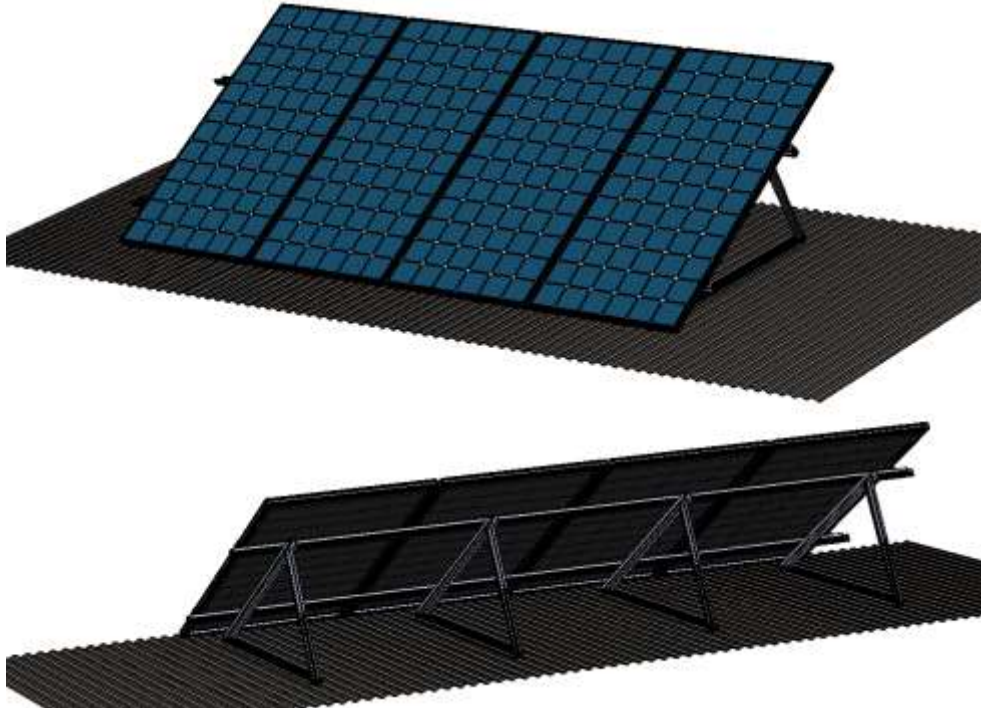
Dear Sir,

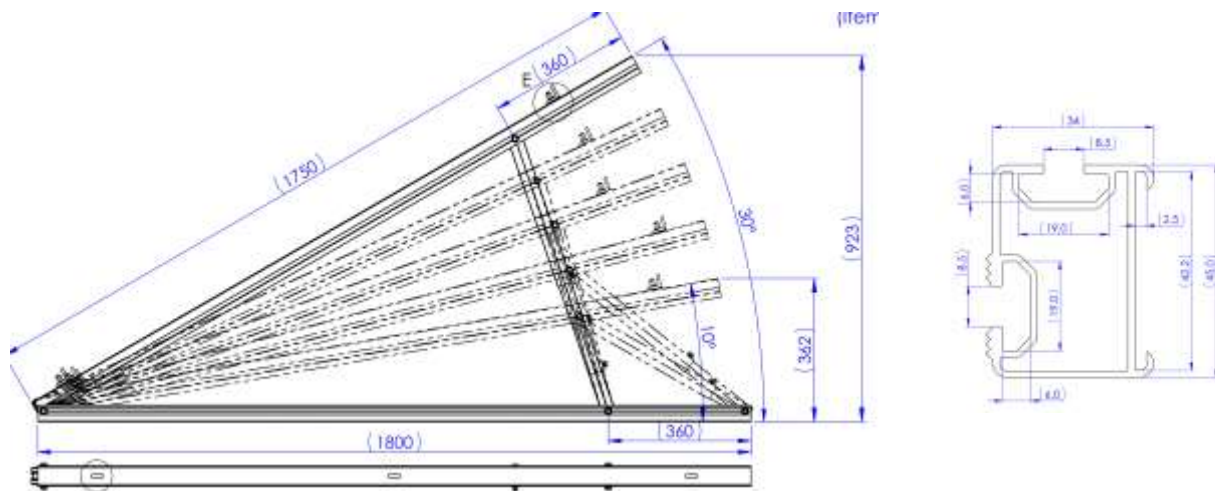
RE: RED DOT RACK SOLAR PANEL SUPPORT FRAME ADJUSTABLE
MOUNTING SYSTEM FOR METAL CLAD ROOF

As requested, we have reviewed the structural adequacy of the Aluminum support framing components as detailed in the drawings issued by Red Dot Rack Pty 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 supported by the legs which are fixed directly to the rafters, purlins or concrete roof.

The spacing of the longer back legs shall be limited as tabulated below in tables 1.1 & 1.2 for 1650 long panels and 2.1 & 2.2 for 1970 panels.





Terrain Category 2 (TC2) Open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.

Table 1.1		1650 Long.		Inclination 10 - 15 degrees	
Maximum spacing of the fixing of the Back Legs (mm) Railing: Pro Standard Rail t1.2.					
Roof Height	Region A	Region B	Region C	Region D	
5m	1770	1180	700	440	
10m	1450	970	630	400	
15m	1300	880	550	350	
20m	1230	830	490	310	

Table 1.2.		1650 Long.		Inclination 20 - 30 degrees	
Maximum spacing of the fixing of the Back Legs (mm) Railing:: Pro Standard Rail t1.2.					
Roof Height	Region A	Region B	Region C	Region D	
5m	1210	820	490	310	
10m	1000	670	440	280	
15m	900	610	380	240	
20m	850	570	340	220	

Terrain Category 2 (TC2) Open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.

Table 2.1. 1970 Long. Inclination 10 - 15 degrees				
Maximum spacing of the fixing of the Back Legs (mm) Railing: Pro Standard Rail t1.2.				
Roof Height	Region A	Region B	Region C	Region D
5m	1480	980	580	370
10m	1210	810	520	330
15m	1090	730	460	290
20m	1020	690	410	260

Table 2.2. 1970 Long. Inclination 20 - 30 degrees				
Maximum spacing of the fixing of the Back Legs (mm) Railing: Pro Standard Rail t1.2.				
Roof Height	Region A	Region B	Region C	Region D
5m	1020	680	410	260
10m	840	560	370	230
15m	750	510	320	200
20m	710	480	290	180

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

- AS 1170.0-2002 Structural design Actions Part 0: General principles
- AS 1170.2-2002 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 3566.2-2002 Part 2: Corrosion resistance requirements
- ISO 3506:1-2009 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 7 degrees
- Aluminum Rails 6005 - T5
- Maximum dimensions of Solar panels.
 - 16 Kg panel 1650X990
 - 23 Kg panel 1970X990

List of components related to this framing system that are as tabulated below have been design verified to AS1170.2

Components	Part Number	Description
End Clamp Kit	MR-EC-ST	Fastening parts
Inter Clamp Kit	MR-IC-ST	Fastening parts
Pro Standard Rail	MR-R-ST	Rail L3100mm
Splice for Pro Standard Rail	MR-SP-Pro	Expanding rail length
Front leg	MR-VI-15	Fixed on roofs
Back leg	MR-VI-16	Fixed on roofs
L Feet Hook	MR-VI-01	Fixed on roofs

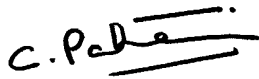
Subject to the following qualifications we certify that the above mentioned frames are structurally adequate and conform to the above Australian standards.

1. Each row of 1650/1970 long solar panels shall have a minimum of two rows of railing to support the panels. The upper railing is supported with back legs (struts). The struts shall be directly fixed to the purlins. The lower railing shall be fixed to the roof purlins with shorter legs of with a use of a base bracket.
2. The purlin spacing shall be in the range of 1200 to 1400 as nominated in the installation manual.
3. The connections between the solar panels shall be flexible to accommodate deflection of the railing.
4. The panel edge that is supported by the longer leg shall not be located within the edge zone, minimum of 0.2b, or 0.2d, or h, as defined in Clause 5.4.4 of AS1170.2.
5. The panel edge that is supported by the short leg shall have a clearance of 300 from the roof edge.
6. 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.
7. The roofing to which the panels are to be installed shall conform to the relevant Australian Standards including AS1684, AS4440, AS1720, AS4100 and AS4600.
8. 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.
9. The installation of the framing shall conform to relevant Australian Standards, Manufacturer's specifications and good building practice.
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 (ex 400mm for 1600 long).
12. The cantilever span of the railing shall not exceed 33% of the adjacent spacing of the installed fixings.
13. For concrete slabs use 2M12 chemset anchors or similar. The water proof membrane shall be reinstated. Use tungsten carbide bots for drilling. Slab reinforcement shall not be damaged.
14. For light framed roofing each fixing shall have a minimum 2 gauge 14 screws.
15. The screws used to attach the railing to the roof framing shall conform to AS3566, ISO 3506.1.

16. The cold formed steel purlins shall have a minimum base material thickness of 1.9mm in Regions A & B and 2.4mm in Regions C & D.
17. Timber with Joint Type classification J4 to J6 are excluded unless tested for Screw capacity. Minimum joint strength requirement shall be J3 for regions A&B and J2 for regions C&D.
18. 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.
19. The panels shall not be located within the edge zone as per AS1170.2
20. Dissimilar metals shall be separated with a suitable inert material to prevent galvanic corrosion.
21. The installation and fixings shall be periodically inspected and maintained.
22. We have relied upon the test certificates and material properties; of the components; supplied by Red Dot Rack Pty Ltd.
23. The following are excluded from this certification.
 - x Framing of the PV Cell.

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; EC27362
Director