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***Orion Solar Racking***

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RESEARCH REPORT (RR) NO.: 930521

Approval Date: June 24, 2017  
Expires: June 24, 2018

**GENERAL APPROVAL** - Renewal - Photovoltaic (PV) Module Rack Grounding System - “Orion Belt” Series & “Venus” Series - Manufactured by Orion Solar Racking.

**CONDITIONS OF APPROVAL**

The installation of the above *PV Rack Grounding System* is approved when the following conditions are met:

- Only the following components are approved for use as a part of the PV Rack Grounding System:

Item #	Description	Part Number	Material	System **
1	Grounding Cap	HDW-GR-CAP	SS* - 301 AMS 5517	OB & V
2	Grip Mid Clamp	OSB-MC-G	Stainless Steel	OB
3	Grounding End Plate	OSB-EP-G	AA* - 5052-H32	OB
4	Solar Belt	OSB-SB	AA* - 5052-H32	OB
5	Connect Belt	OSB-CB	AA* - 5052-H32	OB
6	Ballast Pan	OSB-BP	AA* - 5052-H32	OB
7	Low Bracket	OSB-LB	AA* - 5052-H32	OB
8	High Bracket	OSB-HB	AA* - 5052-H32	OB
9	Wire Management Raceway	OSB-WM-RW	AA* - 6061-T6	OB
10	Ground Lug	OSB-G-SGB-5	AA* - 6005-T5	OB & V
11	Orion Standard Rail	GR-R-STD	Stainless Steel	V
12	Spring Mid Clamp	GR-MC-GSP	AA* - 6063-T6	V
13	Universal End Clamp	GR-EC-UNV	Stainless Steel	V
14	Grounding T Bolt assembly	GR-G-TB	Stainless Steel	V
15	Grip End Clamp	GR-EC-G	Stainless Steel	V
16	Smart Ground Clip	GR-G-SGC	Stainless Steel	V
17	Rail Ground Lug	GR-G-RGL-ST	Stainless Steel	V
18	Grounding Splice Bar	GR-SPL-G	AA-6063.T6	V

\* SS = Stainless Steel  
\* AA= Aluminum Alloy

\*\* OB = Orion Belt  
\*\* V = Venus

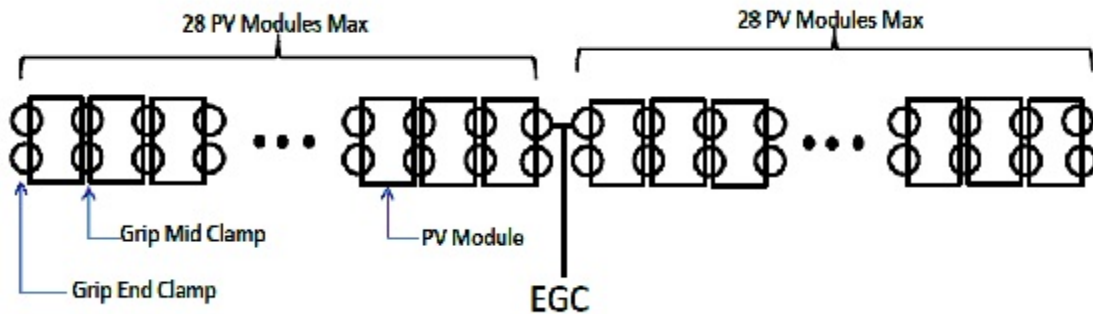
2. Each component of the PV Rack Grounding System shall be plainly and permanently marked with the following:
  - a. Manufacturer’s Name,
  - b. Model or Part number.
3. Upon installation, the following marking shall be permanently printed on a tag and placed on each end of PV Rack Grounding System run(s):
 

“The installation of this PV Racking System shall comply with City of Los Angeles Research Report (RR) number 930521. Not valid if the RR is expired. For a copy of RR visit [www.LADBS.org](http://www.LADBS.org) or call 323-224-2168.”
4. This PV Rack Grounding System is only approved for use with aluminum framed PV modules that provide a minimum surface contact width of not less than ½" for use with the “Mid-Clamp” and “End-Clamp”.

The following listed PV modules were evaluated with this PV Rack Grounding System:

Manufacturer’s Name	Model or Series	Manufacturer’s Name	Model or Series
SUNPOWER	X Series	Mitsubishi Electric	MLE Series
Sun-Module Plus	SW Series	Hanwha Q-Cells	Q.PRO - G3, G4.0, G4.1
Hyundai	MG Series	Canadian Solar	CS6P
LG	LG Neon 2		

5. The PV module frames shall be made of aluminum channels connected together at each corner using aluminum screws / bolts to form one solid frame around the module.
6. The maximum number of adjacent bonded PV modules or straps from the “Grounding Lug” (GR-G-SGB-5) attached to the first supporting bracket shall not exceed 28 in each direction.



7. For installations, where some of the modules can not be installed adjacent to each other one of the following methods shall be used to maintain the bonding between the PV modules using approved Grounding Lug ( GR-G-SGB-5):
  - a. A solid #6 AWG copper conductor with a maximum length of 15 feet,
  - b. Solar Belt (OSB-SB) or Ballast Pan (OSB-BP) where the total number of modules and straps does not to exceed 28.

8. The size of the equipment grounding conductor from the inverter to the Grounding Lug (GR-G-SGB-5) shall be based on the requirements of the 2014 Los Angeles Electrical Code.
9. The installed PV module, shall be supported by two Brackets on each side. The Bracket shall be provided with a “Grounding Cap” or “Grounding End Plate”.
10. Every “Grip Mid Clamp” shall consist of a minimum of one Grounding Cap in contact with the PV module frame. The “Grounding End Plate” shall consist of aluminum plate with two grounding studs.
11. The “Grip Mid Clamp” shall bond two adjacent PV modules and the maximum distance between the installed modules shall not exceed 3/4 Inch.
12. The aluminum frame of each PV module shall have a positive contact with a minimum of two Grounding Caps at all times, where the maximum DC ground fault current from a PV source circuit does not exceed 25 Amperes.
13. The aluminum frame of each PV module shall have a positive contact with two Grounding Caps at all times where the maximum DC ground fault current from a PV source circuit exceeds 25 Amperes.
14. The installed “Grip Mid Clamps” and “Grounding End Plates” shall be securely torqued in place in accordance with the manufacturer’s installation instructions.
15. The “Grounding End Plate” (OSB-EP-G) shall bond the first and the last PV module to the Bracket through the built-in “Pem Nut” on the Bracket.
16. The “Grip Mid Clamp” (OSB-MC-G) shall bond the adjacent PV modules to the Bracket through a built-in “Pem Nut” on the Bracket.
17. Upon the completion of the installation of the PV system, the grounding continuity of all the PV modules and the PV Rack System shall be verified by the “Qualified Installer”.
18. Dissimilar metal parts of the PV rack system grounding path shall not have a combined electrochemical potential above 0.6 eV.
19. If any component of the installed PV Rack Grounding System or the PV modules is removed or replaced, the “Qualified Person” shall maintain the grounding resistance at a maximum of 0.1 ohms from the grounding clamp to the furthest PV module.
20. The installation of the PV Rack Grounding System shall comply with the applicable provisions of the Los Angeles City Electrical Code.
21. A component, when replaced, shall be of the identical original manufacturer’s part that was approved by the Los Angeles City Electrical Testing Laboratory.
22. The PV Rack Grounding System shall only be used in PV systems with DC ground fault protection.

23. This PV Rack Grounding System shall not be installed in the following conditions or areas:
  - a. In Hazardous / Classified Areas,
  - b. Where subject to physical damage,
  - c. Within 5 miles of a marine environment.
24. The PV Rack Grounding System shall be installed and maintained by a “Qualified Person” as defined in the Los Angeles Electrical Code and in compliance with manufacturer’s instructions.
25. If the PV Rack Grounding System is no longer in service, it shall be disconnected and removed, and the electrical supply shall be permanently de-energized.
26. An electrical permit shall be obtained prior to the installation or relocation of this PV Rack Grounding System in the City of Los Angeles.
27. Clearances or approval from Zoning, Building Plan Check, and Los Angeles Fire Department as applicable, shall be obtained prior to installation.
28. This approval shall be void if the product is modified or moved without prior authorization from the Los Angeles City Electrical Testing Laboratory.

## **DISCUSSION**

The product covered under this Research Report is a PV Rack Grounding System intended to provide equipment grounding for PV module frames using approved mounting means and devices identified for bonding of adjacent PV modules.

This PV Rack Grounding System consist of a Grounding Cap, Solar Belt, Low Bracket, High Bracket, Grip Mid Clamp and Grounding End Plate.

Each “Grip Mid Clamp” (OSB-MC-G) consists of a 1/4" x 20 x 2.5" machine screw with a 7/16" hex head, a 3/4" serrated washer, a 9/16" lock washer, and one 1 3/8" Dia Grounding Cap.

The Solar Belts (OSB-SB) are made of Aluminum Alloy 5052-H32, sized 32" x 3" x 0.08". The Grounding Lug (GR-G-SGB-5) is listed for use with #4 - #14 AWG copper or aluminum conductors.

Each PV module is supported by two “Grip Mid Clamps” or one “Grounding End Plate” on each side, for a total of 3 or 4 points of support.

The Grounding Cap (HDW-GR-CAP) is a circular stainless steel material with sharp triangular edges. When installed in accordance with the manufacturer’s installation instructions, it will pierce through the protective anodized layer of the aluminum frames of two adjacent modules to make a positive electrical path between them.

When this PV Rack Grounding System is installed in accordance with the provisions of this General Approval and manufacturer's installation instructions, it provides equipment ground continuity from the Ground Lug to the PV modules throughout the PV system and complies with section 690.43 of the Los Angeles City Electrical Code.






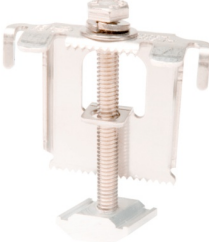
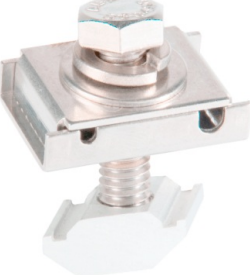
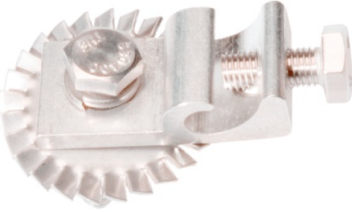

For this General Approval to be valid on any installation in the City of Los Angeles, an engineer or inspector of the Department of Building and Safety must make a determination that all conditions of the General Approval required to provide equivalency have been met.

This General Approval is in accordance with Section 93.0303 of the Electrical Code pertaining to "New Materials and Methods of Construction" and does not waive the requirements of the City of Los Angeles Building Code.

This General Approval is neither a product endorsement nor a certification of accuracy or function of the approved item.

**PICTURES:**

1 Grounding Cap 	2 Grip Mid Clamp 	3 Grounding End Plate 
4 Solar Belt 	5 Connect Belt 	6 Ballast Pan 
7 Low Bracket 	8 High Bracket 	9 Wire Management Raceway 

<p>10 Ground Lug, #SGB-5</p> 	<p>11 Orion Standard Rail</p> 	<p>12 Spring Mid Clamp</p> 
<p>13 Universal End Clamp</p> 	<p>14 Grounding T Bolt assembly</p> 	<p>15 Grip End Clamp</p> 
<p>16 Smart Ground Clip</p> 	<p>17 Rail Ground Lug</p> 	<p>18 Grounding Splice Bar</p> 

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