



October 13, 2016

Orion Solar
2917 Vail Ave.
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Attn.: Engineering Department

Re: Job 201424680
Subject: Engineering Certification for the Jupiter Ground Mount System

PZSE, Inc. – Structural Engineers has reviewed the Orion Jupiter Ground Mount System. The review addressed the following items: Jupiter Ground Mount System Configuration, Engineering Span Methodology, a consideration of Thermal Expansion, and Ground Mount Foundation Requirements. In addition to the review, a component capacity check was performed. This letter certifies that the Jupiter Ground Mount System and all information, data and analysis contained within the Jupiter Design tables are in compliance with the documents referenced below:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-10
2. 2012 International Building Code, by International Code Council, Inc
3. 2013 California Building Code, by California Buildings and Standards Commission
4. 2010 Aluminum Design Manual, by The Aluminum Association
5. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012, by ICC-ES

The following are the requirements to meet the above referenced documents.

Jupiter Ground Mount System Configuration

The structure is a column and beam (cross pipe) system, with diagonal bracing. The columns & cross pipes are standard weight (schedule 40) steel pipes. The diagonal bracing is square tube sections. The tops of the columns are connected in the E-W direction by the cross pipes which cantilever over and extend past the end columns. The cross pipes are connected by proprietary Orion Solar Racking Rails spanning up and down the slope which cantilever over and extend past the top and bottom cross pipes. The solar panels are attached to the rails with Orion Solar Racking clamps. There are typically two rails per column of panels. Gravity loads are transferred to the columns and foundations by the rails and cross pipes acting as simple beams. Lateral loads are resisted by the diagonal bracing. The column spacing in the N-S direction is 7'-6". The column (bay) spacing in the E-W direction is selected from the "Jupiter Design Tables".



Engineering Span Methodology

The procedures for calculating the maximum east-west span values found in the "Jupiter Design Tables" are based on the following assumptions:

1. Cells with filled with an asterisk "*" indicate special engineering required –contact Orion.
2. Cross pipe splices are not permitted in end spans or in middle 1/3 of interior spans.
3. Topographic (Wind) Factor = 1.0 (no topographic effects).
4. Importance factor, $I = 1.0$
5. Site Coefficient, $F_a = 1.0$
6. Site Coefficient, $F_v = 1.5$
7. Dead Load (Weight) = 5.0 psf including photovoltaic panels and ground rack system

Thermal Expansion

To allow for thermal expansion, a maximum total continuous cross pipe length of 50 feet is recommended. If 50 feet is to be exceeded, it is recommended that a structural engineer is consulted.

Ground Mount Foundation Requirements

The foundation requirements for a concrete cast-in-drilled-hole (CIDH) pier system may be obtained from Tables 1, 2 & 3. These tables are based on the piers being installed at their maximum allowable spacing. The assumptions for the foundation depth values are as follows:

1. Class 5 Soils – ref 2012 IBC & CBC 2013 Table 1806.2
2. Concrete Weight = 145 pcf
3. Concrete Strength, $f'_c = 2500$ psi
4. Skin Friction per 2012 IBC & CBC 2013 1810.3.3.1.4 & 5
5. Snow Load = 0 psf
6. Special foundation requirements indicated by an asterisk "*". Contact Orion for more information.
7. Resistance to corrosion and/or sulfate attack, along with possible adverse effects due to expansive soils has not been considered in these foundation recommendations. A soils report is widely considered the most reliable and accurate method for determining the type and depth of piers for any ground array system. Soils reports can be obtained through a Geotechnical Engineer.

PZSE can also provide non-standard certifications, wet-stamped letters, or specialized engineering requests.

If you have any questions on the above, do not hesitate to call.

Prepared by:
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