

## Solar Array Weight and Loading Calculation Worksheet

### Point Load Calculation:

1. Number of panels in array \_\_\_\_\_

2. Number of connections to roof \_\_\_\_\_

3. Weight of individual panel \_\_\_\_\_

4. Mounting system weight \_\_\_\_\_

5. total weight of array \_\_\_\_\_

6. Weight at each connection \_\_\_\_\_

(≤ 45lbs.; Combined point loads not to exceed 200 lbs. at any one member)

$$\begin{array}{ccccccc} \boxed{\phantom{000}} & \times & \boxed{\phantom{000}} & + & \boxed{\phantom{000}} & = & \boxed{\phantom{000}} \\ \mathbf{1.} & & \mathbf{3.} & & \mathbf{4.} & & \mathbf{5.} \\ \boxed{\phantom{000}} & / & \boxed{\phantom{000}} & = & \boxed{\phantom{000}} & & \\ \mathbf{5.} & & \mathbf{2.} & & \mathbf{6.} & & \end{array}$$

### Distributed Load Calculations:

7. Solar panel area  
(length x width) \_\_\_\_\_

8. Total array area \_\_\_\_\_

9. Distributed Load \_\_\_\_\_

(Max. allowable distributed load is 5/lbs. per sq. ft.)

$$\begin{array}{ccccccc} \boxed{\phantom{000}} & \times & \boxed{\phantom{000}} & = & \boxed{\phantom{000}} & & \\ \mathbf{1.} & & \mathbf{7.} & & \mathbf{8.} & & \\ \boxed{\phantom{000}} & / & \boxed{\phantom{000}} & = & \boxed{\phantom{000}} & & \\ \mathbf{5.} & & \mathbf{8.} & & \mathbf{9.} & & \end{array}$$



## **Bernalillo County Planning & Development Services**

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### ***Solar Installation Permit Requirements***

The requirements in this package apply to ***All*** solar installation applications for permit, residential or commercial.

1. **FOOTING DETAIL** – Only if ground or pole mounted
  
2. **ROOF FRAMING PLAN** – Only if roof mounted
  
3. **ELEVATIONS**
  
4. **ELECTRICAL PLANS** – For PV
  
5. **PLUMBING PLANS** – For solar hot water
  
6. **ENGINEERING WITH CALCULATIONS**
  
7. **COMPLETED PERMIT APPLICATION**
  
8. **SIGNED “HOMEOWNER RESPONSIBILITY” FORM** – Only if homeowner permit for residential installation is being requested.

The following list contains items that are required in order to obtain permits for residential PV and solar hot water systems. Two (2) complete sets of documentation are required to be submitted at the time that application is made. For commercial installations (3) sets of the following items must be submitted for permit only that there is no exception for engineering. ***All Commercial applications must have engineer stamp.***

#### **A. Ground (or pole) Mount Systems**

- a. **Site Plan** – Indicates location of proposed array; the proximity of the array to any structure and the property lines
- b. **Footing details** – Indicates length, width and depth of footing below grade and reinforcement (if applicable)
- c. **Elevations** – A general elevation illustrating the array and it's finished height above grade
- d. **Construction details** – comprehensive drawings showing mounting rails, support frame for mounting rails and anchoring system (if not pole mounted).
- e. **Engineering** – If total structure height above grade, measured to the top of panel, is greater than 6', calculations and stamp from a licensed structural engineer or architect must be provided.

#### **B. Roof Mount Systems**

- a. **Calculations** – The weight of the complete system, including all of the working fluid in thermal systems, the weight of the complete system per square foot, and the concentrated load at each mounting location.
- b. **Elevations** – For any installation that will not be flush with the roof, a simple building elevation showing the location of the array(s) with relation the roof system, the overall height of the building and the height of the array. Array cannot be more than 10'-0" above the roof measured from the roof to the top of the array (topmost panel).
- c. **Penetrations** – Show location of all penetrations of the building envelope and the proposed means to weatherproof those penetrations. Penetrations being any hole made in the exterior of the building through which piping or electrical conduit passes.
- d. **Fasteners** – Indicate the location, type, grade, length, and pullout strength of fasteners proposed to secure the array to the roof structure.
- e. **Framing Plan** - Provide an existing roof framing plan shows the slope, member size, grade and spans of all roofing members where array is to be mounted. Arrays must be located such that there is three (3) feet of clearance around the array.
- f. **Engineering** – Provide engineering calculations certified (by the placement of the engineers seal, signature and date) by an engineer or architect licensed in the State of New Mexico verifying that the existing roof structure is adequate for the increased loads from the proposed array(s).
  - i. **Exception** – Engineering will not be required if ***all*** of the following criteria are met:
    1. **Roof Structure** – The supporting members shall be of typical residential construction with multiple, parallel wood rafters, engineered "I" joists, or

trusses. Minimum rafter or truss chord shall be 2x4 with a maximum of 24" on center spacing.

2. **Roofing Materials** – Roofing material can be only one layer of any material described and installed in accordance with section R905 of the IRC except for R905.3, Clay and Concrete Tile, or R905.6, Slate or Slate-Type Shingles.
3. **Loading** – The solar panels are either mounted directly to the roof framing members or be mounted to continuous rails that are directly attached to the roof framing members. Attachments to the roof framing members will be no more than 4'-0" on center spacing. Solar panels and all mounting hardware (frame, rails, etc.) weight does not exceed five (5) pounds per square foot (psf) or 45 pounds (lbs) concentrated load at each point of attachment or support, with a maximum weight of two-hundred (200) lbs per framing member. The calculated weight shall include the weight of all of the working fluid inside of the panel(s).
4. **Height** – Maximum panel height above roof shall be no more than 18" from the top of the panel to the roof surface.

### C. Electrical Information

- a. **One-line diagram** – Indicate the following:
  - i. The number of PV panels proposed
  - ii. The voltage and kilowatt output rating of each panel
  - iii. The total system voltage and kilowatt output
  - iv. All conductor sizes
  - v. All conduit sizes
  - vi. Ampacity of all overcurrent devices
  - vii. Ampacity of any disconnects
  - viii. Max ampacity of main electrical panel and any sub panel that is to be used.
- b. **Installation** – Provide the manufacturer's installation instructions and specifications for the inverter, the PV module(s), and mounting system.
- c. **Battery Storage** – If batteries are to be used with the system for storage of electricity, indicate number, size and location of batteries. Indicate grounding of batteries to storage box or rack. (other requirements from the Building Official may be necessary)
- d. **Markings** – All installations, markings, signage, and warning labels shall comply with the most current version of the NEC and state codes as well as the Uniform Solar Energy Code.
- e. **PNM** – Approval from PNM to connect the system or to participate in PNM's solar photovoltaic program will require prior approval by PNM before making application for a building permit.

### D. Plumbing Information

- a. Riser diagram indicating all of the code requirements (i.e. pipe sizes, valves, backflow prevention devices, etc.)