

Revisions Approved November 25, 2014

# **CITY OF ATASCADERO**

## **FIRE DEPARTMENT**



### **SOLAR PHOTOVOLTAIC**

### **INSTALLATION GUIDELINE**

2014

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## SOLAR PHOTOVOLTAIC INSTALLATION GUIDELINE

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## 1.0 MARKING

PV systems must be marked. Marking is needed to provide emergency responders with appropriate warning and guidance with respect to working around and isolating the solar electric system. This can facilitate identifying energized electrical lines that connect the solar modules to the inverter, as these should not be cut when venting for smoke removal.

Materials used for marking must be weather resistant. It is recommended that Underwriters Laboratories Marking and Labeling System 969 (UL 969) be used as standard to determine weather rating. (UL listing of markings is not required).

### 1.1 Main Service Disconnect

Means must be provided to disconnect all electrical wiring within the building automatically or manually. If conductors enter the building from the roof top they shall be able to be disconnected before they enter the building by a NEMA approved load-rated manual disconnect or a micro inverter or power optimizer that limits output to more than one (1) volt per panel when electrical service to the building has been shut off. All manual disconnects, including the main service disconnect, shall be labeled "FIRE DISCONNECT"

For residential applications, the marking may be placed within the main service disconnect. If the main service disconnect is operable with the service panel closed, the marking should be placed on the outside cover.

For commercial application, the marking should be placed adjacent to the main service disconnect in a location clearly visible from the location where the lever is operated.

#### 1.1.1 Marking Content and Format

- MARKING CONTENT: CAUTION: SOLAR ELECTRIC SYSTEM
- **RED BACKGROUND**
- **WHITE LETTERING**
- MINIMUM 3/8" LETTER HEIGHT
- ALL CAPITAL LETTERS
- ARIAL OR SIMILAR FONT, NON-BOLD
- REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (durable adhesive materials may meet this requirement)

**CAUTION: SOLAR ELECTRIC SYSTEM**

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## 1.2 Marking for Direct Current Conduit, Raceways, Enclosures, Cable Assemblies, Junction Boxes, and Disconnects

Marking is required on all interior and exterior DC conduit, raceways, enclosures, cable assemblies, and junction boxes to alert the Fire Service to avoid cutting them. Marking should be placed on all interior and exterior DC conduit, raceways, enclosures, and cable assemblies, every 10 feet, at turns and above and/or below penetrations and all DC combiner and junction boxes.

### 1.2.1 Marking Content and Format

- MARKING CONTENT: CAUTION: SOLAR CIRCUIT
- **RED BACKGROUND**
- **WHITE LETTERING**
- MINIMUM 3/8" LETTER HEIGHT
- ALL CAPITAL LETTERS
- ARIAL OR SIMILAR FONT, NON-BOLD
- REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (durable adhesive materials meet this requirement)

**CAUTION: SOLAR CIRCUIT**

### 1.3 Inverters

The inverter is a device used to convert DC electricity from the solar system to AC electricity for use in the building's electrical system or the grid.

No markings are required for the inverter other than DC systems characteristics labeling per CEC 690.53

## 2.0 ACCESS, PATHWAYS AND SMOKE VENTILATION

Access and spacing requirements should be observed in order to:

- Ensure access to the roof
- Provide pathways to specific areas of the roof
- Provide for smoke ventilation opportunities area
- Provide emergency egress from the roof

Local jurisdictions may create exceptions to this requirement where access, pathway or ventilation requirements are reduced due to:

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- Proximity and type of adjacent exposures
- Alternative access opportunities (as from adjoining roofs)
- Ground level access to the roof area in question
- Adequate ventilation opportunities beneath solar array (as with significantly elevated or widely-spaced arrays)
- Adequate ventilation opportunities afforded by module set back from other rooftop equipment (example: shading or structural constraints may leave significant areas open for ventilation near HVAC equipment)
- Automatic ventilation device
- New technology, methods, or other innovations that ensure adequate fire department access, pathways and ventilation opportunities

Designation of ridge, hip, and valley does not apply to roofs with 2-in-12 or less pitch. All roof dimensions are measured to centerlines.

Roof access points should be defined as areas where ladders are not placed over openings (i.e., windows or doors) and are located at strong points of building construction and in locations where they will not conflict with overhead obstructions (i.e., tree limbs, wires, or signs). An elevation or picture showing access points shall be provided for plan review.

## **2.1 Residential Systems—Single and Two-Unit Residential Dwellings**

**All systems require plan review by Atascadero Department. (Atascadero Fire)**

### **2.1.1 Access/Pathways and Smoke Ventilation**

Provide two 3' wide clear access paths from eave to ridge on each roof slope where modules are located. Rake/gable paths are to be measured **3' from load bearing roof framing** to array edge or around obstructions. At hips/valleys the path may be on either side of the hip/valley. If modules are located on both sides of a hip/valley there must be 3' between modules on each side and around obstructions. Modules are to be located no more than 3' to a ridge. The designation of ridge, hip and valley do not apply to roofs with 2-in-12 pitch or less.

## **2.2 Commercial Buildings and Residential Housing Comprised of Three (3) or More Units**

Exception: If a local fire department determines that the roof configuration is similar to residential (such as in the case of townhouses, condominiums, or single family attached buildings), the local fire department may make a determination to apply the residential access and ventilation requirements.

Examples of these requirements appear at the end of this guideline.

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## 2.2.1 Access

There should be a minimum six foot (6') wide clear perimeter around the edges of the roof.

Exception: If either axis of the building is 250 feet or less, there should be a minimum four feet (4') wide clear perimeter around the edges of the roof, **four foot (4') from ridge or parapet. (Atascadero Fire)**

## 2.2.2 Pathways

Pathways should be established in the design of the solar installation. Pathways should meet the following requirements:

- a. Should be over structural members
- b. Centerline axis pathways should be provided in both axis of the roof. Centerline axis pathways should run on structural members or over the next closest structural member nearest to the center lines of the roof
- c. Should be straight line not less than 4 feet (4') clear to skylights and/or ventilation hatches.
- d. Should be straight line not less than 4 feet (4') clear to roof standpipes.
- e. Should provide not less than 4 feet (4') clear around roof access hatch with at least one not less than 4 feet (4') clear pathway to parapet or roof edge

## 2.2.3 Smoke Ventilation

- a. Arrays should be no greater than **50 by 50** feet in distance in either axis **(Atascadero Fire)**
- b. Ventilation options between array sections should be either:
  - A pathway **4 feet (4')** or greater in width **(Atascadero Fire)**
  - 4 feet (4') or greater in width pathway **and** bordering on existing roof skylights or ventilation hatches
  - 4 feet (4') or greater in width pathway **and** bordering four feet (4') x 8 feet 8' "venting cutouts" every 20 feet (20') on alternating sides of the pathway

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## 3.0 LOCATION OF DIRECT CURRENT (DC) CONDUCTORS

Conduit, wiring systems, and raceways for photovoltaic circuits should be located as close as possible to the ridge or hip or valley and from the hip or valley as directly as possible to an outside wall to reduce trip hazards and maximize ventilation opportunities.

Conduit runs between sub arrays and to DC combiner boxes should use design guidelines that minimize total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box. The DC combiner boxes are to be located such that conduit runs are minimized in the pathways between arrays.

To limit the hazard of cutting live conduit in venting operations, DC wiring is to be run in metallic conduit or raceways when located inside building per CEC 690.31(E) and should be run, to the maximum extent possible, along the bottom of load-bearing members.

## 4.0 NON-HABITABLE BUILDINGS

This guideline does not apply to non-habitable structures. Examples of non-habitable structures include, but are not limited to, parking shade structures, solar trellises, etc.

## 5.0 GROUND MOUNTED PHOTOVOLTAIC ARRAYS

Setback requirements do not apply to ground-mounted, freestanding photovoltaic arrays. A clear brush area of ten feet (10') is required for ground mounted photovoltaic arrays.

- a) Mounts shall be on noncombustible construction
- b) Arrays shall be located a minimum of 20' from structure and shall not impeded access to and around a structure in any manner
- c) No storage shall be permitted under the panel arrays
- d) Vegetation shall be cleared and maintained underneath the array area
- e) Array locations shall not locate upon recorded biological conservation easements, riparian or vernal pool areas

## DEFINITIONS

Inverter: Devices that convert dc electricity (single or multiphase), either for stand alone systems (not connected to the grid) or for utility-interactive systems.

Photovoltaic (PV): Pertaining to the direct conversion of light into electricity.

Array: Any number of photovoltaic modules connected together to provide a single electric output. Arrays are often designed to produce significant amounts of electricity.

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**Support Bracket I Frame: Used to secure the panel to the roof and other surfaces.**

**Connectors: Devices used to hold the panels to the framework or brackets. (Atascadero Fire) \*\*\*SEE PAGES 9 – 14 FOR EXAMPLES\*\*\***

Call Atascadero Fire Department at (805) 461-5070 if you have any questions.

Revisions to this guide have been updated and confirmed by the Fire Chief as signed below per section 4-7.105 of the Atascadero Municipal Code and Section 102.9 of the California Fire Code:

A handwritten signature in black ink, appearing to read 'Kurt Stone', written over a horizontal line.

November 25, 2014

Kurt Stone, Fire Chief