



# ONTARIO FIRE DEPARTMENT FIRE PROTECTION STANDARD

## SOLAR PHOTOVOLTAIC SYSTEMS STANDARD #E-006 EFFECTIVE 06-11-08 PAGES 5

### **PURPOSE:**

Alternative sources of power are becoming more and more popular. Solar Systems used to produce electricity, are becoming commonplace throughout the City of Ontario. The following are basic guidelines for the use and placement of equipment for these systems.

### **SCOPE:**

This guideline is for solar photovoltaic system installed on homes, commercial businesses and free standing structures within the City of Ontario jurisdiction. Solar photovoltaic systems covered by this standard may be interactive with other electrical power production sources or stand-alone, with or without electrical energy storage such as batteries. These systems may have AC or DC output for utilization

### **AUTHORITY:**

Solar Photovoltaic power systems shall be installed in accordance with sections 605.11.1 through 605.11.4 of the California Fire Code, the California Building Code and the California Electrical Code.

### **GENERAL:**

#### **1.0 Marking**

Marking is required on interior and exterior direct-current (DC) conduit, enclosures, raceways, cable assemblies, junction boxes and disconnects.

Materials used for marking shall be weather resistant and suitable for the environment. Marking as required, shall all letters in capitalized with a minimum height of 3/8 inch white on red background.

#### **1.1 Main Service 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, then the marking should be placed on the outside cover.

For commercial application, the marking shall 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 CONNECTED

- 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 ELECTRIC SYSTEM**

## **1.2 Shut off Marking for DC conduit, raceways, enclosures, cable assemblies, and junction boxes**

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 shall 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.

### **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 (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.

## **2.0 Access, Pathways and Smoke Ventilation**

Access and spacing requirements shall 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

The Ontario Fire Department may create exceptions to this requirement where access, pathway or ventilation requirements are reduced due to:

- 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 panel set back from other rooftop equipment (shading or structural constraints may leave significant areas open for ventilation near HVAC equipment, for example.)
- 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 measured to centerlines.

Roof access points shall be defined as an area that does not place ladders over openings (i.e., windows or doors) and are located at strong points of building construction and in locations where it does not conflict with overhead obstructions such as tree limbs, wires, or signs.

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

Fire Department Plan review is required if a system is to be installed that will occupy more than 50% of the roof area of a residential building.

### **2.1.1 Access**

- a. Residential Buildings with hip roof layouts. Panels shall be located in a manner that provides one (1) three-foot (3') wide clear access pathway from the eave to the ridge on each roof slope where panels are located. The access pathway shall be located at a structurally strong location on the building (such as a bearing wall.)
- b. Residential Buildings with a single ridge. Panels shall be located in a manner that provides two (2) three-foot (3') wide access pathways from the eave to the ridge on each roof slope where panels are located.
- c. Hips and Valleys: Panels shall be located no closer than 18 inches to a hip or a valley if panels are to be placed on both sides of a hip or valley. If the panels are to be located on only one side of a hip or valley that is of equal length then the panels may be placed directly adjacent to the hip or valley.

### **2.1.2 Ventilation**

Panels shall be located no higher than three feet (3) below the ridge.

Exception: Local fire departments may allow panels to be located two (2) feet below the ridge if the fire department has determined that an approved product or method will provide opportunity for ventilation.

## **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.

### **2.2.1 Access**

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

Exception: If either axis of the building is 250 feet or less, there shall be a minimum four feet (4') wide clear perimeter around the edges of the roof.

### **2.2.2 Pathways**

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

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

### **2.2.3 Ventilation**

- a. Arrays shall be no greater than 150 by 150 feet in distance in either axis
- b. Ventilation options between array sections shall be either:
  1. A pathway 8 feet or greater in width
  2. 4 feet or greater in width pathway **and** bordering on existing roof skylights or ventilation hatches
  3. 4 feet or greater in width pathway **and** bordering 4' x 8' "venting cutouts" every 20 feet on alternating sides of the pathway

### **3.0     Location of 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 shall 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 shall be run in metallic conduit or raceways when located within enclosed spaces in a building and shall 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.

#### **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.

### **5.0     Alternative Means of Compliance**

Growing demand for solar photovoltaic products is leading to new products, designs, technologies, and installation methods. As new products and methods become available, Ontario Fire Department may encounter solar photovoltaic systems that will require an alternative means of compliance. Solar contractors should contact Ontario Fire Department to determine if alternate means or methods would allow for a safe installation that is acceptable to the fire department. For example, if new products, designs, technologies or methods become available that provides sufficient alternative protection and access, pathways and ventilation opportunities for fire crews.