



# Roseville Fire Department

## Fire & Life Safety Division

316 Vernon Street Suite 480 · Roseville, CA 95678 · (916) 774-5800 · [FLSDivision@roseville.ca.us](mailto:FLSDivision@roseville.ca.us)

### Fire & Life Safety Standard

#### Title: Solar Photovoltaic Power System

**Note:** *This standard is a summary of Roseville Fire Department clarifications of City and State Codes. Information contained herein applies to typical circumstances and may not address all situations.*

#### PURPOSE

This standard was developed with safety as the principle objective, pursuant to the California Fire Code (CFC) Section: 104.1 General Authority and Responsibilities. The fire code official is authorized to render interpretations of the CFC, and to adopt policies, procedures, rules and regulations in order to clarify the application of its provisions. Such interpretations, policies, procedures, rules and regulations shall be in compliance with the intent and purpose of the CFC and shall not have the effect of waiving requirements specifically provided for in the CFC.

#### SCOPE

This standard applies to any newly installed or modified solar photovoltaic system. Solar photovoltaic systems shall be designed and installed in accordance with the CFC and the applicable National Fire Protection Association (NFPA) standards.

#### REQUIREMENTS

A DC disconnect is installed on the site side of the inverter. Typical systems have an inverter located near the utility service panel. Some inverters (micro inverters, AC modules) are located at the photovoltaic (PV) module. If the inverter is located at the PV module, the conduit from the modules to the utility power supply is AC. The DC disconnect at the service panel cuts power to the inverter, which is then unable to export power to the utility service panel and prevents any solar electricity from harming service or maintenance workers on the utility side of the panel. During the day, there is power in the conduit between the PV modules and the DC disconnect. The systems can produce up to 8 amps and up to 600 volts of electricity which varies by installation. Multiple strings are connected together at a combiner box.

#### 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 shall 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. **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, the marking shall 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.

##### 2. **Marking for Direct Current 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



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conduit, raceways, enclosures, and cable assemblies every 10 feet, within 1 foot of turns, at penetrations (above and/or below) and all DC combiner and junction boxes.

### 3. Marking Content and Format

- Marking shall contain – “WARNING: PHOTOVOLTAIC POWER SOURCE”
  - Red background
- White lettering
- Minimum 3/8 inch 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)

**WARNING: PHOTOVOLTAIC POWER SOURCE**

### LOCATION OF DIRECT CURRENT (DC) CONDUCTORS

Conduit, wiring systems, and raceways for photovoltaic circuits shall be located as close as possible to the ridge, hip or valley and 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 the total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box. The DC combiner boxes shall 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.

### 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 smoke ventilation areas
- Provide emergency egress from the roof

The Roseville 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 points (as from adjoining roofs)
- Ground level access to the roof area
- Adequate ventilation points beneath solar arrays (as with significantly elevated or widely spaced arrays)
- Adequate ventilation points 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 devices
- New technology, methods, or other innovations that ensure adequate fire department access, pathways and ventilation points



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

### 1. Residential Systems for One and Two Family Dwellings

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

#### a. Access/Pathways

- i. Residential buildings with hip roof layouts: Modules shall be located in a manner that provides a 3 foot wide clear access pathway from the eave to the ridge on each roof slope where modules are located. The access pathway shall be located at a structurally strong location on the building (such as a bearing wall).
- ii. Residential buildings with a single ridge: Modules shall be located in a manner that provides two 3 foot wide access pathways from the eave to the ridge on each roof slope where modules are located.
- iii. Hips and Valleys: Modules shall be located no closer than 1.5 feet to a hip or a valley if modules are to be placed on both sides of a hip or valley. If the modules are to be located on only one side of a hip or valley of equal length then the modules may be placed directly adjacent to the hip or valley.

#### b. Smoke Ventilation

The modules shall be located no higher than 3 feet below the ridge.

### 2. Commercial Buildings and Residential Housing Comprised of Three or More Units

Exception: If the Roseville 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 Roseville Fire Department may make a determination to apply the residential access and ventilation requirements.

#### a. Access

There shall be a minimum 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 4 foot wide clear perimeter around the edges of the roof.

#### b. Pathways

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

- i. Shall be over areas capable of supporting the live load of fire fighters accessing the roof
- ii. Centerline axis pathways shall be provided in both axis of the roof. Centerline axis pathways shall run where the roof structure capable of supporting the live load of fire fighters accessing the roof
- iii. Shall be a straight line not less than 4 feet clear to skylights and/or ventilation hatches
- iv. Shall be a straight line not less than 4 feet clear to roof standpipes
- v. 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

#### c. Smoke Ventilation

Arrays should be no greater than 150 by 150 feet in distance in either axis

- i. Ventilation options between array sections shall be either:



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- A pathway 8 feet or greater in width, or
- 4 feet or greater in width pathway and bordering on existing roof skylights or ventilation hatches, or
- 4 feet or greater in width pathway and bordering 4 by 8 feet “venting cutouts” every 20 feet on alternating sides of the pathway

### **NON-HABITABLE BUILDINGS**

This standard 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 10 feet is required for ground mounted photovoltaic arrays.

\*\*\*SEE PAGES 5-10 FOR DIAGRAMS\*\*\*



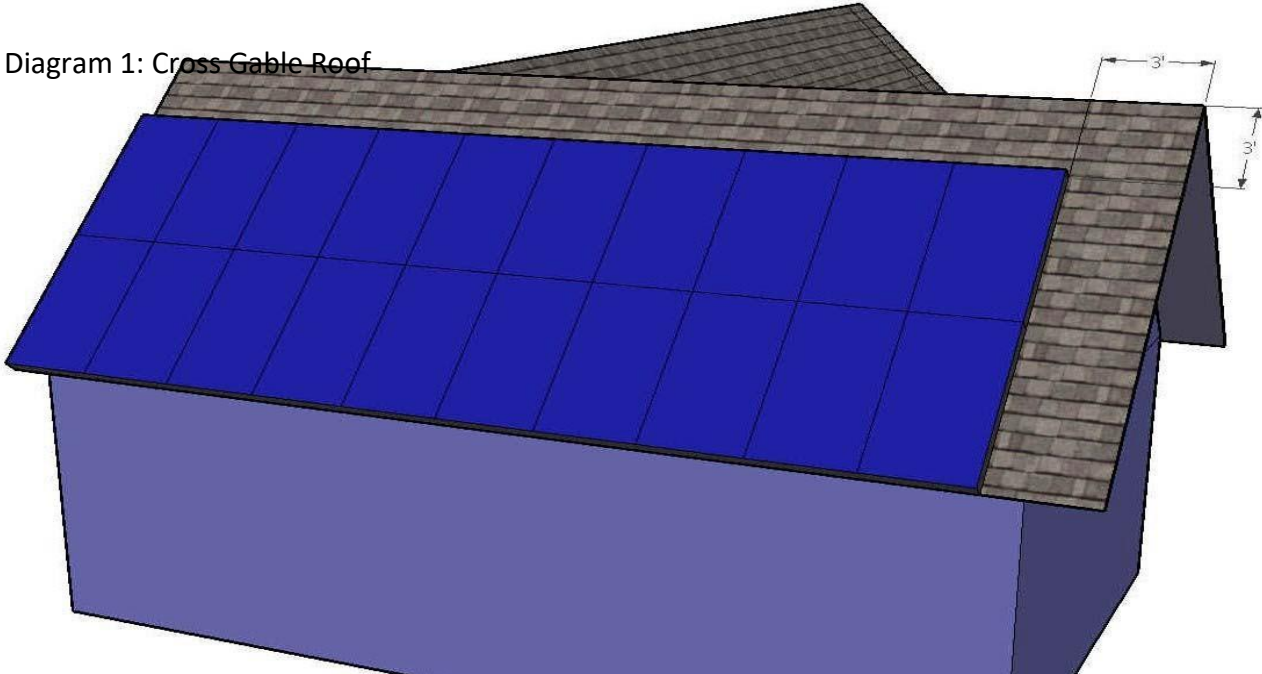
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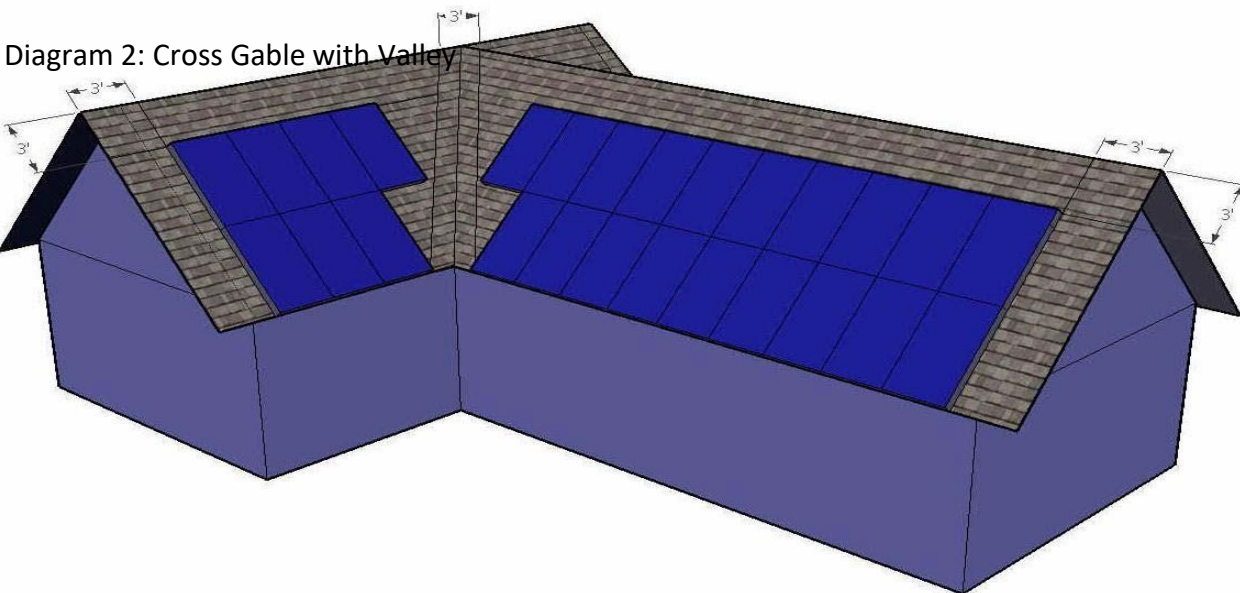
**FIGURE - 1**

Diagram 1: Cross Gable Roof



**FIGURE - 2**

Diagram 2: Cross Gable with Valley





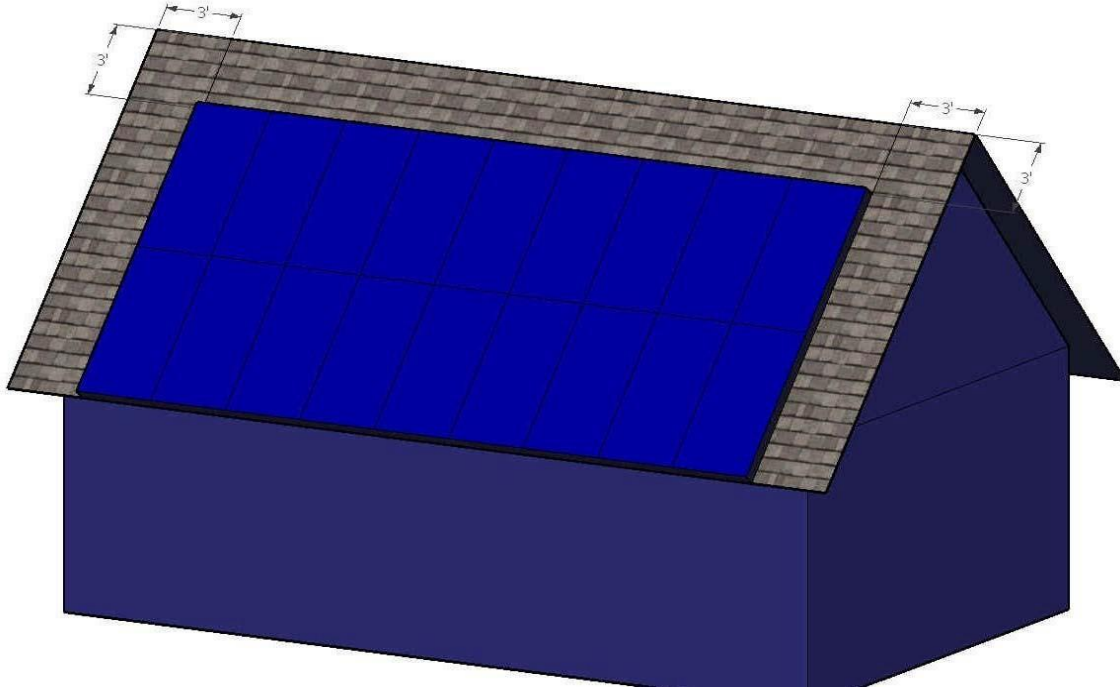
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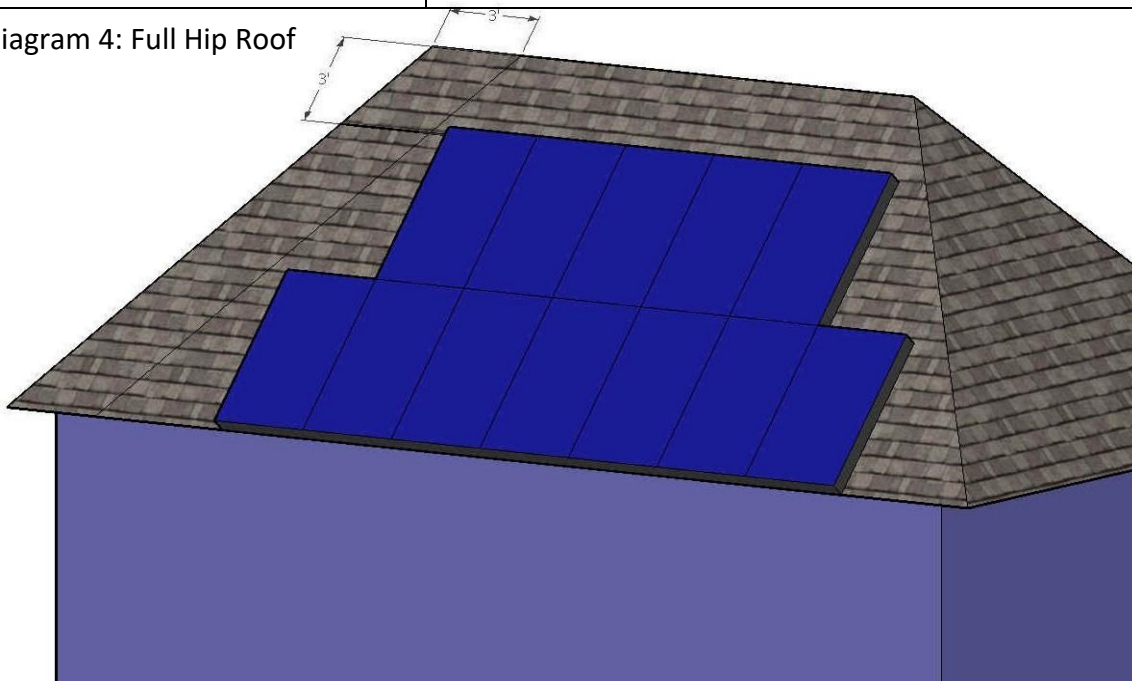
**FIGURE - 3**

Diagram 3: Full Gable



**FIGURE - 4**

Diagram 4: Full Hip Roof





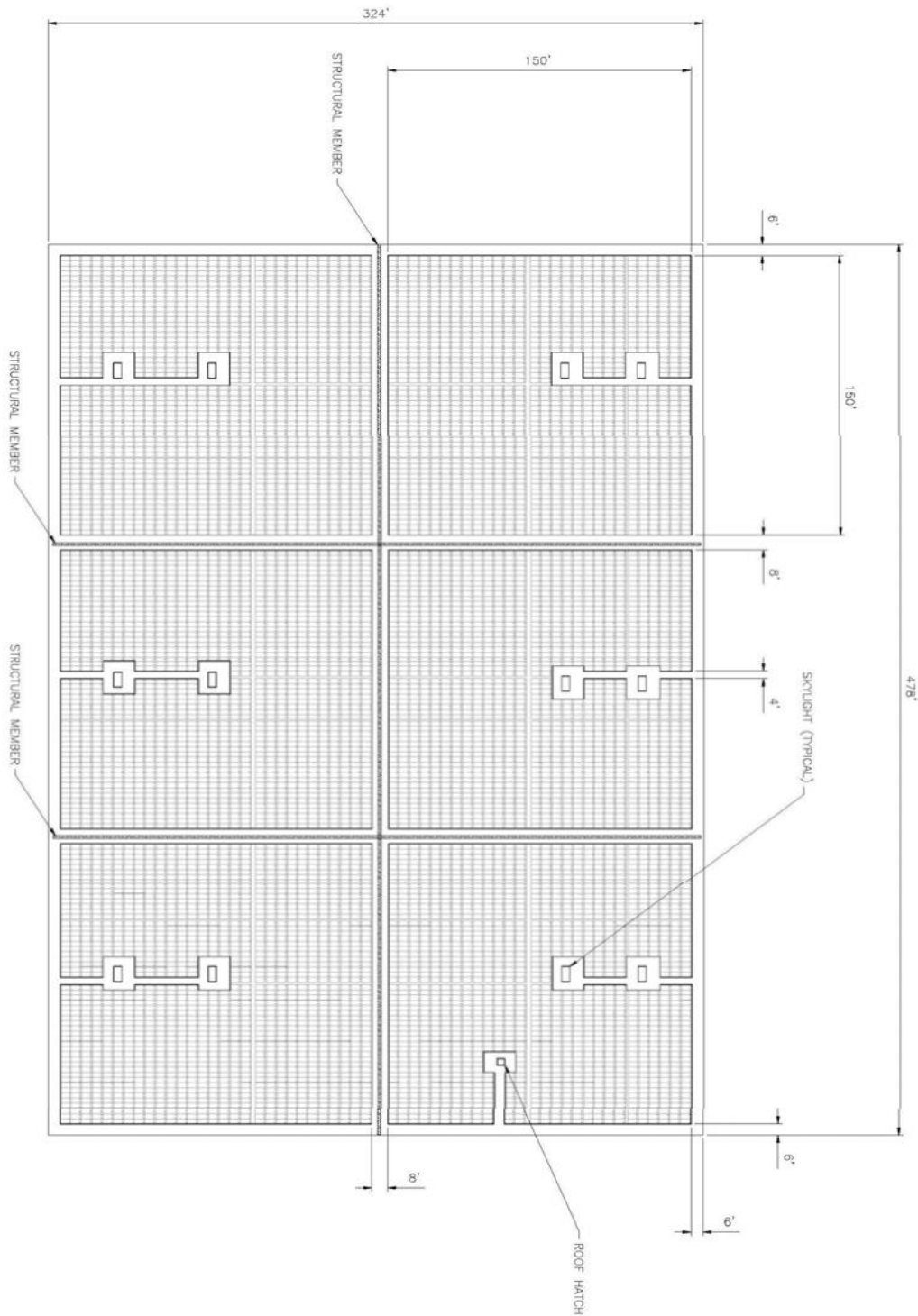
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FIGURE - 5

SOLAR ARRAY EXAMPLE - LARGE COMMERCIAL  
8' WALKWAYS



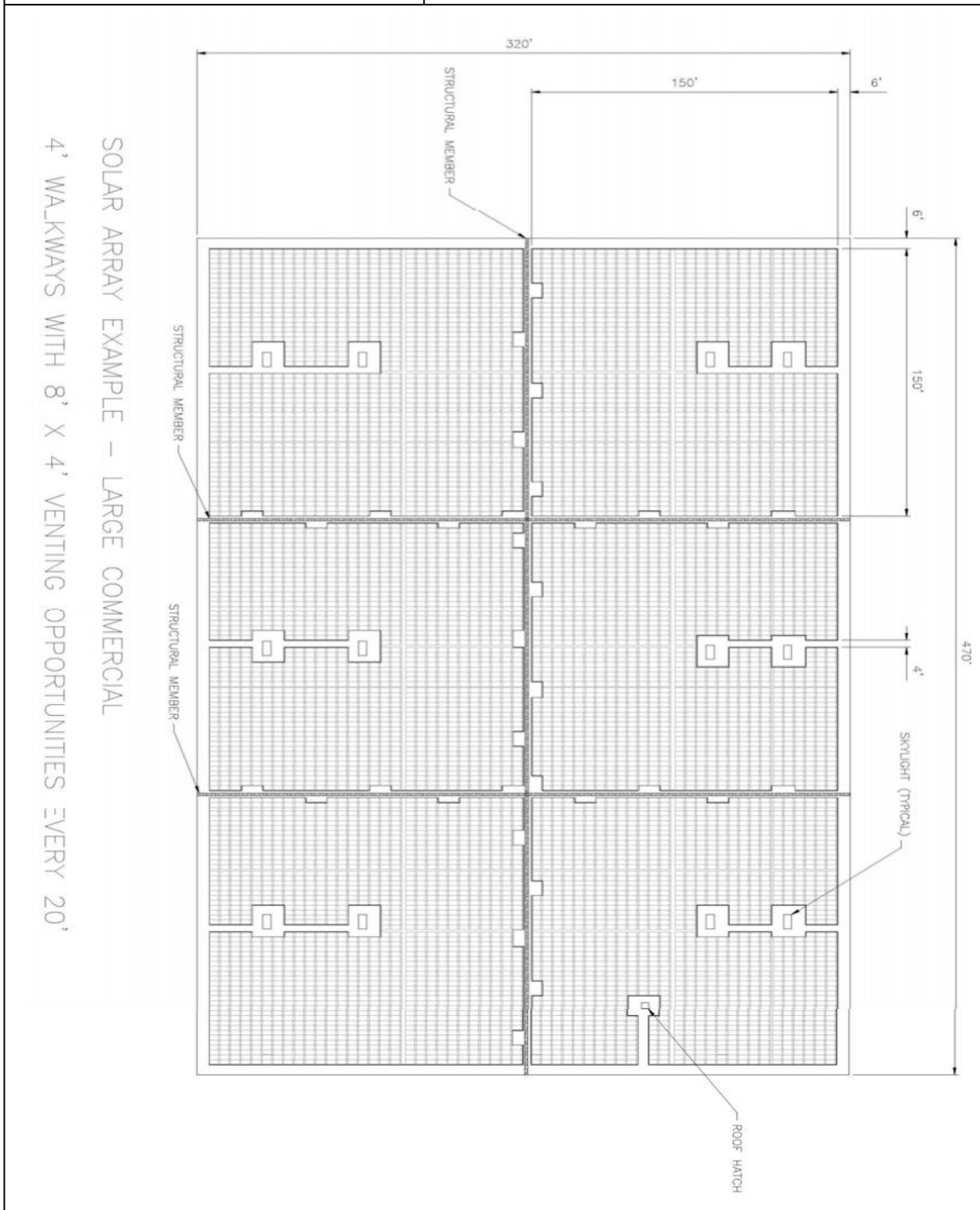


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FIGURE - 6





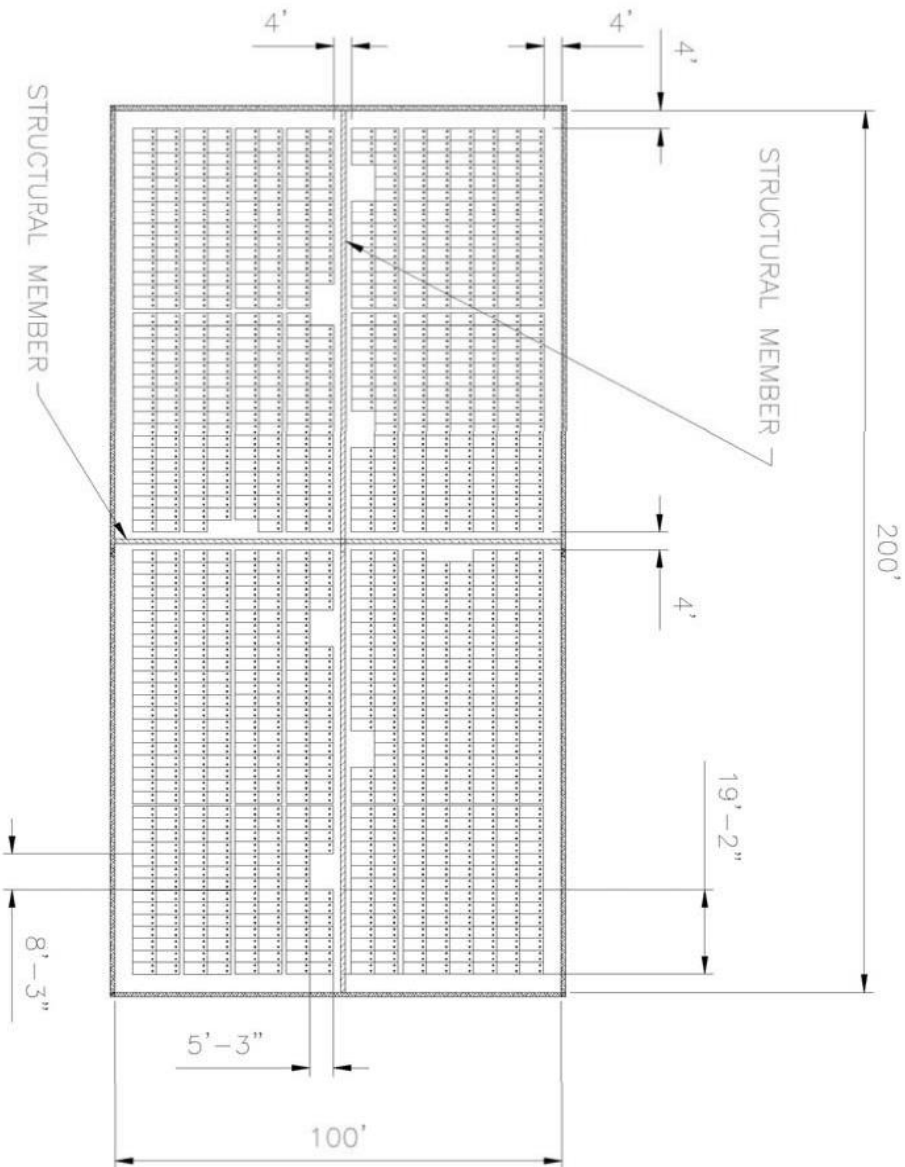
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FIGURE - 7

SOLAR ARRAY EXAMPLE – SMALL COMMERCIAL  
4' WALKWAYS WITH 8' X 4' VENTING OPPORTUNITIES EVERY 20' ALONG WALKW.





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FIGURE - 8

SOLAR ARRAY EXAMPLE – SMALL COMMERCIAL  
8' WALKWAYS

