Photovoltaic System

Effective Date: January 1, 2020

1.0 Requirements

2.0 Permit

2.1 Photovoltaic (PV) systems require building permits and shall comply with California Building Code (CBC), California Electrical Code (CEC), California Fire Code (CFC), and California Residential Code (CRC) R327, as is applicable. Residential systems up to 15 kW will be permitted and inspected in accordance with the California State requirements and San Jose Municipal Code 20.100.1030 (c 5) by the Building Division of The City of San Jose. Larger or commercial PV systems will be subject to City of San Jose standard permitting and inspection procedures including fire review.

2.2 See current Fee Schedule.

3.0 Design and Installation

3.1 **Group R-3 Buildings** shall adhere to requirements in 2019 CFC Section 1204.2.1

3.1.1 Access, Pathways, and Spacing

3.1.1.1 Hip Roof Layouts

3.1.1.1.1 Hip roofs require one 3 ft pathway because it is necessary for at least one 3 ft pathway be available on any roof slope with a PV array.

3.1.1.2 Residential Buildings with a Single Ridge

3.1.1.2.1 Single ridge residences require two 3 ft wide pathways to provide alternate means of access and egress for firefighters during operations. These ridges can be long relative to the size of the structure so there is a high likelihood that one pathway is inaccessible in a fire.

3.1.1.3 Hips and Valleys

3.1.1.3.1 Many roofs cannot be described as simple hip or gable roofs but include a combination or ridges, valleys, and hips. Hips and valleys are treated differently from gable construction since the hips and valleys often do not have structural walls under them. This makes hips and valleys less substantial than other access and egress options and therefore a lower priority during firefighting operations. However, hips and valleys may become a path for emergency egress should a fire prevent the firefighter from accessing the preferred structural access and egress location.

3.1.1.4 Variance would be required to use 2019 CFC Section 1204.2 Exception 2: Roof Access, pathways and spacing requirements need not be provided where the fire code official has determined that rooftop operations will not be employed. See variance section below.

3.1.2 Smoke Ventilation

3.1.2.1 Dangerous gases and dark smoke accumulate in a burning building. “Venting” is when a hole is made in the roof. This allows the smoke and gases to escape because heat and smoke rise.

3.1.2.2 It increases visibility; reduces the possibilities of backdraft and flashover by reducing heat

and removing flammable and toxic gases; and gives victims trapped inside a greater chance of survival because more oxygen is present, and firefighters can perform a more efficient search.

3.1.2.3 Another reason for venting the roof is to see how far the fire has progressed. One of the fastest avenues through which fires spread is the attic. Heat and smoke rise into the attic where the fire can move quickly. Firefighters may go ahead of the fire on a roof, cut holes to access the attic and stop the fire from spreading through the attic.

3.2 **Other than Group R-3 Buildings** shall adhere to requirements in 2019 CFC Section 1204.3.1 through 1204.3.3

3.2.1 Access, Pathways, and Spacing

3.2.2 Smoke Ventilation

3.2.3 Signs and Labels

3.2.3.1 The CFC outlines the signs, labels, and diagrams required. These will indicate what parts of the system can be shut down and how, and what remains energized.

3.2.3.2 All signs, labels, and diagrams shall be provided on the plans for approval.

3.2.3.3 All signs, labels, and diagrams shall be located at the appropriate locations per CFC.

3.2.4 Locations of DC Conductors

3.2.5 2019 CFC Section 1204.3 Exception: This exception is generally not granted.

3.3 **Ground Mounted and Photovoltaic Above Parking**

3.3.1 Ground-Mounted photovoltaic panel systems shall follow 2019 CFC section 1204.4

3.3.2 Photovoltaic above parking may be subject to 2019 CBC 503.1 Exception 3

3.4 **Fire Sprinkler Protection**

3.4.1 For fully sprinklered buildings with PV systems with use underneath (e.g.; parking or storage), fire sprinkler protection shall be required below the PV system.

3.5 **Variances**

3.5.1 Items to consider when requesting a variance to address access issues.

3.5.1.1 Access and spacing requirements are 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

3.5.1.2 The fire code official may consider a **v**ariance to this requirement where access, pathway or ventilation requirements are reduced due to:

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

access, pathways and ventilation opportunities.

Items a–c describe examples of options that may allow fire departments to relax the setback options on a roof.PV arrays are often only mounted on one roof face. So, other roof faces may be fully open to roof access and venting options. This may result influence acceptance of a reduction being allowed to the mandated 3’ ridge setback by up to 18”.

Items d & e describe examples of PV array placement that allows for sufficient venting options due to the array being tilted above the roof pitch sufficiently to access the roof below the array or gaps in the array to reduce the shading effects of rooftop equipment such as HVAC units or shrouds hiding this equipment.

Items f & g describe currently available ventilation options (automatic roof vents) and potential newinnovations that may allow easy removal of PV modules for roof ventilation access.

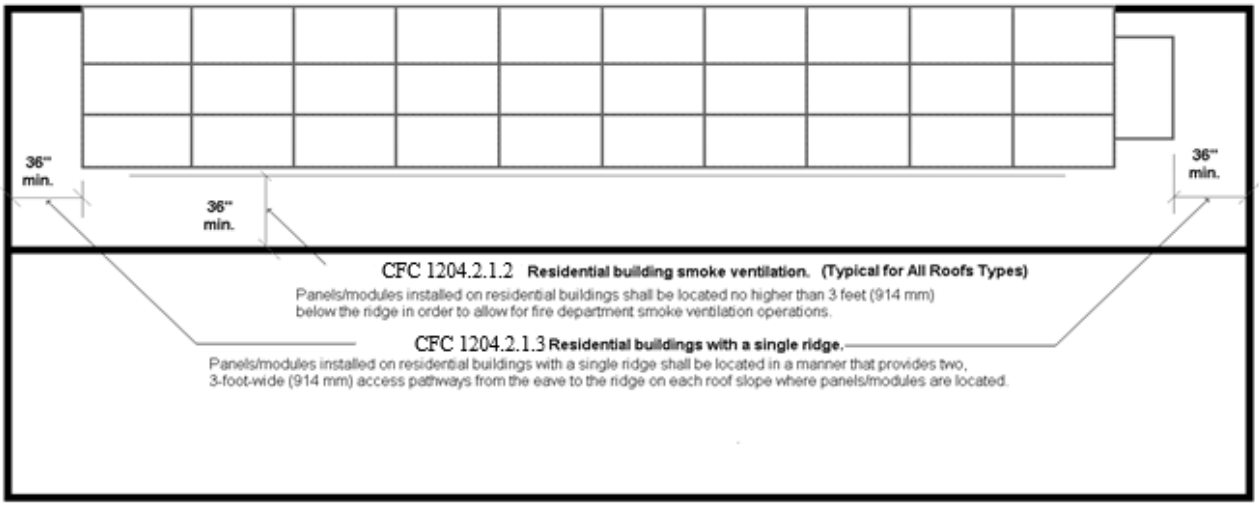
All these measures can be presented for consideration when evaluating optional means and methods to meet the intent of adequate roof access and ventilation opportunities.

4.0 Document Revisions

4.1 This document is subject to revisions. For general information and to verify that you have the most current document, see SJFD development website, or call (408) 535-7750 and request the current version date.

Roof Access Point Diagrams - Plan Views

These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2: 12) or less.



CFC 1204.2.1.2 **Residential building smoke ventilation. (Typical for All Roofs Types)**

Panels/modules installed on residential buildings shall be located no higher than 3 feet (914 mm) below the ridge in order to allow for fire department smoke ventilation operations.

CFC 1204.2.1.3 **Residential buildings with a single ridge.**

Panels/modules installed on residential buildings with a single ridge shall be located in a manner that provides two, 3-foot-wide (914 mm) access pathways from the eave to the ridge on each roof slope where panels/modules are located.

For a Cross Gable Roofs (See Diagram 1 of the Residential Isometric Diagram)
A single 3' gutter to ridge setback along one side of the array is allowed if the rear gable is clear of panels, accessible and otherwise unobstructed.

Residential buildings with roof hips and valleys.

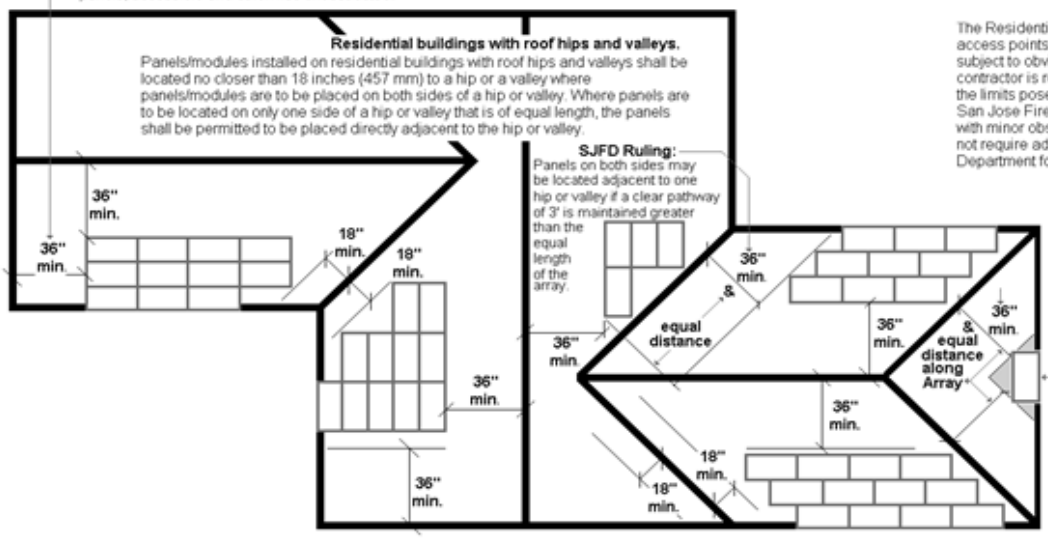
Panels/modules installed on residential buildings with roof hips and valleys shall be located no closer than 18 inches (457 mm) to a hip or a valley where panels/modules are to be placed on both sides of a hip or valley. Where panels are to be located on only one side of a hip or valley that is of equal length, the panels shall be permitted to be placed directly adjacent to the hip or valley.

SJFD Ruling:

Panels on both sides may be located adjacent to one hip or valley if a clear pathway of 3' is maintained greater than the equal length of the array.

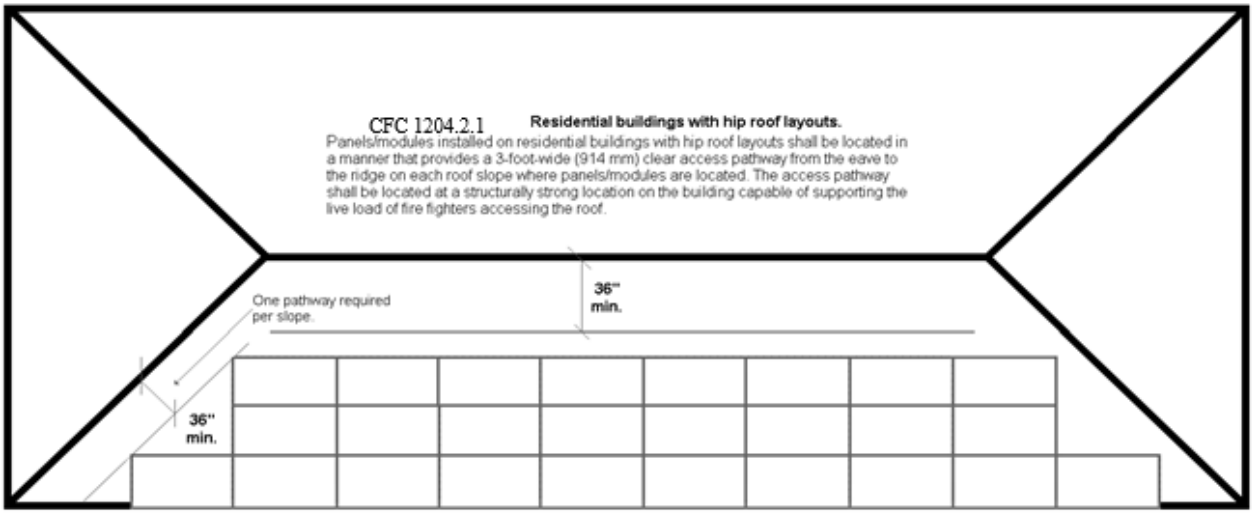
SJFD Ruling:

The Residential and Fire Codes require that roof access points be located in areas that are not subject to obvious obstructions. The installation contractor is responsible for compliance. Due to the limits posed by Senate Bill 1222 and since the San Jose Fire Department is equipped to deal with minor obstructions, the installation permit will not require additional inspection by the Fire Department for compliance.



SJFD Ruling:

Panels may be adjacent to the hip ridge (0") if a 3' path along side the Array is maintained on the adjacent roof slope. In this case the adjacent hip is shown without an Array as the area outside the required 3' clear path is insufficient to support additional panels.



CFC 1204.2.1 **Residential buildings with hip roof layouts.**

Panels/modules installed on residential buildings with hip roof layouts shall be located in a manner that provides a 3-foot-wide (914 mm) clear access pathway from the eave to the ridge on each roof slope where panels/modules are located. The access pathway shall be located at a structurally strong location on the building capable of supporting the live load of fire fighters accessing the roof.

Residential Isometric Diagrams:

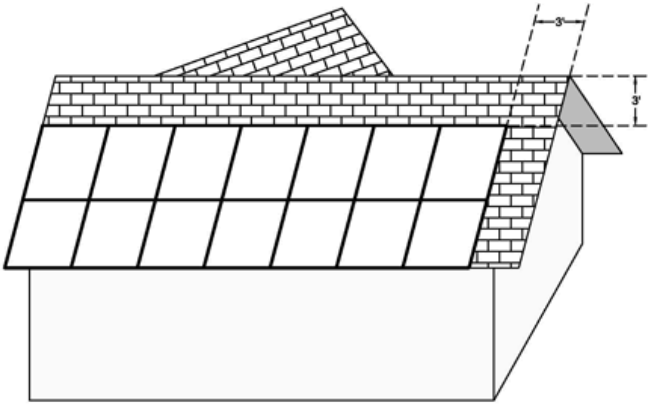


DIAGRAM 1: CROSS GABLE ROOF

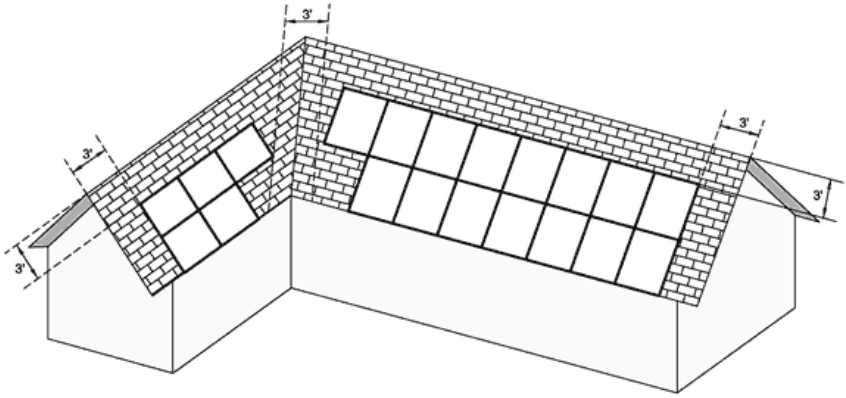


DIAGRAM 2: CROSS GABLE WITH VALLEY

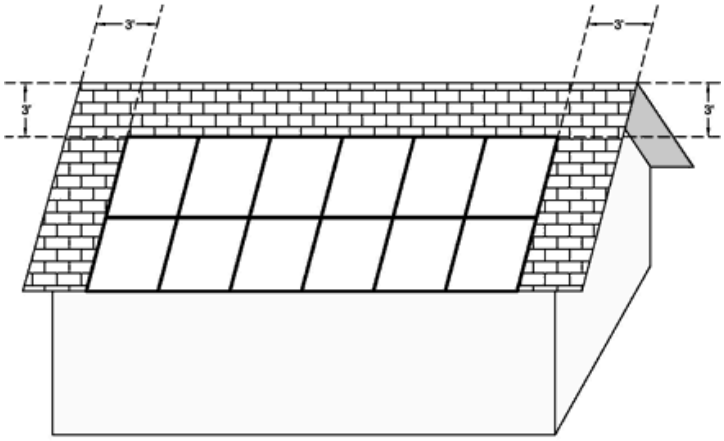


DIAGRAM 3: FULL GABLE ROOF

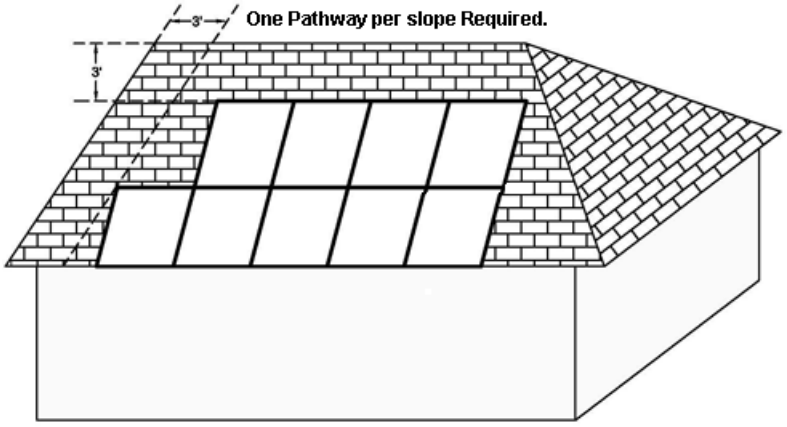


DIAGRAM 4: FULL HIP ROOF

SJFD Revised Diagrams Originally published in the *Solar Photovoltaic Installation Guideline* The California Department of Forestry and Fire Protection (CalFire), Office of the State Fire Marshal

Commercial Diagrams – CFC 1204.3.3

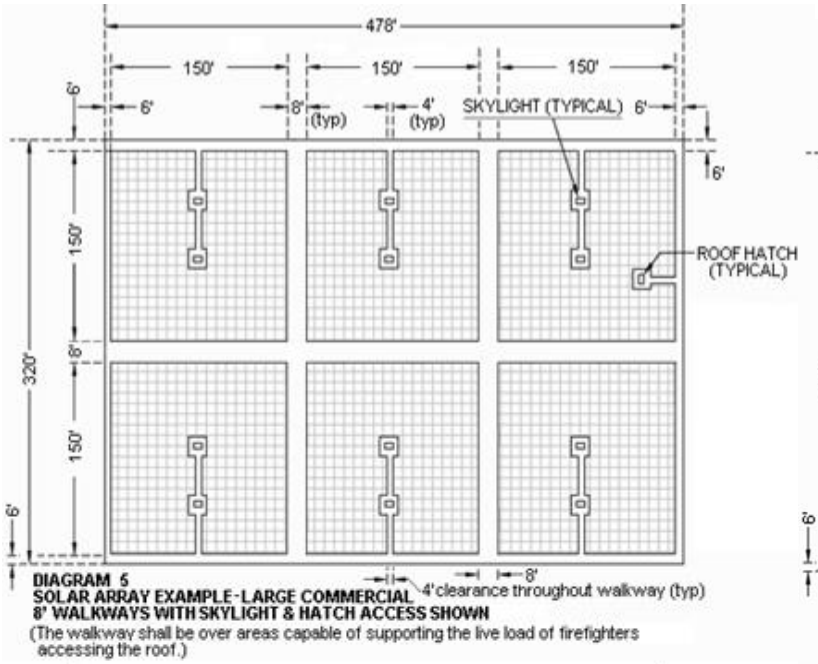


DIAGRAM 5
SOLAR ARRAY EXAMPLE - LARGE COMMERCIAL
8' WALKWAYS WITH SKYLIGHT & HATCH ACCESS SHOWN
(The walkway shall be over areas capable of supporting the live load of firefighters accessing the roof.)

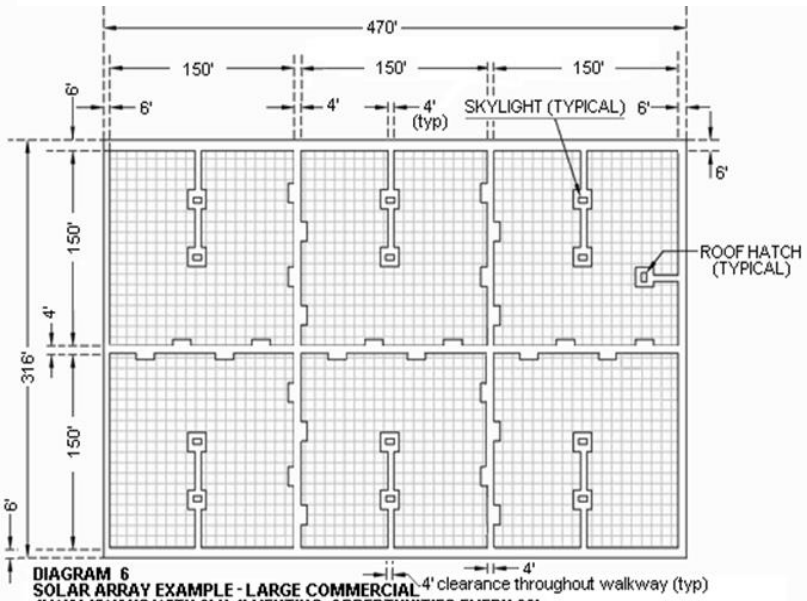


DIAGRAM 6
SOLAR ARRAY EXAMPLE - LARGE COMMERCIAL
4' WALKWAYS WITH 8' X 4' VENTING OPPERTUNITIES EVERY 20'
(The walkway shall be over areas capable of supporting the live load of firefighters accessing the roof.)

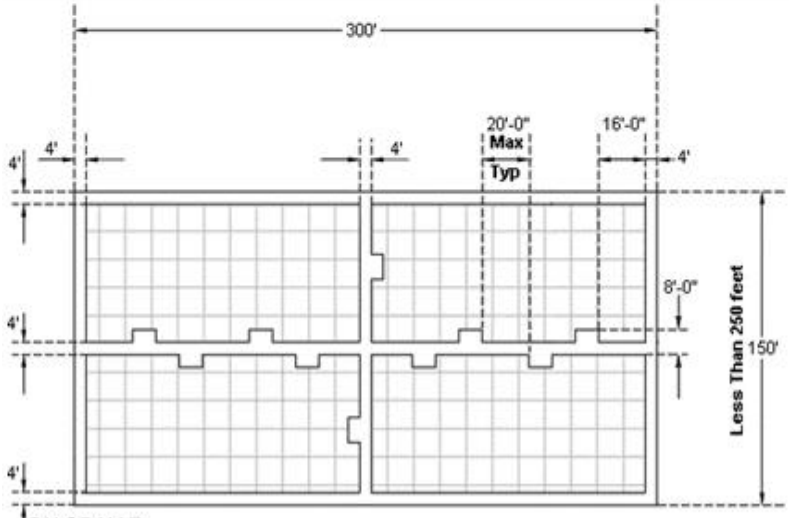


DIAGRAM 7
SOLAR ARRAY EXAMPLE - SMALL COMMERCIAL CFC 1204.3.3
4' WALKWAYS WITH 8' X 4' VENTING OPPORTUNITIES EVERY 20'
(The walkways shall be over areas capable of supporting the live load of fire fighters accessing the roof.)

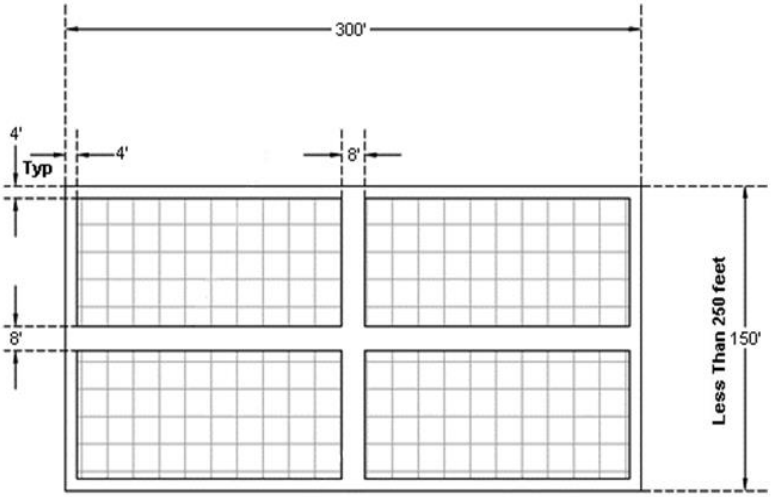


DIAGRAM 8
SOLAR ARRAY EXAMPLE - SMALL COMMERCIAL CFC 1204.3.3
8' WALKWAYS
(The walkways shall be over areas capable of supporting the live load of fire fighters accessing the roof.)

Diagrams Not to Scale