



# City of Manhattan Beach

## Community Development

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### Photovoltaic Solar Panel Plan Check Guidelines

Updated: 10-01-15

**ORDINANCE NO. 15-0022**

**MBMC 9.06**

**CALIFORNIA CIVIL CODE SECTION 714**

**GOVERNMENT CODE SECTION 658505**

**Please attach these forms to approved plans**

1. All work must comply with 2013 California Building Code and Electrical Code as well as applicable Manhattan Beach Municipal Code and amendments.
2. Provide engineering calculations and details demonstrating method of attachment of panels and adequacy of supporting members. Include wind uplift effects. Per ASCE 7-05, all calculations and designs to be stamped and signed by the engineer of record. Exemption for new Single Family Dwelling or Duplexes built after 1990: engineering calculations are not required, but the following must be provided:
  - . Structural framing plans for the existing building
  - . Solar panels must be flush mounted on the roof (4" from surface)
  - . Pre-fabricated roof systems require plans
  - . Structural installation details for the photovoltaic systemStructural calculations by a licensed Engineer or Architect may be required at plan check, as determined by the Plan Check Engineer.
3. Provide elevation drawings that show heights of the panels and indicate how they comply with the height limit for the property, including any limits or conditions on any discretionary applications such as Coastal Permitting, Minor Exceptions or Variances.
4. Per Planning Division requirements:
  - . Provide a site plan that shows location of panels and all related equipment, and distances to property lines.
  - . Panels and equipment cannot be located in required front or side setbacks or required parking, driveway or vehicular areas.
  - . Related equipment may be located where on-site utility meters are permitted 3' clear of P/L.
  - . Ground-mounted panels may be located where accessory structures are permitted.
  - . Solar panel height must comply with MBMC 10.60.060 A (see **Page 7**).
5. Visually screen all related equipment and conduit in accordance with MBMC 10.60.090.
6. Provide three (3) sets of plans, minimum 18" x 24"; attach all manufacturer's specification sheets, installation instructions and listing.

7. Add notes to plans: *“Exterior Remote Disconnect @ Roof Top and @ Inverter/Panel: DC and AC array conductors that are routed and installed completely on the exterior of the building shall be contained in galvanized rigid steel conduit from any PV array rooftop “J” box, fusible combiner box, or fusible DC/AC disconnect @ rooftop to the ground level DC/AC disconnect and/or inverter (integral or separate components). These DC/AC array conductors installed in galvanized rigid steel conduit need to be run entirely on the exterior of the building.”*
8. Add notes to plans: *“Interior Remote Disconnect: DC array conductors that are routed through the building are required to be in galvanized rigid steel conduit from any PV array rooftop “J” box, fusible combiner box, or fusible DC disconnect through any attic. Conduit run through the interior of the building shall be installed a minimum of 18” below the roof surface.”* Note: E.M.T conduit is not approved for exterior use or the interior attic space.
9. Add note to plans: *“Inspection required for roof connection mounting assemblies prior to installing solar module.”*
10. Provide DC array solar panel Voc calculated @  $\times 1.13$  [Temp. Corr.] //Isc calculated @  $\times 125\%$  [CEC-690]  $\times 125\%$  [UL 1703].
11. Provide complete inverter and solar module manufacturer specification sheet.
12. Show all conduit and conductor sizes, include derating of conductors.
13. Inverter integral AC/DC disconnects are not permitted. The AD/DC disconnects must be the blade-type (not drum-type). Drum-type disconnects are not permitted.
14. AC disconnect between inverter AC output and connection to utility to be a visible blade, lockable type disconnect listed for its use. Required DC/AC disconnects at roof top and at entrance of ground mounted inverters, to be visible blade-type listed for its use.
15. Distance between inverter and next downstream AC over current protection device to be maximum 25'. AC over current device is required prior to entering the building (line of sight).
16. Verify main electrical service over current device and buss rating. For a dwelling unit the sum of the ampere ratings of the over current devices shall not exceed 120% or the rating of the busbar or conductor.
17. Show existing main electric service equipment and ground electrode system, conduit and conductor size.
18. Provide ground electrode system from inverter to existing main service ground electrode per CEC Article 250.50 through 250.86.
19. Ground electrode conductor from inverter to ground electrode to be minimum protection of bare armor sheathed cable, #8 awg. minimum.

20. Show all signage required per 2013 CEC – Article 690. See **Page 3**.
21. Roof top blade type disconnects are required for all DC and AC systems per City of Manhattan Beach Fire Department requirements. See Fire Department Solar Photovoltaic System Requirements “Residential 1 and 2 Family Homes” and “Commercial Building and Residential Housing of 3 or More Units.”

COMMERCIAL

# SOLAR – PHOTOVOLTAIC SYSTEM REQUIRED BUILDING INSPECTIONS

## BUILDING INSPECTOR / CONTRACTOR NOTE

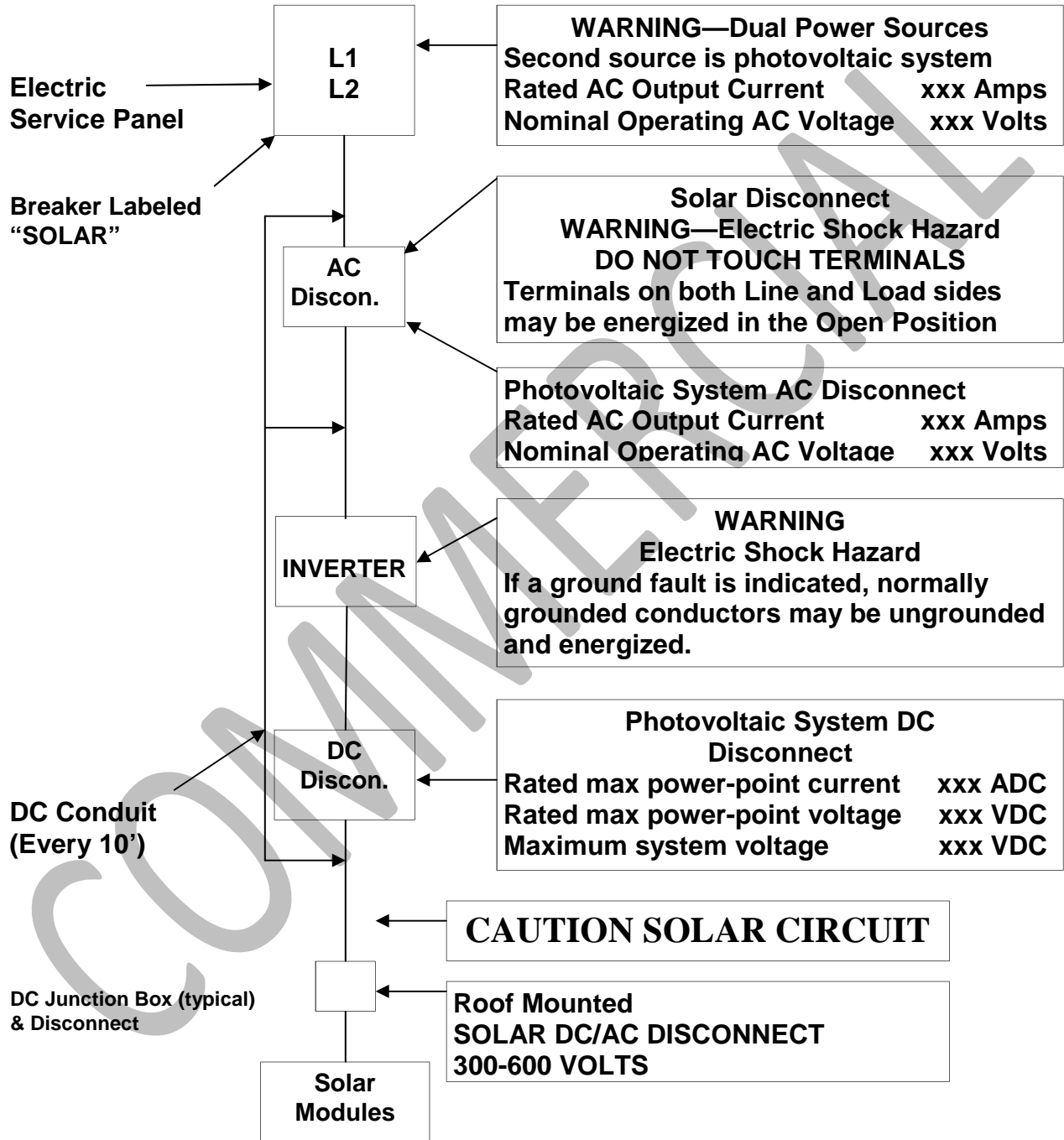
Two site inspections are required for roof-mounted PV systems:

1. **FIRST INSPECTION TO INCLUDE:**
  - a. PV mounting bases, stanchions, roof flashings, rails, roof shingle/roof tile penetrations, conductor type and sizing, and conduit runs, combiner boxes, rough electrical components.
  - b. Provide a ladder for Building Inspector to use. Structural calculations (where applicable) to be on site and available for the Building Inspector.
  - c. No PV modules to be mounted until all of the above components have been inspected and approved (including fasteners).
  
2. **SECOND / FINAL INSPECTION TO INCLUDE:**
  - a. Verifying conductor size/conductor type, grounding and bonding components, transfer switches, combiner boxes, through-roof penetrations, panel boards, disconnects, and warning labels.
  - b. Sealants, caulking products need to be listed and approved for the application.
  - c. Contractor shall have the product cut sheets, caulking & sealant product available for the Building Inspector.



**CITY OF MANHATTAN BEACH**

**PHOTOVOLTAIC SIGNAGE REQUIREMENTS  
Per 2013 CEC—Article 690**



**SIGNAGE**

Signage material shall be reflective, weather-resistant material suitable for the environment. All signage shall fall within the following format:

- White Lettering on a Red Background
- Minimum 3/8" Letter Height
- All Letters Shall be Capitalized

## REQUIRED LABELS FOR SOLAR ELECTRIC (PV) SYSTEMS <10KW

- Labels shall be made of RED plastic material with engraved white letters
- Letters shall be a minimum 3/8” in size
- The labels shall be permanently attached to the appropriate panel.
- AC & DC conduit, raceway, enclosures, cable assemblies and junction boxes shall be RED background with WHITE lettering made of durable adhesive, reflective weather resistant material suitable for the environment – to alert Fire Department to avoid cutting them off.

**WARNING!**  
**DUAL POWER SUPPLY**  
**SOLAR ELECTRIC SYSTEM**

ATTACH THIS TAG TO METER PANEL

**WARNING!**  
**DUAL POWER SUPPLY**  
**SOLAR ELECTRIC SYSTEM**  
**DISCONNECT**

ATTACH THIS TAG TO PV DISCONNECT DEVICE

**CAUTION:**  
**SOLAR ELECTRIC CIRCUIT**

ATTACH THIS TAG TO AC & DC CIRCUIT EQUIPMENT



<b>CITY OF MANHATTAN BEACH</b>	
<b>LABEL REQUIREMENTS : SOLAR-PV SYSTEMS</b>	
DRAWING: SPV-1	Updated: 4-21-10

## REQUIRED LABELS FOR SOLAR ELECTRIC (PV) SYSTEMS w/BATTERY BACK-UP <10KW

- Labels shall be made of RED plastic material with engraved white letters
- Letters shall be a minimum 3/8" in size
- The labels shall be permanently attached to the appropriate panel.
- AC & DC conduit, raceway, enclosures, cable assemblies and junction boxes shall be RED background with WHITE lettering made of durable adhesive, reflective weather resistant material suitable for the environment – to alert Fire Department to avoid cutting them off.

**WARNING!  
DUAL POWER SUPPLY  
SOLAR ELECTRIC SYSTEM  
CRITICAL LOAD MUST BE  
DISCONNECTED SEPARATELY**

ATTACH THIS TAG TO METER PANEL

**WARNING!  
DUAL POWER SUPPLY  
SOLAR ELECTRIC  
SYSTEM  
DISCONNECT**

ATTACH THIS TAG TO PV DISCONNECT DEVICE

**CAUTION:  
SOLAR ELECTRIC CIRCUIT**

ATTACH THIS TAG TO AC & DC CIRCUIT EQUIPMENT

**CRITICAL LOAD DISCONNECT**

ATTACH THIS TAG TO AC & DC CIRCUIT EQUIPMENT



<b>LABEL REQUIREMENTS : SOLAR-PV SYSTEMS W/BATTERY BACKUP</b>	
DRAWING: SPV-2	Updated: 10-01-15

## **REQUIRED LABELS FOR MULTI-SOLAR ELECTRIC (PV) SYSTEMS <10KW**

- Labels shall be made of RED plastic material with engraved white letters
- Letters shall be a minimum 3/8" in size
- The labels shall be permanently attached to the appropriate panel.
- AC & DC conduit, raceway, enclosures, cable assemblies and junction boxes shall be RED background with WHITE lettering made of durable adhesive, reflective weather resistant material suitable for the environment – to alert Fire Department to avoid cutting them off.

**WARNING!**  
**DUAL POWER SUPPLY**  
**2 - SOLAR ELECTRIC SYSTEMS**  
**2- DISCONNECT DEVICES**

ATTACH THIS TAG TO METER PANEL

**WARNING!**  
**DUAL POWER SUPPLY**  
**SOLAR ELECTRIC SYSTEM**  
**DISCONNECT 1 of 2**

ATTACH THIS TAG TO PV DISCONNECT DEVICE

**WARNING!**  
**DUAL POWER SUPPLY**  
**SOLAR ELECTRIC SYSTEM**  
**DISCONNECT 2 of 2**

ATTACH THIS TAG TO PV DISCONNECT DEVICE

**CAUTION:**  
**SOLAR ELECTRIC CIRCUIT**

ATTACH THIS TAG TO AC & DC CIRCUIT EQUIPMENT





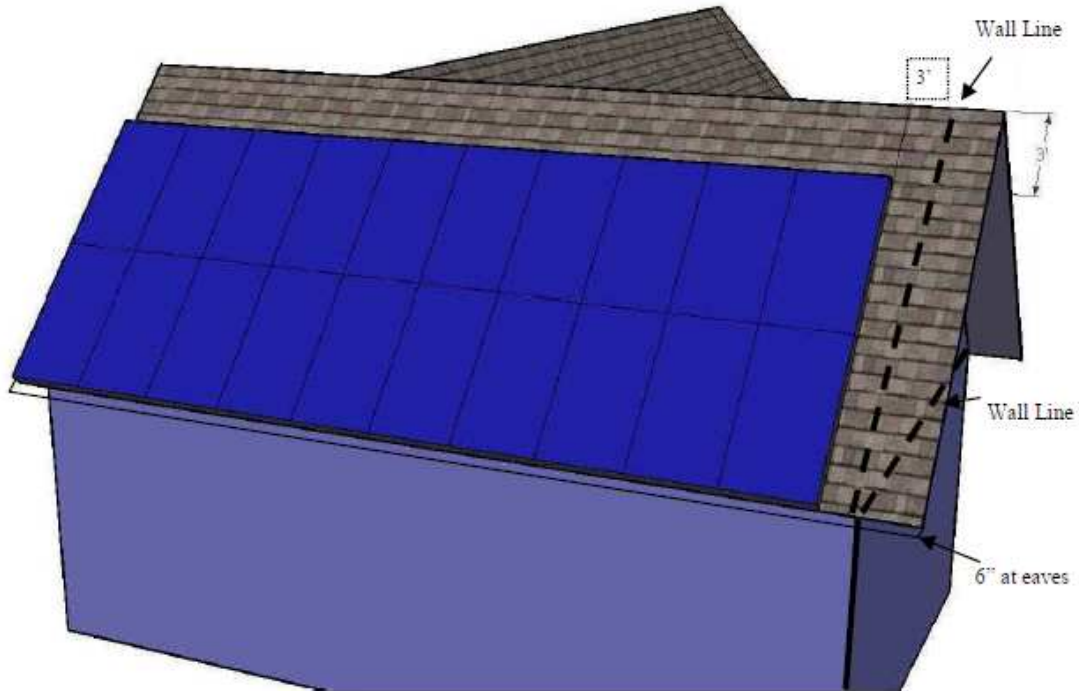
**CITY OF MANHATTAN BEACH**  
**LABEL REQUIREMENTS : MULTIPLE SOLAR-PV SYSTEMS**

DRAWING: SPV-3

Updated: 4-21-10

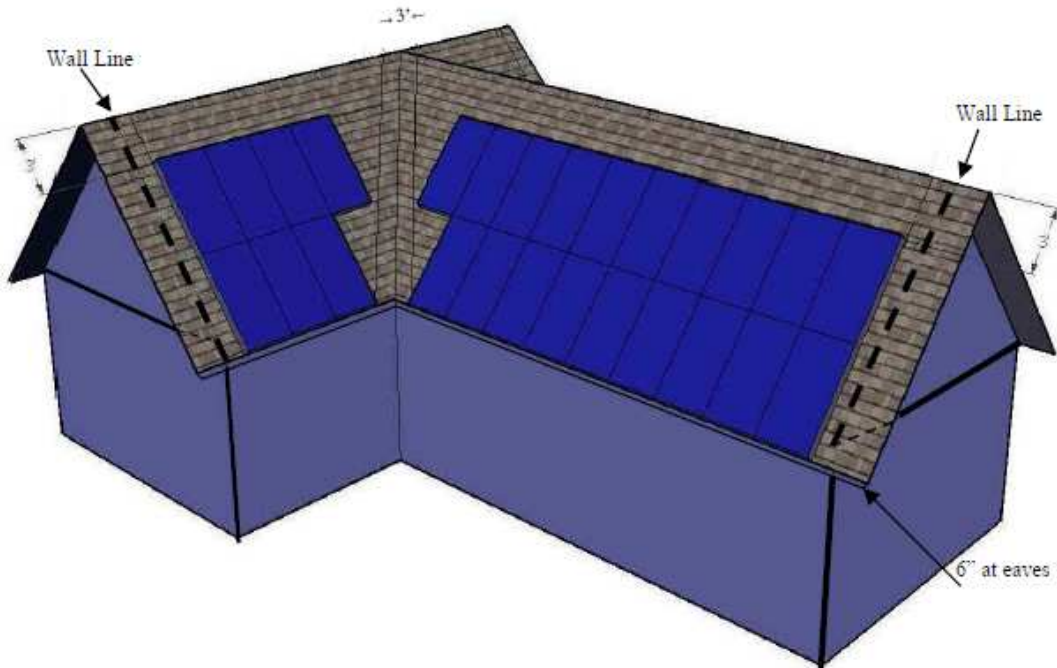
COMMERCIAL

**RESIDENTIAL DIAGRAM 1: Cross Gable Roof**

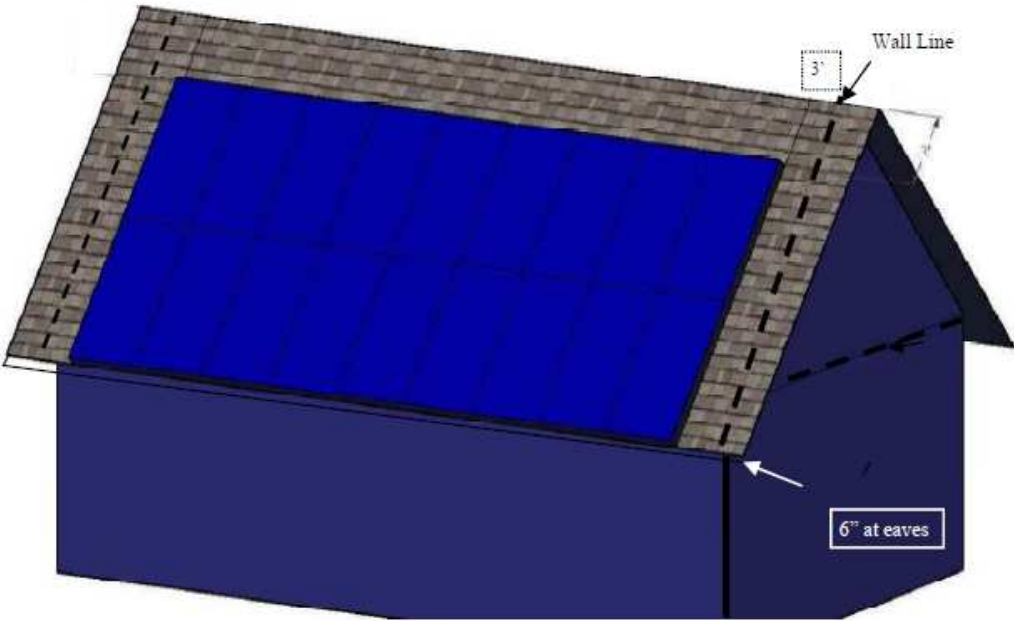


Three feet (3') measured from face of exterior wall line at non-structural eaves.

**RESIDENTIAL DIAGRAM 2: Cross Gable with Valley**

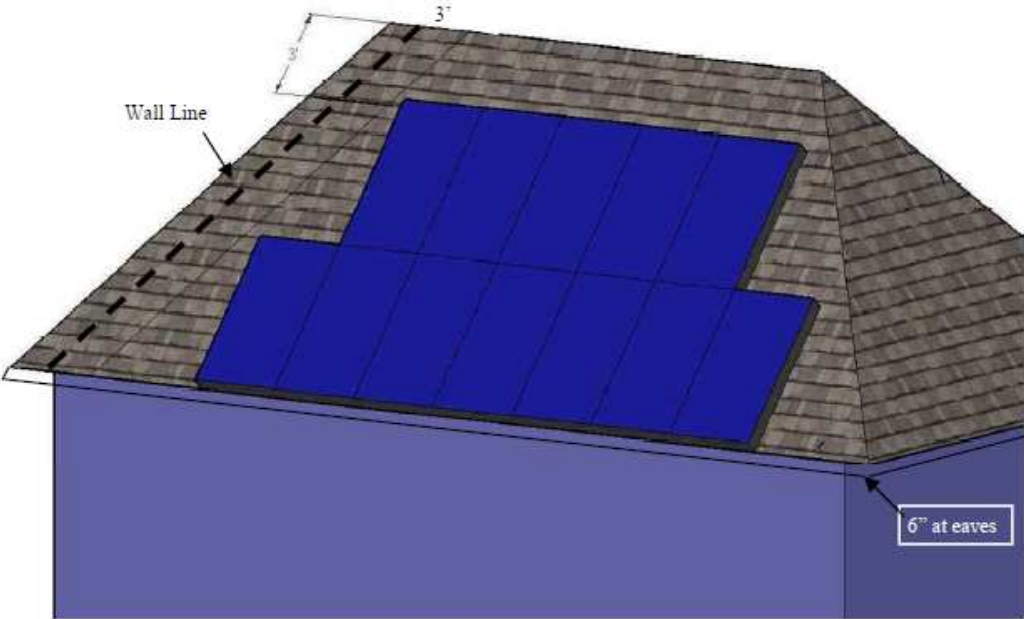


**RESIDENTIAL DIAGRAM 3: Full Gable**



Three feet (3') measured from face of exterior wall line at non-structural eaves.

**RESIDENTIAL DIAGRAM 4: Full Hip Roof**

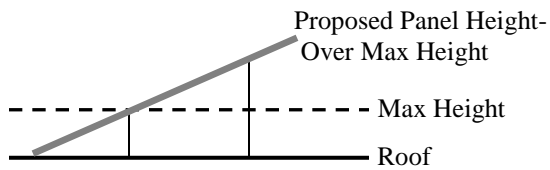


# City of Manhattan Beach Planning Requirements

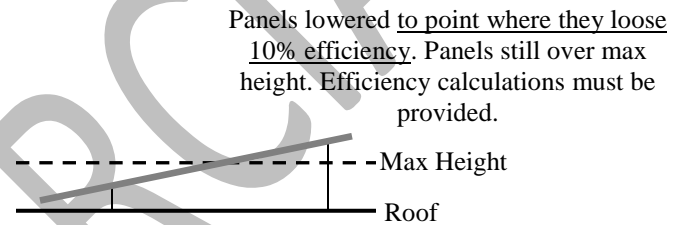
## Solar Panel Height

Solar panels for domestic water or swimming pool heating systems may exceed the maximum height limit if it is shown that the performance of the panel drops below 90% of the performance achieved at maximum efficiency, as defined by the State Solar Rights Act (CA Civil Code 714). All solar panels cannot exceed the maximum height limit by more than 12" per MBMC 10.60.060 A. Solar panels and equipment shall comply with all conditions of any discretionary applications.

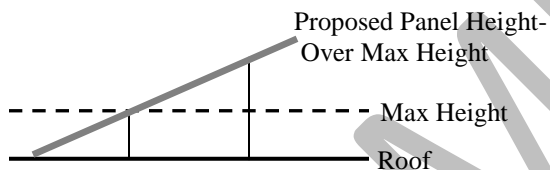
### Scenario 1



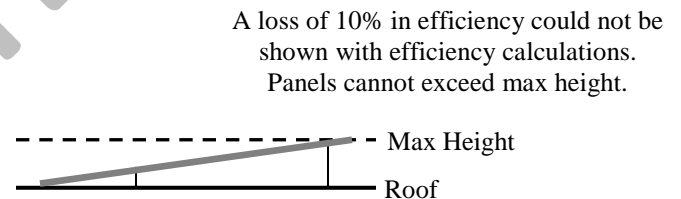
Cross Sections



### Scenario 2



Cross Sections



### Plans Must Show:

- Maximum allowable building height, obtained from the original approved building plans on file or by obtaining a property survey.
- Actual maximum building height (either top of ridge or top of parapet), obtained from looking at the original approved building plans on file or by obtaining a property survey.
- If panels exceed height limit, efficiency calculations must be provided.
- If a building's maximum height cannot be determined, either because it is not shown on the plans or because plans cannot be found, the panels will not be allowed to exceed the roof ridge or top of parapet. The applicant can determine the maximum height by getting a property survey.



# MANHATTAN BEACH FIRE DEPARTMENT FIRE PREVENTION BUREAU

400 15<sup>TH</sup> Street

Manhattan Beach, CA 90266

Telephone (310) 802-5205

FAX (310) 802-5201

## **SOLAR PHOTOVOLTAIC SYSTEM REQUIREMENTS Commercial Buildings and Residential Housing of 3 or More Units**

The following are the Manhattan Beach Fire Department's **minimum** requirements for Solar Photovoltaic System Installations. Manhattan Beach Fire Department may create exceptions to these requirements due to new technology, methods, or other innovations to ensure firefighter and public safety.

### **SECTION 1 - SCOPE**

These requirements regulate the installation of solar photovoltaic systems and their ancillary devices. Included are requirements regulating access, fire protection, and other measures and general precautions relating to solar photovoltaic systems.

### **SECTION 2 - PLAN REVIEW**

Photovoltaic (PV) installations shall be approved by the Manhattan Beach Fire Department prior to installation.

At a **minimum**, the following information shall be presented for approval:

- A. Site plan of the structure on which the photovoltaic array is to be installed (see Community Development requirements for site plans)
- B. Note indicating rooftop-mounted panels and modules have the proper fire classification rating

### **SECTION 3 - MARKINGS, LABELS, AND WARNING SIGNS**

- A. Purpose: Provide emergency responders with appropriate warning and guidance with respect to isolating the solar electrical system. This can facilitate identifying energized electrical lines that connect the solar panels to the inverter, as these should not be cut when venting for smoke removal.
- B. Marking: Markings are required on interior and exterior AC conduit, DC conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects (utility/safety disconnect at main electrical panel and rooftop emergency disconnect). The markings should be readily visible from any direction of approach.

## SECTION 4 – ACCESS, PATHWAYS, AND SMOKE VENTILATION

- A. Access: A minimum 6' wide clear perimeter is required around the entire circumference of the roof.
- B. There shall be an unobstructed clearance of 7' or more between the roof deck surface and the underside of an overhead array.
- C. Pathways: Shall be established in the design of the solar installation and meet the following requirements:
  - 1. Located over structurally supported members.
  - 2. Center line axis pathways shall be provided in both axes of the roof. Centerline axis pathways shall run on structurally supported members or over the next closest structurally supported member nearest to the centerlines of the roof.
  - 3. A minimum of 4' clear straight line pathway shall be provided from the access path to skylights and/or ventilation hatches.
  - 4. A minimum of 4' clear straight line pathway shall be provided from the access path to roof standpipes.
  - 5. A minimum of 4' clearance around roof access hatches with at least one 4' clear straight line pathway to parapet or roof edge.
- D. Smoke Ventilation:
  - 1. Panels/modules shall be located no higher than 3' below the ridge.
  - 2. The panels may be located no higher than 18" below the ridge if photovoltaic panels are installed on only one side of the ridge.
  - 3. Arrays shall be no greater than 150' by 150' in distance in either axis.
  - 4. Smoke ventilation options between array sections shall be one of the following:
    - i. An access pathway 8' or greater in width.
    - ii. A 4' or greater in width access pathway and bordering roof skylights or smoke and heat ventilation hatches.
    - iii. A 4' or greater in width access pathway and bordering 4' by 8' "venting cutouts" every 20' on alternating sides of the pathway.

**EXCEPTION:** The **MBFD** may determine that the roof configuration is similar to that of a one-or two-family dwelling residential building, as in the case of townhouses, condominiums, or single family attached buildings in which case the residential access requirements may be used.

## **SECTION 5 - CONDUCTOR LOCATIONS, AC and DC**

### **A. Conduit, Wiring Systems, and Raceways:**

To reduce trip hazards and maximize ventilation opportunities photovoltaic circuits shall be located as close as possible to the ridge, hip or valley and from the hip or valley as directly as possible to an outside wall.

### **B. Conduit Runs between Sub Arrays and DC Combiner Boxes shall:**

1. Use design guidelines that minimizes the total amount of conduit used on the roof by taking the shortest path from the array to the DC combiner box.
2. The DC combiner boxes are to be located in such a manner that conduit runs are minimized in the pathways between arrays.

### **C. AC and DC Wiring:**

1. AC and DC wiring shall be run in metallic conduit or raceways when located within enclosed spaces in a building.
2. Conduit shall run a minimum of 18" below the roof decking.

## **SECTION 6 – DISCONNECTS**

### **A. Central Inverter Systems:**

Central inverter systems shall have a DC disconnect switch on the roof at the combiner (emergency disconnect) and a DC disconnect at the inverter in the area of the main service panel (utility/safety disconnect) for the purpose of de-energizing or providing for rapid shutdown of PV system.

### **B. Micro inverter Systems:**

Micro inverter systems shall have an AC disconnect switch on the roof at the collector circuit breaker panel (emergency disconnect) and an AC disconnect at the main service panel (utility/safety disconnect) for the purpose of de-energizing or providing for rapid shutdown of PV system.

## **SECTION 7 - GROUND MOUNTED PHOTOVOLTAIC ARRAYS**

- A. Shall not obstruct Fire Department access.
- B. Overhead arrays shall comply with the same marking, labeling, and warning signs as required of roof-mounted systems.

## **SECTION 8 – BATTERY SYSTEMS**

Battery systems shall comply with CFC Section 608: Stationary Storage Battery Systems.