



City of Manhattan Beach

Community Development

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Photovoltaic Solar Panel Plan Check Guidelines

Updated: 12-20-16

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 2016 California Building Code and California 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 9**).
5. Visually screen all related equipment and conduit in accordance with MBMC 10.60.090.
6. Provide two (2) 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. Provide DC array solar panel Voc calculated @ $x 1.13$ [Temp. Corr.] //Isc calculated @ $x 125\%$ [CEC-690] $x 125\%$ [UL 1703].
10. Provide complete inverter and solar module manufacturer specification sheet.
11. Show all conduit and conductor sizes, include derating of conductors.
12. 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.
13. 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.
14. 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).
15. 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.
16. Show existing main electric service equipment and ground electrode system, conduit and conductor size.
17. Provide ground electrode system from inverter to existing main service ground electrode per CEC Article 250.50 through 250.86.
18. Ground electrode conductor from inverter to ground electrode to be minimum protection of bare armor sheathed cable, #8 awg. minimum.
19. Show all signage required per 2016 CEC – Article 690 (see **Pages 6-8**).

20. 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.”

RESIDENTIAL

SOLAR – PHOTOVOLTAIC SYSTEM REQUIRED BUILDING INSPECTIONS

BUILDING INSPECTOR / CONTRACTOR NOTE

One site inspection is required for roof-mounted PV systems:

1. FINAL INSPECTION TO INCLUDE:

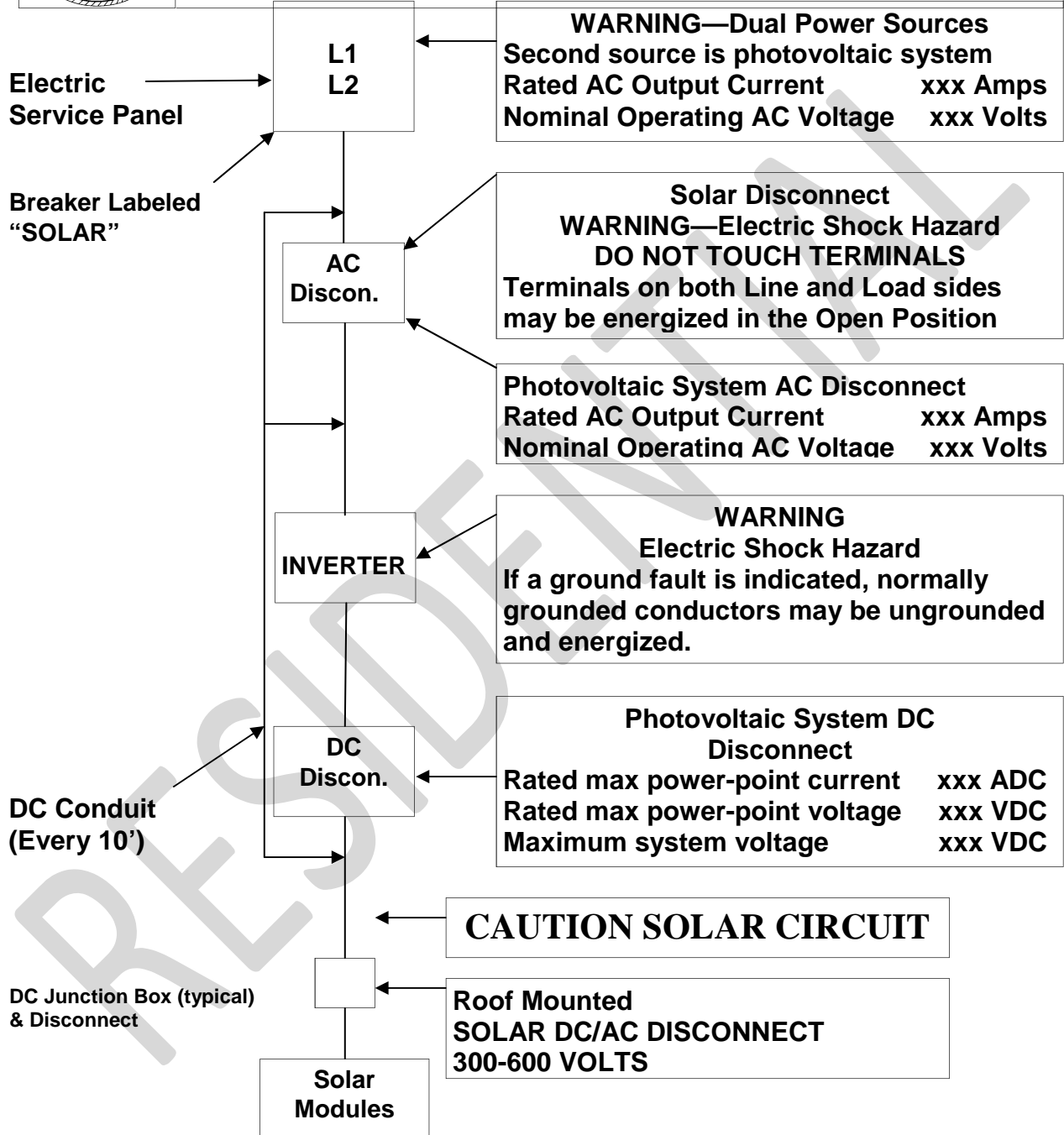
- A. Verifying conductor size/conductor type, grounding and bonding components, transfer switches, combiner boxes, through-roof penetrations, panel boards, disconnects, and warning labels.
- B. Sealants, caulking products need to be listed and approved for the application.
- C. Contractor shall have the product cut sheets, caulking & sealant product available for the Building Inspector.

RESIDENTIAL



CITY OF MANHATTAN BEACH

**PHOTOVOLTAIC SIGNAGE REQUIREMENTS
Per 2016 CEC—Article 690**



WARNING—Dual Power Sources
 Second source is photovoltaic system
 Rated AC Output Current xxx Amps
 Nominal Operating AC Voltage xxx Volts

Solar Disconnect
WARNING—Electric Shock Hazard
DO NOT TOUCH TERMINALS
 Terminals on both Line and Load sides
 may be energized in the Open Position

Photovoltaic System AC Disconnect
 Rated AC Output Current xxx Amps
 Nominal Operating AC Voltage xxx Volts

WARNING
Electric Shock Hazard
 If a ground fault is indicated, normally
 grounded conductors may be ungrounded
 and energized.

Photovoltaic System DC Disconnect
 Rated max power-point current xxx ADC
 Rated max power-point voltage xxx VDC
 Maximum system voltage xxx VDC

CAUTION SOLAR CIRCUIT

Roof Mounted SOLAR DC/AC DISCONNECT 300-600 VOLTS

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
- All Letters Shall be Capitalized
- Minimum 3/8" Letter Height
- Arial or Similar Font, Non-Bold

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

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

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

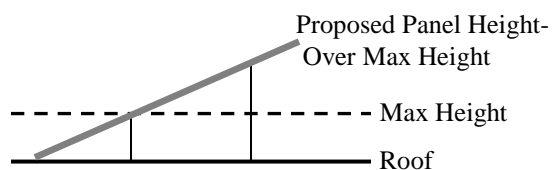
ATTACH THIS TAG TO AC & DC CIRCUIT EQUIPMENT

City of Manhattan Beach Planning Requirements

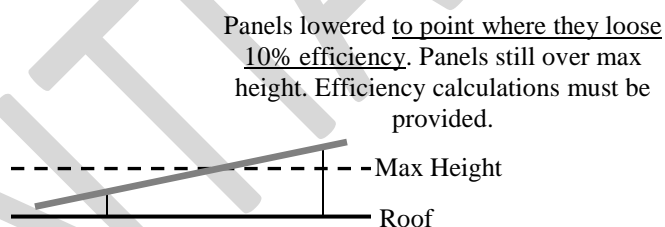
Solar Panel Height

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.

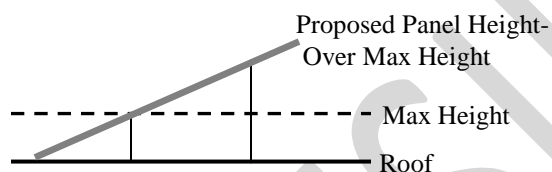
Scenario 1



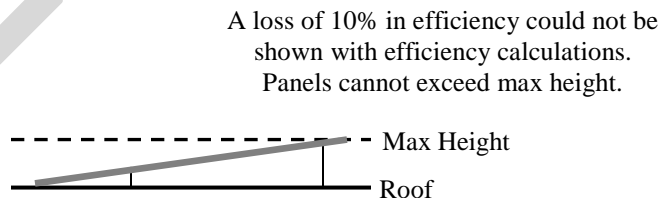
Cross Sections



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 15TH Street

Manhattan Beach, CA 90266

Telephone (310) 802-5205

FAX (310) 802-5201

SOLAR PHOTOVOLTAIC SYSTEM REQUIREMENTS Residential 1 and 2 Family Homes

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

For qualifying rooftop photovoltaic systems on one and two family dwellings and accessory structures, the City of Manhattan Beach Department of Community Development shall ensure compliance with MBFD requirements.

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 site plan requirements)
- B. Note indicating rooftop-mounted panels and modules have the proper fire classification rating

SECTION 3 - MARKINGS, LABELS, AND WARNING SIGNS

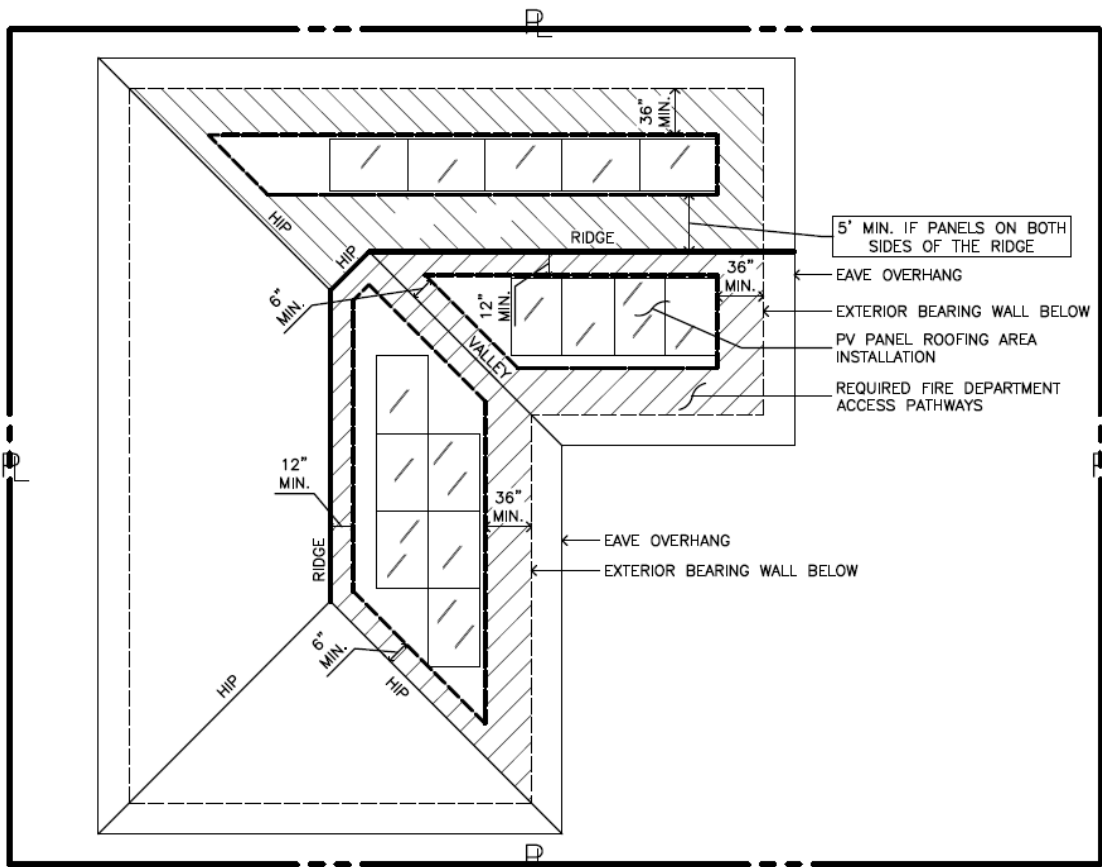
- A. Purpose: Provide emergency responders with appropriate warning and guidance with respect to isolating the solar electrical system. This can facilitate identifying energized electrical lines that connect the solar panels to the inverter, as these should not be cut when venting for smoke removal.
- 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. Panels and modules shall be located in a manner that provides a minimum 3-foot-wide (968 mm) clear perimeter around the edges of the roof. The access pathway shall be capable of supporting the firefighters accessing the roof, i.e. over an exterior load-bearing wall.
- B. Access pathway clear width shall not include eaves or overhangs unless eave or overhang is constructed of primary roof rafters and NOT sistered or constructed with decorative rafters that are not part of the structural integrity of the roofing system. Structural plans or other required documents for verification must be submitted with the site plan for this variance to be considered.
- C. Panels/modules shall be located no closer than 6-inches minimum (12-inches preferred) to a hip or valley if placed on both sides of the hip or valley.
- D. Where panels/modules are located on only one side of a hip or valley that is of equal length, the panels may be placed directly adjacent to the hip or valley.
- E. Panels/modules shall be located on only one side of any ridge and shall be located no higher than 1-foot below the ridge.

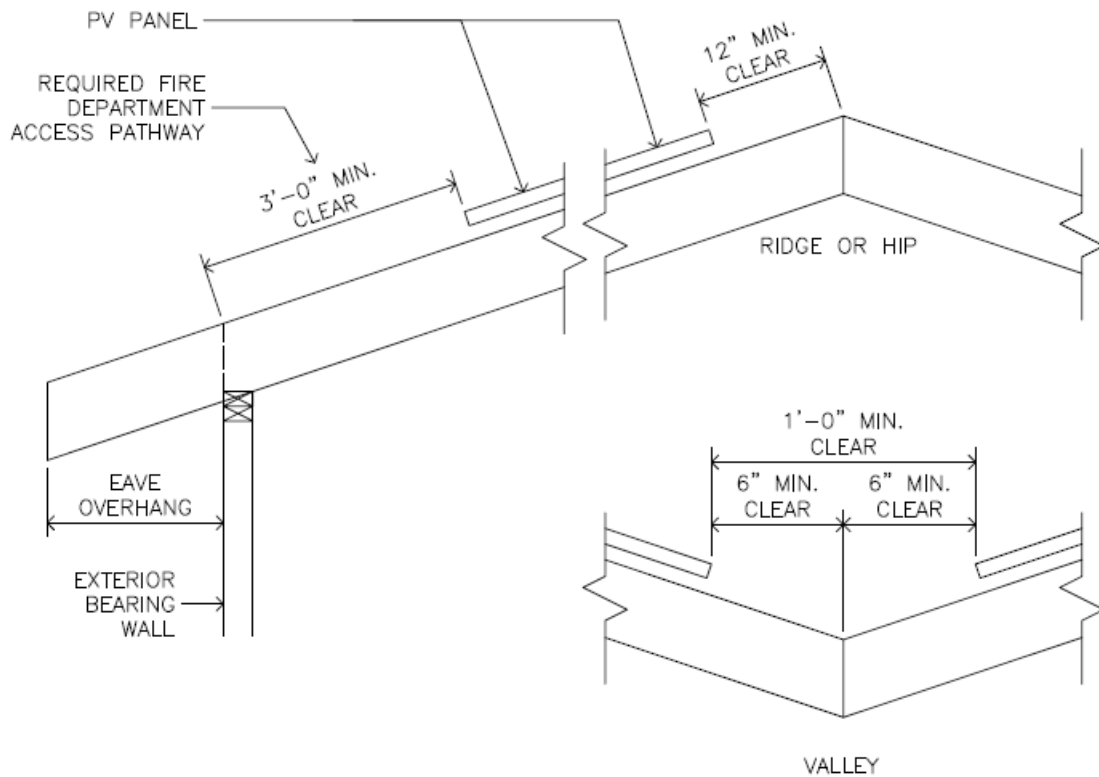
EXCEPTIONS:

1. Where solar panels are located a minimum of 5-feet from the ridge on the opposing side.
2. Where alternative means of allowance for smoke ventilation operations have been approved by the fire chief.



REQUIRED FIRE DEPARTMENT ACCESS PATHWAY ROOF PLAN
 NOT TO SCALE

RESIDUAL



REQUIRED FIRE DEPARTMENT ACCESS PATHWAY SECTIONS

$\frac{1}{2}'' = 1'-0''$

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. 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-inches 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, as much as possible, de-energizing the PV system.

B. Micro Inverter Systems

Micro inverter systems shall have an AC disconnect switch on the roof (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.

The rooftop emergency disconnect is for firefighters to use if there is an electrical emergency or if the residence is on fire. With this in mind, the disconnect shall be installed in a logical, accessible, visible location.

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 Local amendment 105.6.48 Battery systems

SECTION 9 – INSPECTIONS

The City of Manhattan Beach Building and Safety Division verifies that all photovoltaic systems are built per plan. In support of the Building and Safety Division, Manhattan Beach Fire Department may accompany Building Inspectors on inspections, particularly on unusual installations or installations where a variance is issued to assure accuracy and compliance with Solar Photovoltaic System Requirements.