



City of Oceanside  
Building Division  
300 N Coast Hwy  
Oceanside, CA 92054  
760-435-3950

## PHOTOVOLTAIC PERMITTING

### References:

- Seismic Zone: D or based on updated code requirement and soils report.
- California Code Of Regulations, Title 25.
- Basic wind speed: 70 mph
- Maximum rain intensity: 1.5" per hour
- 2010 editions of the California Electric Code (CEC), California Building Code (CBC), California Plumbing Code (CPC), California Mechanical Code (CMC), California Fire Code (CFC), and California Health and Safety Code amendments.
- 2010 California Energy Code Energy Efficiency Standards, Climate Zone 7
- 2010 CBC Title 24 Accessibility Regulations
- Soils Class per CBC Table 1804.2 or a soils report per CBC §1805.

### PRIOR TO INSTALLATION

- Prior to installation plans shall be submitted reviewed and approved.

### PLAN SUBMITTAL REQUIREMENTS

ALL INFORMATION LISTED BELOW **MUST** BE PROVIDED AT THE TIME OF PERMIT APPLICATION FOR PLAN REVIEW TO OCCUR.

- Obtain a Zoning Clearance from Planning for all photovoltaic panel arrays
- Provide three (3) complete sets of plans and specifications for the photovoltaic modules, panels, arrays and framing supports.
- Provide Minimum plan drawings 18" x 24"
- Provide a plot plan showing the location on the property of the PV array in relationship to the property lot lines with required setbacks dimensions and location of all disconnects (amps), inverter (make and size) and existing electrical meter(s) (service size).
- All drawings are required to be wet signed.
- Specify all conduit size, location (inside and outside the building), conductor type and AWG.
- Provide details for all roof mounted solar panel support and attachment. Specify roof dead load (PSF) and wind uplift values.
- Structural analysis is required if dead load of the arrays exceed five (5) pounds per square foot.
- Provide details identifying the method of flashing and sealing of the roof penetrations.
- Provide City of Oceanside two (2) page "**Generic PV System Electrical Diagram**" showing the number of PV panels with voltage and kilowatt outage ratings, the size of the main service electrical panel bussing in amperes, and size of PV circuit breaker in amperes. <http://www.brooksolar.com/files/Fill-in-form-doc3.pdf>
- Identify all means of grounding and bonding for all equipment and support systems.
- Show and specify the building directory signage required by CEC Article 225.37, 705.10
- Provide the manufacturer's information brochures for the inverter, the PV modules and mounting system.

## REQUIRED INSPECTIONS

- Footings for ground mount support systems
- Structural attachment of racking system
- Underground conduit
- All conduit/wiring that enters the building
- Final

## GENERAL REQUIREMENTS

- The plans, permit and installation instructions shall be on site at the time of the inspection.
- Field installations shall be per code/plan. Changes shall be submitted to the City of Oceanside Building Division for approval prior to inspection.
- All structural attachments must be inspected prior to covering.
- Where DC wiring is installed inside the structure shall be installed in metal raceways. CEC 690.31(E), see additional requirements at: <http://www.sandiego.gov/development-services/industry/elecnews.shtml>
- Where DC wiring enters the structure a rough electrical inspection is required.
- Installer shall have a ladder and be on site at the time of inspection. The ladder shall extend 36" above the roof and the ladder must be secured at roof.
- All equipment shall be open and ready for inspection.
- If using the WEEB system for grounding, a letter of acceptance from the module manufacturer, signed by their engineer, is required.

## MAIN ELECTRIC SERVICE

- Verify utility point of interconnection (circuit breaker) is per plan and does not exceed 120% of the bus rating CEC 690.64 **NOTE:** All connections to the supply side of the service disconnect will require 3<sup>rd</sup> party certification.
- Circuit breakers shall be the same manufacturer as the main electrical service.
- Verify grounding electrode system from inverter to ground rod then bonded to existing AC grounding electrode or provide grounding electrode conductor directly from inverter to existing grounding electrode with separate attachment.
- If there is not an existing AC grounding electrode, the PV contractor shall install ground rod(s) at the main electrical service. CEC 250.52(A)(5)

## ROOF TOP INSTALLATION

- All equipment on the roof requiring servicing shall meet the required clearances of CEC 110.26 and California Department of fire protection. See all requirements at: <http://osfm.fire.ca.gov/pdf/reports/solarphotovoltaicguideline.pdf>

### Residential Systems-Single and Two-Unit Residential Dwellings Access/Pathways

- a) Residential buildings with hip roof layouts: Modules 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 modules are located. The access pathway shall be located at structurally strong location on the building (such as a bearing wall).
- b) Residential Buildings with single ridge: Modules 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 modules are located.

- c) Hips and Valleys: Modules shall be located no closer than one and half (1.5) feet to a hip or valley if modules are to be placed on both sides of the hip or valley that is equal length then the modules may be placed directly adjacent to the hip or valley.

## **SIGNAGE**

### **MAIN ELECTRICAL SERVICE**

- Buildings or Structures with both utility service and a photovoltaic system shall have a permanent plaque or directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means if not located at the same location. CEC 690.56(b)
- A permanent phenolic plaque shall be placed at the point of interconnection stating the **MAXIMUM AC OUTPUT OPERATING CURRENT** and the **OPERATING AC VOLTAGE**. CEC 690.54

### **AC DISCONNECT**

- Provide permanent phenolic plaques at all ac disconnects; **“PHOTOVOLTAIC ARRAY AC DISCONNECT SWITCH”**. CEC 690.14©(2)
- Load centers used as photovoltaic combiner boxes shall be labeled... **“PHOTOVOLTAIC CIRCUITS ONLY. NO ADDITIONAL CIRCUITS ALLOWED”**.

### **DC DISCONNECT**

- Provide a permanent phenolic plaque at all dc disconnects; **“PHOTOVOLTAIC ARRAY DC DISCONNECT SWITCH”** CEC 690.14© (2). **ADDITIONAL SIGNAGE** is required at dc disconnects providing **OPERATING CURRENT AND VOLTAGE, MAXIMUM SYSTEM VOLTAGE AND SHORT CIRCUIT CURRENT**. CEC 690.53

### **INVERTERS**

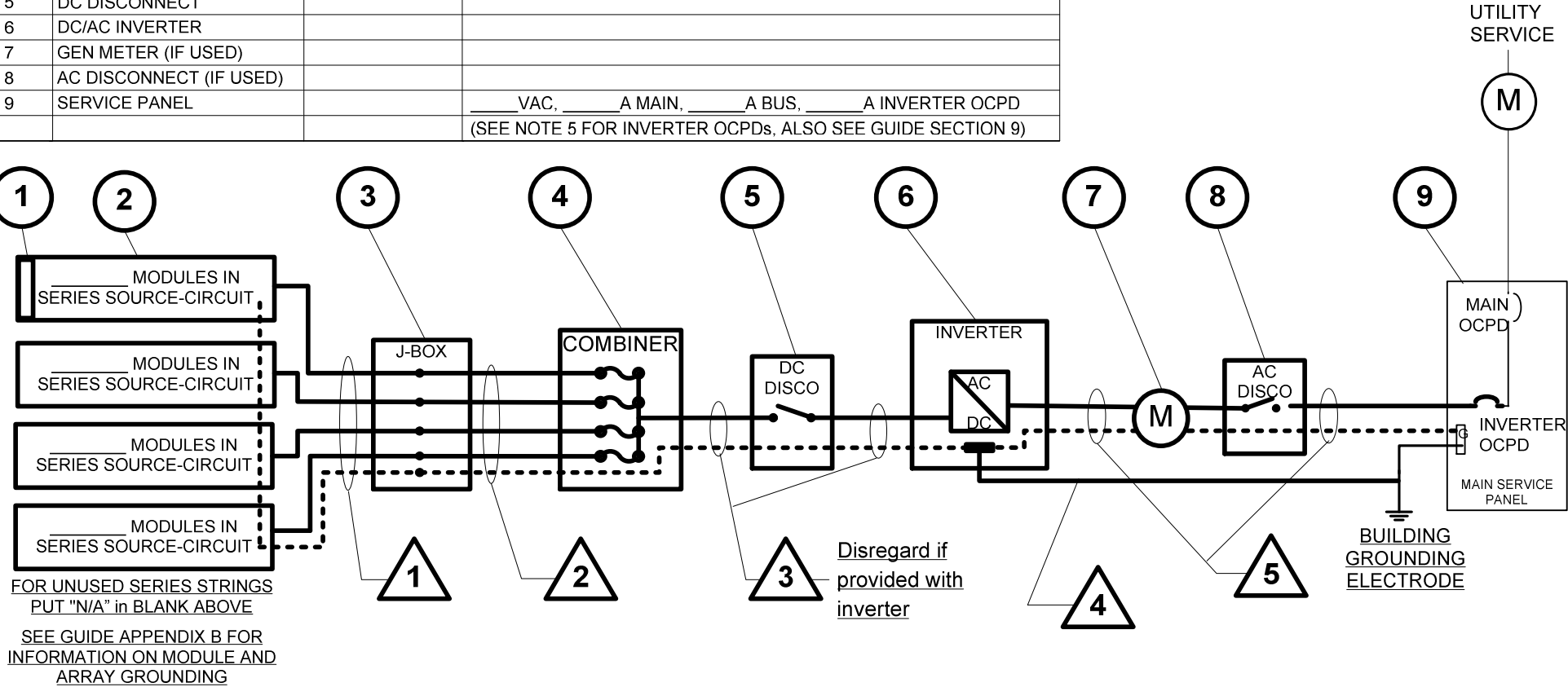
- Where inverters are located other than at the main electrical service locations, a permanent phenolic plaque or directory denoting all electrical power sources shall be installed. CEC 690.14(d), 705.10. See <http://www.sandiego.gov/development-services/industry/elecnews.shtml> for additional local plaque specifications.

### **ALL PLACARDS SHALL BE RED PHENOLIC OR METAL WITH WHITE LETTERING**

- At the AC and DC disconnect means: **WARNING ELECTRICAL SHOCK HAZARD DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE ON POSITION**. CEC 690.17(4)
- Main electrical service panel. **THIS ELECTRICAL SYSTEM IS ALSO SERVED BY A PHOTOVOLTAIC SYSTEM**. CEC 705.10

Contractor Name, Address and Phone:  _____ _____ _____ _____	Site Plan for Small-Scale, Single-Phase PV Systems			
	Site Name: _____			
	Site Address: _____			
	System AC Size: _____			
Drawn By: _____	SIZE	FSCM NO	DWG NO S1.1	REV
Checked By: _____	SCALE	NTS	Date: _____	SHEET

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE		
2	PV ARRAY		
3	J-BOX (IF USED)		
4	COMBINER (IF USED)		
5	DC DISCONNECT		
6	DC/AC INVERTER		
7	GEN METER (IF USED)		
8	AC DISCONNECT (IF USED)		
9	SERVICE PANEL		____ VAC, ____ A MAIN, ____ A BUS, ____ A INVERTER OCPD
			(SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 <input type="checkbox"/> or PV WIRE <input type="checkbox"/>			N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)			N/A	N/A
2	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>				
3	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>				
	INSULATED EGC				
4	DC GROUNDING ELECTRODE COND.				
5	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>				
	INSULATED EGC				

Contractor Name, Address and Phone:		One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems			
		Site Name: _____ Site Address: _____ System AC Size: _____			
Drawn By: _____	SIZE	FSCM NO	DWG NO	REV	
Checked By: _____	SCALE	NTS	Date: _____	SHEET	
		E1.1			

# PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT ( $I_{MP}$ )	A
MAX POWER-POINT VOLTAGE ( $V_{MP}$ )	V
OPEN-CIRCUIT VOLTAGE ( $V_{OC}$ )	V
SHORT-CIRCUIT CURRENT ( $I_{SC}$ )	A
MAX SERIES FUSE (OCPD)	A
MAXIMUM POWER ( $P_{MAX}$ )	W
MAX VOLTAGE (TYP 600V <sub>DC</sub> )	V
VOC TEMP COEFF (mV/°C <input type="checkbox"/> or %/°C <input type="checkbox"/> )	
IF COEFF SUPPLIED, CIRCLE UNITS	

## NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE  
 NATIONAL ELECTRICAL CODE® REFERENCES  
 SHOWN AS (NEC XXX.XX)

## INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	V
MAX POWER @ 40°C	W
NOMINAL AC VOLTAGE	V
MAX AC CURRENT	A
MAX OCPD RATING	A

## SIGNS—SEE GUIDE SECTION 7

### SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE	
RATED MPP CURRENT	A
RATED MPP VOLTAGE	V
MAX SYSTEM VOLTAGE	V
MAX CIRCUIT CURRENT	A
WARNING: ELECTRICAL SHOCK HAZARD—LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION	

### SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	A
NOMINAL AC VOLTAGE	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)	

## NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

- 1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP \_\_\_\_°C
- 2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE \_\_\_\_°C
- 2.) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),
  - a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH  $I_{SC}$  OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.
  - b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH  $I_{SC}$  OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

## NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

- 1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐
- 2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐
- 3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT
- 4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)
- 5) TOTAL OF \_\_\_\_\_ INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☐ NO ☐

Contractor Name, Address and Phone:  _____ _____ _____ _____		Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems			
		Site Name: _____ Site Address: _____ System AC Size: _____			
Drawn By: _____	SIZE	FSCM NO	DWG NO E1.2	REV	
Checked By: _____	SCALE	NTS	Date: _____	SHEET	