



**DEPARTMENT OF BUILDING AND SAFETY**

**INDEPENDENCE OFFICE**

P.O. Drawer Q  
Independence, CA 93526  
Ph. (760) 878-0213  
Fax. (760) 878-2001

**BISHOP OFFICE**

207 W. South St.  
Bishop, CA 93514  
Ph. (760) 873-7857  
Fax. (760) 873-8867

**County of  
INYO**

**EXPEDITED PERMIT  
PROCESS FOR  
PHOTOVOLTAIC (PV)  
SYSTEMS**

**REVISED 2/26/10**

## Expedited Permit Process for Small-Scale PV Systems

The information in this guideline is intended to help local jurisdictions and contractors identify when PV system installations are simple, needing only a basic review, and when an installation is more complex. It is likely that 50%-75% of all residential systems will comply with these simple criteria. For projects that fail to meet the simple criteria, resolution steps may be suggested to provide a path to permit approval.

### Required Information for Permit:

1. Site plan showing location of major components on the property. This drawing need not be exactly to scale, but it should represent relative location of components at site (see supplied example site plan). PV arrays on dwellings with a 3' perimeter space at ridge and sides may not need separate fire service review.
2. Electrical diagram showing PV array configuration, wiring system, overcurrent protection, inverter, disconnects, required signs, and ac connection to building (see supplied standard electrical diagram).
3. Specification sheets and installation manuals (if available) for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.

### Step 1: Structural Review of PV Array Mounting System

Is the array to be mounted on a defined, permitted roof structure?  Yes  No

If No due to non-compliant roof or a ground mount, submit completed worksheet for the structure WKS1.

#### Roof Information:

1. Is the roofing type lightweight (Yes = composition, lightweight masonry, metal, etc...) \_\_\_\_\_  
If No, submit completed worksheet for roof structure WKS1 (No = heavy masonry, slate, etc...).
2. Does the roof have a single roof covering?  Yes  No  
If No, submit completed worksheet for roof structure WKS1.
3. Provide method and type of weatherproofing roof penetrations (e.g. flashing, caulk) \_\_\_\_\_

#### Mounting System Information:

1. The mounting structure is an engineered product designed to mount PV modules?  Yes  No  
If No, provide details of structural attachment certified by a design professional.
2. For manufactured mounting systems, fill out information on the mounting system below:
  - a. Mounting System Manufacturer \_\_\_\_\_ Product Name and Model# \_\_\_\_\_
  - b. Total Weight of PV Modules and Rails \_\_\_\_\_ lbs
  - c. Total Number of Attachment Points \_\_\_\_\_
  - d. Weight per Attachment Point (b÷c) \_\_\_\_\_ lbs (if greater than 40 lbs, see WKS1)
  - e. Maximum Spacing Between Attachment Points on a Rail \_\_\_\_\_ inches (see product manual for maximum spacing allowed based on maximum design wind speed)
  - f. Total Surface Area of PV Modules (square feet) \_\_\_\_\_ ft<sup>2</sup>
  - g. Distributed Weight of PV Module on Roof (b÷f) \_\_\_\_\_ lbs/ft<sup>2</sup>  
If distributed weight of the PV system is greater than 5 lbs/ft<sup>2</sup>, see WKS1.

### Step 2: Electrical Review of PV System (Calculations for Electrical Diagram)

In order for a PV system to be considered for an expedited permit process, the following must apply:

1. PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
2. The PV array is composed of 4 series strings or less per inverter, and 15 kW<sub>STC</sub> or less.
3. The total inverter capacity has a continuous power output 13,440 Watts or less
4. The ac interconnection point is on the load side of service disconnecting means (690.64(B)).
5. The electrical diagram (E1.1) can be used to accurately represent the PV system.

Fill out the standard electrical diagram completely. A guide to the electrical diagram is provided to help the applicant understand each blank to fill in. If the electrical system is more complex than the standard electrical diagram can effectively communicate, provide an alternative diagram with appropriate detail.

**NOTE: FOR INSTALLATIONS IN DEPARTMENT OF WATER AND POWER (DWP) JURISDICTIONS, PRIOR APPROVAL FROM DWP MUST BE PROVIDED TO THIS OFFICE BEFORE A PERMIT WILL BE ISSUED.**

ROOFTOP J-BOX TO  
TRANSITION EXPOSED  
USE-2 TO THWN-2  
CONDUCTORS IN 3/4" EMT

INVERTER WITH  
SUPPLIED  
COMBINER AND  
DC DISCONNECT

EXISTING ALL-IN-ONE  
SERVICE EQUIPMENT  
WITH 40-AMP PV  
BREAKER AS AC  
DISCONNECT

**SAMPLE**

10'-8"

12'-7"

3'-0"

11'-3"

3'-0"

3'-0"

EXISTING FENCE



24 SOLARWORLD SW 175  
MODULES IN 2 SERIES STRINGS  
OF 12 MODULES EACH ON  
EXISTING SHADE STRUCTURE

24 SOLARWORLD SW 175  
MODULES IN 2 SERIES STRINGS  
OF 12 MODULES EACH ON  
EXISTING ROOF STRUCTURE

Contractor Name:  
Address and Phone:

**Sample Site Plan**  
for Small-Scale, Single-Phase PV Systems  
Site Name: \_\_\_\_\_  
Site Address: \_\_\_\_\_  
System AC Size: \_\_\_\_\_

DATE: \_\_\_\_\_  
SCALE: \_\_\_\_\_  
DRAWN BY: \_\_\_\_\_  
CHECKED BY: \_\_\_\_\_

Contractor Name,  
Address and Phone:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Drawn By:

Checked By:

### Site Plan for Small-Scale, Single-Phase PV Systems

Site Name: \_\_\_\_\_

Site Address: \_\_\_\_\_

System AC Size: \_\_\_\_\_

SIZE

FSCH/NO

DWG/NO

S1.1

REV

Scale

NTS

Date:

Sheet

**PV MODULE RATINGS @ STC (Guide Section 5)**

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT (I <sub>mp</sub> )	A
MAX POWER-POINT VOLTAGE (V <sub>mp</sub> )	V
OPEN-CIRCUIT VOLTAGE (V <sub>oc</sub> )	V
SHORT-CIRCUIT CURRENT (I <sub>sc</sub> )	A
MAX SERIES FUSE (OCPD)	A
MAXIMUM POWER (P <sub>max</sub> )	W
MAX VOLTAGE (TYP 800V <sub>oc</sub> )	V
VOC TEMP COEFF (mV/°C or %/°C)	
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

**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	A
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<sub>sc</sub> OF 7.88 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<sub>sc</sub> OF 8.6 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 890.53 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 890.64(1)(2)(a)? YES  NO

**NOTE: FOR INSTALLATIONS IN DEPARTMENT OF WATER AND POWER (DWP) JURISDICTIONS, PRIOR APPROVAL FROM DWP MUST BE PROVIDED TO THIS OFFICE BEFORE A PERMIT WILL BE ISSUED.**

Contractor Name,  
Address and Phone:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems**

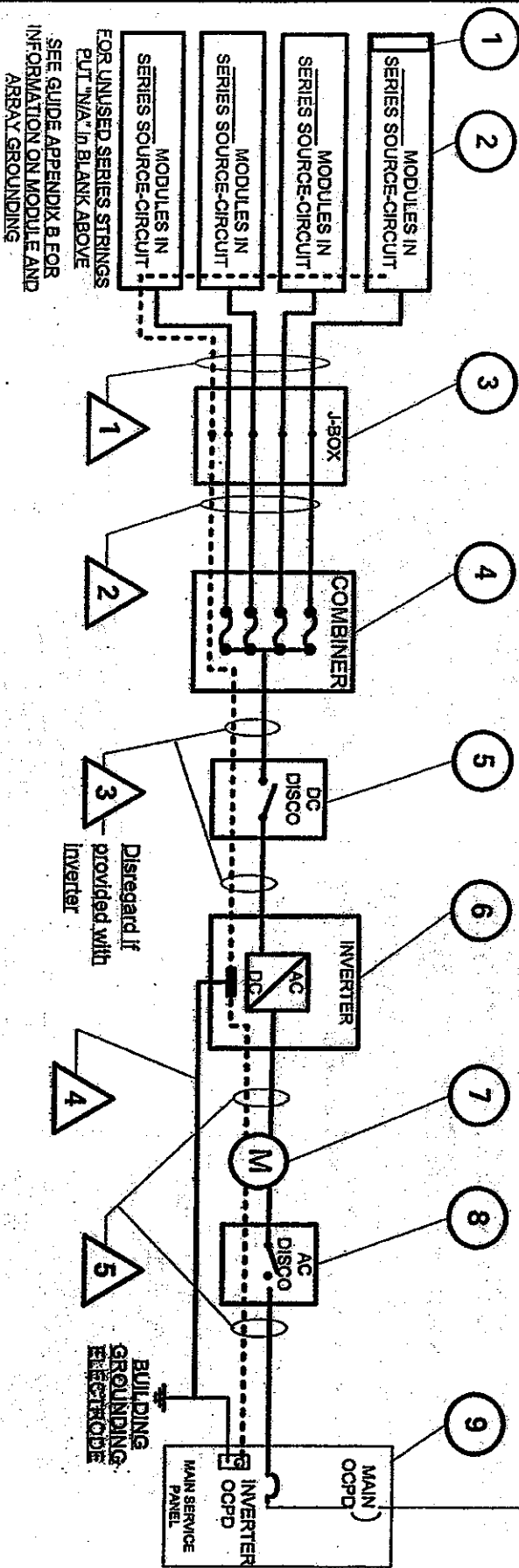
Site Name: \_\_\_\_\_  
 Site Address: \_\_\_\_\_  
 System AC Size: \_\_\_\_\_

Drawn By:	SIZE	FSCN NO	DWG NO	REV
Checked By:	SCALE	NTS	Date:	Sheet:
			E1.2	

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 6 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
2	BARE COPPER EQ. GRD. COND. (EGG)			N/A	N/A
3	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>			N/A	N/A
4	INSULATED EGG				
5	DC GROUNDING ELECTRODE COND. THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>				
6	INSULATED EGG				

Contractor Name,  
Address and Phone:

Drawn By: \_\_\_\_\_  
Checked By: \_\_\_\_\_

One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems

Site Name: \_\_\_\_\_  
Site Address: \_\_\_\_\_  
System AC Size: \_\_\_\_\_

SIZE: \_\_\_\_\_ PSCH NO: \_\_\_\_\_ DWG NO: E1.1  
SCALE: \_\_\_\_\_ NTS: \_\_\_\_\_ Date: \_\_\_\_\_ REV: \_\_\_\_\_

## SIGNAGE REQUIREMENTS FOR PV SYSTEMS

Three forms of signage are required for Solar PV Systems. Permanently affixed labels shall have a red background with white lettering. Printed material shall be resistant to fading per UL 969.

1. Exterior/Interior Conduit signage: The label shall state, "CAUTION: SOLAR PV SYSTEM MAY REMAIN ENERGIZED AFTER DISCONNECTION DURING DAYLIGHT HOURS"
  - a. Required shut off 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.
  - b. Marking shall be placed every 10 feet, at turns and above and/or below penetrations and at all dc combiner and junction boxes.
  - c. Vertical conduits shall be provided with a minimum of one label to be affixed 66" above clear standing surface.
  - d. Exterior/Interior Conduit signage shall be:
    - i. Red background with white lettering.
    - ii. Reflective, weather resistant printed material shall be resistant to fading per UL 969.
    - iii. Letters shall be "Arial" font or similar, non bold, a minimum of 3/8" height lettering, and be all capital letters
2. Exterior/Interior of Electrical Panel signage: Exterior/Interior of Electrical Panel signage: Signs are required on all interior and exterior overcurrent devices (electrical panels, etc.)
3. A permanent placard with fade-resistant material listed per UL 969 shall be installed on exterior and interior of main electrical panel stating: "CAUTION: SOLAR PV SYSTEM MAY REMAIN ENERGIZED AFTER DISCONNECTION DURING DAYLIGHT HOURS".

**CAUTION: SOLAR PV WIRING  
MAY REMAIN ENERGIZED  
AFTER DISCONNECTION  
DURING DAYLIGHT HOURS**

- a. Exterior/Interior overcurrent device signage shall be:
  - i. Red background with white lettering.
  - ii. Of durable non fading weather resistant material attached or adhered to panel or directly adjacent to the panel.
  - iii. Letters shall be "Arial" font or similar, non bold, a minimum of 3/8" height lettering, and be all capital letters

4. Roof top signage: All roof top disconnects are to be labeled as to be easily identified.

## PROTECTION OF EMERGENCY RESPONDERS

The following conditions shall be verified and apply to all roof and ground mount Solar PV systems:

1. All sharp edges and fastener tips shall be covered or crimped over as to not provide a sharp edge where emergency responders or any other individual accessing the roof top may be injured.
2. All roof surface mounted conduits, pipes, braces, etc crossing the pathways are to be clearly identified by a red/white reflective tape or other fire department approved identifying material. Any item higher than 18" must have steps up and down on either side.

## SYSTEM MAINTENANCE

1. For all new Photovoltaic systems a maintenance manual of the system shall be required to be on site prior to permit final.
2. The maintenance Manual shall include (as applicable), but not limited to:
  - a. The required schedule of maintenance.
  - b. Required periodic inspection and maintenance of all components of the new PV system including: mechanical connections, electrical connections and necessary inspection of all source circuits, check all voltages, and/or programming.
  - c. Specific battery maintenance, if applicable.

## B.2 SPAN TABLES

A framing plan is required *only* if the combined weight of the PV array exceeds 5 pounds per square foot (PSF or lbs/ft<sup>2</sup>) or the existing rafters are over-spanned. The following span tables from the 2003 International Residential Code (IRC) can be used to determine if the rafters are over-spanned. For installations in jurisdictions using different span tables, follow the local tables.

### Span Table R802.5.1(1),

Use this table for rafter spans that have conventional light-weight dead loads and do *not* have a ceiling attached.

10 PSF Dead Load							
Roof live load = 20 psf, ceiling not attached to rafters, L/Δ=180							
Rafter Size			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
Spacing (inches)	Species	Grade	The measurements below are in feet-inches (e.g. 9-10 = 9 feet, 10 inches).				
16	Douglas Fir-larch	#2 or better	9-10	14-4	18-2	22-3	25-9
16	Hem-fir	#2 or better	9-2	14-2	17-11	21-11	25-5
24	Douglas Fir-larch	#2 or better	7-10	11-9	14-10	18-2	21-0
24	Hem-fir	#2 or better	7-3	11-5	14-8	17-10	20-9

Use this table for rafter spans that have heavy dead loads and do *not* have a ceiling attached.

20 PSF Dead Load							
Roof live load = 20 psf, ceiling not attached to rafters, L/Δ=180							
Rafter Size			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
Spacing (inches)	Species	Grade	The measurements below are in feet-inches (e.g. 9-10 = 9 feet, 10 inches).				
16	Douglas Fir-larch	#2 or better	8-6	12-5	15-9	19-3	22-4
16	Hem-fir	#2 or better	8-5	12-3	15-6	18-11	22-0
24	Douglas Fir-larch	#2 or better	6-11	10-2	12-10	15-8	18-3
24	Hem-fir	#2 or better	6-10	10-0	12-8	15-6	17-11



Span Table R802.5.1(2),

Use this table for rafter spans *with a ceiling attached and conventional light-weight dead loads.*

10 PSF Dead Load							
Roof live load = 20 psf, ceiling attached to rafters, L/Δ=240							
Rafter Size			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
Spacing (inches)	Species	Grade	The measurements below are in feet-inches (e.g. 9-10 = 9 feet, 10 inches).				
16	Douglas Fir-larch	#2 or better	8-11	14-1	18-2	22-3	25-9
16	Hem-fir	#2 or better	8-4	13-1	17-3	21-11	25-5
24	Douglas Fir-larch	#2 or better	7-10	11-9	14-10	18-2	21-0
24	Hem-fir	#2 or better	7-3	11-5	14-8	17-10	20-9

Use this table for rafter spans *with a ceiling attached and where heavy dead loads exist.*

20 PSF Dead Load							
Roof live load = 20 psf, ceiling attached to rafters, L/Δ=240							
Rafter Size			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
Spacing (inches)	Species	Grade	The measurements below are in feet-inches (e.g. 9-10 = 9 feet, 10 inches).				
16	Douglas Fir-larch	#2 or better	8-6	12-5	15-9	19-3	22-4
16	Hem-fir	#2 or better	8-4	12-3	15-6	18-11	22-0
24	Douglas Fir-larch	#2 or better	6-11	10-2	12-10	15-8	18-3
24	Hem-fir	#2 or better	6-10	10-0	12-8	15-6	17-11

Use the conventional light-weight dead load table when the existing roofing materials are wood shake, wood shingle, composition roofing or light-weight tile roofs. (The rationale for allowing these tables to be used is that the installation of a PV system should be considered as part of the live load, since additional loading will not be added to the section of the roof where a PV array is installed.)

Where heavy roofing systems exist (e.g. clay tile or heavy concrete tile roofs), use the 20 lbs/ft<sup>2</sup> dead load tables.

The first part of the report discusses the general situation of the country and the progress of the work. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and a list of the references.

The second part of the report describes the various projects and the results achieved. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and a list of the references.

The third part of the report describes the various projects and the results achieved. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and a list of the references.

The fourth part of the report describes the various projects and the results achieved. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and a list of the references.