



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 1 – Submittal Requirements Bulletin

This information bulletin is published to guide applicants through a streamlined permitting process for solar photovoltaic (PV) projects 10 kW in size or smaller. This bulletin provides information about submittal requirements for plan review, required fees and inspections.

1. Approval Requirements

The following permits are required to install a solar PV system with a maximum power output of 10 kW or less:

- a) Building/ Electrical Permit
- b) Plumbing Permit for Solar Water-heating System

Planning review not required for solar PV installations of this size.

Fire Department approval not required for solar PV installations of this size.

2. Submittal Requirements

- a) Completed permit application form. This permit application form can be downloaded at www.cityofcalabasas.com/BuildingSafety/solar/expedited-solar.html .
- b) Demonstrate compliance with the eligibility checklist for expedited permitting.
- c) A completed Standard Electrical Plan. The standard plan may be used for proposed solar installations 10 kW in size or smaller. (PV Toolkit Document #3 and #4)

If standard electrical plans are not provided for use, an electrical plan should be submitted that includes the following.

- Locations of main service or utility disconnect
 - Total number of modules, number of modules per string and the total number of strings
 - Make and model of inverter(s) and/or combiner box if used
 - One-line diagram of system
 - Specify grounding/bonding, conductor type and size, conduit type and size and number of conductors in each section of conduit
 - If batteries are to be installed, include them in the diagram and show their locations and venting
 - Equipment cut sheets including inverters, modules, AC and DC disconnects, combiners and wind generators
 - Labeling of equipment as required by CEC, Sections 690 and 705
 - Site diagram showing the arrangement of panels on the roof or ground, north arrow, lot dimensions and the distance from property lines to adjacent buildings/structures (existing and proposed)
- d) A roof plan showing roof layout, PV panels and the following fire safety items: approximate location of roof access point, location of code-compliant access pathways, PV system fire classification and the locations of all required labels and markings. Examples of clear path access pathways are available in the State Fire Marshal Solar PV Installation Guide.



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<http://osfm.fire.ca.gov/pdf/reports/solarphotovoltaicguideline.pdf>.

- e) Completed expedited Structural Criteria along with required documentation. Structural Criteria can be found in PV Toolkit Document #5. A full explanation of the methods and calculations used to produce these criteria can be found in the Structural Technical Appendix for Residential Rooftop Solar Installations, which is available at http://www.opr.ca.gov/docs/Solar_Structural_Technical_Appendix.pdf

For non-qualifying systems, provide structural drawings and calculations stamped and signed by a California-licensed civil or structural engineer, along with the following information.

- The type of roof covering and the number of roof coverings installed
- Type of roof framing, size of members and spacing
- Weight of panels, support locations and method of attachment
- Framing plan and details for any work necessary to strengthen the existing roof structure
- Site-specific structural calculations
- Where an approved racking system is used, provide documentation showing manufacturer of the rack system, maximum allowable weight the system can support, attachment method to the roof or ground and product evaluation information or structural design for the rack system

3. Plan Review

Permit applications can be submitted to Building & Safety Department in person at 100 Civic Center way, Calabasas, CA and if plans meet expedited process requirements they can be electronically submitted to solar@cityofcalabasas.com.

Permit applications should be reviewed within three working days. Permit applications utilizing standard plan may be approved “over-the-counter”. To utilize the “over-the-counter” process, permit applications must be submitted electronically to solar@cityofcalabasas.com.

4. Fees

For systems utilizing the standard plan, the fees are as follows:

The plan check fee for Solar Photovoltaic Systems will be based on nameplate rated AC output measured in Kilowatts. Plan check fee for Solar Potable Water-Heating System (includes water heater and vent) will be based on a minimum charge of \$130.

For Solar Photovoltaic Systems, the permit fees will be as follows:

The system will be based on the nameplate rated AC output measured in Kilowatts. Issuance fee also applies.

For each Solar Potable Water-Heating System, the permit fees will be as follows:
System will be based on a minimum fee of \$123.00.



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Issuance fee also applies.

Plan check fees will be collected upon submittal and permit fees will be collected when the permit is issued.

5. Inspections

Once all permits to construct the solar installation have been issued and the system has been installed, it must be inspected before final approval is granted for the solar system. On-site inspections can be scheduled by contacting the Building & Safety's inspection request line at (818)224-1738 or electronically <http://www.cityofcalabasas.com/BuildingSafety/inspection-requests.html>. Inspection requests received upto 7:00am the same day are typically scheduled for the same business day. If same business day is not available, inspection will occur as soon as possible.

Permit holders must be prepared to show conformance with all technical requirements in the field at the time of inspection. The inspector will verify that the installation is in conformance with applicable code requirements and with the approved plans. Approved plans must be on-site and accessible to the building inspector.

The inspection checklist provides an overview of common points of inspection that the applicant should be prepared to show compliance. If not available, common checks include the following.

- Number of PV modules and model number match plans and specification sheets number match plans and specification sheets.
- Array conductors and components are installed in a neat and workman-like manner.
- PV array is properly grounded.
- Electrical boxes are accessible and connections are suitable for environment.
- Array is fastened and sealed according to attachment detail.
- Conductor's ratings and sizes match plans.
- Appropriate signs are property constructed, installed and displayed, including the following.
 - Sign identifying PV power source system attributes at DC disconnect
 - Sign identifying AC point of connection
 - Sign identifying switch for alternative power system
- Equipment ratings are consistent with application and installed signs on the installation, including the following.
 - Inverter has a rating as high as max voltage on PV power source sign.
 - DC-side overcurrent circuit protection devices (OCPDs) are DC rated at least as high as max voltage on sign.
 - Switches and OCPDs are installed according to the manufacturer's specifications (i.e., many 600VDC switches require passing through the switch poles twice in a specific way).
 - Inverter is rated for the site AC voltage supplied and shown on the AC point of connection sign.
 - OCPD connected to the AC output of the inverter is rated at least 125% of maximum current on sign and is no larger than the maximum OCPD on the inverter listing label.
 - Sum of the main OCPD and the inverter OCPD is rated for not more than 120% of the bus bar rating.

Building and Safety Division
Policy and Procedure No. A093015
Effective Date January 1, 2017

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CITY of CALABASAS

6. Departmental Contact Information

For additional information regarding this permit process, please consult our departmental website at www.cityofcalabasas.com/BuildingSafety.html or contact Building & Safety at (818)224-1725.



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Form 2 – Eligibility Checklist

GENERAL REQUIREMENTS

- | | | |
|--|----------------------------|----------------------------|
| A. System size is 10 kW AC CEC rating or less | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| B. The solar array is roof-mounted on one- or two-family dwelling or accessory structure | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| C. The solar panel/module arrays will not exceed the maximum legal building height | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| D. Solar system is utility interactive and without battery storage | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| E. Permit application is completed and attached | <input type="checkbox"/> Y | <input type="checkbox"/> N |

ELECTRICAL REQUIREMENTS

- | | | |
|--|----------------------------|----------------------------|
| A. No more than four photovoltaic module strings are connected to each Maximum Power Point Tracking (MPPT) input where source circuit fusing is included in the inverter | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| 1) No more than two strings per MPPT input where source circuit fusing is not included | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| 2) Fuses (if needed) are rated to the series fuse rating of the PV module | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| 3) No more than one noninverter-integrated DC combiner is utilized per inverter | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| B. For central inverter systems: No more than two inverters are utilized | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| C. The PV system is interconnected to a single-phase AC service panel of nominal 120/220 Vac with a bus bar rating of 225 A or less | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| D. The PV system is connected to the load side of the utility distribution equipment | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| E. A Solar PV Standard Plan and supporting documentation is completed and attached | <input type="checkbox"/> Y | <input type="checkbox"/> N |

STRUCTURAL REQUIREMENTS

- | | | |
|---|----------------------------|----------------------------|
| A. A completed Structural Criteria and supporting documentation is attached (if required) | <input type="checkbox"/> Y | <input type="checkbox"/> N |
|---|----------------------------|----------------------------|

FIRE SAFETY REQUIREMENTS

- | | | |
|--|----------------------------|----------------------------|
| A. Clear access pathways provided | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| B. Fire classification solar system is provided | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| C. All required markings and labels are provided | <input type="checkbox"/> Y | <input type="checkbox"/> N |
| D. A diagram of the roof layout of all panels, modules, clear access pathways and approximate locations of electrical disconnecting means and roof access points is completed and attached | <input type="checkbox"/> Y | <input type="checkbox"/> N |

Notes:

1. These criteria are intended for expedited solar permitting process.
2. If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.



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Form 3 – Permit Application**

Official Use Only
Permit No.

Check One : Electrical Permit - or - Plumbing Permit

SCOPE OF WORK

Please accurately describe the scope of work:

Construction Cost- Valuation in dollar amount: \$ _____

IDENTIFY YOUR BUILDING PROJECT

Property Address: _____

Parcel Number (APN) _____ - _____ - _____

This permit is to be issued in the name of the LICENSED CONTRACTOR or the PROPERTY OWNER as the permit holder of record who will be responsible and liable for the construction. **IN ADDITION** – Please see the “Permit Conditions” below the signatory area of this permit application regarding the “one-inspection process, safe roof access, and any existing improvements to the residential structure that may not be benefit of building permit/s and inspection approval/s

Property Owner Name: _____ Phone # _____

Mailing Address: _____ City/State/Zip _____

Email Address: _____

Licensed Design Professional (Architect or Engineer in charge of the project) information

Name: _____ License No. _____ Phone # _____

Mailing Address: _____ City/State/Zip _____

Email Address: _____



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IDENTIFY WHO WILL PERFORM THE WORK

California Licensed Contractors Declaration

I hereby affirm under penalty of perjury that I am licensed under provisions of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code, and my license is in full force and effect.

Contractor Name and Address: _____

CA Contractors License # _____ Class: _____ Expiration Date: _____

Phone Number: _____

Email: _____

OWNER-BUILDER DECLARATION

I hereby affirm under penalty of perjury that I am exempt from the Contractor's State License Law for the reason(s) indicated below by the checkmark(s) I have placed next to the applicable item(s) (Section 7031.5, Business and Professions Code: Any city or county that requires a permit to construct, alter, improve, demolish, or repair any structure, prior to its issuance, also requires the applicant for the permit to file a signed statement that he or she is licensed pursuant to the provisions of the Contractor's State License Law {Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code} or that he or she is exempt from licensure and the basis for the alleged exemption. Any violation of Section 7031.5 by any applicant for a permit subjects the applicant to a civil penalty of not more than five hundred dollars (\$500):

I, as owner of the property, or my employees with wages as their sole compensation, will do

ALL OF OR PORTIONS OF the work, and the structure is not intended or offered for sale. (Section 7044, Business and Professions Code: The Contractors State License Law does not apply to an owner of the property, who through employees' or personal effort, builds or improves the property, provided that the improvements are not intended or offered for sale. If, however, the building or improvement is sold within one year of completion, the Owner-Builder will have the burden of providing that it was not built or improved for the purpose of sale).

I, as owner of the property, am exclusively contracting with licensed Contractors to construct the project (Section 7044, Business and Professions code: The Contractor's State License Law does not apply to an owner of property who builds or improves thereon, and who contracts for the projects with a licensed Contractor pursuant to the Contractors' State License Law).

I am exempt from Licensure under the Contractors State License Law for the following reason:



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By my signature below, I acknowledge that, except for my personal residence in which I must have resided for at least one year prior to completion of the improvements covered by this permit, I cannot legally sell a structure that I have built as an owner-builder if it has not been constructed in its entirety by licensed contractors. I understand that a copy of the applicable law, Section 7044 of the Business and Professions Code, is available upon request when this application is submitted or at the following Web site: <http://leginfo.legislature.ca.gov>

Property Owner Signature: _____ **Date:** _____

IDENTIFY THE CONSTRUCTION LENDING AGENCY

I hereby affirm under penalty of perjury that there is a construction lending agency for the performance of the work for which this permit is issued (Section 8172, Civic Code).

Lender's Name _____

Mailing Address _____ City/State/Zip _____

IDENTIFY WORKER'S COMPENSATION COVERAGE

WARNING: Failure to secure worker's compensation coverage is unlawful, and shall subject an employer to criminal penalties and civil fines up to one hundred thousand dollars (\$100,000). In addition to the cost of compensation, damages as provided for in Section 3706 for the Labor Code, interest, and attorney's fees. I hereby affirm under penalty of perjury one of the following declarations:

I have and will maintain a certificate of consent to self-insure for worker's compensation, issued by the Director of Industrial Relations as provide for by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. Policy No: _____

I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My worker's compensation insurance carrier and policy number are:

Insurance Carrier: _____ Policy # _____ Exp. Date: _____

Name of Insurance Agent _____ Phone # _____

I certify that in the performance of the work for which this permit is issued. I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California, and agree that, if I should become subject to the workers' compensation provisions of Section 3700 of the Labor Code, I shall forthwith comply with those provisions.

CALIFORNIA LICENSED CONTRACTOR OR **PROPERTY OWNER**

SIGNATURE: _____ **DATE:** _____



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DECLARATION BY CONSTRUCTION PERMIT APPLICANT

I AM () A CALIFORNIA LICENSED CONTRACTOR OR () THE PROPERTY OWNER

I have read this construction permit application and the information provided is correct. I agree to comply with all City ordinances and State laws relating to building construction. I authorize representatives of the City to enter the above-identified property for inspection purposes.

I further agree, that issuance of this permit does not constitute legal status

CALIFORNIA LICENSED CONTRACTOR or PROPERTY OWNER

SIGNATURE: _____ **DATE:** _____

Permit Conditions

One Building Inspection Process - Per recent State legislation, only one building inspection is required (a Final inspection.) This requirement differs from the traditional inspections typically outlined by the California Building Code.

In-Process inspections enable the building inspector to observe components of the system and penetrations through the walls and the roof of the structure prior to their concealment. An in-process inspection also enables pro-active communication between the building inspector and contractor to help avoid potential pitfalls before a final inspection is requested. In addition, a single "Final" inspection may require the contractor to disassemble components of the PV system not readily observable or otherwise difficult to view. If the contractor or homeowner opts to choose the single Final inspection process, the contractor is highly encouraged to take photographs **during** of the installation and bring those photographs to the final inspection and the contractor shall also be on site at the time of the final inspection with a suitable digital camera (iPhone and Droid type are acceptable) to take additional on the spot photographs of various related areas as directed by the inspector. **Please note** – if an in process inspection is requested by the homeowner or the contractor; it will be accommodated by the inspector at no additional cost.

Safe Roof Access – In support of the "one –inspection process" and in order to enable the facilitation of various vantage points for the building inspector, the contractor shall provide an OSHA approved ladder, secured in place with the side rails extended 36 inches above the roof surface. The ladder may be requested to be relocated to different vantage points as the inspector deems necessary. The inspector's observations will be limited to that vantage point unless the finish roof materials provide a safe walkable surface. Building Inspectors will not be accessing the roofs of structures with any of the following: ladders extended more than two-story's in height or with finish roof materials of concrete tile, or clay tile, or metal (unless protective coverings are placed on top of said materials to protect against physical damage). **Please note** – at any time during the installation process of the solar system, if either the homeowner or the contractor request an in-process inspection of roof mounted components and safe



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access is provided for the inspector, that inspection will be accommodated by the inspector at no additional cost.

Licensed Contractor or Homeowner–Declaration

I, _____ (print full name), the legal representative of the solar energy system installation company or the homeowner _____ (print “company name” or “homeowner”), certify and declare under penalty of perjury that I am aware that the proposed solar energy system at this site shall be installed only on a structure built and maintained with the appropriate permits and approvals as stated above. We have reviewed the site and all available public records relating to building permits and approvals to verify that the installation will be placed on a structure benefit of building permits and inspection approvals. In the event that the solar energy system is determined to have been installed on an structure without the benefit of building permits and inspection approvals, or on a structure of which any portion thereof is not benefit of building permits and inspection approvals, and or is being maintained in violation of the Calabasas Municipal Code, _____ (print company or homeowner name) may be responsible for the relocation or removal of the solar system and the homeowner may be subject to code enforcement actions to mitigate the other determined violations.



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Form 4 – Solar Standard Plan- Simplified Microinverter and ACM Systems

SCOPE: Use this plan ONLY for systems using utility-interactive Microinverters or AC Modules (ACM) not exceeding a combined system AC inverter output rating of 10 kW, with a maximum of 3 branch circuits, one PV module per inverter and with PV module ISC maximum of 10-A DC, installed on a roof of a one- or two-family dwelling or accessory structure. The photovoltaic system must interconnect to a single-phase AC service panel of 120/240 Vac with service panel bus bar rating of 225 A or less. This plan is not intended for bipolar systems, hybrid systems or systems that utilize storage batteries, charge controllers or trackers. Systems must be in compliance with current California Building Standards Codes and local amendments of the authority having jurisdiction (AHJ). Other articles of the California Electrical Code (CEC) shall apply as specified in section 690.3.

MANUFACTURER'S SPECIFICATION SHEETS MUST BE PROVIDED for proposed inverters, modules, combiner/junction boxes and racking systems. Installation instructions for bonding and grounding equipment shall be provided and local AHJs may require additional details. Listed and labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling (CEC 110.3). Equipment intended for use with PV system shall be identified and listed for the application CEC 690.4(D).

Applicant and Site Information

Job Address: _____ Permit #: _____
Contractor/Engineer Name: _____ License # and Class: _____
Signature: _____ Date: _____ Phone Number: _____

1. General Requirements and System Information

Microinverter
Number of PV modules installed: _____
Number of Microinverters installed: _____

AC Module (ACM)
Number of ACMs installed: _____
Note: Listed Alternating-Current Module (ACM) is defined in CEC 690.2 and installed per CEC 690.6

- 1.1 Number of Branch Circuits, 1, 2 or 3: _____
- 1.2 Actual number of Microinverters or ACMs per branch circuit: 1 _____ 2. _____ 3. _____
- 1.3 Total AC system power rating = (Total Number of Microinverters or ACMs) * (AC inverter power output)
= _____ Watts
- 1.4 Lowest expected ambient temperature for this plan in Table 1: For -1° to -5° C use 1.12 or for -6° to -10° C use 1.14 correction factors.
- 1.5 Average ambient high temperature for this plan: = +47° C
Note: For lower expected ambient or higher average ambient high temperatures, use Comprehensive Standard Plan.

2. Microinverter or ACM Information and Ratings

Microinverters with ungrounded DC inputs shall be installed in accordance with CEC 690.35.

Microinverter or ACM Manufacturer: _____
Model: _____

2.1 Rated (continuous) AC output power: _____ Watts

2.2 Nominal AC voltage rating: _____ Volts

2.3 Rated (continuous) AC output current: _____ Amps

If installing ACMs, skip [STEPS 2.4]

2.4 Maximum DC input voltage rating: _____ Volts (limited to 79 V, otherwise use the Comprehensive Standard Plan)

2.5 Maximum AC output overcurrent protection device (OCPD) _____ Amps

2.6 Maximum number of microinverters or ACMs per branch circuit: _____

3. PV Module Information

(If installing ACMs, skip to [STEP 4])

PV Module Manufacturer: _____

Model: _____

Module DC output power under standard test conditions (STC) = _____ Watts

3.1 Module V_{oc} at STC (from module nameplate): _____ Volts

3.2 Module I_{sc} at STC (from module nameplate): _____ Amps

3.3 Adjusted PV Module DC voltage at minimum temperature = [Table 1] _____ [cannot exceed Step 2.4]

Table 1. Module V_{oc} at STC Based on Inverter Maximum DC Input Voltage Derived from CEC 690.7																
Microinverter Max. DC Input [STEP 2.4] (Volts)	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79
Max. Module V_{oc} @ STC, 1.12 (-1° to -5° C) Correction Factor (Volts)	30.4	33.0	35.7	38.4	41.1	43.8	46.4	49.1	51.8	54.5	57.1	59.8	62.5	65.2	67.9	70.5
Max. Module V_{oc} @ STC, 1.14 (-6° to -10° C) Correction Factor (Volts)	29.8	32.5	35.1	37.7	40.4	43.0	45.6	48.2	50.9	53.5	56.1	58.8	61.4	64.0	66.7	69.3

4. Branch Circuit Output Information

Fill in [Table 3] to describe the branch circuit inverter output conductor and OCPD size. Use [Table 2] for determining the OCPD and Minimum Conductor size.

Table 2. Branch Circuit OCPD and Minimum Conductor Size*				
Circuit Current (Amps)	Circuit Power (Watts)	OCPD (Amps)	Minimum Conductor Size (AWG)	Minimum Metal Conduit Size for 6 Current Carrying Conductors
12	2880	15	12	¾"
16	3840	20	10	¾"
20	4800	25	8	1"
24	5760	30	8	1"

*CEC 690.8 and 210.19 (A)(1) factored in Table 2, conductors are copper, insulation must be 90° C wet-rated. Table 2 values are based on maximum ambient temperature of 69° C, which includes 22° C adder, exposed to direct sunlight, mounted > 0.5 inches above rooftop, ≤ 6 current carrying conductors (3 circuits) in a circular raceway. Otherwise use Comprehensive Standard Plan.

Table 3. PV Array Configuration Summary			
	Branch 1	Branch 2	Branch 3
Number of Microinverters or ACMs [Step 1]			
Selected Conductor Size [Table 2] (AWG)			
Selected Branch and Inverter Output OCPD [Table 2]			

5. Solar Load Center (if used)

5.1 Solar Load Center is to have a bus bar rating not less than 100 Amps. Otherwise use Comprehensive Standard Plan.

5.2 Circuit Power see [STEP 1] = _____ Watts

5.3 Circuit Current = (Circuit Power) / (AC voltage) = _____ Amps

Table 4. Solar Load Center and Total Inverter Output OCPD and Conductor Size**				
Circuit Current (Amps)	Circuit Power (Watts)	OCPD (Amps)	Minimum Conductor Size (AWG)	Minimum Metal Conduit Size
24	5760	30	10	½"
28	6720	35	8	¾"
32	7680	40	8	¾"
36	8640	45	8	¾"
40	9600	50	8	¾"
41.6	≤ 10000	60	6	¾"

**CEC 690.8 and 210.19 (A)(1) factored in Table 4, conductors are copper, insulation must be 90° C wet-rated. Table 4 values are based on maximum ambient temperature of 47° C (no rooftop temperature adder in this calculation), ≤ 3 current carrying conductors in a circular raceway. Otherwise use Comprehensive Standard Plan.

6. Point of Connection to Utility:

6.1 Load Side Connection only! Otherwise use the Comprehensive Standard Plan.

6.2 Is the PV OCPD positioned at the opposite end from input feeder location or main OCPD location?

Yes No (If No, then use 120% row in Table 5)

6.3 Per 705.12(D)(2): (Combined inverter output OCPD size + Main OCPD size) ≤ [bus bar size × (120%)]

Table 5. Maximum Combined Inverter Output Circuit OCPD									
Bus Bar Size (Amps)	100	125	125	200	200	200	225	225	225
Main OCPD (Amps)	100	100	125	150	175	200	175	200	225
Maximum Combined Inverter OCPD with 120% of bus bar rating (Amps)	20	50	25	60 [†]	60 [†]	40	60 [†]	60 [†]	45
Maximum Combined Inverter OCPD with 100% of bus bar rating (Amps)	0	25	0	50	25	0	50	25	0

[†]This plan limits the maximum system size to less than 10 kW, therefore the OCPD size is limited to 60 A. Reduction of Main Breaker is not permitted with this plan.

7. Grounding and Bonding

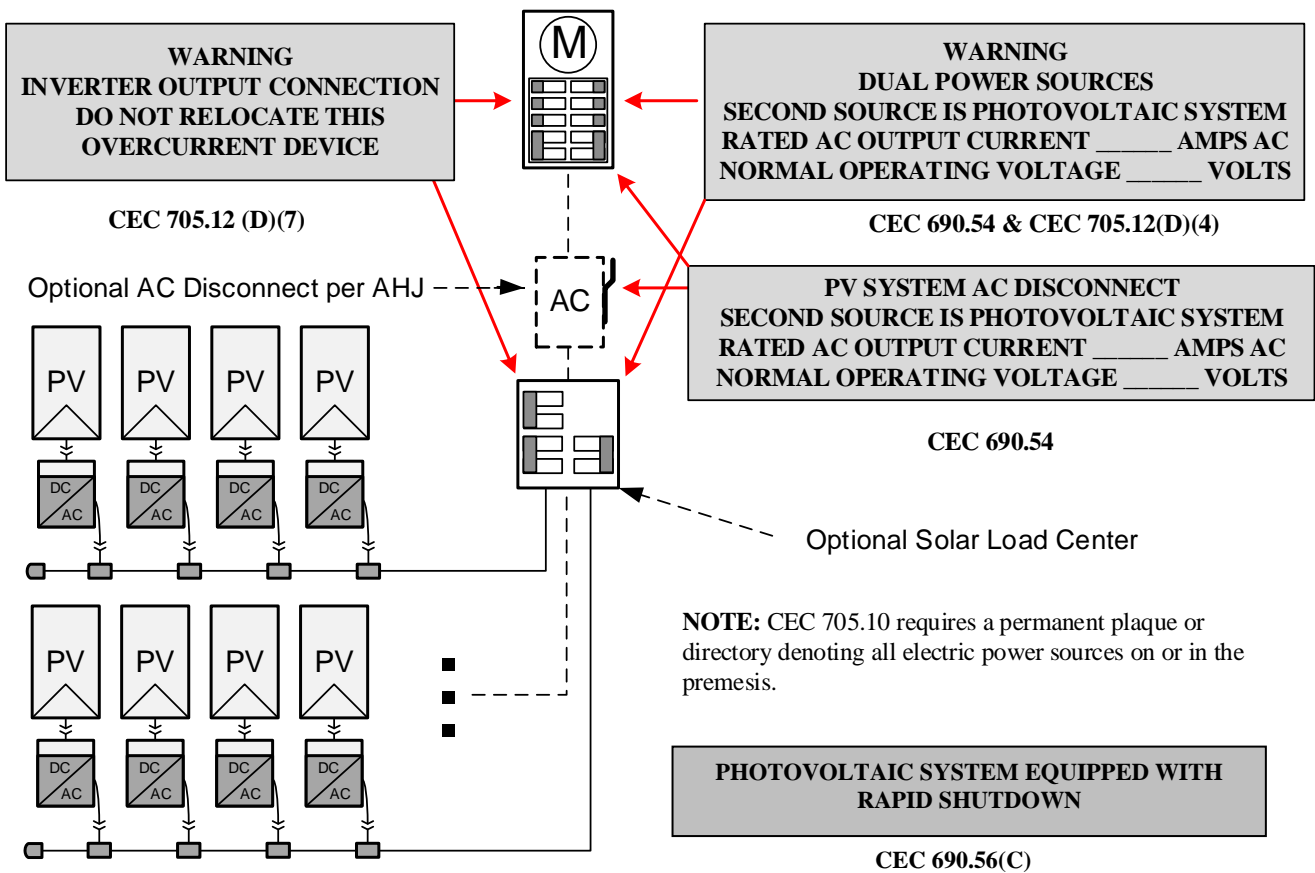
Check one of the boxes for whether system is grounded or ungrounded: Grounded Ungrounded

For Microinverters with a grounded DC input, systems must follow the requirements of GEC (CEC 690.47) and EGC (CEC 690.43).

For ACM systems and Microinverters with ungrounded a DC input follow the EGC requirements of (CEC 690.43).

8. Markings

Informational note: ANSI Z535.4 provides guidelines for the design of safety signs and labels for application to products. A phenolic plaque with contrasting colors between the text and background would meet the intent of the code for permanency. No type size is specified, but 20 point (3/8") should be considered the minimum.



Solar PV Standard Plan — Simplified Central/String Inverter Systems for One- and Two-Family Dwellings

9. Single-Inverter Line Diagram

Equipment Schedule	
TAG	DESCRIPTION: (Provide model # if provided)
1	Solar PV Module or ACM:
2	Microinverter (if not ACM):
3	Junction Box (es):
4	Solar Load Center, Yes / No:
5	Performance Meter Yes / No:
6	*Utility External Disconnect Switch Yes / No:
7	Main Electrical Service Panel

Single-Line Diagram for Microinverters or ACMs

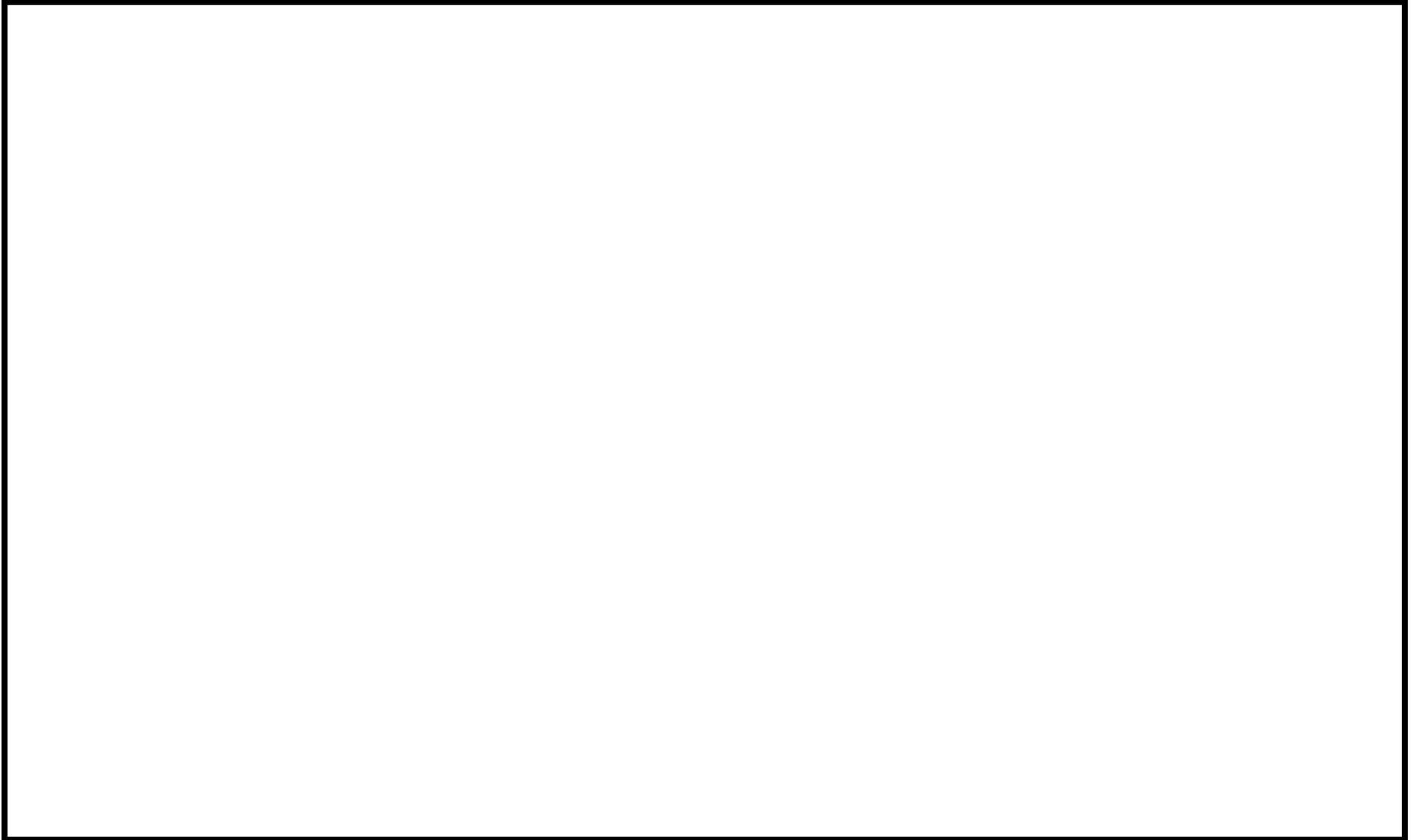
Check a box for dc system grounding: Grounded, Ungrounded
 For ungrounded dc power systems, EGC is required
 For grounded dc power systems, GEC & EGC are required
 Refer to CEC 250.120 for EGC installation & Table 250.122 for sizing

* Consult with your local AHJ and /or Utility

Conductor, Cable and Conduit Schedule					
TAG	Description and Conductor Type: (Table 3)	Conductor Size	Number of Conductors	Conduit/ Conductor/ Cable Type	Conduit Size
Current-Carrying Conductors: (for each branch circuit)					
A	EGC:				
	GEC (when required):				
Current-Carrying Conductors:					
B	EGC:				
	GEC (when required):				

SOLAR PV STANDARD PLAN - SIMPLIFIED

**Microinverter and ACM Systems for One- and Two-Family Dwellings
ROOF LAYOUT PLAN**



Items required: roof layout of all panels, modules, clear access pathways and approximate locations of electrical disconnecting means and roof access points.



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Residential Roof-Top Mounted Solar Installations

Form 5 – Solar PV Standard Plan – Simplified Central/String Inverter Systems

SCOPE: Use this plan ONLY for utility-interactive central/string inverter systems not exceeding a system AC inverter output rating of 10kW on the roof of a one or two-family dwelling or accessory structure. The photovoltaic system must interconnect to the load side of a single-phase AC service panel of nominal 120/240Vac with a bus bar rating of 225A or less. This plan is not intended for bipolar systems, hybrid systems or systems that utilize storage batteries, charge controllers, trackers, more than two inverters or more than one DC combiner (noninverter-integrated) per inverter. Systems must be in compliance with current California Building Standards Codes and local amendments of the authority having jurisdiction (AHJ). Other Articles of the California Electrical Code (CEC) shall apply as specified in 690.3.

MANUFACTURER’S SPECIFICATION SHEETS MUST BE PROVIDED for proposed inverter, modules, combiner/junction boxes and racking systems. Installation instructions for bonding and grounding equipment shall be provided, and local AHJs may require additional details. Listed and labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling (CEC 110.3). Equipment intended for use with PV system shall be identified and listed for the application (CEC 690.4[D]).

Job Address: _____ Permit #: _____

Contractor/Engineer Name: _____ License # and Class: _____

Signature: _____ Date: _____ Phone Number: _____

Total # of Inverters installed: _____ (If more than one inverter, complete and attach the “Supplemental Calculation Sheets” and the “Load Center Calculations” if a new load center is to be used.)

Inverter 1 AC Output Power Rating: _____ Watts

Inverter 2 AC Output Power Rating (if applicable): _____ Watts

Combined Inverter Output Power Rating: _____ ≤ 10,000 Watts

Location Ambient Temperatures (Check box next to which lowest expected temperature is used):

1) <input type="checkbox"/> Lowest expected ambient temperature for the location (T_L) = Between -1° to -5° C <input type="checkbox"/> Lowest expected ambient temperature for the location (T_L) = Between -6° to -10° C Average ambient high temperature (T_H) ≤ 47° C Note: For a lower T_L or a higher T_H , <u>this plan is not applicable.</u>

DC Information:

Module Manufacturer: _____ Model: _____
2) Module V_{oc} (from module nameplate): _____ Volts
3) Module I_{sc} (from module nameplate): _____ Amps Is Module I_{sc} below 9.6 Amps? <input type="checkbox"/> Yes <input type="checkbox"/> No (If No, this plan is not applicable.)
4) Module DC output power under standard test conditions (STC) = _____ Watts (STC)

5) DC Module Layout

Identify each source circuit (string) for inverter 1 shown on the roof plan with a Tag (e.g. A,B,C,...)	Number of modules per source circuit for inverter 1	Identify, by tag, which source circuits on the roof are to be paralleled (if none, put N/A)
		Combiner 1:
		Combiner 2:
Total number of source circuits for inverter 1:		

6) Are DC/DC Converters used? Yes No If No, skip to Step 7. If Yes enter info below.

DC/DC Converter Model #: _____
 Max DC Output Current: _____ Amps
 Max # of DC/DC Converters in an Input Circuit: _____

DC/DC Converter Max DC Input Voltage: _____ Volts
 Max DC Output Current: _____ Volts
 DC/DC Converter Max DC Input Power: _____ Watts

7) Maximum System DC Voltage — Use A1 or A2 for systems without DC/DC converters, and B1 or B2 with DC/DC Converters.

- A1. Module V_{oc} (STEP 2) = _____ x # of modules in series (STEP 5) _____ x 1.12 (If $-1 \leq T_L \leq -5^\circ\text{C}$, STEP 1) = _____ V
- A2. Module V_{oc} (STEP 2) = _____ x # of modules in series (STEP 5) _____ x 1.14 (If $-6 \leq T_L \leq -10^\circ\text{C}$, STEP 1) = _____ V

Max. Rated Module V_{oc} (*1.12) (Volts)	29.76	31.51	33.48	35.71	38.27	41.21	44.64	48.70	53.57	59.52	66.96	76.53	89.29
Max. Rated Module V_{oc} (*1.14) (Volts)	29.24	30.96	32.89	35.09	37.59	40.49	43.86	47.85	52.63	58.48	65.79	75.19	87.72
Max # of Modules for 600 Vdc	18	17	16	15	14	13	12	11	10	9	8	7	6

Use for DC/DC converters. The value calculated below must be less than DC/DC converter max DC input voltage (STEP 6).

- B1. Module V_{oc} (STEP 2) = _____ x # of modules per converter (STEP 6) _____ x 1.12 (If $-1 \leq T_L \leq -5^\circ\text{C}$, STEP 1) = _____ V
- B2. Module V_{oc} (STEP 2) = _____ x # of modules per converter (STEP 6) _____ x 1.14 (If $-6 \leq T_L \leq -10^\circ\text{C}$, STEP 1) = _____ V

Max. Rated Module V_{oc} (*1.12) (Volts)	30.4	33.0	35.7	38.4	41.1	43.8	46.4	49.1	51.8	54.5	57.1	59.8	62.5	65.2	67.9	70.5
Max. Rated Module V_{oc} (*1.14) (Volts)	29.8	32.5	35.1	37.7	40.4	43.0	45.6	48.2	50.9	53.5	56.1	58.8	61.4	64.0	66.7	69.3
DC/DC Converter Max DC Input (Step #6) (Volts)	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79

8) Maximum System DC Voltage from DC/DC Converters to Inverter — Only required if Yes in Step 6
 Maximum System DC Voltage = _____ Volts

9) Sizing Source Circuit Conductors

Source Circuit Conductor Size = Min. #10 AWG copper conductor, 90° C wet (USE-2, PV Wire, XHHW-2, THWN-2, RHW-2)

For up to 8 conductors in roof-mounted conduit exposed to sunlight at least 1/2" from the roof covering (CEC 310)

Note: For over 8 conductors in the conduit or mounting height of lower than 1/2" from the roof, use Comprehensive Plan.

10) Are PV source circuits combined prior to the inverter? Yes No

If No, use Single Line Diagram 1 and proceed to Step 12.

If Yes, use Single Line Diagram 2 with Single Line Diagram 4 and proceed to Step 11.

Is source circuit OCPD required? Yes No

Source circuit OCPD size (if needed): 15 Amps

Are the source circuits combined on the roof? Yes No

If "Yes", the DC output of the combiner shall have a load break disconnecting means located in the combiner or within 1.8m (6ft) of the combiner (CEC 690.15(c)).

11) Sizing PV Output Circuit Conductors

Sizing strings are combined (answered "Yes" in step 10).

Output Circuit Conductor Size = Min. #6 AWG copper conductor

12) Inverter DC Disconnect

Does the inverter have an integrated DC disconnect? Yes No If Yes, proceed to step 13.

If No, the external DC disconnect to be installed is rated for _____ Amps (DC) and _____ Volts (DC)

13) Inverter Information

Manufacturer: _____ Model: _____

Max. Continuous AC Output Current Rating: _____ Amps

Integrated DC Arc-Fault Circuit Protection? Yes No (If No is selected, this plan is not applicable)

Grounded or Ungrounded System? Grounded Ungrounded

AC Information:

14) Sizing Inverter Output Circuit Conductors and OCPD

Inverter Output OCPD rating = _____ Amps (Table 3)

Inverter Output Circuit Conductor Size = _____ AWG (Table 3)

Table 3. Minimum Inverter Output OCPD and Circuit Conductor Size									
Inverter Continuous Output Current Rating (Amps) (Step 14)	12	16	20	24	28	32	36	40	48
Minimum OCPD Size (Amps)	15	20	25	30	35	40	45	50	60
Minimum Conductor Size (AWG, 75° C, Copper)	14	12	10	10	8	8	6	6	6

15) Point of Connection to Utility

Note: Only load side connections are permitted with this plan.

Is the PV OCPD positioned at the opposite end from input feeder location or main OCPD location? Yes No

If Yes, use Table 4 row 3 circle the Max combined PV System OCPD(s) at 120% based on the busbar rating and main OCPD values.

If No, use Table 4, row 3 and circle the Max Combined PV System OCPD(s) at 120% based on the busbar rating and the main OCPD values.

Per 705.12(D)(2)(3): [Inverter output OCPD size [Step #14 or S18] + Main OCPD Size] ≤ [bus size x (120%)]

Table 4. Maximum Combined Supply OCPDs Based on Bus Bar Rating (Amps) per CEC 705.12(D)(2)(3)(b)										
Bus Bar Rating	100	125	125	200	200	200	225	225	225	
Main OCPD	100	100	125	150	175	200	175	200	225	
Max Combined PV System OCPD(s) at 120% of Bus Bar Rating	20	50	25	60*	60*	40	60*	60*	45	
Max Combined PV System OCPD(s) at 100% Bus Bar Rating	0	25	0	50	25	0	50	25	0	

*This value has been lowered to 60 A from the calculated value to reflect 10 kW AC size maximum.

Reduction of the main breaker is not permitted with this plan.

Line-side tap is not permitted with this plan.

16) Rapid Shutdown

The rapid shutdown initiation device shall be labeled according to CEC 690.56(C), and its location shall be shown on the site plan drawing. The rapid shutdown initiation device may be the inverter output or input circuits' disconnecting means, the service main disconnect, or a separate device as approved by the AHJ. The disconnecting means shall be identified for the purpose, suitable for their environment, and listed as a disconnecting means. A single rapid shutdown initiation device shall operate all disconnecting means necessary to control conductors in compliance with CEC 690.12. Note: Check with the AHJ regarding approval where field verification of reduction of voltage within the time required by CEC 690.12 is performed.

Rapid shutdown shall be provided as required by CEC 690.12 with one of the following methods (Select one):

- The inverter(s) is within 10 feet of the array, and the location of the inverter is such that uncontrolled PV system conductors are no greater than 5 feet of length within the building. A remotely-controlled AC disconnecting means is required immediately adjacent to or as close as practicable to the inverters, and located within 10 feet of the array.
- The inverter(s) is within 10 feet of the array, and the location of the inverter is such that uncontrolled PV system conductors are no greater than 5 feet of length within the building. Reduction of the voltage for the inverter output within the time required by CEC 690.12 shall be verified in the field, or the inverter output is listed to UL 1741 with rapid shutdown capability.
- Remotely-controlled DC disconnecting means are located within 10 feet of the PV array and DC input of the inverter(s), and the locations of the disconnecting means are such that uncontrolled PV system conductors are no greater than 5 feet of length within the building. Reduction of the voltage for the inverter output within the time required by CEC 690.12 shall be verified in the field, or the inverter output is listed to UL 1741 with rapid shutdown capability.
- Remotely-controlled DC disconnecting means is located within 10 feet of the array at the DC input of inverter(s) connected to a module level DC-DC converter circuit where the DC-DC converter circuit meets the requirements for controlled conductors when disconnected from the inverter. Reduction of the voltage for the DC-DC converter output and the inverter output within the time required by CEC 690.12 shall be verified in the field, or the DC-DC converter output and the inverter output are listed to UL 1741 with rapid shutdown capability.
- A UL 1741-listed and identified inverter(s) with input and output rapid shutdown capability supplying module level DC-DC converter circuit where the DC-DC converter circuit meets the requirements for controlled conductors when disconnected from the inverter.
- A UL 1741-listed rapid shutdown system:
Manufacturer: _____
Testing Agency Name: _____
System Model Number: _____
System Components: _____

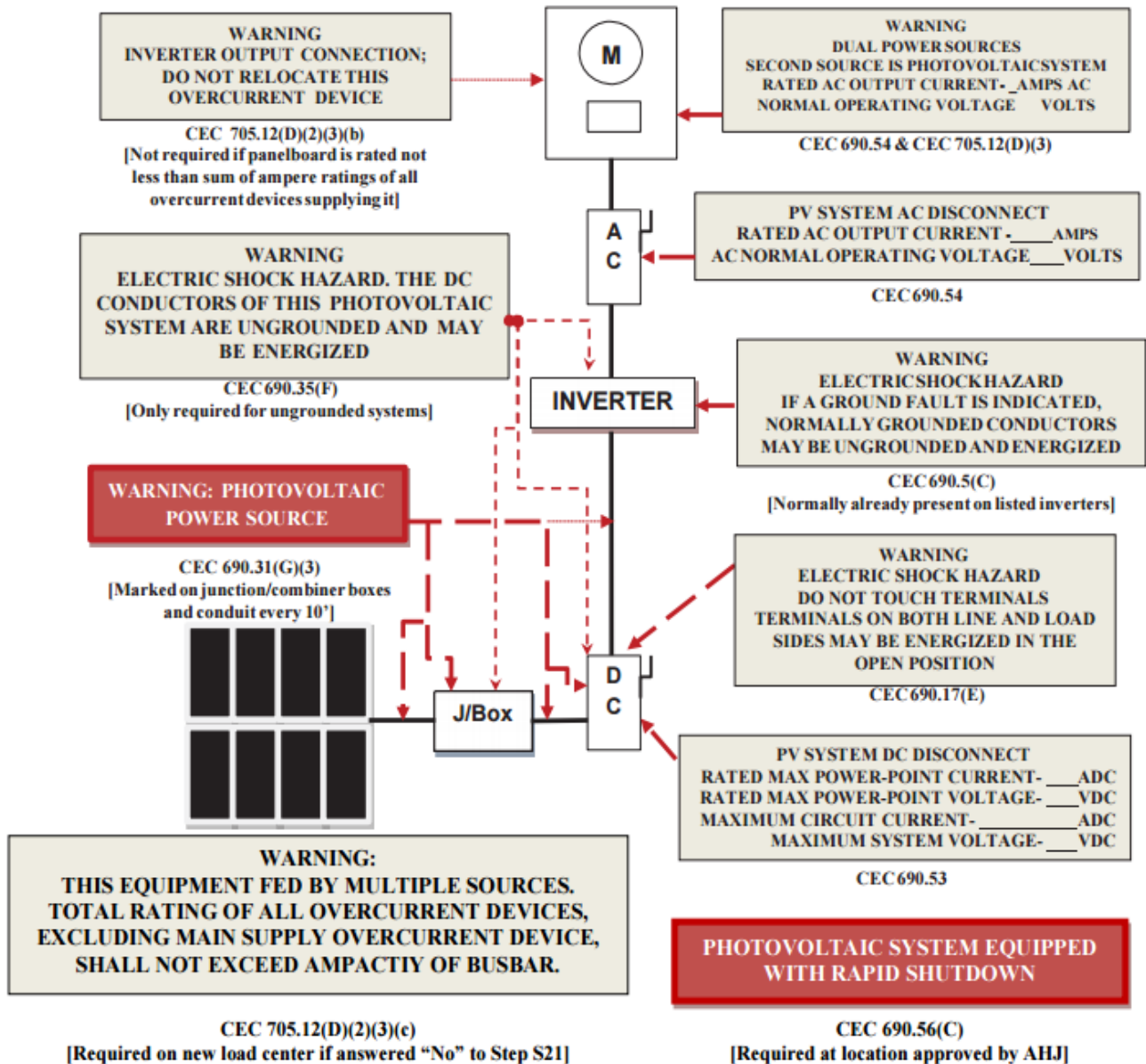
17) Grounding and Bonding of Modules and Racking System (select one):

- Racking system listed to UL 2703 using modules identified in the listing.
- Other method subject to AHJ approval

Solar PV Standard Plan – Simplified Central/String Inverter Systems for One- and Two-Family Dwellings

Markings

CEC Articles 690 and 705 and CA Residential Code Section R324 require the following labels or markings be installed at these components of the photovoltaic system:



Informational note: ANSI Z535.4 provides guidelines for the design of safety signs and labels for application to products. A phenolic plaque with contrasting colors between the text and background would meet the intent of the code for permanency. No type size is specified, but 20 point (3/8") should be considered the minimum.

CEC 705.12 requires a permanent plaque or directory denoting all electric power sources on or in the premises or rapid fire shutdown equipment.

Solar PV Standard Plan – Simplified Central/String Inverter System for One- and Two-Family Dwellings

△ TAG	DESCRIPTION
1	SOLAR PV MODULE / STRING
2	DC/DC CONVERTERS INSTALLED? YES / NO (IF YES, STEPS 6 & 8 REQUIRED)
3	SOURCE CIRCUIT JUNCTION BOX INSTALLED?: YES / NO
4	SEPARATE DC DISCONNECT INSTALLED?: YES / NO
5	INTERNAL INVERTER DC DISCONNECT: YES / NO
6	CENTRAL INVERTER
7	LOAD CENTER INSTALLED?: YES / NO
8	PV PRODUCTION METER INSTALLED?: YES / NO
9	*SEPARATE AC DISCONNECT INSTALLED?: YES / NO
10	CONNECT TO INVERTER #2 (USE LINE DIAGRAM 2)

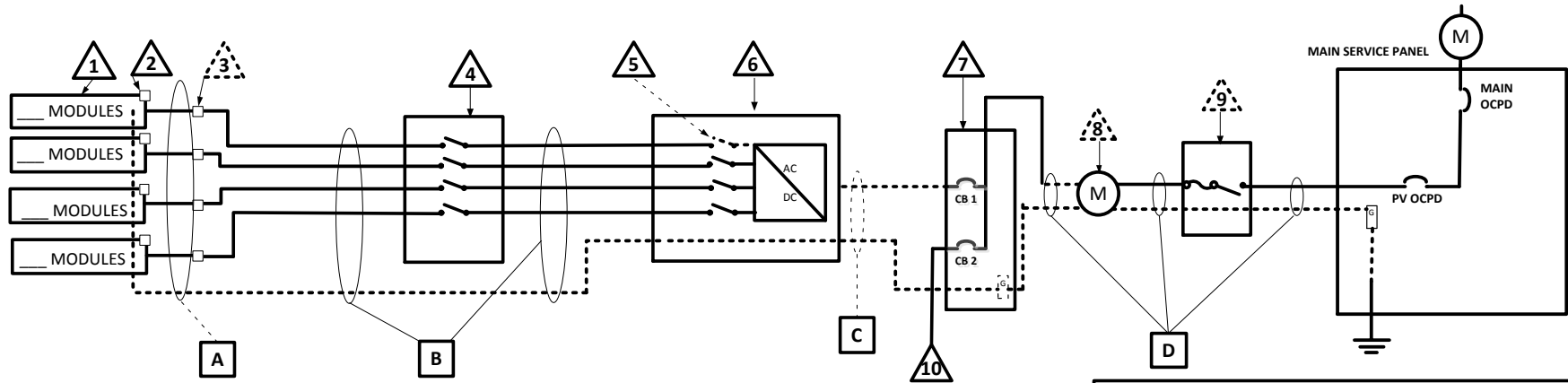
* Consult with your local AHJ and /or Utility

SINGLE-LINE DIAGRAM #1 – NO STRINGS COMBINED PRIOR TO INVERTER

CHECK A BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: GROUNDED (INCLUDE GEC) UNGROUNDED

FOR UNGROUNDED SYSTEMS:

- DC OCPD MUST DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT
- UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE-FINISHED CONDUCTORS ARE NOT PERMITTED.



CONDUCTOR/CONDUIT SCHEDULE					
□ TAG	DESCRIPTION AND CONDUCTOR TYPE	CONDUCTOR SIZE	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE
A	USE-2 <input type="checkbox"/> OR PV-WIRE <input type="checkbox"/>				
	EGC/GEC:				
B					
	EGC/GEC:				
C					
	EGC/GEC:				
D					
	EGC/GEC:				

ENTER "N/A" WHERE SUITABLE FOR WHEN NOT USING CONDUIT OR CABLE AS PERMITTED BY CODE

IF DC/DC CONVERTERS ARE USED, CHECK THE BOX BELOW THE CORRESPONDING CONFIGURATION

PARALLEL DC/DC CONVERTERS ON ONE SOURCE CIRCUIT (FIXED UNIT VOLTAGE DC/DC CONVERTERS)

DC/DC CONVERTERS ARE ALL RUN IN SERIES (FIXED SOURCE CIRCUIT VOLTAGE DC/DC CONVERTERS)

Solar PV Standard Plan – Simplified Central/String Inverter System for One- and Two-Family Dwellings

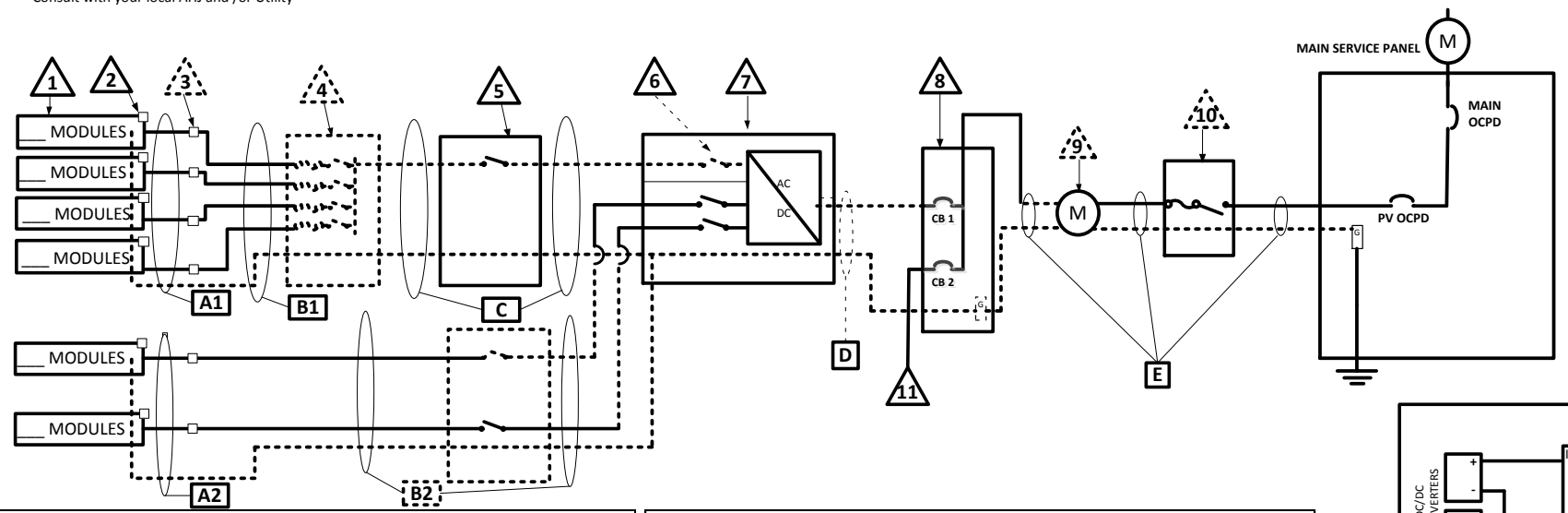
△ TAG	DESCRIPTION
1	SOLAR PV MODULE / STRING
2	DC/DC CONVERTERS INSTALLED? YES / NO (IF YES, STEPS 6 & 8 REQUIRED)
3	SOURCE CIRCUIT JUNCTION BOX INSTALLED?: YES / NO
4	COMBINER BOX (STEPS 11 & 12 REQUIRED)
5	SEPARATE DC DISCONNECT INSTALLED?: YES / NO
6	INTERNAL INVERTER DC DISCONNECT: YES / NO
7	CENTRAL INVERTER
8	LOAD CENTER INSTALLED?: YES / NO
9	PV PRODUCTION METER INSTALLED?: YES / NO
10	*SEPARATE AC DISCONNECT INSTALLED?: YES / NO
11	CONNECT TO INVERTER #2 (USE LINE DIAGRAM 4)

SINGLE-LINE DIAGRAM #2 – COMBINING STRINGS PRIOR TO INVERTER

CHECK A BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: GROUNDED (INCLUDE GEC) UNGROUNDED

FOR UNGROUNDED SYSTEMS:
 - DC OCPD MUST DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT
 - UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE-FINISHED CONDUCTORS ARE NOT PERMITTED.

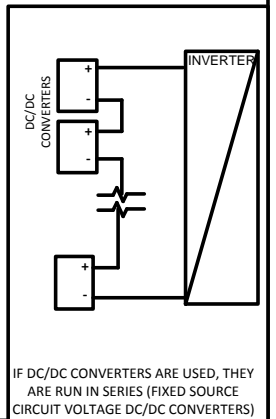
* Consult with your local AHJ and /or Utility



COMBINER CONDUCTOR/CONDUIT SCHEDULE					
□ TAG	DESCRIPTION AND CONDUCTOR TYPE	CONDUCTOR SIZE	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE
A1	USE-2 <input type="checkbox"/> OR PV-WIRE <input type="checkbox"/>				
	EGC/GEC:				
B1					
	EGC/GEC:				
C					
	EGC/GEC:				
D					
	EGC/GEC:				
E					
	EGC/GEC:				

NON-COMBINED STRINGS CONDUCTOR/CONDUIT SCHEDULE (IF APPLICABLE)					
□ TAG	DESCRIPTION AND CONDUCTOR TYPE	CONDUCTOR SIZE	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE
A2	USE-2 <input type="checkbox"/> OR PV-WIRE <input type="checkbox"/>				
	EGC/GEC:				
B2					
	EGC/GEC:				

ENTER "N/A" WHERE SUITABLE FOR WHEN NOT USING CONDUIT OR CABLE AS PERMITTED BY CODE



Supplemental Calculation Sheets for Inverter #2 (Only include if second inverter is used)

DC Information:

Module Manufacturer: _____ Model: _____		
S2) Module V_{oc} (from module nameplate): _____ Volts	S3) Module I_{sc} (from module nameplate): _____ Amps Is Module I_{sc} below 9.6 Amps? <input type="checkbox"/> Yes <input type="checkbox"/> No	
S4) Module DC output power under standard test conditions (STC) = _____ Watts (STC)		
S5) DC Module Layout		
Identify each source circuit (string) for inverter 1 shown on the roof plan with a Tag (e.g. A,B,C,...)	Number of modules per source circuit for inverter 1	Identify, by tag, which source circuits on the roof are to be paralleled (if none, put N/A)
		Combiner 1:
		Combiner 2:
Total number of source circuits for inverter 1: _____		
S6) Are DC/DC Converters used? <input type="checkbox"/> Yes <input type="checkbox"/> No		
If No, skip to Step S7. If Yes, enter info below.		
DC/DC Converter Model #: _____ Max DC	DC/DC Converter Max DC Input Voltage: _____ Volts	
Max DC Output Current: _____ Amps	Max DC Output Current: _____ Volts	
Max # of DC/DC Converters in an Input Circuit: _____	DC/DC Converter Max DC Input Power: _____ Watts	

S7) Maximum System DC Voltage — Use systems without DC/DC converters

A. Module V_{oc} (STEP S2) = _____ x # of modules in series (STEP S5) _____ x C_f (Step 1) _____ = _____ V

Table S1. Maximum Number of PV Modules in Series Based on Module Rated V_{oc} for 600Vdc Rated Equipment (CEC 690.7)													
Max. Rated Module V_{oc} (*1.12) (Volts)	29.76	31.51	33.48	35.71	38.27	41.21	44.64	48.70	53.57	59.52	66.96	76.53	89.29
Max. Rated Module V_{oc} (*1.14) (Volts)	29.24	30.96	32.89	35.09	37.59	40.49	43.86	47.85	52.63	58.48	65.79	75.19	87.72
Max # of Modules for 600 Vdc	18	17	16	15	14	13	12	11	10	9	8	7	6

Use for systems with DC/DC converters. The value calculated below must be less than DC/DC converter max DC input voltage (STEP S6).

B. Module V_{oc} (STEP S2) = _____ x # of modules per converter (STEP S6) _____ x C_f (Step 1) _____ = _____ V

Table 2. Largest Module V_{oc} for Single-Module DC/DC Converter Configurations (with 80 V AFCI Cap) (CEC 690.7 and 690.11)																
Max. Rated Module V_{oc} (*1.12) (Volts)	30.4	33.0	35.7	38.4	41.1	43.8	46.4	49.1	51.8	54.5	57.1	59.8	62.5	65.2	67.9	70.5
Max. Rated Module V_{oc} (*1.14) (Volts)	29.8	32.5	35.1	37.7	40.4	43.0	45.6	48.2	50.9	53.5	56.1	58.8	61.4	64.0	66.7	69.3
DC/DC Converter Max DC Input (Step 6) (Volts)	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79

S8) Maximum System DC Voltage from DC/DC Converters to Inverter — Only required if Yes in Step S6
 Maximum System DC Voltage = _____ Volts

S9) Sizing Source Circuit Conductors

Source Circuit Conductor Size = Min. #10 AWG copper conductor, 90° C wet (USE-2, PV Wire, XHHW-2, THWN-2, RHW-2)

For up to 8 conductors in roof-mounted conduit exposed to sunlight at least ½" from the roof covering (CEC 310)

Note: For over 8 conductors in the conduit or mounting height of lower than ½" from the roof, this plan is not applicable.

S10) Are PV source circuits combined prior to the inverter? Yes No

If No, use Single Line Diagram 1 with Single Line Diagram 3 and proceed to Step S12.

If Yes, use Single Line Diagram 2 with Single Line Diagram 4 and proceed to Step S11.

Is source circuit OCPD required? Yes No

Source circuit OCPD size (if needed): 15 Amps

Are the source circuits combined on the roof? Yes No

If "Yes," the DC output of the combiner shall have a load breaker disconnecting means located in the combiner or within 1.8m (6ft) of the combiner.

S11) Sizing PV Output Circuit Conductors — If strings are combined (answer "Yes" in Step S10), Output Circuit Conductor Size = Min. #6 AWG copper conductor

S12) Inverter Disconnect

Does the inverter have an integrated DC disconnect? Yes No If Yes, proceed to Step S13.

If No, the external DC disconnect to be installed is rated for _____ Amps (DC) and _____ Volts (DC)

S13) Inverter Information

Manufacturer: _____ Model: _____
Max. Continuous AC Output Current Rating: _____ Amps
Integrated DC Arc-Fault Circuit Protection? Yes No (If No is selected, this plan is not applicable)
Grounded or Ungrounded System? Grounded Ungrounded

AC Information:

S14) Sizing Inverter Output Circuit Conductors and OCPD

Inverter Output OCPD rating = _____ Amps (Table 3)
Inverter Output Circuit Conductor Size = _____ AWG (Table 3)

Inverter Continuous Output Current Rating (Amps) (Step 14)	12	16	20	24	28	32	36	40	48
Minimum OCPD Size (Amps)	15	20	25	30	35	40	45	50	60
Minimum Conductor Size (AWG, 75° C, Copper)	14	12	10	10	8	8	6	6	6

Load Center Calculations
(Omit if a load center will not be installed for PV OCPDs)

S18) Load Center Output:

Calculate the sum of the maximum AC outputs from each inverter.
Inverter #1 Max Continuous AC Output Current Rating [STEP S13] _____ × 1.25 = _____ Amps
Inverter #2 Max Continuous AC Output Current Rating [STEP S13] _____ × 1.25 = _____ Amps
Total inverter currents connected to load center (sum of above) = _____ Amps

Conductor Size: _____ AWG
Overcurrent Protection Device: _____ Amps
Load center bus bar rating: _____ Amps
Can the load center accept more than two breakers? Yes No

If Yes, the sum of 125% of the inverter output circuit currents and the rating of the overcurrent device protecting the busbar shall not exceed 120% of the ampacity of the busbar.

If No, the sum of the ampere rating of the two PV overcurrent devices shall not exceed the rating of the busbar.

Solar PV Standard Plan – Simplified Central/String Inverter System for One- and Two-Family Dwellings

△ TAG	DESCRIPTION
1	SOLAR PV MODULE / STRING
2	DC/DC CONVERTERS INSTALLED? YES / NO (IF YES, STEPS 6 & 8 REQUIRED)
3	SOURCE CIRCUIT JUNCTION BOX INSTALLED?: YES / NO
4	SEPARATE DC DISCONNECT INSTALLED?: YES / NO
5	INTERNAL INVERTER DC DISCONNECT: YES / NO
6	CENTRAL INVERTER
7	*SEPARATE AC DISCONNECT INSTALLED?: YES / NO
8	TO LOAD CENTER ON LINE DIAGRAM 1

* Consult with your local AHJ and /or Utility

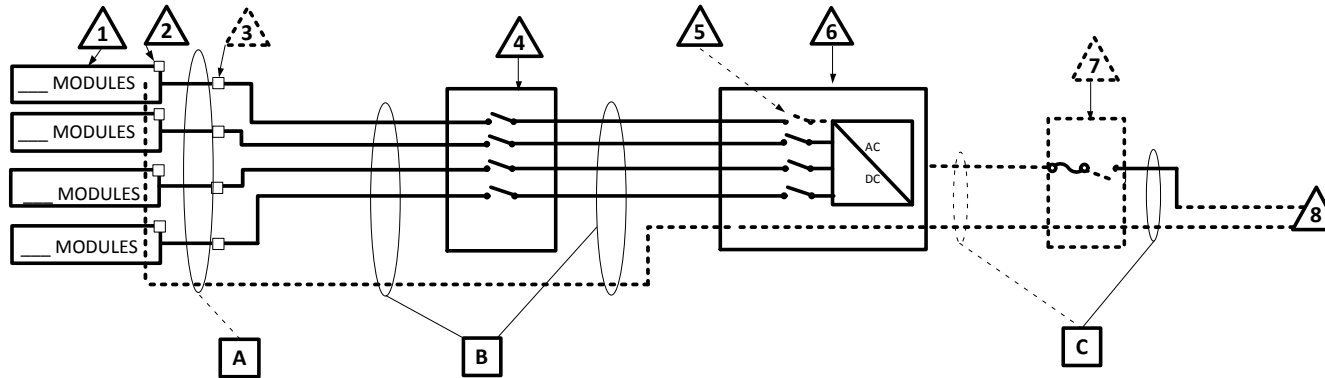
SINGLE-LINE DIAGRAM #3 – ADDITIONAL INVERTER FOR DIAGRAM #1

INVERTER # 2

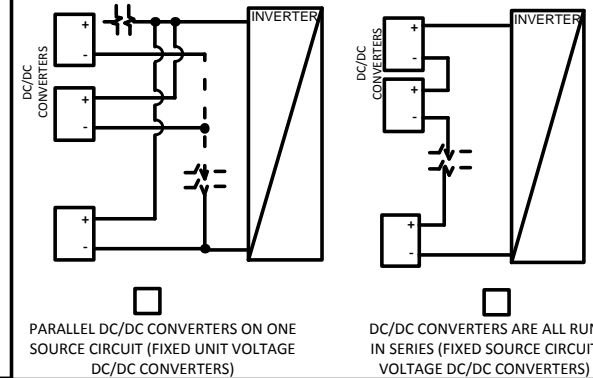
CHECK A BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: GROUNDED (INCLUDE GEC) UNGROUNDED

FOR UNGROUNDED SYSTEMS:

- DC OCPD MUST DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT
- UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE-FINISHED CONDUCTORS ARE NOT PERMITTED.



IF DC/DC CONVERTERS ARE USED, CHECK THE BOX BELOW THE CORRESPONDING CONFIGURATION



ENTER "N/A" WHERE SUITABLE FOR WHEN NOT USING CONDUIT OR CABLE AS PERMITTED BY CODE

CONDUITOR/CONDUIT SCHEDULE

<input type="checkbox"/> TAG	DESCRIPTION AND CONDUCTOR TYPE	CONDUCTOR SIZE	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE
A	USE-2 <input type="checkbox"/> OR PV-WIRE <input type="checkbox"/>				
	EGC/GEC:				
B					
	EGC/GEC:				
C					
	EGC/GEC:				

Solar PV Standard Plan – Simplified Central/String Inverter System for One- and Two-Family Dwellings

△ TAG	DESCRIPTION
1	SOLAR PV MODULE / STRING
2	DC/DC CONVERTERS INSTALLED? YES / NO (IF YES, STEPS 6 & 8 REQUIRED)
3	SOURCE CIRCUIT JUNCTION BOX INSTALLED?: YES / NO
4	COMBINER BOX (STEPS 11 & 12 REQUIRED)
5	SEPARATE DC DISCONNECT INSTALLED?: YES / NO
6	INTERNAL INVERTER DC DISCONNECT: YES / NO
7	CENTRAL INVERTER
8	*SEPARATE AC DISCONNECT INSTALLED?: YES / NO
9	TO LOAD CENTER ON LINE DIAGRAM 3

* Consult with your local AHJ and /or Utility

SINGLE-LINE DIAGRAM #4 – ADDITIONAL INVERTER FOR DIAGRAM #2

INVERTER # 2

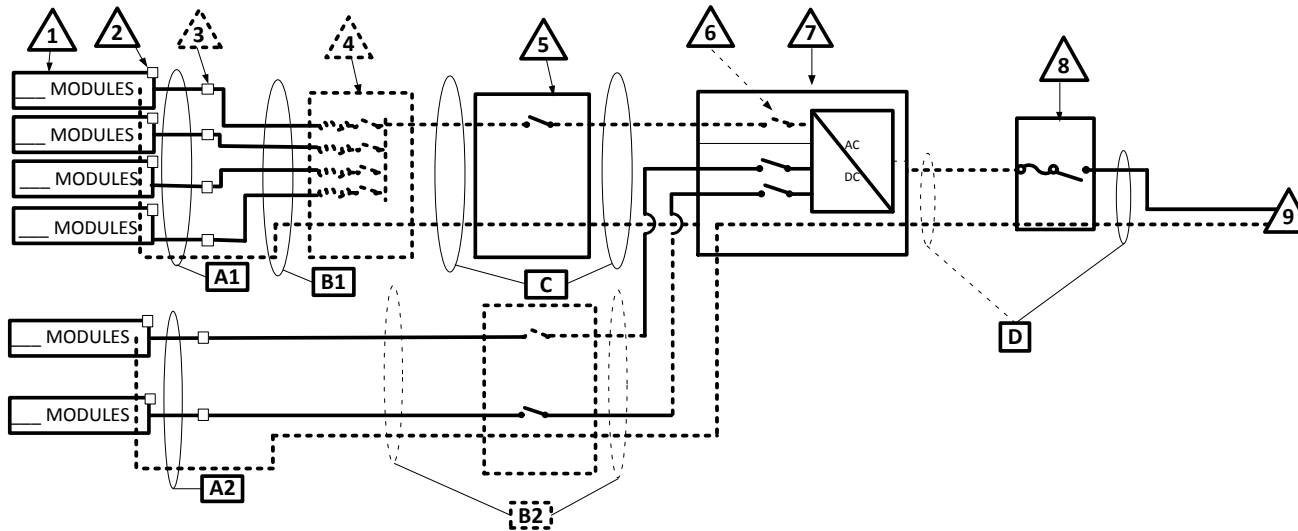
CHECK A BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: GROUNDED (INCLUDE GEC)

UNGROUNDED

FOR UNGROUNDED SYSTEMS:

- DC OCPD MUST DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT

- UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE-FINISHED CONDUCTORS ARE NOT PERMITTED.



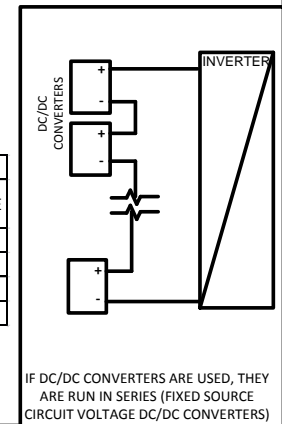
COMBINER CONDUCTOR/CONDUIT SCHEDULE

<input type="checkbox"/> TAG	DESCRIPTION AND CONDUCTOR TYPE	CONDUCTOR SIZE	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE
A1	USE-2 <input type="checkbox"/> OR PV-WIRE <input type="checkbox"/>				
	EGC/GEC:				
B1					
	EGC/GEC:				
C					
	EGC/GEC:				
D					
	EGC/GEC:				

NON-COMBINED STRINGS CONDUCTOR/CONDUIT SCHEDULE (IF APPLICABLE)

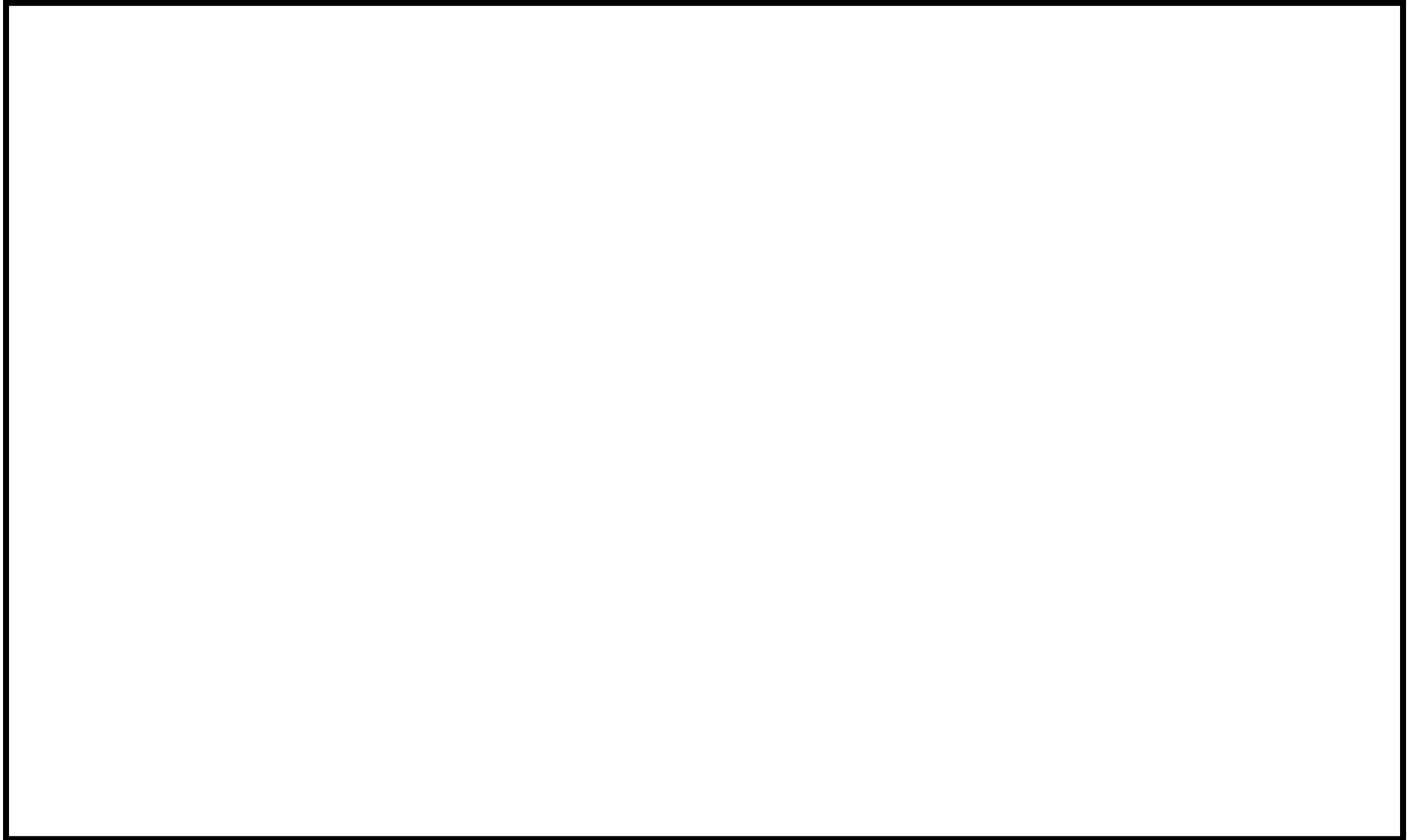
<input type="checkbox"/> TAG	DESCRIPTION AND CONDUCTOR TYPE	CONDUCTOR SIZE	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE
A2	USE-2 <input type="checkbox"/> OR PV-WIRE <input type="checkbox"/>				
	EGC/GEC:				
B2					
	EGC/GEC:				

ENTER "N/A" WHERE SUITABLE FOR WHEN NOT USING CONDUIT OR CABLE AS PERMITTED BY CODE



SOLAR PV STANDARD PLAN

Roof Layout Diagram for One- and Two-Family Dwellings



Items required: roof layout of all panels, modules, clear access pathways and approximate locations of electrical disconnecting means and roof access points.



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 6 - Solar Domestic Water Heating Standard Plan 30 kWth or Less

ELIGIBILITY CHECKLIST FOR EXPEDITED SOLAR DOMESTIC WATER HEATER PERMITTING

GENERAL REQUIREMENTS

- A. System size is 30 kWth (462 square feet of collector) or less Y N
- B. The solar array is roof-mounted on one- or two-family dwelling or accessory structure Y N
- C. The solar collector arrays will not exceed the maximum legal building height Y N
- D. Solar collectors are certified by an accredited listing agency Y N
- E. Solar domestic water heating system is certified by an accredited listing agency Y N
- F. Permit application is completed and attached Y N
- G. System schematic is included Y N
- H. List of major components to match system schematic Y N
- I. Heat transfer fluid is either water or a nontoxic fluid Y N

PLUMBING REQUIREMENTS

- A. Adequate extreme temperature protection is provided Y N

STRUCTURAL REQUIREMENTS

- A. A completed Structural Criteria and supporting documentation is attached (as required) Y N

Notes:

These criteria are intended for streamlined solar permitting process.

1. *If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.*



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 6 - Solar Domestic Water Heating Standard Plan 30 kWth or Less

SCOPE: Use this plan ONLY for solar domestic water heating systems not exceeding a thermal output rating of 30 kWth on the roof of a one- or two-family dwelling or accessory structure and used for domestic water heating. Systems must be in compliance with current California Building Standards Code, Title 24 and local amendments of the authority having jurisdiction (AHJ). Other articles of the California Plumbing Code (CPC) or California Mechanical Code (CMC) or other California health and safety codes shall apply.

MANUFACTURER'S SPECIFICATION SHEETS MUST BE PROVIDED for proposed collector, controller, pump, storage tank/heat exchanger/ heat transfer fluid (if applicable) and mounting systems. Equipment intended for use with SWH system shall be identified and listed for the application.

Job Address: _____ Permit #: _____

Contractor/Engineer Name: _____ License # and Class: _____

Signature: _____ Date: _____ Phone Number: _____

Email: _____

Total # of Collectors Installed _____ Total Area of Collectors _____

Collector Certification Number (include certifying agency) _____

System Certification Number (include certifying agency) _____

Max Height Above Roof _____ Height Above Ground _____

Major Components (for SDWH systems)

Solar Tank Make/Model _____ Gallons _____ Insulation R- _____ Pressurized?

Heat Exchanger Make/Model _____ Number of Walls _____ Heat Exchange Fluid

Solar Control Make/Model _____

Solar Pump/Circulator Make/Model _____

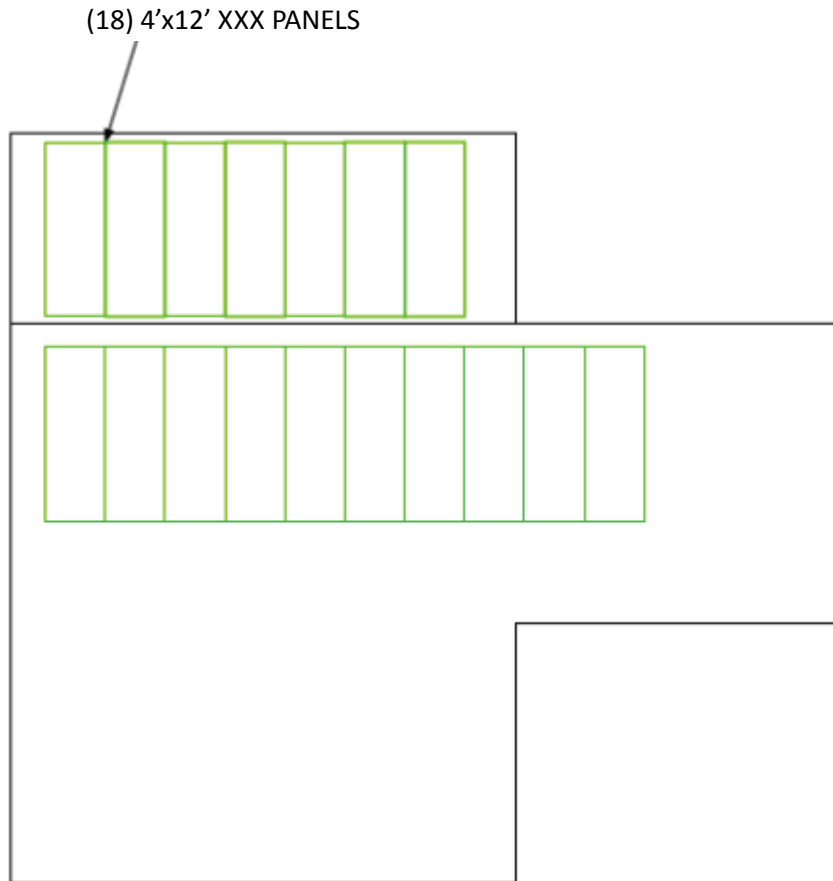
Expansion Tank Make/Model _____ Appropriately Sized for Use? _____

Mounting Hardware Make/Model or Type _____

Do all the above data match substantially the data used for certification? _____

SAMPLE ROOF PLAN for SDWH and SPH systems

- ROOF TYPE: STANDING SEAM
- ROOF HEIGHT (Elevation): MAX 15' (1 story)
- RAFTERS: 2" X 6" @ 24" OC





**Expedited Permitting Process
 Residential Roof-Top Mounted Solar Installations**

Form 6 - Solar Domestic Water Heating Standard Plan 30 kWth or Less

INSPECTION GUIDE FOR SOLAR DOMESTIC WATER HEATER

This document is a field inspection guide for SDWH systems. These inspection references detail most of the issues that relate to SDWH systems during the inspection process.

All California Electrical Code (CEC), California Residential Code (CRC), California Building Code (CBC), California Mechanical Code (CMC), and California Plumbing Code (CPC) references are to the 2016 versions unless otherwise noted.

SOLAR DOMESTIC WATER HEATING SYSTEM ELIGIBILITY			
SYSTEM	CRITERIA		YES
		1. Major component installed match those of certified system?	
SOLAR DOMESTIC WATER HEATING INSPECTION GUIDE			
ROOF	GUIDELINE	SOURCE OF GUIDELINE	YES
	I. Roof penetrations/attachments are properly flashed	CBC Chap 15, CRC Chap 9	
SOLAR LOOP PIPING	I. Piping must be properly supported, hung and anchored per code	CPC 313.1	
	II. Solar piping properly insulated	AHJ	
	III. Dissimilar materials isolated, as required	CPC 310.6	
	IV. Penetrations through structural members as per code	CPC 312.2	
	V. Penetrations through fire-resistant assemblies installed per code	CPC 1405.2	
	VI. System has adequate freeze protection	CPC 312.6	
	VII. System overheat protection	CPC 505.2	
	VIII. Expansion tank sized correctly (indirect system) according to	CMC 1004.3,	



**Expedited Permitting Process
 Residential Roof-Top Mounted Solar Installations**

Form 6 - Solar Domestic Water Heating Standard Plan 30 kWth or Less

	need for operation or overheat protection?	1004.4	
	IX. Pressure relief/temperature relief valve(s) installed per design (if applicable)	CPC 608.4, 608.5	
	X. Piping labels show type of fluid and direction of flow	CPC 601.2	
	XI. Drain and fill valves capped and labeled	CPC 601.2	
STORAGE TANK	I. Tank labeled with pressure rating for pressurized storage	CPC 505.4	
	II. Relief drain installed properly for pressurized storage	CPC 504.6, CMC 1005.1	
	III. Heat exchanger must protect potable water system from being contaminated by the heat transfer medium	CPC 603.5.4	
	IV. Tank installed in garage meets code requirements	CPC 507.13	
	V. Pan installed under tank (as required)	CPC 507.5	
	VI. Tank installed on level surface	CPC 508.4.3	
	VII. Tank supported for seismic loads	CPC 507.2	
	VIII. All valves, fittings and solders are rated for potable systems and meeting CA lead law requirements	CPC 604.1	
	IX. Unions installed within 12" of tank connections for all piping to and from tank and heat exchangers	CPC 609.5	
POTABLE PIPING	I. All valves, fittings and solders are rated for potable systems and meeting CA lead law requirements	CPC 604.1	
	II. Potable water piping properly labeled	CPC 601.3	
	III. Any connection to PEX more than 18" from tank fittings	CPC 604.13	
	IV. Hot water service piping insulated properly	AHJ	
	V. Vacuum relief valve properly installed (if required)	CPC 603.5.4, 608.7	



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 6 - Solar Domestic Water Heating Standard Plan 30 kWth or Less

CONTROLS	I. Control and pump disconnect(s) properly installed	CEC 430(IX), 690.17	
	II. Conductors between control and power source properly installed	CEC 430(II)	
	III. Conductors between control and pump properly installed	CEC 430(II), 690(IV)	
	IV. Solar collector sensors protected from sun and weather	CEC 310.8.10 D(1), D(2)	
	V. Control relay rated higher than load for each output	CEC 430.83	



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 7 - Solar Pool Heating Standard Plan 30 kWth or Less

ELIGIBILITY CHECKLIST FOR EXPEDITED SOLAR POOL HEATING PERMITTING

GENERAL REQUIREMENTS

- | | |
|--|---|
| A. System size is 30 kWth (462 square feet of collector) or less | <input type="checkbox"/> Y <input type="checkbox"/> N |
| B. The solar array is roof-mounted on one- or two-family dwelling or accessory structure | <input type="checkbox"/> Y <input type="checkbox"/> N |
| C. The solar collector arrays will not exceed the maximum legal building height | <input type="checkbox"/> Y <input type="checkbox"/> N |
| D. Solar collectors are certified by an accredited listing agency | <input type="checkbox"/> Y <input type="checkbox"/> N |
| E. Permit application is completed and attached | <input type="checkbox"/> Y <input type="checkbox"/> N |
| F. Heat transfer fluid is either water or a nontoxic fluid | <input type="checkbox"/> Y <input type="checkbox"/> N |

PLUMBING REQUIREMENTS

- | | |
|---|---|
| A. Adequate extreme temperature protection is provided | <input type="checkbox"/> Y <input type="checkbox"/> N |
| B. Standard one-line plumbing diagram is provided with components showing solar Interface with existing plumbing. | <input type="checkbox"/> Y <input type="checkbox"/> N |

STRUCTURAL REQUIREMENTS

- | | |
|---|---|
| A. A completed Structural Criteria and supporting documentation is attached (as required) | <input type="checkbox"/> Y <input type="checkbox"/> N |
|---|---|

Notes:

These criteria are intended for streamlined solar permitting process.

- If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.*



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 7 - Solar Pool Heating Standard Plan 30 kWth or Less

SCOPE: Use this plan ONLY for solar pool heating systems not exceeding a thermal output rating of 30 kWth on the roof of a one- or two-family dwelling or accessory structure and used for residential solar pool heating. Systems must be in compliance with current California Building Standards Code, Title 24 and local amendments of the authority having jurisdiction (AHJ). Other articles of the California Plumbing Code (CPC) or California Mechanical Code (CMC) or other health and safety codes shall apply.

MANUFACTURER'S SPECIFICATION SHEETS MUST BE PROVIDED for proposed collector, controller, solar pump (if applicable), heat exchanger/heat transfer fluid (if applicable), diverting valve (if applicable) and mounting systems. Equipment intended for use with a solar pool heating system shall be identified and listed for the application.

Job Address: _____ Permit #: _____

Contractor/Engineer Name: _____ License # and Class: _____

Signature: _____ Date: _____ Phone Number: _____

Email: _____

Total # of Collectors Installed _____ Total Collector Area _____

Collector Certification Number (include certifying agency) _____

Collector Material _____

Max Height Above Roof _____ Height Above Ground _____

Major components

Solar Control Make/Model _____

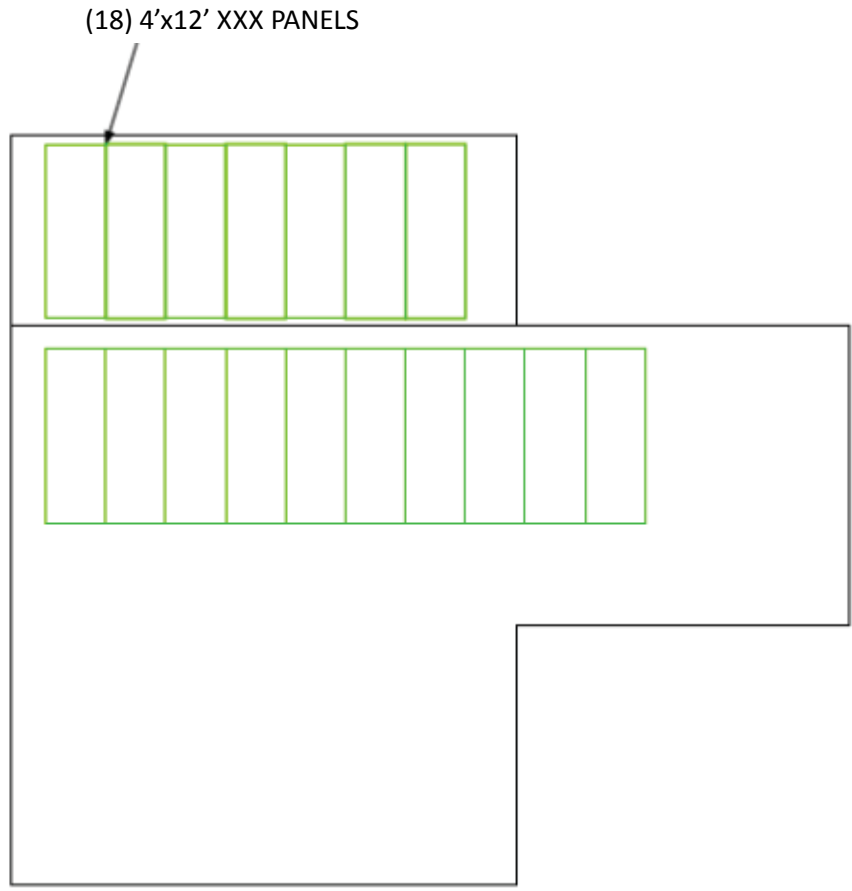
Solar Pump Make/Model (if applicable) _____

Diverting Valve Make/Model _____

Mounting Hardware Make/Model or Type _____

SAMPLE ROOF PLAN for SDWH and SPH systems

- ROOF TYPE: STANDING SEAM
- ROOF HEIGHT (Elevation): MAX 15' (1 story)
- RAFTERS: 2" X 6" @ 24" OC



SAMPLE ONE LINE PLUMBING DIAGRAM
For SPH Systems



**Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations**

Form 7 - Solar Pool Heating Standard Plan 30 kWth or Less

INSPECTION GUIDE FOR SOLAR POOL HEATING

This document is a field inspection guide for SPH systems. These inspection references detail most of the issues that relate to SDWH systems during the inspection process.

All California Electrical Code (CEC), California Residential Code (CRC), California Building Code (CBC), California Mechanical Code (CMC), and California Plumbing Code (CPC) references are to the 2016 versions unless otherwise noted.

SOLAR POOL HEATING SYSTEM ELIGIBILITY			
SYSTEM	CRITERIA		YES
		1. Major component installed match those of certified system?	
SOLAR POOL HEATING SYSTEM INSPECTION GUIDE			
	GUIDELINE	SOURCE OF GUIDELINE	YES
ROOF	I. Roof penetrations/attachments are properly flashed	CBC Chap 15, CRC Chap 9	
SOLAR LOOP PIPING	I. Piping must be properly supported, hung and anchored per code	CPC 313.1	
	II. Vacuum relief valve installed (if required by manufacturer)	AHJ	
	III. Drain valves installed if the system is not self-draining	CPC 312.6	
	IV. Penetrations through structural members as per code	CPC 312.2	
	V. Penetrations through fire-resistant assemblies installed per code	CPC 1405.2	
	VI. System has adequate freeze protection	CPC 312.6	
CONTROLS	I. Control and pump properly installed and bolted to pad	CEC 430(IX), 690.17	
	II. Conductors between control and power source properly installed	CEC 430(II)	
	III. Conductors between control and pump properly installed	CEC 430(II), 690(IV)	
	IV. Solar collector sensors protected from sun and weather	CEC 310.8.10 D(1), D(2)	
	V. Control relay rated higher than load for each output	CEC 430.83	



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 8 – Structural Criteria for Residential Rooftop Solar Energy Installations

STRUCTURAL CRITERIA FOR RESIDENTIAL FLUSH-MOUNTED SOLAR ARRAYS

1. ROOF CHECKS

- A. Visual Review/Contractor's Site Audit of Existing Conditions:
- 1) Is the roof a single roof without a reroof overlay? Y N
 - 2) Does the roof structure appear structurally sound, without signs of alterations or significant structural deterioration or sagging, as illustrated in Figure 1? Y N
- B. Roof Structure Data:
- 1) Measured roof slope (e.g. 6:12): _____:12
 - 2) Measured rafter spacing (center-to-center): _____ inch
 - 3) Type of roof framing (rafter or manufactured truss): Rafter Truss

2. SOLAR ARRAY CHECKS

- A. Flush-mounted Solar Array:
- 1) Is the plane of the modules (panels) parallel to the plane of the roof? Y N
 - 2) Is there a 2" to 10" gap between underside of module and the roof surface? Y N
 - 3) Modules do not overhang any roof edges (ridges, hips, gable ends, eaves)? Y N
- B. Do the modules plus support components weigh no more than:
4 psf for photovoltaic arrays or 5 psf for solar thermal arrays? Y N
- C. Does the array cover no more than half of the total roof area (all roof planes)? Y N
- D. Are solar support component manufacturer's project-specific completed worksheets, tables with relevant cells circled, or web-based calculator results attached? Y N
- E. Is a roof plan of the module and anchor layout attached? (see Figure 2) Y N
- F. Downward Load Check (Anchor Layout Check):
- 1) Proposed anchor horizontal spacing (see Figure 2): _____' - _____"ft-in
 - 2) Horizontal anchor spacing per Table 1: _____' - _____"ft-in
 - 3) Is proposed anchor horizontal spacing equal to or less than Table 1 spacing? Y N
- G. Wind Uplift Check (Anchor Fastener Check):
- 1) Anchor fastener data (see Figure 3):
 - a. Diameter of lag screw, hanger bolt or self-drilling screw: _____ inch
 - b. Embedment depth of rafter: _____ inch
 - c. Number of screws per anchor (typically one): _____
 - d. Are 5/16" diameter lag screws with 2.5" embedment into the rafter used, OR does the anchor fastener meet the manufacturer's guidelines? Y N

3. SUMMARY

- A. All items above are checked YES. No additional calculations are required.
- B. One or more items are checked NO. Attach project-specific drawings and calculations stamped and signed by a California-licensed civil or structural engineer.

Job Address: _____ Permit #: _____
Contractor/Installer: _____ License # & Class: _____
Signature: _____ Date: _____ Phone #: _____

Optional Additional Rafter Span Check Criteria

1. ROOF CHECKS

B. Roof Structure Data:

4) Measured rafter size (e.g. 13/4 x 33/4, not 2x4):

_____ x _____ inch

5) Measured rafter horizontal span (see Figure 4):

_____ ' - _____ "ft-in

6) Horizontal rafter span per Table 2:

_____ ' - _____ "ft-in

7) Is measured horizontal rafter span less than Table 2 span?

Y N Truss

Table 1. Maximum Horizontal Anchor Spacing				
Roof Slope		Rafter Spacing		
		16" o.c.	24" o.c.	32" o.c.
Photovoltaic Arrays (4 psf max)				
Flat to 6:12	0° to 26°	5'-4"	6'-0"	5'-4"
7:12 to 12:12	27° to 45°	1'-4"	2'-0"	2'-8"
13:12 to 24:12	46° to 63°	1'-4"	2'-0"	2'-8"
Solar Thermal Arrays (5 psf max)				
Flat to 6:12	0° to 26°	4'-0"	4'-0"	5'-4"
7:12 to 12:12	27° to 45°	1'-4"	2'-0"	2'-8"
13:12 to 24:12	46° to 63°	Calc. Req'd	Calc. Req'd	Calc. Req'd

Solar support component manufacturer's guidelines may be relied upon to ensure the array above the roof is properly designed, but manufacturer's guidelines typically do NOT check to ensure that the roof itself can support the concentrated loads from the solar array. Table 1 assumes that the roof complied with the building code in effect at the time of construction, and places limits on anchor horizontal spacing to ensure that a roof structure is not overloaded under either downward loads or wind uplift loads. Note 4 below lists the basic assumptions upon which this table is based.

Table 1 Notes:

1. Anchors are also known as "stand-offs," "feet," "mounts" or "points of attachment." Horizontal anchor spacing is also known as "cross-slope" or "east-west" anchor spacing (see Figure 2).
2. If anchors are staggered from row-to-row going up the roof, the anchor spacing may be twice that shown above, but no greater than 6'-0".
3. For manufactured plated wood trusses at slopes of flat to 6:12, the horizontal anchor spacing shall not exceed 4'-0" and anchors in adjacent rows shall be staggered.
4. This table is based on the following assumptions:
 - The roof structure conformed to building code requirements at the time it was built.
 - The attached list of criteria is met.
 - Mean roof height is not greater than 40 feet.
 - Roof sheathing is at least 7/16" thick oriented strand board or plywood. 1x skip sheathing is acceptable.
 - Dwellings within the City of Calabasas fall under Wind Exposure C category (within 500 yards of large open fields or grasslands), all of the following conditions apply.
 - Design wind speed is 110 mph or less (not in a Special Wind Region).
 - The dwelling is not located on the top half of a tall hill.
 - The solar array displaces roof live loads (temporary construction loads) that the roof was originally designed to carry.
 - The Structural Technical Appendix provides additional information about analysis assumptions.

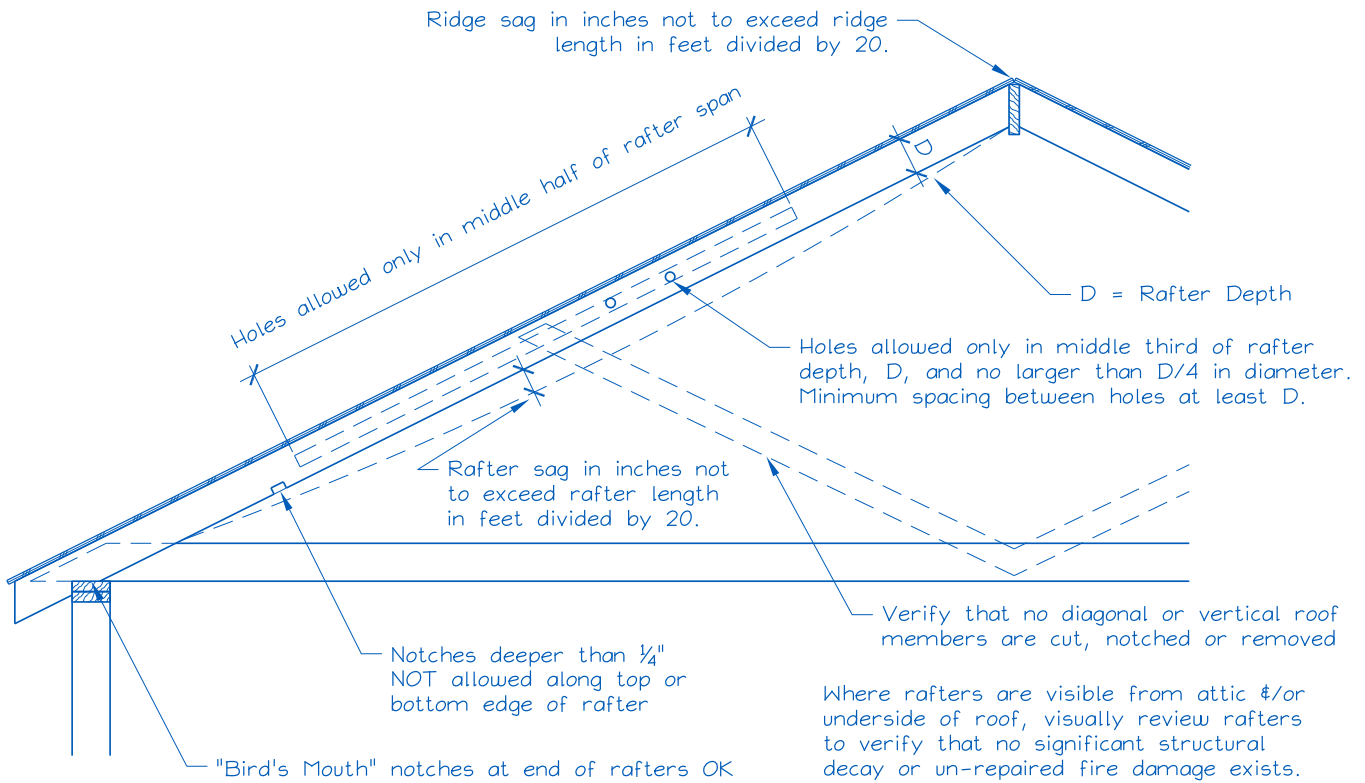


Figure 1. Roof Visual Structural Review (Contractor's Site Audit) of Existing Conditions.

The site auditor should verify the following:

1. No visually apparent disallowed rafter holes, notches and truss modifications as shown above.
2. No visually apparent structural decay or un-repaired fire damage.
3. Roof sag, measured in inches, is not more than the rafter or ridge beam length in feet divided by 20.

Rafters that fail the above criteria should not be used to support solar arrays unless they are first strengthened.

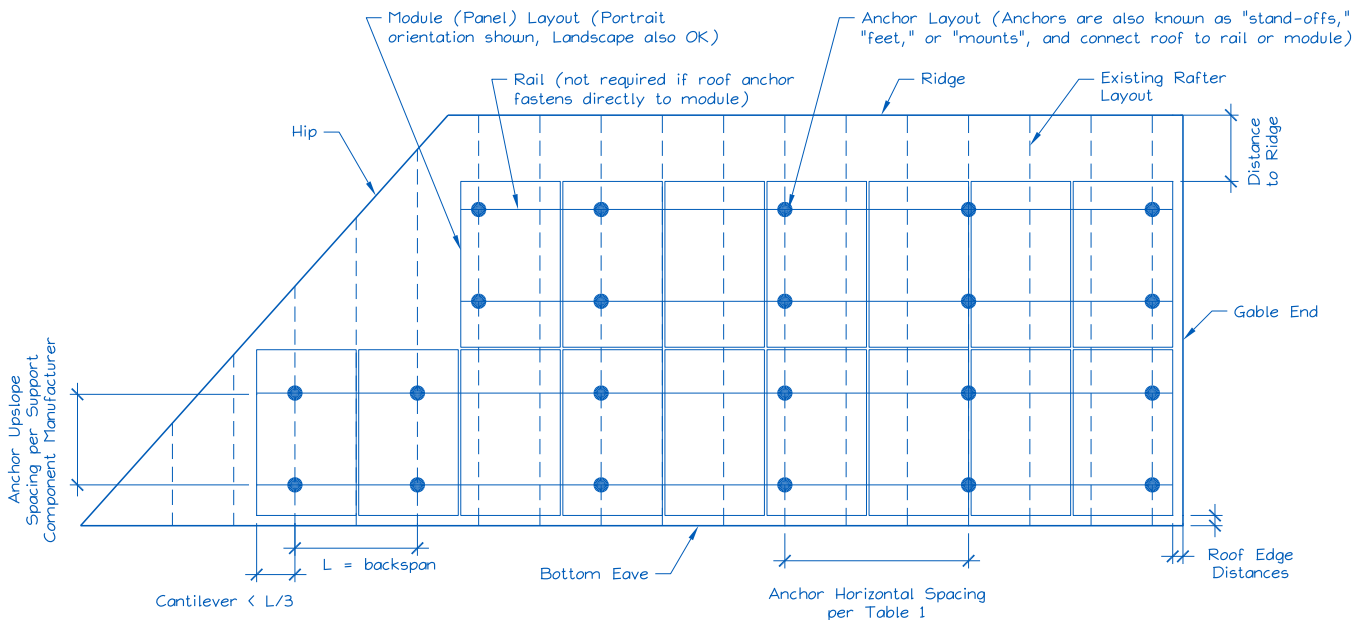


Figure 2. Sample Solar Panel Array and Anchor Layout Diagram (Roof Plan).

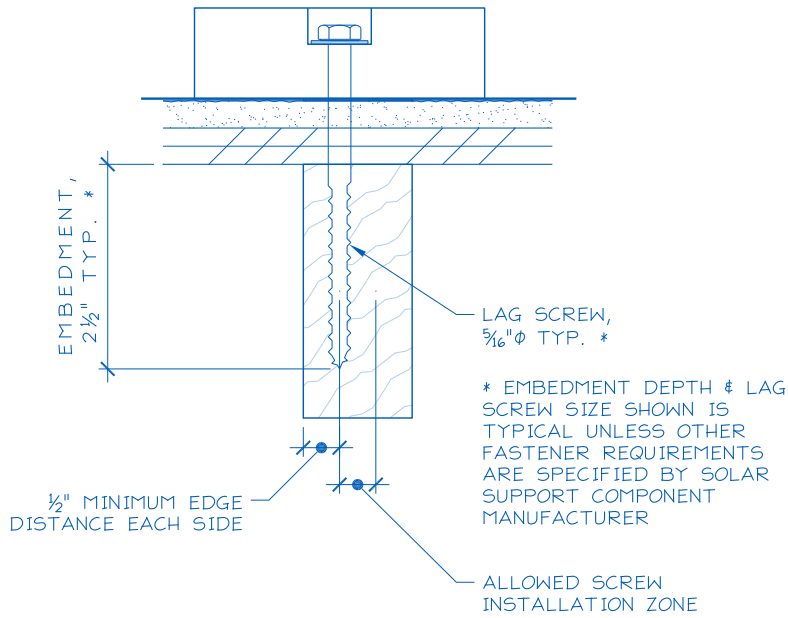
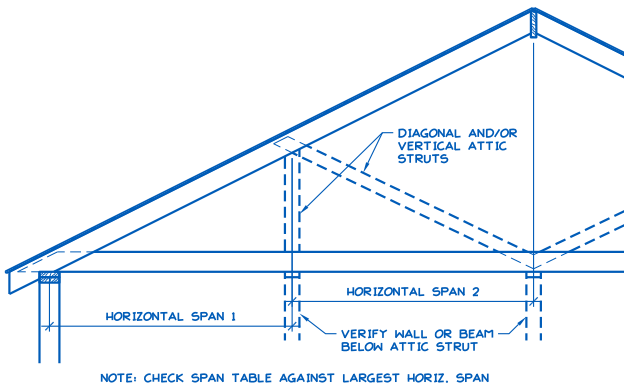
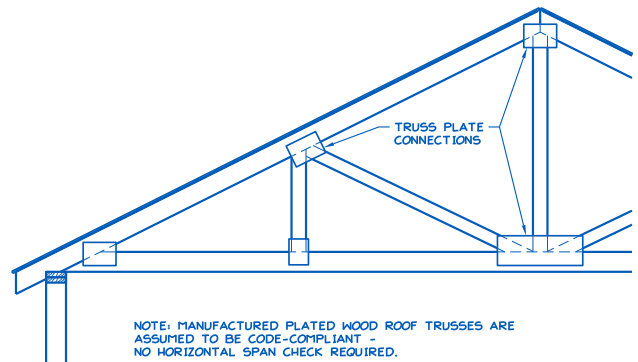


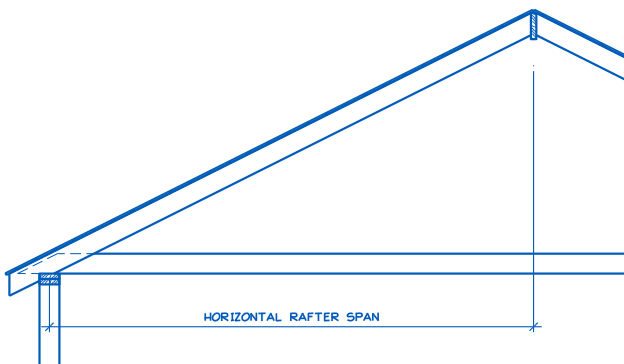
Figure 3. Typical Anchor with Lag Screw Attachment.



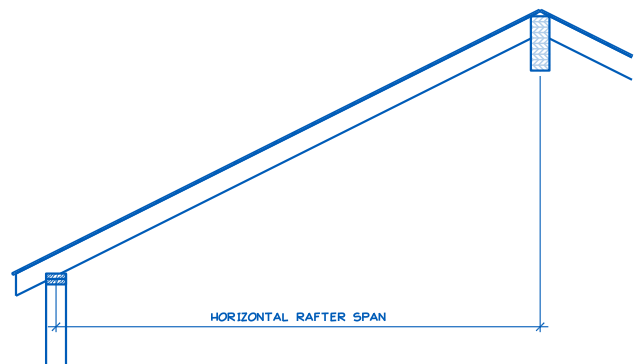
C STRUTS TO WALLS BELOW



D MANUFACTURED PLATED WOOD ROOF TRUSS



A SIMPLE ATTIC



B CATHEDRAL CEILING

Figure 4. Definition of Rafter Horizontal Span.



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations
Form 9 – Affidavit – Smoke and Carbon Monoxide Alarms

AFFIDAVIT- SMOKE AND CARBON MONOXIDE ALARMS

PLEASE PRINT

Project Address: _____

Number of smoke alarms installed: _____

Number of carbon monoxide alarms installed: _____

The State of California requires smoke and carbon monoxide alarms to be installed in all residential buildings. Smoke and carbon monoxide alarms are permitted to be battery operated when hardwiring is not available. Fully battery-powered alarms shall not replace existing hardwired alarms. Smoke, carbon monoxide or combination alarms (carbon monoxide and smoke alarms) must be approved and listed by the State Fire Marshal. For an approved list of alarms, go to www.osfm.fire.ca.gov. The devices must be installed per the manufacturer's instructions.

As of January 1, 2014, all new and replacement battery-operated smoke alarms must be equipped with a non-replaceable, non-removable battery capable of powering the alarm for 10 years. All existing smoke alarms shall be replaced after 10 years from the date of manufacture or if the date of manufacture cannot be determined.

By signing this document, the property owner certifies to the City of Calabasas that both smoke alarms and carbon monoxide alarms have been installed on the above-referenced project as specified within this document and in compliance with Section R314 and R314 of the 2013 California Residential Code (CRC), Section 907 and 420 of the 2013 California Building Code (CBC) and California Health and Safety Code Section 13113.7:



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations
Form 9 – Affidavit – Smoke and Carbon Monoxide Alarms

ALARM LOCATION REQUIREMENTS (*diagram next page)

Smoke Alarms shall be installed:

- In each room used for sleeping purposes (all bedrooms or rooms containing closets)
- In each hallway outside of the sleeping room(s)
- A minimum of one required alarms on each level of the dwelling, including basements and habitable attics

Carbon monoxide alarms shall be installed in dwelling or sleeping units containing fuel burning appliances, fireplaces or having attached garages:

- Outside of each sleeping room in the immediate vicinity of the bedroom(s)
- On each level of the dwelling, including basements

I the property owner declare under penalty of perjury that the foregoing is true and correct, and that this declaration was executed on (Date)_____ at Calabasas, California.

Name: _____

Address: _____

Email: _____

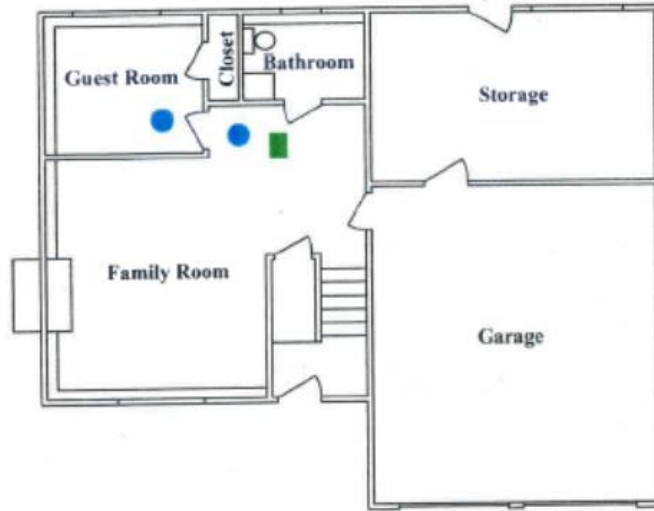
Telephone: _____

Signature: _____



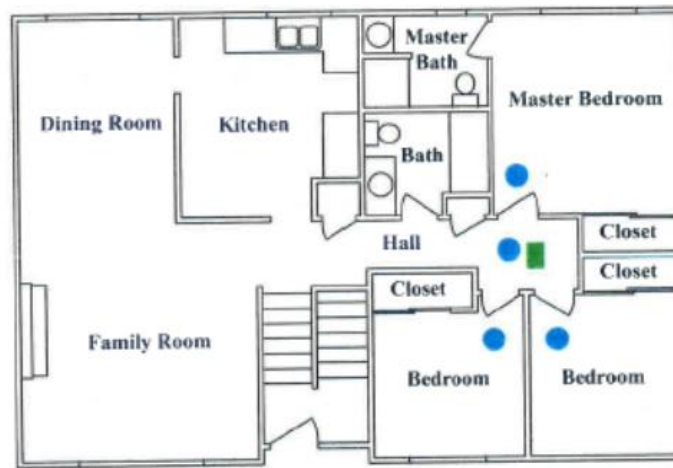
Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations
Form 9 – Affidavit – Smoke and Carbon Monoxide Alarms

Smoke and Carbon Monoxide Alarm Locations



FIRST FLOOR PLAN

● SMOKE ALARM ■ CARBON MONOXIDE ALARM



SECOND FLOOR PLAN

● SMOKE ALARM ■ CARBON MONOXIDE ALARM



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 10 – Inspection Criterion

- 1) **Permit Condition - Existing improvements on the property must all be benefit of permits and inspections.** Prior to the inspection of the system, the Building and Safety staff may review the existing permit and tax assessor's information to ensure the proposed application and plans match the existing information within the available permanent records. It is prudent for the permit applicant to perform due diligence prior to submitting permit applications in order to confirm all improvements are lawful - issuance of an expedited solar permit does not constitute legal non-conforming planning or building and safety status for any improvements to the property or the structure that are not benefit of building permits and building inspection approval. At any time during the permit process it is revealed to a Building and Safety staff member that there are improvements to the property not benefit of said approvals above, code enforcement actions and the building permit rehabilitation process may be commenced.

- 2) **Permit Condition - One Building Inspection Process** - Per recent State legislation, only one building inspection is required (a Final inspection.) This requirement differs from the traditional inspections typically outlined by the California Building Code.

In-Process Inspections – In-Process inspections enable the building inspector to observe components of the system and penetrations through the walls and the roof of the structure prior to their concealment. An in-Process inspection also enables pro-active communication between the building inspector and contractor to help avoid potential pitfalls before a final inspection is requested. In addition, a single "Final" inspection may require the contractor to disassemble components of the PV system not readily observable or otherwise difficult to view. If the contractor or homeowner opts to choose the single Final inspection process, the contractor shall be on site with a suitable digital camera to take on the spot photographs of various related areas as directed by the inspector. In these regards, many cities are allowing contractors to photo document the installation of the solar system while in progress and the City of Calabasas highly encourages this practice (See Solar Energy Action Committee Issue Statement 1, as described. With the one "Final" inspection process and it is highly encouraged to have that photo documentation available during the "one-inspection/final inspection." **Please note** – an in process inspection if be requested by the homeowner or the contractor, will be accommodated by the inspector at no additional cost.

Safe Roof Access – The contractor shall provide an OSHA approved ladder, secured in place with the side rails extended 36 inches above the roof surface. The ladder may be requested to be relocated to different vantage points as the inspector deems necessary. The inspector's observations will be limited to that vantage point unless the finish roof materials provide a safe walkable surface. Building Inspectors will not be accessing the roofs of structures with any of the following: ladders extended more than two-story's in height or with finish roof materials of concrete tile, or clay tile, or metal (unless protective coverings are placed on top of said materials to protect against physical damage).

- 3) Smoke and Carbon Monoxide Detectors – A smoke and carbon monoxide detector affidavit "**Form 9**" affirming smoke detectors and carbon monoxide detectors are present and functioning shall be provided, or the contractor or the homeowner shall provide access for the related inspections.



Expedited Permitting Process
Residential Roof-Top Mounted Solar Installations

Form 10 – Inspection Criterion

Document Submittal and Fees

All documents (2 – 12) above may be submitted to Building and Safety in person at 100 Civic Center Way Calabasas, CA 91302 - OR – emailed with scanned and attached PDF documents via:

solar@cityofcalabasas.com.

- 4) For in-person submittals, permit applicants utilizing Forms 3-14 above may be approved “over-the-counter.”
- 5) Permit applications utilizing the standard plans and all other forms submitted via email will be expedited. Applications deemed complete will be processed in one to three working days.
- 6) Documents shall be scanned and attached as PDF xxxx.

PLEASE NOTE - In consideration of Section 714 (e) (2) of the California Civil Code – application for a permit **will not be deemed submitted** until all mandatory Forms 2 – 12 have been received by Building and Safety staff.

Inspection Requests – Inspection Criterion

- 7) Once all permits to construct the solar installation have been issued and the system has been installed, the system must be inspected as described above before final approval is granted for the solar system. On-site inspections can be scheduled by contacting the Building and Safety Department as follows:

Telephone: (818) 225-1738

email: <http://cityofcalabasas.com/BuildingandSafety/inspection-requests.html>.

Inspection requests received via telephone within business hours are typically scheduled for the next business day. An emailed inspection request received any time during normal business hours are typically scheduled for the next business day. Please note, emailed inspection requests may be sent after hours up until 7:00 A.M, and the inspection will still be accommodated that day. Emailed requests received after 7:00 A.M., will be scheduled for the following business day. Please note, Building and Safety policy is to provide any project that has requested an inspection a two hour inspection time window. However, to confirm the two-hour window for the arrival of the inspector, please contact your inspector at (818) 224-1600 between 7:30 A.M. – 9:00 A.M. the morning of your scheduled inspection.

- 8) The licensed contractor shall be on site for the inspection with all permit documentation – the Building and Safety Division will not have printed copies in their possession. The licensed contractor shall be prepared to provide a wiring inspection and show conformance with all technical requirements at the project site at the time of inspection. The inspector will verify that the installation is in conformance with applicable code requirements and with the approved plans. Please note, as stated above in item 8, an OSHA approved ladder, secured in place, with the top three rungs extended above the roof surface,



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Form 10 – Inspection Criterion

and placed in as many locations as the inspector deems necessary will be required. The inspector's observations will be limited to that vantage point and the inspector will not be accessing the roof unless it one or two story in height, and comprised of asphalt shingles or other walkable non-damageable roof covering, and the roof pitch is 4:12 or less.)

- 9) The "Guidebook" Tool Kit 7 Section 1 and 2, provides an overview of common points of inspection criteria. Neither section is all-inclusive and is solely intended as an aid during the inspection process.

(Please note, as described in Section 13 above, unless otherwise requested by the homeowner or contractor, criteria that can only be verified via walking/navigating around the roof - will not be part of the "one-stop" inspection process.)

Section 1 – Field Inspection Guide: The purpose of Section 1 of the Guidebook is to give the building inspector a single-page "at a glance" reminder of the most important items pertaining to the field inspection. That criterion is recited herein as follows:

1. All work done in a neat and workmanlike manner (*CEC 110.12.*)
2. PV module model number, quantity and location according to the approved plan.
3. Array mounting system and structural connections according to the approved plan.
4. Roof penetrations flashed/sealed according to the approved plan.
5. Array exposed conductors are properly secured, supported and routed to prevent physical damage.
6. Conduit installation according to (*CRC R331.3 and CEC 690.4(F).*)
7. Firefighter access according to approved plan.
8. Roof-mounted PV systems have the required fire classification (*CBC 1505.9 or CRC R902.4*).
9. Grounding/bonding of rack and modules according to the manufacturer's installation instructions that are approved and listed.
10. Equipment installed, listed and labeled according to the approved plan (e.g., PV modules, AC/DC converters, combiners, inverters, disconnects, load centers and electrical service equipment).
11. For grid-connected systems, inverter is marked "utility interactive."
12. For ungrounded inverters, installation complies with *CEC 690.35*.
13. Conductors, cables and conduit types, sizes and markings according to the approved plan.
14. Overcurrent devices are the type and size according to the approved plan.
15. Disconnects according to the approved plan and properly located as required by the CEC.
16. Inverter output circuit breaker is located at opposite end of bus from utility supply at load center and/or service panelboard (not required if the sum of the inverter and utility supply circuit breakers is less than or equal to the panelboard bus rating).



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17. PV system markings, labels and signs according to the approved plan.
18. Connection of the PV system to the grounding electrode system according to the approved plan.
19. Access and working space for operation and maintenance of PV equipment such as inverters, disconnecting means and panelboards (not required for PV modules) (CEC 110.26).

Section 2- of the Guidebook starts on page 59. It is a multipage comprehensive list that is intended to be used as a code “Fast Finder” for the inspector. Again, not all items outlined in this section are relevant to each PV system, and due to the lengthy list, they are not recited here within but they may be viewed via:

http://www.opr.ca.gov/docs/California_Solar_Permitting_Guidebook_Spring_2015.pdf

- 10)** In process photographs – Solar Energy Action Committee “SEAC” recommendations. The City of Calabasas Building and Safety Division is proud to recognize SEAC recommendations in regards to the the “one-inspection process” and “in-process photographs” of the actual installation of the solar system. Simply put, the contractor cannot take too many photographs of the actual installation of the solar system. During the one-inspection/final inspection, should the installer have the in-process photographs available, it may help the inspection proceed in a much more rapid manner.

SEAC is a progressive group with an objective is to ensure a strategic and systematic approach in quickly developing and delivering recommended solutions to improve standards and guidelines for implementation and use by the solar industry, more information about SEAC can be found by visiting:

<http://dpw.lacounty.gov/bsd/seac/>

Calabasas Building and Safety recognizes SEAC Issue Statement 1 which states the following:

1. Issue Statement:
What should be considered sufficient to the Authority Having Jurisdiction (AHJ) in order to comply with the single inspection requirements of AB 2188?
2. Background:
All California jurisdictions are mandated by the State to adopt an expedited PV permitting process in accordance with Assembly Bill 2188. The Solar Energy Action Committee (SEAC) has identified practical methods of compliance with the AB 2188 requirements in an effort to assist local building officials.
3. Current Status:
The SEAC has identified successful single inspection procedures currently in use by several jurisdictions. In addition, SEAC is providing innovative recommendations that can be used to develop AB 2188 compliant single inspection procedures.



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4. Key considerations:

The objective of this briefing is to facilitate system approval in one inspection. Many of the solutions simply require a greater education, relationship, and communication of expectations between the AHJ and the installer.

5. Recommendation/s:

- 1) The installer should ensure that a qualified individual who is familiar with the applicable codes and installation procedures be onsite at time of inspection to provide access to the system and all components and to answer any questions from the inspector.
- 2) Access to the roof should be provided in accordance with the latest CAL/OSHA guidelines.
- 3) Approved construction documents and installation instructions shall be available onsite at time of inspection for major system components, including: Inverters, Modules, Power Optimizers, and Racking and Mounting systems.
- 4) Affidavits, signed by the installer and homeowner, may be considered by the AHJ as verification of installation of the smoke and carbon monoxide alarms required by the California Residential Code.
- 5) Ongoing training by qualified organizations regarding the one inspection process and installation procedures should be encouraged on a regional basis.
- 6) The AHJ may adopt specific details on photographic documentation that is required at time of inspection as an aid of the inspection process and as a tool to be used in lieu of removal of specific components.

SEAC recommendations include the following photo guidelines that may be used for inspection of items not readily accessible to the inspector and should include, but not necessarily be limited to:

Photographs shall be of sufficient clarity to clearly demonstrate the elements being inspected, and shall include evidence that the photograph is connected to the property of the inspection site.

Include photo(s) of:

- 1) PV module label. If more than one module type is used on a project, there must be a photo for each different module, including the micro-inverter.
- 2) Method of flashings at attachments and penetrations, including the sub flashing beneath tiles.
- 3) Method of grounding and bonding PV modules and racking systems.



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- 4) Wire management under PV modules.
- 5) Conduit penetrations of the roof and inaccessible portions of the structure.
- 6) Proof of height of conduit above the roofing material to verify temperature de-rate calculations.
- 7) Attic-run conduit and fastening methods.
- 8) All junction and/or combiner boxes with the cover removed.
- 9) Any required labels or markings not readily accessible at time of inspection.

6. Applicable to whom: AHJs, Contractors, Homeowners and Fire Departments

7. SEAC Consensus Date – November 9, 2015

Departmental Contact Information

For additional information regarding this expedited program and the inspection process, please consult the City of Calabasas, Building and Safety Department at (818) 224-1600.



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Form 11 – Affidavit – Roof Access for Inspection Purposes

AFFIDAVIT – ROOF ACCESS FOR INSPECTION PURPOSES

Safe Roof Access – In support of the “one –inspection process” and in order to enable the facilitation of various vantage points for the building inspector, the contractor shall provide an OSHA approved ladder, secured in place with the side rails extended 36 inches above the roof surface. The ladder may be requested to be relocated to different vantage points as the inspector deems necessary. The inspector’s observations will be limited to that vantage point unless the finish roof materials provide a safe walkable surface. Building Inspectors will not be accessing the roofs of structures with any of the following: ladders extended more than two-story’s in height or with finish roof materials of concrete tile, or clay tile, or metal (unless protective coverings are placed on top of said materials to protect against physical damage). Both the homeowner and the contractor shall sign this affidavit acknowledging the inspector roof access limitations. **Please note** – at any time during the installation process of the solar system, if either the homeowner or the contractor request an in-process inspection of roof mounted components and safe access is provided for the inspector, that inspection will be accommodated by the inspector at no additional cost.

Property Owner’s Declaration:

I, _____ (print full name), legal owner of the above referenced property, have read and discussed roof access provisions for inspection purposes as described above and in support of the “one-inspection process” hereby acknowledge the inspectors limitations for accessing the roof of my home to personally observe the various components of the solar system; however, should the inspectors observation from the limited vantage points from the top of the ladder, or the inspectors observations of photographs presented during the course of the inspection reveal closer vantage points from the top of the roof may be necessary, safe access with a safe walkable surface shall be provided for the inspector in order to enable those observations.

Licensed Contractor – Solar Company Declaration

I, _____ (print full name), the Contractor performing the work in relation to the proposed Residential Roof-Top Mounted Solar Installation, have explained the roof access provisions for inspection purposes as described above and in support of the “one-inspection process” hereby acknowledge the inspectors limitations for accessing the roof of the home to personally observe the various components of the solar system; however, should the inspectors observation from the limited vantage points from the top of the ladder, or the inspectors observations of photographs presented during the course of the inspection reveal closer vantage points from the top of the roof may be necessary, I will provide safe access with a safe walkable surface for the inspector in order to enable those observations.



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Form 11 – Affidavit – Roof Access for Inspection Purposes

Property Owner

Name: _____

Address: _____

Email: _____

Telephone: _____

Signature: _____

Licensed Contractor – Solar Company

Name: _____

Address: _____

Email: _____

Telephone: _____

Signature: _____



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Residential Roof-Top Mounted Solar Installations
Form 12 – Affidavit – Smoke and Carbon Monoxide Alarms

AFFIDAVIT- SMOKE AND CARBON MONOXIDE ALARMS

PLEASE PRINT

Project Address: _____

Number of smoke alarms installed: _____

Number of carbon monoxide alarms installed: _____

The State of California requires smoke and carbon monoxide alarms to be installed in all residential buildings. Smoke and carbon monoxide alarms are permitted to be battery operated when hardwiring is not available. Fully battery-powered alarms shall not replace existing hardwired alarms. Smoke, carbon monoxide or combination alarms (carbon monoxide and smoke alarms) must be approved and listed by the State Fire Marshal. For an approved list of alarms, go to www.osfm.fire.ca.gov. The devices must be installed per the manufacturer's instructions.

As of January 1, 2014, all new and replacement battery-operated smoke alarms must be equipped with a non-replaceable, non-removable battery capable of powering the alarm for 10 years. All existing smoke alarms shall be replaced after 10 years from the date of manufacture or if the date of manufacture cannot be determined.

By signing this document, the property owner certifies to the City of Calabasas that both smoke alarms and carbon monoxide alarms have been installed on the above-referenced project as specified within this document and in compliance with Section R314 and R314 of the 2013 California Residential Code (CRC), Section 907 and 420 of the 2013 California Building Code (CBC) and California Health and Safety Code Section 13113.7:



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Residential Roof-Top Mounted Solar Installations
Form 12 – Affidavit – Smoke and Carbon Monoxide Alarms

ALARM LOCATION REQUIREMENTS (*diagram next page)

Smoke Alarms shall be installed:

- In each room used for sleeping purposes (all bedrooms or rooms containing closets)
- In each hallway outside of the sleeping room(s)
- A minimum of one required alarms on each level of the dwelling, including basements and habitable attics

Carbon monoxide alarms shall be installed in dwelling or sleeping units containing fuel burning appliances, fireplaces or having attached garages:

- Outside of each sleeping room in the immediate vicinity of the bedroom(s)
- On each level of the dwelling, including basements

I the property owner declare under penalty of perjury that the foregoing is true and correct, and that this declaration was executed on (Date)_____ at Calabasas, California.

Name: _____

Address: _____

Email: _____

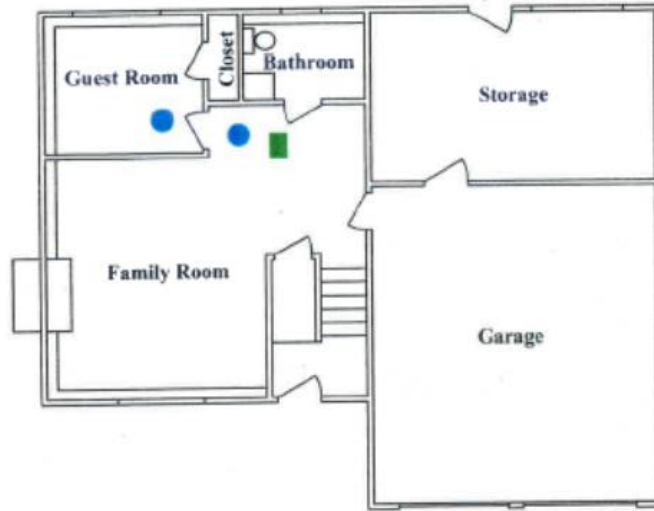
Telephone: _____

Signature: _____



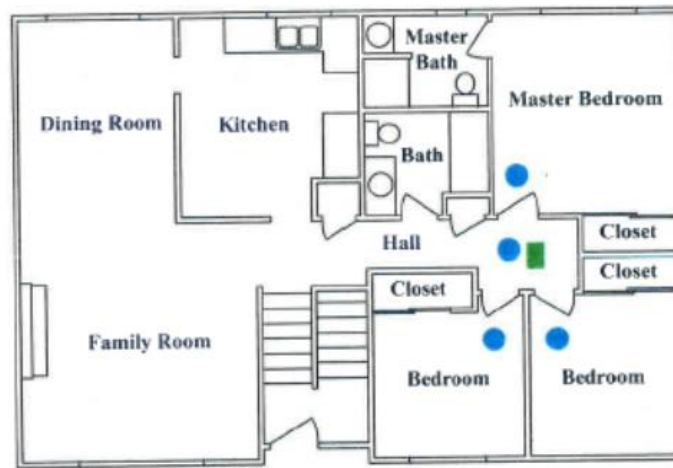
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Form 12 – Affidavit – Smoke and Carbon Monoxide Alarms

Smoke and Carbon Monoxide Alarm Locations



FIRST FLOOR PLAN

● SMOKE ALARM ■ CARBON MONOXIDE ALARM



SECOND FLOOR PLAN

● SMOKE ALARM ■ CARBON MONOXIDE ALARM