



Eligibility Checklist for Streamlined Small Residential Rooftop Solar Permitting

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.

General Requirements

- A. System size is 10 kW AC CEC rating or less
B. The solar array is roof-mounted on one- or two-family dwelling or accessory structure
C. The solar panel/module arrays will not exceed the maximum legal building height
D. Solar system is utility interactive and without battery storage
E. Permit application is completed and attached
F. Permit pulled by a California Licensed Contractor authorized to install Photovoltaic systems
G. Is the building/structure designated historic? ... If yes, is a Historic Eligibility determination included?

Electrical Requirements

- A. No more than four photovoltaic module strings are connected to each Maximum PowerPoint Tracking (MPPT) input where source circuit fusing is included in the inverter
1) No more than two strings per MPPT input where source circuit fusing is not included
2) Fuses (if needed) are rated to the series fuse rating of the PV module
3) No more than one noninverter-integrated DC combiner is utilized per inverter
B. For central inverter systems: No more than two inverters are utilized
C. The PV system is interconnected to a single-phase AC service panel of nominal 120/240 Vac with a bus bar rating of 225 A or less
D. The PV system is connected to the load side of the utility distribution equipment
E. A Solar PV Standard Plan and supporting documentation, that conform to the standard plans contained in the most current version of the California Solar Permitting Guidebook
F. The existing electrical system including existing line, load, ground and bonding wiring as well as main panel and subpanel sizes are adequately sized...

Structural Requirements

- A completed Structural Criteria for Residential Flush-mount Solar Arrays and supporting documentation is attached.

Fire Safety Requirements

- A. Clear access and ventilation pathways provided
B. Fire classification solar system is provided meeting the requirements of Section R902.4 of the CA Residential Code?
C. All required markings and labels are provided including a directory plaque.
D. A diagram of the roof layout of all panels, modules, clear access and ventilation pathways and approximate locations of electrical disconnecting means and roof access points is completed and attached

Job Address: _____ Permit #: _____

Contractor/Installer: _____ License # & Class: _____

Signature: _____ Date: _____ Phone #: _____



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? [] 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, hops, 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 1)

[] Y [] N

F. Downward Load Check (Anchor Layout Check):

- 1) Proposed anchor horizontal spacing (see Figure 1): _____' - _____"ft-in
2) Horizontal anchor spacing per Table 1: _____' - _____"ft-in
3) Is proposed anchor horizontal spacing less than or equal to Table 1 spacing? [] Y [] N

G. Wind Uplift Check (Anchor Fastener Check):

- 1) Anchor fastener data (see Figure 2):
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. The permit application may no longer qualify for streamlined permitting.

Job Address: _____ Permit #: _____

Contractor/Installer: _____ License # & Class: _____

Signature: _____ Date: _____ Phone #: _____



Structural Criteria for Residential Flush-Mounted Solar Arrays

Table 1. Maximum Horizontal Anchor Spacing ^{(2),(3)}				
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 1).
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 criteria listed in the Structural Criteria for Residential Flush-Mounted Solar Arrays 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.
 - If the dwelling is in Wind Exposure B (typical urban, suburban or wooded areas farther than 500 yards from large open fields), no more than one of the following conditions apply:
 - The dwelling is located in a special wind region with design wind speed between 115 and 130 mph per ASCE 7-10, or
 - The dwelling is located on the top half of a tall hill, provided average slope steepness is less than 15%.
 - If the dwelling is In Wind Exposure C (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), and
 - The dwelling is not located on the top half of a tall hill.

Structural Criteria for Residential Flush-Mounted Solar Arrays

- The solar array displaces roof live loads (temporary construction loads) that the roof was originally designed to carry.

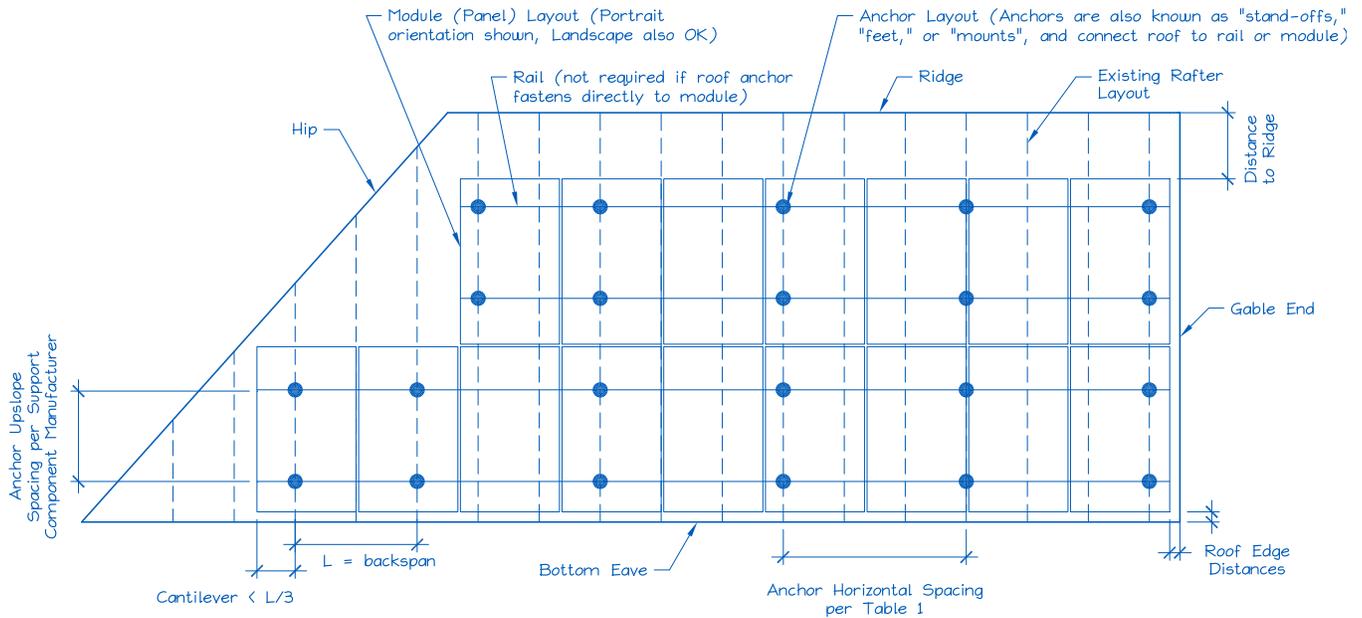


Figure 1. Sample Solar Panel Array and Anchor Layout Diagram (Roof Plan).

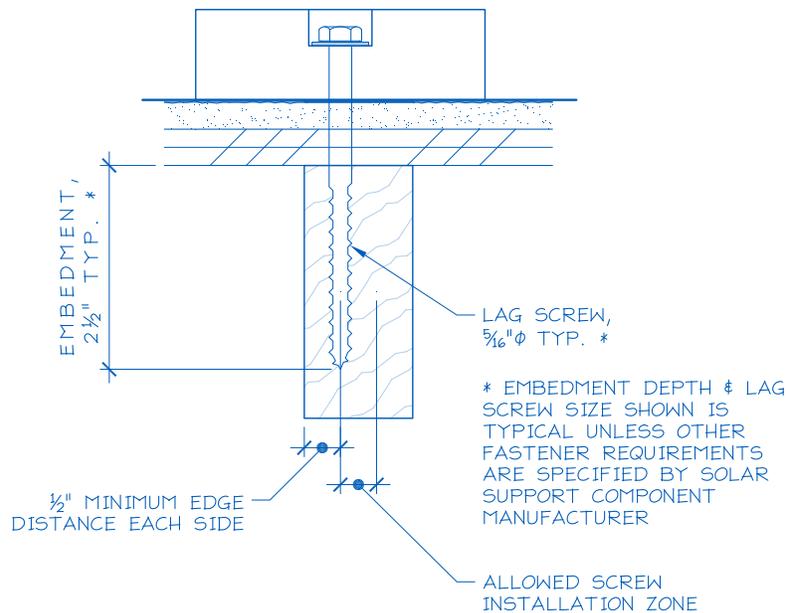


Figure 2. Typical Anchor with Lag Screw Attachment.



Solar PV Standard Plan – Simplified Microinverter and ACM
Systems for One-and Two-Family Dwellings

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 City of Chula Vista. 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 other details required by the City of Chula Vista. 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 AC Module (ACM)
Number of PV modules installed: Number of ACMs installed:

Number of Microinverters 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



Solar PV Standard Plan – Simplified Microinverter and ACM Systems for One-and Two-Family Dwellings

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 VOC @ 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 VOC @ 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	3/4"
16	3840	20	10	3/4"
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.



Solar PV Standard Plan – Simplified Microinverter and ACM Systems for One-and Two-Family Dwellings

Table 3. PV Array Configuration Summary			
	Branch 1	Branch 2	Branch 3
Number of Microinverters or ACMs [STEP 1]			
Selected Conductor Size [Error! Reference source not found.] (AWG)			
Selected Branch and Inverter Output OCPD [Error! Reference source not found.]			

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 100% row in Table 5)



Solar PV Standard Plan – Simplified Microinverter and ACM Systems for One-and Two-Family Dwellings

6.3 Per 705.12(D)(2): (Combined inverter output OCPD size + Main OCPD size) ≤ [bus bar size × (100% or 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.

Solar PV Standard Plan – Simplified Microinverter and ACM Systems for One-and Two-Family Dwellings

7. Grounding and Bonding

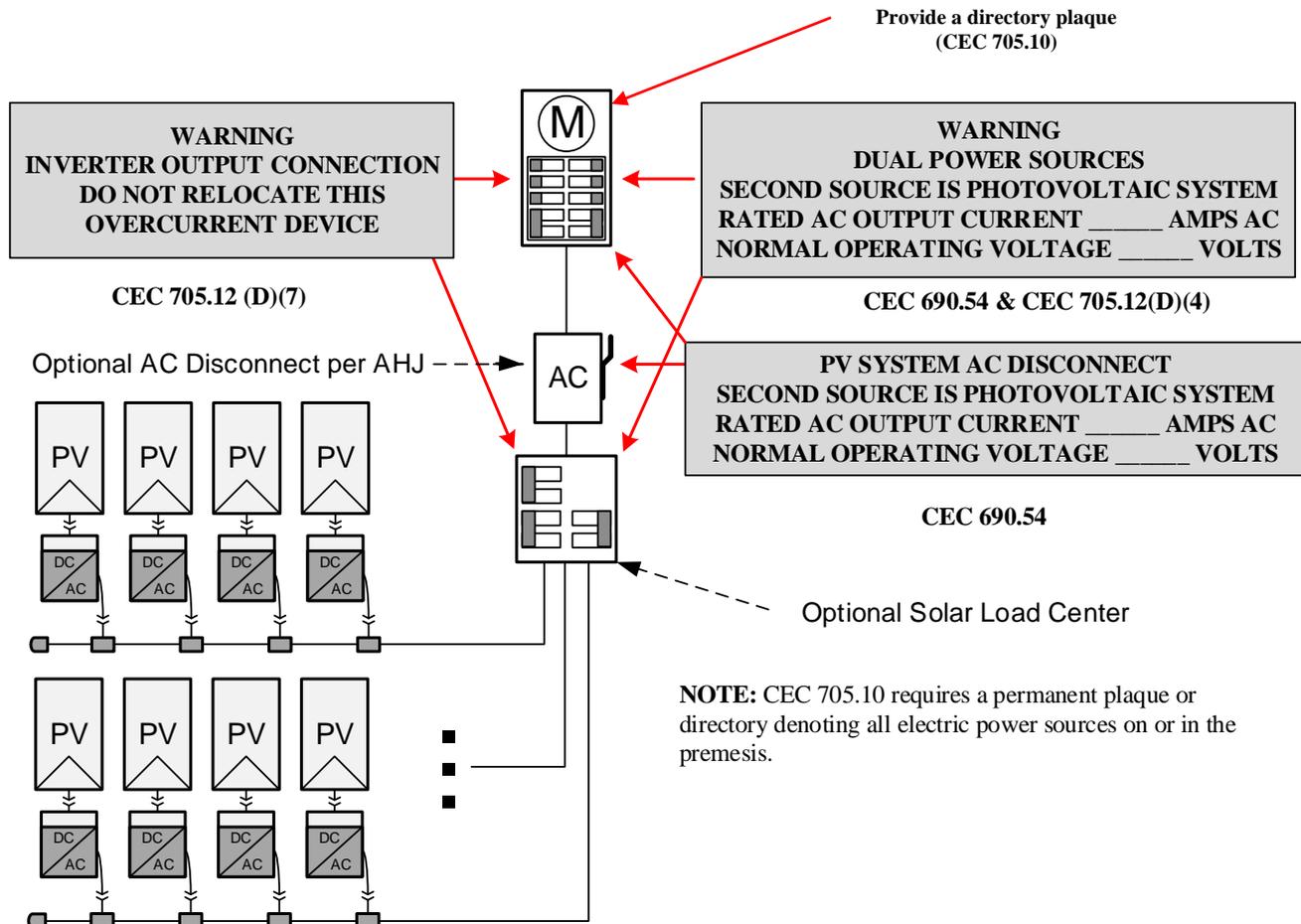
Check one of the boxes for whether system is grounded or ungrounded: Grounded Ungrounded

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

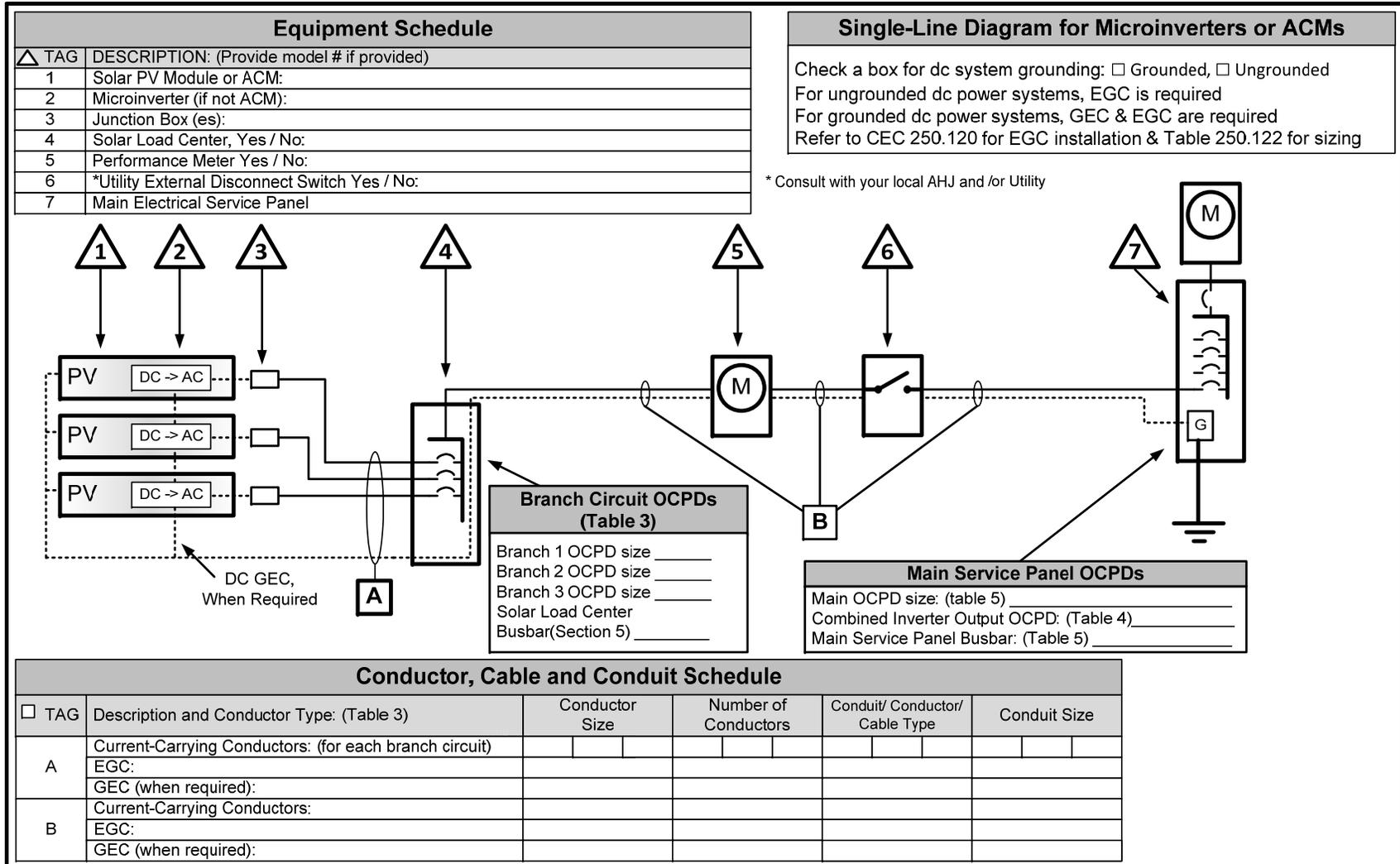
Informational note: ANSI Z535.4 provides guidelines for the design of safety signs and labels for application to products. A phenolic plaque with contrasting colors between the text and background would meet the intent of the code for permanency. No type size is specified, but 20 point (3/8") should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





Solar PV Standard Plan – Simplified Microinverter and ACM Systems for One-and Two-Family Dwellings

9. Micro-Inverter Line Diagram





Solar PV Standard Plan – Simplified Microinverter and ACM Systems for One-and Two-Family
Dwellings

SOLAR PV STANDARD PLAN - SIMPLIFIED

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

