Panning & Building Agency Building Safety Division
20 Civic Center Plaza
P.O. Box 1988 (M-19)
Santa Ana, CA 92702
(714) 647-5800
www.santa-ana.org

City of Santa Ana

REQUIREMENTS FOR RESIDENTIAL SOLAR PV
(Other Code requirements may apply)

PROJECT INFORMATION

1. Solar PV size will be ≤ 38.4 kilowatt (kW)
2. Solar PV is a flush rooftop-mounted array on a one- or two-family dwelling or accessory building/structure
3. No equipment may be installed upon any unpermitted structure—please verify that all structures in the project scope are permitted and approved.

GENERAL REQUIREMENTS

4. **For SolarAPP online permit projects, a full copy of the current, valid Inspection Checklist MUST be printed and provided during all inspections. Include all specification sheets and calculations as provided by SolarAPP.**
5. A licensed and qualified contractor will install the Solar PV and/or ESS, if applicable.
6. Solar PV and/or ESS, if applicable, will be installed per the manufacturer's instructions for all installed equipment and have manufacturer's instruction available at the time of inspection.
7. Each residence must have a unique utility meter (SolarAPP requirement).
8. Any Service upgrades or changes will require utility (SCE) approval. Obtain a "meter spot" location for any service change project.
    a. Be advised that SCE may not allow a service meter and panel to be located against a bedroom—this is to mitigate EMS exposure. SCE ESR-1, 14.5
    b. If the existing service is located under a patio cover (permitted or not), SCE does not allow a service drop to occur under such a patio cover. It is imperative to request a service meter spot from SCE planning to understand the service meter location that SCE will allow—it will likely be in a different location. Please review the latest SCE ESR manual. SCE ESR-2, 3.1
9. It is the policy of the City of Santa Ana that no existing service main disconnect can be de-rated by more than 15%. Please review handout "ELC-21 Residential Services, Alterations, Relocated Loads".
10. Any existing Service equipment must be safe and serviceable without damage, deterioration, missing parts or closures, etc. If the existing Service equipment is not, or cannot be made safe and serviceable, then changes to that equipment will NOT be permitted.

ELECTRICAL REQUIREMENTS

11. **SolarAPP Eligibility:**
    a. 600V Max per DC System Size
    b. Single phase 240V or 208V only
    c. Aluminum wires are only allowed for Backup Initiation Device feeders (but only AWG #4 or larger per Santa Ana Municipal Code (SAMC))
    d. Must Use 600V rated PV wire (due to outer diameter > 0.24" (6.1mm))
    e. Must use 90 deg C rated insulated wire
    f. Max 2 DC strings in parallel
    g. Inverter output circuit conductors must be THWN-2, or listed NM

h. Terminals must be rated to 75 deg C, labeled for use with Cu wires, and accept minimum 8 AWG wire
i. Microinverters or AC Modules branch circuit overcurrent protection device must be rated for a maximum of 20A
j. Permitted to install on up to or equal to 400A Service
k. Permitted to install on up to or equal to 225A Service Disconnect
l. Permitted to install on up to or equal to 225A busbars
m. No existing PV or ESS
n. May install only 1 PV module model
o. May install up to 2 Inverters for String Inverters
p. May install up to 1 inverter model for Microinverters and AC Modules
q. Conduit may not be Schedule 80 PVC
r. Modules and Inverters must be listed on CEC
s. Energy Storage Systems and Batteries must be listed on CEC
t. Rapid Shutdown cannot be satisfied using the method: No exposed wiring or conductive parts [690.12(B)(2)(3)]
u. No trenching allowed
v. All power production inverter outputs have the same point of connection
w. No new loads, only new monitoring loads are allowed
x. All equipment is assumed to be non-continuous rated
y. ESS must be paired with new PV
z. May install only 1 racking system model
aa. Height of rooftop conduit > = 7/8"
bb. Flat Plate PV Modules Only

12. Solar PV's breaker(s) will be connected on the opposite end of the service panel (and subpanel(s) if applicable) that contain loads [CEC 705.12(B)(3)(2)]
13. Installation will not have a line side tap (GMA is acceptable) or will not have a Load-Side Source Connections: Feeders/Taps [CEC 705.12(A) and (B)]
14. PV overcurrent devices, where required, will be rated 125% output current calculated in CEC 690.8(A) [CEC 690.9(B)]
15. Solar PV point of interconnection at panel(s) will be provided based on ONE of the following compliance methods [CEC 705.12(B)(3)]
    a. 120% Rule not applicable. The sum of 125% of the power source(s) output circuit current and the rating of the overcurrent device protecting the busbar will not exceed the ampacity of the busbar [CEC 705.12(B)(3)(1)]
    b. 120% Rule. Where two sources, one a primary power source and the other another power source, are located at opposite ends of a busbar that contain loads, the sum of 125% of the power source(s) output circuit current and the rating of the overcurrent device protecting the busbar will not exceed 120% of the ampacity of the busbar [CEC 705.12(B)(3)(2)]
    c. 120% Rule not applicable. The sum of the ampere ratings of all overcurrent devices on panelboards, both load and supply devices, excluding the rating of the overcurrent device protecting the busbar, shall not exceed the ampacity of the busbar [CEC705.12(B)(3)(3)]
    d. 120% Rule for Center Fed Panels. A connection at either end, but not both ends, of a center-fed panelboard in dwellings shall be permitted where the sum of 125% of the power source(s) output circuit current and the rating of the overcurrent device protecting the busbar does not exceed 120% of the current rating of the busbar [CEC 705.12(B)(3)(4)]
16. All required markings and placards will be permanently etched on plastic or phenolic resin placards; sticker marking will be placed on the DC conduits/junction boxes [CEC 110.21]

17. Access and working space will be provided and maintained about all electrical equipment of the Solar PV and/or ESS, if applicable, to permit ready and safe operation and maintenance of such equipment [CEC 110.26]
18. All electrical equipment and related installation (e.g., panel, ac unit, outlet, telecom or irrigation box, vent or openings such as windows and doors, etc.) will be maintained a minimum distance of 36" to the regulator vent of the gas meter

GROUNDING AND BONDING

19. Any splice in a solar module rail system shall a have bonding jumper per CEC Art. 250.
20. Electrode grounding system shall be bonded back to service's electrical system per CEC Art. 250.50. AC service shall have a GEC system and be bonded to metallic water piping.
21. When more than one grounding electrode exists, all grounding electrodes are to be bonded together per CEC Art. 250.50 to form a grounding electrode system. Bonding jumper size to be the larger of CEC Table 250.66 (for AC) and CEC Art. 250.166 (for DC).
22. New electrodes shall be embedded in direct contact with soil a minimum of 8'-0" feet with 10'-0" x ¾" diameter rods where attachment is made above grade. CEC Art. 250.53(A)(4). Space electrodes min. 6'-0" apart per CEC Art. 250.53(8).
23. Bonding between supplemental and service electrodes shall be no larger than #6 AWG per CEC Art. 250.53(E). Bonding jumper to be connected to electrodes per CEC Art. 250.70.
24. Grounding Electrode Conductor (GEC) smaller than 6 AWG shall be protected in rigid metal conduit, intermediate metal conduit, rigid non-metallic conduit, electrical metallic tubing, or cable armor. 6 AWG GEC free from exposure to physical damage shall be permitted to run along surface of building construction without metal covering or protection if securely fastened to construction. 4 AWG GEC shall be protected where exposed from physical damage. CEC Art. 250.64(8).
25. GEC shall be installed in one continuous length without joint or splice. Splicing shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by the exothermic welding process per CEC Art. 250.64(()(1). Note: If exception is used, inspector is to field verify attachment from existing GEC to UFER.
26. Microinverters: #6 AWG GEC (free from physical damage) shall be installed in one continuous length without joint or splice from all Microinverters to electrode; and ground for all modules and railing to be continuous. GEC shall not be broken at bus bar. CEC Art. 250.64(8) & (C). Splicing shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by exothermic welding process per CEC Art. 250.64(()(1).
27. Each end of ferrous raceways enclosing the GEC shall be bonded per CEC Art. 250.64(E).
28. GEC shall be #6 AWG for services larger than125A. #8 AWG okay for 100A service or less. Per CEC Table 310.16; CEC Table 250.66 & CEC Art. 250.66(A).
29. EMT to be bonded at each end of raceway where encountering eccentric or concentric knockouts per CEC Art. 250.97.
30. For Grounding of modules and rails, Equipment Grounding Conductors (EGC) smaller than 6 AWG shall be protected from physical damage by a raceway or cable armor except where run in hollow spaces of walls of partitions, where not subject to physical damage, or where protected from physical damage per CEC Art. 690.45 and CEC Art. 250.120 (C).

CONDUCTORS AND RACEWAYS

31. Conductors 8 AWG and larger shall be stranded where installed in raceways and conduit per CEC Art. 310.3((.
32. Conductors shall be listed **for wet locations per CEC Art.** 310.lO(C).
33. PVC raceways require expansion fittings and support straps (attached to mounting surface with two fasteners) per CEC Art. 352.30 and CEC Art. 352.44 and manufacturer's **installation instructions.**
34. EMT shall be shall be fastened every 10 feet and within 3 feet of boxes, cabinets and/or terminations per CEC Art. 358.30(A) and supported every 3 feet per CEC Art. 358.30(8).
35. Where inside buildings, PV system de circuits exceeding 30 volts or 8 amps shall be contained in

metal raceways per Art. 690.31(D).

MARKINGS AND LABELS

36. PV working placards are to be 3/8" high capitalized white letters on red background per CEC Art. 690.31(D)(2).
37. Provide a directory denoting all electric power sources on or in the premises. Directory shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected per CEC Art. 705.10. At the top of the placard, be sure to include the Code-required wording: 'CAUTION: MULTIPLE SOURCES OF POWER".
38. PV systems shall be installed with listed rapid shut down equipment per Art. 690.12 and labeled per Art. 690.56

FIRE SAFETY REQUIREMENTS

39. Roof penetrations will be flashed and sealed [CRC R324.4.3]
40. When a roof slope is greater than 2 units vertical in 12 units horizontal (17% slope), ALL of the following will apply: [CRC R324.6]
    a. Solar PV will provide a min. of two pathways on separate roof planes from lowest roof edge to ridge and will not be < 36" wide [CRC R324.6.1]
    b. Solar PV will provide a min. of one pathway on the street or driveway side of the roof [CRC R324.6.1]
    c. Solar PV will provide a pathway of not < 36" wide from the lowest roof edge to ridge at ONE of the following locations: [CRC R324.6.1]
        i. On the same roof plane as the Solar PV
        ii. On an adjacent roof plane
        iii. Straddling the same and adjacent roof plane
    d. Pathways will be over areas capable of supporting fire fighters accessing the roof [CRC R324.6.1]
    e. Pathways will be in areas with minimal obstructions (e.g., vent pipes, conduit, or mechanical equipment) [CRC R324.6.1]
    f. Solar PV will occupy the roof area and provide a clear setback on both sides of the horizontal ridge based on ONE of the following options: [CRC R324.6.2]
        i. Will occupy ≤ 33% of the total roof area and provide ≥ 18" clear setback on both sides of the ridge
        ii. Will occupy > 33% of the total roof area and provide ≥ 36" clear setback on both sides of the ridge
    g. Panels and modules will not be placed on the portion of the roof that is below an emergency escape and rescue opening(s) (e.g., bedroom windows or doors) AND will provide a pathway ≥ 36" wide to the emergency escape and rescue opening(s) [CRC R324.6.3]

STRUCTURAL REQUIREMENTS (when Solar PV is proposed)

41. A registered design professional (e.g., registered architect, licensed civil or structural engineer) will be responsible for the structural analysis, design and detailing of the roof to support the Solar PV.

GENERAL

42. Solar PV will not be installed on dwelling unit or accessory building/structure that is more than 3-stories in height; and will not be installed on attached or detached carport, patio, or non-permanent structure
43. Solar PV will not be installed over wood shake or wood shingle roofing
44. Solar PV and related hardware will weigh ≤ 4 psf

45. SolarAPP Eligibility:
    a. Installations in multi-family structures or R-2 occupancies shall not be permitted.
    b. Installations on mobile homes governed by Health and Safety Code and/or Housing and Urban Development regulations shall not be permitted.
    c. Applicable International Residential Code
    d. No ground mounted systems
    e. No carports or non-permanent structures
    f. No modification alterations or upgrades to the structure
    g. At least 20% of each tilt-up mounted array must be contained under 2 feet above the roof
    h. Installed on a permitted structure
    i. Limit of 10" above the roof for pitched (>2/12) roof systems

ROOF CHECKS

46. Site Audit of Existing Conditions:
    a. Roof is a single roof without a reroof overlay
    b. Roof structure shall appear structurally sound, without signs of alterations or significant structural deterioration or sagging.

SOLAR ARRAY CHECKS

47. Flush-Mounted System:
    a. Plane of the modules (panels) is parallel to the plane of the roof
    b. Modules do not overhang any roof edges (ridges, hips, gable ends, eaves)
48. PV array covers no more than half of the total roof area (all roof planes)
49. Downward Load Check (Does Anchor Layout meet specifications?)
50. Wind Uplift Check (Anchor Fastener Check—Field pull-up yank check)
51. Anchor fastener data (Are anchors per specifications?)