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County of San Diego, Planning & Development Services
RESIDENTIAL BUILDING CODE PLAN CHECK
BUILDING DIVISION

*** CUSTOMER INFORMATION VERSION ***

Roof-mounted solar photovoltaic systems and stationary storage battery systems associated with one- and two-family dwellings and their accessory structures

The items listed below are commonly omitted from plans submitted for review. Advance preparation by applicants to satisfy these requirements will help expedite the plan review process. Be advised: Just as specific items on this list may not apply to specific projects, this list also does not necessarily include all requirements for all projects; other items may apply. Please use this list as a guide only.

A. GENERAL REQUIREMENTS

1. For projects processed at the PDS offices, provide two complete sets of legible plans and supporting documents.
2. For projects processed online, respond directly via email to plan reviewer with attached PDF file of revised plans.
3. Plans shall include the following:
 - Cover sheet
 - County of San Diego solar PV minimum construction specifications (PDS #081s)
 - Dimensioned roof plan
 - Plot plan (if all equipment is not mounted on the main structure)
 - Single-line electrical diagram
 - Electrical calculations
 - Product manufacturer's data and specification sheets for each piece of equipment (e.g., modules, inverters, batteries, racking)
 - Structural racking plan

B. PLAN REQUIREMENTS

1. Cover sheet shall include the following:
 - Sheet index
 - Project address
 - Owner on application and/or contractor's name and license number.
 - Scope of work indicating number of modules, number and output rating of inverters, and total system size in total DC wattage
2. Roof plan shall include the following:
 - All roof edges, ridges, and valleys
 - All roof slopes
 - All patio covers, trellises, decks, balconies, etc.
 - Module layout
 - Inverter location(s)
 - Electrical disconnect location(s)
 - Electrical panel location(s)
 - Electrical meter location(s)
 - Routing of all conductors and conduit with materials identified (e.g., on roof, in attic, at exterior walls, in the interior of the house, in the interior of the garage, etc)
 - Stand-off distance the conduit is above the roof
 - Grounding electrode type(s) and location(s)
3. Plot plan or additional information required due to the following:
 - All solar related equipment – including the utility electric meter – is not located on the main structure. Provide a plot plan indicating the location of all structures and solar-related equipment (see Minimum Plot Plan Information, form PDS #090).
 - The proposed support structure or proposed battery/solar equipment storage building cannot be verified as a legal, permitted structure. Permits will be required for structure(s) built without a permit (see Minimum Essential Plan Submittal Items for Single-Family Dwelling and Accessory Structures, form PDS #658).
 - A generator is proposed with the solar panels, and additional requirements will apply for the generator. Call the County of San Diego Noise Specialist at (858) 694-2177 and the Chief Electrical Inspector for further information.

- The proposed system is to be mounted on a manufactured home unit or mobile home unit. A permit from the State of California Department of Housing and Community Development (HCD) will be required. Call HCD at (951) 782-4420 for further information.

C. ELECTRICAL REQUIREMENTS

1. Provide a complete electrical single-line diagram indicating:
 - Modules
 - Inverters
 - Electric panels
 - Meter panels
 - Junction boxes
 - Combiner boxes
 - Disconnects
 - Circuit breakers
 - Fuses
 - Equipment grounding
 - Grounding electrodes
 - Grounding electrode conductors
 - Conduits
 - Conductors
 - Batteries
 - Wiring Methods
2. Address the following item(s) related to wiring methods:
 - Identify the number of modules per string or circuit
 - Identify individual conduit types and sizes
 - Identify the type, size, and number of conductors in a cable or raceway
 - Show a metallic raceway for any DC conductors located inside the structure
 - Show breakers/fuses with locations and sizes
 - Show the location of all disconnects on the plan. AC and DC disconnects are to be located within sight of the inverter. This applies to remotely located inverters as well including roof-mounted micro-inverters. PV disconnects also shall be installed at a readily accessible location outside of the building or inside of the building nearest the entrance of the PV system conductors to disconnect all conductors in a building from the PV system conductors
3. Address the following item(s) related to grounding:
 - Identify the grounding method on the plans. All exposed metal parts (modules, frames, rails, boxes, posts, etc.) shall be grounded. Specify the grounding device, manufacturer name, model number, and UL approval report number on plans. (CEC 250)
 - Unless specified by the manufacturer, all inverters -- including micro inverters -- are required to have a grounding electrode conductor with a minimum size of #8 copper. (CEC 690.47)
4. Provide manufacturer's technical cut sheets for all equipment and components per the following:
 - Provide evidence the solar modules are listed to UL 1703 by a nationally recognized testing agency and provide manufacturer's specification sheets.
 - Inverter shall be listed to UL standard 1741 and identified for use in interactive photovoltaic power systems. Provide evidence the inverter is listed by a nationally recognized testing agency and provide manufacturer's specification sheets.
5. Provide electrical calculations for each string, circuit, and array per the following:
 - The solar output rating (i.e., inverter(s) max output x 125%) determines the minimum size solar-breaker in a panel. Verify compliance with the maximum breaker allowed by the inverter manufacturer.
 - The solar breaker together with the electric panel main breaker rating may not exceed 120% of the panel buss rating.
 - Panels with main breakers located at the center of the buss may not use the 120% rule allowance. The combination of breakers in such a panel may not exceed the rating of the buss.
 - When the combined rating of the main breaker serving a panel and the solar breaker exceeds the buss rating, the solar breaker must be at the end opposite the main breaker. (CEC 690.64(b)(7))
 - De-rating of the main breaker is allowed on a case-by-case basis. Electrical load calculations will be required, and the panel manufacturer must authorize such modification. Additionally a label is required at the panel stating "The main breaker has been de-rated to ___." Note this labeling requirement on the plans. (CEC 690.17, CEC 690.53, CEC 705.10)
 - A line-side tap typically is not allowed on residential electric panels (the exception being a 400amp or larger panel). Most side taps will require the panel to be re-evaluated to UL standards by a third-party testing agency.
 - A 400-amp split main panel with (2) 200-amp breakers is not the same as a true 400-amp panel for determining the size of the allowable solar breaker.
 - Provide DC and AC sides conductor (wiring) sizing calculations per CEC Article 690 on plans.
 - AC conductors are to be sized to correspond with the overcurrent protection device on the circuit.
 - Conductor ampacity shall be based on the 60-degree column of CEC Table 310.16 regardless of the temperature rating of the conductors, unless the equipment terminations are shown to be rated otherwise.
 - Include temperature correction factors for sizing of the conductors per CEC Table 310.16. This is based on the area the project is located. See ASHRAE tables for ambient temperatures in the various areas of the county and apply the de-rating factors per NEC requirements.

- Account for the additional ambient temperature for conduits exposed to Sunlight on or above the roof per 2010 CEC Table 310.15(B)(2)(C).
 - More than 3 conductors in conduit. Apply the de-rating factors per CEC Table 310.15(B)(2)(C).
 - Apply ambient temperature voltage correction factors for modules as defined in CEC Article 690.
 - Over-current protection shall not exceed the conductor-allowable ampacity after any correction factors for ambient temperature, number of conductors, and roof-mounted conduit have been applied per CEC Article 240.4(D).
 - System DC voltage exceeds the allowed 600 volts for residential installations. (CEC 690)
 - Correct the plan/design due to maximum open-circuit voltage of the modules exceeding the maximum input voltage for the inverter as specified on manufacturer's electrical data sheet.
 - The DC short-circuit current creates the need for fuses, per the module manufacturer's specifications.
 - Correct the plan/design due to the maximum short current of modules exceeding the maximum input current for the inverter as specified on manufacturer's electrical data sheet.
 - Provide buss tap assembly detail and components from the original manufacturer, a field evaluation of the electrical contractor's tap by a nationally recognized testing agency, or provide details from an approved switchboard manufacturer.
 - Check conduits allowable fill per CEC chapter 9.
 - Account for thermal expansion that will occur at conduit on the roof. (CEC 300.7 and 352.44)
 - Does this project include a meter upgrade, rewire, and/or relocation of the panel? If so, include in scope of work and permit application. Additionally SDG&E Service Work Order shall be on site at time inspection.
6. Specify on plans the following for residential stationary storage battery systems (CRC R327):
- System shall be listed and labeled in accordance with UL 9540
Exception: Repurposed unlisted battery systems from electric vehicles are allowed for installation outdoors or in detached sheds located minimum 5 feet from exterior walls, property lines, and public ways
Exception: Battery systems that are in integral part of an electric vehicle are allowed if the installation complies with section 625.48 of NFPA 70
Exception: Battery systems of less than 1 kWh
 - System shall be installed in accordance with the manufacturer's listed instructions
 - System shall not be installed within the habitable space of a dwelling unit
 - System shall be installed in accordance with NFPA 70
 - Inverters shall be listed and labeled in accordance with UL 1741 or provided as part of the UL 9540 listing
 - System connected to the utility grid shall use inverters listed for utility interaction
 - Indoor installation of system including batteries producing hydrogen or other flammable gases during charging shall be ventilated in accordance with the California Mechanical Code
 - System installed in a location subject to vehicle damage shall be protected by an approved barrier

D. STRUCTURAL REQUIREMENTS

1. All arrays shall be attached to a racking system with positive connection to roof-framing members (i.e., rafters, beams, pre-fab trusses).
2. Plans shall include details and specifications indicating the following:
 - Size, embedment, and spacing (both directions) of fasteners connecting racking to roof framing
 - Manufactured racking system manufacturer and model
 - Allowable span(s) of racking considering 85 mph wind speed, exposure C
 - Existing roofing material
 - Spacing of existing roof framing
3. Provide dimensioned roof-framing plan to verify framing adequate for system proposed. Specify all rafters, beams, and headers. Distinguish between new and existing framing.
4. This design requires plans and calculations prepared, stamped, and wet-signed by California-licensed civil engineer or architect.

E. MISCELLANEOUS REQUIREMENTS

1. Arrays on **R-3 occupancy structures or structures accessory to R-3 occupancies** shall comply with the following (CRC 331.2, CBC 3111.2):
 - Adequate firefighter access pathways provided **adjacent to – but not within – each solar zone** per the following (CRC R324.6, CBC 3111.2):
Exception: Roofs with 2:12 slope or less
Exception: Detached, nonhabitable accessory structures
 - o At least two minimum 36-inch-wide pathways – each on a separate roof plane – with at least one pathway on the street or driveway side of roof
 - o At least one minimum 36-inch-wide pathway on each roof plane with a photovoltaic array **or** on an adjacent roof plane **or** straddling the same and adjacent roof planes
 - o Pathways extend from lowest roof edge to ridge
 - o Pathways free of obstructions, such as vent pipes, conduit, or mechanical equipment
 - Adequate smoke ventilation setback at ridges **adjacent to – but not within – each solar zone** per the following (CRC R324.6, CBC 3111.2):

Exception: Roofs with 2:12 slope or less

Exception: Detached, nonhabitable accessory structures

○ **Sprinklered buildings with photovoltaic arrays occupying not more than 66% of total roof area in plan view:**

Minimum 18-inch clear set back required on both sides of horizontal ridge

○ **Sprinklered buildings with photovoltaic arrays occupying more than 66% of total roof area in plan view:**

Minimum 36-inch clear set back required on both sides of horizontal ridge

○ **Unsprinklered buildings with photovoltaic arrays occupying not more than 33% of total roof area in plan view:** Minimum 18-inch clear set back required on both sides of horizontal ridge

○ **Unsprinklered buildings with photovoltaic arrays occupying more than 33% of total roof area in plan view:** Minimum 36-inch clear set back required on both sides of horizontal ridge

□ Adequate emergency escape and rescue opening pathway **adjacent to – but not within – each solar zone** per the following (CRC R324.6, CBC 3111.2):

○ Minimum 36-inch-wide pathway from each required emergency escape and rescue opening

2. Arrays on commercial or multi-family structures shall comply with the following (CBC 3111.4.3):

Exception: Provisions of item E.1 may be applied where fire code official determines roof configuration is similar to R-3 occupancy dwelling

Exception: Roof access, pathway, and spacing requirements need not be provided where the fire chief has determined rooftop operations will not be employed

□ Maximum 150 feet in either axis

□ Minimum 6-foot-wide clear perimeter provided around edges of the roof

Exception: Minimum 4-foot-wide clear perimeter acceptable where either axis of building is 250 feet or less

□ Pathways provided per the following:

○ Located over areas capable of supporting live load of firefighters accessing roof

○ Centerline axis pathways provided on both axes of roof

Exception: Centerline axis pathway not required where perpendicular array dimension is less than 150 feet

○ Minimum 4-foot-wide clear pathway to roof standpipes or ventilation hatches

○ Minimum 4-foot-wide clear pathway around roof access hatch

○ Minimum 4-foot-wide clear pathway from roof access hatch to roof perimeter

□ Provide **one of the following** between array sections to enable smoke ventilation:

○ Minimum 4-foot-wide pathway bordering roof skylights or gravity-operated smoke and heat vents on not less than one side

○ Minimum 4-foot-wide pathway bordering all sides of non-gravity-operated smoke and heat vents

○ Minimum 4-foot-wide pathway bordering minimum 4-foot by 8-foot venting cutouts every 20 feet on alternating sides of the pathway

3. Roof-mounted solar photovoltaic systems shall comply with zoning requirements per Setbacks for Solar Photovoltaic Panels, form PDS #276.