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Residential PV Inspection Checklist

The following is a compilation of the most common requirements for a photovoltaic inspection as compiled by the City of San Ramon Building and Safety Division. Please review and consider these requirements/recommendations as you prepare for your inspection. This handout uses information from the 2019 California Codes.

REQUIRED INSPECTIONS

☐ A **ladder is required for all inspections** and **shall extend 18" above roof edge and be secured at the top**.

☐ Provisions shall be made to verify the information located on the modules and equipment on rooftops.

NOTE: Failure to comply with the inspection requirements will result in **re-inspection fees**.

Contractor shall verify that the existing main service panel is safe and free of electrical hazards – if unsafe; owner shall have a licensed electrician correct or replace equipment. An additional electrical permit is required for the replacement of the electrical panel. The 2019

California Electrical Code requires separate AC and DC disconnects for safe servicing or replacement of all equipment in PV System – AC Point of connection is suitable for AC disconnecting means if within sight and 10' of inverter.

☐ Approved plans, permits and installation instructions for ALL components shall be on-site and available for all inspections.

☐ All changes to the approved plans/project shall be reviewed and approved prior to any inspection. If any part of the installation does not match the approved plan, the inspection will not be passed and a re-inspection fee will be charged.

☐ All site revisions, equipment substitutions, equipment relocations, sizes… shall be approved by revising the plans and reviewed and approved by the building division BEFORE scheduling an inspection.

☐ Mounting System – Installed per plan. Packaging for bolts, lags… shall be available for verification.

☐ Verify flashing and counter flashing for water protection of mounting system to the roof.

☐ All combiners, junction boxes, and equipment shall be opened and ready for inspection upon arrival.
NOTE: required when junction boxes and combiners will be located under array.

☐ Conductor type and ampacity – Listed for wet locations and rated, 90 degrees Celsius.

☐ Bonding of rack mounting system installed per listing of modules.

☐ Number and type of modules matches plan (inspector will verify nameplate tag of modules against plan; see above for changes to approved plans).

☐ Clearance from plumbing vents shall be pipe diameter x2 clear from bottom of modules.

☐ Bonding of modules are per manufactures instructions – 2019 CEC 690.43, 690.45 250.134, 250.136(A).

☐ Equipment Grounding Conductor – Sized according to Table 250.122 – 2019 CEC 690.43.

☐ Access to attic area required to verify roof framing matches plan and to check connections to framing members and structural upgrades where applicable.

☐ DC conductors installed inside the structure shall be contained within a metallic raceway and labeled.

☐ Photovoltaic source circuits and PV output circuits shall not be contained in the same raceway, cable tray, cable, outlet box, junction box, or similar fitting as conductors, feeders, or branch circuits of other non-PV systems, unless the conductors of the different systems are separated by a partition. See 690.4(B) (1) for exceptions.

☐ Exterior labeling and markings shall be of sufficient durability to withstand the environment involved (CEC 110.21(A)), shall be permanently affixed to the equipment or wiring method and shall not be hand written (2019 CEC 110.21(B)(2)). Exception to 110.21(B)(2): Portions of labels or markings that are variable, or that could be subject to changes shall be permitted to be hand written and shall be legible.

FINAL INSPECTION

☐ If any part of the installation does not match the approved plan, the inspection will not be passed. All site revisions, equipment substitutions, equipment locations, shall be approved by revising the plans and reviewed and approved by the building division BEFORE scheduling an inspection.

☐ AC and DC disconnects located within sight and 10' of inverter – required for all installations with or without integrated disconnects in inverter.

☐ Inverter - type and model match plan – installed per manufacturer's instructions.

☐ Inverter is located in an area out of direct sunlight with space for ventilation (if required by installation instructions).

☐ Verify string overcurrent protection is sized adequately and rated of DC voltage (check calculations if 3 or more strings being combined).

☐ Wire management – All cables shall be secured and protected from physical damage (i.e. NO conductors/cables laying on roof or hanging below modules).

☐ All combiners, junction boxes, and equipment shall be opened and ready for inspection upon arrival.

☐ Electrical Line Diagram matches approved plans – Verify conductor and overcurrent protection sizing.

☐ Verify Existing Grounding Electrode System – If no existing Grounding Electrode System is available all available grounding electrodes shall be used (e.g. underground metal water service, ufer, etc.) A ground rod may be used if no other electrodes are present.

☐ Grounding Electrode Conductor – Grounding Electrode Conductor sized in accordance with Table 250.66 CEC 690.47 C (when run in ferrous metal raceways shall be bonded where they enter and exit raceway into any enclosure or disconnect).

☐ Verification of all markings, signs and labels (see below).

☐ Access to attic area required to verify conduit installation and marking, if any part of the system has been run through the attic.

☐ Panels/modules shall be located no higher than 3 feet below the ridge.

☐ Panels/modules installed in the areas of roof hips layouts shall be installed in a manner that provides a 3 foot wide clear access pathway from the eave to the ridge on each roof slope where panels/modules are located. No conduits or other obstructions can be located in the clear pathway area. Pathways shall be located at structurally sound locations. These requirements do not apply to roofs with slopes of 2:12 or less.

☐ Panels/modules installed in the areas of roof hips or valleys shall be located no closer than 18 inches to a hip a valley where panels/modules are to be placed on both sides of a hip or valley. These requirements do not apply to roofs with slopes of 2:12 or less.

☐ Roof access points shall be located in areas that do not require placement of ground ladders over openings such as doors or windows and are at strong points of building construction.

☐ Roof access points shall not have overhead obstructions such as tree limbs, signs or wires.

☐ Verify carbon monoxide alarms and smoke detectors are installed in the dwelling as required by the 2019 CBC Section 915 and Section 907.2.11.

☐ Verify Arc-Fault circuit protection for DC source circuits for system of 80 volts or greater.

☐ Labeling and markings shall be of sufficient durability to withstand the environment involved (CEC 110.21(A)), shall be permanently affixed to the equipment or wiring method and shall not be hand written (2019 CEC 110.21(B)(2)).

☐ There shall be a permanent plaque or directory providing the location of the service disconnecting means and the PV system disconnecting means if not located at the same location. The warning signs and labels shall comply with 110.21(B), (2019 CEC 690.56(B)).

☐ Contractor shall have an electrical testing meter onsite to test the rapid shutdown and other disconnecting means.

☐ Electrical Metallic Tubing (EMT) conduit supports shall securely fastened (2019 CEC 358.30) with a positive connection with the structure and shall be located every 10' and within 3' of each bend, outlet box, junction box, device box, cabinet, conduit body, or other tubing termination (2019 CEC 358.30).

MARKINGS, SIGNS AND LABELS

Marking is required on all interior and exterior direct current DC conduits, and covers on enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects (2019 CEC 690.31(3)).

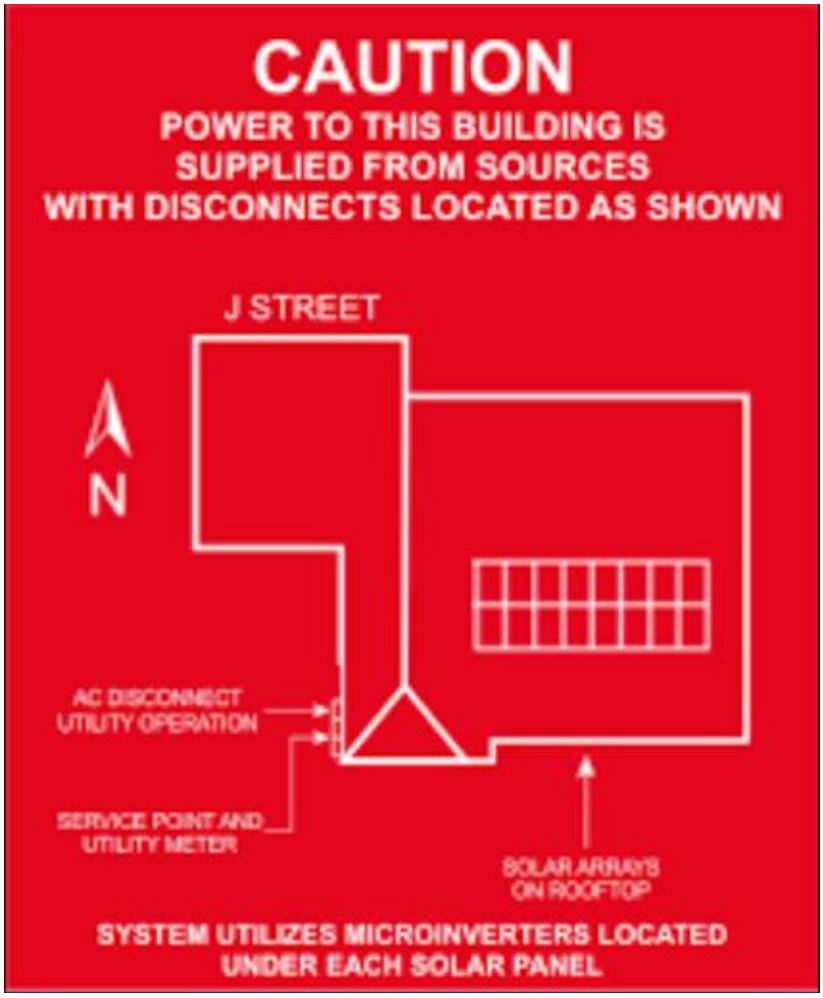
Materials the materials used for marking shall be reflective, weather resistant, suitable for the environment and, unless otherwise noted, shall have all letters capitalized with a minimum height of 3/8 white lettering on red background (2019 CEC 690.31(4)).

Marking unless otherwise noted marking content noted the marking shall contain the words:

WARNING: PHOTOVOLTAIC POWER SOURCE

Main Service Disconnect Marking shall be placed adjacent to the main service disconnect in a location clearly visible from the location the disconnect is operated.

Directory Placard if the service disconnecting means and the PV system disconnecting means are not located at the same location (i.e. not within line of sight of each other), then a directory placard is required.



Location of marking(s) shall be placed on interior and exterior DC conduits, raceways, enclosures and cable assemblies every 10 feet, within 1 foot of turns or bends and within 1 foot above and below penetrations of roof/ceiling assemblies, walls and barriers.

ADDITIONAL MARKINGS LISTED BELOW MAY BE REQURED DEPENDING FOR THE INSTALLATION.

Ground-Fault Detection and Interruption A warning label shall appear on the utility – **interactive inverter** or be applied by the installer near the ground fault indicator at a visible location, stating the following (609.5):

WARNING: ELECTRIC SHOCK HAZARD. IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

Disconnection of Photovoltaic Equipment Where terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnect means stating;

WARNING: ELECTRIC SHOCK HAZARD DO NOT TOUCH TERMINALS TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POISITION

Inverter Output Connection to Panelboard A connection in a panelboard shall be positioned at the opposite (load) end from the input feeder location or main circuit location. A marking label shall be applied to the distribution equipment stating;

WARNING: INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVISE

Main Service Panel and Inverter Install permanent plaque or directory, denoting all electric power sources on the premises. Plaque or directory shall be installed at each service equipment location and at locations of all electric power producing sources capable of being interconnected.

Modules Modules shall be marked (not as described above) with identification of terminals or leads as to polarity, maximum overcurrent device rating for module protection, and with the following ratings: (1) Open-circuit voltage, (2) Operating voltage, (3) Maximum permissible system voltage, (4) Operating current, (5) Short-circuit current, and (6) Maximum power. 2019 CEC 690.51

Alternating –Current Photovoltaic Modules Alternating-current modules shall be marked (not as described above) with identification of terminals or leads and with identification of the following ratings: (1) Nominal operating ac voltage, (2) Nominal operating ac frequency, (3) Maximum ac power, (4) Maximum ac current, and (5) Maximum overcurrent device rating for ac module protection. 2019 CEC 690.52

Direct-Current Photovoltaic Power Source A permanent label for the direct-current photovoltaic power source, as follows, shall be provided at the photovoltaic disconnect means: (1) Maximum voltage (See 690.7 for voltage), (2) Maximum circuit current (See 690.8(A)) for calculation of maximum circuit current), (3) Maximum rated output current of the charge controller or dc-to-dc converter (if installed). 2019 CEC 690.53