



Residential Electrical Service Upgrade Requirements

An electrical permit is required for replacement and upgrade of the main electrical service panel prior to the installation of the new panel. The following is a list of the general requirements for electrical panel replacements based on the 2022 California Electrical Code (CEC). For additional information, contact the Building & Safety Division.

Inspection Requirements:

The following inspections are required for electrical service replacements/upgrades;

- 1) Electrical Service Inspection
- 2) Exterior Lath (If stucco or other exterior wall covering requires patching for panel replacement)
- 3) Final Electrical Inspection (Patches complete, Panel Complete)

Inspections must be requested via voicemail by calling (951) 270-5600 before 4 PM the day before the inspection is needed (Note that no inspections are available on Friday). Please provide any special requests for the Electrical Service Inspection for same day disconnect/reconnect or any other inspection issues with your inspection request. The electrical service clearance will be emailed to Edison after the Electrical Service Inspection is approved and the service complies with minimum safety requirements.

General Requirements:

The minimum size electrical service for a Single-Family Home (SFR) shall be rated 100 amps, up to 200 amps. Services rated over 200 amps will require plans, including electrical load calculations, single-line diagram, and a plot plan in order to justify the larger service. Edison Service Planning will also need to be contacted to investigate what size of service can be provided at a particular address before obtaining a service upgrade permit or starting any work on the project.

Service Entrance Conductors (Wires)

Conductors shall have a vertical clearance of not less than 8' above the roof surfaces. The service head shall be so located that the service drops together with the open wires between the service drop will have a minimum clearance of 10' vertically above ground and tree feet radius from doors and windows (CEC 230.24)

Conductors and cables exposed to direct sunlight, including overhead service conductors, shall be listed and marked as "sunlight resistant." Service entrance conductors and conduit shall be sized according to the following table (Chapter 9 Table 1):

SERVICE ENTRANCE CONDUCTORS SIZE AND RATING			
Service or Feeder Rating	Copper Conductors	Aluminum or Copper-Clad Aluminum	Minimum Conduit Size
100 Amps	#4 AWG	#2 AWG	1-1/4 inch
125 Amps	#2 AWG	#1/ 0 AWG	1-1/4 inch
150 Amps	#1 AWG	#2/ 0 AWG	1-1/4 inch
200 Amps	#2/ 0 AWG	#4/ 0 AWG	1-1/2 inch

The grounding conductors must be identified by white or grey tape at both ends (CEC, 200.6)

Meter Location – The height of the meter shall be between 48" and 66" above the ground.

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Working Space – The clear working space in front of the panel shall be 30” wide by 36” deep with a minimum head room clearance of 6’-6” (CEC 110.26)

Grounding of Services – Grounding shall consist of a continuous grounding electrode conductor run from the panel to a ground rod (grounding electrode), to a 2nd ground rod a minimum of 6’ away, then to the cold-water pipe. Grounding of the electrical service at the main water line must be within the first 5’ of water piping into the building. The underground water service shall not be used as the grounding electrode without supplemental electrode (CEC 250.53 [d]). If an existing **UFER** ground is present, then the grounding electrode must be connected from the panel to the UFER, and no supplemental ground rods are required. If an OHMS test (provided by the Contractor) shows resistance of 25 OHMS or less, then only one ground rod is required (if no UFER present).

The grounding electrode (ground rod) shall be nonferrous (copper), listed, and not be less than 1/2” in diameter. The electrode shall be installed such that at least 8’ of length is in contact with the soil. The upper end of the electrode shall be flush with or below ground level unless the above-ground end and the ground electrode conductor attachment is protected against physical damage. Grounding electrodes must be protected from damage when smaller than a #6. The required grounding electrode conductor (from electrode to panel) size is listed in the following table:

GROUNDING ELECTRODE CONDUCTOR SIZING (Table CEC 250.66)		
Size of Main Panel	Copper Conductors	Aluminum or Copper-Clad Aluminum
100 Amps	#8 AWG	#6 AWG
125 Amps	#8 AWG	#6 AWG
150 Amps	#6 AWG	#4 AWG
200 Amps	#4 AWG	#2 AWG

Bonding – Bonding of the hot, cold, and gas lines is required when the electrical panel is replaced. Bonding of the hot, cold, and gas lines is required with water service replacements (if using a less conductive material than is existing) and for all re-pipes. Bonding shall consist of a continuous bond jumper and is recommended to be installed at the water heater between the hot, cold, and gas lines. The bonding jumper shall be sized based on the following table:

BONDING JUMPER SIZING (Table CEC 250.122)		
Size of Main Panel	Copper Conductors	Aluminum or Copper-Clad Aluminum
100 Amps	#8 AWG	#6 AWG
125 Amps	#6 AWG	#4 AWG
150 Amps	#6 AWG	#4 AWG
200 Amps	#4 AWG	#2 AWG

An installer will also need to be familiar with all other sections of the Code which are applicable including:

- 1) **Intersystem Bonding Terminal**- An intersystem bonding termination is required. Provide a listed terminal at the meter enclosure or a bonding bar near the service equipment enclosure or near the GEC. Bonding bar connection is a minimum 6 AWG. Termination is required to have a minimum of three positions and shall remain accessible. (CEC 250.94)
- 2) **Surge Protector Devices (SPD)** must be installed with all service upgrades per CEC 230.67(New for the 2022 code)
- 3) **AFCI Protection**- Circuits required to be AFCI (Arc-Fault) protected per CEC 210.12 in existing panels are not required to be upgraded to AFCI protection if the circuits are not extended more than 6’. If the new main panel is moved more than 6’ away from the existing location, then AFCI protection is required for all circuits serving the areas as noted in CEC 210.12. See CEC 210.12 (D) *Branch Circuit modifications/extensions for exceptions*.
- 4) Annex C Table C.8- Maximum Number of Conductors or Fixture Wires in Rigid Metal Conduit (RMC).

- 5) Methods of Grounding and Bonding Conductor Connection to Electrodes- CEC 250.70
- 6) Installation of a ground rod at the panel and subpanel (if located at a detached garage) if some other means for grounding the system does not exist- CEC 250.24(A)(1) - (A)(5). Note: The ground rod must be driven eight feet into the ground.
- 7) Protection of the grounding electrode conductor if smaller than 6AWG by means of rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metallic tubing, or cable armor- CEC 250.64(B)
- 8) Continuity of metal enclosures for grounding electrode conductors- CEC 250.64 (E)
- 9) Internal parts of electrical equipment, including bus bars, wiring, terminals, insulators, and other surfaces, shall not be damaged or contaminated by foreign materials such as paint, plaster, cleaners, abrasives, or corrosive residues CEC 110.12(B)
- 10) Overhead service risers in excess of 36" above the roof surface or supporting service drops must be braced. (CEC 230.28)
- 11) Circuit breakers shall be listed to be used with panel (per the manufacturer).
- 12) All unused circuit breaker opening shall be closed. (CEC 408.7)
- 13) Unused knock outs and openings shall be sealed with listed plugs CEC 110.12 (A)
- 14) Provide bollards to protect electrical equipment from physical damage. (110.26 E.2)
- 15) Disconnect switches and breakers shall be installed so that the center of the operating handle at its highest position is not more than 6'-7" above the floor or working platform and shall be in a readily accessible location. [CEC 240.24A]
- 16) Overcurrent protection devices shall not be located oversteps of a stairway. CEC 240.24(F)
- 17) Provide the required minimum working clearance in front of the service panel. (30" wide X 36" deep) (CEC Table 110.26 A1)
- 18) Grounds and neutrals located at subpanel and panels at separate structures shall be on a separate bus bar CEC 250.6 & CEC 250.32(D)(1)
- 19) Ground rod (UFER) connection to grounding electrode conductor shall be accessible. 250.68(A)
- 20) The grounding electrode conductor shall be installed in one continuous length without a splice or joint to the first electrode. (250.64C)
- 21) Protect grounding electrode conductor in accordance with (CEC 250.64B)
- 22) Metal raceways used to protect the GEC shall be properly bonded at each end. (250.64 E.1)
- 23) Overhead service entrance conductors shall be equipped with a rain tight service head or gooseneck. The service head shall be listed for use in wet locations. (CEC 230.54B)
- 24) Installation of roof flashing at riser. It must be sealed/watertight.
- 25) Service entrance conductors must be a minimum of 3 feet away from all sides of openable windows (CEC 230.9A)
- 26) Service entrance conductor vertical clearance above grade or a walking surface is required to be minimum 10ft. (CEC 230.24 B 1)
- 27) The service entrance conductor vertical clearance above driveways is required to be a minimum 12 ft. (CEC 230.24 B2)
- 28) The service drop conductor's vertical clearance above pool water is 22 ½ feet. [CEC 680.8A]
- 29) Where the roof slope is less than 4 in 12 the service drop conductor's vertical clearance above the roof surface is required to be a minimum 8ft. [CEC 230.24 A; Read EXC. 2&3]
- 30) Where the roof slope is greater than 4 in 12 a minimum 3 feet is required from the service drop conductors to the roof surface. (CEC 230.24 A; EXC. 2)

Edison/Utility Requirements

Before installing or upgrading a residential meter panel, please call Southern California Edison (SCE) to approve the panel location (800) 655-4555. SCE service requirements can be found at <https://www.sce.com/regulatory/distribution-manuals/electrical-service-requirements>

Building Permit Application Requirements

Building permits for electrical panel replacements are available at the Building and Safety Division counter from 10 AM - 4 PM, Monday – Thursday or via email at building@ci.norco.ca.us.