



Residential Electrical Guidelines – 2016 California Electrical Code

Applicable Building Standards: 2016 California Energy Code, 2016 California Electrical Code

Code references in this broad guideline are for your convenience and may not be complete.
See the 2016 California Electrical Code or other referenced codes and regulations for complete texts.

SERVICE:

Consult a Southern California Edison Co. planner for meter location requirements. New houses usually have all underground-fed utility services: Power, gas, cable TV, & phones. A minimum 100 amp electrical service ampacity is required. See section 230.79(C).

LIGHTING:

At least one 15 ampere general purpose lighting circuit shall be provided for each 600 square feet of the dwelling area (800 square feet when using 20 ampere circuits) including the basement, but not including open porches or garages. See section 220.12.

A wall switch controlled lighting outlet must be installed at every outside door as well as in every habitable room, in bathrooms, hallways, stairways, attached garages and detached garages that have electricity. At interior stairways, there must be a wall switch at each floor level to control the lighting whenever the difference in floor levels is six steps or more. Switches required at any stairwell that has an entry. 210.70. In habitable rooms (NOT kitchens, halls, and bathrooms) a wall switched receptacle outlet is allowed instead of a light fixture. Receptacle outlets may not be controlled by a dimmer switch. See section 406.15.

A lighting outlet must be installed in each basement. A light must also be installed in any attic or crawl space or utility room that contains equipment that could require servicing, or if the space may be used for storage. Locate the lights at or near the equipment and the switches near the point of entry to the spaces mention above. A second (three-way) switch at the equipment is often needed. See section 210.70.

In clothes closets completely enclosed and surface mounted LED fixtures must be 12 inches from closet storage. A flush (recessed) LED or Fluorescent that is completely enclosed may be installed 6 inches from storage. Open or enclosed incandescent lamps and pendants are not permitted in closets or at bathtubs and showers. Section 410.16.

RECEPTACLES:

Receptacle outlets must be installed in every habitable room of a residence so that no point on any wall is over six (6) feet from an outlet in the unbroken wall space of that room. In other words, you need an outlet within six feet (6) of a doorway or fireplace, but in the rest of the room the outlets may be twelve (12) feet apart if there is no break in the wall between them. Walls are measured around corners. Any wall space two (2) feet wide or greater requires a receptacle outlet. An outlet over five feet six inches (5'6") above the floor cannot be counted as a required outlet for that space. Outlets on the floor within 18 inches of the wall may be counted as an outlet for that space. See section 210.52(A).

A receptacle outlet is required in any hallway of 10 feet or more in length. See section 210.52(H)

Foyers of an area larger than 60 sq. feet must have a receptacle in every wall space that is 3 feet or more. Doorways, windows that extend to the floor, and similar are not considered foyer wall space. See 210.52(I).

A ground-fault circuit-interrupter protected receptacle (GFCI) outlet is required adjacent to each basin in every bathroom. Outlet must be located within 3 ft. of basin edge. Locate on wall, partition, on face, or side of cabinet. In no case, more than 12 inches below basin. See section 210.52(D).

At least one, 20-ampere branch circuit must be installed to serve only receptacle outlets in bathrooms. That circuit may power lights, fans and other loads in that same bathroom **only** when that circuit feeds no other rooms. In other words, each bathroom must have its own dedicated circuit if anything besides the bathroom sink receptacle outlet is fed from that circuit. 210.11(C)(3)



Residential Electrical Guidelines – 2016 California Electrical Code

At least one receptacle outlet is required for laundry facilities. The laundry receptacle outlets must be fed by a 20-ampere circuit(s). That individual circuit may only serve the laundry area. See 210.11(C)(2). The laundry outlet must be within six (6) feet of the laundry equipment location. There must be an open laundry receptacle outlet accessible after the washer & dryer are installed. This is for irons, steamers, and similar laundry appliances. All receptacle outlets in laundry must have GFCI protection. See section 210.52(F).

For one-family dwellings, and each unit of a two-family dwelling that is at grade level, at least one GFCI receptacle outlet must be installed at the front and back of the dwelling. That receptacle must be accessible from grade level and not more than 6 feet, 6 inches above grade. 210.52(E)(1) This receptacle, and all others outdoors, must have a weatherproof-while-in-use type of cover. See section 406.9(B).

A receptacle outlet is needed at every balcony, deck, or porch of any size that is accessible from inside the dwelling. All receptacle outlets in wet locations must be weather-duty type and also need listed weatherproof while-in-use covers, and GFCI protection. See sections 210.52(E)(3) and 210.8(A).

For one-and two-family dwellings, a receptacle outlet is required for the servicing of heating, air-conditioning, and refrigeration equipment when they are outdoors or located in attics and crawl spaces. The receptacle must be on the same level as the units and within 25 feet. Rooftop HVAC equipment also needs a GFCI receptacle outlet on the same level as unit. See section 210.63.

In an attached garage, or a detached garage with electric power, at least one receptacle outlet shall be installed for each car space. 210.52(G)

In kitchens and dining areas, a receptacle outlet must be installed at each wall counter space 12 inches or wider. Receptacles shall be installed so that no point along the counter walls is over 24 inches from a receptacle. Island and peninsular countertops (not on a wall) with a long dimension of 24 inches or more and a short dimension of 12 inches or more must have at least one receptacle outlet. Corner sinks with more than 18 inches and standard sinks with more than 12 inches behind them, are counted as wall space.

Receptacles installed above a counter, but not more than 20 inches higher than the counter. Where there is no back-wall or cabinets above the counter to mount a receptacle outlet, it may be installed no more than 12 inches below the counter with the consent of the Inspector. Counter broken by a range, refrigerator, or a sink creates a new counter wall space. Receptacle outlets behind refrigerators, freezers, or other fixed or stationary equipment are not counted as an outlet for that wall space. See section 210.52(C).

A receptacle for a range hood must be fed by an individual (dedicated) circuit. See section 422.16(B).

CIRCUITS:

The kitchen countertop areas must have receptacle outlets supplied by at least two (2) 20-ampere circuits. The receptacle outlets in the dining area, pantry, or breakfast nook must also be fed from a 20-ampere circuit. The circuits dedicated to these areas may not supply other receptacle outlets or lights. All kitchen receptacle outlets that may serve countertop need GFCI protection. See sections 210.52(C) and 210.8(A).

If a waste disposer or compactor, or both, are to be installed, a separate circuit suitable for the load must be installed for them. If a dishwasher is to be installed, a separate circuit of proper ampacity should be provided for it. The dishwasher receptacle outlet requires GFCI protection. See sections 210.23 & 220.14.

A circuit suitable for the load (minimum of 40 amperes) is required for a normal electric range of 8-3/4 kW or more, either free standing or drop-in type. See section 210.19. A minimum 30 ampere, 240-volt, circuit is required for an electrical clothes dryer. See section 220.54. A circuit sized for 125% of nameplate rating is required for an electric water heater. See section 422.13.

A circuit breaker or fused switch is not allowed in a closet or in a bathroom. See section 240.24.

All bath fans must be controlled by a humidistat unless used for whole-house ventilation. CALGreen 4.506

GFCI Protection:



Ground-fault circuit-interrupter protection must be provided for the following 15- and 20-ampere, 125 volt, receptacle outlets at dwelling units. See section 210.8 for details. **These rules have NO exceptions.**

1. All bathroom receptacles.
2. All garage receptacle outlets.
3. Grade-level portions of unfinished accessory buildings receptacles.
4. All outdoor receptacles.
5. All the receptacles in crawl spaces at or below finished grade.
6. All the receptacles in unfinished basements.
7. All receptacles in kitchens (or adjacent areas) that can serve kitchen countertop surfaces.
8. All receptacles within 6 feet of any sink, bathtub, or shower stall.
9. All laundry receptacle outlets.
10. The power for a dishwasher must be protected by a GFCI – hard-wired or cord-connected.

AFCI Protection:



Almost all 125-volt 15 and 20 ampere branch circuits in a dwelling must be arc-fault circuit-interrupter (AFCI) protected. This is all circuits - including lighting (closets too) and the power for smoke or carbon monoxide alarms. A listed combination-type overcurrent protective device is required.

These circuits must be 2-wire (black & white) only. If 3-wire (black, red, & white) circuits are used, then two-pole AFCI circuit breakers would be needed. Only bathrooms, garage, crawl space, attic, and outdoor circuits do not require this special protection. An indoor switch for an exterior light must also have AFCI. See section 210.12.

Tamper-resistant receptacle outlets:



All dwelling receptacle outlets that are 125-volt, 15- and 20-ampere need to be listed as tamper-resistant receptacles. These prevent pin, wire, or paperclip insertions. See section 406.12.

Exceptions: Receptacles in the following locations are not required to be tamper-resistant:

- (1) More than 5½ ft. above the floor.
- (2) Receptacles that are part of a luminaire or appliance.
- (3) A single (simplex) for one appliance; a duplex receptacle for two appliances located within a dedicated appliance space. This exception is only for appliances that are not easily moved from one place to another.

Smoke Alarms & Carbon Monoxide (CO) Alarms:



These are required by the Building Code

Smoke Alarms are required inside each sleeping area **and** also outside all sleeping areas. At least one is needed on each floor and at top of stairways. More are needed when ceiling height changes by 2 feet.

CO Alarm on every floor when any fireplace, natural gas, LP gas, or other fuel burning appliance is installed; or has an attached garage. Inside any sleeping area when a fuel-burning unit is in that area.

When one Smoke, or one CO alarm sounds, all must then automatically sound. All must be hard wired to a normal lighting circuit and also have a ten-year battery. All these alarms must be at least three feet from an air vent or openable window. See the manufacturer installation instructions for complete spacing details.

Residential Electrical Guidelines – 2016 California Electrical Code

1 & 2 Family Dwellings vs. Lighting

Room Requirements	MANDATORY General Rules	Hardwired Lights Shall* be High-Efficacy	*NOTES
Kitchen	LED or electronic ballasts ★★★★ AND ★★★★★	Yes - 50% minimum	Up to 50% of the hardwired WATTS may be low-efficacy
Bathroom		At least one in bathrooms	Manual switch ON Vacancy-sensor OFF
Garage Laundry Utility Rooms	Recessed cans in insulated ceilings "IC" type & certified airtight ★★★★ AND ★★★★★	Yes 100%	Manual switch ON Vacancy-sensor OFF
All Other Rooms (Hall, Stairs, Dining, Bedroom)		Yes 100%	Manual switch for ON AND Vacancy-sensor OFF ★★★★ OR ★★★★★★ Electronic dimmer switches
Outdoor Lights on Buildings	Switch all high-efficacy lights separately from low-efficacy lights.	Yes 100%	Motion sensor ON AND Photo-cell sensor OFF

High efficacy lighting must be switched separately from low-efficacy sources.

What is a high efficacy light?* Initial lamp Lumens divided by Watts = efficacy	
Up to 15 watts a lamp needs	40 lumens per watt to be high-efficacy
From 15 to 40 watts a lamp needs	50 lumens per watt to be high-efficacy
Over 40 watts a lamp needs	60 lumens per watt to be high-efficacy
* Virtually all pin-based fluorescent lamps qualify as high-efficacy Screw-in fluorescent or LED lamps that fit in regular lamp sockets do not comply	