California 2022 Codes

Chico, California Presentation

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Disclaimer:

- ***Building codes are subject to local amendments and interpretation. While every attempt has been made to present accurate information in this presentation, it is best to refer to the adopted code of the local jurisdiction to ensure compliance with that jurisdiction's adopted code(s).***
- ***Any reference or implied reference to a particular product or appliance is for the purpose of clarity and should not be interpreted as an endorsement.***

What we will cover:

- California Residential Code
- California Electrical Code (residential only)
- California Plumbing Code (residential only)
- California Mechanical Code (residential only)
- California Energy Code (residential only)
- California Green Building Code (residential only)

How do we get our codes?

Code organizations through collaboration of all stakeholders in the code making process, publish model codes that jurisdictions can adopt.

Local Jurisdictions can amend the code to fit local needs.

- ICC
- NFPA
- IAPMO

Code Adoption Process

The local political body must adopt a code for it to be enforceable.

In California, the local jurisdiction adopts Title-24 State Codes with (or without) local amendments.

- *The local political body holds a Public Hearing and first-reading of the proposed code.*
- *A second-reading occurs at a scheduled public meeting.*
- *After the second-reading, the political body votes to adopt proposed code. If there is a majority vote to adopt, the code may be enforced not sooner than 30-days after adoption.*

Any local amendments must be sent to CBSC prior to enforcement.

- If the local jurisdiction amends the code, a copy of the signed ordinance along with the amendments must be sent to the California Building Standards Commission for approval before the amendments can be enforced.

In order for code adoption to be successful (and on time), the adoption process should start not later than the end of October!

This will allow a first reading/ public hearing; then at a scheduled public meeting, a second reading (and vote for adoption); then 30-days to take effect. The final step is to gain CBSC approval of amendments (if any) before January 1st!

What's new in the 2022 California Residential Code?

- ***New section for aging-in-place features***

- **…And lots of other new sections and/or re-written sections!**

2022 California Residential Code

- **101.3 Purpose;**

- *The purpose of this code is to establish minimum requirements to provide a reasonable level of safety, health,… and to provide a reasonable level of safety to firefighters and emergency responders.*
- Previous code read: …establish minimum requirements to safeguard public safety…

2022 California Residential Code

- **105.2 Work exempt from permit**

- *1. Except for Storm Shelters, one-story detached accessory structures that do not exceed 120 SF**. It is permissible that these structures still be regulated by 710A despite exemption from permit.***

2022 California Residential Code

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- **R105.5 Permit Expiration.**
- *Permits issued* **on or after January 1, 2019 shall become invalid with no commencement of work after 12 months.** *Permits may be extended for 180-days upon written request to the Building Official*

2022 California Residential Code

- **106.1 Submittal of documents;**

- *Documents shall be submitted in two-sets or more, or in a digital format where allowed by the Building Official*

2022 California Residential Code

- **R114 Stop Work Orders;** *(This section has been completely re-written.)*
- ***R114.1 authority-*** ***Where the Building Official finds any work regulated by this code being performed in a manner that is contrary to the provisions of this code or in a dangerous or unsafe manner, the Building Official is authorized to issue a Stop Work Order.***
- ***R114.2 Issuance-*** ***The Stop Work Order shall be in writing and shall be given to the owner of the property or the owner's agent or to the person performing the work. Upon issuance of a Stop Work Order, the cited work shall immediately cease. The Stop Work Order shall state the reason for the order and the conditions under which the cited work is authorized to resume.***
- ***R114.3 Emergencies- Where an emergency exists, the Building Official shall not be required to provide written notice prior to stopping the work.***

2022 California Residential Code

- **R114.4 Failure to comply- Any person who shall continue any work after having been served a Stop Work Order, except such work that the person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the AHJ.**
- *(This was wording from R114.2 CRC 2019; it has now been relocated to its own section.)*

2022 California Residential Code

- **Chapter 2 Definitions;**

Photovoltaic (PV) System Ground-mounted has been added to definitions: *An independent photovoltaic (PV) system without usable space underneath, installed directly on the ground.*

- *While R324 had language for ground-mount PV systems, there wasn't a definition for these systems in the 2019 CRC.

2022 California Residential Code

- **R301.1.4 Intermodal Shipping Containers;** *Intermodal shipping containers that are repurposed as buildings or structures shall be designed in accordance with the structural provisions of 3115 CBC.*

- ** This is a new section*

2022 California Residential Code

R301.1.4 Intermodal Shipping Containers; (continued)

- *ICC G5-2019 Guideline for the Safe Use of ISO Shipping Containers Repurposed as Buildings was recently published to assist building departments in their evaluation of the buildings.*
- *A majority of these containers are either 20’ or 40’ standard length boxes with corrugated steel sides with plywood flooring.*
- *The CBC requires an engineered design for the use of the containers.*
- *All containers are to be tested by a third-party to ensure they still meet the ISO requirements for strength capacity of the roof, walls, and floor.*

2022 California Residential Code

R301.2.1 Wind Design Criteria;

**New language added for metal roofing, and wind speed design.*

- **Metal roofs shingles shall be designed for wind speeds in accordance with R905.4.4**

- **Where ultimate wind speed designs in Figure R301.2(2) are less than the lowest wind speed indicated in the prescriptive provisions of this code, the lowest wind speed indicated in the prescriptive provisions of this code shall be used.**

**Wind speeds are no longer 115 MPH for the central part of the US, and 110 MPH on the west coast. The map is updated to reflect lower wind speeds (90, 95, 100, & 105 MPH). Generally wind speeds have dropped across the country, with some locations having wind speeds lowered significantly. The CRC is now inline with ASCE 7 and ASCE 7-16 wind speeds for non-hurricane prone areas.*

2022 California Residential Code

R301.2.1 Wind Design Criteria; (Continued)

- **While some wind speeds have been decreased in some parts of the country, component and cladding roof wind pressures have increased. See Table R302.1 (1)*

2022 California Residential Code

- **R301.2.2.6 Irregular Buildings;** (in Seismic Design Category C & D)
- **New category added to this Section:*

- *#8 Hillside Light-frame Construction; Conditions in which all of the following apply:*
- *8.1 Grade slope exceeds 1 units vertical to 5 units horizontal where averaged across the full length of any side of the dwelling*

2022 California Residential Code

- 8.2 The tallest cripple wall height exceeds 7’ or where a post and beam system occurs at the dwelling perimeter, the tallest post exceeds 7’
- 8.3 Of the total plan area below the lowest floor, whether open or enclosed, less than 50% is living space having interior wall finishes conforming to section R702
- Where item 8 is applicable, design with acceptable engineering practices shall be provided for the floor above the cripple wall or post and beam system
- 1 Exception for this section: (full-height concrete or masonry walls)

2022 California Residential Code

- **R301.2.2.10 Anchorage of water heaters;** In seismic Design Category D, water heaters shall be anchored against movement and overturning in accordance with the CPC. (2019 CRC)

- **R301.2.2.10 Anchorage of water heaters;** *Water heaters and thermal storage units shall be anchored against movement and overturning in accordance with the California Plumbing Code.*

2022 California Residential Code

R301.3 Story Height; The wind and seismic provisions of this code shall apply to buildings with story heights not exceeding the following:

- **1.** For wood wall framing, the story height shall not exceed 11 feet, 7 inches and the laterally unsupported bearing wall stud height permitted by Table R602.3 (5).
- **Exception;** *A story height not exceeding 13 feet, 7 inches is permitted provided that the maximum wall stud clear height does not exceed 12 feet, the wall studs are in accordance with Exception 2 or 3 of R602.3.1, or and engineered design is provided for the wall framing members, and wall bracing for the building complies with R602.10. Studs shall be laterally supported at the top and bottom plate in accordance with R602.3*

**New exception has been added to this section.*

2022 California Residential Code

R302 Fire-Resistant Construction

R302.2 Townhouses; **This section has been completely re-written to clarify requirements.*

Walls separating townhouse units shall be constructed in accordance with Section R302.2.1, or R302.2.2 *and shall comply with Sections 302.2.3 through 302.2.5*.

R302.2.1 Double Walls; Each townhouse *unit* shall be separated *from other townhouse units* by two 1-hour fire-resistance-rated wall assemblies tested in accordance with ASTM E119, UL263, or Section 703.2.2 CBC.

**Note: The definition of Townhouse has been revised in R202*

R302 Fire Resistant Construction

- **R302.2.2 Common Walls;** Common walls separating townhouse *units* shall be assigned a fire-resistance rating in accordance with item 1 or 2 ***and shall be rated for fire exposure from both sides.*** Common walls shall extend to and be tight against the exterior sheathing of exterior walls, *or the inside face of the exterior walls without stud cavities,* and the underside of the roof sheathing. The common wall shared by two townhouse *units* shall be constructed without plumbing or mechanical equipment, ducts or vents, *other than water-filled fire-sprinkler piping* in the cavity of the common wall. Electrical installations shall comply with the California Electrical Code. Penetration of the membrane of common walls for electrical boxes shall comply with R302.4

R302 Fire-Resistant Construction

R302.2.2 Common Walls;

- 1. Where an *automatic* sprinkler system in accordance with R313 is provided, the common wall shall not be less than 1-HR tested in accordance with ASTM E119, UL 263, or 703.2.2 CBC.
- 2. Where an *automatic* sprinkler system in accordance with R313 is not provided, the common wall shall be not less than 2-HR tested in accordance with ASTM E119, UL 263, or 703.2.2 CBC.

Exception: *Common walls are permitted to extend to and be tight against the inside of the exterior walls if the cavity between the end of common wall and the exterior sheathing is filled with a minimum of 2-inch nominal thickness wood studs.*

- **The "structural independence" requirement has been removed for sprinklered buildings. This was added as an incentive for parts of the country that have not adopted sprinkler requirements. See R302.2.6*

R302 Fire-Resistant Construction

- **R302.3 Two-family dwellings;** Dwelling units in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance-rating where tested in accordance with ASTM E119, UL 263, or 703.2.2 of the California Building Code. *Such separation shall be provided regardless of whether a lot line exists between the two dwelling units or not.* Fire-resistant rated floor/ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.
- **This was added to the code to clarify that separation walls consistent with townhouse construction was required in duplexes. This change acknowledges that a fire does not know if a property line exists or not between units.*

2022 California Residential Code

R302.4 Dwelling unit Rated Penetrations;

- **An exception has been added for sprinkler pipe filled with water. The sprinkler piping of any approved type material does not require fire-stop intumescent caulking to fill the annular space around the pipe. And approved material is required to be placed around piping, but can be similar to metal piping. Through wall and membrane penetrations no longer require fire-stop products around plastic sprinkler piping.*

2022 California Residential Code

R302 .5 Dwelling Garage Opening Protection; Openings and penetrations through the garage walls or ceilings separating the dwelling from the garage shall be in accordance with Sections R302.5.1 through R302.5.3

- R302.5.1 Doors shall be self-closing *and self-latching*.

2022 California Residential Code

- R302.8 Foam Plastics; see R316 for requirements.
- **302.8.1 Interior finishes; foam plastics used as interior finishes shall comply with R316.5.10**

2022 California Residential Code

R303.1 Mechanical Ventilation;

- **The exceptions have changed… mostly for kitchen exhaust. We will cover the requirements in the CMC and Energy Code.*

2022 California Residential Code

- R305. 1, Ceiling Height; Habitable space , hallways and portions of basements shall have a ceiling height of 7’ minimum. Bathrooms, toilet rooms, and laundry rooms shall have a ceiling height of not less than 6 feet, 8 inches.

2022 California Residential Code

- **Exceptions:**

1. For rooms with sloped ceilings, the required floor area shall have a ceiling height of not less than 5 feet and not less than 50% of the required floor area shall have a ceiling height of not less than 7 feet.
2. The ceiling heights above bathrooms and toilet fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower head shall not be less than 6'-8" and the show shall have a 30" X 30" area min.
3. Beams, girders, ducts or other obstructions in basements containing habitable space shall be permitted to project to within 6'-4" of the finished floor.
4. ***Beams and girders spaced apart not more than 36" in clear finished width shall project not more than 78" from the finished floor.***

2022 California Residential Code

R308.4.5 Glazing and Wet Surfaces; Glazing in walls, fences, or enclosures containing or *adjacent to* hot-tubs, spas, whirlpools, steam-rooms, saunas, bath-tubs, showers, and indoor or outdoor swimming pools where the bottom edge of the glazing is less than 60 inches above the standing or walking surface shall be considered a hazardous location.

2022 California Residential Code

- **R310 Emergency Escape and Rescue Openings;** Basements, habitable attics, and every sleeping shall have not less than one operable emergency escape & rescue opening. Where basements contain more than one sleeping room, an emergency escape shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way.
- ***This section, starting with the exceptions has been completely re-written and now is consistent with the CBC Section 1030.***
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- ***Note: Definition of Emergency Escape & Rescue Opening has changed in R202.***

2022 California Residential Code

R310.1 Exceptions:

- ***1. Basements with a ceiling height of less than 80" shall not be required to have emergency escape and rescue openings.***
- ***2. Emergency escape and rescue openings are not required from basements or sleeping rooms that have an exist door or exit access door that opens directly into a public way or to a yard, court or exterior egress balcony that opens to a public way.***
- ***3.*** Basements ***without habitable spaces and*** having not more than 200 SF in floor ***area shall not be required to have an emergency escape and rescue opening.***
- ***4.*** Storm shelters ***are not required to comply with this section where the shelter is constructed to ICC 500.***
- ***5.*** Where the dwelling unit or townhouse unit is equipped with an automatic sprinkler system installed to Section R313, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided the basement has one of the following:

2022 California Residential Code

- **5.1** One means of egress complying with Section R311 and one emergency escape and rescue opening.
- **5.2** Two means of egress complying with Section R311.
- **R310.1.1 Operational constraints and opening control devices;** Emergency escape and rescue openings shall be maintained free of any obstructions other than those allowed by this section and shall be operational from inside of the room without the use of keys, tools or special knowledge. Window opening control devices ***and fall prevention devices*** complying with ASTM F2090 ***shall be permitted for use on windows serving as a required emergency escape and rescue opening, and shall not be more than 70" AFF. The release mechanism shall be maintained operable at all times***.
- ***Such bars, grills, grates or any similar devices shall be equipped with an approved exterior release device for use by the fire department only when required by the AHJ.***
- ***Where security bars (burglar bars) are installed on emergency egress and rescue windows or doors, on or after July 1, 2000, such devices shall comply with California Building Standards Code, Part 12, Chapter 12-3, and other applicable provisions of this code***

2022 California Residential Code

R310.2 Emergency escape and rescue openings shall have minimum dimensions ***in accordance with Sections R310.2.1 through R310.2.4***.

- **R310.2.1** ***Minimum size***; Emergency escape and rescue openings shall have a net clear opening of not less than 5.7 square feet.
- Ex**ception:** ***The minimum*** net clear opening for grade-floor emergency escape and rescue openings shall be 5 SF.
- ***R310.2.2 Minimum Dimensions;*** The ***minimum*** net clear opening height dimension shall be 24”. The ***minimum*** net clear width opening shall be 20” ***The net clear opening dimensions shall be the result of normal operation of the opening***

2022 California Residential Code

- ***R310.2.3 Maximum height from floor***; Emergency escape and rescue openings shall have the bottom of the clear opening not greater than 44” measured from the floor. (R202 now clarifies measurement)
- ***R310.2.4*** Emergency escape and rescue openings under decks, porches ***and cantilevers***; Emergency escape and rescue openings installed under decks, porches ***or cantilevers*** shall be fully openable and provide a path not less than 36” in width to a yard or court.
- **R310.3 Emergency Escape and rescue doors;** Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a sliding door.
- **There has been some deletion of language for area wells below grade, and some additional or re-written language in these sections..*

2022 California Residential Code

- ***R310.4 Area Wells; An emergency escape and rescue opening where the clear opening is below the adjacent grade shall be provided with an area well in accordance with the sections R310.4.1 through R310.4.4.***
- ***R310.4.1 Minimum size; The horizontal area of*** area well ***shall not be less than 9 SF,*** with a horizontal projection and width of not less than 36”. The size of the area well shall allow the emergency and rescue opening to fully open.

- ***Exception: The ladder or steps required by R310.4.2 shall be permitted to encroach into the required area well by not more than 6”.***

2022 California Residential Code

R310.4.2 Ladder and steps; Area wells with a vertical depth greater than 44” shall be equipped with an approved permanently fixed ladder or steps. ***The ladder or steps shall not be obstructed by the emergency escape or rescue opening where the door or window in the open position***. Ladder or steps required by this section shall not be required to comply with R311.7

- **R310.4.2.1** Ladders and rungs shall have an inside width of not less than 12”, shall project not less than 3” from the wall, and shall not be spaced by not more than 18 inches on center vertically for the full height of the area well.
- ***R310.4.2.2 Steps shall have an inside width of not less than 12”, a minimum tread of 5”, and a maximum riser height of 18” for the full height of the area well***

2022 California Residential Code

- **R310.6 Dwelling additions**; Where dwelling additions contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where dwelling additions have basements, an emergency escape and rescue opening shall be provided in the new basement.
- Exceptions:
- 1. An emergency escape and rescue opening is not required in a new basement that contains a sleeping room with an emergency escape and rescue opening.
- 2. An emergency escape and rescue opening is not required in a new in a new basement where there is an emergency escape and rescue opening in an existing basement that is accessed from the new basement.
- ***3. An openable window complying with Section 310.7.1 shall be acceptable as an emergency escape and rescue opening.***

2022 California Residential Code

- ***R310.7*** **Alterations or repairs of existing basements**; New sleeping rooms created in an existing basement shall be provided with emergency escape and rescue openings in accordance with R310.1. Other than new sleeping rooms where existing basements undergo alterations or repairs, and emergency escape and rescue opening is not required.
- ***Exception: An operable window complying with Section 310.7.1 shall be acceptable as an emergency escape and rescue opening.***

2022 California Residential Code

- ***R310.7.1 Existing emergency escape and rescue openings; Where a change of occupancy would require and emergency escape and rescue opening, in accordance with R310.1, operable windows serving as the emergency escape and rescue opening shall comply with the following:***
- ***1. An existing operable window shall provide a minimum net clear opening of 4 square feet with a net clear opening height of 22", and a minimum net clear opening width of 20".***
- ***2. A replacement window where such window complies with both the following:***
- ***2.1 The replacement window meets the size requirements in item 1.***
- ***2.2 The replacement window is the manufacturer's largest standard size window that will fit into the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window, or a style that provides for an equal or greater window opening area than the existing window.***

- * Opening reductions are now allowed in basement remodels, basement additions or change of occupancy.

2022 California Residential Code

- **Means of Egress** –
- ***R311.7 Stairways****; Where required by this code or provided, stairways shall comply with this section****.***
- ***Exceptions:***
- ***1. Stairways not within or serving a building, porch or deck.***
- ***2. Stairways leading to non-habitable attics.***
- ***3. Stairways leading to crawl spaces.***

**This section has been re-written with new exceptions added. This section previously only applied to stairs within or serving a building, porch or deck. (see R202 definition for stairway)*

2022 California Residential Code

- **R311.7.7 Stairway walking surface;** The walking surface of treads and landings of stairways shall be sloped not steeper than 1 unit vertical in 48 units horizontal (2%).

- ***A new exception has been added to this section.***

2022 California Residential Code

- ***Exception**: Where the surface of a landing is required elsewhere in the code to drain surface water, the walking surface of the landing shall not be sloped steeper than 1 unit vertical in 20 units horizontal (5%).*

2022 California Residential Code

- **R311.8 Ramps**; *Where required by this code or provided, ramps shall comply with this section.*
- ***Exception:*** *Ramps not within or serving a building, porch, or deck.*
- **Portions of this section re-written and exception is new. Essentially the ramp slopes, handrail, and landing requirements remain the same.*

2022 California Residential Code

- **R312 Guards and window fall protection**

- **R312.2.1** In dwelling units where ***the bottom of the clear opening of an*** operable window opening is located less than 24” AFF and greater than 6’ above finished grade or other surface below on the exterior of the building, the operable window shall comply with one of the following:
- 1. Operable window openings will not allow a 4” diameter sphere to pass through where openings are in their largest opened position.
- 2. Operable windows are provided window opening control devices ***or fall protection devices*** that comply with ASTM 2090.
- **R312.2.2** ***Emergency escape and rescue openings***. ***Where a operable window serves as an emergency escape and rescue opening***, a window opening control device ***or fall protection device***, after operation to release the control device ***or fall prevention device*** allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1 ***and R310.2.2***

- **The above change from sill to clear opening matches other code language.*

2022 California Residential Code

- **R313.3.3.2 Shutoff valves prohibited;** With the exception of shutoff valves for the entire water distribution system *or a single master control valve for the automatic sprinkler system that is locked in the open position*, valves shall not be installed in any location where the valve would isolate piping serving one or more sprinklers.

2022 California Residential Code.

R314 **Smoke Alarms**

- **314.3 Location;** Smoke alarms shall be installed in the following locations:
- 1. In each sleeping room
- 2. Outside each sleeping area in the immediate vicinity of the bedrooms
- 3. On each additional story of the dwelling, including basements and habitable attics and not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
- 4. Not less than 3' horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
- ***5. In the hallway and in the room open to the hallway in dwelling units where the ceiling height of a room open to the hallway serving bedrooms exceeds that of the hallway by 24 inches or more.***

2022 California residential Code

R315 Carbon Monoxide Alarms

- **R315.2.2 Alterations, repairs and additions**; Where an addition is made to an existing dwelling or a fuel-burning heater, appliance or fireplace is added to an existing dwelling not previously required to be provided with carbon monoxide alarms, new carbon monoxide alarms shall be installed in accordance with Section R315.
- **Exceptions:**
- **1**. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition of or replacement of windows or doors, or the addition of a porch or deck.
- **2**. Installation, alteration or repairs of plumbing systems.
- ***3. Installation, alteration or repairs of mechanical systems that are not fuel-fired***.

*Not sure this exception will be significant since the California Energy Code is moving towards all-electric homes!

2022 California Residential Code

- R316 **Foam Plastic**
- **R316.3 Surface burning characteristics.** Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction ***shall comply with Section R316.3.1 or R316.3.2.*** Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke developed index.
- **Exceptions:**
- ***1. Spray foam plastic insulation more than 4" in thickness shall have a flame spread index of not more than 25, and a smoke developed index of not more than 450 where tested at a thickness of 4" and at the density intended for use. Such spray foam plastic shall be separated from the interior of the building by ½" gypsum wallboard, or by a material that has been tested in accordance with NFPA 275, and shall meet the acceptance criteria of both the Temperature Transmission Fire Test, and the Integrity Fire Test.***

2022 California Residential Code

- ***R316.3.1 Foam plastic 4 inches thick or less.*** *Foam plastic insulation installed at 4 inches in thickness or less shall have a flame spread index of not more than 75 and a smoke developed index of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723.*
- ***R316.3.2 Foam plastic insulation more than 4 inches thick.*** *Foam plastic insulation installed at more than 4" in thickness shall have a flame spread index of not more than 75, and a smoke developed index of not more than 450 where tested at a thickness of 4 inches in accordance with ASTM E84 or UL 723 provided the end use is approved in accordance with Section R316.6 using the density and thickness intended for use.*

2022 California Residential Code

- **R317 Protection of Wood and Wood-based Products against Decay;** Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood, or wood that is preservative-treated in accordance with AWPA UI:
- 1. In crawl spaces or unexcavated areas located within the periphery of the building foundation, wood joists or the bottom of a wood structural floor where closer than 18” to the exposed ground, wood girders where closer than 12” to the exposed ground, and wood columns where closer than 8” to the exposed ground.
- 2. Wood framing members*, including columns,* that rest directly on concrete or masonry exterior foundation walls and are less than 8” from the exposed ground.
- 3. Sills and sleepers…
- 4. The ends of wood girders…
- 5. Wood structural members supporting moisture-permeable floors or roofs…

2022 California Residential Code

- **R317 Protection of Wood** *(continued)*
- 6. Wood siding…
- 7. Wood furring strips…
- *8. Portions of wood structural members that form the structural support of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from roof, eave, overhang or other covering that would prevent water or moisture accumulation on the surface or at joints between members.*
- ***Exception:*** *Sawn lumber used in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use naturally durable or preservative-treated wood where the structure is exposed to the weather.*
- *9. Wood columns in contact with basement floor slabs unless supported by concrete piers or metal pedestals 1” above the concrete floor and separated from the concrete floor by an impervious moisture barrier.*

R320 Accessibility

- **R320.1 Scope;** Dwelling units in a building consisting of three or more dwelling units or four or more condo units shall meet the requirements of the CBC Chapter 11A. Covered multi-family dwellings include but are not limited to dwelling units listed in Section 1.8.2.1.2. Dwelling units within a single structure separated by firewalls do not constitute separate buildings.
- ***R320.2 Live/work units;*** *In a structure where there are four or more live/work units, the dwelling portion of the live/work unit shall comply with Chapter 11A. In a structure where there are one or more units defined as public housing, the dwelling portion of the live/work unit shall comply with Chapter 11B of the CBC. The work portion of the unit must comply with 11B if it is a public accommodation.*

R324 Solar Energy Systems

- ***This section has some new language for exceptions for installation of Building Integrated Photo-voltaic panels (BIPV), and some expanded equipment listings.***
- The following have added exceptions for BIPV:
- Section R324.6; Roof access and pathways (not required for firefighters).
- Section R324.6.3; Emergency Escape and Rescue Openings (36” pathway not required)
- *There is also some new language for Solar PV installed on support structures. See R324.8*

What's New in the 2022 California Residential Code?

R327 Aging in place design and fall protection;

**This is a completely new section in the code*

SB-280 October 8, 2019 was signed into law requiring HCD to consider changes to CRC to address aging-in-place

R327 Aging In Place Design

R327.1 Newly constructed dwellings shall comply with Section R327.1.1 through R327.1.4;

- ***exceptions:*** *multi-family built in accordance with 11A CBC; or Public housing built in compliance with 11B CBC.*
- ***R327.1.1 Reinforcement for grab bars;*** *at least one bathroom on the entry-level shall comply with the requirements for reinforcement in this section. If there is no bathroom on the entry-level, at least one bathroom on the second or third-floor shall comply.*
- ***1****. Reinforcement shall be solid lumber or other construction material approved by the enforcing agency.*
- ***2.*** *Reinforcement shall not be less than 2X8 nominal lumber or other construction material providing equal height and load capacity. Reinforcement shall be located between 32” and 39 ¼” AFF****.***
- ***3.*** *Water closet reinforcement shall be installed on sidewall and back wall****.***
- ***4.*** *Shower compartment reinforcement shall be continuous where wall framing is provided.*
- ***5.*** *Bathtub and combination bathtub/showers shall have reinforcement continuous on each end wall, and the back wall. Additionally, the back wall shall have reinforcement for a lower bar not higher than 6” above the bathtub rim.*

R327 Aging In-place

- ***Exceptions:***
- ***1****. Where water closet is not placed next to a side wall capable of accommodating a grab bar, the bathroom shall have provisions for a floor-mounted grab bar, fold-away grab bar or similar reinforcement approved by the enforcing agency.*
- ***2.*** *Reinforcement shall not be required in wall framing for pre-fabricated shower enclosures and bathtub wall panels that have integral factory installed grab bars.*
- ***3.*** *Shower enclosures that do not permit installation of grab bars shall be permitted provided that reinforcement for floor-mounted grab bars is provided, or alternate method is approved by the enforcing agency****.***
- ***4****. Bathtubs with no surrounding walls or where wall panels do not permit the installation of reinforcement shall be permitted provided reinforcement for floor-mounted grab bars is provided adjacent to the tub or alternate method approved by the AHJ.*
- ***5.*** *Reinforcement is not required for tubs or showers installed on concrete slab floors.*

R327 Aging In-place

- **R327.1.1.1 Documentation of grab bar reinforcement;**
- Information and/or drawings identifying the location of grab bar reinforcement shall be provided in a maintenance manual in accordance with the California Green Building Standards Code, Chapter 4, Division 4.4

R327 Aging In-place

R327.1.2 Electrical Receptacle outlet, switch and control heights;

- Electrical receptacle outlets, switches and controls (including controls for HVAC), intended to be used by the occupants shall not be located higher than 48” AFF measured from top of box, nor lower than 15” from finished floor measured from the bottom of the box.
- **Exceptions:**
- **1.** Dedicated receptacles, floor receptacles, controls mounted on ceiling fans or lights, or appliances. 2. Receptacles required by the CEC on the wall where the distance between a built-in feature and finished floor is less than 15”, such as a window.

R327 Aging In-place

- **R327.1.3 Interior Doors;**
- Effective July 1, 2024, at least one bathroom and one bedroom door at the entry level shall provide a doorway with a net clear opening of not less than 32” with the door positioned at a 90 deg angle from the closed position. Where a bedroom or bathroom is not located on the entry level, a bedroom and/or bathroom on the second or third floor of the dwelling shall comply.

R327 Aging In-place

- **R327.1.4 Doorbell buttons;** Doorbell buttons or controls shall be located not more than 48” above the finished landing or exterior floor measured from the top of the button or control.
- **Where doorbell buttons integrated with other features are required to be above 48”, a standard button shall be installed at 48” AFF.**

R328 Energy Storage Systems

- *This section was formerly R327 Stationary Storage Battery Systems in the 2019 CRC.*

- *This section is now located in **R328** with a new title and many new requirements.*

R328 Energy Storage Systems

R328.1 General; Energy Storage Systems (ESS) shall comply with this section.

- **Exceptions:**

1. **ESS** listed and labeled in accordance with UL 9540 and marked "For use in residential dwellings" where installed in accordance with the manufacturer's instructions **and the California Electrical Code.**
2. **ESS less than 1kWh (3.6 megajoules)**

R328.2 Equipment listings; **Energy Storage Systems** shall be listed and labeled in accordance with UL 9540

Exception: *Where approved, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds not less than 5' from exterior walls, property lines or public ways*

R328 Energy Storage Systems

- R328.3 **Installation**; ESS shall be installed according to their listing and the manufacturer's instructions.
- **R328.3.1 Spacing;** Individual units shall be separated from each other not less than 3' except where smaller separation distances are documented based on large-scale fire testing complying with Section 1207.1.5 CFC

R328 Energy Storage Systems

- **R328.4 Locations;** ESS shall only be installed in the following locations:

1. *Detached garages and detached accessory structures.*
2. *Attached garages separated from the dwelling in accordance with Section R302.6*
3. *Outdoors or on the exterior side of exterior walls located not less than 3’ from doors or windows of the dwelling.*
4. *Enclosed utility closets, basements, storage or utility spaces within dwelling units that have finished or non-combustible walls and ceiling. Walls and ceilings shall have 5/8” Type-X gypsum Board. ESS shall not be installed in sleeping rooms, or closets or spaces opening directly into sleeping rooms or in habitable spaces of the dwelling.*

R328 Energy Storage Systems

R328.5 Energy Ratings; Individual ESS units shall have a maximum rating of 20 kWh. The aggregate ESS rating shall not exceed:

- **1. 40 kWh within utility closets, basements and storage spaces.**
- **2. 80 kWh in attached or detached garages and detached accessory structures**
- **3. 80 kWh on exterior walls**
- **4. 80 kWh outdoors on the ground**

- *ESS installations exceeding the permitted individual or aggregate ratings shall be installed in accordance with Section 1207 CFC*

R328 Energy Storage Systems

- **R328.6 Electrical installation**; **ESS shall be installed according to the CEC**. Inverters shall be listed to UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall also use inverters listed for utility interaction.
- **R328.7 Fire Detection;** Rooms and areas within dwelling units, basements and attached garages in which ESS is installed shall be protected by smoke alarms in accordance with Section R314. A heat detector listed and interconnected to the smoke alarms, shall be installed in locations within dwelling units and attached garages where smoke alarms cannot be installed based on their listing.

R328 Energy Storage System

- **R328.8 Protection from impact**; **ESS** installed in a location subject to vehicle damage **in accordance with R328.8.1 or R328.8.2 shall be provided with impact protection in accordance with R328.8.3**.
- **R328.8.1 Garages;** *Where ESS is installed in normal driving path in the garage, impact resistance shall be provided in accordance with 1207.11.7.3; the normal driving path is the space between the vehicle door and the back wall to a height of 48" AFF. The width of the normal driving path is the width of the garage door opening. Impact protection shall also be provided for the following locations*:
- **1.** *On the interior face of the back wall and located within 36" to the left or right of the normal driving path*.
- **2.** *On the interior face of a side wall and located within 24" of the back wall and within 36" of the normal driving path.*
- **Exception:** ***Where the clear height of the vehicle garage opening is 7'-6" or less, ESS installed not less than 36" AFF are not subject to vehicle impact requirements***.

R328 Energy Storage System

- **R328.8.3 Impact protection options**; *(there are various options to protect these batteries).*
- ***R328.9 Ventilation**; Hydrogen or other flammable gases produced by indoor ESS shall be ventilated according to the CMC.*
- ***R328.10 Electric vehicle use;** the temporary use of an electric vehicle to power a dwelling unit while parked in a garage or outdoors, shall comply with the manufacturer's instructions and the CEC.*

- *R328.11 **Documentation and labeling**; The following info shall be provided:*
- ***1.** A copy of the manufacturer's installation, operating, maintenance and decommissioning instructions shall be provided to the owner or placed near the ESS.*
- ***2**. A label on the installed equipment containing the contact info for a qualified maintenance and service provider.*

R328 Energy Storage Systems

And finally…

R328.12 Toxic and highly toxic gas; ESS that have the potential to release toxic or highly toxic gases during charging, discharging or normal usage, shall not be installed in R-3 or R-4 occupancies.

R329 Stationary Engine Generators

This is an entirely new section in the CRC

- **R329.1 General**; Stationary generators shall be listed and labeled in accordance with UL 2200…
- **R329.2 Installation**; The installation of Stationary Engine Generators shall be in an approved location and in accordance with the listing, the manufacturer's instructions, and the CEC.

R329 Stationary Engine Generators (continued)

- **R329.1 … The connection of Stationary Engine Generators to the premise wiring system shall be by means of a listed transfer switch**

- ***Let's take a look at the CFC section on portable generators.***

2022 California Fire Code

- **Section 1204 PORTABLE GENERATORS:**
- **1204.1 Portable Generators;** The use, operation and maintenance of portable generators shall comply with this section.
- **1204.2 Listing;** *Portable generators manufactured after January 1, 2021 shall be listed and labeled in accordance with UL 2201.*
- **1204.3 Operation and maintenance;** Portable generators shall be operated and maintained in accordance with the manufacturer's instructions.
- **1204.4 Grounding;** Portable generators shall be grounded in accordance with the California Electrical Code.

2022 California Fire Code

- **1204.5 Operating locations;** *Portable generators shall be operated outdoors only; a minimum of 5’ from any building openings such as windows, doors or air intakes. Portable generators shall not be operated within buildings or in enclosed areas. Additional separation for tents, membranes structures and outdoor assembly events shall comply with Chapter 31.*

- **1204.6 Cords and wiring;** *Extension cords and temporary wiring used to connect portable generators shall be in accordance to Section 603, and shall be provided GFCI protection.*

2022 California Fire Code

1204.7 Connection to premise wiring;
Connections to a premise wiring system shall comply with all of the following:

1. Power shall not be provided in a manner that "back-feeds" receptacles or the premise wiring system.

2022 California Fire Code

- ***1204.7 Connection to premise wiring;*** (continued)
- ***2*. Connection to a premise served by commercial power shall be made through a listed transfer switch installed, used and maintained in accordance with the California Electrical Code.**
- ***3.*** *Connections to buildings not served with commercial power shall comply with the California Electrical Code.*

R330 Stationary Fuel Cell Power Systems

- ***This is an entirely new code section.***

- ***R330.1 General; Stationary Fuel Cell Power Systems in new and existing structures shall comply with Section 1206 of the California Fire Code.***

2022 California Residential Code

- ***R337.2 Fire-resistant Vegetation;*** *Plants, shrubs, trees and other vegetation which exhibit properties such as high moisture content, little accumulation of dead vegetation, and low sap or resin content, that make them less likely to ignite…*

R337.2 Fire Resistant Vegetation (continued)

- *…or contribute heat or spread flame in a fire than native vegetation typically found in the region.*

- Note: The following sources contain examples of types of vegetation that can be considered fire-resistant vegetation: Fire Resistant Plants for Home Landscapes, A Pacific Northwest Extension publication; Home Landscaping for Fire, UC division of Ag & Natural Resources; Sunset Western Garden Book

2022 California Residential Code

- **R337.10.4 Fire Ratings of Accessory Buildings; Roof Construction.**
- *Roofs of accessory buildings required to be constructed entirely of non-combustible materials or ignition-resistant materials shall comply with the requirements of R337 and Chapter 9. Roof assemblies in Fire Hazard Severity Zones shall comply with a Class A rating…*
- *This new section clarifies that when non-combustible or ignition-resistant construction is required, the roof shall be Class A Fire Rated.

Chapter 4: Foundations

- Tables R403.1(1), (2), and (3) were modified to reflect current practice and actual loads. (some footing sizes have been *reduced* to what previous code editions had for minimum footing sizes).
- 406.2 Foundation Waterproofing; *6-mil polyvinyl chloride and polyethylene fabrics have been deleted* as an approved waterproofing method. Six-mil products have been found to not hold up to backfill materials and may tear, causing water intrusion into the building's interior.

Chapter 5: Floors

- **R506.2.3 Vapor Retarders** Under Concrete Slabs; A thicker vapor retarder, *10-mil* (instead of 6-mil) is required below slabs-on-grade in the 2022 CRC.
- **R507 Deck Loads;** Decks are now required to be designed for a 40 pound live-load, and 10 pound dead-load. The *2022 CRC requires the deck to be designed for snow loads* (if applicable).
- **R507.3 Deck Footings;** Free standing deck footing exceptions clarified, and add an additional tributary area of 5 psf to footing size table. This change allows a smaller footing than the minimum size of 12” X 12”. A *7” square* or *8” round* footing is allowed for small areas such as stairs or landings.

2022 California Residential Code

- R507.4 Deck Posts; Table R507.4 has been modified to allow for more options on post heights and wood species. This change will allow *taller post heights for 4X4 and 4X6* posts.
- R507.5 Deck Beams, R507.6 Deck Joists; The deck beam and deck joists Tables have been revised to consider *snow loads greater than 40 psf.* Cantilever spans are based on *actual span* rather than what the beam or joist was allowed to span.
- R507.7 Decking; The decking span table has been revised to allow *24" OC joists spacing for 2" nominal wood decking* instead of the maximum 16" OC for the 2019 CRC. The 2019 CRC was conservative and not consistent with the American Lumber Standard Committee which allowed 24" OC joists spacing for 2" nominal lumber.

Chapter 6 Wall Construction

- Table R602.3 (1) has been modified to add options for fasteners for roofs and walls. This change aligns the fastener options in Table 2304.10.1 CBC with Table R602.3 (1) CRC.

**There were some fasteners in the CBC that were not in the CRC; this change will make these two tables consistent.*

- Item 12 was also added to Table R602.3(1), Full-height (King) stud nailing to header.

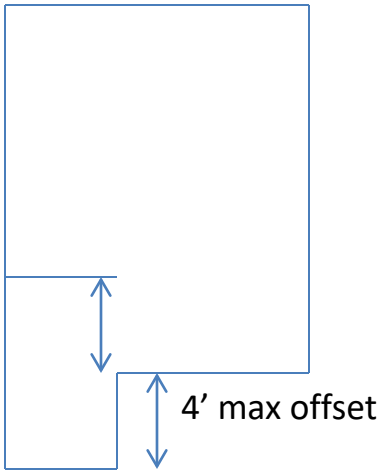
2022 CRC Chapter 6

- Table R602.3(1) Fasteners – Roof Sheathing:
- *Item 31, 32, and 33 have been modified to increase nailing to intermediate supports (field nailing) to 6” O.C. for some fasteners. Roof sheathing nailing has been updated in Table R602.3 (1) based on wind load values from ASCE 7.*
- *WSP are also now required to be 6” O.C.in the field and edges.*

2022 California Residential Code

- *A new footnote has been added to Table R602.3 (1) to allow alternate attachment for roof sheathing; *In areas with wind-speeds equal or less than 110 MPH, 0.113-inch diameter nails are allowed at a maximum of 3” O.C. spacing.*

2022 California Residential Code



- **R602.10.1.2 Location of Braced Wall Lines and permitted offsets;** *Each Braced Wall line shall be located such that no more than two-thirds of the required braced wall panel length is located to one side of the braced wall line. Braced wall panels shall be permitted to be offset not more than 4 feet from the designated braced wall line. Braced wall panels parallel to a braced wall line shall be offset not more than 4 feet from the designated braced wall line location as shown in Figure R602.10.1.1*
- *This section was modified to prevent misinterpretation of the bracing requirements of Chapter 6. Some designers were taking advantage of the vague language that was in Chapter 6 since the wall bracing section was re-written in the 2010 Code and ignoring the fundamentals of wall bracing.

2022 California Residential Code

- **R602.10.2.2 Location of Braced Wall Panels (BWP's);** A braced wall panel shall begin within 10 feet from each end of a braced wall line as determined in Section R602.10.1.1. The distance between the adjacent edges of BWP's along a braced wall line shall not be greater than 20 feet as shown in Figure R602.10.2.2.

Exceptions:

- *1. Braced wall panels in Seismic Design Category D shall comply with Section R602.10.2.2.1*
- *2. Braced Wall Panels with continuous sheathing in Seismic Design Category A, B, or C shall comply with Section R602.10.7*

2022 California Residential Code

- **R602.10.2.2.1 Location of BWP's in SDC D;** Braced wall panels shall be located at each end of the braced wall line.

- **Exceptions:**

1. BWP's constructed of WSP or BV-WSP and continuous sheathing methods as specified in R602.10.4 shall be permitted to begin not more than 10'from end of braced wall line provided it complies with the following:

- 1.1 A min. 24" wide panel for Method WSP, CS-WSP, CS-G, and CSPF is applied to each side of the building corner as shown in End Condition 4 of Figure R602.10.7

2022 California Residential Code

R602.10.2.2.1 *(continued)*

- **1.2** The end of each braced wall panel closest to the end of the braced wall panel line shall have an 1,800 lb hold-down device fastened to the stud at the edge of the BWP closest to the corner and to the foundation or framing below as shown in End Condition 5 of Figure R602.10.7
- ***2.*** *Braced Wall Panels constructed of Method PFH or ABWP or of Method BV-WSP where a hold-down device is provided in accordance with Table R602.10.6.5.4 shall be permitted to begin not more than 10' from each end of the braced wall line.*

2022 California Residential Code

Chapter 7
Wall Covering

- **R703.2 Water Resistive Barriers;** *Not fewer than one-layer* of water resistive barrier shall be applied over studs or sheathing of all exterior walls *with flashing as indicated in R703.4, in such a manner as to provide a continuous water resistive barrier behind the exterior wall veneer. The water resistive barrier material* shall be continuous to the top of the walls and terminated at penetrations and building appendages in a manner to meet the requirements of exterior wall envelope as described in R703.1.

2022 California Residential Code

Water resistive barrier materials shall comply with one of the following:

1. No. 15 felt complying with ASTM D226, Type I
2. ASTM E2556 Type I or II
3. ASTM E331 in accordance with Section R703.1.1
4. Other approved materials installed in accordance with the manufacturer's installations instructions.

2022 California Residential Code

R703.7.3 Water-resistive Barriers; Water-resistive barriers shall be installed as required in R703.2 and where applied over wood-based sheathing*, shall comply with Section R703.7.3.1 or R703.7.3.2.*

R703.7.3.1 Dry climates; *In dry climates, as indicated in Figure N1101.7, water resistive barriers shall comply with one of the following:*

2022 California Residential Code

- ***1.*** *The water-resistive barrier shall be two-layers of 10-minute Grade D paper or have water-resistance equal to or greater than two-layers of water-resistive barrier complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane. Flashing installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, shall be directed between the layers.*

2022 California Residential Code

- ***2.*** *The water-resistive barrier shall be 60-minute Grade D paper or have a water-resistance equal to or greater than one-layer of a water-resistive barrier complying with ASTM E2556, Type II. The water-resistive barrier shall be separated from the stucco by a layer of foam plastic insulated sheathing or other non-water absorbing layer or a designed drainage space.*

2022 California Residential Code

- R704 Soffits

- **R704.1 General Wind Limitations; Where the design wind pressure is 30 pounds per square foot or less, soffits shall comply with Section R704.2. Where the design wind pressure exceeds 30 pounds per square foot, soffits shall comply with R704.3. The design wind pressure on soffits shall be determined using the component and cladding loads specified in Table R301.2.1 (1) for walls using an effective wind area of 10 SF and adjusted for height and exposure in accordance with Table R301.2.1 (2).**

- *This is new language for soffits and addresses several different material types to ensure they are properly attached and have proper backing. This section was proposed to address poor performance of soffits in hurricane prone regions.*

2022 California Residential Code

- ***Chapter 8 Roof- Ceiling Construction***

R802 Fire-Retardant-Treated Wood

- R802.1.5 ***This Section has some new wording to clarify testing and methods of treating wood products.***

- **R802.1.5.2 Other means during manufacture;** *For wood products impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.* ***The use of paints, coatings, stains or other surface treatments is not an approved method of protection as required by this section.***

R802 Fire-Retardant-Treated Wood

- **R802.1.5.3 Testing;** For fire retardant treated wood products, the front and back faces shall tested in accordance with and produce the results in Section R802.1.5

- **R802.1.5.3.1 Testing of wood structural panels;** wood structural panels shall be tested with a ripped or cut longitudinal gap of 1/8”.
- ***(*this is a new method of required testing for structural panels)***

R802 Ridge

- **R802.3 Ridge;** A ridge board used to connect opposing rafters shall be not less than 1” nominal thickness and not less in depth than the cut end of the rafter. Where ceiling joist or rafter ties do not provide continuous ties across the structure as required by R802.5.2, the ridge shall be supported by a ***wall*** or ridge beam ***designed in accordance with accepted engineering practice***, and supported on each end by a wall or ***column***.

2022 California Residential Code

- **R802.4.2 Framing Details;** Rafters shall be framed *opposite from each other* to a ridge board, shall not be offset more than 1 ½" from each other, and shall be connected with a collar-tie or ridge strap in accordance with Section R802.4.6, *or directly opposite each other to a gusset plate in accordance with Table R602.3(1).*
- **R802.4.6 Collar Ties;** Where collar ties are used to connect opposing rafters, they shall be located in the upper-third of the attic space…collar-ties shall not be less than 1 X 4" nominal, spaced not more than 4' O.C. *Ridge straps shall be permitted to replace collar-ties. Ridge straps shall be not less than 1 ¼" X 20 gage and shall be nailed to the top of each rafter with not fewer than three 10d common nails, with the closest nail 2 1/8" from end of rafter.*

2022 California Residential Code

- **R802.5 Ceiling Joists;** Ceiling joists shall be continuous across the structure or securely joined where they meet over the interior partitions in accordance with *Section R802.5.2.1. Ceiling joists shall be fastened to the top plate in accordance with Table R602.3 (1).*

2022 California Residential Code

- **R802.5.2 Ceiling Joist and Rafter Connections;** Where ceiling joists run parallel to rafters, *and are located* in the bottom third of the rafter height, *they shall be installed* in accordance with Figure R802.4.5 *and fastened to rafters in accordance with Table R802.5.2(1).* Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be designed as a beam *in accordance with Section R802.3.* Where ceiling joist do not run parallel to rafters, rafters shall be tied across the structure with a rafter-tie *in accordance with R802.5.2.2, or the ridge shall be designed as a beam in accordance with R802.3.*

2022 California Residential Code

- **R802.5.2.1 Ceiling Joists Lapped;** Ends of ceiling joists shall be lapped not less than 3” or butted over the bearing partition or beam and toenailed to the bearing member. Where ceiling joists are used *to provide the continuous tie across the building,* lapped joists shall be nailed together…

**The connection requirements for ceiling joists, rafters, and collar-ties has been clarified in the 2022 code. Roof loads will often push out the bearing walls, so the code has clarified requirements to prevent this. The triangle created by rafters, ceiling joists and collar-ties provide a very strong and stable shape.*

2022 California Residential Code

- **Chapter 8 – Roof-Ceiling Construction**

- *California Energy Commission*

- **R806 Roof Ventilation**;
- Informational Note added to the section with specific reference to Table R702.7(5)
- regarding the applicability of energy efficiency measures and to reinforce the
- difference between climate zones identified in ICC model codes and climate zones
- identified in the California Energy Code.

2022 California Residential Code

- State Fire Marshal

- ***R806.1.1 Vents in the Wildland Urban Interface (WUI)***
- **Added to ensure that where vents are provided in WUI areas, they are required to*
- *be protected from the intrusion of burning embers and flame.*

2022 California Residential Code

- **R806.1.1 Vents in the Wildland Urban Interface (WUI);** *Where provided, ventilation openings for enclosed attics, gable ends, ridge ends, under eaves, and cornices, enclosed eave soffit spaces, enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters, underfloor ventilation, foundation and crawls spaces, or any other opening intended to permit ventilation either in a horizontal or vertical plane, shall be in accordance with R337.6.1 through R337.6.2 to resist building ignition from the intrusion of burning embers and flame through the ventilation openings.*

- *This is a new section added to ensure homes within the WUI install ember-resistant vents.

2022 California Residential Code

- **R902.3 Building Integrated Photo-voltaic product**; BIPV products installed as the roof covering shall be tested, listed and labeled for fire classification in accordance with *UL 7103*, Section R902.1 through R902.1.3*. Class A, B, or C BIPV products shall be installed where the edge of the roof is less than 3' from a lot line.*

2022 California Residential Code

- **R902.4 Rooftop-mounted PV Panel Systems;** Roof mounted PV panel systems mounted on or above a roof covering, shall be tested, listed and identified with a fire classification in accordance with *UL 2703. Listed systems shall be installed in accordance with the manufacturer's installation instructions and their listing…*

- **Also see Section R907 Rooftop-mounted PV systems. Section R918 language has been moved into R907 and R918 has been deleted*

2022 California Residential Code

- **R905.4.4.1 Wind Resistance of Metal Roof Shingles;** *Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580, or UL 1897…*

- *This is a new section added to the 2022 CRC. Metal roofs perform differently than asphalt shingles in high-wind events, so this new section and a new Table will ensure that wind loading is considered when installing metal roofs.

2022 California Residential Code

**A new table has been added to Section R906*

- **Table R906.16.6 Classification of Photovoltaic shingles:**

* Maximum Basic Wind Speed from Table R301.2.1.3; 85-100 MPH, the UL 7103 shingle classification permitted is A, D or F. For wind speeds in excess of 100 MPH, the shingle classification is F

2022 California Residential Code Chapter 10

- **R1001.13 Fireplace Accessories;** *Listed and labeled fireplace accessories shall be installed in accordance with the conditions of the listing and the manufacturer's instructions. Fireplace accessories shall comply with UL 907*

- *This is a new section in Chapter 10!

What's New in the 2022 California Electrical Code?

- *Hint: more GFCI requirements!*
- *… and lots more*

2022 California Electrical Code

Article 90

90.2 Scope; This code covers the installation and removal of electrical conductors, equipment and raceways; signaling and communication conductors, equipment and raceways; and optical fiber cables for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings.

(2) Yards, lots, parking lots, carnivals and industrial substations.

(3) Installation of conductors and equipment that connect to the supply of electricity.

(4) Installations used by the electric utility such as an office building, warehouse, garage, machine shop, and recreational buildings that are not an integral part of a generating plant, substation or control center.

(5) *Installations supplying shore power to ships and watercraft in marinas and boatyards, including monitoring of leakage current.*

(6) *Installation used to export electric power from vehicles to premise wiring or for bi-directional current flow.*

2022 California Electrical Code

Article 100 Definitions:

There are many new definitions in the 2022 CEC; too many to list for this class!

Here is an example:

Laundry area: *An area containing or designated to contain a laundry tray, clothes washer, or clothes dryer.*

2022 California Electrical Code

- **110.14 (D) Terminal Connection Torque;** *Tightening torque values for terminal connections shall be as indicated* on equipment or in the installation instructions provided by the manufacturer. *An approved means* shall be used to achieve the indicated torque value.
- *Informational Note #1: Examples of approved means of achieving the indicated torque values include torque tools or devices such as shear bolts or breakaway-style devices with visual indicators that demonstrate the proper torque has been achieved.
- Note #2: The manufacturer can be contacted for torque values if not indicated on equipment.
- Note #3: Additional torque info available in Section 8.11 of NFPA 70-B 2019 *Recommended Practice for Electrical Equipment Maintenance.*

2022 California Electrical Code

200.6 Means of Identifying Grounded Conductors;

(A) Sizes 6 AWG or smaller; An insulated grounded conductor of 6 AWG or smaller shall be identified by one of the following means:

- **(1)** *The insulated conductor shall have a* continuous white outer finish
- **(2)** *The insulated conductor shall have a* continuous gray outer finish
- **(3)** *The insulated conductor shall have three* continuous white or gray stripes along the *conductor's* entire length on other than green insulation.
- **(4)** *Insulated conductors* that have their outer covering finish to show a white or gray color but have a colored tracer thread braid identifying the source of manufacture *are acceptable means of identification.*

2022 California Electrical Code

200.6 (A) *continued:*

(5) *A single conductor, sunlight resistant, outdoor rated cable used as a solidly grounded conductor in photovoltaic power systems, as permitted by 690.41, shall be identified at the time of installation by markings at terminations in accordance with 200.6 (A) (1)-(4).*

(6) The grounded conductor of Type MI shall be identified at time of installation…

(7) Fixture wire shall comply ... as specified in 402.8

(8) Aerial cable identification shall *comply with one of the methods in 200.6 (A) (1) – (5),* or by means of a ridge located on the exterior of the cable…

2022 Electrical Code

Additional locations and requirements for GFCI in the 2022 CEC:

- ***210.8 (A) Dwelling Units;***
- ** in previous code editions, GFCI protection was limited to 125v, 15 or 20 amp receptacles, and required in the following locations:*
- *Bathrooms, Garages and accessory buildings, Outdoors, Crawl Spaces, basements, Kitchen counter receptacles, Receptacles within 6' of sinks, Receptacles within 6' of bathtubs or showers, and Laundry areas.*

2022 California Electrical Code

- **(1)** Bathrooms
- **(2)** Garages and also accessory buildings that have a floor located at or below grade not intended as habitable rooms and limited to storage areas, work areas or similar use.
- **(3)** Outdoors

Exception: snow melting/deicing equipment

- **(4**) Crawl spaces - at or below grade level
- **(5)** *Basements *(unfinished deleted)*

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to be GFCI protected.

- **(6)** Kitchens – where the receptacles are installed to serve the countertop surfaces.
- **(7)** Sinks – where the receptacles are within 6’ of the top inside edge of sink bowl.
- **(8)** Boathouses
- **(9)** Bathtubs or shower stalls – where the receptacles are installed within 6’ of the edge of the bathtub or shower.
- **(10)** Laundry areas
- ***Exception to (1) through (3), (5) through (8), and (10):*** *Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of a ceiling luminaire or ceiling fan shall not be required to be GFCI. If a convenience receptacle is integral to the ceiling fan or luminaire, GFCI protection shall be provided.*
- ***(11)*** *Indoor damp and wet locations*

2022 California Electrical Code

- **210.8 (A) Dwelling Units; All 125v *through 250v* receptacles installed in the locations specified in 210.8 (A)(1) through (A)*(11) and supplied by single-phase branch circuits rated 150-volts or less to ground* shall have ground-fault circuit interrupter protection for personnel.**
- **Note: Requirements have been increased to 250-volts, and the amperage limitations have been removed. This will require the clothes dryer in the laundry room to be GFCI…**

2022 California Electrical Code

- **…and the cooking range in the kitchen shall be GFCI (if within 6’ of sink).**

2022 California Electrical Code

-
- The following locations are added to GFCI locations:

1. **Basements; *finished or* unfinished.**
2. ***Bedroom receptacles within 6’ of sink.***
3. ***Hallway receptacles within 6’ of sinks.***

2022 California Electrical Code

- **4. Indoor wet or damp locations; GFCI protection required for all indoor wet or damp locations. 210.8 (A) (11)**
- ***This could be a mud room or where pet-washing facilities are located whether or not receptacles are located within 6' of a sink. The AHJ will determine these locations.***

2022 California Electrical Code

- **210.63 Heating, AC and refrigeration equipment outlets;** A 125v single-phase 15 or 20 amp receptacle shall be installed (within 25’) for servicing equipment.
- 210.8 (E) ***GFCI protection required for all outlets required by 210.63***
- **This is required whether indoor or outdoors.*

2022 California Electrical Code

- **…More GFCI locations:**

- ***210.8 (F) Exterior outlets 125-volt through 250-volt; GFCI protection required for all exterior receptacles 125v through 250v.***
- ***Exception: GFCI protection shall not be required for lighting outlets other than those covered in 210.8 (C) .***

- *This will include Septic Aerators, *AC condensers or *heat-pumps including those that are hardwired.*
- **Note: NFPA issued a TIA to suspend this requirement until 9/1/2026*

2022 California Electrical Code

- *Our sub-panels and services will need to have more breaker spaces to accommodate the required GFCI and AFCI circuit breakers!...*

2022 Electrical Code

- **210.11(C) (3)**
- ***Changes to branch circuits for bathrooms.***
- In addition to the number of branch circuits required by other parts of this section, one or more 120-volt, 20-ampere branch circuit shall be provided to supply bathroom(s) receptacle outlet(s) required by 210.52(D) and any countertop and similar work surface receptacle outlets. Such circuits shall have no other outlets.

2022 California Electrical Code

- **210.11 (C) (4) Garage receptacles;** In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be installed to supply receptacle outlets required by 210.52(G)(1) for attached garages and in detached garages with electric power. This circuit shall have no other outlets.

- **This change will allow additional garage receptacles on a 15 amp circuit as long as this is in addition to the required separate 20 amp circuit required for each garage bay.*

2022 California Electrical Code

- **210.12 Arc-fault Circuit Interrupter Protection;**
- Additional areas have been added to the list of required locations.

2022 California Electrical Code

- **210.12(A) Dwelling Units**; All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):
- **(1)** A listed combination-type arc-fault circuit interrupter installed to provide protection of the entire branch circuit
- **(2)** A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

2022 California Electrical Code

- **(3)** A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:

- **a**. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
- **b**. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.
- **c**. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

2022 California Electrical Code

- **(4**) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

- **a**. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
- **b**. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.
- **c.** The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- **d.** The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.

2022 California Electrical Code

- **(5)** If metal raceway, metal wireways, metal auxiliary gutters, or Type MC, or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, metal conduit bodies, and metal enclosures are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

- **(6)** Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

- **Exception:**

- AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures

2022 California Electrical Code

- **210.12 (C)** Arc-fault Circuit Protection for guest rooms, guest suites, **and patient sleeping rooms in Nursing Homes and Limited Care Facilities;**

2022 California Electrical Code

- **210.15 Reconditioned Equipment**; *The following shall not be reconditioned:*
- *(1) Equipment that provides GFCI protection for personnel*
- *(2) Equipment that provides AFCI protection*
- *(3) Equipment that provides GFCI protection to equipment*

**This is a new section.*

2022 California Electrical Code

210.52 (C) Countertops and Work surfaces;

- ***(2) Island and Peninsular Countertops and Work Surfaces;*** *Receptacles shall be installed in accordance with 210.52 (C) (2) (a) and (C) (2) (b).*
- ***(a)*** At least one receptacle outlet shall be provided for the first 9 sf, or fraction thereof, or the countertop or work surface. Each additional 18 sf or fraction thereof shall provided a receptacle outlet.
- (b) At least one receptacle shall be located within 2’ of the outer end of a peninsular countertop or work surface. Additional required outlets may be located by installer, designer or owner.

- * This section is new, however, it is really just re-written with language from other sections all merged into a new section.

2022 California Electrical Code

- **210.52 (G) (1) Garages;** For one and two-family dwellings, and ***multi-family dwellings***, at least one receptacle outlet shall be installed in the areas specified in (G) (1) through (G) (3).
- **(1)** In each attached and detached garage with electric power, at least one receptacle outlet shall be installed in each vehicle bay at not more than 5 ½’ above the floor.

2022 California Electrical Code

210.63 Equipment Requiring Servicing; A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location within 7.5 m (25 ft) of the equipment as specified in 210.63(A) and (B). Exception:

- A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers.

(A) Heating, Air-Conditioning, and Refrigeration Equipment; The required receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment's branch-circuit disconnecting means.

- **(B) Other Electrical Equipment;** In other than one and two-family dwellings, a receptacle outlet shall be located as specified in 210.63(B)(1) and (B)(2).
- **(1) Indoor Service Equipment**; The required receptacle outlet shall be located within the same room or area as the service equipment.
- **(2) Indoor Equipment Requiring Dedicated Equipment Spaces;** Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment's branch-circuit disconnecting means.

2022 California Electrical Code

- **210.70 (A) Dwelling Units.**

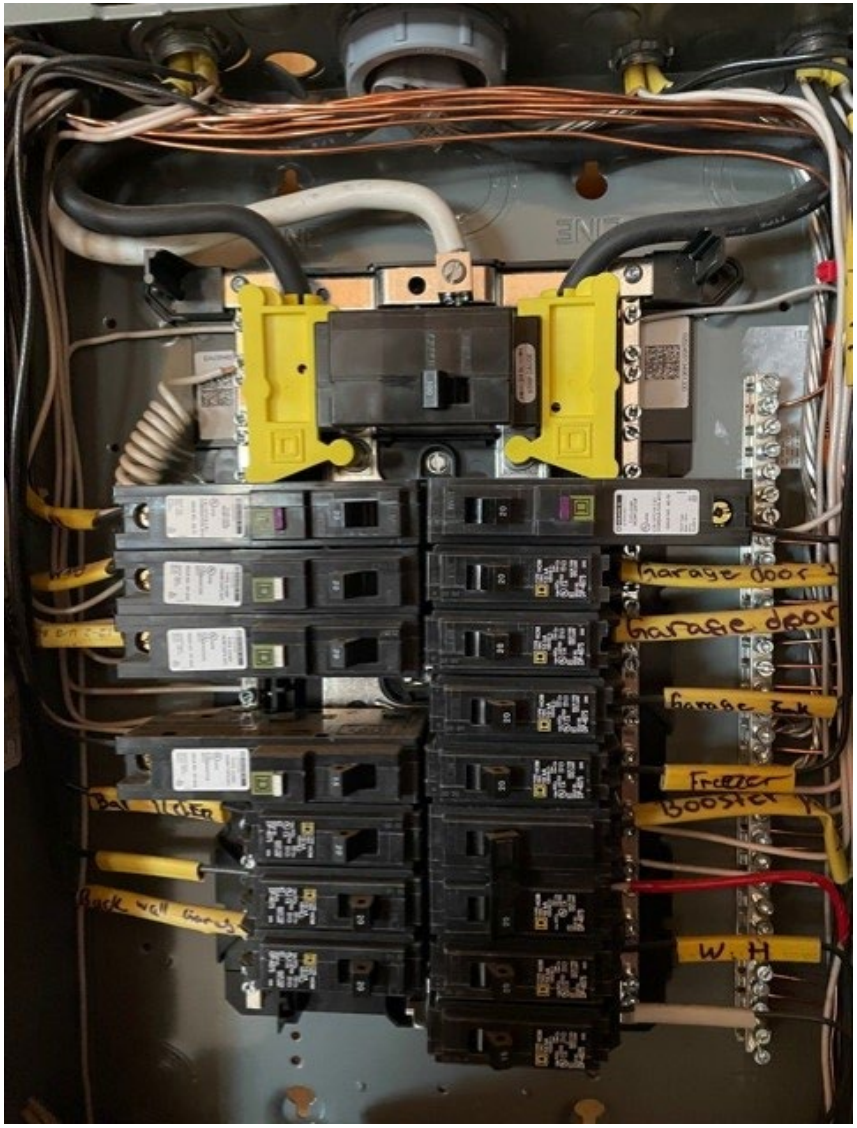
- In dwelling units, lighting outlets shall be installed in accordance with 210.70(A)(1), (A)(2), and (A)(3).

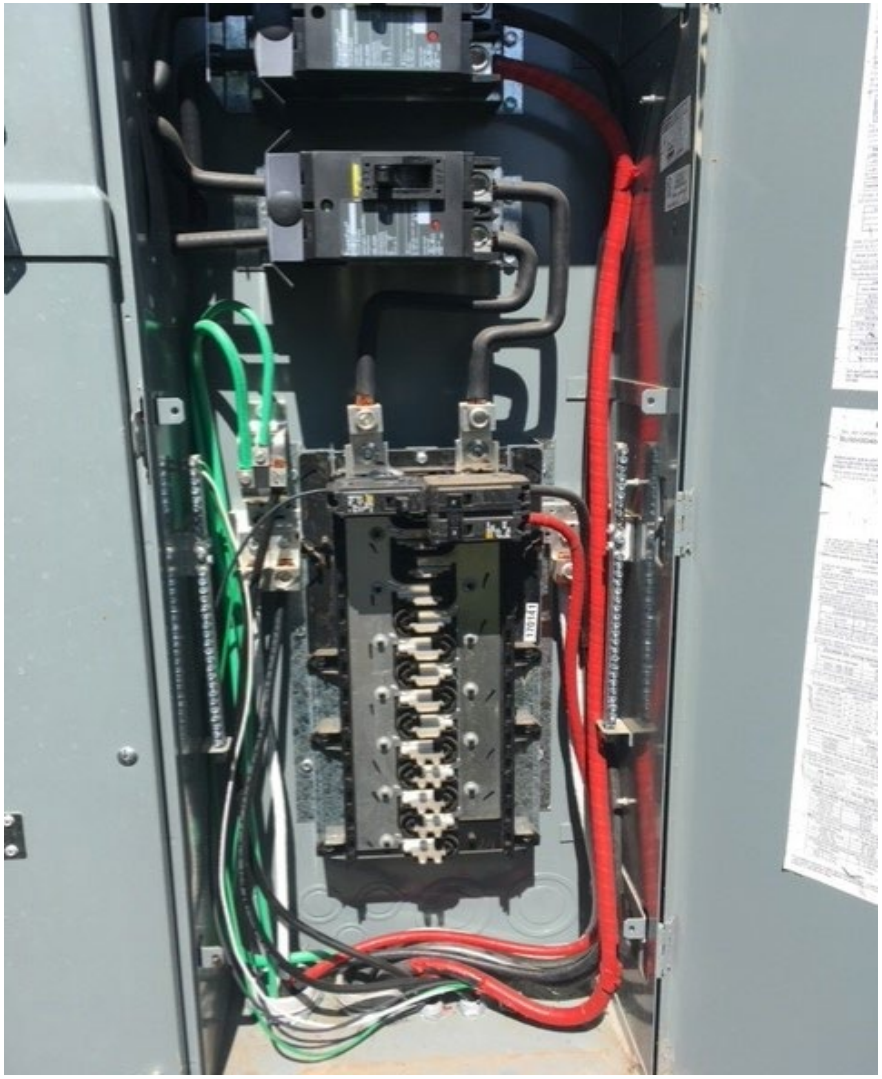
- **(1) Habitable Rooms;** At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in every habitable room, kitchen, and bathroom. The wall-mounted control device shall be located near an entrance to the room on a wall.
- **Exception No. 1:** In other than kitchens and bathrooms, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets.
- **Exception No. 2:** Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

2022 California Electrical Code

- **230.62 (C) Service Equipment**; Enclosed or Guarded Barriers. **Barriers shall be placed in service equipment so that no un-insulated, ungrounded service busbar or service terminal is exposed to inadvertent contact during servicing.**

Guarded vs. un-Guarded





2022 California Electrical Code

230.67 (A) Services; Surge Protection:

- All services supplying dwellings shall be provided with a Surge Protective Device (SPD).
- **(B) Location;** The SPD shall be an integral part of the service equipment or shall be located immediately adjacent thereto.
- **Exception:** The SPD shall not be required to be located next to the service equipment as required in (B) if located at each next level of distribution equipment downstream toward the load.
- **(C) Type;** The SPD shall be a Type 1 or Type 2 SPD
- ***(D) Replacement; Where service equipment is replaced, all of the requirements of this section shall be apply.***

**The need for surge protection has become necessary to protect such devices as fire alarms, smoke alarms, GFCI's and AFCI's.*

2022 California Electrical Code

- **230.71 Service equipment disconnecting means**

- **Changes to maximum number of disconnects.*

2022 California Electrical Code

- **230.71 Service equipment disconnecting means; Maximum number of disconnects:** Each service shall have only one disconnecting means unless the requirements of 230.71 (B) are met.

2022 California Electrical Code

- **230.71 (B);** Two to Six service disconnects shall be permitted for each service permitted by 230.2 or for each set of SEC permitted by 230.40, exc. #1, 3, 4, or 5. The two to six disconnecting means shall be permitted to consist of a combination of any of the following:

2022 California Electrical Code

- **230.71 (B)** *continued*;
- **1.** Separate enclosures with a main service disconnecting means in each enclosure.
- **2.** Panelboards with a main service disconnecting means in each panelboard enclosure.
- **3.** Switchboards where there is only one service disconnect in each separate vertical section where there are barriers separating each vertical section.
- **4**. Service disconnects in switchgear or metering centers where each disconnect is located in a separate compartment.

- ***The intent is to provide safer installations by having a single disconnect to de-energize conductors and other live parts in the enclosure. This will hopefully reduce the possibility of contacting energized parts. The "Six disconnect rule" has been altered to no longer allow a single enclosure with a group of disconnects.***

2022 California Electrical Code

- **230.82 Equipment Connected to the Supply Side of Service Disconnect;** Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

- **(1**) Cable limiters.
- **(2)** Meters and meter sockets nominally rated not in excess of 1000 volts, if all metal housings and service enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250.
- **(3)** Meter disconnect switches nominally rated not in excess of 1000 volts that have a short-circuit current rating equal to or greater than the available fault current, if all metal housings and service enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250. A meter disconnect switch shall be capable of interrupting the load served. A meter disconnect shall be legibly field marked on its exterior in a manner suitable for the environment as follows:
- METER DISCONNECT
- NOT SERVICE EQUIPMENT
- **(4)** Instrument transformers (current and voltage), impedance shunts, load management devices, surge arresters, and Type 1 surge-protective devices.
- **(5)** Conductors used to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors.

2022 California Electrical Code

- **230.82 Equipment Connected to the Supply Side of Service Disconnect;** Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means: *(continued*)
- **(6)** Solar photovoltaic systems, fuel cell systems, wind electric systems, energy storage systems, or interconnected electric power production sources, *if provided with a disconnecting means listed as suitable for use as service equipment, and overcurrent protection as specified in Part VII of Article 230*

2022 CEC

230.82 Equipment Connected to the Supply Side of Service Disconnect.

- Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means: *(continued)*

- **(7)** Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided.
- **(8)** Ground-fault protection systems or Type 2 surge-protective devices, where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.
- **(9**) Connections used only to supply listed communications equipment under the exclusive control of the serving electric utility, if suitable overcurrent protection and disconnecting means are provided. For installations of equipment by the serving electric utility, a disconnecting means is not required if the supply is installed as part of a meter socket, such that access can only be gained with the meter removed.
- ***(10)*** *Emergency disconnects in accordance with 230.85, if all metal housings and service enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250.*

2022 CEC

- **(11)** Meter-mounted transfer switches nominally rated not in excess of 1000 volts that have a short-circuit current rating equal to or greater than the available fault current. A meter-mounted transfer switch shall be listed and be capable of transferring the load served. A meter-mounted transfer switch shall be marked on its exterior with both of the following:
- **a.** Meter-mounted transfer switch
- **b**. Not service equipment

2022 California Electrical Code

- **230.85 Emergency Disconnect; For one and two-family dwellings all service conductors shall terminate in a disconnecting means in a readily accessible outdoor location.**

(1) Service disconnects marked as follows:

- ***EMERGENCY DISCONNECT,***
- ***METER DISCONNECT,***
- ***NOT SERVICE EQUIPMENT***

- **This is a new section that requires an Emergency Disconnect for services at a readily accessible outdoor location for dwelling units. This will aid first responders in being able to de-energize power to a structure without having to pull the meter.*
- **Note: Meter/breaker combo panel meets this requirement by default.*

2022 California Electrical Code

Article 242 Overvoltage Protection

- ***242.1 Scope;*** *This article provides the general requirements, installation requirements, and connection requirements for over-voltage protection and over-voltage protective devices. Part II covers Surge-Protective Devices (SPD) permanently installed on premises wiring systems of 1,000 volts or less, while Part III covers surge arrestors for over 1,000 volts.*

** This is a new section and replaces Articles 280 and 285 in previous code.*

2022 California Electrical Code

- **300.4 Protection Against Physical Damage;** Where subject to physical damage, conductors, raceways, and cables shall be protected

- **(G) Fittings;** Where raceways contain 4 AWG or larger insulated circuit conductors, and these conductors enter a cabinet, a box, an enclosure, or a raceway, the conductors shall be protected in accordance with any of the following:

- **(1)** An identified fitting providing a smoothly rounded insulating surface
- **(2)** A listed metal fitting that has smoothly rounded edges
- **(3)** Separation from the fitting or raceway using an identified insulating material that is securely fastened in place
- **(4)** Threaded hubs or bosses that are an integral part of a cabinet, box, enclosure, or raceway providing a smoothly rounded or flared entry for conductors

- Conduit bushings constructed wholly of insulating material shall not be used to secure a fitting or raceway. The insulating fitting or insulating material shall have a temperature rating not less than the insulation temperature rating of the installed conductors.

2022 California Electrical Code

310.12 Single-phase Dwelling Services and Feeders; For one-family dwellings, individual dwelling units of two-family and multi-family dwellings, service and feeder conductors supplied by 1-PH, 120/240 v system shall be permitted to be sized in accordance with 310.12 (A) through (D).

(A) Services; *For services rated 100- 400 amps, the service conductors supplying the entire load associated with a one-family, two-family or multi-family dwelling shall be permitted to have an ampacity of not less than 83% of the service rating. If no adjustment or correction factors are required, Table 310.12 shall be permitted to be applied.*

2022 California Electrical Code

Table 310.12 Single-Phase dwellings:

Amperes		
Service or Feeder	**Copper**	**AL**
100	4	2
125	2	1/0
200	2/0	4/0
225	3/0	250
400	400	600

*Note: If no adjustment or correction factors are required, this table shall be permitted to be applied.

***(B) Feeders**; For a feeder rated 100- 400 amps, the feeder conductors supplying the entire load with a one-family or individual unit in two-family or multi-family dwelling shall be permitted to have an ampacity not less than 83% of the feeder rating. If no adjustment or correction factors are required, Table 310.12 shall be permitted to be applied.*

***(C) Feeder ampacity;** In no case shall a feeder for an individual dwelling unit be required to have an ampacity greater than that specified in 310.12 (A) or (B).*

***(D) Grounded Conductors;** Grounded conductors shall be permitted to be sized smaller than the ungrounded conductors if the requirements of 220.61 & 230.42 are met.*

2022 California Electrical Code

- ***310.15 (B) (2) Rooftop;*** *For raceways or cables exposed to direct sunlight on or above rooftops where the distance above the roof to the bottom of the raceway or cable is less than 7/8", a temperature adder of 60-deg F shall be added to the outdoor temp to determine the applicable ambient temp.*

- *Exception: Type XHHW-2 insulated conductors shall not be subject to this ampacity adjustment.*

2022 California Electrical Code

- **406.4 (D)(4) Replacement Receptacles;** Replacement of receptacles shall comply with 406.4(D)1 through 406.4 (*D)7, as applicable. Arc-fault circuit and ground-fault circuit interrupter type receptacles* shall be installed in a readily accessible location.
- **(4**) If a receptacle outlet located in any of the areas specified in 210.12 (A), (B), *or (C)* is replaced, a replacement receptacle at this outlet shall be one of the following:
- **(1).** *A listed outlet branch circuit type arc-fault circuit interrupter receptacle*
- **(2).** *A receptacle protected by a listed outlet-branch circuit type arc-fault circuit interrupter type receptacle*
- **(3**). A receptacle protected by a listed combination type arc-fault breaker
- **Exception:** Section 210.12 (D), Exception, shall not apply to replacement of receptacles.

2022 California Electrical Code

- **406.9 (C) Receptacles in Damp or Wet Locations;**
- **(C) Bathtub and shower space**; Receptacles shall not be installed within a zone measured 3 feet horizontally and 8 feet vertically from the top of the bathtub rim or shower stall threshold. The identified zone is all encompassing and shall include the space directly over the shower or tub.
- ***Exception****: In bathrooms with less than the required zone the receptacle(s) shall be permitted to be installed opposite the bathtub rim or shower stall threshold on the farthest wall within the room.*
- ***404.4 (C)*** *Switches in damp or wet locations is also amended to not closer than 3' from tub or shower.*

2022 California Electrical Code

406.12 Tamper-Resistant Receptacles; All 15 or 20 amp, 125v-250v non-locking type receptacles in the areas specified in 406.12 (1) through (7) shall be tamper-resistant receptacles.

- **(1)** Dwelling units, including attached and detached garages and accessory buildings to dwelling units, and common areas of multifamily dwellings specified in 210.52 and 550.13
- **(2)** Guest rooms of hotels/motels, and their common areas
- **(3)** Childcare facilities.
- **(4)** Preschools and elementary education facilities.
- **(5)** Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities.
- **(6)** Assembly areas described in 518.2 to include places of waiting transportation, gyms, skating rinks and auditoriums.
- **(7)** Dormitories.
- **(8)** Assisted living facilities.

2022 California Electrical Code

408 Switchboards, Switchgear, and Panelboards.

- ***408.2 (A) California Energy Code requirements for panelboards in single-family buildings.*** *Panelboards serving individual dwelling units shall be provided with circuit breaker spaces for heat-pump water heaters, heat-pump space heaters, electric cooktops and electric clothes dryers as specified in Section 150.0 (n), (t), (u), and (v).*
- ***408.2 (B) California Energy Code requirements in multi-family buildings;*** *…Shall comply with Section 160.9 (a), (b), and (c).*

2022 California Electrical Code

- **408.8 Reconditioning of Equipment.**

- Reconditioning of equipment within the scope of this article shall be limited as described in 408.8(A) and (B). The reconditioning process shall use design qualified parts verified under applicable standards and be performed in accordance with any instructions provided by the manufacturer***. If equipment has been damaged by fire, products of combustion, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.***
- ****This is a new section***

2022 California Electrical Code

- **(A) Panelboards;** Panelboards shall not be permitted to be reconditioned. This shall not prevent the replacement of a panelboard within an enclosure. In the event the replacement has not been listed for the specific enclosure and the available fault current is greater than 10,000 amperes, the completed work shall be field labeled, and any previously applied listing marks on the cabinet that pertain to the panelboard shall be removed.
- **(B) Switchboards and Switchgear;** Switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted to be reconditioned. Reconditioned switchgear shall be listed or field labeled as reconditioned, and previously applied listing marks, if any, within the portions reconditioned shall be removed.

2022 California Electrical Code

410 Luminaires, Lampholders, and Lamps;

410.10 (D) Bathtub and Shower Areas; *A luminaire installed in a bathtub or shower area shall meet all of the following:*

- *(1) No parts of cord-connected luminaires, chain or cable, or cord-suspended luminaires, lighting track, pendants, or ceiling suspended (paddle) fans shall be located within a zone measured 3' horizontally, and 8' vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the space directly over the tub or shower stall.*
- *(2) Luminaires located within the actual outside dimension of the bathtub or shower space… shall be marked suitable for damp or wet locations. Where subject to shower spray, the luminaire shall be marked for wet locations.*

2022 California Electrical Code

- **410.116 Luminaire Clearance and Installation;**
- **(C)** ***Installation in Fire-Resistant Construction;*** *Luminaires marked "FOR USE IN NON-FIRE-RATED INSTALLATIONS" shall not be used in fire-rated installations. Where a luminaire is recessed in fire-resistant material in a building of fire-resistant construction, the recessed luminaire shall satisfy one of the following*:
- **(1)** *The recessed luminaire shall be listed for use in a fire resistance–rated construction.*
- ***(2)*** *The recessed luminaire shall be installed in or used with a luminaire enclosure that is listed for use in a fire resistance–rated construction.*
- ***(3)*** *The recessed luminaire shall be listed and shall be installed in accordance with a tested fire resistance–rated assembly. When a tested fire resistance–rated assembly allows the installation of a recessed fluorescent luminaire, a recessed LED luminaire of comparable construction shall be permitted.*

2022 California Electrical Code

422 Appliances;

- *422.3 (A) & (B) are new sections that reference California Energy Code requirements for Electric appliances.*

- **This language is also repeated in Section 440.3 for Air Conditioners.*

2022 California Electrical Code

- **422.5 (A) GFCI for appliances;** Appliances listed below and rated 150v or less to ground, and 60 amps or less, single or 3-phase shall be provided with Class A GFCI protection.

- 1. Automotive vacuum machines
- 2. Drinking Water coolers and bottle fill stations
- 3. cord & plug connected high pressure spray washing machines
- 4. Tire inflation machines
- 5. Vending machines
- 6. Sump pumps
- 7. Dishwashers

2022 California Electrical Code

- GENERATORS:
- **445.18 Disconnecting Means and *Emergency* Shutdown.**
- **(A) Disconnecting Means**; Generators other than cord-and-plug-connected portable *generators* shall have one or more disconnecting means. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable open in accordance with 110.25.
- **(B) *Emergency* Shutdown of Prime Mover;** Generators shall have provisions to shut down the prime mover. The means of shutdown shall comply with all of the following:

- **(1)** Be equipped with provisions to disable all prime mover start control circuits to render the prime mover incapable of starting
- **(2)** Initiate a shutdown mechanism that requires a mechanical reset.

2022 California Electrical Code

- **445.18 Generators; Disconnecting and Emergency Shutdown:**

- ***(C) Remote Emergency Shutdown;*** *Generators with greater than 15 kW rating shall be provided with a remote emergency stop switch to shut down the prime mover. The remote emergency stop switch shall be located outside the equipment room or generator enclosure and shall also meet the requirements of 445.18(B)(1) and (B)(2).*

- ***(D) Emergency Shutdown in One- and Two-Family Dwelling Units;*** *For other than cord-and-plug-connected portable generators, an emergency shutdown device shall be located outside the dwelling unit at a readily accessible location.*

2022 California Electrical Code

- 480 BATTERY STORAGE:
- **480.7 DC Disconnect Methods;**
- (A) Disconnecting Means; A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system with a voltage over 60 volts dc. A disconnecting means shall be readily accessible and located within sight of the battery system.

- ***(B) Emergency Disconnect;*** *For one-family and two-family dwellings, a disconnecting means or its remote control for a stationary battery system shall be located at a readily accessible location outside the building for emergency use. The disconnect shall be labeled "EMERGENCY DISCONNECT".*

- *This requirement applies only to the battery systems covered under the scope of Article 480 that are installed as a primary or standby power source at one- and two-family dwellings. If a battery-type energy storage system (ESS) is installed as a power source for a one- or two-family dwelling, the requirements of Article 706 apply to the installation. For requirements on ESS disconnecting means at one- and two-family dwellings, see 706.15(A).*

2022 California Electrical Code

- ***625.60 AC Receptacle Outlets Used for EVPE;*** *AC receptacles installed in electric vehicles and intended to allow for connection of off-board utilization equipment shall comply with 625.60(A) through (D).*

2022 California Electrical Code

- **(A) Type; The receptacle outlet shall be listed.**
- **(B) Rating; The receptacle outlet shall be rated 250 volts maximum, single phase 50 amperes maximum.**
- **(C) Overcurrent Protection; Electric vehicles provided with receptacle outlets for power export shall be provided with overcurrent protection integral to the power export system. The overcurrent protection shall have a nominal rating sufficient for the receptacle it protects. The overcurrent protection shall also be sufficiently rated for the maximum available fault current at the receptacle and shall be included in the interactive equipment evaluation. See 625.48.**
- **(D) GFCI Protection for Personnel; Ground-fault circuit-interrupter protection for personnel shall be provided for all receptacles. The ground-fault circuit-interrupter indication and reset shall be installed in a readily accessible location.**

2022 California Electrical Code

- **680.11 Underground Wiring:**

Underground wiring shall comply with 680.11 ***(A) through (C).***

- ***(A)*** Underground Wiring; Underground wiring within 1.5 m (5 ft) horizontally from the inside wall of the pool shall be permitted. The following wiring methods shall be considered suitable for the conditions in these locations:

- (1) Rigid metal conduit
- (2) Intermediate metal conduit
- (3) Rigid polyvinyl chloride conduit
- (4) Reinforced thermosetting resin conduit
- (5) Jacketed Type MC cable *that is listed for burial use*
- *(6) Liquidtight flexible nonmetallic conduit listed for direct burial use*
- *(7) Liquidtight flexible metal conduit listed for direct burial use*

- ***(B) Wiring Under Pools***; Underground wiring shall not be permitted under the pool unless this wiring is necessary to supply pool equipment permitted by this article.

- ***(C) Minimum Cover Requirements;*** Minimum cover depths shall be as given in Table 300.5

2022 California Electrical Code

- **680.21 (C) & (D) Swimming Pools, Fountains and similar installations**; *(Motors – GFCI Protection and pool pump motor replacement)*
- ***(D)*** *Where a pool pump motor in 680.21 (C) is replaced for maintenance or repair, the replacement pump motor shall be provided GFCI protection.*

2022 California Electrical Code

- 680.23 Underwater Luminaires.

- **(B) Wet-Niche Luminaires;**
- **(6) Servicing**; Wet-niche luminaires shall be removable from the water for inspection, re-lamping, or other maintenance. The forming shell location and length of cord in the forming shell shall permit personnel to place the removed luminaire on the deck or other dry location for such maintenance. The luminaire maintenance location shall be accessible without entering or going in the pool water.

- *In spa locations where wet-niche luminaires are installed low in the foot well of the spa, the luminaire shall only be required to reach the bench location, where the spa can be drained to make the bench location dry.*

2022 California Electrical Code

- **680.26 Equipotential Bonding;**
- **(B) Bonded Parts.**

- The parts specified in 680.26(B)(1) through (B)(7) shall be bonded together using solid copper conductors, insulated covered, or bare, not smaller than 8 AWG or with rigid metal conduit of brass or other identified corrosion-resistant metal. Connections to bonded parts shall be made in accordance with 250.8. An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool area shall not be required to be extended or attached to remote panelboards, service equipment, or electrodes.

- **(1) Conductive Pool Shells;** Bonding to conductive pool shells shall be provided as specified in 680.26(B)(1)(a) or (B)(1)(b). *Cast-in-place* concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings shall all be considered conductive materials due to water permeability and porosity. Vinyl liners and fiberglass composite shells shall be considered to be nonconductive materials*. Reconstructed pool shells shall also meet the requirements of this section.*

2022 California Electrical Code

- **680.26 (B) (2);**
- **(b) Copper Ring.** Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, a copper conductor(s) shall be utilized where the following requirements are met:

- **(1)** At least one minimum 8 AWG bare solid copper conductor shall be provided.
- **(2)** The conductors shall follow the contour of the perimeter surface.
- **(3)** Only listed splicing devices *or exothermic welding* shall be permitted.
- **(4)** The required conductor shall be 450 mm to 600 mm (18 in. to 24 in.) from the inside walls of the pool.
- **(5)** The required conductor shall be secured within or under the perimeter surface 100 mm to 150 mm (4 in. to 6 in.) below the subgrade.

2022 California Electrical Code

Article 702 Optional Standby Systems

- **702.4(B) System Capacity.**
- **(1) Manual Transfer Equipment;** Where manual transfer equipment is used, an optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the optional standby system shall be permitted to select the load connected to the system.

- **(2) Automatic Transfer Equipment;** Where automatic transfer equipment is used, an optional standby system shall comply with 702.4(B)(2)(a) or (B)(2)(b) in accordance with Article 220 or by another approved method.

- **(a) Full Load.** The standby source shall be capable of supplying the full load that is transferred by the automatic transfer equipment.
- **(b) Load Management.** Where a system is employed that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the load management system.

2022 California Electrical Code

702.5 Transfer Equipment.

- ***(A) General;*** *Transfer equipment shall be required for all standby systems subject to the requirements of this article and for which an electric utility supply is either the normal or standby source. Transfer switches shall not be permitted to be reconditioned.*
- *Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.*

- ***(B) Meter-Mounted Transfer Switches;*** *Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches and shall be approved. Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2).*

- ***(C) Documentation****; In other than dwelling units, the short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.*
- ***(D) Inadvertent Interconnection****; Transfer equipment shall be suitable for the intended use and shall be listed, designed, and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.*
- ***(E) Parallel Installation;*** *Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall also meet the requirements of Article 705.*

2022 California Electrical Code

- **702.7 Signs.**

- **(A) Standby**; A sign shall be placed at the service-entrance equipment for commercial and industrial installations that indicates the type and location of each on-site optional standby power source*. For one- and two-family dwelling units, a sign shall be placed at the disconnecting means required in 230.85 that indicates the location of each permanently installed on-site optional standby power source disconnect or means to shut down the prime mover as required in 445.18(D).*

2022 California Electrical Code

705 Interconnected Electric Power Production Sources

- **705.10 Identification of Power Sources**; A permanent plaque or directory shall be installed at each service equipment location, *or at an approved readily visible location. The plaque or directory shall denote the location of each power source disconnecting means for the building or structure and be grouped with other plaques or directories for other on-site sources. The plaque or directory shall be marked with the wording "CAUTION MULTIPLE SOURCES OF POWER". Any posted diagrams shall be correctly oriented with respect to the diagram's location.* The marking shall comply with 110.21 (B).
- Exception: Installations with *multiple co-located* power production sources shall be permitted to be *identified as a group(s). The plaque or directory shall not be required to identify each power source individually*.

2022 California Electrical Code

705.11 Supply-side Source Connections;

- ***(D) Connections;*** *The connection of power source output circuit conductors to the service conductors shall be made using listed connectors as described in 110.14, and comply all enclosure fill requirements. Any modifications to existing equipment shall be made in accordance with the manufacturer's instructions or the modification must be evaluated for the application and have a field label applied. For meter socket enclosures or other equipment under the exclusive control of the utility, only connections approved by the electric utility shall be permitted.*

- **This entire section has been re-written; there are too many changes to cover in this class.*

2022 California Electrical Code

- **705.12** ***Load-side Source Connections;*** *The output of an interconnected electric power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises. Where distribution equipment or feeders are fed simultaneously by a primary source of electricity and one or more other power source and are capable of supplying multiple branch circuits or feeders, or both, the interconnecting equipment shall comply with* 705.12 (A) *through (E).*
- *This section has also been completely re-written; too many changes to cover in this class.

2022 California Electrical Code

705.20 ***Disconnecting Means, Source;*** *Means shall be provided to disconnect the power source output circuit conductors of electric power production equipment from conductors of other systems. The disconnecting means shall comply with the following:*

(1) Be one of the following types:

- *(a) A manually operable switch or circuit breaker.*
- *(b) A load-break pull-out switch.*
- *(c) A power-operated or remote-controlled switch or circuit breaker that is manually operable locally and opens automatically when control power is interrupted.*
- *(d) A device listed or approved for the intended application.*

(2) Simultaneously disconnect all ungrounded conductors of the circuit.

(3) located where readily accessible.

2022 California Electrical Code

- **705.20** *(continued)*

(4) Externally operable without exposed live parts.

(5) Enclosures with doors or hinged covers with exposed live parts when open that require a tool to open or are lockable where readily accessible to unqualified persons.

(6) Plainly indicate whether in the open (off) or closed (on) position.

(7) Have ratings sufficient for the maximum circuit current, available fault current, and voltage that is available at the terminals.

2022 California Electrical Code

- …and finally:
- *(8) Be marked in accordance with the warning in 690.13 (B), where the line and load terminals are capable of being energized in the open position.*

- * This section was completely re-written from language in 705.21 and 705.22, which have now been deleted.

2022 California Electrical Code

706 Energy Storage Systems;

- **This article has been completely re-written with many new sections… Too many to cover in this class.*

706.10 California Energy Code requirements for ESS.

- **this section covers the requirements for ESS in Section 150.0 (s) CalEnergy Code.*

What’s New in the 2022 Plumbing Code?

What's New in the 2022 Plumbing Code?

- *Hint: Temperature limiting devices!*

2022 California Plumbing Code

- Significant Changes include:
- ***New provisions for backflow prevention***
- **Additional requirements for temperature limiting devices*
- ***New requirements for guardrails for rooftop equipment***
- **Pressure relief valve discharge piping changes*
- ***New Standards for DWV piping and fittings***
- **Circuit Venting requirements have been updated and expanded*
- ***Updated Fuel Gas provisions***
- **Updated Medical Gas reqs.*

2022 California Plumbing Code

- **104.4.3.1 CPC Expiration of permits:**

- *On or after January 1, 2019, permits shall be valid for 12 months without commencement of any work. Permits may be extended twice for 180-days at a time with written request to the Building Official*
- ** The CMC has the same language in Section 104.4.3.1*

2022 California Plumbing Code

- **303.8.4.1 CMC; 508.2.1.1 CPC; Guards and Rails:**
- **These sections completely re-written*

- A 42” high guard or rail is required when equipment is less than 6’ from edge of roof or the open end of equipment platform is more than 30” above roof, floor or grade. The guard shall prevent a 21” diameter ball or sphere from passing through.

2022 California Plumbing Code

- **309.6 Dead legs:**
- *Dead legs shall have a method of flushing*
- *** This is a new section with a new definition added in Chapter 2**

2022 California Plumbing Code

- **408.5 Shower curbs and thresholds.**

- *Where there is a shower without a threshold, the floor in the same room shall be considered a wet location and shall comply with the CBC, CRC and CEC.*
- * The language in this section was cleaned up to specify the floor in the same room, not “adjoining room” was considered a wet location.

2022 California Plumbing Code

- **Sections 409.4 Bathtub/Whirlpools limit water temp to 120 deg. F, and 410.3 Bidets shall limit water temp to 110 deg. F shall conform to one of the two methods:**
  1. limiting device conforming to ASSE 1070, ASTM A112, or CSA B125, or
- ***2. A water heater conforming to ASSE 1084***

- *These two methods have been added to the code in all sections that require maximum water temps for fixtures.*

2022 California Plumbing Code

- Chapter 5 Water Heaters:

- **501.2 California Energy Code Water Heating System Requirements;** *See California Energy Code Section 110.3 for additional mandatory requirements for all service water heating systems and 150.0 (n) for additional mandatory requirements for residential water heaters.*

2022 California Plumbing Code

- **Chapter 6 Water Supply & Distribution:**

- **606.9 Check Valve required**; All systems that circulate water by means of a pump or other mechanical device or method shall have a check valve(s) or equal device(s) installed to ensure the direction of flow.

- **606.10 Leak Detection devices**; Where leak detection devices for water supply and distribution are installed, they shall comply with IAPMO IGC 115 or 349.

- *These are new sections in 2022

2022 California Plumbing Code

- **608.5 Discharge Piping;** The discharge piping serving a temperature relief valve, pressure relief valve, or combination of both shall have no valves, obstructions, or means of isolation and shall be provided with the following:
- 1. *Not less than* the size of the valve outlet shall discharge full size to the flood level of the area receiving the discharge and pointing down.
- 2. Materials shall be rated at not less than the operating temperature of the system and approved for such use or comply with ASME A112.4.1
- 3. Discharge pipe shall discharge independently by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2’ and not less than 6” AFG and pointing downwards.
- 4. Discharge in such way to not cause personal injury or structural damage.
- 5. No part of discharge piping shall be trapped or subject to freezing.
- 6. The terminal end of the pipe shall not be threaded.
- 7. Discharge from a relief valve into a water heater pan shall be prohibited.
- ***8. The discharge pipe termination point shall be readily observable.***

2022 California Plumbing Code

- **609.8 Pumps**; Pumps shall be installed in accordance with the manufacturer's instructions.
- **609.8.1 Access;** Pumps shall be accessible for repairs.
- **609.8.2 Potable water pumps;** Pumps intended to supply drinking water shall comply with NSF 61.
- *This is a new section

2022 California Plumbing Code

- ***609.12.3 California Energy Code Pipe Insulation Requirements****; See CalEnergy Code Section 150.0 (j) 2 and 120.3 (c) for pipe insulation requirements based on fluid temp and pipe diameter for hot water piping…*

2022 California Plumbing Code

- ***612 Residential Fire Sprinkler Systems:***
- ***612.1 Installation****; Residential fire sprinklers shall comply with the CRC or the CFC.*
- *Section 612 has been deleted in its entirety.

2022 California Plumbing Code

Chapter 7 **Sanitary Drainage:**

- **Table 702.1 Drainage Fixture Unit Values (DFU)**

- **Shower single-head trap;** *footnote #9 has been added to allow a 1 ½" trap for a bathtub to shower retrofit that has a maximum shower pan size of 36" X 60".*

2022 California Plumbing Code

- **707 Cleanouts:**
- **707.2 Approved**; Each C/O fitting, plug or cap shall be of an approved type. An approved list of standards for cleanouts are referenced in Table 707.2
- **707.4 Location;** Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal…
- Exception #3 has added kitchen sinks.

2022 California Plumbing Code

Chapter 12 Fuel Gas Piping:

- **1208.1.1 Addition to existing System;** Where additional appliances are being connected to a gas piping system, the existing piping shall be checked to determine whether it has adequate capacity*. If the capacity of the system is determined to be inadequate for the additional appliances, the existing system shall be enlarged as required, or separate gas piping of adequate capacity shall be provided.*
- *This section re-written for clarification

2022 California Plumbing Code

- **1208.6.5 Plastic Pipe, Tubing, and fittings;**
- Polyethylene Plastic Pipe and fittings used to supply fuel gas shall conform to ASTM D2513. Piping shall be marked “GAS”, and “ASTM D2513”. *Polyamide pipe, tubing and fittings shall be identified in and conform to ASTM F2945.*

2022 California Plumbing Code

- **1215.2 Sizing of Gas Piping Systems;** Sizing of piping systems shall be in accordance with Section 1215.2.1 for natural gas piping systems, and Section 1215.2.2 for propane piping systems.
- **1215.2.1 Natural Gas Piping System;** Table 1215.2 (1) through Table 1215.2 (23) shall be used in conjunction with one of the methods described in Section 1215.1.1 through Section 1215.1.3 for piping materials other than non-corrugated stainless steel tubing.
- *The Table for CSST has been completely re-written

2022 California Plumbing Code.

1505; Alternate water sources for non-potable water applications;

- **1505.1** (added landscape irrigation systems as acceptable use for reclaimed water.
- **1505.4** (added exception to allow a swivel ell or changeover device to be connected to potable water source and reclaimed water – dual water source to use potable water if there is an interruption in reclaimed water supply.

What's new for the 2022 California Mechanical Code?

Hint: Changes to indoor air ventilation & kitchen exhaust requirements

2022 California Mechanical Code

- **303.8.4.1 CMC; Guards and rails.**
  A 42” high guard or rail is required when equipment is less than 6’ from edge of roof or the
- open end of equipment platform is more than 30” above roof, floor or grade. The guard shall prevent a 21” diameter ball or sphere from passing through.

2022 California Mechanical Code

405 Indoor air quality for Residential occupancies.

- *This is an entirely new section in the California Mechanical Code that addresses kitchen and bathroom ventilation.*

- ***405.3 Bathroom Exhaust; A mechanical exhaust directly to the outdoors shall be provided in each room containing a bathtub, shower or bathtub/shower combo. The fan shall run intermittently (on demand), or continuously. Each bathroom shall also comply with Division 4.5 of the CalGreen Code. *(humidistat controlled fan)***

2022 California Mechanical Code

- ***405.4 Kitchen exhaust**; A mechanical exhaust directly to the outdoors shall be provided in each kitchen. The fan shall run intermittently (on demand), or continuously.*
- *405.4.1 **Exhaust Rate**; The exhaust rate shall not be less than 100 cfm's for intermittent, or 5 air changes/HR for continuous.*

2022 California Mechanical Code

- 405.5 **Ventilation openings**; Occupiable spaces shall have a readily accessible ventilation opening to the outdoors. The opening shall be not less than 5 sf or 4% of the floor area.

- (this requirement is similar to CRC Section R303)

2022 California Mechanical Code

- **502.2.1 Environmental Air Ducts**; Environmental air duct exhaust shall terminate not less than 3 feet from a property line, 10 feet from a forced air inlet, ***10 feet above a public walkway,*** and 3 feet from openings into the building. The discharge of the environmental exhaust duct shall not be ***directed*** onto a public walkway.

2022 California Mechanical Code

- **Chapter 6, Duct Systems**

- **601.2 Sizing Requirements**; Duct systems shall be sized in accordance with applicable standards in Chapter 17 or by other approved methods.
- ***Exception:*** *Residential duct systems shall be sized in accordance with ACCA Manual D, ACCA Manual Zr, as applicable, or by other approved methods.*

- **This is a new exception; 2019 code had exception that sizing was not required for alterations.*

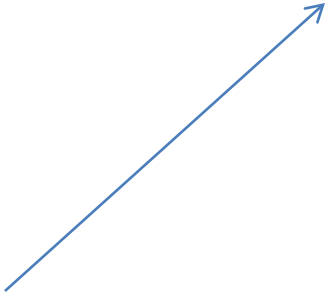
2022 California Mechanical Code

- **601.2.1 California Energy Code Residential Return Duct sizing requirements;** California Energy Code Tables 150.0-B, and 150.0-C specify return duct sizing for single return and multiple duct return systems, respectively, that are applicable as an alternative to confirming system airflow via field verification and diagnostic testing. See CalEnergy Code Section 150.0 (m) 13 for newly constructed buildings, and Section 150.2 (b) (1) (F) (ii) (a) for alterations.

Table 150.0-B *California Energy Code*

Return Duct Sizing For Single Return Duct Systems:

System Nominal Cooling Capacity	Return Duct Minimum Size (diameter)	Min. Total Return Filter Grille
1.5 ton	16 inches	500 sq. inches
2.0 ton	18 inches	600 sq, inches
2.5 ton	20 inches	800 sq. inches



This is a 20”X 30” filter grille

2022 California Mechanical Code

- **603 Installation of Ducts:**
- **603.1 General*;*** *Air ducts shall be installed in accordance with this chapter and the installation instructions.*
- **603.1.1 Pressure Classification;** The pressure classification of ducts shall not be less than the design operating pressure of the air distribution in which the duct is utilized.
- **603.1.2 Air Temperature**; The temperature of the air to be conveyed in a duct shall not exceed 250 deg. F.
- **603.1.3 Protection**; Air ducts other than plastic ducts, shall be installed with not less than 4” of separation from earth, except where installed as a liner inside of concrete, tile, or metal pipe and shall be protected from physical damage.
- **603.1.4 Vertical Risers**; Ducts listed and labeled to UL 181 shall not be used for vertical risers in air duct systems serving more than two stories.
- **603.1.5 Penetrations**; Ducts labeled and listed to UL 181 shall not penetrate a fire-resistance-rated assembly of construction.
- *These sections have been re-written and/or moved from other locations in the 2019 Code

2022 California Mechanical Code

- **802.4 Type of Venting System to be Used;**
- **802.4.1 Plastic Piping**; Where plastic piping is used to vent an appliance, the appliance shall be listed for use of such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material. *The plastic pipe venting material shall be labeled in accordance with the product standards specified by the appliance manufacturer or shall be listed and labeled in accordance with UL 1738.*

2022 California Mechanical Code

- **802.4.2 Plastic Vent Joints**; Plastic pipe and fittings *used to vent appliances* shall be installed in accordance with the appliance manufacturer's instructions. *Plastic pipe venting materials listed and labeled with UL 1738 shall be installed in accordance with the vent manufacturer's installation instructions*. Where primer is required, it shall be of a contrasting color.

2022 California Mechanical Code

- **Chapter 12, Hydronics:**
- 1205 Installation, Testing and Inspection;
- **1205.2 Pressure Testing;** System piping and components shall be tested with a pressure not less than 1 ½ times the operating pressure but not less than 100 psi. Piping shall be tested with water or air except that plastic pipe shall not be tested with air. Test pressures shall be held for 30 minutes…
- **Exceptions:**
- (1) PEX, PP-R, PPRCT, PEX-AL-PEX, PE-RT, and PE-AL-PE piping systems shall be permitted to be tested with air where authorized by the manufacturer's instructions, and air testing is not prohibited by other codes or laws.
- *(2) Copper tubing shall be permitted to be tested at not less than 80 psi.*
- **New exception added*

2022 California Mechanical Code

- **1213 System Controls:**
- **1213.1 Water Temperature Controls;**
- **1213.2 Operating Steam Controls;**
- **1213.2.1 Water level controls;**
- **1213.3 Occupied Spaces**; A temperature sensing device shall be installed in the occupied space to regulate the operation of the hydronic system.
- **1213.4 Simultaneous Operation***; Radiant heating and cooling systems sharing a common space temp control shall be configured to prevent simultaneous heating and cooling.*
- **1213.5 Temperature Reading;** *A temp gauge or transmitter shall be installed for reading the fluid temperatures in the panel system supply and heat-source outlet. One temperature gauge or transmitter shall be permitted where the temp between the heat source outlet and panel system supply are the same.*

2022 California Mechanical Code

- **1217 Radiant Heating and Cooling:**

- **1217.5.2 Insulation;** Where a poured concrete radiant floor system is installed in contact with the soil, *insulation recommended by the manufacturer for such an application and with* a minimum R-5 shall be placed between the soil and the concrete, extend to the outside edges of the concrete, and be placed on all sides of the slab edges.

- ***1217.5.2.1 California Energy Code Insulation Requirements for Heated Slab Floors;*** *See CalEnergy Code Section 110.8 for additional insulation requirements for heated slab floors- a higher level of insulation is required for CZ-16, and more detailed installation requirements apply to all Climate Zones.*

What's new for the 2022 California Energy Code?

Hint: Heat-pumps and all electric homes!

2022 California Energy Code

- The goal in 2022 is to generate and store energy on-site, and…

2022 California Energy Code

Heat-pumps are in; Gas is out!

2022 California Energy Code

- Energy Code Requirements:

- **Mandatory requirements**
- *Mandatory requirement must always be met.*
- *Can never trade-off*
- **Two approaches for compliance:**
- **1. Prescriptive**
- *Efficiency requirements listed in the code*
- *May supersede mandatory requirements*
- *Requirements differ depending on whether the project is new construction, addition, or alteration.*
- **2. Performance**
- *Trade-offs allowed*
- *Allows flexibility*
- *Computer generated using CEC approved software*
- *All mandatory requirements must be met*

2022 California Energy Code

- Section 100.0 Scope;
- D. **Single-family buildings; *This was Low-rise residential buildings in 2019 code**
- **ii. Compliance approaches;** In order to comply with Part 6, newly constructed *single-family buildings* must meet the requirements of:
- **a.** Mandatory measures of Sections 110.0 through 110.10, and 150.0; and
- **b.** Either:
- **(i)** Performance approach Section 150.1 (a) and (b); or
- **(ii)** Prescriptive approach Section 150.1 (a) and (c).

2022 California Energy Code

- **100.0 (e) 2**
- **E. Multi-family Buildings;**
- i. Sections applicable; Sections 160.0 through 170.2 apply to newly constructed multi-family buildings.
- ii. Compliance approaches; In order to comply with Part 6, newly constructed multi-family buildings must meet the requirements of:
- a. The applicable mandatory measures in Section 110.0 through 110.10, and 160.0; and
- b. Either:
- (i) Performance approach Section 170.1; or
- (ii) Prescriptive approach Section 170.2 (a) through (f).

2022 California Energy Code

- 100.0 (e) 3
- **C. Multi-family Buildings**; Section 180.0 applies to new construction in existing multifamily buildings. New construction in existing buildings includes additions, alterations, and repairs. Section 180.0 specifies requirements that uniquely apply to additions, alterations or repairs to existing buildings, and specifies which requirements in other sections also apply. For alterations that change the occupancy classification of the building, the requirements of Section 180.0 apply to the occupancy after the alteration.

2022 California Energy Code

- **Section 100.1 Definitions and Rules of Construction;**
- **Lots of new standards, document references, and definitions added to this section… too many to list!*

- *Here is and example:*
- ***Roof Recover** is the process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.*
- ***Roof Replacement** is the process of removing the existing roof covering, repairing any damaged substrate, and installing a new roof covering.*

** There are also new definitions for **ESS-Ready Interconnection Equipment, and ESS-Ready Panel-board,** lighting and lighting controls, along with many other new definitions related to new requirements.*

2022 California Energy Code

- Many changes to **Table 110.2** (and new tables) to address new technologies and new requirements for heat-pumps, water-source heat-pumps, etc.

- Too many changes to address in this class!

2022 California Energy Code

- **Section 110.4 Mandatory Requirements for Pool and Spa Systems and Equipment;**

- **(a) 1. Efficiency**; *For equipment subject to state or federal appliance efficiency standards, listings in the commission's directory of certified equipment showing compliance with applicable standards;*

2022 California Energy Code

- **Section 110.8 Mandatory Requirements for Insulation, Roofing Products and Radiant Barriers;**
- * There are a few minor changes to this section to recognize the new multifamily category, and citing compliance of Section R806 of the CRC when filling an accessible attic completely with insulation (see Exception 110.8(d) 1.
- Water heater external insulation has been reduced to R3.5 (2019 code required R12) for unfired storage tanks. 110.8 (d) 2
- **Section 110.9 Mandatory Requirements for Lighting Controls; 110.9(b) 5 Part-night Outdoor Lighting Controls** *has been deleted in its entirety.*

2022 California Energy Code

- **Single-family Residential Buildings – Mandatory Features and Devices:**
- **Section 150.0**; *Single-family* residential buildings shall comply with the applicable requirements of Sections 150.0 (a) through 150.0 *(v).*
- *Note: The requirements of Section 150.0(a) through 150.0 (r) apply to newly constructed buildings. Sections 150.2 (a) and 150.2 (b) specify which requirements of Sections 150.0 (a) through 150.0 (r) also apply to additions or alterations.*

2022 California Energy Code

- **The next 33 slides are *mandatory* requirements for *NEW* construction**
- Some will apply to alterations/additions also

2022 California Energy Code

- **150.0 (a) Roof deck, Ceiling and Rafter Roof Insulation;** The opaque portions of roof decks separating attic spaces from ambient air, and ceilings or rafter roofs separating conditioned space from unconditioned spaces or ambient air shall meet the requirements of items 1 through 4 below:
- 1. In CZ – 4, and 8-16, roof decks in newly constructed attic systems shall be insulated to achieve an area weighted average U-factor not exceeding U-0.184.
- **Exceptions:**
- i. The space conditioning system air handler and ducts are located entirely in the conditioned space below the ceiling separating the occupiable space from the attic; or
- ii. The space-conditioning system air handler is located in unconditioned space and has less than 12 linear feet or less of supply duct, including the length of the air handler and the plenum, located in unconditioned space, with all other portions of the supply ducts located in the conditioned space below the ceiling separating the occupiable space from the attic.
- 2 Ceilings and rafter roofs shall be insulated to achieve an area-weighted average U-factor not exceeding U-0.043 (minimum R-22)

2022 California Energy Code

- (b) Loose fill insulation; (no changes to this section)
- (c) Wall insulation; (only a couple of deletions of Table references in this section)
- (d) Raised-floor insulation; (only deletion of reference to Table in this section)
- (e) Installation of fireplaces, decorative gas appliances, and gas logs; (no changes to this section)
- (f) Slab-edge insulation; (no changes)
- (g) Vapor retarder; (no changes)
- (h) Space-conditioning equipment; (no Changes)
- (i) Thermostats; (no Changes)
- (j) Insulation for piping and tanks; (deletion of tank insulation (now located in other part of code), and minor wording changes)

2022 California Energy Code

150.0(k) Residential Lighting;

- 1. Luminaire Requirements.
- A. **Luminaire efficacy**; all installed luminaires shall meet the requirements in Table 150.0-A
- **Exception 1**: Lighting integral to *exhaust fans,* kitchen range hoods*, bath vanity mirrors and garage door openers.*
- **Exception 2**: Navigation lighting such as night lights, step lights, and path lights less than 5 watts.
- ***Exception 3****: Lighting integral to drawers, cabinetry, and linen closets with an efficacy of 45 lumens per watt or greater.*
- B. **Screw based luminaires** shall contain lamps that comply with Reference Joint Appendix JA8.

2022 California Energy Code

- **150.0 (k) C. Recessed down-light luminaires in ceilings;** luminaires recessed into ceilings shall meet all of the following requirements:
- **i.** Shall not contain screw-base lamp sockets; and
- **ii**. Have a label that certifies the luminaire is airtight with air leakage less than 2.0 cfm at 75 pascals when tested to ASTM E283*. An exhaust fan light housing shall not be required to be certified airtight;* and
- **iii.** Be sealed with a gasket or caulk between the luminaire housing and ceiling, and have all air leak paths between conditioned and unconditioned spaces sealed with a gasket or caulk, *or be installed per the manufacturer's instructions to maintain airtightness between the luminaire housing and ceiling;* and
- ***iv.*** *Meet the clearance and installation requirements of the California Electrical Code Section 410.116*
- ***Exceptions****: Recessed luminaires marked for use in fire-rated ceilings.*

2022 California Energy Code

- **150.0 (k) 2. Indoor Lighting Controls;**
- **A.** Lighting shall have a readily accessible wall mounted control that allows lighting to be manually turned ON and OFF.
- **E. Automatic-off controls;** In bathrooms, garages, laundry rooms, utility rooms, *and walk-in closets,* at least one installed luminaire shall be controlled by an occupancy or vacancy sensor providing automatic-off functionality.
- ***F. Dimming Controls;*** *Lighting in habitable spaces, including but not limited to living rooms, dining rooms, kitchens and bedrooms, shall have readily accessible wall mounted dimming controls that allow the lighting to be manually adjusted up and down.*

2022 California Energy Code

- ***150.0 (k)F. Dimmer Controls; Exceptions:***
- ***1.*** *Ceiling fans controlled via remote control*
- ***2.*** *Luminaires connected to a circuit with controlled lighting power less than 20 watts or controlled by a vacancy sensor.*
- ***3.*** *Navigation lighting such as night lights, step lights, and path lights less than 5 watts, and internal drawer and cabinet lights with auto-off controls.*
- **G. Independent Controls;** *Integral lighting of exhaust fans shall be controlled independently of the fan.* The following shall be controlled separately from ceiling installed lighting such that one can be turned on without the other:
- **i.** Under-cabinet lighting
- ***ii.*** *Under-shelf lighting*
- ***iii.*** *Interior lighting of display cabinet*
- ***Iv.*** *Switched outlets*

2022 California Energy Code

- **150.0 (l) *reserved**
- **150.0 (m) Air-distribution and ventilation system ducts, plenums and fans;**
- **B**. Portions of supply-air and return-air ducts and plenums of a space HVAC system shall be insulated in accordance with either Subsection I or ii below:
- **i.** Ducts shall have a minimum installed level of R-6, or
- **Exception**: Portions of the duct system located in conditioned space below the ceiling are not required to be insulated if the following are met:
- **a**. The non-insulated portion of the duct system is located entirely inside the building's thermal envelope, confirmed by visual inspection.
- **b.** At all locations where non-insulated portions of the duct system penetrate into unconditioned space, the penetration shall be draft-stopped compliant with CFC Section 703.1 and 704.1. All connections in unconditioned space are insulated to a minimum of R-6 confirmed by visual inspection.
- ***ii.*** *Ducts do not require insulation when the duct system is located entirely in conditioned space.*

2022 California Energy Code

- *150.0 (m) 12 B v, Filter racks or grills shall use gaskets, sealing or other means to close gaps around inserted filters to prevent air from bypassing the filter.*

2022 California Energy Code

- ***Mandatory requirements if installing nat. gas or propane Water Heater. 150.0 (n):***
- 240v, 30amp circuit terminated within 3’ of designated WH space, and 2-pole designated space in electrical panel
- Space at water heater location large enough to accommodate HP water heater (2.5’ X 2.5’ X 7’)
- Hot & cold waterlines routed through designated space
- Condensate drain

2022 California Energy Code

- **150.0(n) Water Heating System;**
- **1.** Systems using gas or propane water heaters to serve individual dwelling units *shall designate a space at least 2.5' X 2.5' wide and 7 feet tall suitable for the future installation of a heat-pump water heater (HPWH) by **either** meeting A or B below. All electrical components shall comply the California Electrical Code.*
- **A.** *If the designated space is* within 3 feet from the water heater, then this space shall include the following:

2022 California Energy Code

- **i.** A dedicated 125v 20 amp electrical receptacle that is connected to the electrical panel with a 120/240 volt 3-conductor, 10 awg copper branch circuit, within 3’ from the water heater *with no obstructions;* and
- **ii**. Both ends of the unused conductor shall be labeled “SPARE” and be electrically isolated; and
- **iii**. A reserved single-pole circuit breaker space in the electrical panel adjacent to the circuit breaker for the branch circuit in A above, and labeled “FUTURE 240v USE”; and
- **iv.** A condensate drain that is no more than 2” above the base of the installed water heater to allow natural draining without pump assistance.

2022 California Energy Code

- **150.0 (n) water heater systems** **in new construction**
- ***B.*** *If the dedicated space is* ***more*** *than 3' from the water heater, then this space shall include the following:*
- ***i.*** *A dedicated 240v branch circuit shall be installed within 3' from the designated space. The branch circuit shall be rated @ 30 amps minimum. The blank cover shall be identified as "240v READY"; and*
- ***ii****. The main electrical service panel shall have a reserved space to allow for installation of a 2-pole breaker for a future HPWH. The reserved space shall be marked "FOR FUTURE 240v USE"; and*
- ***iii.*** *Either a dedicated cold water-supply, or the cold water-supply shall pass through the designated HPWH space just before reaching the gas or propane water heater; and*
- ***iv.*** *The hot water-supply coming out of the gas water heater shall be routed first through the designated space before serving any fixtures; and*
- ***v.*** *The hot and cold water piping shall be exposed and readily accessible in the designated HPWH space for future installation; and*
- ***vi.*** *A condensation drain that is no more than 2" higher than the base of the installed water heater, and allows natural draining without pump.*

2022 California Energy Code

- ***New requirements for central fan integrated ventilation systems requiring a motorized controlled damper. 150.0 (o)***
- *Specifies requirements for outdoor air dampers, damper control, and variable ventilation controls.*

2022 California Energy Code

- 150.0 (o) **Requirements for ventilation and indoor air quality;** All dwelling units shall meet the requirements of ASHRE Standard 62.2. Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified in Section 150.0 (o). All dwelling units shall comply with Section 150.0 (2) below.
- ***Exception to Section 150.0 (o): The following sections of ASHRE 62.2 shall not be required for compliance: Section 4.1.1, 4.1.2, 4.1.4, 4.3, 4.6, Section 5, Section 6.1.1, 6.5.2, and Normative Appendix A***
- ***1. Amendments to ASHRAE 62.2:***
- ***A. Window operation is not a permissible method of providing the dwelling unit ventilation airflow specified in Section 150.0(o)1C below.***

2022 California Energy Code

150.0 (o) Requirements for ventilation and indoor air quality; *(continued)*:

- ***B. Central fan integrated*** *(CFI) ventilation systems shall meet the following:*
- ***i.*** *Continuous operation of the central forced air fan is prohibited as a means of whole-dwelling unit ventilation.*
- ***ii. Outdoor air damper(s);*** *A motorized air damper shall be installed on the connected ventilation ducts of CFI system that prevents all airflow into or out of the space-conditioning duct system when the damper is closed.*
- ***iii. Damper Control;*** *The required motorized damper(s) shall be controlled to be in the open position when outdoor air ventilation is required for compliance, and in the closed position when ventilation air is not required.*
- ***iv. Variable Ventilation;*** *CFI ventilation systems shall incorporate controls that track outdoor air ventilation run time, and either open or close the motorized damper(s) depending on whether or not outdoor ventilation air is required.*

2022 California Energy Code

- 150.0 (o) C. **Whole-dwelling unit mechanical ventilation for single-family detached and townhouses**; Single-family detached dwelling units and attached dwelling units not sharing ceilings or floors with other units, occupiable spaces, public garages, or commercial spaces shall have mechanical ventilation airflow as specified in **Sub-Sections i, ii, and iii.**

2022 California Energy Code

- ***150.0 (o) G; Updated kitchen range-hood exhaust rates; Gas ranges require higher ventilation rates or capture efficiencies than electric ranges. 150.0 Table G CEC***
- *Example: 1,500 + SF home requires 50% CE or110 cfm for electric range, or 70% CE or 180 cfm for gas range*
- *This is a mandatory requirement for Ventilation and IAQ

2022 California Energy Code

- ***150.0 (o)G Local Mechanical Exhaust;*** *A local mechanical exhaust system shall be installed in each kitchen and bathroom. Systems shall be rated for airflow in accordance with ASHRAE 62.2 Section 7.1.*
- ***i****. Non-enclosed kitchens shall have a demand-controlled mechanical exhaust system meeting the requirements of Section 150.0(o)1Giii.*
- ***ii.*** *Enclosed kitchens and all bathrooms shall have either one of the following:*
- ***a.*** *Demand-controlled mechanical exhaust system that complies with 150.0(o)1Giii.*
- ***b.*** *A continuous mechanical exhaust system meeting the requirements of Section 150.0(o)1Giv.*

2022 California Energy Code

iii. Demand controlled mechanical exhaust; A local mechanical exhaust system shall be designed to be operated as needed.

- ***a. Control and operation;*** *Systems shall be provided with at least one of the following:*
- **1.** A readily accessible occupant-controlled ON-OFF control
- ***2****. An automatic control that does not impede occupant ON control.*
- ***b. Ventilation rate and capture efficiency;*** *The system shall meet or exceed either the minimum airflow shown in Table 150.0-E or the minimum capture efficiency shown in Tables 150.0-E and 150.0-G. Capture efficiency rates shall be determined by ASTM E3087 and listed in a product directory approved by the Energy Commission.*

2022 California Energy Code

- **150.0(p) Pool Systems and Equipment;**
- **D.** Pump motors used for filtration shall *meet the applicable federal standards in 10 CFR 431.465* (2019 code required pump motors 1 HP or greater to be multi-speed).

2022 California Energy Code

150.0(q) Fenestration Products;

- **1.** Fenestration, including skylights shall have a maximum U-factor of 0.45 *(*this changed from 0.58 in the 2019 code to 0.45).*

2022 California Energy Code

- **150.0 (r) Solar Ready Buildings;**

- (There are no changes to this section)

2022 California Energy Code

- ***ESS ready Single-family Dwelling* (this includes ADU's) *150.0 (s):***
- Requires a 225 amp minimum service panel

- And…

2022 California Energy Code

- ***150.0 (s) Energy Storage Systems (ESS) ready**; All single-family family residences that include one and two family dwellings shall meet the following. All electrical components shall meet the requirements of the California Electrical Code:*
- ***1.** At least one of the following shall be provided:*
- ***A.** ESS ready interconnection equipment with a minimum backed-up capacity of 60 amps and a minimum of four ESS-supplied branch circuits, or*
- ***B**. A dedicated raceway from the main service to a sub-panel that supplies the branch circuits in 150.0(s)(2). All branch circuits are permitted to be supplied by the main service prior to the installation of ESS. The trade size of the raceway shall not be less than 1 inch. The sub-panel that supplies the branch circuits must be labeled "SUBPANEL SHALL INCLUDE ALL BACKED-UP LOADS".*
- *This is an entirely new section in the 2022 code.

2022 California Energy Code

- **150.0 (s) ESS Ready;** (continued):
- ***2.*** *A minimum of four branch circuits shall be identified and have their source of supply collocated at a single (subpanel) panelboard suitable to be supplied by the ESS. At least one circuit shall supply the Refrigerator, One lighting circuit for the primary egress, and at least One sleeping room receptacle circuit.*
- ***3.*** *The main service panel shall have a minimum busbar rating of 225 amps*
- ***4****. Sufficient space shall be reserved to allow future installation of a system isolation equipment/transfer switch within 3' of the main panelboard. Raceways shall be installed between the panelboard and the system isolation equipment/transfer switch location to allow the connection of back-up power source.*

2022 Energy Code

- ***New Battery Storage Ready infrastructure requirements; 150.0 (s):***
- ESS ready interconnection equipment with minimum 60amp back-up capacity and 4 ESS supplied branch circuits, or
- Dedicated raceway from main service to sub-panel that supplies branch circuits, and…

2022 California Energy Code

- ***Identify at least 4 emergency back-up circuits (refrigerator, lighting, bedroom outlet, etc.), and…**
- ***Space for future transfer switch within 3’ of main panel, and raceways from panel to future transfer switch location**

2022 California Energy Code

150.0 (t) Heat-pump space heater ready;

- Heat-Pump space heater ready; 240v, 30 amp circuit with termination within 3’ of furnace; 2-pole breaker space reserved and labeled in main panel
- **This is a completely new section.*

2022 California Energy Code

- ***150.0 (t) Heat-Pump Space Heater Ready;*** *Systems using gas or propane furnace to serve individual dwelling units shall include the following:*
- ***1.*** *A dedicated 240v branch circuit wiring shall be installed within 3' of the furnace and accessible to the furnace with no obstructions. The branch circuit conductors shall be rated a minimum of 30 amps. The blank cover shall be identified as "240v READY". All components shall comply with the California Electrical Code.*
- ***2.*** *The main service panel shall have a reserved space to allow for the installation of a 2-pole breaker for a future heat-pump and shall be marked "240v FUTURE USE".*

2022 California Energy Code

- ***Mandatory Electric-Ready SFD when installing gas; 150.0 (u) CEC:***
- Electric ready cooktop with 240v, 50 amp circuit termination within 3’ of cooktop; 2-pole space reserved and labeled in panel

2022 California Energy Code

- **150.0 (u) Electric Cooktop Ready;** Systems using gas or propane cooktop to serve individual dwelling units shall include the following:
- **1**. A dedicated 240v branch circuit wiring shall be installed within 3’ of the cooktop and accessible without obstructions. The branch circuit conductors shall be rated a minimum of 50 amps. The blank cover shall be marked “ 240v READY”.
- **2**. The main service shall have a reserved space to allow installation of a two-pole breaker for future electric cooktop. The space shall be permanently marked “FOR FUTURE 240v USE”.
- **This is a completely new section in the 2022 code*

2022 California Energy Code

- ***Mandatory Requirements for Electric Ready SFD. 150.0 (v):***
- Electric Clothes Dryer ready with 240v, 30 amp circuit within 3’ of dryer and 2-pole breaker space reserved and labeled in panel

2022 California Energy Code

- ***150.0 (v) Electric Clothes Dryer Ready;*** *Clothes dryer locations with gas or propane plumbing to serve individual dwelling units shall include the following:*
- ***1****. A dedicated 240v branch circuit wiring shall be provided within 3' of the dryer location in an accessible, unobstructed location. The circuit shall be rated 30 amps minimum. The blank cover shall be marked "240v READY".*
- ***2****. The service panel shall have space for a two-pole breaker that is permanently marked "FUTURE 240v USE".*

2022 California Energy Code

- **Section 150.1 Single-Family Residential Buildings - Performance and Prescriptive Compliance Approaches:**
- **(a) Basic Requirements;** *Single-family residential* buildings shall meet all of the following:
- **1.** Section 110.0 through 110.10
- **2.** The mandatory requirements in Section 150.0
- **3.**Either the performance standards or the prescriptive requirements for the climate zone that the building is located in.
- Note: The requirements of Section 150.0 (a) through 150.0 (r) apply to newly constructed buildings, and Section 150.2 (a) and 150.2 (b) specify changes to the requirements of Section 150.1 (a) through 150.1 (c) that apply to additions or alterations.

2022 California Energy Code

- **150.1 (b) Performance Standards;**

- **1. Newly Constructed Buildings;** The Energy Budget for newly constructed buildings is expressed in terms of Energy Design Ratings, which are based on *source energy and Time-dependent Valuation (TDV) energy. The Energy Design Rating 1 (EDR1) is based on source energy*. The Energy Design Rating 2 (EDR2) is based on TDV energy, and has two components, the Energy Design Efficiency Rating, and the Solar Electric Generation and Demand Flexibility Design Rating.

2022 California Energy Code

- **150.1 (c) Prescriptive Standards;** Buildings that comply with prescriptive standards shall be designed, constructed and equipped to meet all the requirements for the appropriate Climate Zone shown in Table 150.1-A. (Table150.1-B moved to multi-family sub-chapter) Installed components shall meet the following:
- **1. Insulation** (no changes)
- **2. Radiant Barrier** (no changes)
- **3. Fenestration** (no changes)
- **4. Shading** (no changes)
- **5. Doors** (no changes)
- **6. Heating system type** (*see changes next slide*)

2022 California Energy Code

- **6. Heating System Type;** Heating system types shall be installed as required by Table 150.1-A. *For CZ-3, 4, 13 and 14, the space-conditioning system shall be a heat-pump, or shall meet the performance requirements of 150.1 (b) 1.*
- **8. Domestic Water Heating Systems;** Water heating systems shall meet the requirements of A, B, or C, or shall meet the performance compliance requirements of Table 150.1(b)1.
- *A. A single 240v heat pump water heater (HPWH). The storage tanks shall be located in the garage or conditioned space. In addition, meet the following:*
- *i. CZ-1 and 16 shall have a field verified compact hot water distribution system; and*
- *ii. A drain water heat recovery tank that is field verified in CZ-16*
- *B. A single 240v HPWH that meets the requirements of NEEA Advanced Water Heater Specification tier 3 or higher.*
- *C. A solar water heating system with electric back-up…*
- *Exception 1. CZ 3, 4, 13 and 14 may install a gas instantaneous water heater with an input rating of 200,000 btu's or less, and no storage tank may be installed.*
- *Note: The space conditioning system shall be a heat-pump as specified in 150.1(c)6*
- *Exception 2: An instantaneous electric water heater with a point of use distribution as required by RA4.4.5 may be installed for new dwelling units with 500 sf or less.*
- *Exception 3: A 120v HPWH for a dwelling unit with one bedroom may be installed.*

2022 California Energy Code

150.1 (c) 14 Photo-voltaic Requirements;

- This section has been completely re-written to define the Solar Access Roof Area (SARA), and clarify locations where solar-PV can be located.
- An exception has been added that no PV is required when the minimum system size is less than 1.8 kW.
- An exception added when there is less than 80 sf of SARA

150.2 Alterations & Additions

- 150.2 (a) Additions; Additions to existing single-family residential buildings shall meet the requirements of Sections 110.0 through 110.9; Sections 150.0 (a) through (n), (p), and (q); and either Section 150.2 (a) 1 or 2.

- *The biggest change for this Section appears to be compliance with 150.0 (n) Electric-ready Water Heater space of 2.5' X 2.5' X 7'. This means even if a tankless WH is installed, a dedicated space with water-piping passing through space, 30 amp 2-pole breaker space with electrical circuit wiring, etc., shall be provided.*

2022 California Energy Code

(Prescriptive for alterations)

- **150.2 (b) C; Entirely new or complete replacement space conditioning system** installed as part of an alteration shall include the system heating or cooling equipment, including but not limited to: cooling or heating coil, condensing unit, *air handler* for a split system; or complete replacement of a packaged unit; plus entirely new or replacement duct system. Entirely new or complete replacement space-conditioning systems shall meet requirements of Sections 150.0(h), 150.0(i), 150.0 (j) 1,&2, 150.0 (m) 1-10, 150.0 (m) 12,&13, 150.1(c) 7, 150.2 (b) 1G, and Table 150.2-A.

2022 California Energy Code

- ***150.2 (b) D; New prescriptive requirements for insulation and sealing in vented attics in all Climate Zones (except 5 & 7) if:***
- Ceiling is altered; **150.2 (b) J**, or
- Entirely new/complete replacement of duct system in a vented attic. ***150.2 (b) D**

**Attic insulation shall be minimum R-49 for vented attics if the air-handler is located in the attic.*

2022 California Energy Code

- ***150.2 (b) D; Reduce the 40' trigger for prescriptive duct sealing and insulation to 25' for altered systems.***
- ***Eliminate the minimum length requirement for additions and require duct-sealing whenever and existing duct system is extended to serve an addition.***

2022 California Energy Code

150.2 (b) 1Diib1 *(prescriptive approach for alterations)*

- ***Reduce the duct sealing target for altered duct and space conditioning systems from 15% to 10% of total duct leakage in all Climate Zones.***

Roof Replacements - 2022 California Energy Code

- **150.2 (b) I Roofs;** Replacement of the exterior surface of existing roofs, including adding a new surface layer on top of the existing exterior surface, shall meet the requirements of Section 110.8 and subsections i & ii where more than 50% of the roof is being replaced.
- **i.** Steep-sloped roofs shall meet the following:

New roofing products in CZ-*4 and 8*-15 shall have a minimum aged solar reflectance of 0.20 and a min. thermal emittance of 0.75, or a minimum SRI of 16.

2022 California Energy Code

- ***Low-sloped roof replacements;*** *In CZ-4, and 6-15 shall have an aged solar reflectance equal to or greater than 0.63 and a thermal emittance equal to or greater than 0.75, or a SRI of 75 minimum.* ***150.2 (b) I, ii a***
- *Exception: Solar reflectance can be met by using insulation at roof deck specified in Table 150.2-B*

2022 California Energy Code

- **150.2 (b) J; Vented attics – ceilings** *(prescriptive approach)*

- **i. Attic insulation shall be R-49 for vented attics in CZ-1-4, 6, 8-16**

Exception: *CZ-1,3, & 6, dwelling units with at least R-19 existing insulation*

- ***ii.*** *In CZ-2, 4, & 8-16 air seal all accessible areas of the ceiling plane between attic and conditioned space per 110.7 and;*
- ***iii.*** *In CZ 1-4 and 8-16, recessed downlights not rated for IC must be replaced or retrofitted with fireproof covers to allow insulation in contact with light fixture. 150.2 J ii, iii*
- **Various exceptions for this section*

150.2 (b) Additions and Alterations (prescriptive approach)

- **K** – Lighting; (formerly 150.2 (b) J) –no changes
- ***L – Mechanical ventilation for indoor air quality – entirely new or complete replacement ventilation system;*** *shall comply with Section 150.0 (o). An entirely new or complete replacement is 75% new duct material and up to 25% re-used parts including grilles, registers, boots, air filtration, and duct materials.*
- ***M – Mechanical ventilation for indoor air quality – altered ventilation systems.*** *(whole-dwelling unit ventilation, bathroom & kitchen exhaust)*

2022 California Energy Code

- ***150.2 (b) N; New doors that result in an increase in exterior door area must meet the new construction requirements of a maximum U-factor of 0.20.***

What's new for the 2022 CalGreen Building Code?

- Hint: New EV-charging requirements!

2022 CalGreen Code

- Chapter 1 Administration; *There are no significant changes in Chapter 1; only some reference standards added.

- Chapter 2 Definitions; *There are a couple of new definitions regarding EV-charging (and other items):
- *Automatic Load Management System: A system designed to manage load across one or more electric vehicle supply equipment…*
- *Electric Vehicle Capable Space: A vehicle space with electrical panel space and load capacity to support a branch circuit and raceways… to support EV-charging.*
- *Electric Vehicle Ready Space: A vehicle space that is provided with a branch circuit, necessary raceways, both underground and/or surface mounted to accommodate EV-charging, terminating in a receptacle or a charger.*

2022 California Green Building Standards Code

- Definitions (continued)

- ***Level 2 EV supply equipment;*** *The 208/240volt 40-amp branch circuit and EV charging connectors… and other apparatus… installed to charge EV.*
- ***Low-power Level 2 EV charge receptacle;*** *208/240v, 20-amp circuit/receptacle.*

2022 California Green Building Standards Code

- Definitions (continued):
- *Off-street Loading Spaces;*this definition excludes passenger loading/unloading*

- *Zero-Emitting and High Efficient Vehicles; Eligible vehicles are limited to the following:*
- *1. Zero-emission vehicle (ZEV) CCR Title 13, 1962*
- *2. Hi-efficiency vehicles regulated by EPA bearing a fuel economy and greenhouse gas rating of 9 or 10…*

2022 California Green Building Code

- ***New requirements for additions or alterations to existing parking facilities**

- **301 Scope**; Buildings shall be designed to include the green building measures specified as mandatory…
- **301.1.1 Additions and alterations;** The mandatory provisions of Chapter 4 shall be applied to additions or alterations of existing residential buildings where the addition or alteration increases the building's conditioned area, volume or size. The requirements shall apply only to and/or within the specific area of the addition or alteration.
- *The mandatory provisions of Section 4.106.4.2 may apply to the addition or alterations of existing parking facilities or the addition of new parking facilities serving existing multi-family buildings. See Section 4.106.4.3 for application.*
- *Note: Repairs including, but not limited to, resurfacing, restriping, or maintaining existing lighting fixtures are not considered alterations for the purpose of this section.*

2022 CalGreen Code

- 4.106.4 EV charging for new construction; New construction shall comply with Section 4.106.4.1 or 4.106.4.2 to facilitate future installation and use of EV chargers…
- Exceptions:
- 1. On a case-by-case basis, where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:
- 1.1 Where there is no local utility power *supply or the local utility is unable to supply adequate power.*
- 1.2 Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements directly related to the implementation of Section 4.106.4 *may adversely impact the construction cost of the project*.
- 2. Accessory Dwelling Units (ADU) and Junior Accessory Dwelling Units (JADU) without additional parking facilities.

Exception 1.2 removed the "<u>***more than $400 per dwelling unit***</u>*" cost.*

2022 CalGreen Code

- *Section 4.106.4.2 has been completely re-written to require the following:*

* EV-Charging for Multi-family, hotels, motels, and Residential New Construction: The entire section has been changed significantly. The code now provides specific requirements for new multi-family dwellings with less than 20 dwelling units, and for those with more than 20 dwelling units. It requires future EVSE Level 2 Chargers and more. The changes are too many to list here. The requirements are still requiring provisions for future chargers, but not to install them at this time.

2022 CalGreen Code

- There have been no changes to Residential Mandatory Requirements Division 4.2 Energy Efficiency, Division 4.3 Water Efficiency and Conservation, or Division 4.5 Environmental Quality.

2022 CalGreen Code

- **4.410 BUILDING MAINTENANCE AND OPERATION MANUAL;** At the time of final inspection, a manual, CD, web-based reference or other media acceptable to the AHJ which includes all of the following shall be placed in the building:
- 1. Directions to the owner or occupant that the manual shall remain in the building for the life of the structure.
- 2. Operation and maintenance instructions for the following:
    a. Equipment and appliances
    b. Yard and roof drainage
    c. Space conditioning systems
    d. Landscape irrigation
    e. Water re-use system
* 3. Info from utility, water, refuse/recycle company

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- 4. Public transportation & carpool for the area
- 5. Educational materials on how to maintain 30-60% interior Relative Humidity
- 6. Information on water-conserving landscape & controllers
- 7. Instructions on gutter maintenance and the importance of keeping water at least 5’ from foundations
- 8. Maintenance measures including caulking, painting, grading, etc.
- 9. Information on solar energy and incentives
- 10. Special Inspection records required by the code or AHJ
- ***11. Information from CalFire on maintenance of Defensible Space around residential structure***
- ***12. Location of the grab bar reinforcement***

2022 Code Changes