

2022 Energy Code

Single-Family Significant Changes



California Energy Commission
April 2023



Agenda

- 2022 Energy Code basics
- Navigating the 2022 Energy Code
- All buildings significant changes
- Single-family significant changes
 - Mandatory
 - Prescriptive
 - Additions and alterations
- Resources



2022 Energy Code Basics

Energy Code History

Warren-Alquist Act established CEC in 1974

- Authority to develop and maintain Building Energy Efficiency Standards (Energy Code)
- Requires CEC to update periodically, usually every 3 years
- Requires Energy Code to be cost-effective over economic life of building

WARREN-ALQUIST ACT

Warren-Alquist
State Energy Resources
Conservation and
Development Act

Public Resources Code
Section 25000 et seq.



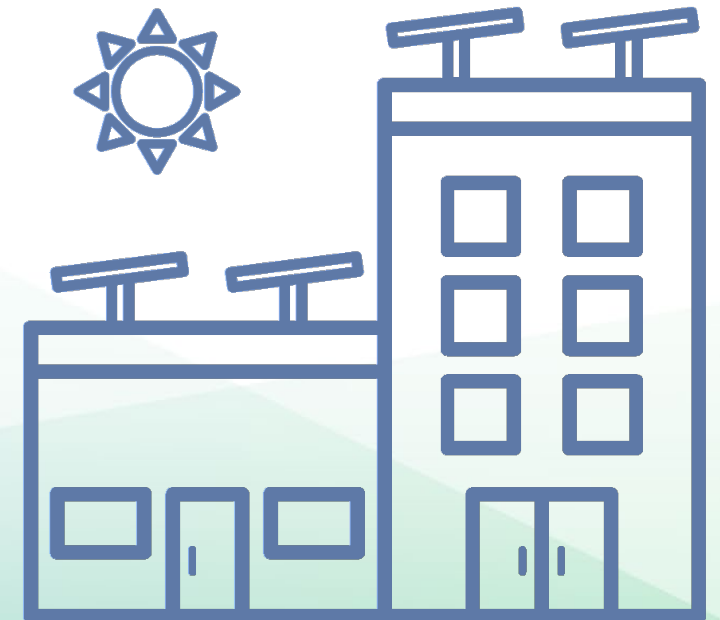
CALIFORNIA
ENERGY COMMISSION
Gavin Newsom, Governor

2020 EDITION
JANUARY 2020
CEC-140-2020-001



2022 Energy Code Goals

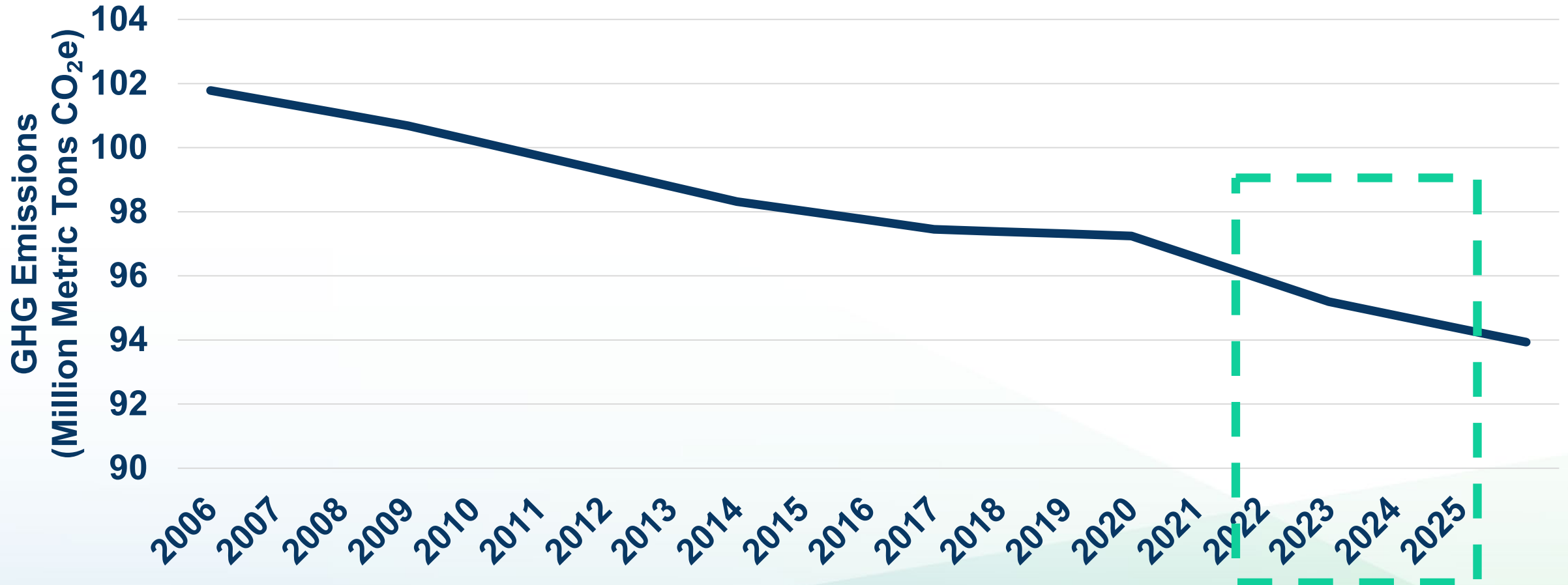
- Increase building energy efficiency cost-effectively
- Contribute to California's GHG reduction goals
- Enable pathways for all-electric buildings
- Reduce residential building impacts on the electricity grid
- Promote demand flexibility and self-utilization of PV
- Provide tools for local government reach codes





Energy Code Environmental Benefit

Reduced Statewide Emissions



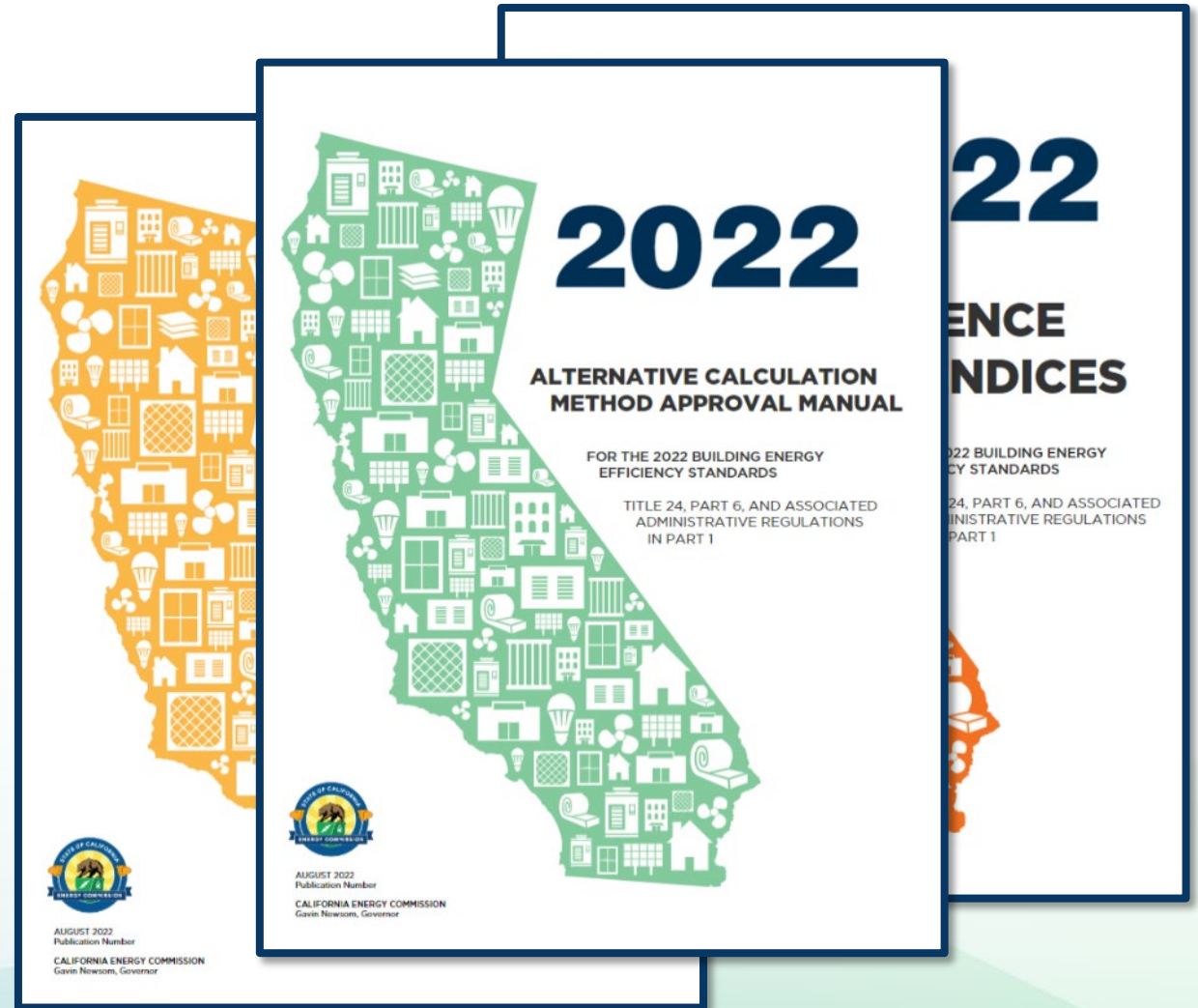
Source: CEC Impact Analysis 2005, 2008, 2013, 2016, 2019, 2022



2022 Energy Code

Effective January 1, 2023

- Building permit applications submitted on or after Jan 1, 2023
- Must use 2022 tools:
 - Software
 - Forms





2022 Documents Online

2022 Building Energy Efficiency Standards

The Building Energy Efficiency Standards (Energy Code) apply to newly constructed buildings, additions, and alterations. They are a vital pillar of California's climate action plan. The 2022 Energy Code will produce benefits to support the state's public health, climate, and clean energy goals.

The California Energy Commission (CEC) updates the Energy Code every three years. On August 11, 2021, the CEC adopted the 2022 Energy Code. In December, it was approved by the California Building Standards Commission for inclusion into the California Building Standards Code. The 2022 Energy Code encourages efficient electric heat pumps, establishes electric-ready requirements for new homes, expands solar photovoltaic and battery storage standards, strengthens ventilation standards, and more. Buildings whose permit applications are applied for on or after January 1, 2023, must comply with the 2022 Energy Code.



2022 Energy Code for Residential and Nonresidential Buildings

[2022 ENERGY CODE >](#)

Expand All

- Supporting Documents – Appendices, Compliance Manuals, and Forms +
- Software – Compliance Software, Manuals, and Tools +

BUILDING ENERGY EFFICIENCY STANDARDS - TITLE 24

2025 Building Energy Efficiency Standards

2022 Building Energy Efficiency Standards ^

- Workshops, Notices, and Documents
- 2019 Building Energy Efficiency Standards
- 2016 Building Energy Efficiency Standards
- Past Building Energy Efficiency Standards
- Climate Zone tool, maps, and information supporting the California Energy Code
- Online Resource Center
- Solar Assessment Tools

RELATED LINKS

Workshops, Notices, and Documents

CONTACT

[Building Energy Efficiency Standards - Title 24](#)

Toll-free in California: 800-772-3300
Outside California: 916-654-5106

SUBSCRIBE

Building Energy Efficiency Standards

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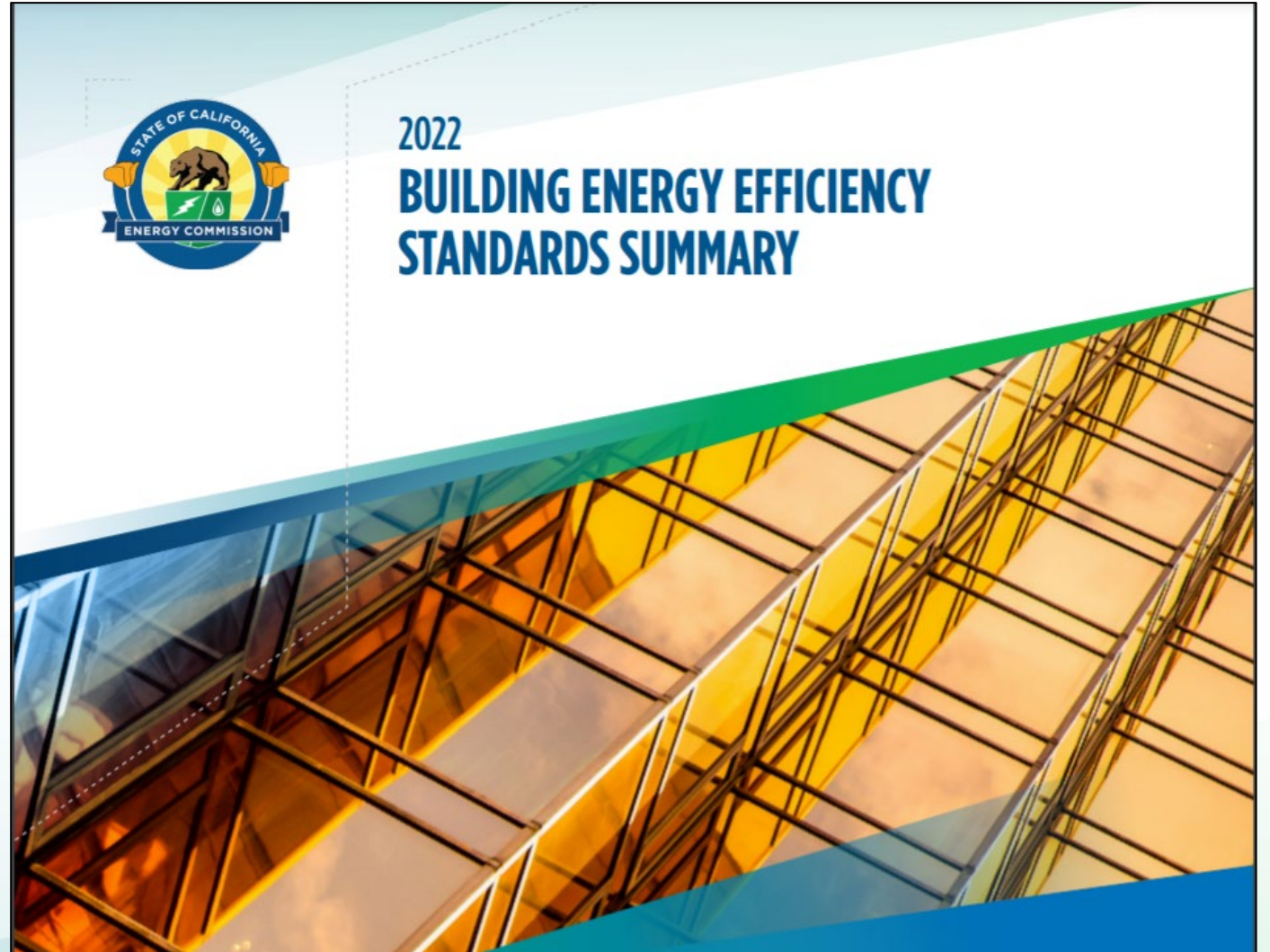
SUBSCRIBE

- Energy Code
- Reference Appendices
- Compliance Manuals
- Software
- Forms



2022 Energy Code Highlights

- Heat pump baselines
- Solar and battery storage
- Ventilation requirements
- Lighting LED baselines
- Multifamily restructuring





Energy Code Requirements

Mandatory requirements

- Minimum efficiency requirements must always be met
- Can never trade-off

Prescriptive requirements

- Predefined efficiency requirements
- May supersede mandatory requirements
- Different requirements for newly constructed buildings, additions, and alterations



Compliance Approaches

Prescriptive approach

- Simple approach, no trade-offs
- Defines the standard building design
- New heat pump baselines

Performance approach

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC-approved software
- Proposed building design meets or exceed standard building design





2022 Performance Metrics

New for 2022

Energy performance calculations

- Single-Family
 - EDR1: hourly source energy
 - EDR2: time dependent valuation (TDV)
 - Efficiency EDR2, PV + flexibility = total EDR2



Demonstrating Compliance

Compliance forms confirm Energy Code is met

Updated for 2022

- Completed by responsible party
 - Designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification

Type of form	Single-family	Multifamily 3 or less habitable stories	Nonresidential Multifamily 4 or more habitable stories
Certificate of compliance	CF1R	LMCC	NRCC
Certificate of installation	CF2R	LMCI	NRCI
Certificate of verification	CF3R	LMCV	NRCV
Certificate of acceptance	-	-	NRCA



2022 Compliance Software

Performance approach must use approved compliance software versions

- Single-family
 - CBECC-Res 2022.2.1
 - EnergyPro 9.0
 - Wright-Energy 2022.2.0



Single-family Defined

All Buildings § 100.1

Updated for 2022

Single-family building

- Occupancy group R-3
 - Two or less dwelling units
 - Not multifamily, hotel, or motel
- Townhouse
- Occupancy group R-3.1
- Occupancy group U on residential site





Navigating 2022 Energy Code



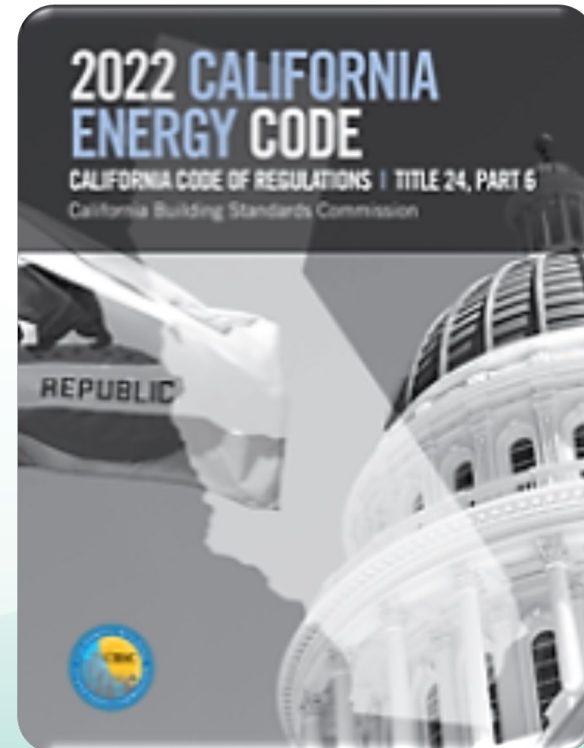
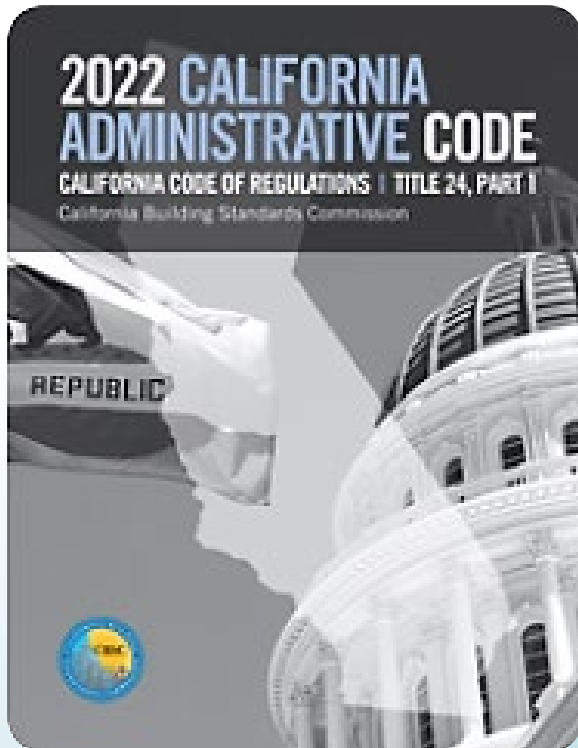
Title 24 – California Building Code

Part 1 - Administrative Code

- Chapter 10
- §§ 10-101 – 10-115
- Administrative requirements

Part 6 - Energy Code

- Subchapters 1 – 9
- §§ 100.0 – 180.4
- Technical requirements





2022 Energy Code Table 100.0-A

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
All Buildings	General	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0
Single-family	General	150.0	150.1((a), (c))	150.1(a), 150.1(b)	150.2(a), 150.2(b)
Single-family	Envelope (conditioned)	110.6, 110.7, 110.8, 150.0(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g), 150.0(q)	150.1(a), (c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
Single-family	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)	150.1(a), (c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
Single-family	Water Heating	110.3, 150.0(j) (n)	150.1(a), (c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
Single-family	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)	150.1(a), (c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
Single-family	Outdoor Lighting	110.9, 130.0, 150.0(k)	150.1(a), (c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
Single-family	Pool and Spa Systems	110.4, 150.0(p)	N. A.	N.A.	150.2(a), 150.2(b)
Single-family	Solar Ready Buildings	110.10	N. A.	N.A.	N.A.
Single-family	Electric Ready	150.0(s), 150.0(t), 150.0(u), 150.0(v)	N.A.	N.A.	N.A.
Single-family	Solar PV Systems	N.A.	150.1(c)14	150.1(a), 150.1(b)	N.A.

Single-family relevant sections

§ 100.1 Definitions

§ 110.0-110.12 All buildings

§ 150.0 Mandatory requirements

§ 150.1 Prescriptive requirements

§ 150.2 Additions and alterations



All Buildings Significant Changes

Administrative § 10-115

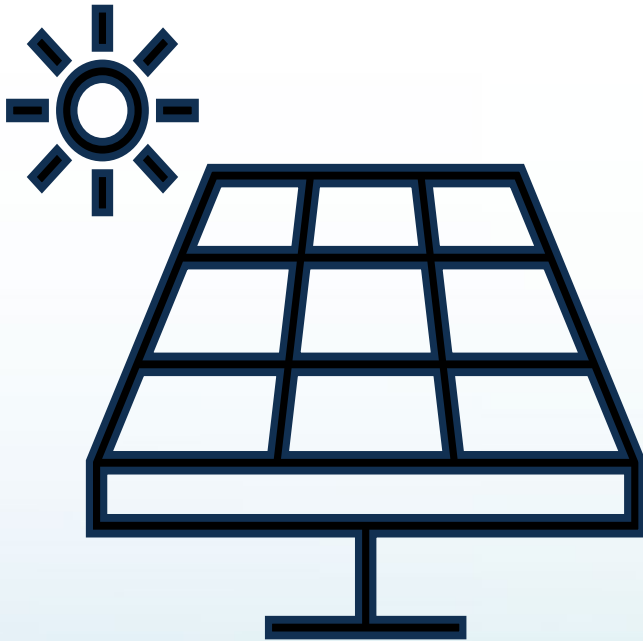
Mandatory § 110.2



Community Shared Solar Administrative Requirements

All Buildings § 10-115

Updated for 2022



- Updates to enhance community-scale projects as alternative to on-site installation of PV and energy storage systems
- Adds requirements
 - Participation period
 - CC&Rs
 - Ability to opt-out
 - Size no larger than 20 megawatts
 - Reporting



Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2(a), Tables 110.2-A-J

Revises various efficiencies to match federal requirements in Tables

Updated for 2022

- 110.2-A Air conditioners and condensing units
- 110.2-B Heat pumps
- 110.2-C Air-cooled gas engine heat pumps
- 110.2-D Water chilling packages
- 110.2-E Packaged terminal air conditioners and packaged terminal heat pumps
- 110.2-F (formerly 110.2-G) Heat rejection equipment
- 110.2-G (formerly 110.2-H) Variable refrigerant flow (VRF) air conditioners
- 110.2-H (formerly 110.2-I) Electrically operated variable refrigerant flow air-to-air and applied heat pumps
- 110.2-I (formerly 110.2-J) Warm-air furnaces and combination warm-air furnaces/air-conditioning units
- 110.2-J (formerly 110.2-K) Gas and oil-fired boilers



HVAC Efficiency Mandatory Requirements

All Buildings § 110.2, Table 110.2-B

Updated for 2022

TABLE 110.2-B HEAT PUMPS, MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Rating Condition	Efficiency ^a	Test Procedure ^b
Air Cooled (Cooling Mode), both split system and single package	≥ 65,000 Btu/h and < 135,000 Btu/h		11.0 EER <u>14.1</u> IEER	AHRI 340/360
<u>Air Cooled</u> <u>(Cooling Mode), both split</u> <u>system and single package</u>	≥ 135,000 Btu/h and < 240,000 Btu/h		10.6 EER <u>13.5</u> IEER	<u>AHRI 340/360</u>
<u>Air Cooled</u> <u>(Cooling Mode), both split</u> <u>system and single package</u>	≥ 240,000 Btu/h		9.5 EER <u>12.5</u> IEER	<u>AHRI 340/360</u>
Water source (cooling mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	86°F entering water	13.0 EER	ISO-13256-1
Groundwater source (cooling mode)	< 135,000 Btu/h	59°F entering water	18.0 EER	ISO-13256-1
Ground source (cooling mode)	< 135,000 Btu/h	77°F entering water	14.1 EER	ISO-13256-1
Water source water-to-water (cooling mode)	< 135,000 Btu/h	86°F entering water	10.6 EER	ISO-13256-2
Groundwater source water-to-water (cooling mode)	< 135,000 Btu/h	59°F entering water	16.3 EER	ISO-13256- <u>2</u>



Mandatory Requirements for Space-Conditioning Equipment

All buildings § 110.2(a), Tables 110.2-K-N

New for 2022

Adds new tables

- 110.2-K DX-DOAS units, single package, and remote condenser
- 110.2-L Floor-mounted air conditioners and condensing units for computer rooms
- 110.2-M Ceiling-mounted air conditioners and condensing units for computer rooms
- 110.2-N Heat pump and heat recovery chillers





Mandatory Requirements for Space-Conditioning Equipment

Federal Requirement EERE-2014-BT-STD-0048-0102

Department of Energy (DOE)

- Equipment meets new EER2, SEER2, HSPF2 federal requirements after January 1, 2023
 - Split AC based on install date
 - Package AC and split heat pump based on manufacture date





Single-Family Significant Changes

Mandatory § 150.0



Insulation Mandatory Requirements

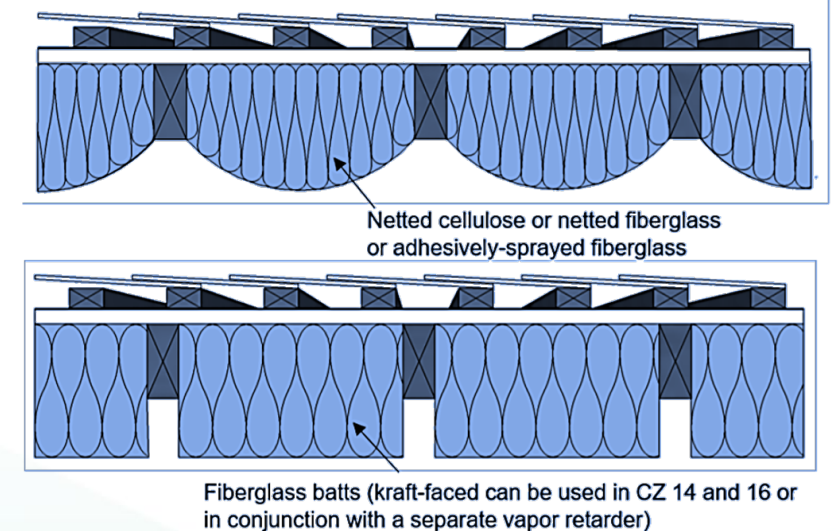
Single-family § 150.0(a)1

New for 2022

Roof deck insulation

- Adds roof deck insulation to mandatory requirement
- Climate zones 4 and 8-16
- Maximum U-factor 0.184
- Exceptions:
 - Ducts and air handler located entirely in conditioned space
 - Air handler and 12 feet or less of supply duct in unconditioned space

Figure 3-25: Placement of Insulation Below the Roof Deck

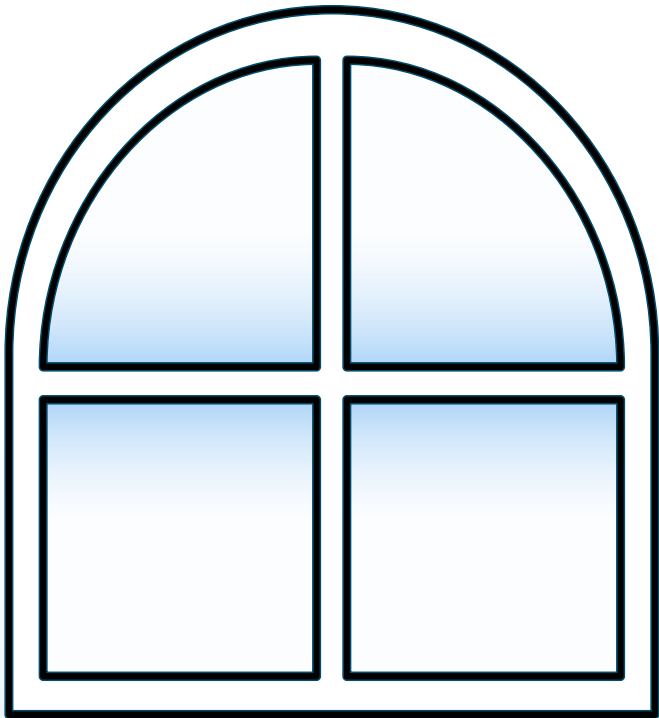




Fenestration Mandatory Requirements

Single-family § 150.0(q)

Updated for 2022



Fenestration products

- Mandatory U-factor more stringent
- Maximum U-factor 0.45
- All climate zones
- Area-weighted average allowed



Lighting Mandatory Requirements

Single-family § 150.0(k)1-2

Updated for 2022



Luminaire requirements

- Ceiling recessed downlight luminaires meet CA Electrical Code § 410.116

Indoor lighting controls

- Adds auto-off controls for lighting in drawers and cabinets
- Undershelf, display cabinets, switched outlets controlled separate from ceiling lighting
- Adds exceptions to dimming control requirements



Lighting Mandatory Requirements

Single-family Table 150.0-A

Updated for 2022

TABLE 150.0-A Classification of High Luminous Efficacy Light Sources

<p>Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high luminous efficacy and are not required to comply with Reference Joint Appendix JA8.</p>	<p>Light sources in this column are required to comply with Reference Joint Appendix JA8 and shall be certified and marked as required by JA8.</p>
<ol style="list-style-type: none">1. LED light sources installed outdoors.2. Inseparable solid-state lighting (SSL) luminaires containing colored light sources that are installed to provide decorative lighting.3. Pin-based linear fluorescent or compact fluorescent light sources using electronic ballasts.4. High intensity discharge (HID) light sources including pulse start metal halide and high-pressure sodium light sources.5. Luminaires with hardwired high frequency generator and induction lamp.6. <u>Ceiling fan light kits subject to federal appliance regulations.</u>	<ol style="list-style-type: none">7. All light sources installed in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw base sockets regardless of lamp type as specified in Section 150.0(k)1C.8. Any light source not otherwise listed in this table.



Air-Distribution and Ventilation Ducts Mandatory Requirements

Single-family § 150.0(m)1B

Updated for 2022

Duct insulation

- Ducts insulated to R-6.0
- Exception: portions of duct system located in conditioned space below ceiling separating occupiable space from attic
 - Non-insulated portion of duct system located entirely inside thermal envelope
 - Locations that penetrate unconditioned space, draft stopped and air-sealed, connections in unconditioned space insulated to R-6.0
- No duct insulation when duct system located entirely in conditioned space and HERS verification per Reference Residential Appendix RA3.1.4.3.8



Air-Distribution and Ventilation Ducts Mandatory Requirements

Single-family § 150.0(m)11-12

Updated for 2022

Duct system sealing and leakage testing

- Clarify terminology used for air handler airflow
- Updates reference to RA3.1.4.2

Air filtration

- Clarifies make-up air systems must comply same as other supply ventilation systems
- Adds air filter racks or grilles be gasketed or sealed to prevent air from bypassing filter



Ventilation and IAQ Mandatory Requirements

Single-family § 150.0(o)1

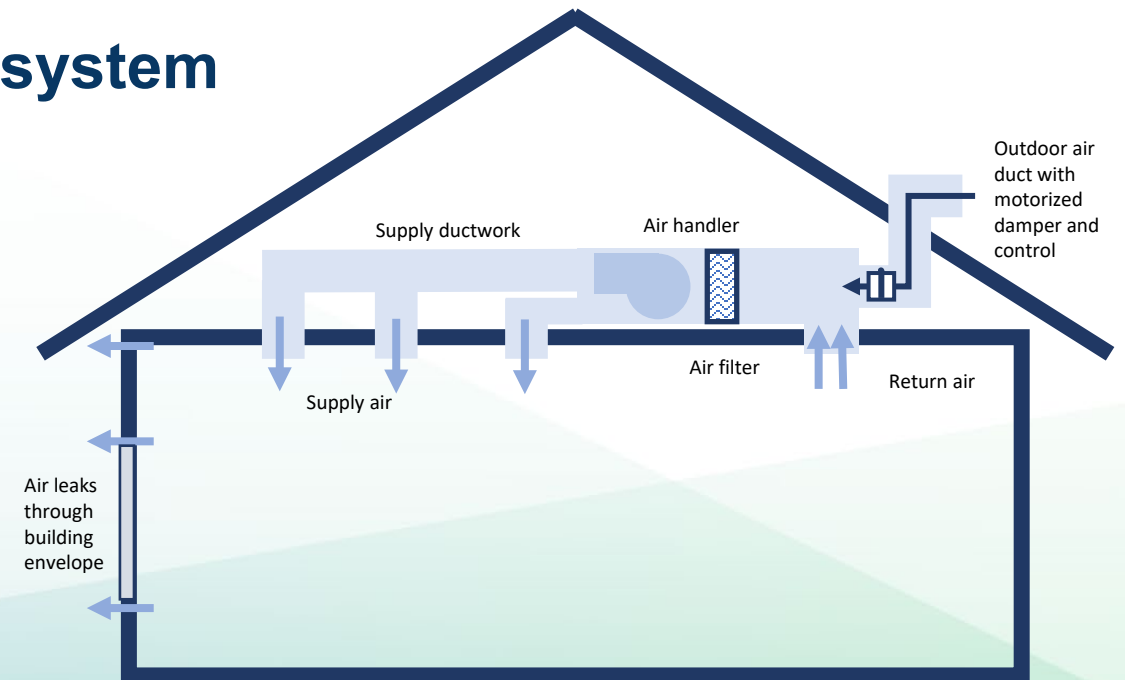
Updated for 2022

Ventilation and indoor air quality

- References ASHRAE 62.2 (2019) per § 100.1
- Updates California amendments to ASHRAE 62.2

Central fan integrated ventilation system

- Adds requirements
 - Outdoor air dampers
 - Damper control
 - Variable ventilation controls





Ventilation and IAQ Mandatory Requirements

Single-family § 150.0(o)1Gi-iii

Updated for 2022

Local mechanical exhaust: Updates to incorporate ASHRAE 62.2

- Nonenclosed kitchen
 - Demand-controlled exhaust system meeting §150.0(o)1Giii
- Enclosed kitchen and all bathroom
 - Demand-controlled exhaust system meeting §150.0(o)1Giii or continuous exhaust system meeting §150.0(o)1Giv
- Demand-controlled mechanical exhaust
 - Control and operation
 - System must have occupant-controlled ON-OFF control or automatic control that not impedes occupant ON control
 - Ventilation rate and capture efficiency
 - Adds Table 150.0-E, Table 150.0-G for ventilation rates and capture efficiency



Ventilation and IAQ Mandatory Requirements

Single-family Tables 150.0-E, 150.0-F

New for 2022

Table 150.0-E Demand-Controlled Local Ventilation Exhaust Airflow Rates and Capture Efficiency

Application	Compliance Criteria
Enclosed Kitchen or Nonenclosed Kitchen	Vented range hood, including appliance-range hood combinations shall meet either the capture efficiency (CE) or the airflow rate specified in Table 150.0-G as applicable.
Enclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm (150 L/s) or a capacity of 5 ACH
Nonenclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm (150 L/s)
Bathroom	50 cfm (25 L/s)

Table 150.0-F Continuous Local Ventilation Exhaust Airflow Rates

Application	Airflow
Enclosed kitchen	5 ach, based on kitchen volume
Bathroom	20 cfm (10 L/s)



Ventilation and IAQ Mandatory Requirements

Single-family Table 150.0-G

New for 2022

*Table 150.0-G Kitchen Range Hood Airflow Rates (cfm) and ASTM E3087 Capture Efficiency (CE) Ratings
According to Dwelling Unit Floor Area and Kitchen Range Fuel Type*

Dwelling Unit Floor Area (ft²)	Hood Over Electric Range	Hood Over Natural Gas Range
>1500	50% CE or 110 cfm	70% CE or 180 cfm
>1000 - 1500	50% CE or 110 cfm	80% CE or 250 cfm
750 - 1000	55% CE or 130 cfm	85% CE or 280 cfm
<750	65% CE or 160 cfm	85% CE or 280 cfm



Ventilation and IAQ Mandatory Requirements

Single-family § 150.0(o)1Gv-vi

Updated for 2022

Local mechanical exhaust

- Updates airflow measurement by system installer either
 - System installer measures airflow per RA3.7
 - Install exhaust fan and duct system meeting Table 150.0-H
 - Visual inspection
 - Airflow rate \geq required value or equal to 62.5 Pa
 - Table 150.0-H applies when
 - Total duct length 25 feet or less
 - System with no more than 3 elbows
 - Termination fitting with hydraulic diameter \geq minimum duct diameter
- Sound ratings
 - Systems rated per 7.2 of ASHRAE 62.2 and not less than required by § 150.0(o)1G



Ventilation and IAQ Mandatory Requirements

Single-family Table 150.0-H

New for 2022

Table 150.0-H Prescriptive Ventilation System Duct Sizing [ASHRAE 62.2:Table 5-3]

Fan Airflow Rating, cfm at minimum static pressure ^f 0.25 in. water (L/s at minimum 62.5 Pa)	≤50 (25)	≤80 (40)	≤100 (50)	≤125 (60)	≤150 (70)	≤175 (85)	≤200 (95)	≤250 (120)	≤350 (165)	≤400 (190)	≤450 (210)	≤700 (330)	≤800 (380)
Minimum Duct Diameter, in. (mm) ^{a,b} For Rigid duct	4 ^e (100)	5 (125)	5 (125)	6 (150)	6 (150)	7 (180)	7 (180)	8 (205)	9 (230)	10 (255)	10 (255)	12 (305)	12 ^d (305)
Minimum Duct Diameter, in. (mm) ^{a,b} For Flex duct ^c	4 (100)	5 (125)	6 (150)	6 (150)	7 (150)	7 (180)	8 (205)	8 (205)	9 (230)	10 (255)	NP	NP	NP

Footnotes for Table 150.0-H:

- For noncircular ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.
- NP = application of the prescriptive table is not permitted for this scenario.
- Use of this table for verification of flex duct systems requires flex duct to be fully extended and any flex duct elbows to have a minimum bend radius to duct diameter ratio of 1.0.
- For this scenario, use of elbows is not permitted.
- For this scenario, 4 in. (100 mm) oval duct shall be permitted, provided the minor axis of the oval is greater than or equal to 3 in. (75 mm)
- When a vented range hood utilizes a capture efficiency rating to demonstrate compliance with 150.0(o)1Giiib, a static pressure greater than or equal to 0.25 in. of water at the rating point shall not be required, and the airflow listed in the approved directory corresponding to the compliant capture efficiency rating point shall be applied to Table 150.0-H for determining compliance.



Ventilation and IAQ Mandatory Requirements

Single-family § 150.0(o)2A-C

Updated for 2022

HERS verifications

- Whole-dwelling unit ventilation
 - Airflow measurement includes ASHRAE 62.2 specification for balanced airflow rate determination and measurement of systems with multiple operating modes
- Kitchen local exhaust
 - Vented range hoods installed to meet IAQ
 - Adds use of capture efficiency ratings for compliance
- Heat recovery ventilation and energy recovery ventilation
 - Requires verification of HRV or ERV fan efficacy no greater than 1.0 watt per cfm



Pipe Insulation Mandatory Requirements

Single-family § 150.0(j)

Updated for 2022

Pipe and tank insulation

- Removed storage tank insulation requirement
 - Covered by § 110.3(c)
- Removed piping conditions requiring 1” thickness or R-7.7
 - Refers to CA Plumbing Code § 609.11
 - Avoids conflict with other parts of Title 24



Electric Ready Mandatory Requirements

Single-family § 150.0(n)

Updated for 2022

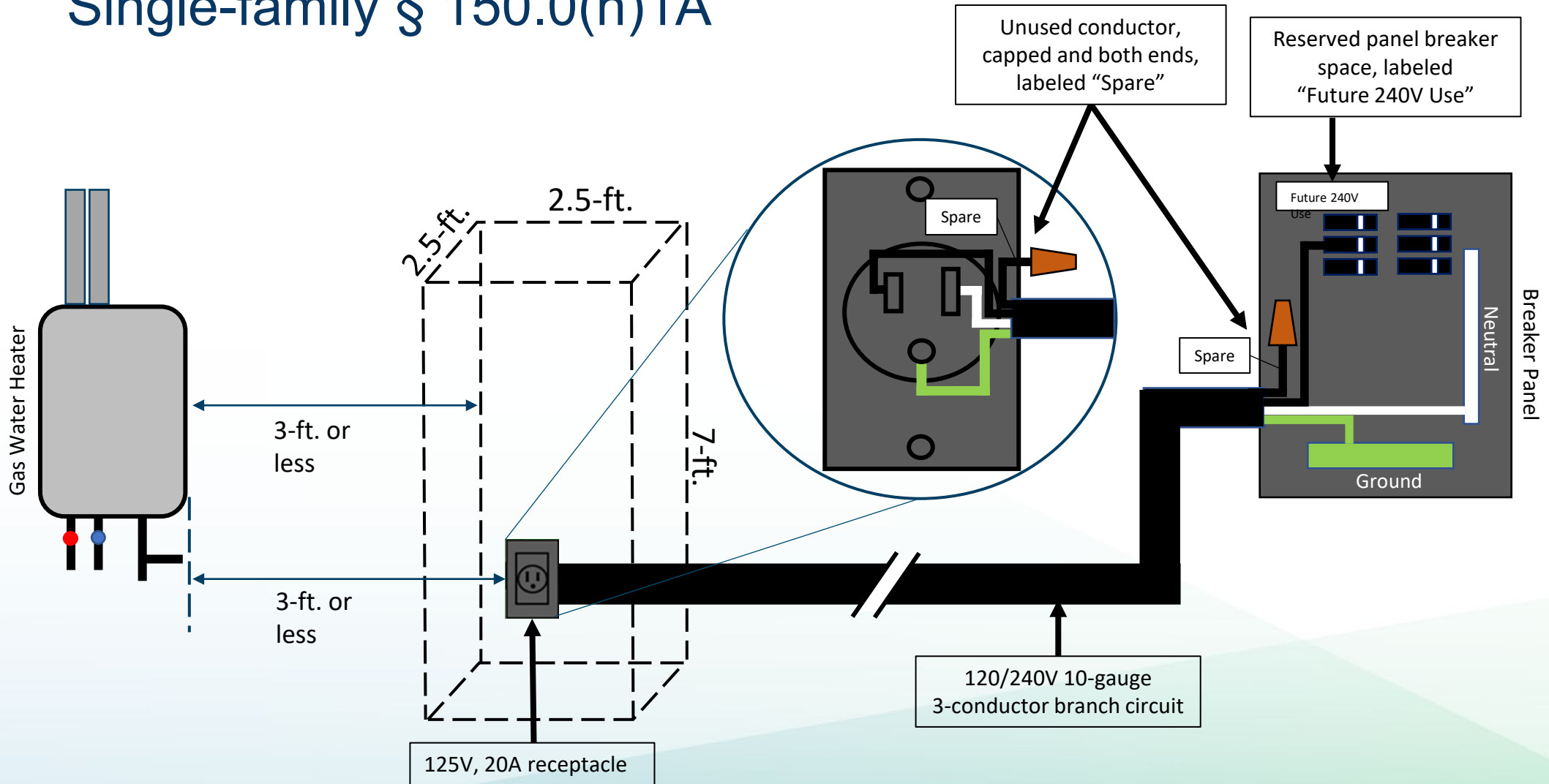
If using gas or propane water heating system

- Provide designated space for future heat pump water heater at least 2.5 feet by 2.5 feet and 7 feet tall
 - If within 3 feet of water heater
 - 125V, 20A circuit with 120/240V 3 conductor, 10 AWG circuit
 - Reserve and label single pole breaker in main panel
 - If more than 3 feet from water heater
 - 240V, 30A circuit with termination 3 feet from designated space
 - Reserve and label double pole breaker in main panel
 - Water lines, both hot and cold, route through designated space before reaching gas or propane water heater
 - Condensate drain



HPWH Electric Ready

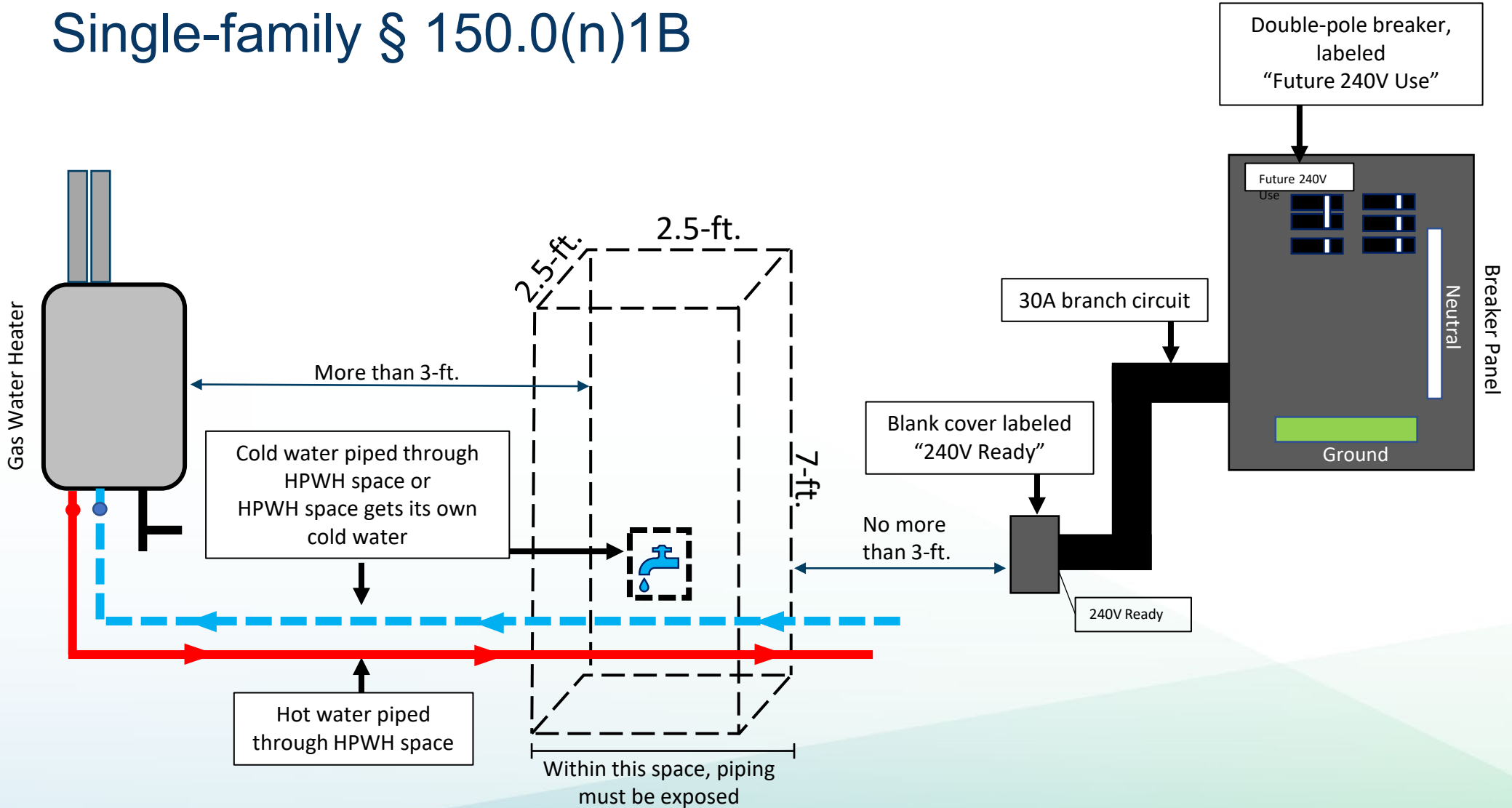
Single-family § 150.0(n)1A





HPWH Electric Ready

Single-family § 150.0(n)1B





Energy Storage Systems Ready Mandatory Requirements

Single-family § 150.0(s)

New for 2022

Adds energy storage systems (ESS) ready

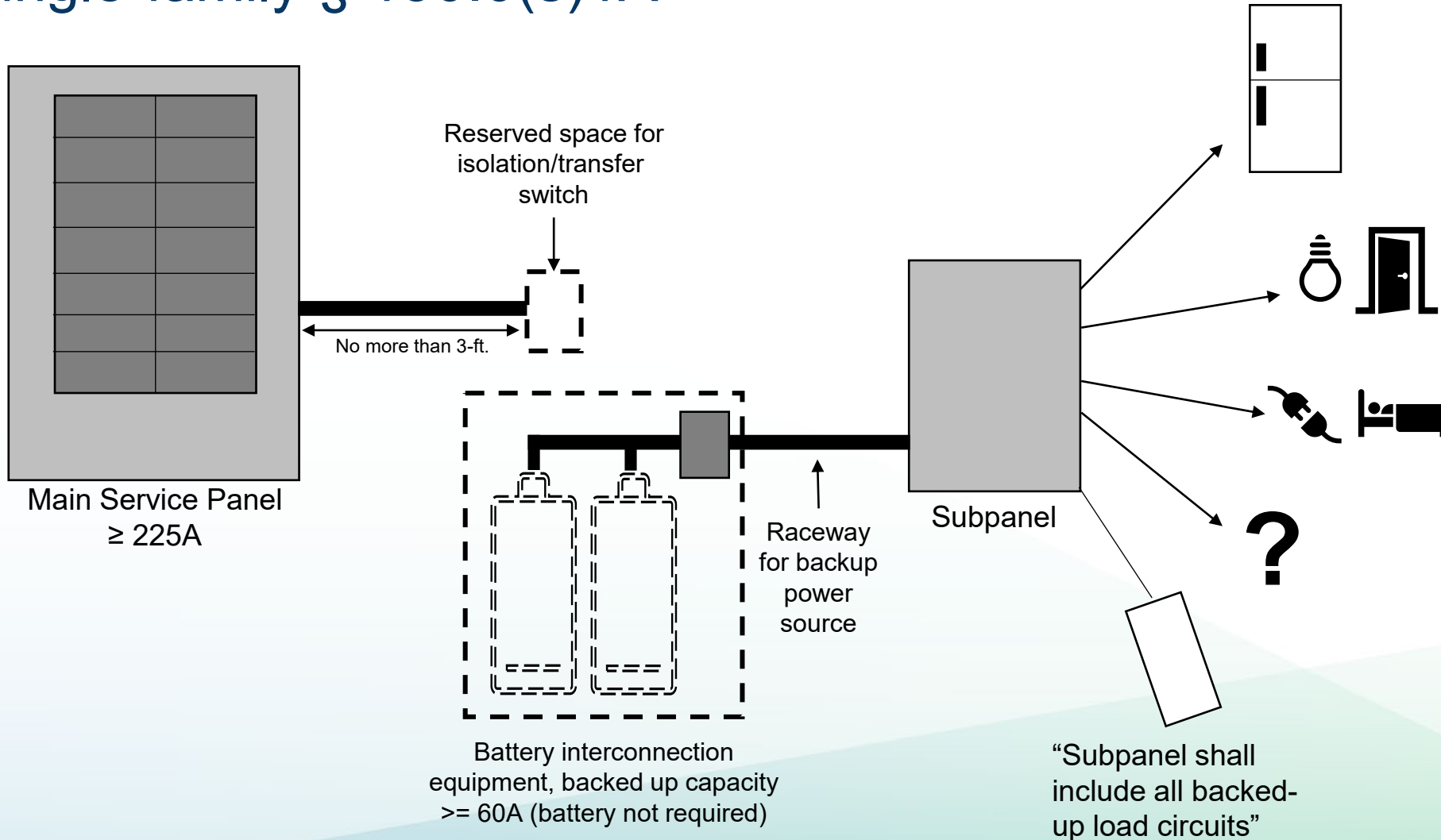
- At least one shall be provided
 - ESS ready interconnection equipment with minimum backed up capacity of 60A and 4 ESS supplied branch circuits
 - Dedicated raceway from main service to subpanel that supplies branch circuits
- Identify at least 4 branch circuits for emergency use
 - Supply refrigerator, lighting near front door, one outlet in bedroom
- Main panel minimum busbar rating of 225A
- Space for future system isolation equipment or transfer switch within 3 feet of main panel
 - Raceways installed between panel and system isolation equipment or transfer switch location to allow the connection of backup power source





Energy Storage System Ready

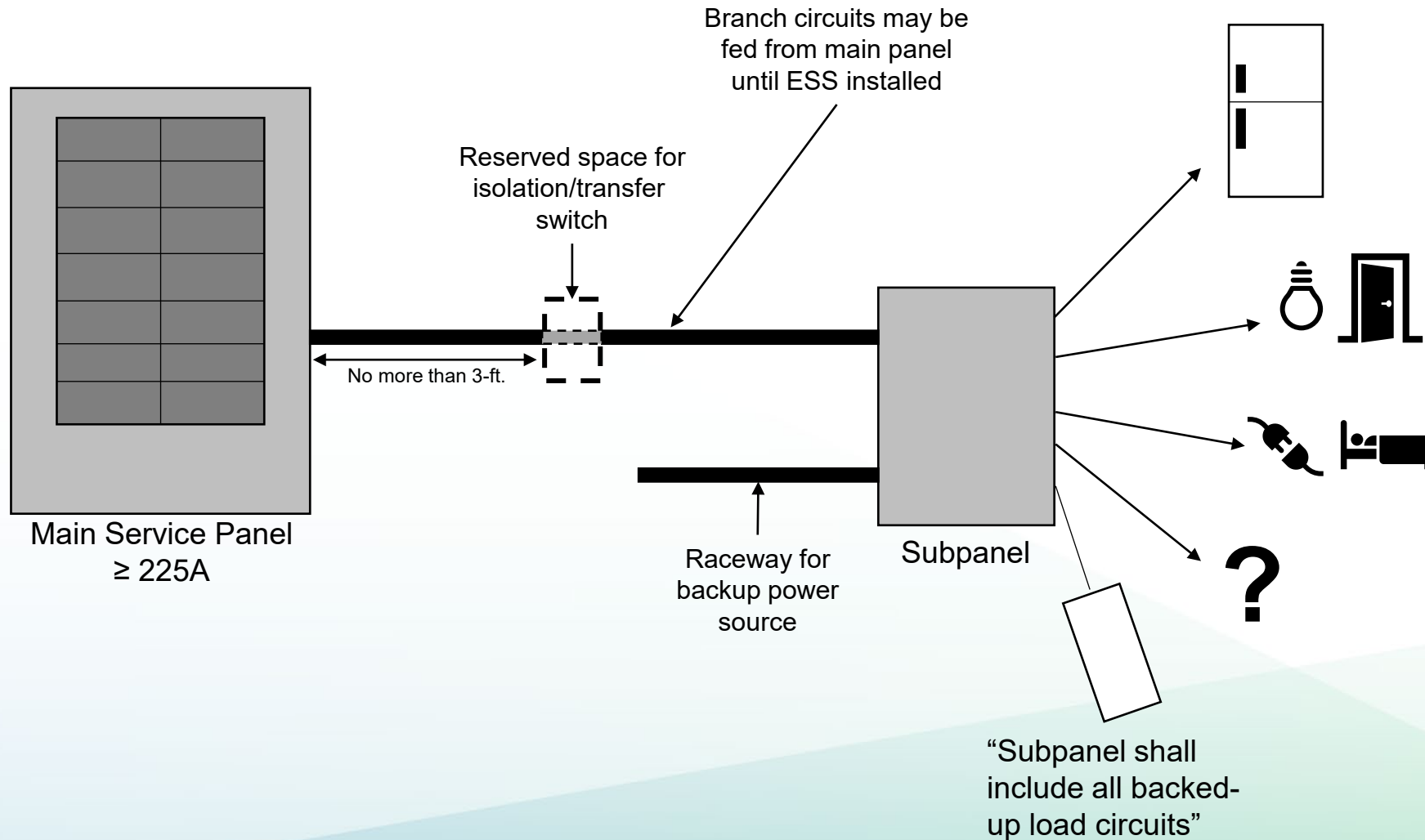
Single-family § 150.0(s)1A





Energy Storage System Ready

Single-family § 150.0(s)1B





Electric Ready Mandatory Requirements

Single-family §§ 150.0(t, u, v)

New for 2022

Adds electric-ready requirements when installing gas systems

- Heat pump space heater ready
 - 240V, 30A circuit with termination 3 feet from furnace
 - Reserve and label double pole breaker in main panel
- Electric cooktop ready
 - 240V, 50A circuit with termination 3 feet from cooktop
 - Reserve and label double pole breaker in main panel
- Electric clothes dryer ready
 - 240V, 30A circuit with termination 3 feet from clothes dryer location
 - Reserve and label double pole breaker in main panel





Check Your Understanding

Single-family ventilation

In an enclosed kitchen, can a vented range hood meet local exhaust requirements in § 150.0(o)?

- Yes. If the vented range hood fan provides the minimum CFM or capture efficiency from Table 150.0-G depending on CFA and range type
 - Gas ranges will require more ventilation than electric ranges
 - Smaller CFA will require more ventilation
 - Per ASHRAE: Enclosed kitchen's permanent openings to interior adjacent spaces do not exceed total of 60 ft²





Single-family Significant Changes

Prescriptive: § 150.1



HVAC

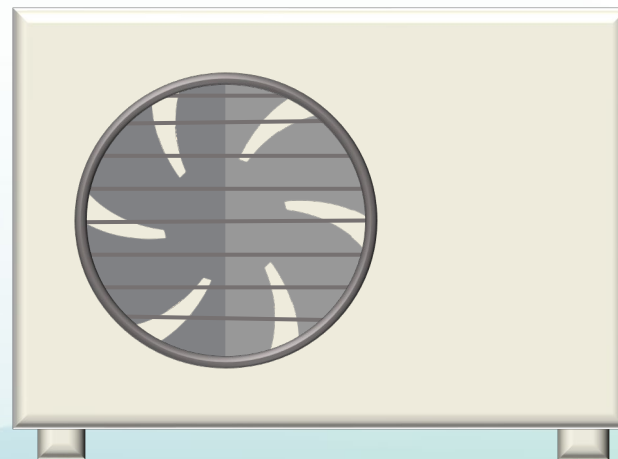
Prescriptive Requirements

Single-family § 150.1(c)6

New for 2022

Heating system type

- Heating system types installed per TABLE 150.1-A
- Climate zones 3, 4, 13, 14 use heat pump space conditioning
 - Note: other types may comply using performance method





HVAC

Prescriptive Requirements

Single-family § 150.1(c)10

Updated for 2022

Adds small duct high velocity requirements

- Central fan integrated ventilation systems
 - Air handling unit fan efficacy maximum
 - 0.45 W/cfm for gas furnace air-handling units
 - 0.58 W/cfm for air-handling units that are not gas furnaces
 - 0.62 W/cfm for small duct high velocity air-handling units verified by HERS
 - Field verification
 - Diagnostic testing per RA3.3
 - Intermittent Systems per RA3.7.4.2



HVAC

Prescriptive Requirements

Single-family § 150.1(c)12

Updated for 2022

Ventilation cooling

- Revises whole house fans to reference use of the Home Ventilating Institute (HVI) certified products directory
- Exception: new dwelling units with 500 ft² or less exempt





Water Heating Prescriptive Requirements

Single-family § 150.1(c)8

Updated for 2022

Domestic water-heating systems

- Heat pump water heater (HPWH) in all climate zones located in garage or conditioned space
 - HPWH 240V
 - Compact distribution in climate zones 1, 16
 - Drain water heat recovery in climate zone 16
 - HPWH 240V meets NEEA Tier 3 or higher
 - Drain water heat recovery in climate zone 16
- Solar water-heating system with electric backup
- Note: other types may comply using performance method





Water Heating Prescriptive Requirements

Single-family § 150.1(c)8

Updated for 2022

Domestic water-heating systems

- Exceptions
 - Climate zones 3, 4, 13, 14 may install instantaneous gas water heater and must use heat pump for space conditioning system
 - New dwelling unit with 500 ft² or less may install instantaneous electric water heater with point of use distribution per RA4.4.5
 - New dwelling unit with 1 bedroom or less may install 120V HPWH in place of 240V HPWH

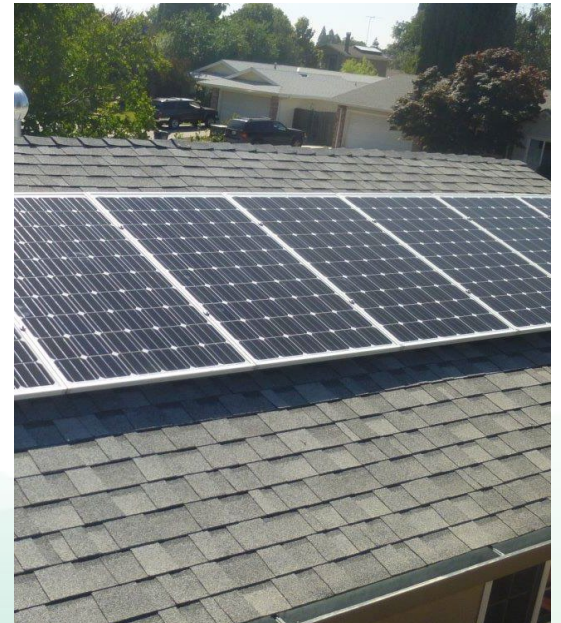


Photovoltaic Systems Prescriptive Requirements

Residential § 150.1(c)14

Updated for 2022

- Updates single-family buildings must have newly installed PV system
- Updates Reference Joint Appendix JA11
 - Verification of number of panels, panel type, size, orientation, tilt, and shading
 - Use approved solar access tools
 - Remote monitoring capability required, with mobile app





Photovoltaic Systems Prescriptive Requirements

Single-family § 150.1(c)14

New for 2022

Photovoltaic (PV) systems

- No larger than what can be installed in available solar access roof area (SARA) or per Equation 150.1-C
- SARA includes area of building's roof space, area of roof space on covered parking areas, carports, and other newly constructed structures on site that can structurally support PV system
- SARA does not include
 - Roof area with less than 70% annual solar access
 - Divides total annual solar insolation with shading, by total annual solar insolation without shading
 - Occupied roofs
 - Roof areas not available due to other building codes



Photovoltaic Systems Prescriptive Requirements

Single-family § 150.1(c)14

Updated for 2022

PV system exceptions

- Steep slope roofs areas with azimuth between 300 degrees and 90 degrees not included in SARA, no PV if SARA is less than 80 ft²
- No PV system when required PV size is less than 1.8 kWdc
- Areas with high snow loads where PV is not possible
- Buildings approved by AHJ prior to January 1, 2020
 - Shading from roof designs and configurations for steep-sloped roofs included in SARA
 - Roof areas that are not allowed to have PV, not considered in SARA
- PV system size reduced by 25% if battery storage system minimum 7.5 kWh installed per Reference Joint Appendix JA12



Check Your Understanding

PV for newly constructed ADU

Does a newly built ADU need to comply with the PV requirements?

- Yes. PV requirements apply to all newly built single-family dwellings
 - Does not apply to additions or alterations
- Check exceptions for very small ADUs
 - No PV system when minimum required PV system is less than 1.8kWdc per Exception 2 to § 150.1(c)14





Single-family Significant Changes

Additions and Alterations: § 150.2



Additions

Mandatory Requirements

Single-family § 150.2(a)

Updated for 2022

Additions to existing single-family buildings

- Meet mandatory §§ 110.0-110.9 and 150.0(a-n, p, q)
- Meet either § 150.2(a)1 or 2
- Exception 4: Space conditioning system ducts
 - Any length of ducts extended from existing duct system to serve the addition to meet duct sealing and duct insulation requirements per §§ 150.2(b)1Di and 150.2(b)1Dii
- Exception 7: Space heating system
 - New or replacement space heating systems serving additions may be heat pump or gas



Roof Additions Prescriptive Requirements

Single-family § 150.2(a)1B

Updated for 2022

Roof and ceiling insulation

- Revises attic insulation for additions 700 ft² or less
 - Climate zones 1, 2, 4, 8-16
 - Overall assembly maximum U-factor 0.025
 - Wood framed R-38 or greater
 - Climate zones 3, 5-7
 - Overall assembly maximum U-factor 0.031
 - Wood framed R-30 or greater



Additions Prescriptive and Performance Requirements

Single-family §§ 150.2(a)1C, 150.2(a)2C

Updated for 2022

Mechanical ventilation for indoor air quality comply with §150.0(o)

- Whole-dwelling unit mechanical ventilation
 - Exceptions
 - Additions 1,000 ft² or less
 - Junior ADUs that are additions to an existing building
 - Note: New ADUs must comply with IAQ regardless of size
- Local mechanical exhaust
 - Additions to existing buildings shall comply with all applicable requirements specified in §§ 150.0(o)1G and 150.0(o)2



Water Heating Additions Prescriptive Requirements

§ 150.2(a)1D

Updated for 2022

Water heating

- Heat pump water heater: meet either
 - Not located outdoors, on R-10 surface, demand responsive
 - High efficiency NEEA Tier 3
- Gas or propane instantaneous water heater
 - 200,000 Btu/hour or less
 - No storage tank
- Additions less than 500 ft²
 - Instantaneous electric water heater allowed
 - Point-of-use distribution per RA4.4.5



HVAC Alterations Prescriptive Requirements

Single-family § 150.2(b)1D, Table 150.2-A

Updated for 2022

Altered duct systems - sealing and insulation

- More than 25 feet of new or replacement ducts are installed
 - Duct sealing required
 - Duct insulation per Table 150.2-A
- Entirely new ducts and air handler in vented attic
 - Meet attic insulation requirements of § 150.2(b)1J

TABLE 150.2-A DUCT INSULATION R-VALUE

Climate Zone	3, 5 through 7	1, 2, 4, 8 through 16
Duct R-Value	R-6	R-8



HVAC Alterations Prescriptive Requirements

Single-family § 150.2(b)1E

Updated for 2022

Duct sealing leakage target for extension of existing ducts

- Reduces duct leakage to 10% or less of system air handler airflow per RA3.1.4.3.1
- Reduces duct leakage to outside option to 7% or less of system air handler airflow per RA3.1.4.3.4
- Note: entirely new or complete replacement ducts leakage to 5% or less





HVAC Alterations

Prescriptive Requirements

Single-family § 150.2(b)1G

Updated for 2022

Altered or replaced space heating system

- No electric resistance as primary heat source
- Exceptions
 - If existing equipment is electric resistance either
 - Non-ducted systems
 - Ducted systems only replacing heating
 - Climate zones 7 or 15



Water Heating Alterations Prescriptive Requirements

Single-family § 150.2(b)1H

Updated for 2022

Water heater replacement options

- Natural gas or propane water heater
- Single heat pump water heater
 - Storage tank not located outdoors, on rigid R-10 surface
 - Demand responsive
 - Meets § 110.12(a) or has ANSI/CTA-2045-B communication port
- Single heat pump water heater
 - NEEA Tier 3 or higher
- If existing water heater is electric resistance
 - May replace with electric water heater
- Water-heating system approved by CEC executive director



Ventilation Alterations Prescriptive Requirements

Single-family § 150.2(b)1L

Updated for 2022

Adds entirely new or complete replacement ventilation systems

- Meet mandatory ventilation requirements in § 150.0(o)
 - Entirely new or complete replacement ventilation system includes new ventilation fan component and entirely new duct system
 - Entirely new or complete replacement duct system at least 75% new duct material



Ventilation Alterations Prescriptive Requirements

Single-family § 150.2(b)1Mi

Updated for 2022

Mechanical ventilation for IAQ - altered ventilation systems

- Whole dwelling unit ventilation
 - If airflow per §150.0(o) was required by previous permit, then shall meet or exceed §§ 150.0(o)1C, 150.0(o)1E, or 150.0(o)1F, with HERS verification
 - If it was not required earlier, then no requirements
- Replacement ventilation fans
 - Fans rated for airflow and sound per ASHRAE 62.2 §§ 7.1, 7.2
 - Rated no less than required airflow rate
- Air filters
 - If air filtration requirements § 150.0(m)12 was required by previous permit, then shall comply with § 150.0(m)12
 - If it was not required earlier, then no requirements



Ventilation Alterations Prescriptive Requirements

Single-family § 150.2(b)1Mii

Updated for 2022

Mechanical ventilation for IAQ - altered ventilation systems

Local mechanical exhaust

- Bathroom exhaust systems per § 150.0(o)1G
- Kitchen local mechanical exhaust
 - If the exhaust requirements § 150.0(o)1G was required by previous permit shall meet or exceed requirements in § 150.0(o)1G
 - If the requirements was required by previous permit for vented kitchen range hood or exhaust fan shall meet the requirements from previous permit or 100 cfm whichever is greater
 - No requirements if none of the above conditions met
- Replacement ventilation fans
 - Fans rated for airflow and sound per ASHRAE 62.2 § 7.1 and §150.0(o)1Gvi
 - Rated no less than required airflow rate



Roof Alterations Prescriptive Requirements

Single-family § 150.2(b)11

Updated for 2022

Roof replacements more than 50%

- Expands climate zones for cool roofs
- Revises exceptions

Roof Type	Climate Zone	Minimum Three-Year Aged Solar Reflectance	Minimum Thermal Emittance	Minimum SRI
Steep-sloped	4, 8-15	0.20	0.75	16
Low-sloped	4, 6-15	0.63	0.75	75



Roof Alterations Prescriptive Requirements

Single-family § 150.2(b)1Iia, Table 150.2-B

Updated for 2022

Roof replacements of more than 50%

- Exception to § 150.2(b)1Iia
 - Updates insulation trade-off for low-sloped roofs in Table 150.2-B

Table 150.2-B Aged Solar Reflectance Insulation Trade-Off

<u>Minimum Aged Solar Reflectance</u>	<u>Roof Deck Continuous Insulation R-value (Climate Zones 6-7)</u>	<u>Roof Deck Continuous Insulation R-value (Climate Zones 2, 4, & 8-15)</u>
<u>0.60</u>	<u>2</u>	<u>16</u>
<u>0.55</u>	<u>4</u>	<u>18</u>
<u>0.50</u>	<u>6</u>	<u>20</u>
<u>0.45</u>	<u>8</u>	<u>22</u>
<u>No Requirement</u>	<u>10</u>	<u>24</u>



Roof Alterations Prescriptive Requirements

Single-family § 150.2(b)1iib

New for 2022

Roof replacements of more than 50%

- Adds above deck roof insulation for low-sloped roofs
 - Climate zones 1, 2, 4, 8-16
 - R-14 or U-factor 0.039
 - Several exceptions

Table 150.2-C Insulation Requirements For Roof Alterations

Climate Zone	Continuous Insulation R-value	Roof Assembly U-factor
3, 5-7	NR	NR
1, 2, 4, 8-16	R-14	0.039



Insulation Alterations Prescriptive Requirements

Single-family § 150.2(b)1J

New for 2022

Adds insulation for vented attics

- Attic ceiling alterations or entirely new ducts or complete replacement per § 150.2(b)1Diia
 - Climate zones 1-4, 6, 8-16 assembly U-factor 0.020 or R-49
 - Exception: climate zones 1, 3, 6 with existing R-19
 - Air seal all accessible areas of ceiling in climate zones 2, 4, 8-16
 - Exception: existing R-19
 - Recessed luminaires must be insulated in climate zones 1-4, 8-16
 - IC rated or fire-proof cover
 - Exception: climate zones 1-4, 8-10 with existing R-19
 - Attic ventilation comply per CBC requirements
- Additional exceptions
 - R-38 existing insulation installed at ceiling
 - Alteration would disturb asbestos
 - Knob and tube wiring located in attic
 - Accessible attic space not large enough to accommodate R-value, entire accessible space shall be filled with insulation and comply with § 806.3 of Title 24, Part 2.5.
 - Attic space above altered dwelling unit is shared with other dwelling units and § 150.2(b)1J not triggered for other dwelling units



Check Your Understanding

HERS verifications for alterations

Do duct alterations require duct leakage verification by a HERS rater when more than 25 feet of new ducts are installed?

- Yes. Per § 150.2(b)1D the duct system must be verified by a HERS Rater per RA3.1
 - Entirely new duct systems
 - Duct leakage to 5% or less
 - Extension of existing ducts
 - Duct leakage to 10% or less
 - Duct leakage to outside option to 7% or less





Resources





Single-family Summary

What's New for Single-family

- Summary of significant changes
- Code references
- Mandatory requirements summary is also available
- Download from the [Online Resource Center](#)



California Energy Commission
2022 Building Energy Efficiency Standards
What's New for Single-Family Residential

Single-Family What's New for 2022 Summary

The most significant change in the 2022 Building Energy Efficiency Standards (Energy Code) affecting single-family residential buildings is a single fuel prescriptive heat pump baseline for either water heating or space heating, depending on the climate zone. There are significant changes in requirements for indoor air quality (IAQ). There are also new requirements and revisions for additions and alterations. The definition for single-family buildings is updated and all multifamily requirements are moved to Sections 160.0 to 180.4.

Mandatory Requirements

- New roof deck insulation maximum area-weighted average U-factor requirement of U-0.184 in climate zones 4 and 8-16. §150.0(a)1
- Simplifies hot water piping language and defers to California Plumbing Code. §150.0(g)
- Simplifies and reorganizes language for lighting requirements. §150.0(k)
- Ducts in conditioned space do not require insulation if specific criteria are met, and ducts are located entirely inside the building's thermal envelope. §150.0(m)1B
- Filter racks or grilles shall be gasketed or sealed to prevent air from bypassing the filter. §150.0(m)12Bv
- Gas water heater installations must provide a designated space for a future heat pump water heater (HPWH) installation. §150.0(n)
- New requirements for central fan integrated ventilation systems requiring a motorized controlled damper, damper controls, and variable ventilation. §150.0(o)1B
- Vented kitchen range hoods require ventilation rates or capture efficiencies based on conditioned floor area and fuel type (see Tables 150.0-E, F, & G). §150.0(o)1G
- Installed heat recovery ventilation (HRV) and energy recovery ventilation (ERV) systems must have a Home Energy Rating System (HERS) verified maximum fan efficacy of 1.0 W/cfm. §150.0(o)2C
- New energy storage system (ESS) ready requirements, including interconnection equipment or a dedicated raceway, a minimum of four branch circuits, a minimum busbar rating of 225 amps, and space for future installation of a system isolation equipment or transfer switch. §150.0(s)
- New electric ready requirements for space heating, cooking, and clothes dryers when gas equipment is installed. Electrical infrastructure must be provided and reserved to the equipment location for the future installation of electrical appliances. §150.0(t)-(v)

Performance Compliance:

- New energy design rating (EDR) metrics – EDR1, based on source energy; efficiency EDR and solar generation/flexibility EDR are now under EDR2. Compliance requires separately meeting EDR1, efficiency EDR2, and total EDR2. §150.1(b)1

Prescriptive Compliance:

- Space heating equipment must be a heat pump in climate zones 3, 4, 13, and 14. In other climate zones it can be either a heat pump or a gas heating system. §150.1(c)6
- Water heating equipment must be a HPWH meeting certain criteria or solar water heating system with electric backup. §150.1(c)8
- In climate zones 3, 4, 13, and 14, a gas instantaneous water heater (max input 200,000 Btu/h, no storage tank) is allowed if the space conditioning system is a heat pump. §150.1(c)8
- New dwelling units with a conditioned floor area 500 square feet (SF) or less may install an instantaneous electric water heater with point of use distribution. §150.1(c)8
- New dwelling units with a conditioned floor area 500 SF or less do not require a whole-house fan. §150.1(c)12
- Revises and updates photovoltaic (PV) language for clarity, including solar access roof area (SARA). §150.1(c)14



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HERS Program information



- Newly constructed buildings
- Additions
- Alterations of residential and nonresidential buildings
- California whole-house home energy ratings
- HERS building performance contractors



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- Newly constructed buildings
- Additions
- Alterations of residential and nonresidential buildings



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- Updates
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Issue 138 | April - June 2022

BLUEPRINT

CALIFORNIA ENERGY COMMISSION
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IN THIS ISSUE

- 2022 Energy Code: Multifamily Summary
- 2022 Energy Code: Compliance Software
- 2019 Energy Code: HERS Verifications
- Q&A
 - Solar PV for Multifamily Buildings
 - Multifamily Water Heating
 - Multifamily Common Use Areas

2022 Energy Code: Multifamily Summary

The 2022 Building Energy Efficiency Standards (Energy Code) reorganizes low-rise (three or fewer habitable stories) and high-rise (four or more habitable stories) multifamily buildings into one building type, updates the multifamily buildings definition in § 100.1, and moves all requirements for multifamily buildings to §§ 160.0-180.4. This and other significant changes include:

Mandatory Requirements

- Updates minimum efficiencies for HVAC equipment; adds minimum efficiency requirements for dedicated outdoor air systems (DOAS), heat pump, and heat recovery chiller packages. § 110.2
- Changes demand responsive lighting controls trigger to 4,000 watts or more; adds requirements for controlled receptacles. §§ 110.12, 160.5(b)4E

- Unifies envelope insulation, vapor retarder, and fenestration requirements. § 160.1
- For dwelling units
 - Adds requirements for central fan integrated ventilation systems requiring a motorized controlled damper, damper controls, and variable ventilation. § 160.2(b)2Aii
 - Requires vented kitchen range hoods ventilation rates or capture efficiencies based on conditioned floor area and fuel type per Tables 160.2-E, F, G. § 160.2(b)2Avic2
 - Requires a HERS-verified maximum fan efficacy of 1.0 Watts per cfm for heat recovery ventilation (HRV) and energy recovery ventilation (ERV) systems. § 160.2(b)2Biii
 - Adds mechanical acceptance testing requirements. § 160.3(d)2
 - Adds electric-ready requirements when gas equipment is installed for space heating, cooking, and clothes dryers. § 160.9(a-c)

For additional help with the Energy Code see Energy Code Ace's **online offerings** of trainings, tools, and resources.



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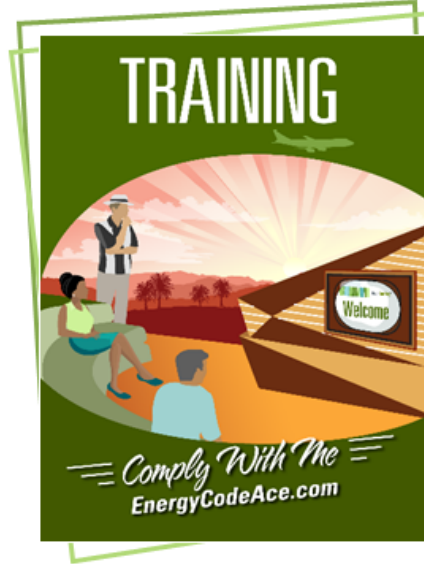


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3C-REN

The screenshot shows the homepage of the 3C-REN website. At the top left is the 3C-REN logo. To its right is a navigation menu with four items: 'ABOUT 3C-REN', 'HOME ENERGY SAVINGS', 'BUILDING PERFORMANCE TRAINING', and 'ENERGY CODE CONNECT'. A search icon is located to the right of the menu. Below the navigation is a large banner image of a mountain range. Overlaid on the bottom of the banner is the text: '3C-REN (Tri-County Regional Energy Network) reduces energy use in our region's buildings for a more affordable, healthy, resilient and sustainable community.' Below the banner are three columns of content. The first column is for 'HOME ENERGY SAVINGS', featuring a building icon, the text 'Save energy and improve your property', and a 'Start Saving Today!' button. The second column is for 'BUILDING PERFORMANCE TRAINING', featuring a person at a computer icon, the text 'Develop your skills in building performance', and a 'Find a Course' button. The third column is for 'ENERGY CODE CONNECT', featuring a house icon, the text 'Personalized coaching and educational events to simplify the energy code', and a 'Submit Your Inquiry' button.

3C-REN

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BayREN

The screenshot shows the BayREN website interface. At the top left is the BayREN logo with the tagline "Local Governments Empowering Our Communities". To the right of the logo is a navigation bar with links: "» HOW TO GET STARTED", "» FIND A CONTRACTOR", "» FIND AN ASSESSOR", and "» PARTNER WITH US". Further right is an accessibility icon (A) and a search bar with a magnifying glass icon and the text "Search".

On the left side, there is a vertical menu with the following items: "REBATES & FINANCING", "HOME LEARNING CENTER", "EVENTS & TRAINING", "LOCAL GOVERNMENT RESOURCES", and "ABOUT". Below the menu are social media icons for Facebook, LinkedIn, Twitter, Instagram, and YouTube.

The main content area features a large background image of a park with people sitting at tables. Overlaid on the right side of this image is a dark purple circular graphic containing the text: "Score big with smart energy upgrades." Below this text is a smaller line: "Upgrade your multifamily building and earn cash back — starting at \$750/unit." At the bottom of the purple circle is a yellow button labeled "Learn More".



Thank you