TRI-COUNTY
REGIONAL ENERGY NETWORK
SAN LUIS OBISPO • SANTA BARBARA • VENTURA

2025 Energy Code in Practice: Single Family Additions and Alterations

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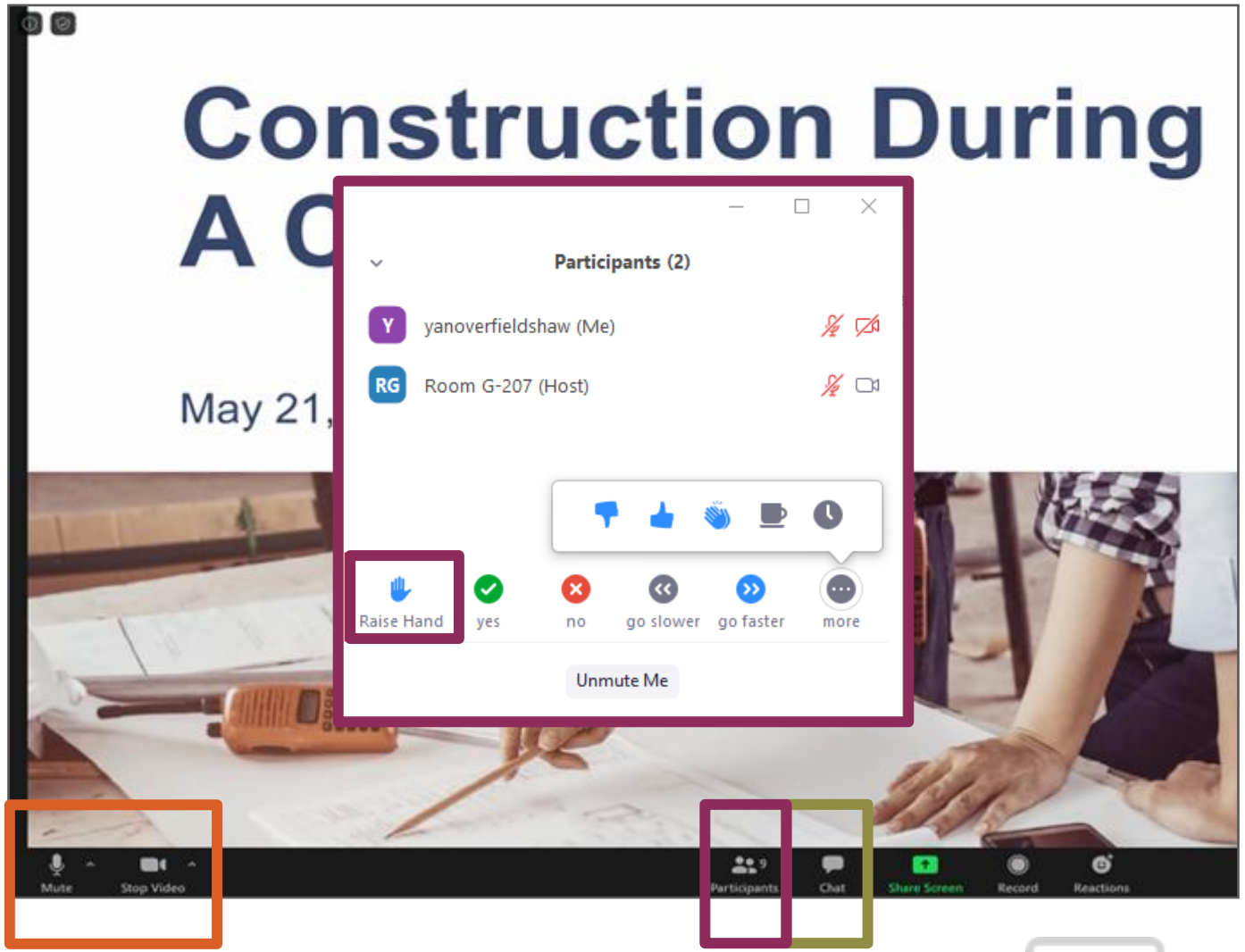
In Balance Green Consulting

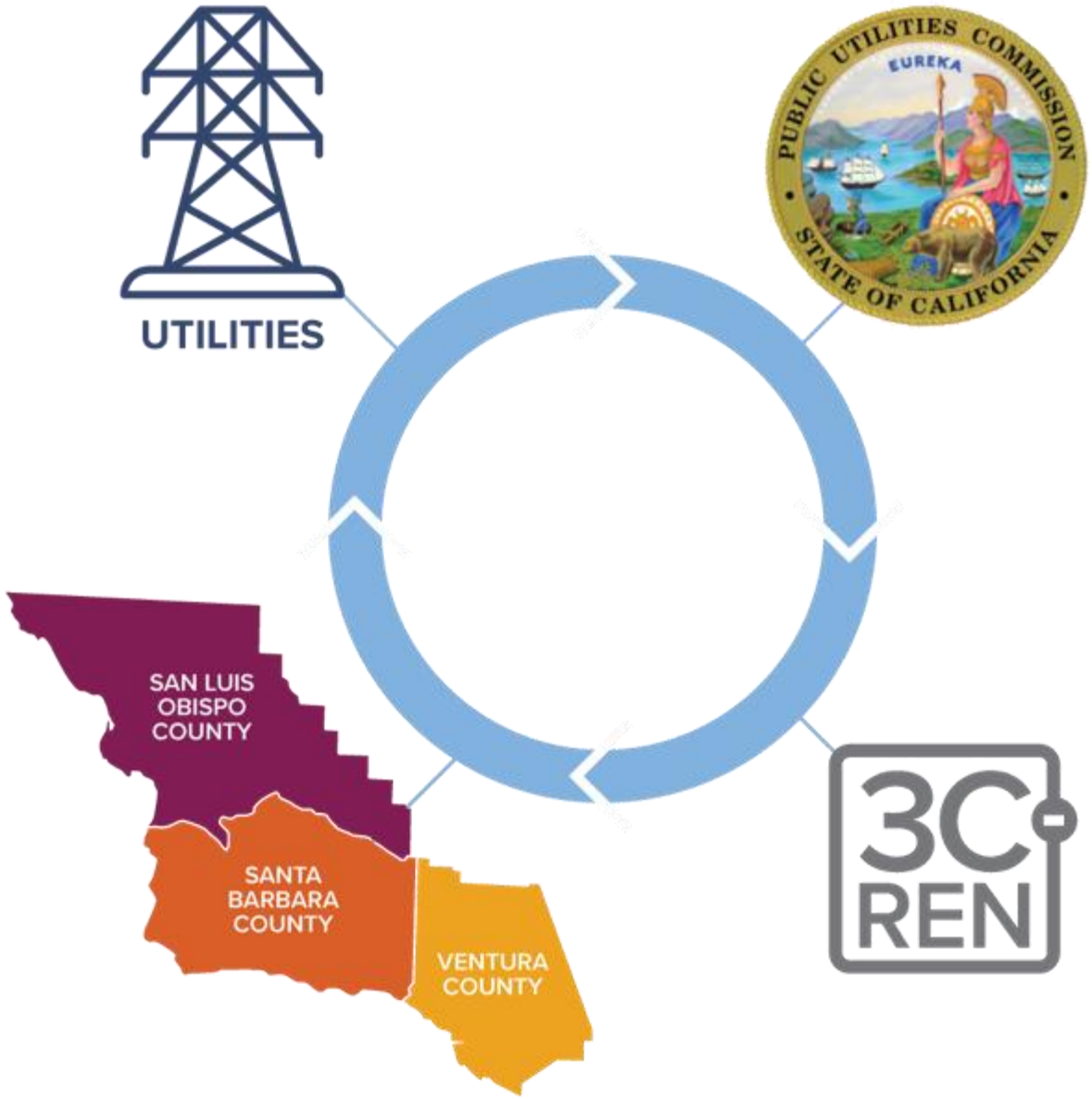
March 10, 2026

Before We Begin

Here are some quick reminders:

- Call in? Please **share** full name to confirm attendance
- To receive AIA LUs, you **must attend** at least 80% of the training. Attendance will be verified
- Use the "**Chat**“ to share questions or comments
- Slides/recording are **shared** after most events and can be found on 3C-REN's on-demand page
- 3C-REN does **not** allow **AI notetakers**, unless used to accommodate a disability





Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region

Our Services

Incentives

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3c-ren.org/for-residents
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2025 Energy Code in Practice

In this series, we'll walk through key components for each building occupancy type, providing sample details, photos of installations and potential pitfalls to avoid. Highlighting 2025 changes throughout, this course is intended for designers, builders and building officials.

- 2025 Energy Code in Practice: Single Family Residential (SFR)
- ***2025 Energy Code in Practice: Single Family Residential Additions and Alterations***
- 2025 Energy Code in Practice : Accessory Dwelling Units (ADUs)
- 2025 Energy Code in Practice : Multi-Family Residential
- 2025 Energy Code in Practice : Non-Residential

https://www.3c-ren.org/calendar-of-events-and-trainings/

Today's Learning Objectives

- Understand the metrics and standards used in the energy code for evaluating energy performance and indoor air quality, and how choices for electric or gas equipment may impact compliance with those standards.
- Within each building type, review key mandatory measures related to energy performance, ventilation, refrigerants and insulation and review potential challenges for integration into design and construction.
- Review the prescriptive "recipe card" approach versus a building performance approach and discuss when to use each strategy to best incorporate energy efficiency and healthy interior environments into the specific project design.
- Recognize where barriers or stumbling blocks may occur within permitting and construction and tips for documentation to smooth out the process, ultimately increasing the energy efficiency, health and safety of our buildings.

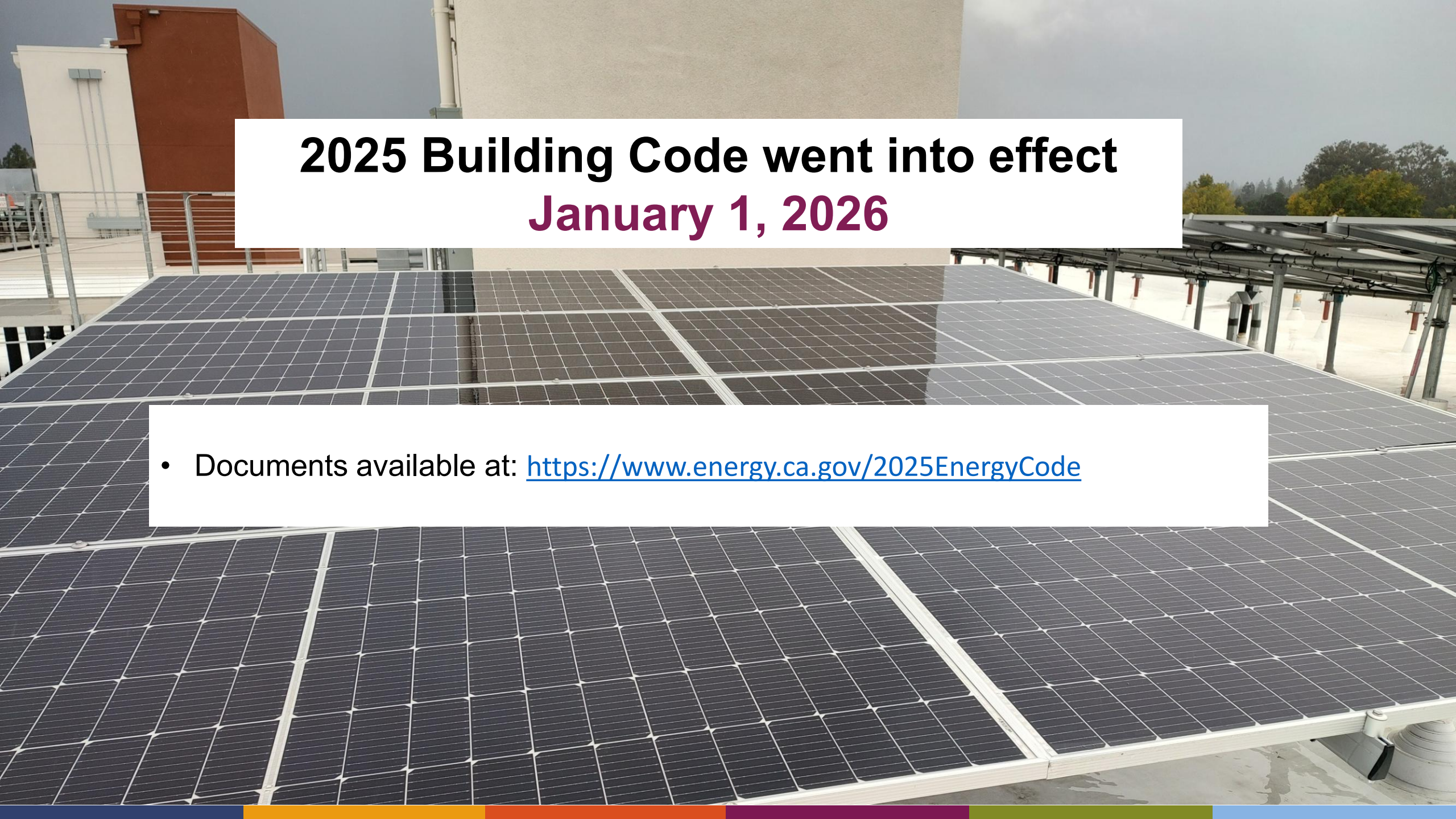
Learning Units:

- 1.50 AIA LUs approved for this course
- 0.15 ICC CEUs approved for this course
- 1.50 CEA CEUs approved for this course

Agenda

1. Code Overview with 2025 Code Highlights
2. Additions and Alterations for Single Family
3. Envelope –Walls, Windows and Attics
4. Domestic Water Heating
5. Electric Ready (Water Heating)
6. ECC (HERS) Verification

2025 Energy Code Overview



2025 Building Code went into effect
January 1, 2026

- Documents available at: https://www.energy.ca.gov/2025EnergyCode

Steady Progress in California

All electric

1978

Title 24 Energy Standard

2008

Energy Efficiency Strategic Plan

2020

PV's for homes; expanded to non-residential in 2023

2030

40% Reduction GHG in Buildings

2045

100% Carbon-Free Electric Generation

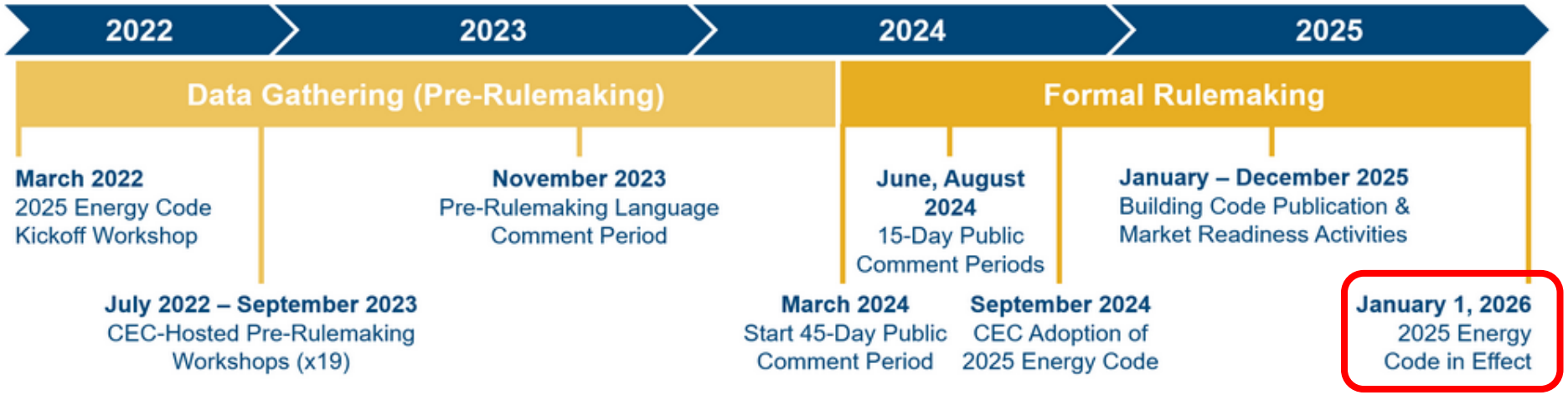
2050

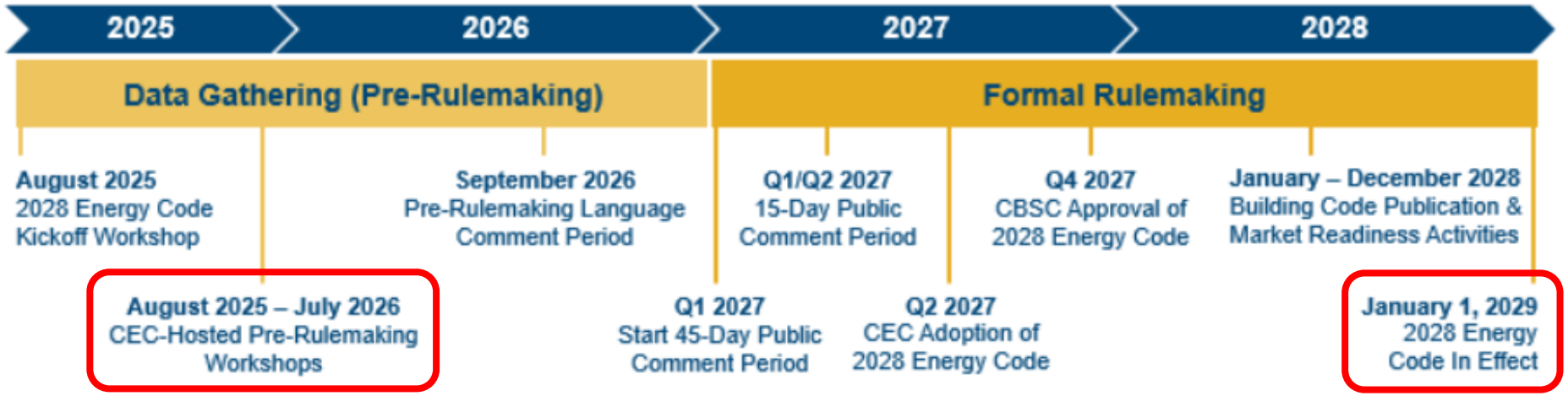
80% Reduction GHG in Buildings

Big Picture Goals for the 2025 Code

- Encourage energy efficient heat pump technology for space and water heating
- Expand PV systems and battery storage standards
- Improve indoor air quality by strengthening ventilation standards
- Save water and save energy by reducing water use in homes and nonresidential buildings
  - References to following Plumbing Code for pipe sizing
  - New Requirements for Chillers and Cooling Towers

Multi-year Adoption Cycle





For more information visit energy.ca.gov

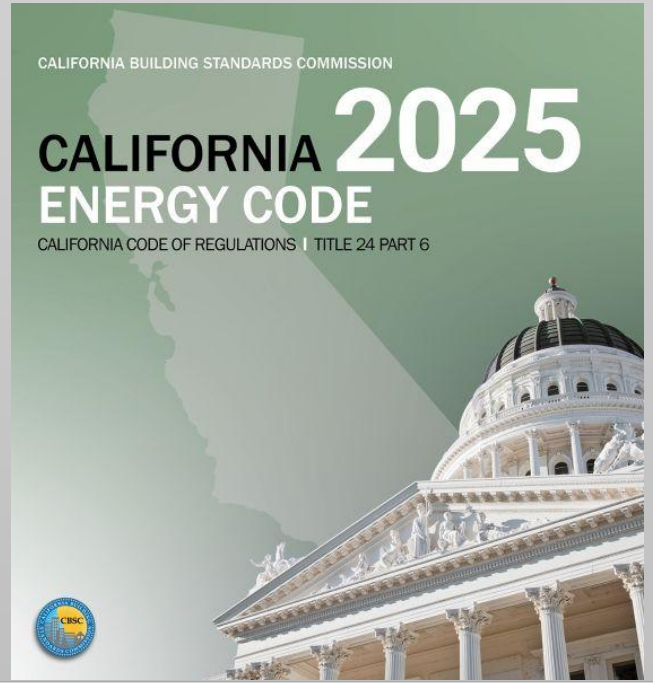
Except…
AB 130: Pause on parts of the 2028 Code Cycle

Residential Standards	**2025 Code** Effective 1/1/2026 (No 2028 Residential Code)		**2031 Code** Effective 1/1/2032
Nonresidential Standards	**2025 Code** Effective 1/1/2026	**2028 Code** Effective 1/1/2029	**2031 Code** Effective 1/1/2032

**2028 Code…? May depend on substance and breadth of allowed changes*

Available in Print on Online

ICC

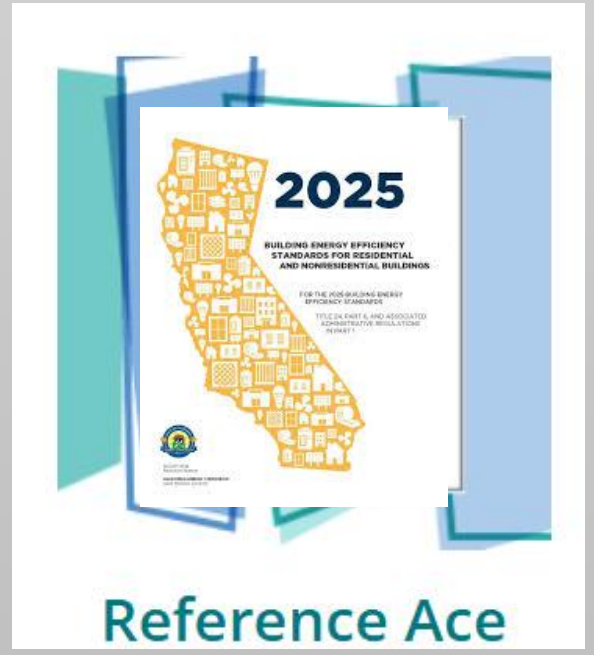


https://codes.iccsafe.org/content/CAEC2025P2

CA Energy Commission

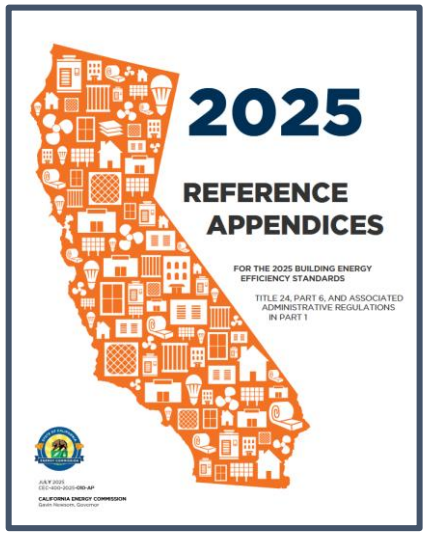
https://www.energy.ca.gov

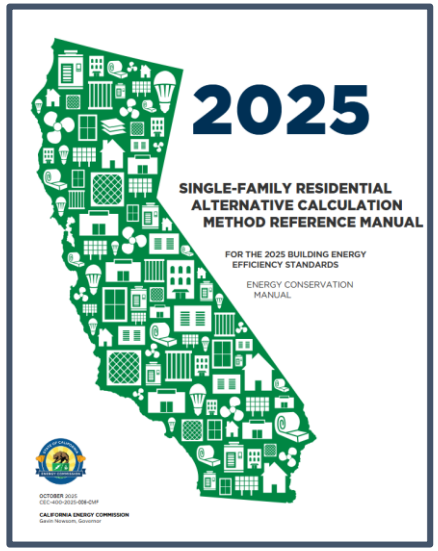
Energy Code Ace

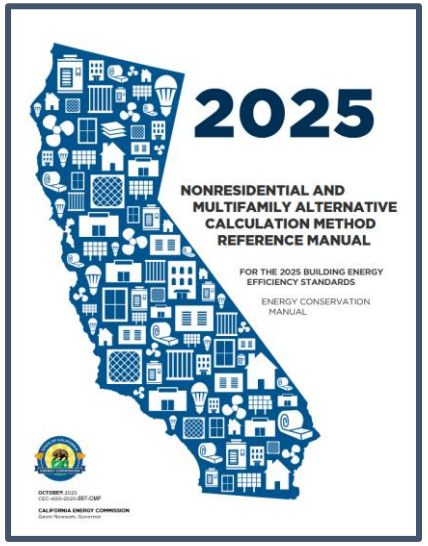


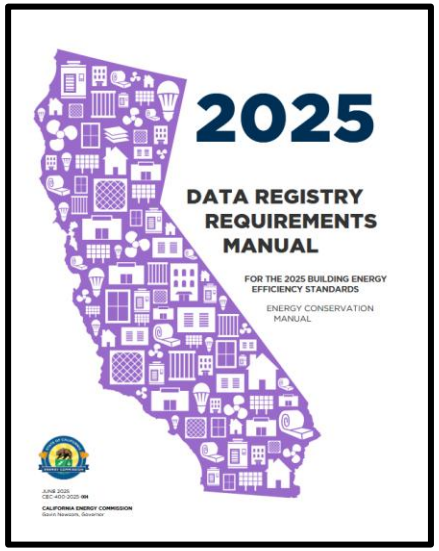
https://energycodeace.com

Title 24 Part 6, 2025 Standards and Manuals









https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency

T24 Part 6 Energy Code – Subchapter Organization

All [*regulated*] *Occupancies*

(A, B, E, F, H, I, L, M, R, S, or U, except I-3 and I-4)

Article 1 –Energy Building Regulations — Sec 10-101 – 10-116

Subchapter 1 –All Occupancy –Scope, Definitions
Subchapter 2 –All Occupancies – Mandatory Requirements — Sec 100.0-100.3, Sec 110.0-110.12

Non-Residential

Subchapter 3 – Nonresidential, Hotel/Motel, Covered Process –Mandatory Requirements [*HVAC and Ventilation*] — Sec 120.0-120.9

Subchapter 4 – Nonresidential, Hotel/Motel –Mandatory Requirements [*Lighting and Power*] — Sec 130.0-130.5

Subchapter 5 –Performance and Prescriptive [*New Construction*] — Sec 140.0-140.9

Subchapter 6 – Additions and Alterations — Sec 141.0-141.1

Single Family Res

Subchapter 7 –Single Family Residential Mandatory Measures — Sec 150.0

Subchapter 8 – Performance and Prescriptive [*New Construction*] — Sec 150.1

Subchapter 9 – Additions and Alterations — Sec 150.2

Multifamily Res

Subchapter 10 – Multifamily Residential Mandatory Measures — Sec 160.0-160.9

Subchapter 11 – Performance and Prescriptive [*New Construction*] — Sec 170.0-170.2

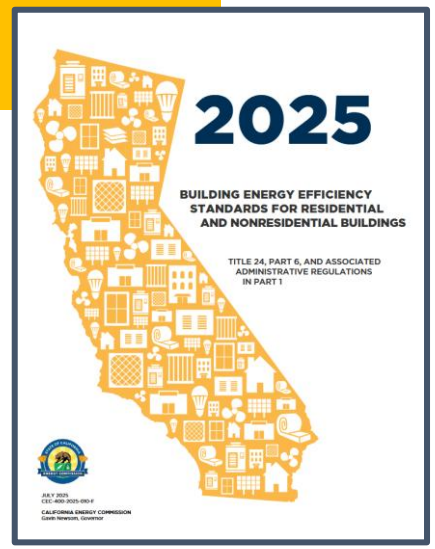
Subchapter 12 – Additions and Alterations — Sec 180.0-180.4

TABLE 100.0-A Application of Standards

TABLE 100.0-A APPLICATION OF STANDARDS (continued)

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions Alterations
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(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 Excerpt



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The Energy Code –Three Compliance Terms

Mandatory Requirements

Energy efficiency measures that are applicable to all projects.

Prescriptive Component Package	Performance Method
Mandatory Requirements are applicable	Mandatory Requirements are applicable
Follow all the parts of the prescriptive package	Other components or measures can be traded-off as long as the Proposed Design Building can be shown to be more energy efficiency than a similar sized Standard Design Building (baseline building)
Note: used to determine the Standard Design Building	
Essentially a **checklist** approach	**Energy modeling** approach

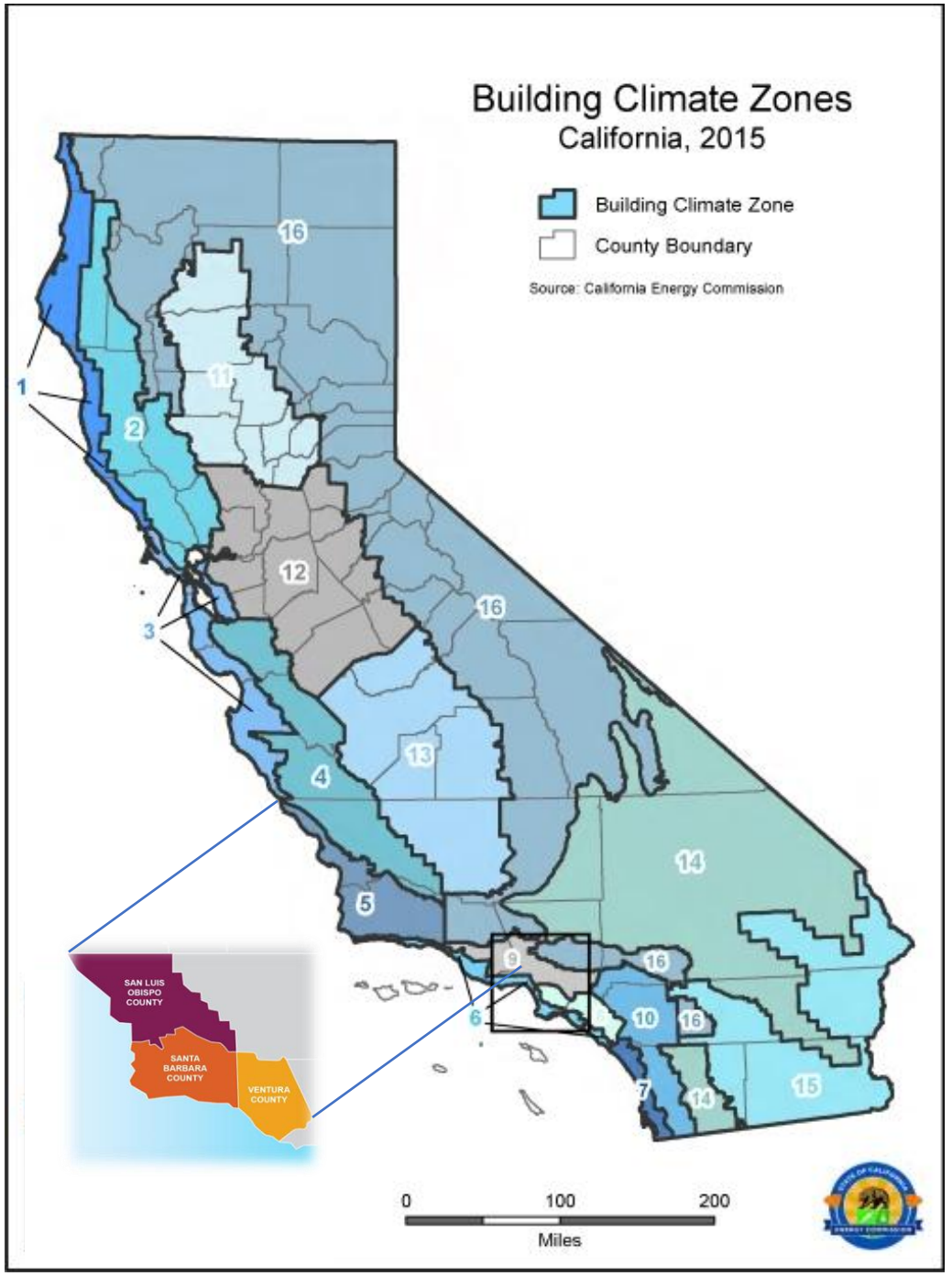
Focus on 3C-REN Tri-County Region

San Luis Obispo, Santa Barbara, and Ventura

CZ's: 4, 5, 6, 9, and 16

Under the Building Energy Efficiency Standards California has 16 defined Climate Zones (CZ)

To find yours search "California EZ Building Climate Zone Search Tool"



New 2025 Performance Method Metrics

- **Long-term system cost (LSC)** -– All electricity, gas or propane used within the modeled buildings shall be converted to LSC. LSC includes the efficiency LSC, which is the sum of LSC energy for space-conditioning, water heating, and mechanical ventilation, and total LSC, which includes efficiency LSC and LSC energy from photovoltaic, energy storage systems, lighting, demand flexibility, and other plug loads.
- **Long-Term System Cost (LSC)** is the CEC-projected present value of costs to the California's energy systems over a period of 30 years. **Note**: LSC does ***not*** represent a prediction of individual utility bills.
- **Source energy** – The energy used within the modeled buildings shall be represented as long-run marginal, hourly source energy.
- **Source** Energy is defined as the long run marginal source energy of ***fossil fuels*** that are combusted as a result of the building energy consumed either directly at the building site or caused to be consumed to meet the electrical demand of the building.
- **Peak Cooling –** kWh upper threshold for new construction homes in Climate Zones (CZ) 4 and 8-15.
- **Peak Cooling** allowable is 120% of the Standard case peak cooling. Peak cooling energy is the total annual mechanical cooling site energy, in kWh, that occurs at peak hours between 4 pm and 9 pm for July to November.

Single Family Metrics for Performance Method

Code Cycle	New Construction (Includes Stand-Alone ADU's)				Additions &/or Alterations
2022	EDRe	EDRt	EDRs	-	TDV
2025	LSCe	LSCt	Source	Peak Cooling	LSCe

TDV = Time Dependent Valuation (kbtu/ft2-yr)
EDR*e* = Energy Design Rating -*efficiency* (Score 0-100)
EDR*t* = Energy Design Rating -*total* (Score 0-100)
EDR*s* = Source Energy Design Rating (kbtu/ft2-yr as a proxy for carbon)

LSCe = Long-term System Cost -*efficiency* ($/ft2)
LSC*t* = Long-term System Cost -*total* ($/ft2)
Source = Total Annual Source Energy
Peak Cooling = 120% of Baseline (kWh). Applies to CZ 4 and 8-15.

Performance Method (Computer Modeling)

Performance Method:

- **Addition Alone –**The Standard (baseline) Design tracks closely with new construction…with exceptions.
- **Existing + Alteration Alone** –The Standard (baseline) Design is comprised of the existing building before alterations.
- **Existing + Alteration + Addition (E+A+A)** –The Standard (baseline) Design is comprised of the existing building before alterations and a baseline addition.
- The '**existing**' building may reflect default values or the *actual situation* if **ECC Verified Existing Conditions** is performed.

Common Trade-Off Strategies:

- If the Addition Alone does not comply, use E+A+A with added trade-offs.
- If added Alteration improvement credit is needed, get a HERS Verified Existing Conditions.

Example –Performance Method Results

Compliance Summary				
	Long Term System Cost (LSC)[1]		Source Energy Use	Peak Cooling**
	Efficiency[2] ($/ft²-yr)	Total[3] ($/ft²-yr)	Total[3] (kBtu/ft²-yr)	Electricity (kWh)
Standard Design	12.17			
Proposed Design	10.02			
Compliance Margins	2.15			
	Pass			
	RESULT*: Complies			

[1]Long-term System Cost (LSC) is a 30-year present value cost to California's energy system. LSC is not a predicted utility bill.
[2]Efficiency measures include energy efficient improvements such as better building envelope and more efficient mechanical equipment
[3]Total includes the sum of efficiency measures, solar photovoltaic (PV) measures and battery storage measures
* Building complies when Proposed Design is equal to or less than Standard Design in all applicable compliance categories
** Peak cooling target represents 120% of the standard design building peak cooling energy use.

Standard Design PV Capacity: 0.00 kWdc

When–LSC Efficiency –has a positive compliance margin value, the project complies.

Example –Performance Method Results

LSC AND SOURCE ENERGY COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS						
Energy Use	Standard Design Source Energy (kBtu/ft^2 -yr)	Standard Design LSC[1] ($/ft^2 -yr)	Proposed Design Source Energy (kBtu/ft^2 -yr)	Proposed Design LSC[1] ($/ft^2 -yr)	Compliance Margin Source (kBtu/ft^2 -yr)	Compliance Margin LSC[1] ($/ft^2 -yr)
Space Heating	0	7.22	0	6.81	0	0.41
Space Cooling	0	0	0	0.02	0	-0.02
IAQ Ventilation	0	0	0	0	0	0
Water Heating	0	4.95	0	3.19	0	1.76
Self Utilization/Flexibility Credit	n/a	n/a	n/a	0	n/a	0
Efficiency Compliance Total	**0**	12.17	**0**	10.02	**0**	2.15
Photovoltaics And Battery	n/a	n/a	n/a	0	n/a	0
Flexibility	n/a	n/a	n/a	n/a	n/a	n/a
Indoor Lighting	0	1.83	0	1.83	n/a	0
Appl. & Cooking	0	6.87	0	6.92	n/a	-0.05
Plug Loads	0	7.48	0	7.48	n/a	0
Outdoor Lighting	0	0.43	0	0.43	n/a	0
TOTAL COMPLIANCE	**0**	**28.78**	**0**	**26.68**	**2.1**	

Example E+A+A Performance Results with Trade-Off

E+A+A Project –Traded-off exterior continuous insulation on the walls of an addition with a higher efficiency HP's

LSC AND SOURCE ENERGY COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS

Energy Use	Standard Design Source Energy (kBtu/ft^2-yr)	Standard Design LSC[1] ($/ft^2-yr)	Proposed Design Source Energy (kBtu/ft^2-yr)	Proposed Design LSC[1] ($/ft^2-yr)	Compliance Margin Source (kBtu/ft^2-yr)	Compliance Margin LSC[1] ($/ft^2-yr)
Space Heating	0	7.22	0	6.81	0	0.41
Space Cooling	0	0	0	0.02	0	-0.02
IAQ Ventilation	0	0	0	0	0	0
Water Heating	0	4.95	0	3.19	0	1.76
Self Utilization/Flexibility Credit	n/a	n/a	n/a	0	n/a	0
Efficiency Compliance Total	0	12.17	0	10.02	0	2.15

Above Standard

Below Standard

Above Standard

HERS —Gets a New Name

HERS Rater:

- Duct Leakage Testing
- Blower Door / Envelope Leakage Testing
- Field Verifications:
  - Refrigerant Charge
  - Exhaust Fan and Kit Hood Fans
  - HVAC Efficiency and Capacity
- Assist/Complete: CF-2R and CF-3R, etc
- Document / Verified Existing Conditions

Residential and Multifamily – *HERS* will be replaced by *ECC*

OLD

HERS

- Title 20 (Ch 4, Art 8, Sec 1670)
- 2022 and Prior Code Cycles
- HERS –Home Energy Rating System
- HERS Rater
  - HERS Field Verification and Diagnostic Testing

NEW

ECC Program

- Title 24, Art 1, Sec 10-103.3
- 2025 Code
- ECC –Energy Code Compliance
- ECC-Rater
  - Field Verification and Diagnostic Testing (FV&DT)

- Includes a **Quality Assurance Review** and audit process for the ECC-Rater.
- The ECC-Rater can achieve an ***Exemplary*** status.

Additions and Alterations

Mandatory Measures
Prescriptive Addition
Prescriptive Alteration

Additions and Alterations –Section 150.2

- **Mandatory Measures** Section150.0(a)-(u); most, but not all apply to Existing, Additions, and Alterations

- **Additions** have some minor updates and a new section for heat pump space heating capacity.
- **Alterations** has some minor updates, most notably fenestration U-factor and SHGC requirements.

Key Take Away: Most of the 2025 changes are related to electrification and support of heat pump space heating and water heating.

The Challenge of Existing Buildings

In addition to new buildings, the standards apply to substantial upgrades to existing homes and businesses.

At least 50 percent of single-family homes and nearly 60 percent of California's apartment complexes (about 14 million total residences) were built before the state's first energy standards.

Updating older buildings is critical to achieving the state's climate and clean energy goals.

Refers to specific Mandatory Measures (MM):
150.0(a)-(n), (p), and (q)

Section 150.2 specifically references the Mandatory Measures as detailed under Section 110.0-110.9 and Section 150.0 for new construction of single-family homes.

***Not listed, but referenced*:**
150.0 (o) – Ventilation and Indoor Air Quality (IAQ) is referenced throughout Section 150.2, but with nuanced exceptions.

Not Included :
150.0 (r) and (s)–Solar Ready and Battery Ready
150.0 (t), (u), (v)–Electric Ready for Heat Pumps, Cooktops, and Dryers

Listed Mandatory Measures:

150.0 (a) –Roof Insulation (Ceiling/Rafter)
150.0 (b) –Loose Fill Insulation
150.0 (c) –Wall Insulation
150.0 (d) –Raised-Floor Insulation
150.0 (e) –Decorative Fireplaces
150.0 (f) – Slab Edge Insulation
150.0 (g) –Vapor Retarder [Crawl Space]
150.0 (h) –Space Conditioning Equip
150.0 (i) –Thermostats
150.0 (j) –Pipe and Tank Insulation
150.0 (k) – Lighting
150.0 (l) – not used
150.0 (m) – Air-distribution [Ducts]
150.0 (n) – Water Heating
150.0 (p) – Pool Equip
150.0 (q) – Fenestration

In General, Prescriptive Additions Follow Most of Prescriptive Requirements for New Construction, except…

- 300 sq ft or less, **Section 150.1(c)11** roofing (SRI ratings, etc) does **not** apply
- 1000 sq ft or less, **Section 150.1(c)12** Whole-House Fan (WHF) ventilation cooling does **no**t apply
- If the ***existing heating unit*** is remaining (not changing) it need **not** meet the Part 6 Energy Standards, but the **expanded duct system must comply with the Energy Standards**.

Clarify a common concern:
Solar Ready, PV's and Batteries, are ***not*** required for any alterations nor additions (nor trigger for an existing home.)

And…

- When **heating or cooling will be extended to an addition** from the existing system(s), the existing heating and cooling equipment need not comply with Part 6 [*Energy Code*].
- The **heating system capacity must be adequate** to meet the minimum requirements of CRC Section *303.10*
- When any length of **duct is extended from an existing duct system** to serve the addition, the existing duct system and the extended duct shall meet the applicable requirements specified in Section 150.2(b)1Di and 150.2(b)1Dii [*i.e. duct leakage and testing, etc.*]

Under 2025 Code

CRC Excerpt:
R303.10 Required heating

…every dwelling unit shall be provided with heating facilities capable of maintaining a room temperature of not less than 68°F (20°C) at a point 3 feet (914 mm) above the floor and 2 feet (610 mm) from exterior walls in habitable rooms at the design temperature. The installation of one or more portable space heaters shall not be used to achieve compliance with this section.

Note:
Typically shown through ACCA or ASHRAE calculations

Space Heating for Additions 2025 Update – Heat Pumps Only

Space heating system. New or replacement space heating system serving an addition may be a **heat pump** system.

Example of a one-to-one mini-split heat pump with programable thermostat

HP Load Calcs and System Capacity

2025 New Space-Conditioning Section

- References MM 150.0(h): New language for system selection, defrost, supplementary heating control and thermostats.
- New Tables 150.2-A,B for maximum Capacity (size) –assumes ducted system is **not** field verified to be 350 cfm/ton of airflow.
- New Table 150.2-C for infiltration rates to be used in Capacity sizing calculations. Exception, if field testing of envelope leakage is performed per RA3.8.

Heat Pump (HP) Ducted Systems

Additions –IAQ Ventilation

The following shall **not be required** to comply with the 150.0(o)1C, 1E, and 1F whole-dwelling unit ventilation (**i.e. outside air ventilation with fan(s) or fan system**)

1. Additions of 1000 square feet or less
2. **Junior Accessory Dwelling Units** (JADU) that are additions to an existing building.

Local Mechanical Exhaust . Additions to existing buildings shall comply with all applicable requirements specified in 150.0(o)1G and 150.0(o)2, (**i.e. mandatory exhaust for kitchen and bathroom, and field testing**)

Prescriptive Addition – references the Mandatory Measures

Requirements for Ventilation and Indoor Air Quality (IAQ)

ASHRAE 62.2 *continues* to be the ***basis*** for section 150.0(o)

- Quantity of outside air (OA) ventilation,
- Allowable methods of meeting the OA ventilation; and
- Field verification of IAQ system(s)

Note:
Outdoor Air (OA) are applicable to Additions over 1,000 square feet

Updated or Added Language:

- Central Fan Integrated (CFI) Ventilation Systems
- Kitchen and Bathroom Exhaust
- Prescriptive Ventilation Duct Sizing
- Balanced Ventilation with Heat/Energy Recovery
- Required Testing of Ventilation System Air Flow

Note:
Kitchen and Bathroom Exhaust applicable to all Additions

New for 2025: Mandatory Measures for IAQ and HRV/ERV Systems

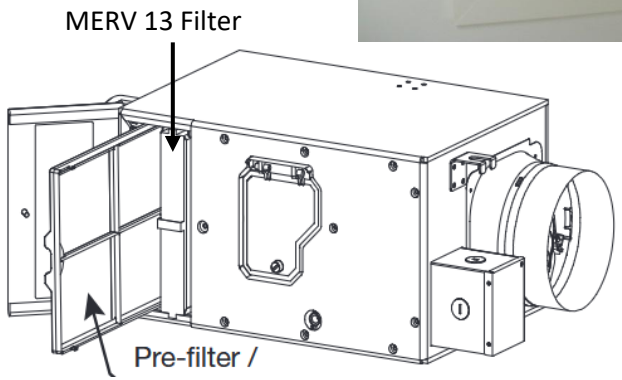
Applicable to balanced and supply-only systems:

Air Filters and HRV/ERV Recovery Cores:

- Accessible from occupiable spaces
- Located no more than 10 feet above a walking surface
- Attic locations require Fault Indicator Display (FID) and have walkway to the HRV/ERV.

Outdoor Air Intakes:

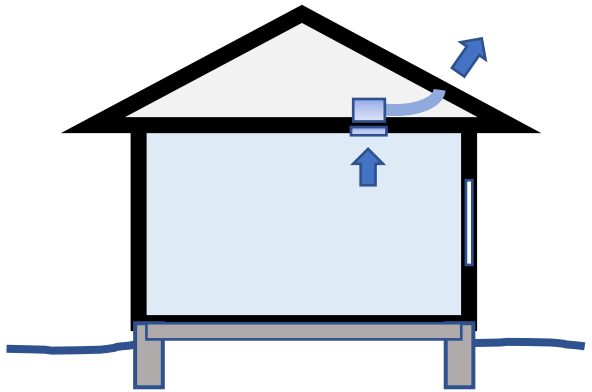
- Be “weather/rain proof”
- Located no more than 10 feet above a walking surface, or utilize FID
- Roof locations have additional access requirements



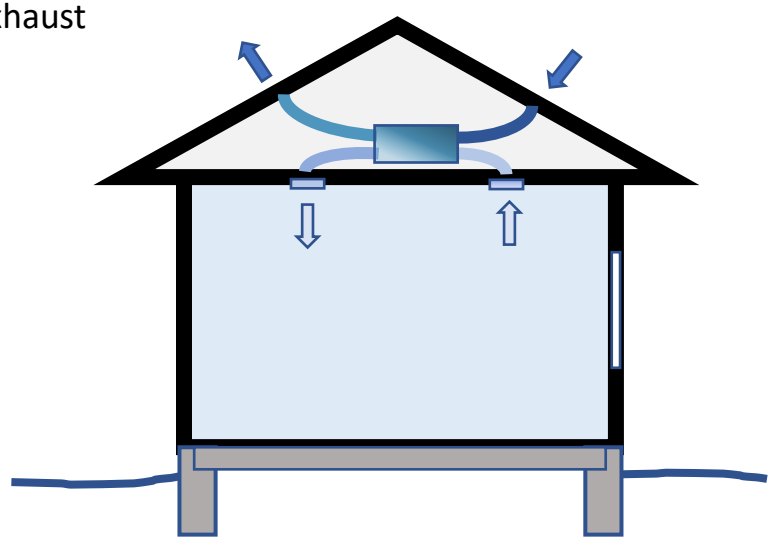
Mechanical Exhaust –Kitchens and Bathrooms

Local Mechanical Exhaust shall be installed in each kitchen and bathroom. Systems shall be rated for airflow in accordance with ASHRAE 62.2 section 7.1.

- **Open (Nonenclosed) Kitchens** shall have demand controls and meet min ventilation flow or capture efficiency requirements
- **Enclosed Kitchens and Bathrooms** can use continuous ventilation systems that are part of Energy or Heat Recovery Balanced Ventilation (ERV/HRV) Systems
- All systems must have occupant **accessible ON-OFF** switches –and if part of IAQ ventilation system be label , "This switch controls the indoor air quality ventilation for the home. Leave it switch in the "on" position at all times unless the **outdoor air quality is very poor**."



Local Exhaust



ERV/HRV Balanced Ventilation with fan efficacy of ≤1.0 W/cfm

Kitchen –Range Hood

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 (ft^2)	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

Note: In this illustration, a hood CE of 55% would only comply for the situations highlighted in blue.

Other exhaust fans, such as downflow, shall be 300 cfm or 5 ACH for enclosed kitchens

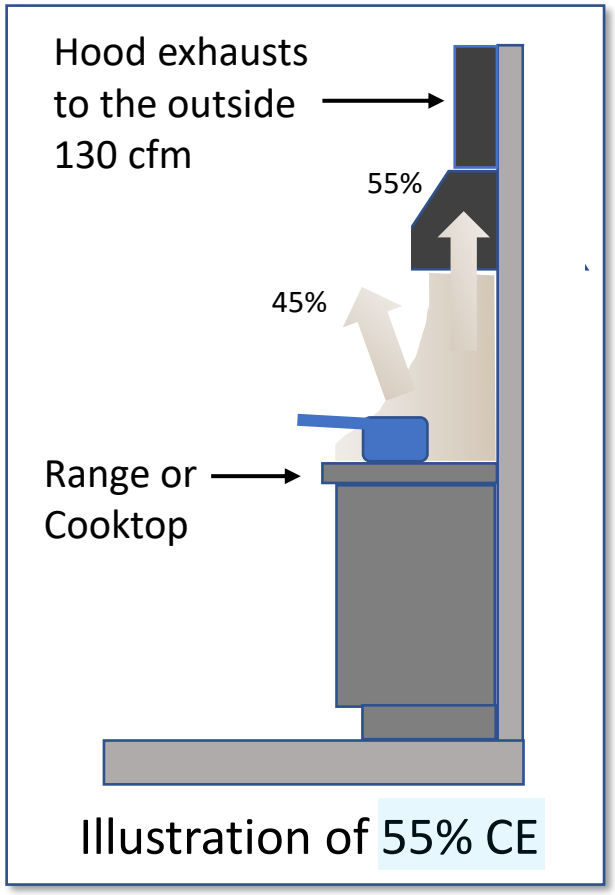


Illustration of 55% CE

Mechanical Exhaust –Kitchen

- Installer to **field test** with air flow hood/grid, or
- Follow **Table 150.0-H Prescriptive** Ventilation System Duct Sizing (ASHRAE 62.2 Table 5-3)
  - Total duct length is ≤ 25 ft
  - Duct system has no more than 3 elbows
  - Duct system has exterior termination fitting

Air Flow Testing Equipment

Key Take Aways:

- Applies to new or complete replacement of kitchen hood and ducting,
- Field test exhaust ducts or follow Prescriptive design,
- Kitchen range hood - HERS field verification required,
- **Exception:** Alteration that only replaces the hood and does not alter, add or replace the existing ductwork.

Alterations –Prescriptive Components

Section 150.2(b)1 Prescriptive Alterations:

A. Add/New Fenestration
B. Fenestration Replacement
C. New/Replaced Space Conditioning System
D. Altered Duct System
E. Altered Space Conditioning System –Duct Sealing
F. Altered Space Conditioning System –Cooling
G. Altered Space Conditioning System –Heating
H. Water Heating System –Replacement
I. Roofs
J. Ceilings –Vented Attics
K. Lighting
L. Mechanical IAQ Ventilation –New/Replaced
M. Mechanical IAQ Ventilation –Altered
N. Exterior Doors

Kitchen Remodel –A common Residential Alteration

- New Appliances and Vent Hood
- New Mini-Split System with Concealed Ducts
- New Lighting, Surface and Recessed Ceiling

Alterations –Ventilation IAQ Systems

Mechanical Ventilation for Indoor Air Quality (IAQ)- Entirely **New** or Complete **Replacement** Ventilation Systems. Considered a complete replacement if **75% of duct** and associated materials are replaced. Duct system to comply with the **Mandatory Measures 150.0(o)** Ventilation and Indoor Air Quality.

Mechanical Ventilation for Indoor Air Quality - Altered Ventilation Systems. Altered ventilation system components or newly installed ventilation equipment serving the alteration shall comply with **Mandatory Measures 150.0(o)** Ventilation and Indoor Air Quality with qualifications...

- Fan Replacement
- Fan Alteration
- Air Filters
- Kitchen Exhaust
- Bathroom Exhaust
- Exhaust Fan Replacement

Dedicated Balanced IAQ Ventilation with Heat Recovery

Alterations –Ducts

Updates:

- Ducts extended at least **25 ft** trigger this section (previously 40 ft)
- Duct leakage to test at **10%** or less (previously 15%)
- Duct leakage to the outside to test at **7%** or less (previously 10%)
- Duct Insulation increased to **R-8 for CZ 1, 2, 4, 8-10, 12, and 13** (previously R-6) Table 150.2-A

TABLE 150.2-A DUCT INSULATION R-VALUE

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

R-8 Flex Duct

Note: Duct leakage testing is triggered when HVAC system located in garage.

Alterations Space Heating

Main Take-away: Clarification on where electric resistance heating can be used

Altered Space-Conditioning Heating System. Altered or replacement space-conditioning heating systems **shall not use electric resistance** as the primary heat source

EXCEPTION 1 to Section 150.2(b)1G: Non-ducted electric resistance space heating systems, if the existing space heating system is electric resistance.

EXCEPTION 2 to Section 150.2(b)1G: Ducted electric resistance space heating systems, if the existing space heating system is electric resistance and a ducted space cooling system is not being replaced or installed

EXCEPTION 3 to Section 150.2(b)1G: Electric resistance space heating systems, if the existing space heating system is electric resistance and the building is located in Climate Zones 7 or 15.

Typically, not allowed...

Ductless Electric Wall Heater

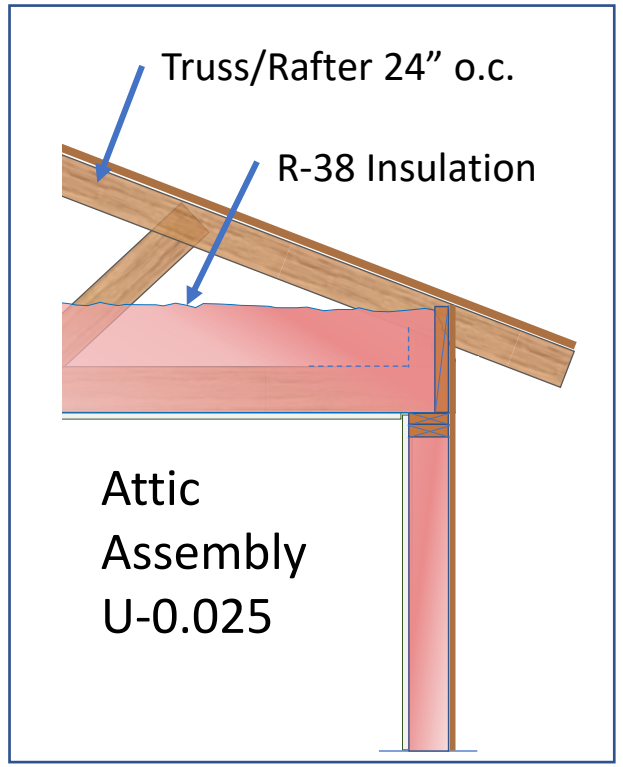
Envelope

Attic/Ceiling Alterations
Wall Extensions, Alteration and Windows

Additions –Prescriptive Roof and Ceiling

Additions that are **700 square feet or less:**

- **CZ 1, 2, 4, and 8 - 16:** Assembly U-factor not exceeding 0.025. In wood framed assemblies, **R-38** or greater.
- **CZ 3, 5, 6, and 7:** Assembly U-factor not exceeding 0.031. In wood framed assemblies, **R-30** or greater.
- **CZ 2 - 15:** Radiant Barriers required

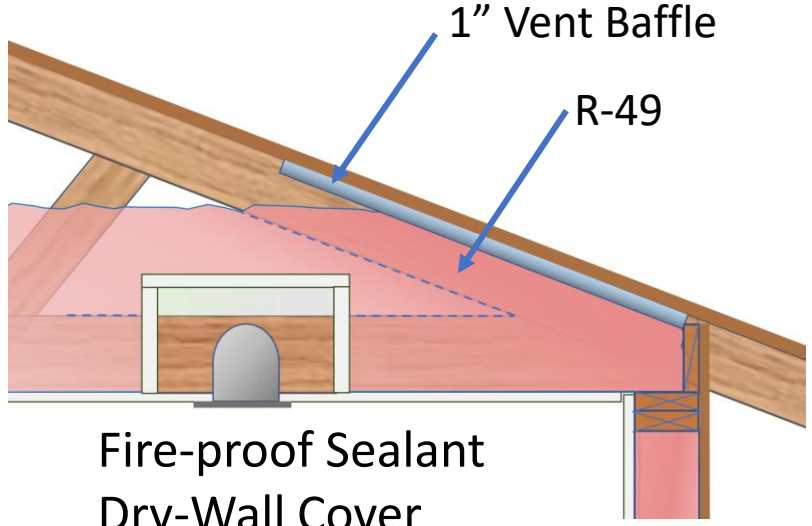


Note:
Additions more than 700 sf will follow the new construction Prescriptive Components Package in Table 150.1 -A

Alterations –Ceilings of Vented Attics

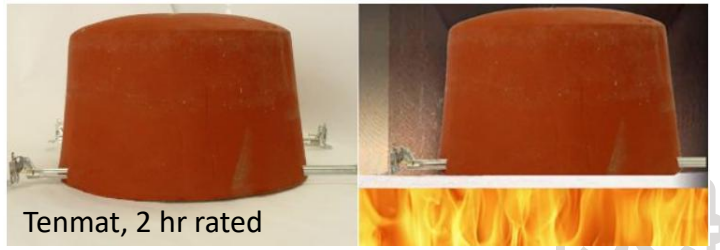
CZ 1-4, 6, 8-16 altered ceilings shall be insulated to R-49 in *or* weighted U-factor of 0.020.

- Except for CZ 1, 3, and 6 with existing R-19 insulation



In CZ 1-4 and 8-16 recessed downlights in the ceiling **shall be covered with insulation** to the same depth as the rest of the ceiling. **Downlights not rated** for insulation contact must be **replaced or retrofitted** with a **fire-proof** cover that allows for insulation to be installed directly over the cover

- Except CZ 1 -4 and 8 -10, existing R-19 insulation *[not CZ 11-16]*



Manufactured Cover

Reference: Section 410.116 of the CA Electric Code

410.116 Clearance and Installation

(A) Clearance

(1) Non-Type IC

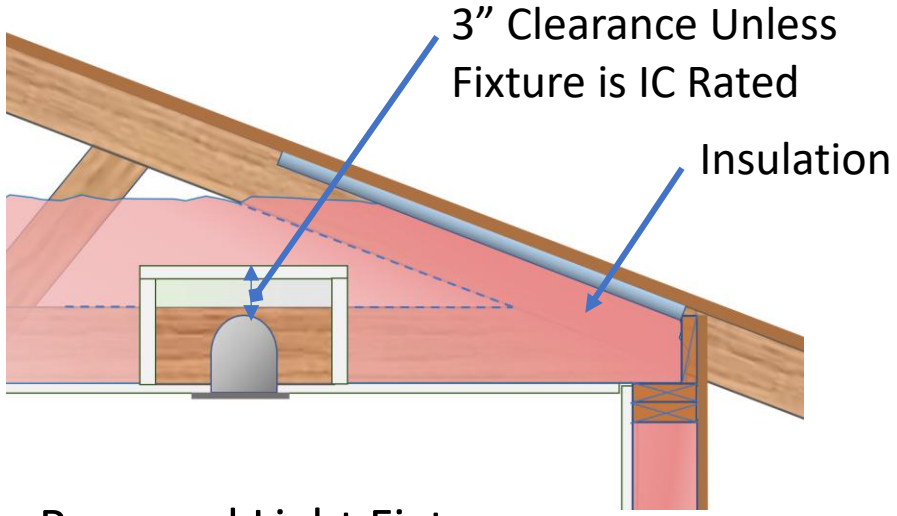
A recessed luminaire that is not identified for contact with insulation shall have all recessed parts spaced not less than 13 mm ($^1/_2$ in.) from combustible materials. The points of support and the trim finishing off the openings in the ceiling, wall, or other finished surface shall be permitted to be in contact with combustible materials.

(2) Type IC

A recessed luminaire that is identified for contact with insulation, Type IC, shall be permitted to be in contact with combustible materials at recessed parts, points of support, and portions passing through or finishing off the opening in the building structure.

(B) Installation

Thermal insulation shall not be installed above a recessed luminaire or within 75 mm (3 in.) of the recessed luminaire's enclosure, wiring compartment, ballast, transformer, LED driver, or power supply unless the luminaire is identified as Type IC for insulation contact.



Recessed Light Fixture
with Fire-proof Cover

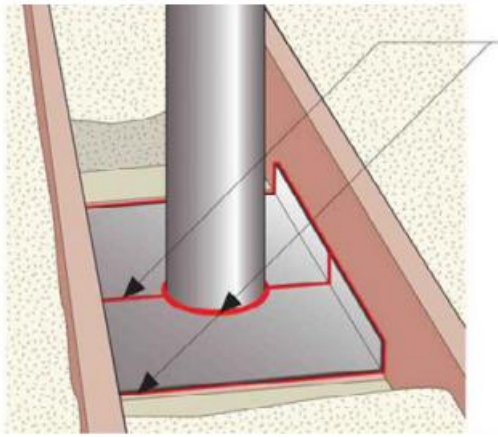
Alterations –Ceilings of Vented Attics

Altered ceilings must be air sealed in CZ 2, 4, 8-16

- Exception for existing R-19 insulation
- Except where combustion appliances are within the air boundary

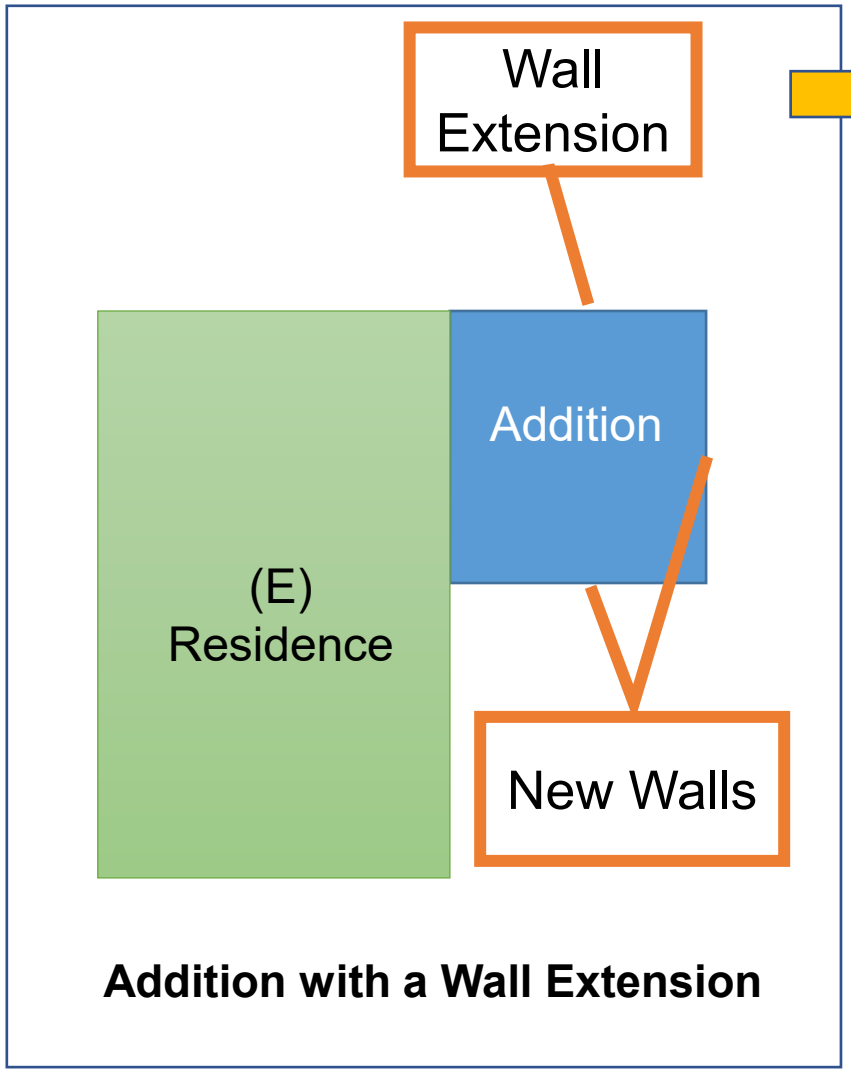
Attic ventilation shall comply with the California Building Code requirements. Exception where

- existing R-38 existing insulation, asbestos, and knob and tube wiring
- the accessible spaces in the attic that are not large enough
- the attic space is shared with other dwellings that are not part of the alteration



Drawings and instructions in the guide show contractors the proper way to air seal around typical breaks in the ceiling. Here, sheet metal and fire-rated caulk provide air sealing around a flue pipe.

Additions –Wall Extensions and Existing Framed Walls



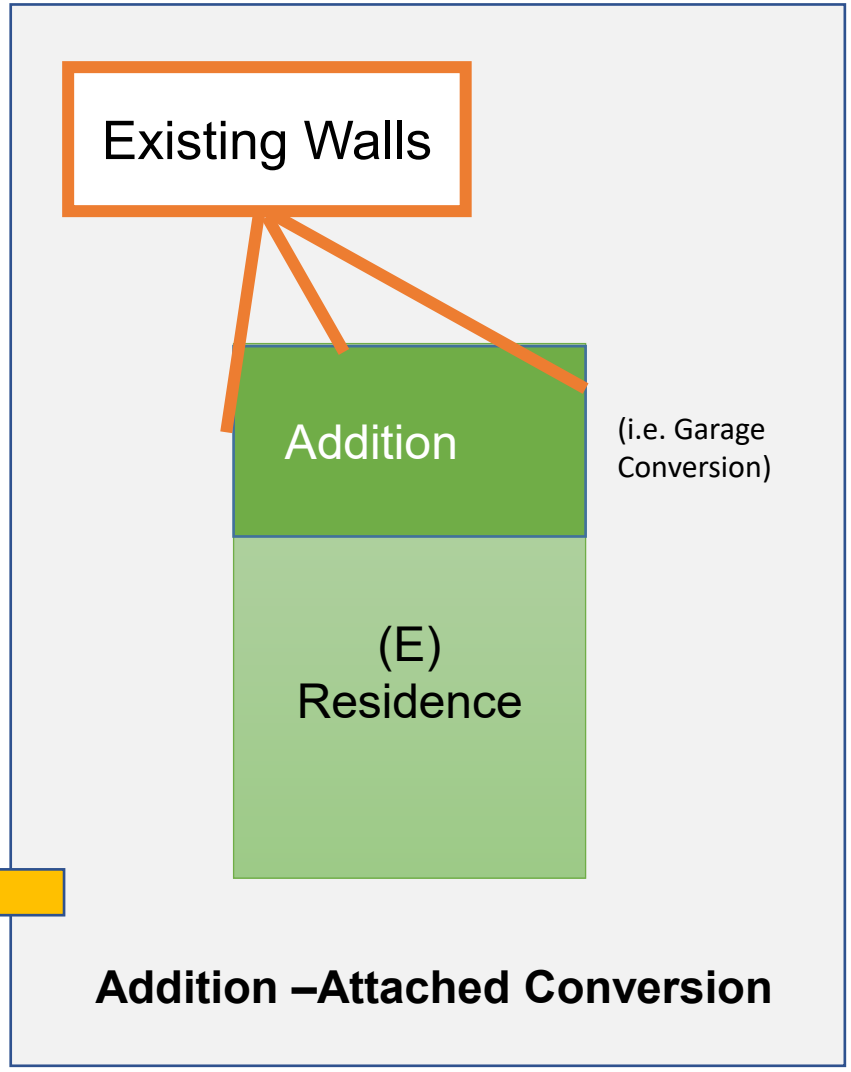
Addition with a Wall Extension

Extensions of existing wood-framed walls may retain the dimensions of the existing walls

- R-15 in a 2×4
- R-21 in a 2×6
- Continuous insulation (CI) *not* required

When existing siding of a wood-framed wall is *not being removed or replaced*:

- R-15 in a 2x4 framing
- R-21 in a 2x6 framing
- CI *not* required



Addition –Attached Conversion

Wall Extension –Where a (N) Wall *aligns* with an (E) Wall

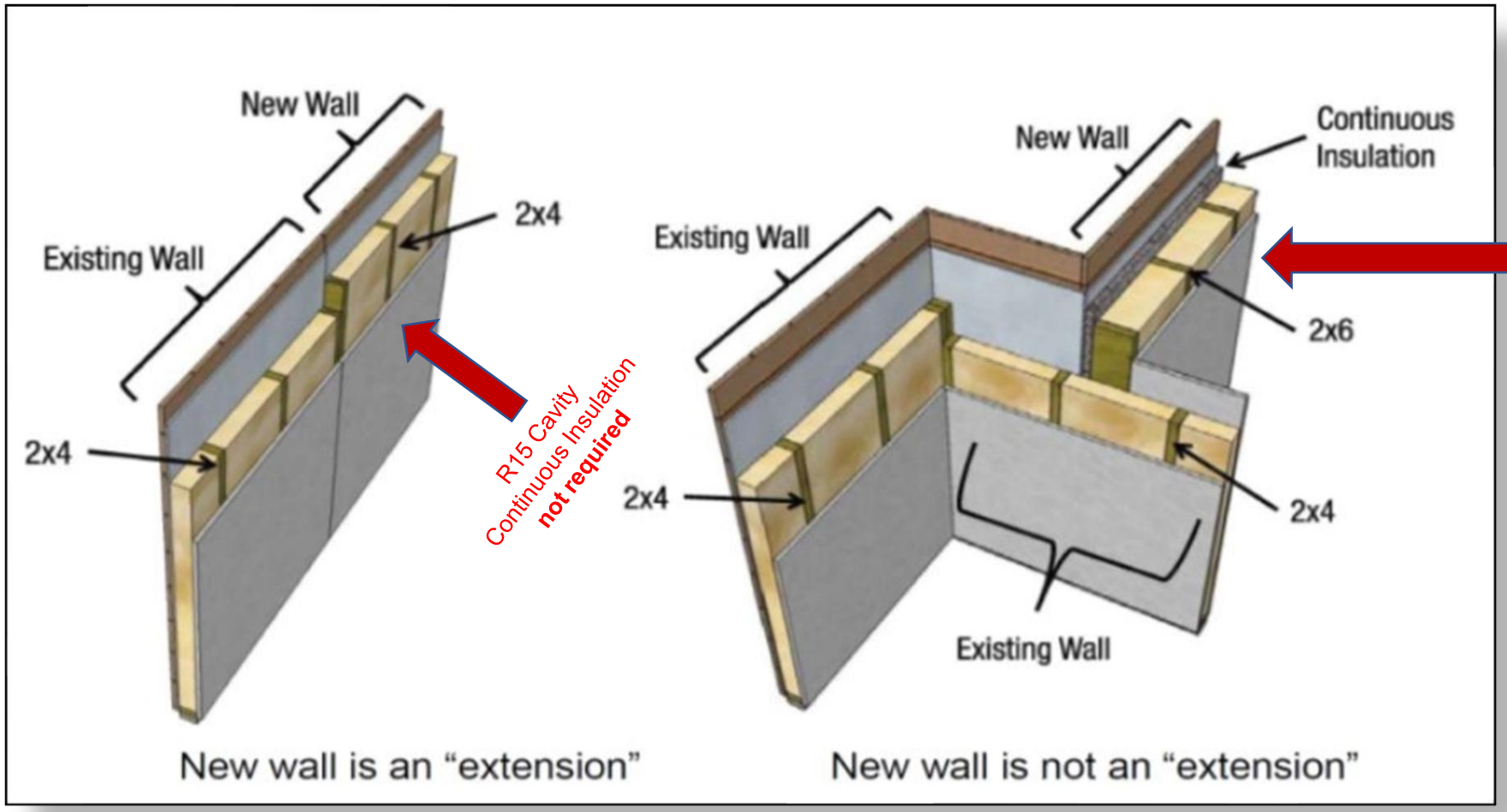


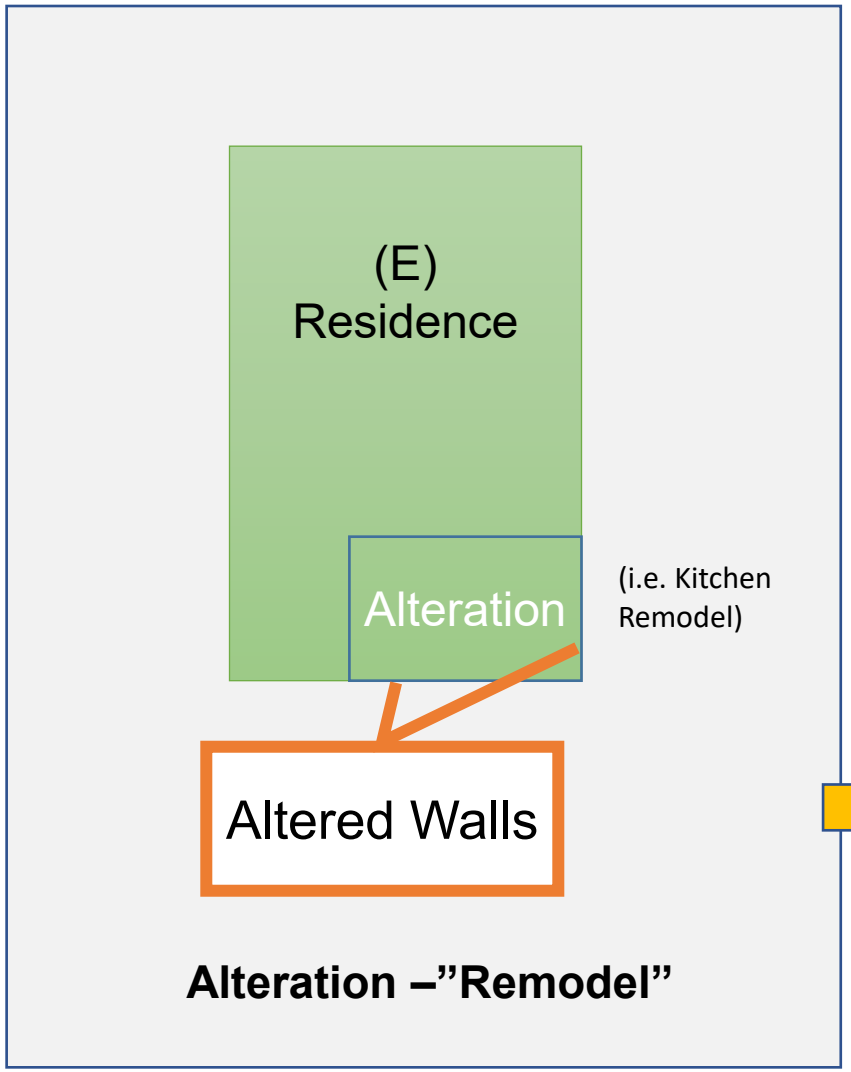
Image from CEC's BluePrint

Continuous Insulation is required Prescriptively.

This could be a cavity filled R-21 batt with R-5 continuous. (U- 0.048)

Wall Extension: R-15 for 2x4 walls and R-21 for 2x6 walls

Alterations –Existing Walls and Wall Alterations



Walls being Altered:

- Equiv R-15 in a 2x4 framing
- Equiv R-21 in a 2x6 framing
- Exception existing walls with R-11

Wall Summary for Additions and Alterations

Based on Table 29: Standard Design for Walls and Doors
Source: California Energy Commission, ACM Manual 2025 Code

Proposed Design Exterior Wall Assembly Type	Addition	Altered
Framed & Non-Mass Exterior Walls	CZ 1-5, 8-16 = R-21+R-5 in 2x6 (U0.048) CZ 6-7 = R-15+R-4 in 2x4 (U-0.065)	R-15 in 2x4 R-21 in 2x6
Wood Framed Existing Walls where **siding is not removed, or an extension** of an existing wall	R-15 in 2x4 R-21 in 2x6	R-15 in 2x4 R-21 in 2x6
Framed Wall Adjacent to Unconditioned (e.g., Demising or Garage Wall)	R-15 in 2x4 R-21 in 2x6	R-15 in 2x4 R-21 in 2x6
Above Grade Mass Interior Insulated	CZ 1-15 = R-13 (0.077) CZ 16 = R-17 (0.059)	N/R Mandatory requirements have no insulation for mass walls
Below Grade Mass Interior Insulation	CZ 1-15 = R-13 (0.077) CZ 16 = R-15 (0.067)	N/R Mandatory requirements have no insulation for mass walls

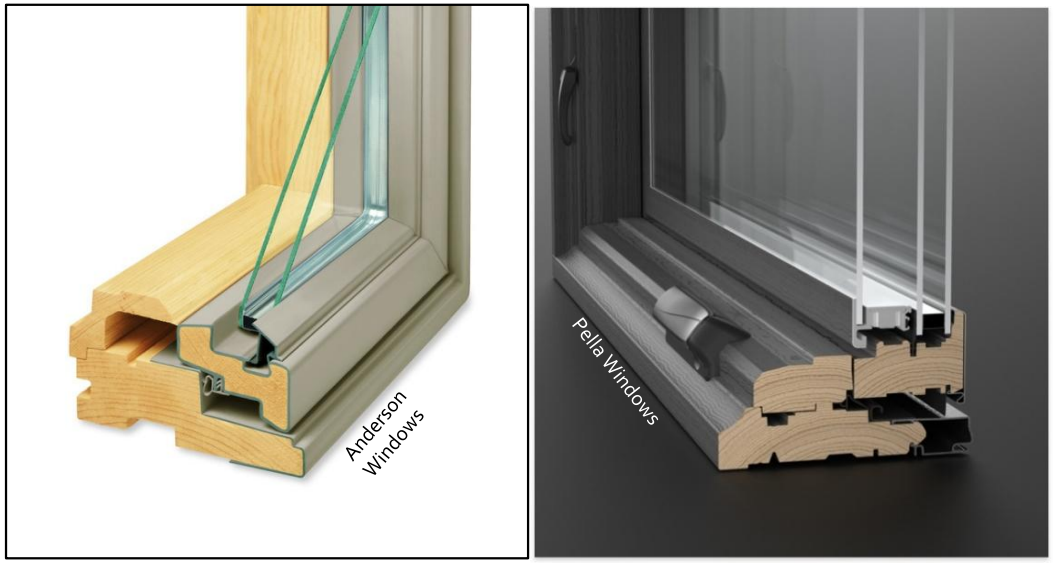
Prescriptive Requirements –for New Construction and Additions

2025 Code:

- **U-0.30** for CZ 6-10 and 15
- **U-0.27** for CZ 1-5, 11-14, and 16

Exception: New dwelling units with a conditioned floor area of **500 sf** or less in **CZ 5** may comply with a max **U-0.30**.

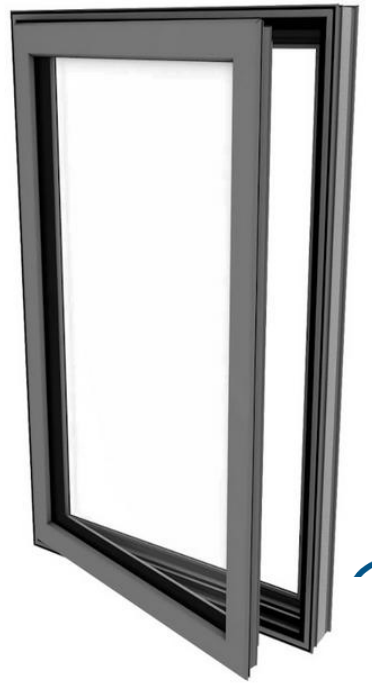
- **SHGC** – Not Required for CZ 1, 3, and 5
- **SHGC-0.23** for CZ 2, 4, 6-14, and 16
- **SHGC-0.20** for CZ 15



Just about all brands of windows offer dual and triple paned options meeting the U-0.27 requirement

Fenestration Alterations –i.e. added and replaced windows and skylights

CZ 1, 3, 5, 16	2025 Code	
Fenestration (Windows and Skylights)	**U-factor**	**SHGC**
Window Replacement 75 sq ft or less	0.40	NR
Skylight Replacement	0.40	0.30
Window Replacement > 75 sq ft or **New Additional Fenestration**	0.27	NR
Total Glazing as a % of Floor Area	20%	
West Facing Glazing	NR	



Models with U-factors as low as U-0.12 are available

ALPEN

EXCEPTION:
Alterations that add up to **16 square feet of new fenestration or skylight** shall not be required to meet the total fenestration area and west-facing fenestration area requirements.

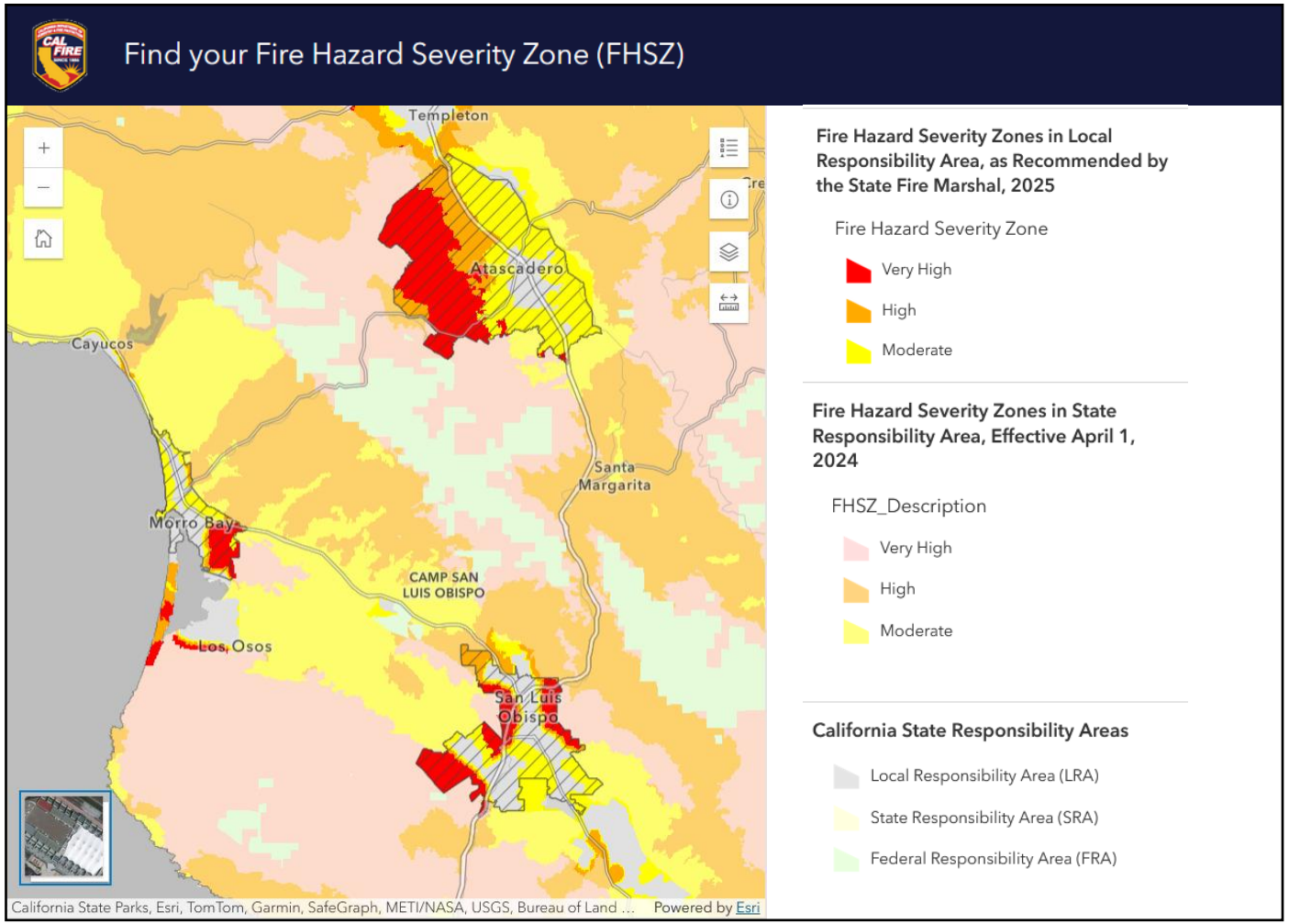
Fenestration Alterations –i.e. added and replaced windows and skylights

CZ 6-10, 15	2025 Code		
Fenestration (Windows and Skylights)	U-factor	SHGC	
		CZ 6-10	CZ 15
Window Replacement 75 sq ft or less	0.40	0.35	0.23
Skylight Replacement	0.40	0.30	0.30
Window Replacement > 75 sq ft or **New Additional Fenestration**	0.30	0.23	0.23
Total Glazing as a % of Floor Area	20%		
West Facing Glazing	5%		

CZ 2, 4, 11-14	2025 Code	
Fenestration (Windows and Skylights)	U-factor	SHGC
Window Replacement 75 sq ft or less	0.40	0.35
Skylight Replacement	0.40	0.30
Window Replacement > 75 sq ft or **New Additional Fenestration**	0.27	0.23
Total Glazing as a % of Floor Area	20%	
West Facing Glazing	5%	

EXCEPTION:
Alterations that add up to **16 square feet of new fenestration or skylight** shall not be required to meet the total fenestration area and west-facing fenestration area requirements.

Windows –Minimum Performance and WUI



https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones

2025 Energy Code:
Mandatory Measure: maximum weighted average **U-factor is U-0.40**

New Energy Code Exception to Mandatory U-factor:

- Windows and Skylights installed in buildings meeting [2025 Title 24] ***Part 7 of the California Building Code, California Wildland-Urban Interface Code*** –where buildings are located in Fire Hazard Severity Zones or WUI Fire Areas as designated by the local enforcement agency.

Resource: WUI Products Handbook

CALIFORNIA DEPARTMENT of FORESTRY
and FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL

STATE FIRE MARSHAL LISTED WILDLAND-URBAN INTERFACE (WUI) PRODUCTS HANDBOOK

Published by *CAL FIRE*
FIRE ENGINEERING AND INVESTIGATIONS DIVISION
BUILDING MATERIALS LISTING PROGRAM
September 2, 2025

Thermally Broken Steel Frame for Residential Construction

RIVIERABRONZE
Distinctive Design for Luxury Living

This product line is based in Ventura and meets the Residential Prescriptive U-factor and the WUI Fire Code requirements.

https://osfm.fire.ca.gov/what-we-do/fire-engineering-and-investigations/building-materials-listing

Domestic Water Heating Addition or Alteration

Additions –Additional Water Heater

- A **single heat pump water heater**
  - NEEA Tier 3 or higher,
  - Otherwise, choose HPWH with specialized communication port, install indoors, and place on a R-10 foam base

SanCO2

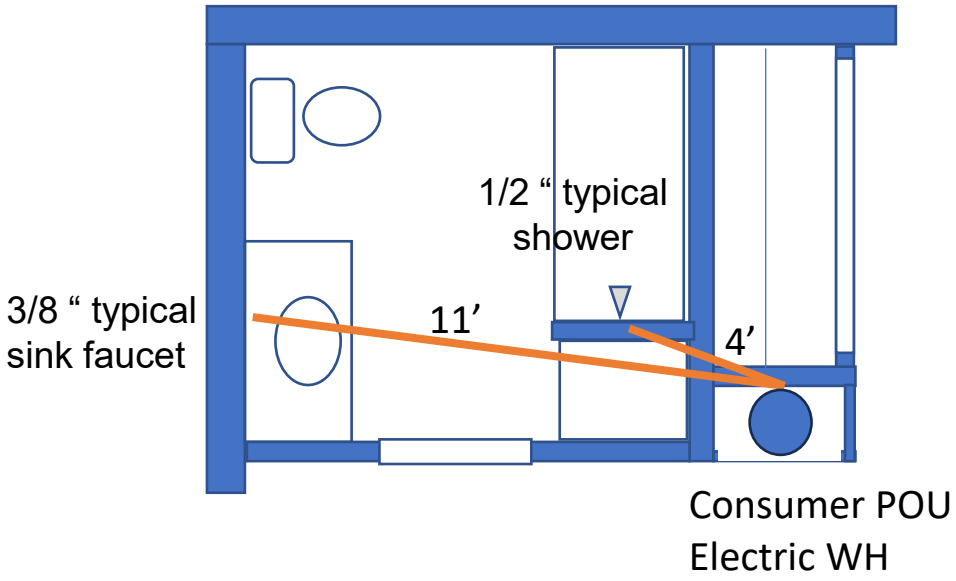
Note: Use the Performance Method for gas or propane water heaters.

- For addition that are **500** sq ft or less, an **electric water heater** with ***point of use distribution*** as specified in RA4.4.5 is allowable

Instantaneous POU (12 kW Rated Input)

Consumer POU Electric (20 gal Storage Tank)

Point of Use (POU) Distribution –Required with Electric Water Heater



Plan check Item: Show the horizontal measurements and piping size on plans.
ECC Provider/Rater Installation: Water heater installation CF2R-PLB02 - “Consumer POU Electric”

POU - Point of Use Distribution
Reference Appendices –RA4.4.5

Table 4.4.5

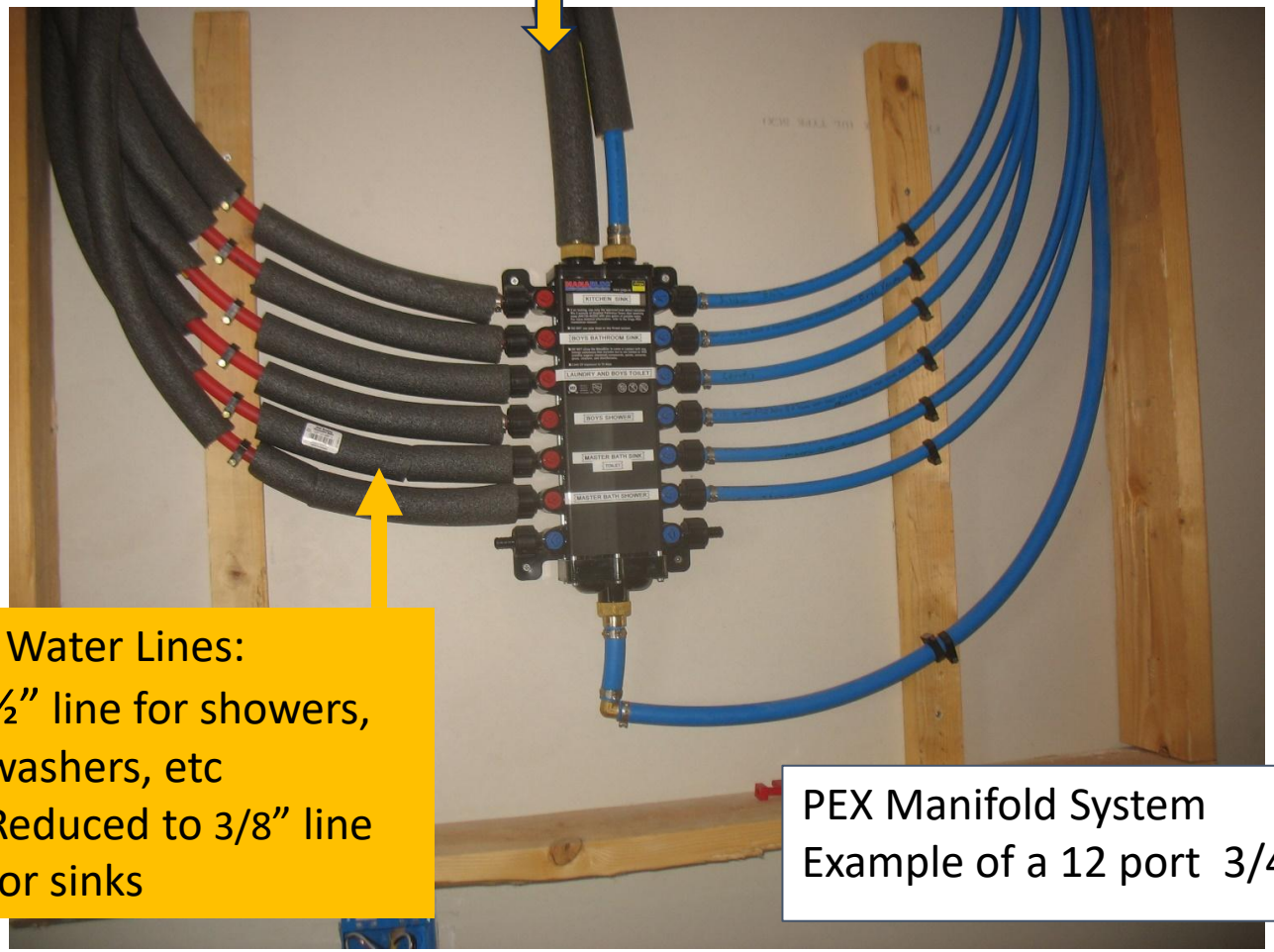
Size Nominal (Inch)	Length of Pipe (feet)
3/8”	15
1/2”	10
3/4”	5

Line size vs Length for each run.

- Take most direct path with truck-branch line.
- If two pipe sizes are used in a single run, half the length of pipe shall be considered for each pipe size.

Example of a Manifold System that can be use for POU, Parallel Plumbing and Compact Plumbing Distribution

¾” Hot Water Line Directly from Water Heater



Hot Water Lines:

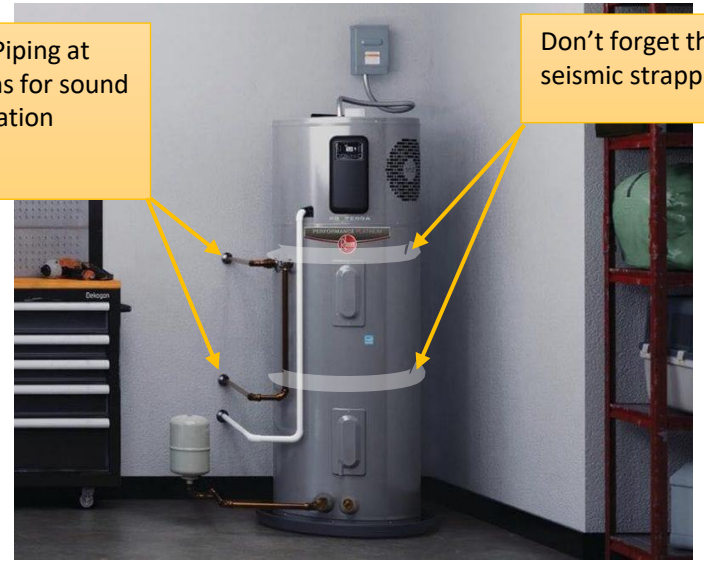
- ½” line for showers, washers, etc
- Reduced to 3/8” line for sinks

PEX Manifold System
Example of a 12 port 3/4 x 1/2

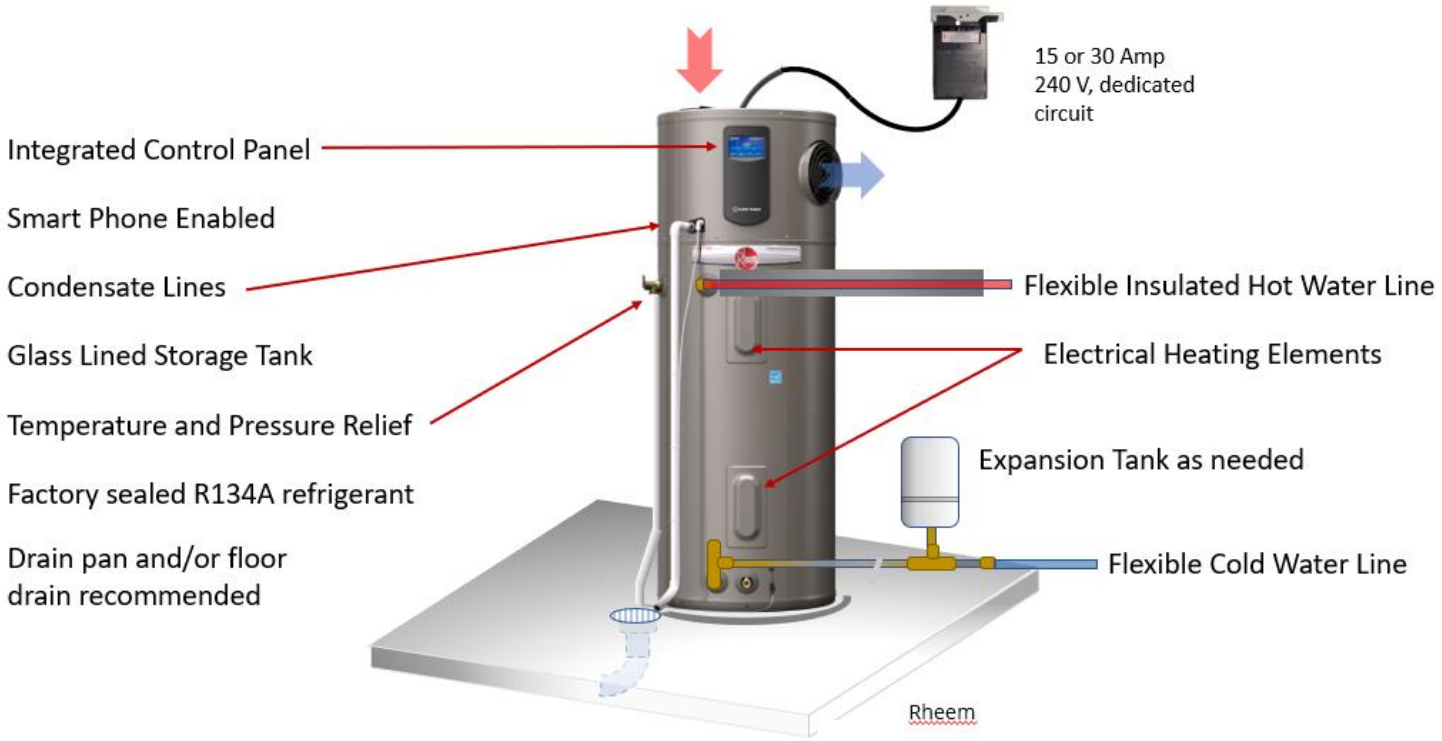
PEX Manifold System
Example of a 4 port 3/4 x 1/2
(Cold water lines shown)

Integrated HPWH

- **Integrated HPWH tanks taller than standard gas or electric units**
- **Sound Level is typically around 50 db**
- **Condensate Drainage needs to be addressed**
- **Ventilation for HP needs to be designed: Older models need 700 – 1000 cubic feet volume, or ducted vent kit, newer models only need 450 cu ft**
- **Operating temperature starts around 45 deg F, some models 37 deg F**



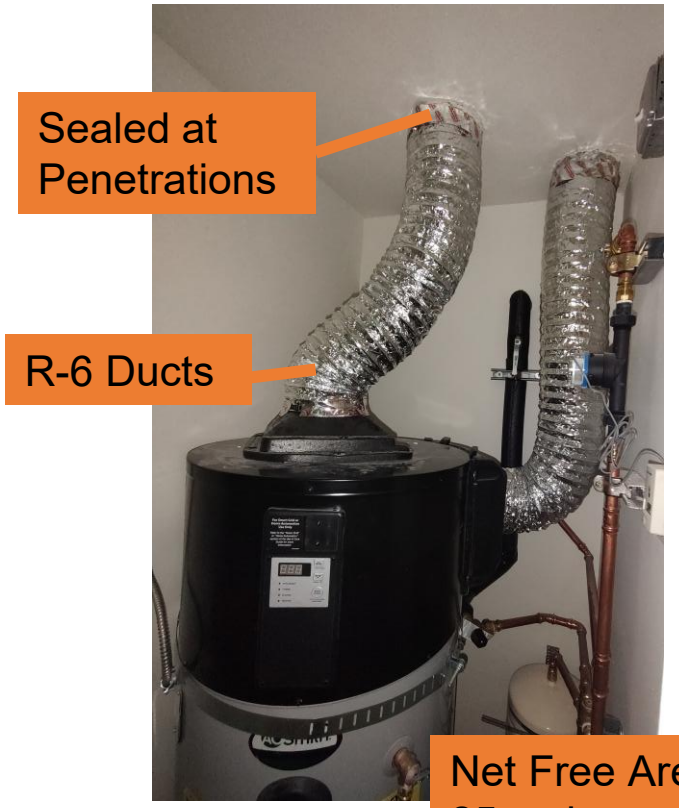
Rheem marketing



New for 2025: Mandatory Measures for HPWH

Heat Pump Water Heaters –Integrated

- Require a Back-Up Heat Source. Can be internal or external to the HPWH
- Ventilation Requirements Including:
  - Volume of Space
  - Net Free Area – Permanent Openings
  - Ducted Systems – Permanent Openings
- Duct Requirements: Where ducts are installed, such as R-6 duct insulation and sealed penetrations



Net Free Area = 125 sq in + 25 sq in per kBtu/h of compressor capacity or manufacturer specifications, whichever is larger.

Insulation for Piping and Tanks

- **All hot water piping** shall be insulated per 609.12 (previously 609.11) of the CA Plumbing Code, i.e. Title 24, Part 5.

- **Exceptions**: Piping surrounded with a
  - 1” min. of wall insulation
  - 2” min. of crawl space insulation
  - 4” min. of attic insulation

Reference: Section 609.12 (previously 609.11) of the CA Plumbing Code

609.12 Pipe Insulation. Insulation of domestic hot water piping shall be in accordance with Section 609.12.1 and Section 609.12.2.

609.12.1 Insulation Requirements. Domestic hot water piping shall be insulated.

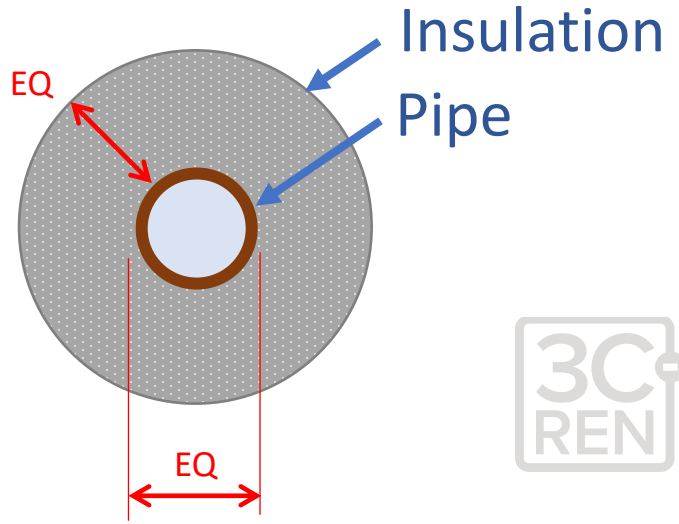
609.12.2 Pipe Insulation Wall Thickness. Hot water pipe insulation shall have a minimum wall thickness of not less than the diameter of the pipe for a pipe up to 2 inches (50 mm) in diameter. Insulation wall thickness shall be not less than 2 inches (51 mm) for a pipe of 2 inches (50 mm) or more in diameter.

Exceptions:

(1) Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration.

(2) Hot water piping between the fixture control valve or supply stop and the fixture or appliance shall not be required to be insulated.

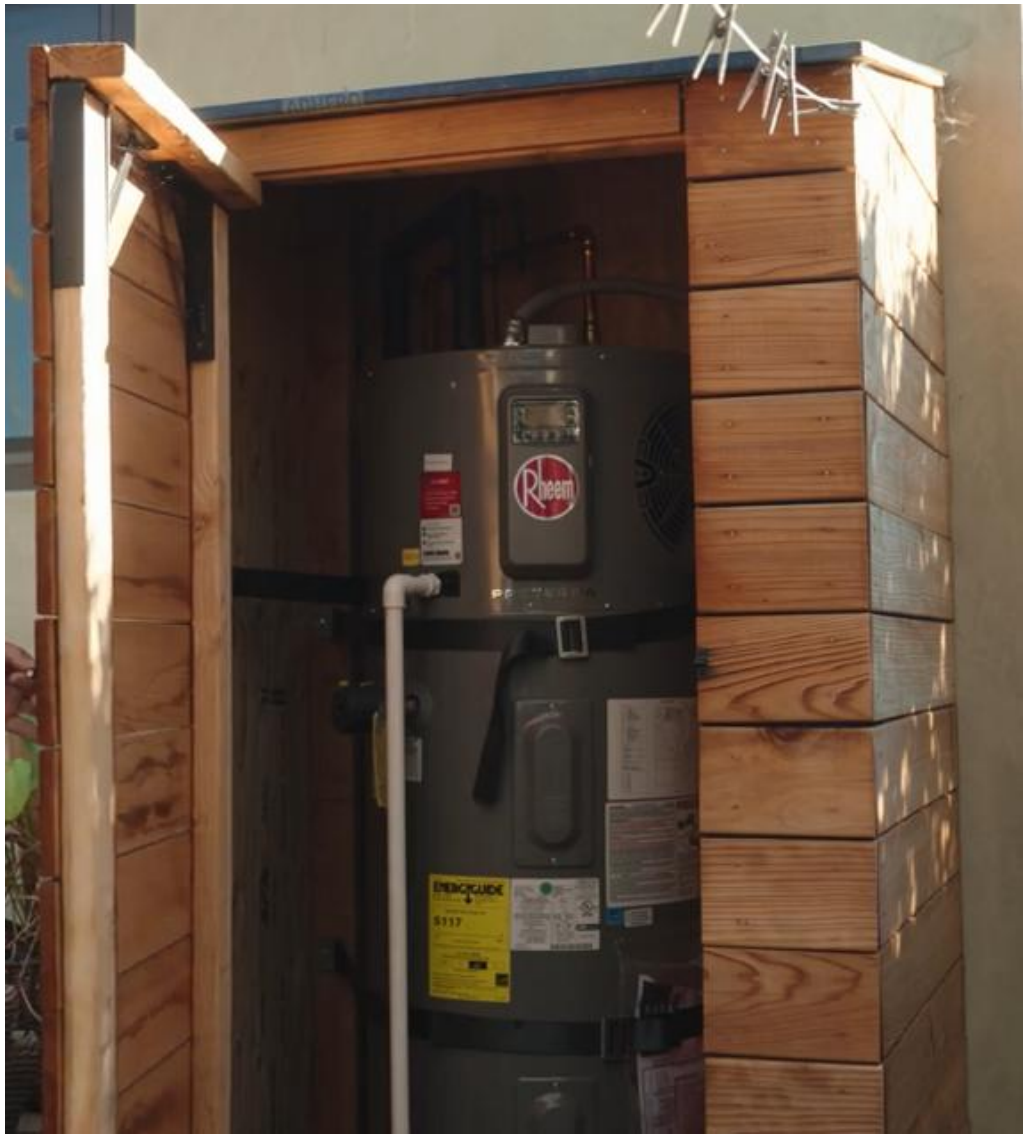
Pipe insulation thickness shall be at least as thick as the pipe diameter.



Garage / Workshop Location

- Hot and Cold piping is plumbed at top of the tank
- Flex Line helps reduce vibration noise
- No ducting needed
- Control panel is accessible
- Intake and Exhaust vents are free from obstruction
- Condensate drainage is plumbed to waste line

Existing Small Homes – Interior space or a garage may not be available



- Enclosure provides protection from the weather
- Appropriate for mild climates (HPWH units go into electric resistance mode around 40-45 deg F)
- Gaps between the siding boards allow for ventilation air

- Control panel is accessible
- Exhaust vent port is free from obstruction
- Condensate drainage is taken outdoors

CF1R with Tank Located in an Outdoor Enclosure

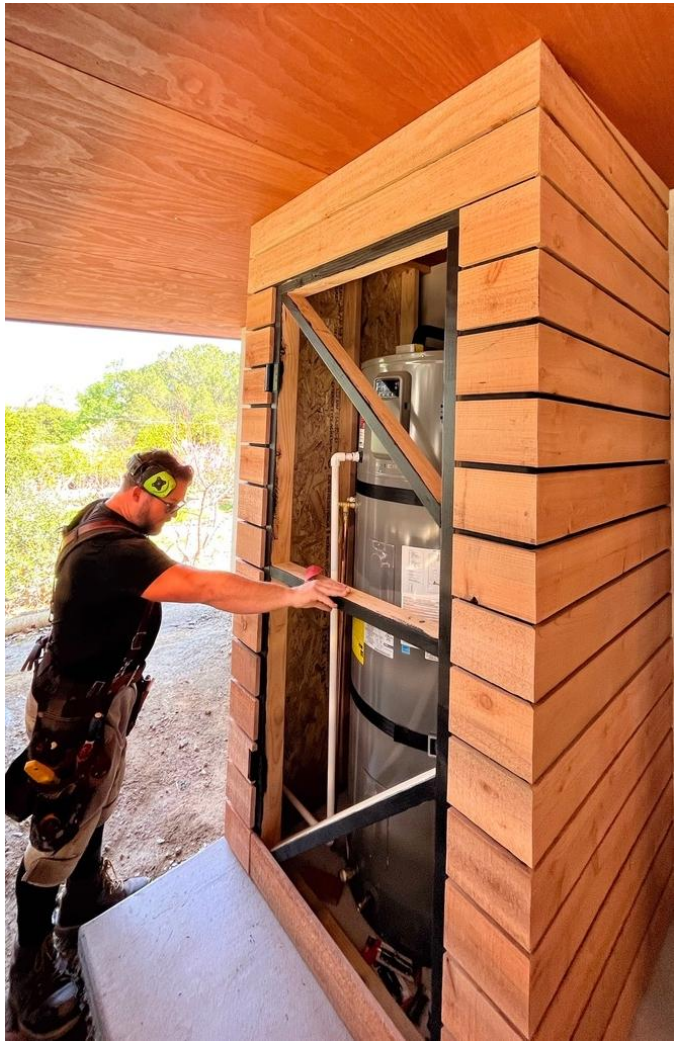
REQUIRED SPECIAL FEATURES
The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.
• Solar Electric Generation Systems / Solar PV System requirements for newly constructed residential buildings are suspended per Executive Order N-29-25 • Indoor air quality, balanced fan • IAQ Ventilation System: as low as 0.14 W/CFM • IAQ Ventilation System Heat Recovery: minimum 60 SRE and 60 ASRE • IAQ Ventilation System: supply outside air inlet, filter, and H/ERV cores accessible per RACM Reference Manual • Floor has high level of insulation • Northwest Energy Efficiency Alliance (NEEA) rated heat pump water heater; specific brand/model, or equivalent, must be installed • One or more heat pump water heaters have been modeled as demand response compatible

WATER HEATING SYSTEMS

01	02	03	04	05	06	07	08	09
Name	System Type	Distribution Type	Water Heater Name	Number of Units	Solar Heating System	Compact Distribution	ECC Verification	Water Heater Name (#)
DHW System 1	Domestic Hot Water (DHW)	Standard	HPWH	1	n/a	None	n/a	HPWH (1)

WATER HEATERS - HEAT PUMP

01	02	03	04	05	06	07	08	09	10
Name	# of Units	Tank Vol. (gal)	NEEA Heat Pump Brand	NEEA Heat Pump Model	Tank Location	Duct Inlet Air Source	Duct Outlet Air Source	UEF	JA13 Compliant
HPWH	1	80	Rheem	RheemPROPH80 T2RH40015	Outside	Outside	Outside	n/a	☒



- CF2R-PLB02-E will be auto-populated from the CF1R
- Completed and signed by the builder or installing contractor

Is an Outdoor Metal Cabinet Allowed under the 2025 Code?

Maybe…? ***Maybe Not…***

- Does the CF1R and CF2R show the tank, air-inlet and air-outlet ‘Outside’?
- Is the unit protected from weather?
- Does the set-up allow for mandatory ventilation per Section 110.3(c)7?
- Does the P&T relief and condensate lines have allowable discharge point(s) per the plumbing and mechanical code(s)?
- All hot water piping insulated per Chapter 6 Section 609.12 (2025 Plumbing Code)?

Prescriptive Alterations –Water Heater Replacement

Section 150.2(b)1H

i. Pipe Insulation. For newly installed and existing accessible piping, the insulation requirements of Section 150.0(j)1 shall be met.

ii. Distribution System. For recirculation distribution systems serving individual dwelling units, only Demand Recirculation Systems with manual on/off control as specified in the Reference Appendix RA4.4.9 shall be installed.

iii. Water heating system. The water heating system shall meet one of the following:

a. A **natural gas or propane** water-heating system; or

b. A **single heat pump water heater**. The storage tank shall not be located outdoors and be placed on an incompressible, rigid insulated surface with a minimum thermal resistance of R-10. The water heater shall be installed with a communication interface that meets either the requirements of Section 110.12(a) or has an ANSI/CTA-2045-B communication port; or

c. A **single heat pump water heater** that meets the requirements of NEEA Advanced Water Heater Specification Tier 3 or higher; or

d. If the existing water heater is an **electric resistance** water heater, a consumer electric water heater; or

e. A water-heating system determined by the Executive Director to use no more energy than the one specified in Item a above; or if no natural gas is connected to the existing water heater location, a water-heating system determined by the executive director to use no more energy than the one specified in Item d above.

Note:

Section 150.2(b)1H did not change under the 2025 Code.

Building Dept Counter Card –To Be Updated…

CALIFORNIA ENERGY COMMISSION | EFFICIENCY DIVISION

Single-Family Residential Water Heater Alterations

2022 Title 24 Building Energy Efficiency Standards

Is the Existing Water Heater Electric Resistance?	What type can I install prescriptively?	What can I install under the performance approach?
NO	• **Natural gas or propane** — tank or tankless (§150.2[b]1Hiiia) • **Heat pump** — (§150.2[b]1Hiiib)[1] • **Heat pump** — NEEA Tier 3 or higher (§150.2[b]1Hiiic)	Any type that uses no more energy than the standard design (gas or propane tankless; or heat pump, if proposed is electric). Must use CEC-approved compliance software (§150.2[b]2B)
YES	**Consumer electric or heat pump** — tank or tankless (§150.2[b]1Hiiid)[2]	Any type that uses no more energy than the standard design (heat pump). Must use CEC-approved compliance software (§150.2[b]2B)

All existing accessible and newly installed piping must be insulated per §150.2(b)1Hi.

Note:
References Prescriptive Alterations Section 150.2(b)1H – see next slide

[1] **Storage tank cannot be outdoors and must be on rigid, incompressible surface insulated to R-10 or higher. Must have a communications interface meeting §110.12(a) requirements or have an ANSI/CTA-2045-B communication port.**

[2] **Per 10 CFR 430.2, consumer electric water heaters include:**
- **Electric storage or instantaneous water heaters with an input of 12 kilowatts or less.**
- **Heat pump-type units, with a maximum current rating of 24 amperes, at a maximum voltage of 250 volts, designed to transfer thermal energy to heat water, including all ancillary equipment (e.g., fans, storage tanks, pumps, or controls) necessary to its function.**

Electric Ready (Water Heating)

Electrification

Additions

Electric-Ready

- Water Heating:
  - Only if a new *second* LP/NG water heater is installed under the *Performance Method* then electric-ready for a future HPWH is triggered

Alterations

Electric Panel

- Electric Code
  - The panelboard shall meet the loads; triggered when the project increases the electric load beyond the existing panel capacity

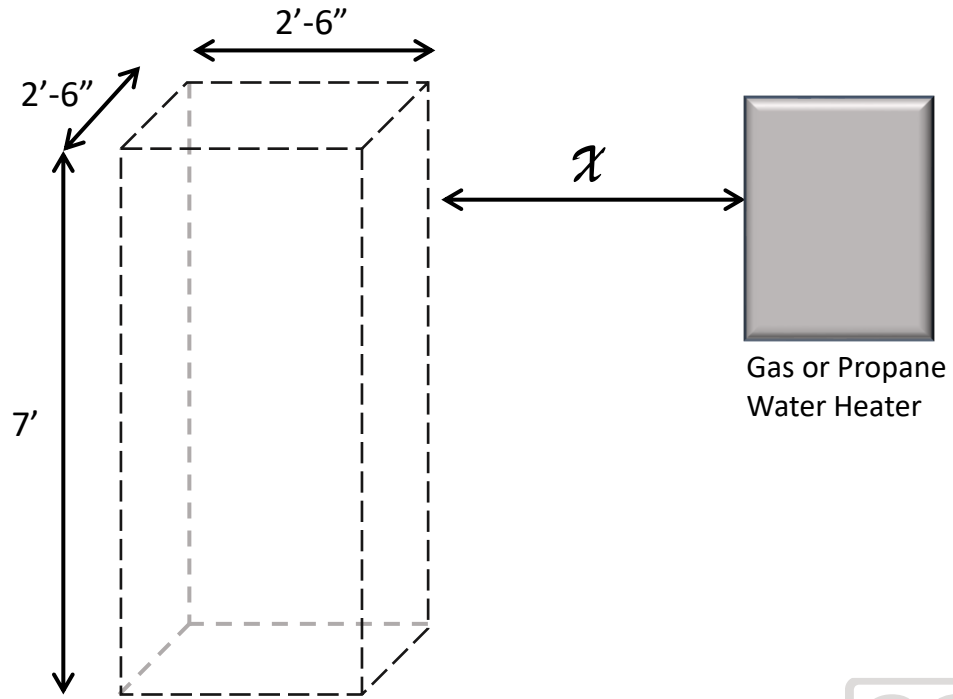
New Construction

Otherwise, *NOT* REQUIRED

- Solar Photovoltaic (PV)
- Solar-Ready
- Battery-Ready
- 225 amp Busbar or Elec Panel
- Electric-Ready:
  - Heat Pump Space Conditioning
  - Cook Top
  - Clothes Dryer

Heat Pump Water Heater (HPWH) Ready
–triggered when installing a gas or propane water heater

- Dedicated space for future HPWH: **30” x 30” x 7**’
- All electrical components shall be installed in accordance with the ***California Electrical Code***.
- Specific electrical and plumbing requirements depend on **relative location** to the gas or propane **water heater**:
  - Use option A when x is 3 ft or less
  - Use option B when x is greater than 3 ft



Pre-Wired for Future HPWH – Option A

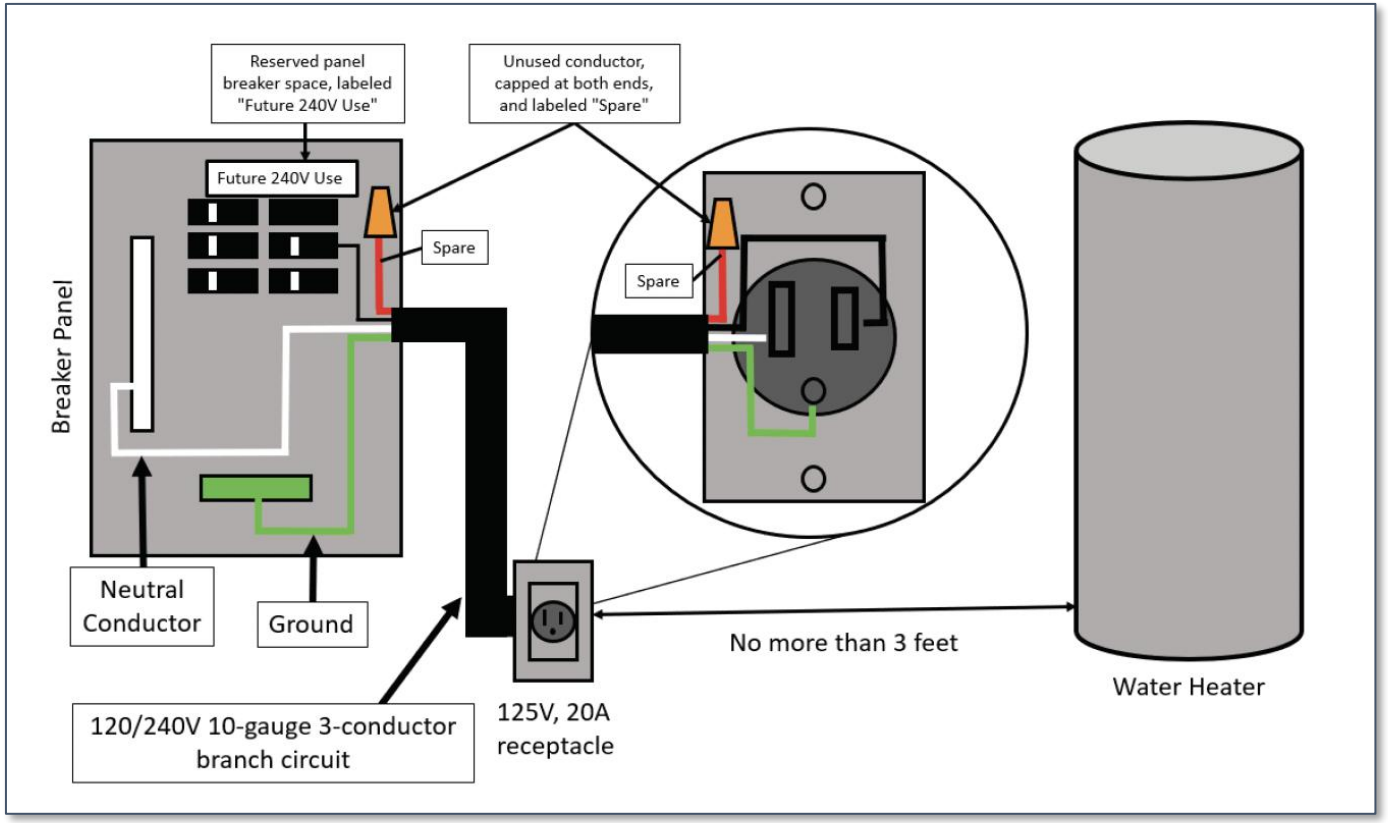
A. If the designated space is **within 3 feet from the water heater**, then this space shall include the following:

i. A dedicated **125 volt**, **20 amp electrical receptacle** that is connected to the electric panel with a 120/240 volt 3 conductor, 30 amp branch circuit, within 3 feet from the water heater and accessible to the water heater with no obstructions; and

ii. Both ends of the unused **conductor shall be labeled** with the word “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 with the words “Future 240V Use”; and

iv. A **condensate drain** that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance.



Credit: Blueprint, California Energy Commission, Issue120 Apr/June 2020
https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center

Pre-Wired for Future HPWH – Option B

B. If the designated space is ***more than 3 feet from the water heater***, then this space shall include the following:

i. A dedicated **240 volt branch circuit** shall be installed within 3 feet from the designated space. The branch circuit shall be rated at **30 amps** minimum. The blank cover shall be identified as **"240V ready"**; and

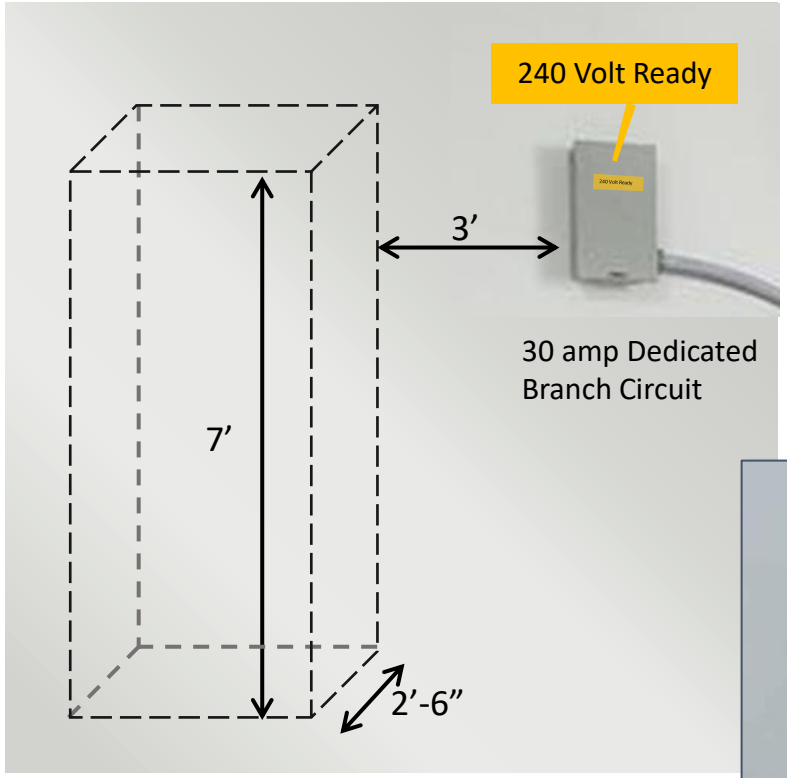
ii. The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future HPWH installation. The reserved space shall be permanently marked as **"For Future 240V use"**; and

iii. Either a dedicated **cold water supply**, or the cold water supply shall pass through the designated HPWH location just before reaching the gas or propane water heater; and

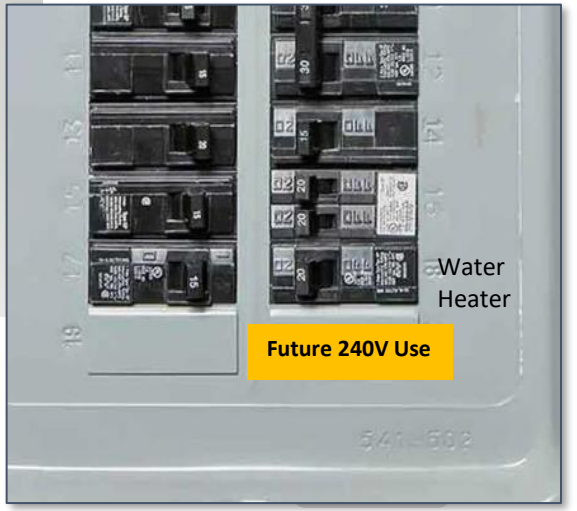
iv. The **hot water supply** pipe coming out of the gas or propane water heater shall be routed first through the designated HPWH location before serving any fixtures; and

v. The hot and cold water piping at the designated HPWH location shall be **exposed and readily accessible** for future installation of an HPWH

vi. A **condensate drain** that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance.



Designated Space for future HPWH

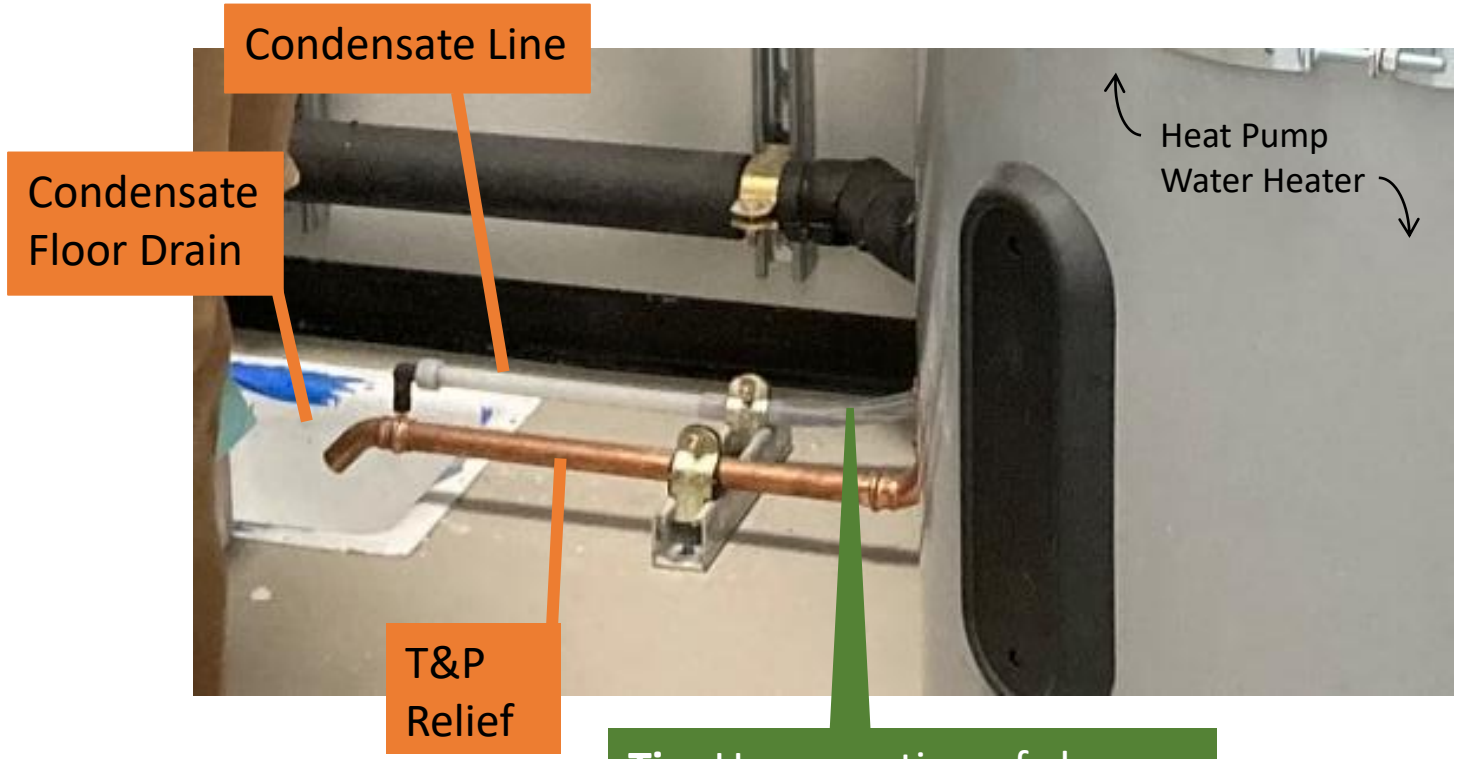


Main Panelboard

Condensate Drain –Required Under Both Option A and B

Additional Requirement:

- **Under Option A.v. and B.vi.:** A **condensate drain** that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance.
- **Note:** The *condensate* is non-acidic. It is condensation from the surrounding air.



Alignment with California Electric Code and Energy Code

ARTICLE 408
Switchboards, Switchgear, and Panelboards

Part I. General

408.2(A) California Energy Code Requirements for Panelboards in Single-Family Buildings [CEC]. *In single-family residential buildings that include one or two dwellings, panelboards serving the individual dwelling unit 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 California Energy Code Section 150.0 (n), (t), (u) and (v).*

Part III. Panelboards

408.30 General. All panelboards shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Part III, IV, or V of Article 220, as applicable.

Article 220 details the manner and loads that shall be included in panel sizing.

Section 150.0(n)
Water Heating Systems

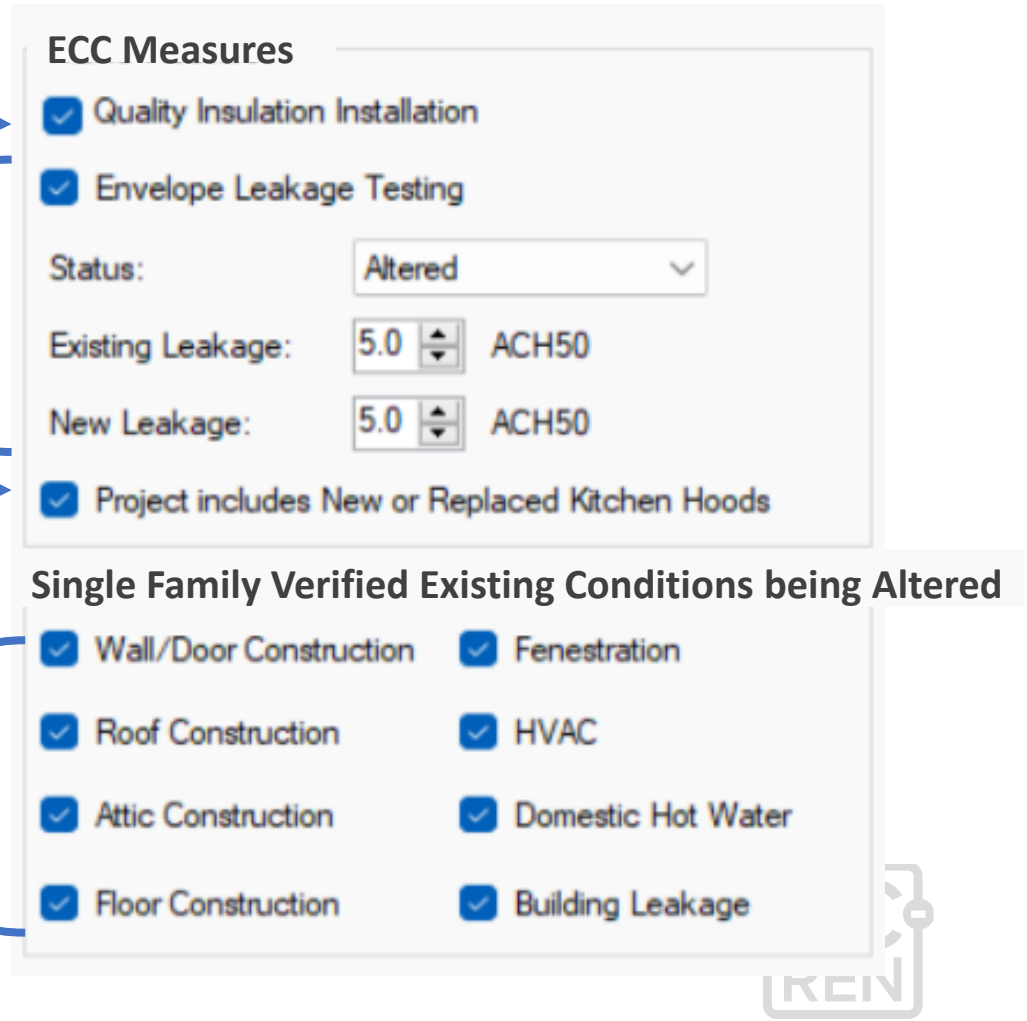
Excerpt:
All electrical components shall be installed in accordance with the *California Electrical Code*.

Similarly, Sections 150.0(t),(u), and (v) address electric ready for heat pump space heating, electric cook tops and electric dryers for new construction.

ECC Verification – Opportunity for Credits

ECC Measures and Verified Existing Conditions

- **Quality Insulation Installation** (QII) is a Prescriptive requirement (and Baseline) for New Construction and *Additions over **700** sq ft*
  - Or a *penalty*, if not done when using the Performance Method
- **Envelope Leakage Testing** – can be a credit, but may be very difficult
- **Kitchen Hood** – Exhaust Ventilation IAQ
- **Verified Existing Conditions** – ECC Credit - Use if installing better insulation, better HVAC system, better water heater, etc. Can be use for Trade-Offs when using the Performance Method
- **Hot Water Distribution:** All Pipes Insulated, Point of Use, and Compact Plumbing, Recirculation, etc.



QII - Air Infiltration Sealing and Quality Insulation Installation

QII - AIR INFILTRATION SEALING – FRAMING STAGE

CALIFORNIA ENERGY COMMISSION CEC-CF2R-ENV-21-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

C. Walls Adjacent to Unconditioned Space

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

01	All penetrations through the exterior wall air barrier are sealed to provide an airtight envelope to unconditioned spaces such as the outdoors, attic, garage, and crawlspace.
02	Exterior wall air barrier is sealed to the top plate ar
03	All electrical boxes, including knockouts, that penet
04	All openings in the top and bottom plate, including for electrical and plumbing.
05	Exterior bottom plates (all stories) are sealed to th
06	All gaps around windows and doors are sealed. The
07	Rim joist gaps and openings are fully sealed.
08	Fan exhaust duct outlet/damper at the exterior wa
09	Knee walls have solid and sealed blocking at the bo

E. Roof Air Barrier – Unvented Attics Adjacer

The responsible person's signature on this c this table have been met.

01	There is a continuous air barrier at the roof deck an
02	Chimneys and flues require sheet metal flashing at flashing is sealed to the surrounding framing.
03	All penetrations in the roof deck and gable ends for

INSULATION INSTALLATION

CALIFORNIA ENERGY COMMISSION CEC-CF2R-ENV-03-E

H. Installed Insulation

Field	Field Description
01	Installed insulation R-values are the same or greater than listed on the CF1R.
02	No gaps or voids between the insulation and framing.
03	No gaps between the sides or ends of batt insulation.
04	Loose-fill insulation must be installed to the minimum installed weight per square foot (density) of the manufacturer's cut sheet for the proposed R-value.
05	Batt insulation is not compressed (no stuffing of the insulation into the cavity) and is installed to its full thickness.
06	Insulation is cut around obstructions such as electrical boxes.
07	Batt insulation is delaminated around all plumbing and electrical lines in ceilings, walls, and floors.
08	Band joists are insulated to the same R-value as the wall.
09	In all narrow cavities the insulation shall be cut to fit or filled with expanding foam.
10	Insulation was installed per manufacturer instructions.

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

I. Wall Insulation

Exterior Bottom (Sill) Plates Sealed to Floor

Meeting QII – Air Infiltration Sealing at the Framing Stage will make –ECC Rater Building /Enclosure Air Leakage Testing much easier!

Water Heating System –Alterations and Additions

ACM Res Manual

Table 36: Standard Design for Water Heater Systems

Proposed Design Water Heating System Type	Addition (adding water heater)	Altered	Verified Altered
Single-Family Residential Buildings	Prescriptive water heating system per Section 2.10.4 Addition-Alone Approach	Proposed fuel type, proposed tank type, mandatory requirements (with no solar)	Existing water heater type(s), efficiency, distribution system.

Alteration: (E+A+A) a replaced water heater can be a valuable credit

Standard Design for Additions:

- The domestic water heating system is a heat pump water heater.
- For additions 500 square feet or less, the standard design is an instantaneous electric water heater if the proposed design is an instantaneous electric water heater, or the standard design is an electric consumer storage water heater less than or equal to 20 gallons if the proposed design is an electric consumer storage water heater less than or equal to 20 gallons.

Additions: 2nd water heater is not 'penalized', but it is not necessarily a 'credit' either

Insulation for Piping

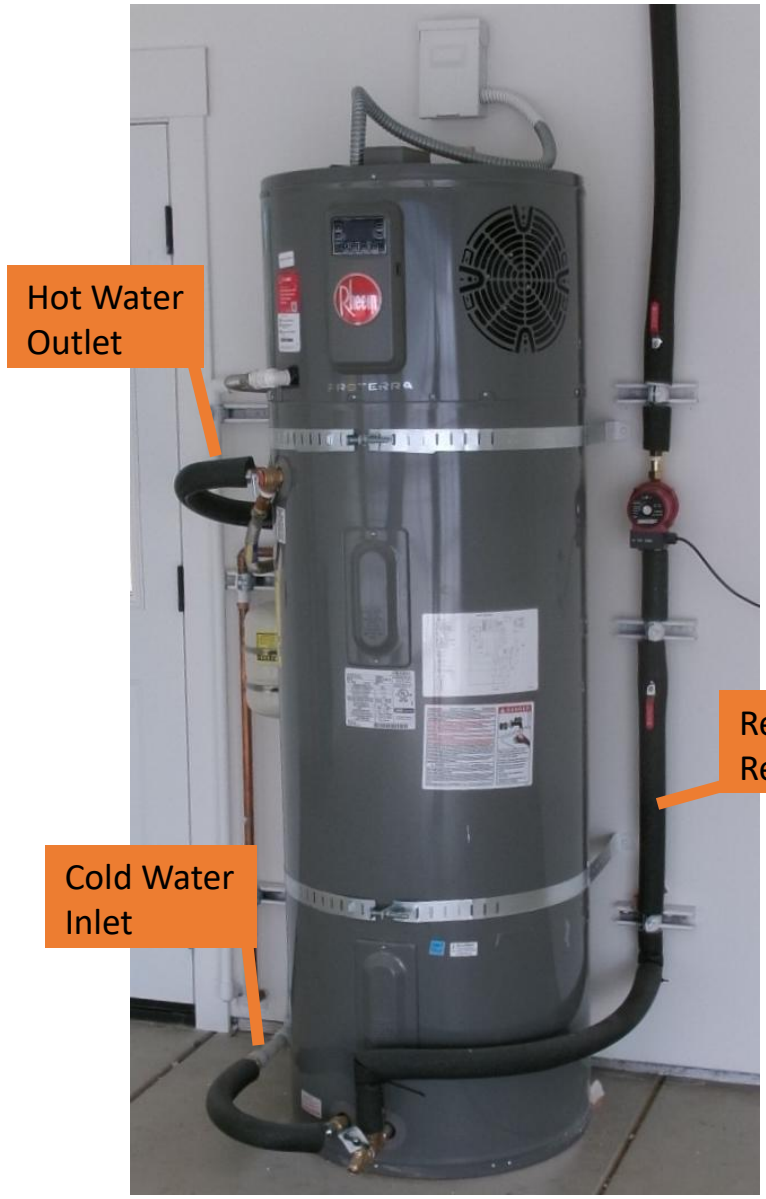
Field Verification, ECC Credit:

- Under the Performance Method - ECC Credit is available for visual inspection to ensure appropriate insulation levels were installed, and other details such as all corners and tees are properly insulated, etc.

- **All hot water piping shall be insulated** per CA Plumbing Code 609.12

- **Exception**: Piping surrounded with a minimum of 1 inch of wall insulation, 2 inches of crawl space insulation, or 4 inches of attic insulation, shall not be required to have pipe insulation.

Reminder: Exception if existing piping is inaccessible



CF3R-EXC-20-H –Existing Conditions

- ECC Rater verifies the status of a home's existing conditions through visual inspection and field testing, when warranted.
- The visual inspection and test results are uploaded to the Registry and shared with the energy consultant and designer.
- Design team can make informed decisions for best energy performance and potential credits/trade-offs.
- If ECC Existing Conditions are not used, default values per Table 150.2-G are assumed.

EXISTING CONDITIONS FOR RESIDENTIAL ALTERATIONS

CALIFORNIA ENERGY COMMISSION — CEC-CF3R-EXC-20-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF VERIFICATION

Note: This table completed by ECC Registry.

Project Name:	CF1R-PRF Calculation Date/Time:
CF1R-PRF Calculation Description:	CF1R-PRF Input File Name:

A. General Information

01	Project Name				
02	Calculation Description				
03	Project Location				
04	CA City		05	Standard Version	
06	Zip Code		07	Software Version	
08	Climate Zone		09	Front Orientation (deg/Cardinal)	
10	Total Building Volume (ft^3)		11	Number of Dwelling Units	
12	Project Scope		13	Number of Bed	
14	New Conditioned Floor Area(ft^2)		15	Number of S	
16	Existing Conditioned Floor Area (ft^2)		17	Fenestration Average U-	
18	Total Conditioned Floor Area (ft^2)		19	Glazing Percenta	

B1. Building Envelope Leakage

01	Date of Diagnostic Test for this Dwelling	
02	Test Procedure Used	
03	Manometer Make	
04	Manometer Model	
05	Manometer Serial Number	
06	Manometer Calibration Date	
07	Manometer Calibration Status	
08	Test Methodology	
09	Target Enclosure Air Leakage from CF1R (ACH50)	
09	Tested Pre-Retrofit CFM50	
10	Tested Pre-Retrofit ACH50	
11	Verification	
12	Verification Status	☐ Pass - all applicable requirements are met; or ☐ Fail - one or more applicable requirements are not met. Enter reason f
13	Correction Notes:	

Registration Number: Registration Date/Time:

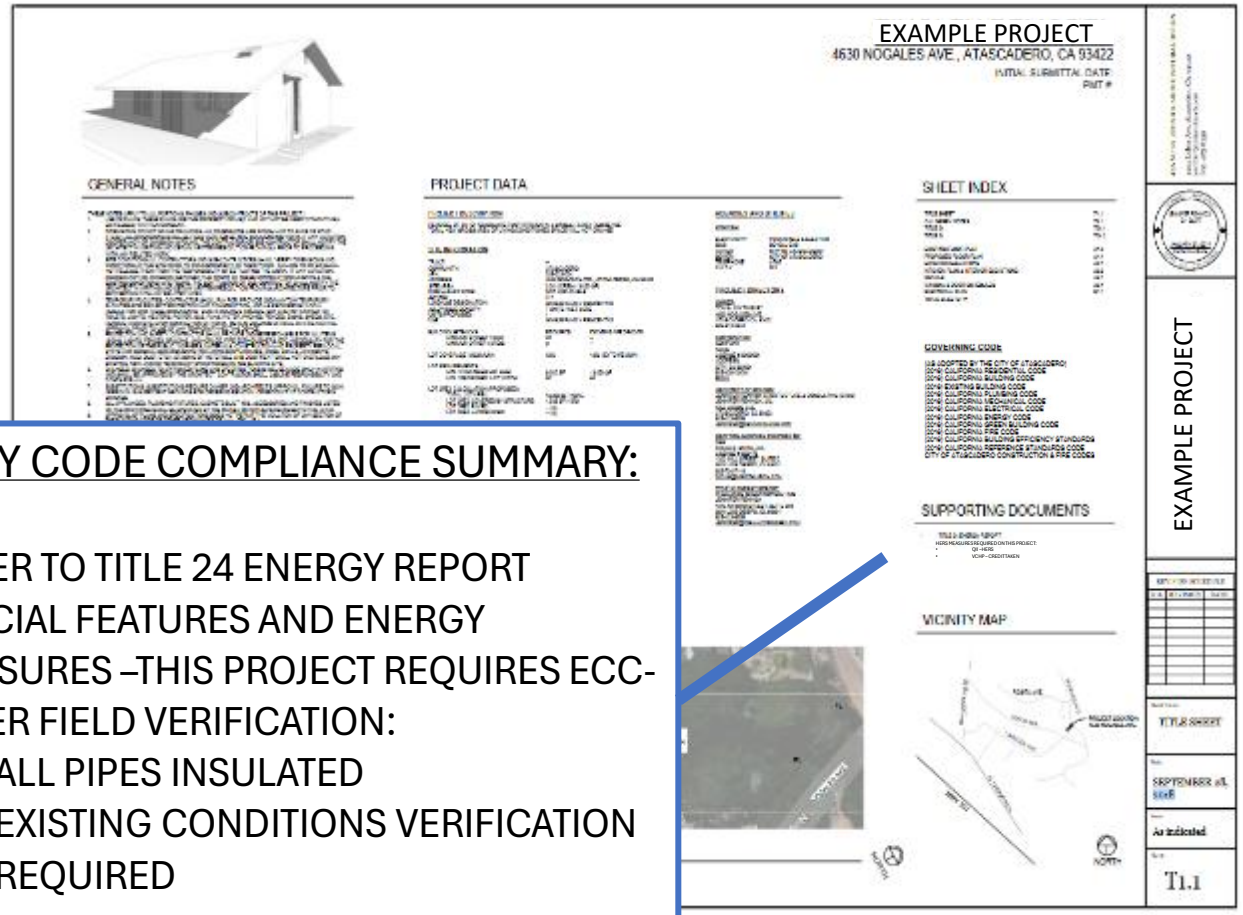
CA Building Energy Efficiency Standards - 2025 Single-Family Compliance

Hire your HERS Rater during design stage.

ECC (HERS) –Show the Special Features and Field Inspections on the Cover Sheet

When a project includes ECC (*HERS*)-special features and energy efficiency measures (See CF1R or LMCC), call that out on the Cover Sheet, i.e.:

- ‘Code Summary’
- ‘Code Analysis’
- ‘Supporting Documents’
- ‘Energy Code Compliance (ECC) Summary’

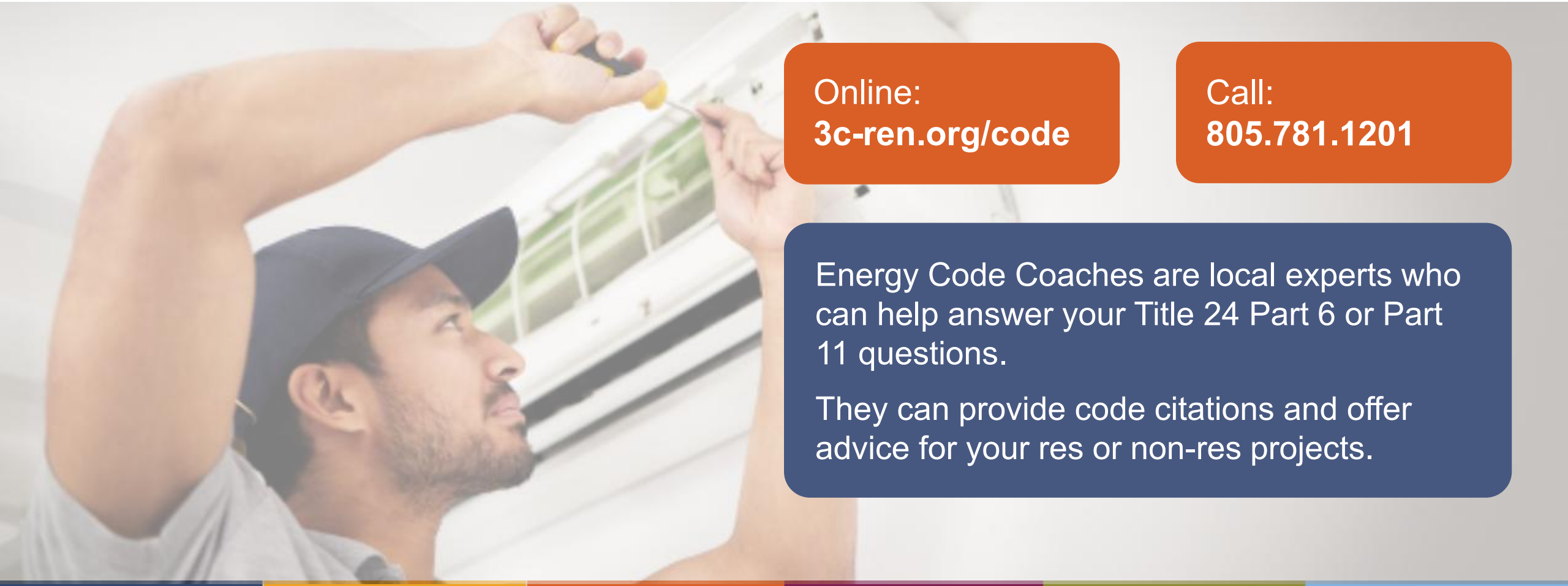


ENERGY CODE COMPLIANCE SUMMARY:

- REFER TO TITLE 24 ENERGY REPORT
- SPECIAL FEATURES AND ENERGY MEASURES –THIS PROJECT REQUIRES ECC-RATER FIELD VERIFICATION:
  - ALL PIPES INSULATED
  - EXISTING CONDITIONS VERIFICATION REQUIRED

Questions about Title 24?

3C-REN offers a *free* Code Coach Service



Online:
3c-ren.org/code

Call:
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 Part 6 or Part 11 questions.

They can provide code citations and offer advice for your res or non-res projects.

Closing

Continuing Education Units Available

- Contact dresurreccion@co.slo.ca.us for AIA and ICC LUs

Coming to Your Inbox Soon!

- Slides & Recording

2025 Energy Code in Practice Series:

- 4/8 Accessory Dwelling Units (ADUs)
- 5/13 Multifamily Residential
- 6/3 Nonresidential

Other Upcoming Courses:

- 3/12 Ask the Experts: Load Calculations

Any phone numbers who joined? Please share your name!

Thank you!

More info: **3c-ren.org**

Questions: **info@3c-ren.org**

Email updates: **3c-ren.org/newsletter**

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