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

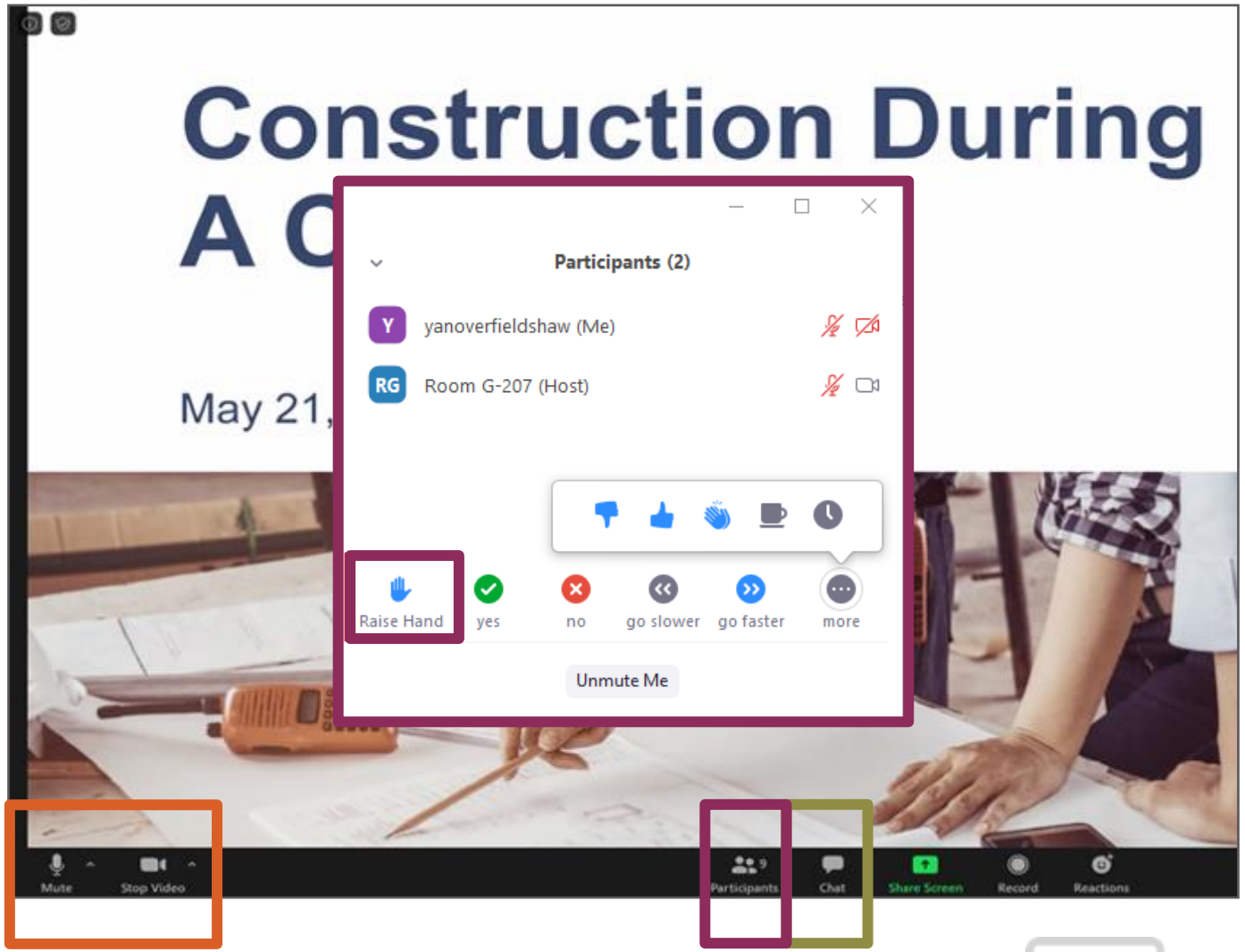
ADU: Energy Code Implementation Series, with 2025 Code Updates

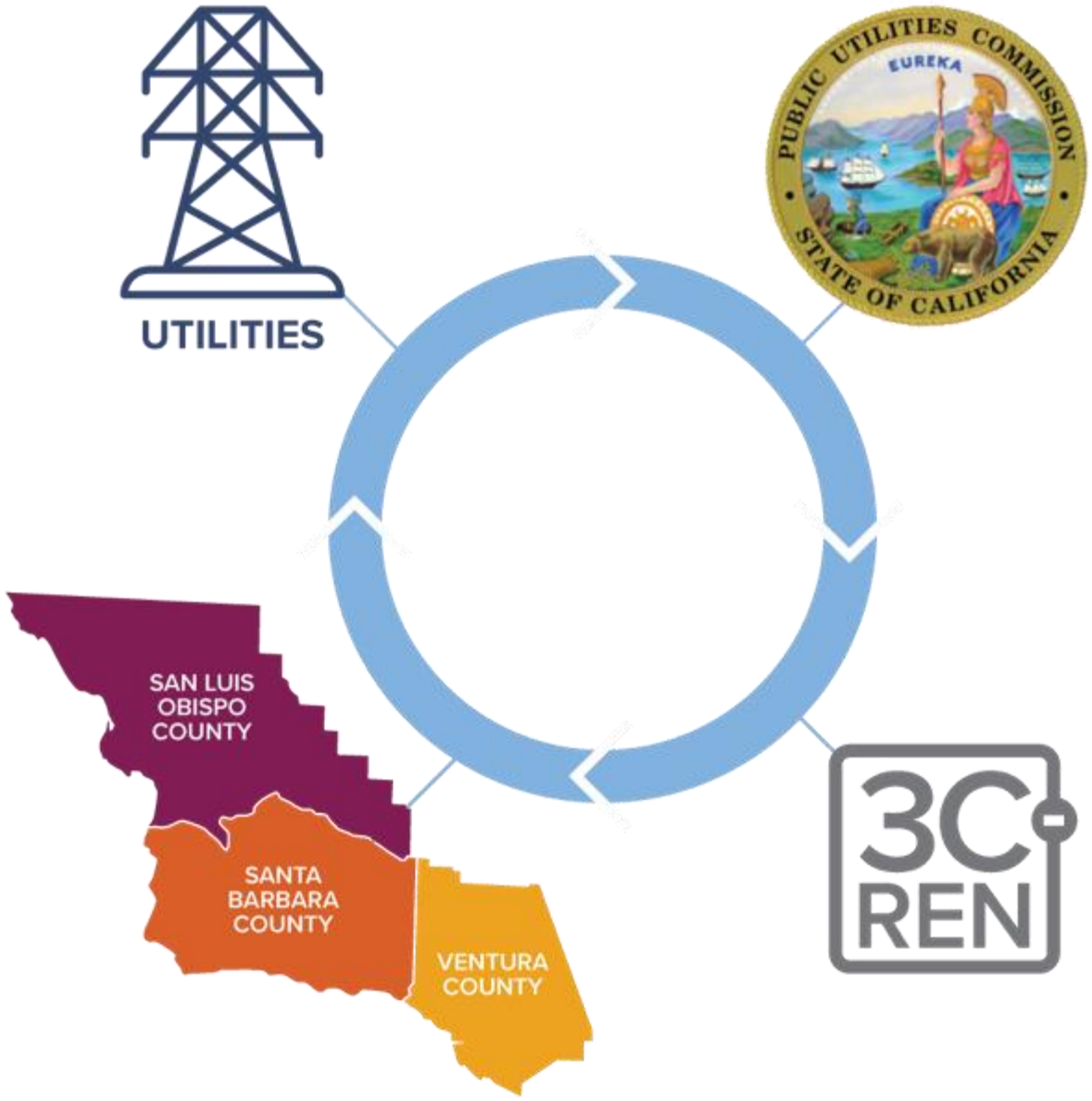
Jennifer Rennick & Grant Murphy – In Balance Green Consulting

June 25, 2025

Zoom Orientation

- Add an **introduction** in the chat.
  Be sure **full name** is displayed.
- Did you call in? Please **share** first and last name with us.
- Please **mute** upon joining
- Use the "**Chat**" to share questions or comments
- Under "**Participant**" select "**Raise Hand**" to share a question or comment verbally
- Session may be **recorded** and posted to 3C-REN's on-demand page
- Slides/recording are **shared** after most events
- 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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Energy Code Implementation Series

This series focuses on current best practices for implementation of energy strategies, as well as what's around the corner with the new code that will take effect Jan. 1, 2026. With particular focus on the Central Coast region, we'll discuss on what to include in construction documents to streamline the permitting process and tips for construction to ease signoffs and occupancy for each building type:

- Energy Code Implementation: Non-Residential
- Energy Code Implementation: Single Family New Construction
- Energy Code Implementation: Single Family Additions and Alterations
- ***Energy Code Implementation: ADUs***
- Energy Code Implementation: Multi-Family

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

Today's Learning Objectives

- Understand the current and upcoming 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.

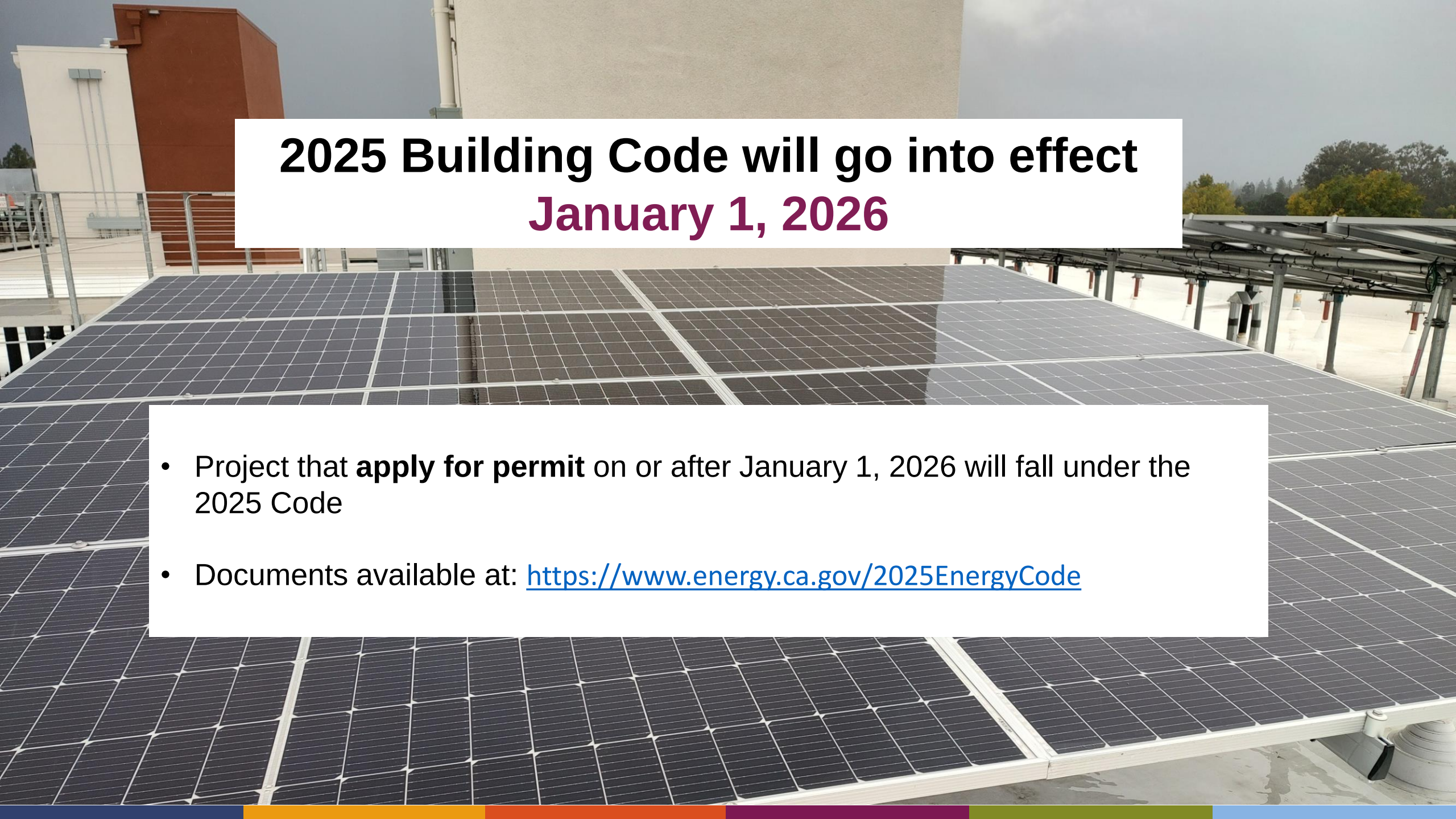
Learning Units:

1.5 AIA HSW LU approved for this course
0.15 ICC CEU approved for this course

Agenda

1. 2025 Energy Code –Broad Overview
2. ADU Resources and Definitions
3. New Construction:
   - PV / Solar
   - Battery Ready
   - Electric Ready
4. Walls and Fenestration
5. IAQ Ventilation
6. Domestic Water Heating
7. Heat Pump for Space Conditioning –VCHP Credit

2025 Energy Code Overview



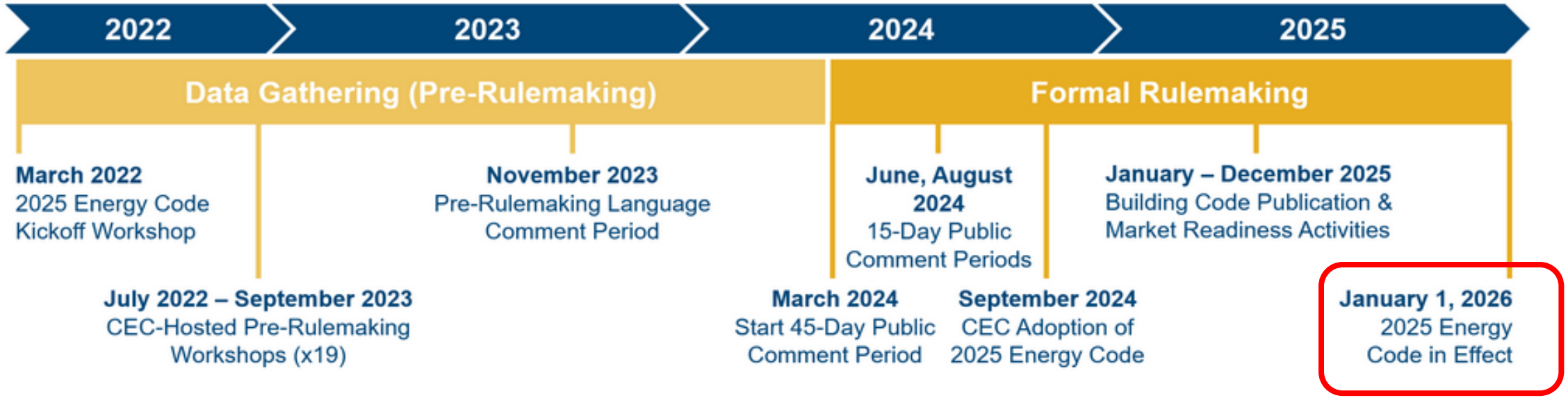
2025 Building Code will go into effect
January 1, 2026

- Project that **apply for permit** on or after January 1, 2026 will fall under the 2025 Code
- Documents available at: https://www.energy.ca.gov/2025EnergyCode

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

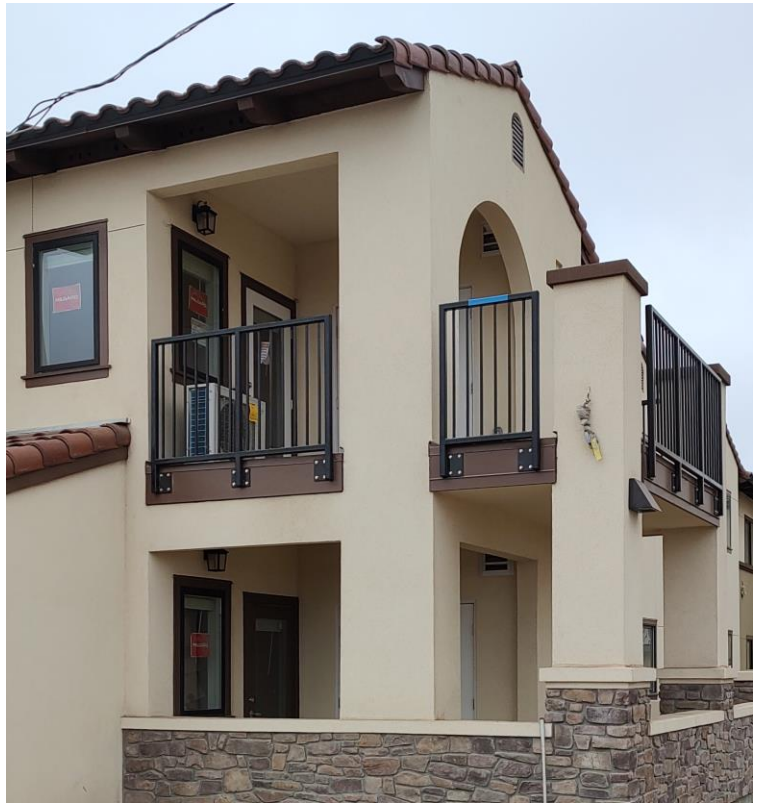
Multi-year Process –Adoption Timeline for the 2025 Energy Code



For more information visit
energy.ca.gov

Residential High-Level Changes

- EDR Metric is Replaced
- Revised IAQ Ventilation
- Prescriptive requirements expanded
  - Fenestration
  - Heat Pumps
  - ERV/HRV
- Roof/Attic Insulation Increased for some climate zones



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	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)

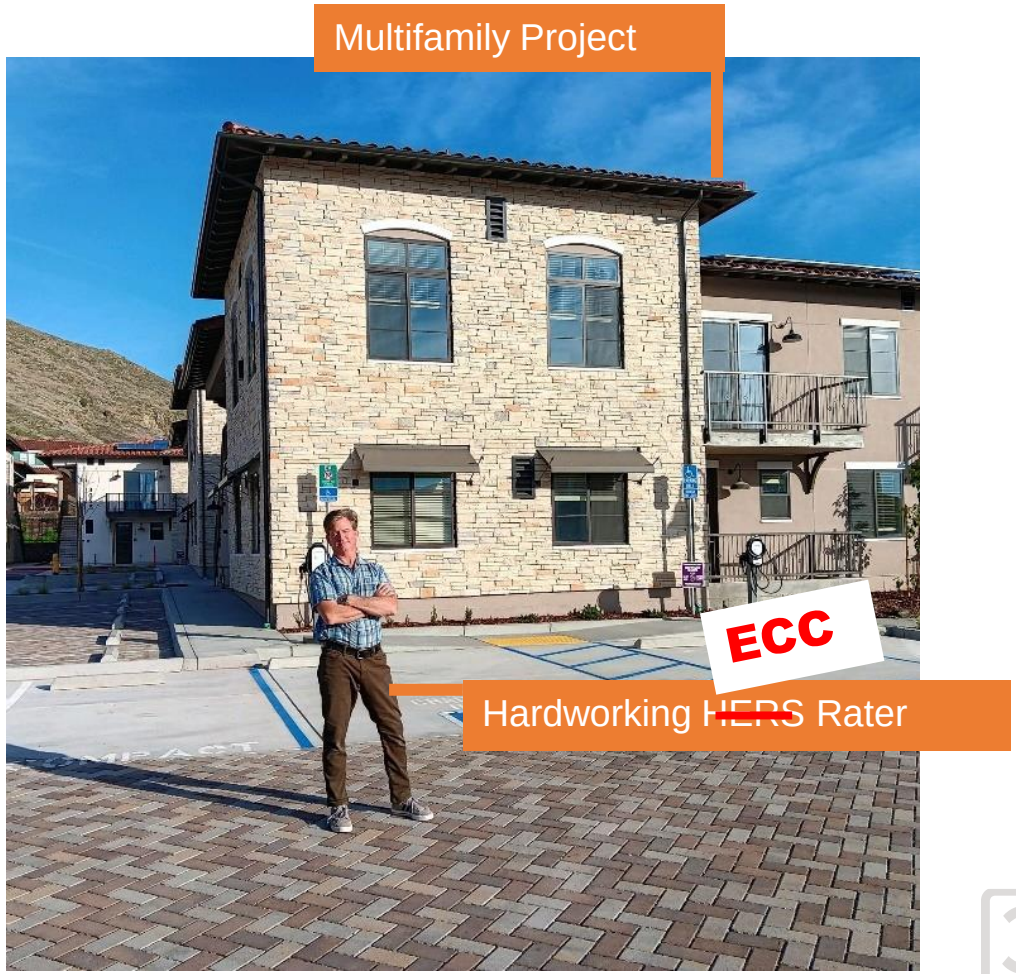
LSC*e* = Long-term System Cost -*efficiency* ($/ft2)
LSC*t* = Long-term System Cost -*total* ($/ft2)
Source = Total Annual Source Energy

Source Energy is based on the impacts of fossil fuel combustion, both at the site and as a source of creating electricity.

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



The Energy Code –Three Compliance Terms

Mandatory Requirements

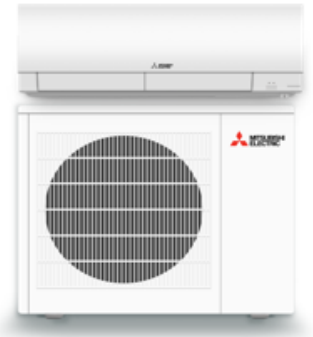
Energy efficiency measures that are applicable to all projects.

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

New Prescriptive Requirements –Applies to CZ 1-16

- **Heat Pump Space Conditioning**; Gas no longer applicable for Prescriptive compliance
- Heat Pumps **Refrigerant Charge Verification**; ECC-Rater to verify –formerly a HERS Rater
- **Fault Indicator Display** (FID) required, if ERV/HRV is installed –ECC field verified.
- **Heat Pump Water Heaters**; Gas water heaters allowed only under the Performance method.

Ducted Heat Pump



Ductless Mini-Split Heat Pump

ERV/HRV

HPWH

Accessory Dwelling Units (ADUs) Resources and Definitions

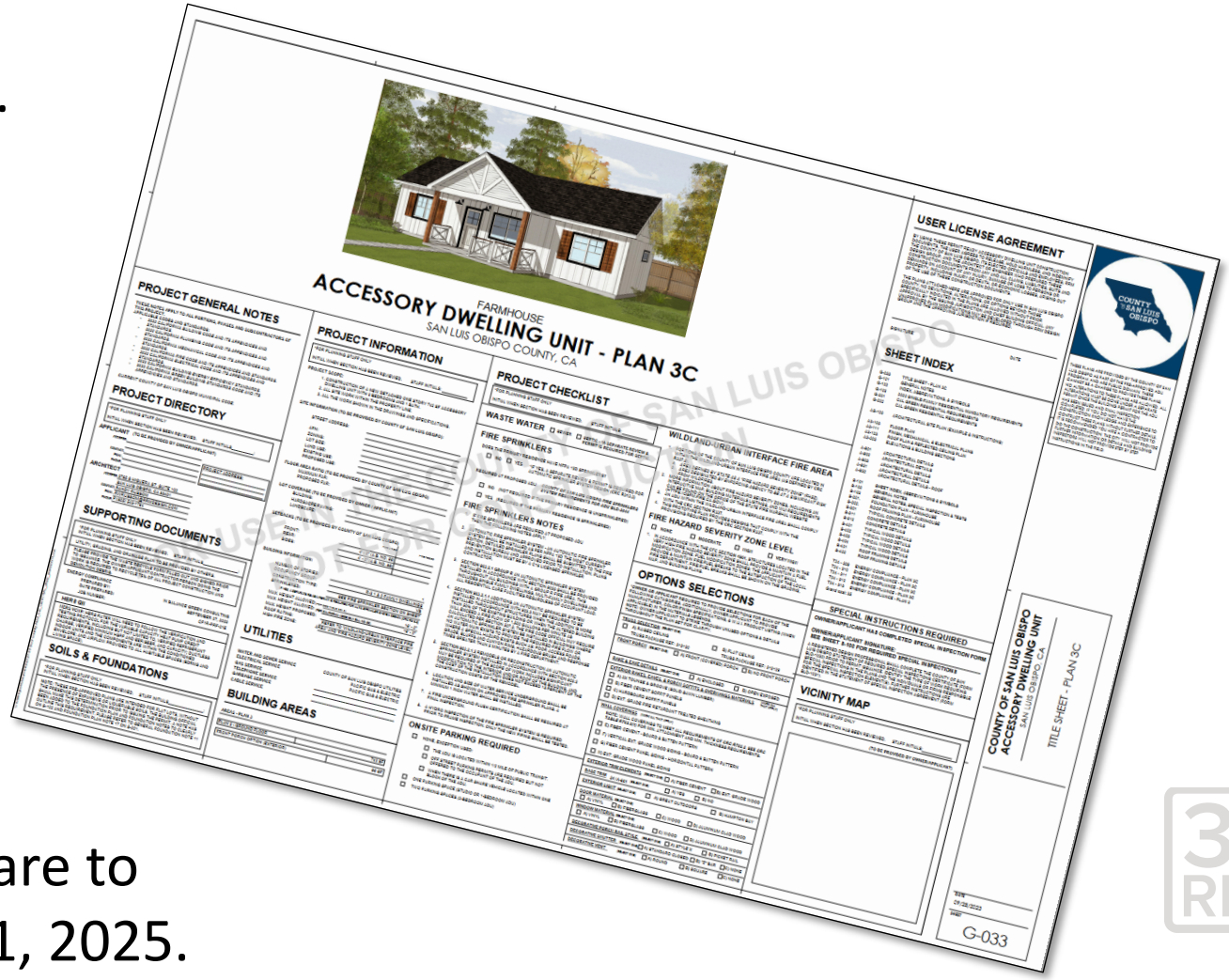
Benefits of Accessory Dwelling Units

Image Courtesy of Julie Clayton, AIA

- Affordable
  - No new land purchase
  - No major infrastructure needed
- Family & Community Connection
  - Extended Family
  - Essential Workers
- Flexible Living
  - Aging in Place
  - Home Healthcare
- Rental Income

“Pre-Reviewed” or “Pre-Approved” Plan Sets

- Title 24 Documentation, i.e. Energy Code Compliance
- HERS Registry
- Note Special Features and HERS Measures Requirements
- HERS Rater



Building/Planning jurisdictions are to have plan sets available by Jan 1, 2025.

ADU– Resources

https://www.hcd.ca.gov

California Department of **Housing and Community Development**

Grants & Funding | Manufactured & Mobilehomes | Building Standards | Planning & Community Development | Policy & Research | About HCD

Home › Policy & Research › Accessory Dwelling Units

Accessory Dwelling Units

Accessory Dwelling Units (ADUs) and Junior Accessory Dwelling Units (JADUs) are an innovative and effective option for adding much needed housing in California.

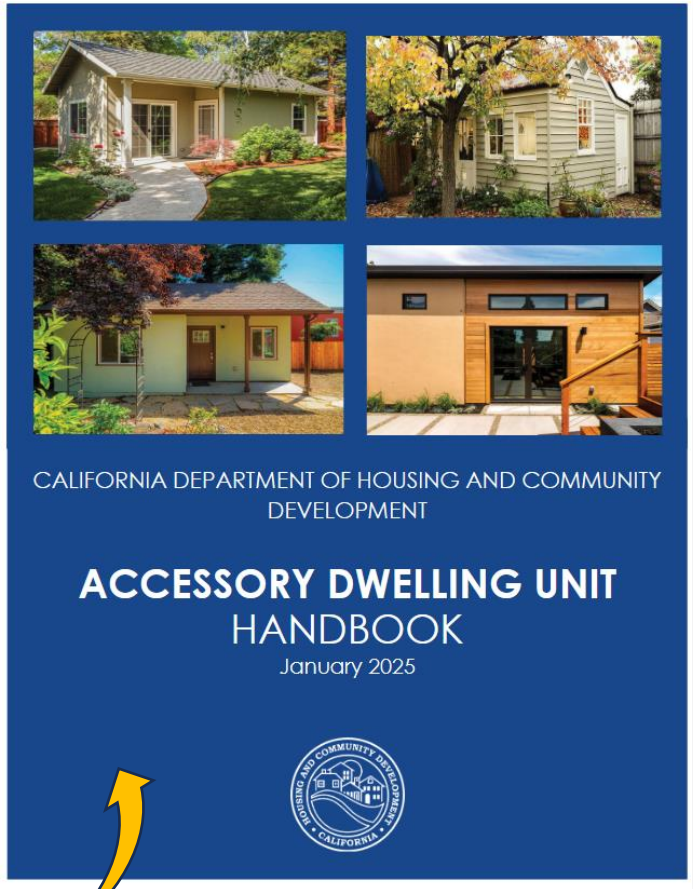
ADUs have been known by many names: granny flats, in-law units, backyard cottages, secondary units and more. HCD is the state's leader on local ADU ordinances, which — while optional — have grown exponentially in number as more cities, counties, and homeowners become interested in ADUs as one solution to increasing the supply of affordable housing.

Contact the ADU Team:

Submit a Question

Resources

Accessory Dwelling Unit Handbook (PDF)



ADU– Accessory Dwelling Unit

ADU is an accessory dwelling unit with **complete independent living facilities** for one or more persons with permanent provisions for living, sleeping, eating, cooking and sanitation.

- Can have a “full” or “efficiency” kitchen, i.e. cooking facility with appliances and reasonably sized food prep counter and storage (*definition: www.3c-ren.org/efficiency-kitchen*)
- Has independent bathroom facilities
- Must have a heating and cooling system that does not sharing air with another dwelling.
- Has its own thermostat, i.e. independent controls

Image Courtesy of Julie Clayton, AIA

JADU – Junior Accessory Dwelling Units

Conversion of existing space that is no more than 500 sq. ft. and is **contained entirely within an existing or proposed single-family residence**.

- May include separate or shared sanitation facilities
- May share central HVAC systems
- Has an “efficiency” kitchen, i.e. cooking facility with appliances and reasonably sized food prep counter and storage
- Has a door to the exterior
- May have an interior access door

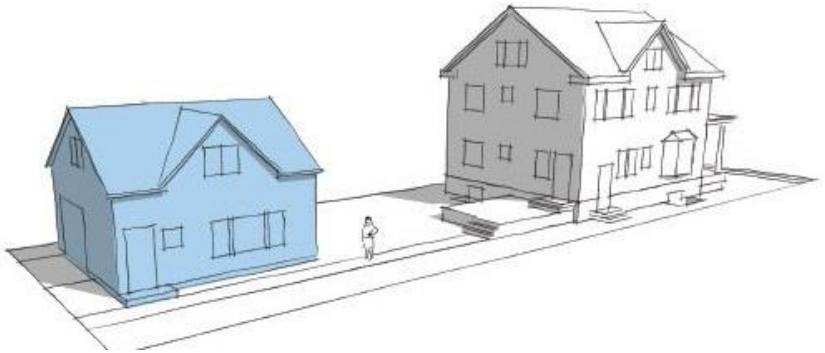
Photo: ADU Resource Center

Common Allowable ADU and JADU “Types”

In the language of the Energy Code

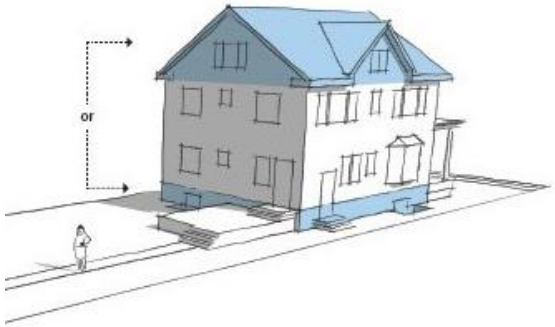
Energy Code: New Construction

Detached [New Construction]



Energy Code: Alterations and Additions

Attached (Internal)



Internal / [Detached] Conversion

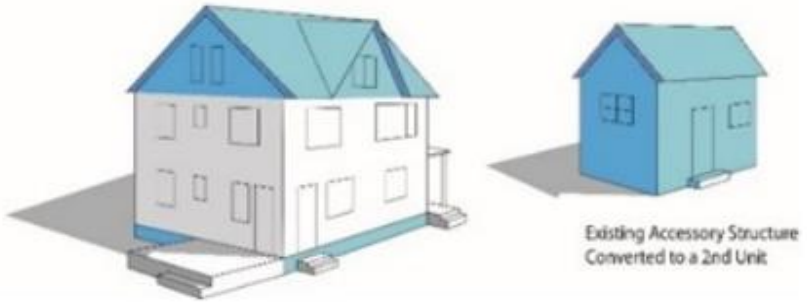
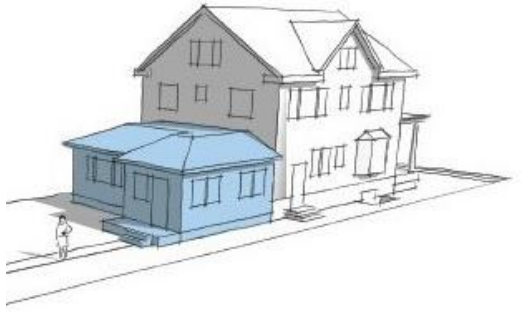


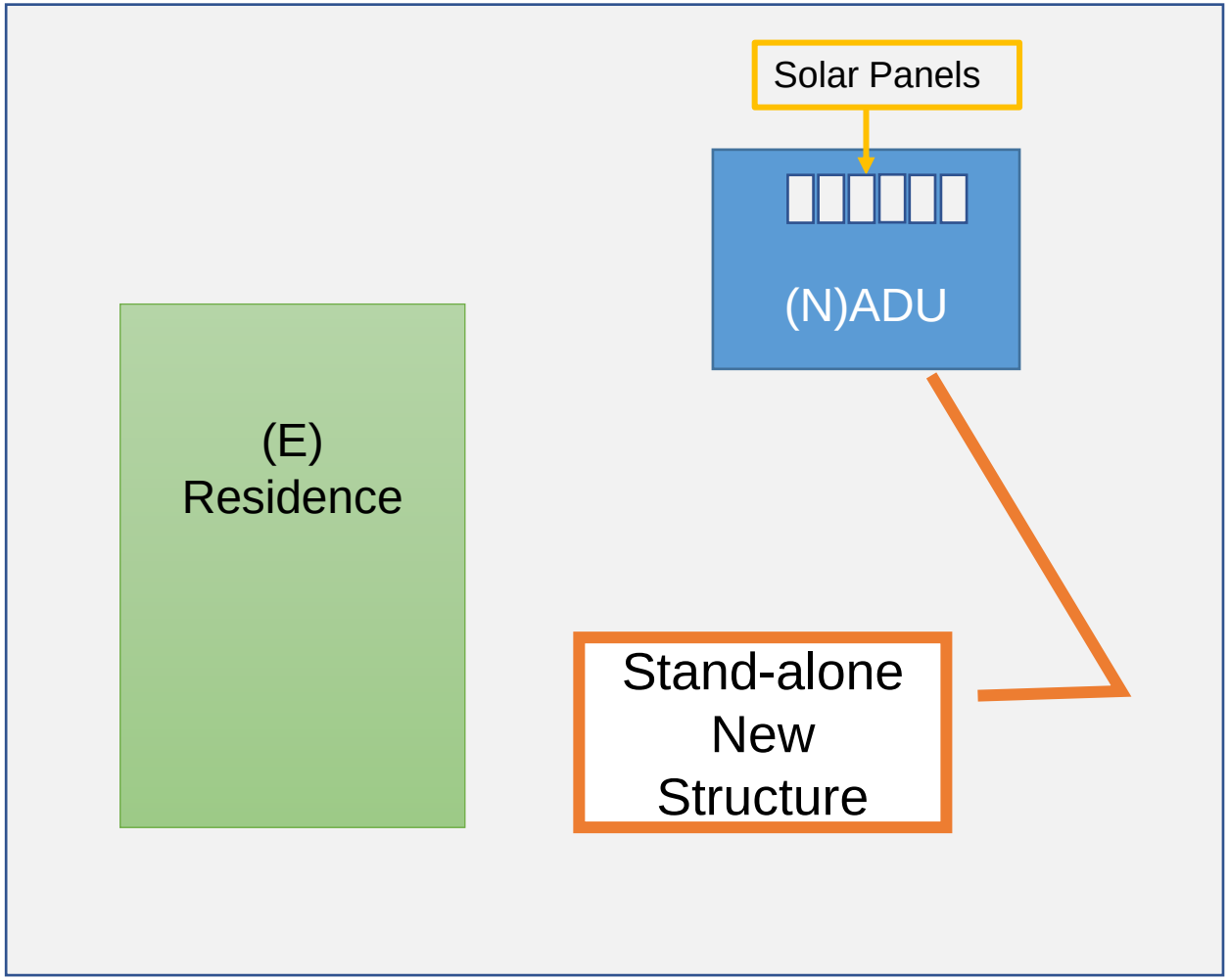
Image: City of Stockton, CA -- ADU Guide

Attached (Addition)



Images: City of Saint Paul, MN

New Construction: Stand Alone Structure under the Energy Code



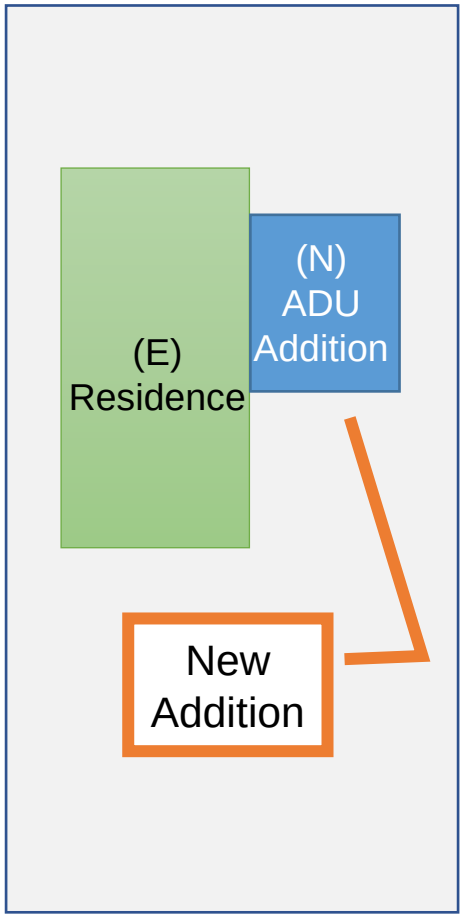
New Construction –Detached

Section 150.1 –New Construction – Low Rise Residential

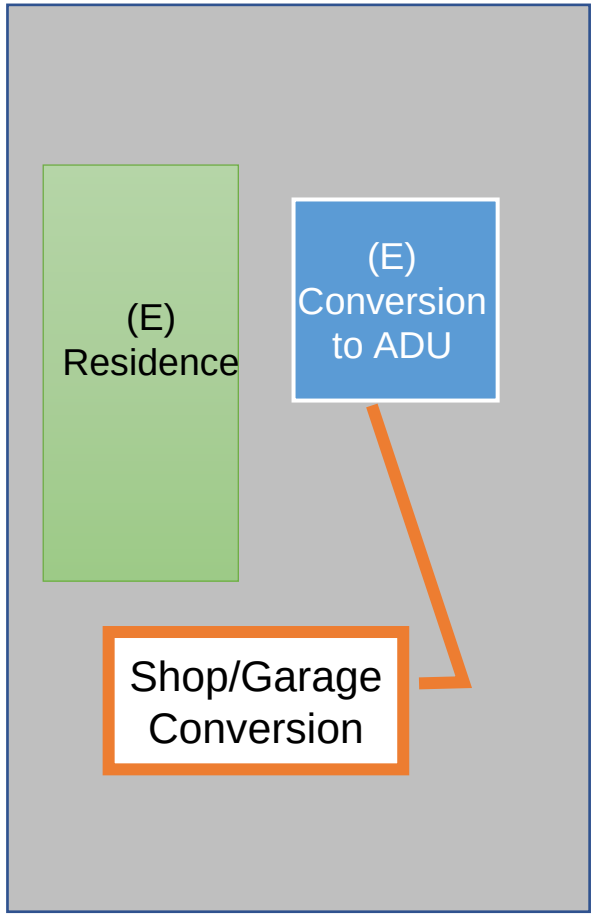
All subsections apply, including:

- Envelope (Walls, Roof, Floor, and Fenestration)
- Ventilation (IAQ –Indoor Air Quality),
- Mechanical Heating and Cooling
- DHW,
- Electric Ready
- Battery Storage Ready
- PV's (Solar Panels)

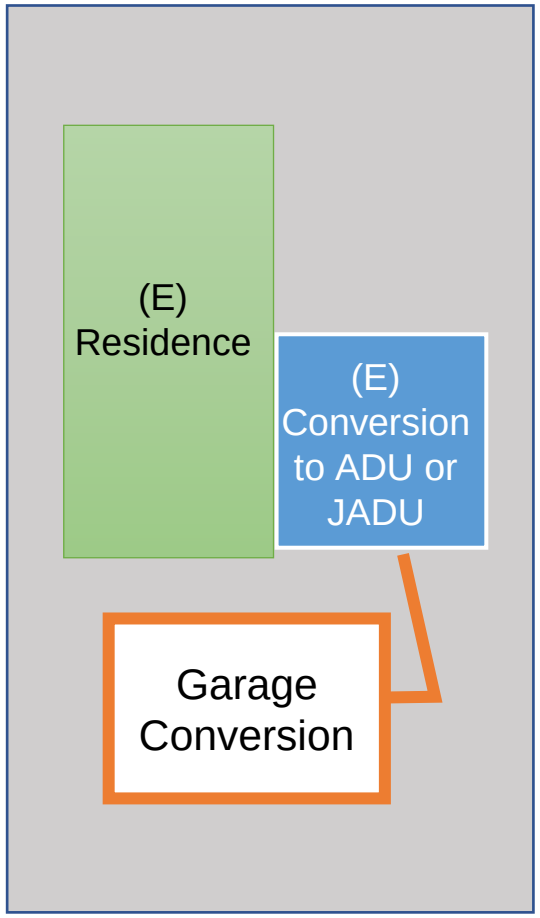
Additions: Three Scenarios under the Energy Code



Addition –Attached



Addition –Detached Conversion

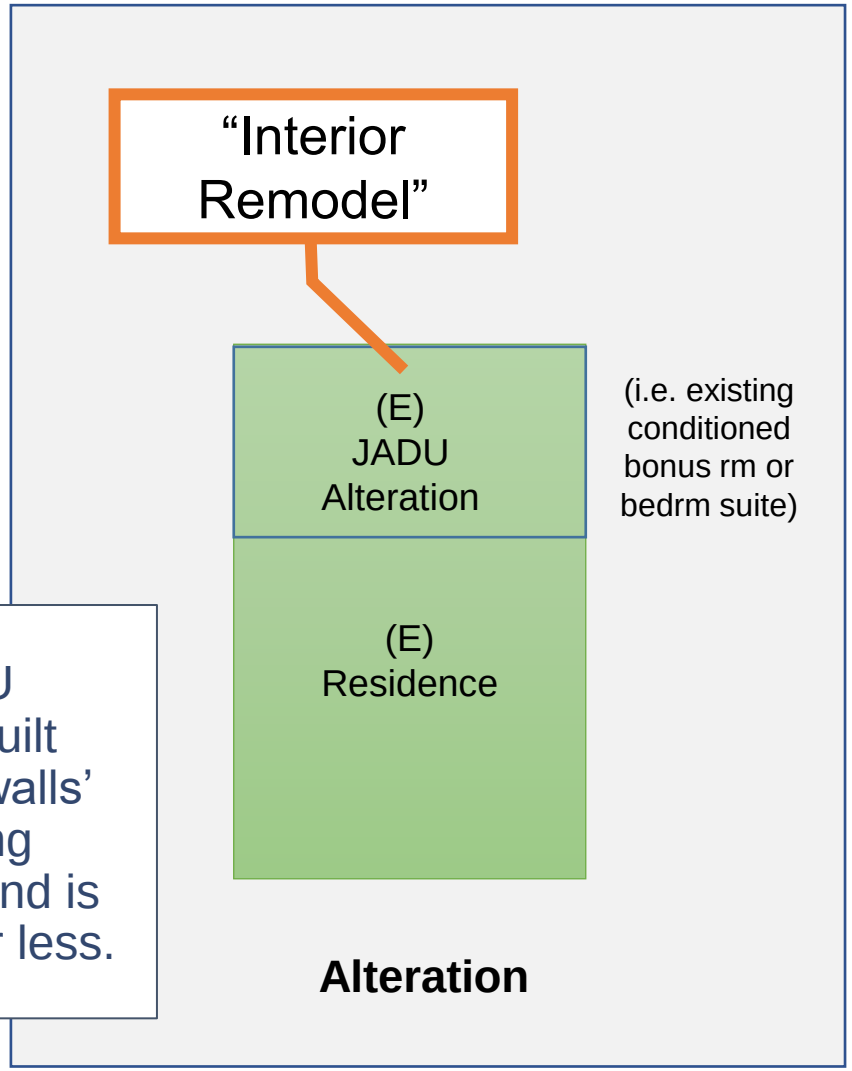


Addition –Attached Conversion

Section 150.2(a) –Additions

- Envelope (Walls, Roof, Floor, and Fenestration)
  - Wall Exceptions
  - Roofing Exceptions
- Ventilation (IAQ –Indoor Air Quality)
  - Bathroom, Kitchens, Floor Area
- Mechanical Heating and Cooling
  - ADU or JADU
- DHW
  - Adding second water heater
  - HPWH Ready

Alteration: Does *not* Increase Conditioned Floor Area under the Energy Code



*Junior ADU (JADU) is built within the ‘walls’ of an existing residence and is 500 sf. ft. or less.

Section 150.2(b) –Alterations

- Envelope (Walls, Roof, Floor, and Fenestration)
  - Wall Exceptions
  - Ceilings Alterations
- Ventilation (IAQ –Indoor Air Quality)
  - Bathroom, Kitchens, Floor Area
- Mechanical Heating and Cooling
  - Alterations and Duct Extensions
- DHW
  - Water Heater Replacement

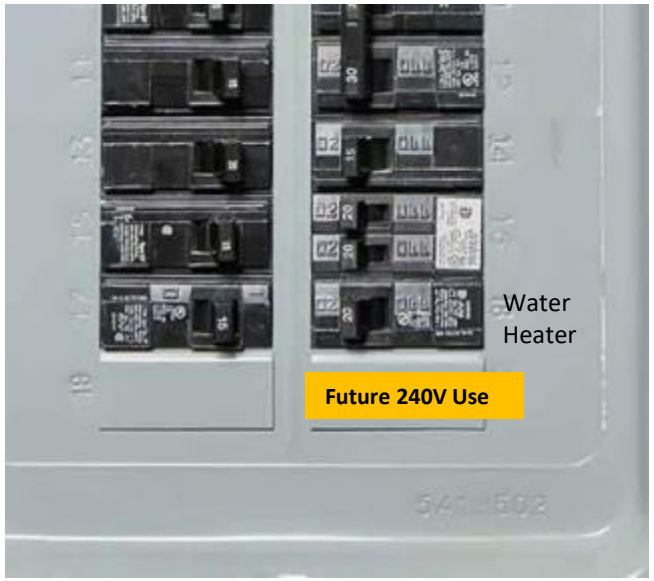
NEW CONSTRUCTION –

Electric Ready
PV (Solar Energy)
Battery Ready

"Electric Ready" Infrastructure Required *only where* propane or natural gas appliances are installed in new construction

- **Water heaters**: gas or propane water heaters must be installed in or adjacent to a space large enough for a heat pump water heater HPWH. (2.5' x 2.5' x 7') Must install 240v/20amp or 240v/30amp circuit depending on location - **150.0(n)**
- **Furnaces**: provide conductors rated at 240 volt/ 30 amp to the furnace for future heat pump installation- **150.0(t)**
- **Cooktops**: provide conductors rated at 240 volt/ 50 amp for future cooktop- **150.0(u)**
- **Dryers**: provide conductors rated at 240 volt/ 30 amp feed to dryer - **150.0(v)**

Electric ready items require breaker space and labeling in panel
AND
Electrical feed within 3 ft of non-electric appliance location



Solar Photovoltaic (PV) –New Construction

Prescriptive PV Sizing:

Equation 150.1-C Annual Photovoltaic Electrical Output

System Size kWPV = (CFA x A)/1000 + (N_{dwell} x B)

Where:

kW_{PV} = kW DC size of PV system

CFA = Conditioned Floor Area

A = CFA adjustment factor

N_{dwell} = Number of dwelling units (1 single, 2 duplex)

B = Dwelling adjustment factor

CZ	A	B
4	0.586	1.21
5	0.585	1.06
6	**0.594**	**1.23**
9	0.613	1.36

Example: 1000 sf ADU in CZ 6

kWpv = (1000 sf x 0.594)/1000 + 1(1.23) = 1.82 kW system

1.82 kW / 300 W panel = 6 panels

[each panel approx. 40”x67”]

2025 Code Update

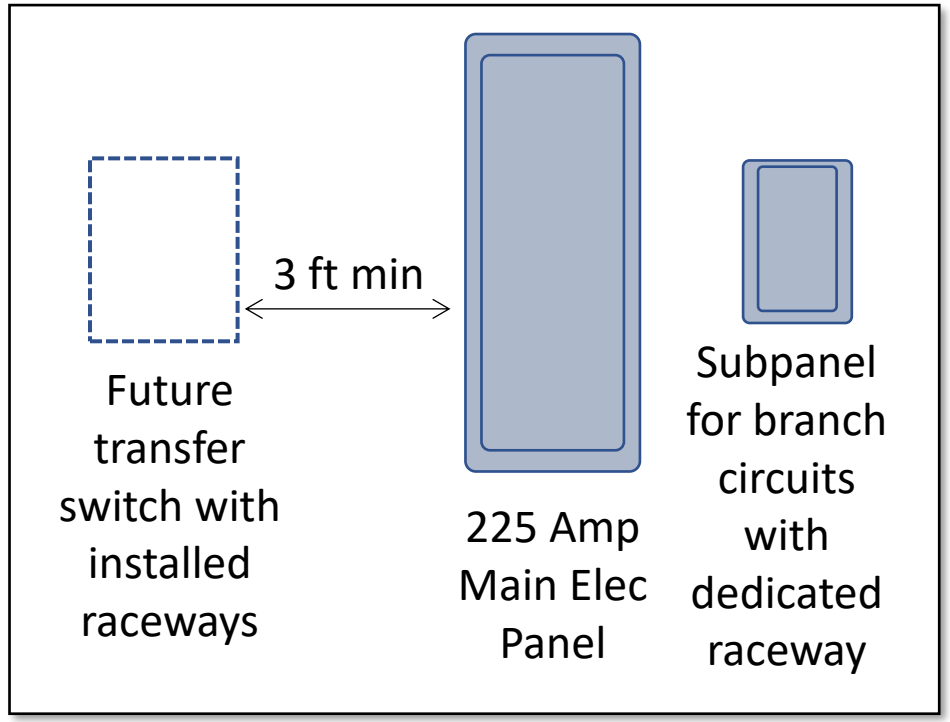
Exemptions:

- **PV not required, when kW_{PV} is less than 1.8 kW**
- **PV not required, when SARA is less than 80 sf**
- **PV size may be reduced by 25% if a cycling battery capacity of 7.5 kWh is installed**

PV system size:
The lesser of Equation 150.1-C or 14W x SARA for low-sloped roofs or 18W x SARA for steep sloped roofs

“Battery Ready” – Infrastructure Required

- At least **one** of the following required:
  - **Interconnection equipment** with minimum backed up capacity of 60 amps
  - **Dedicated raceway** (min 1”) from the main service to subpanel that supplies the branch circuits
- A **minimum of 4 branch circuits** shall be identified feeding:
  - **Refrigerator**
  - **One lighting** circuit near the primary egress
  - A **sleeping room receptacle** outlet
- Main panel must have busbar rating of **225 amps minimum**
- Sufficient space shall be reserved to **allow future installation** of a system **isolation equipment or transfer switch** within 3 feet of the main panelboard
- **Raceways** shall be installed between the panelboard and the system isolation equipment or transfer switch location to **allow the connection of backup power source**

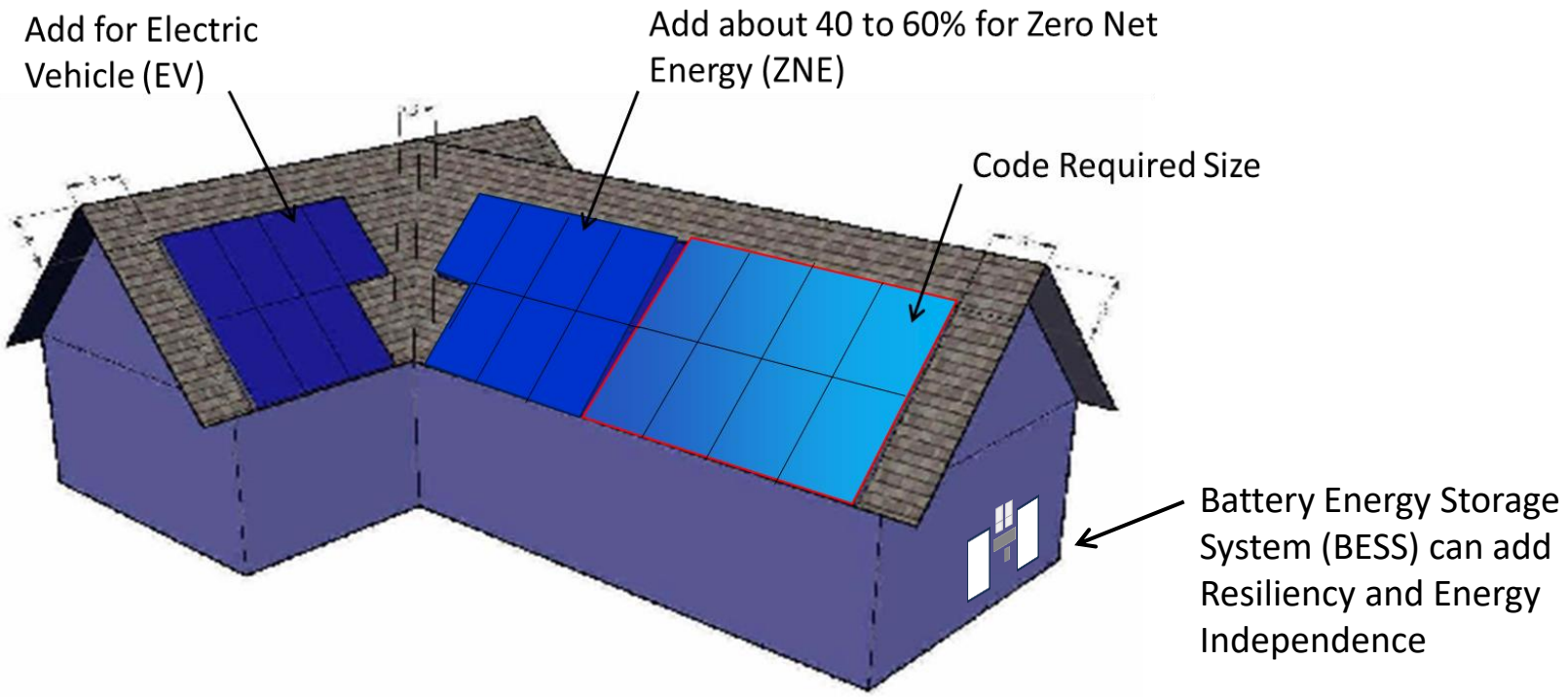


Energy Storage System (ESS) - “Battery Ready”

- Applicable only to new construction
- Infrastructure is Mandatory
- Battery is an optional credit
- Performance pathway:
  - Min Battery Size of 5 kWh
  - Needs to interface with the ‘Grid’
  - Performance credit is relatively small
  - Battery with PV system can be cost effective

Key Concept:
Intent is to increase a household’s electric generation and storage system to be able to offset evening **electrical grid** usage and address **resiliency**

2025 Energy Code –BESS and Self-Utilization Credit



For Example: New Construction 2000 SF home in Atascadero (climate zone 4) a 2.38 kW system would be required.
Santa Barbara and Ventura coastal areas would be slightly less.

Definition Updated:

SELF-UTILIZATION CREDIT is the limited Efficiency LSC energy budget compliance credit available for combined PV and battery energy storage systems for single-family, as specified by the Residential ACM Reference Manual, and low-rise multifamily, as specified by the Nonresidential and Multifamily ACM Reference Manual.

New Construction – 225 amp Busbar Rating

Could a 200 amp panel meet the mandatory energy storage system (ESS) ready requirements in the 2022 Energy Code § 150.0(s)1B?

Yes. A 200 amp panel could meet the requirement if the busbar rating is 225 amps and it is clearly marked on the panel. However, if there is no specific busbar rating on the panel, the 200 amp panel will not meet the requirement, since the busbar rating will be the same as the panel rating. Panels must also meet applicable requirements in the California Electrical Code.

Does an ADU need to have its own 225 amp panel if the ADU is built with a subpanel connected to the existing main residence?

No. The subpanel to the ADU from the main panel could meet § 150.0(s)1B, as long as the main panel has the 225 amp busbar rating.

Does installing a battery storage system in a newly constructed single-family home meet the mandatory ESS ready requirements in § 150.0(s)?

Yes. If the newly built home's energy storage system meets all the necessary wiring and other electrical components required to support a fully operating energy storage system, this will satisfy the mandatory requirements in § 150.0(s).

https://www.energy.ca.gov/newsroom/blueprint-newsletter

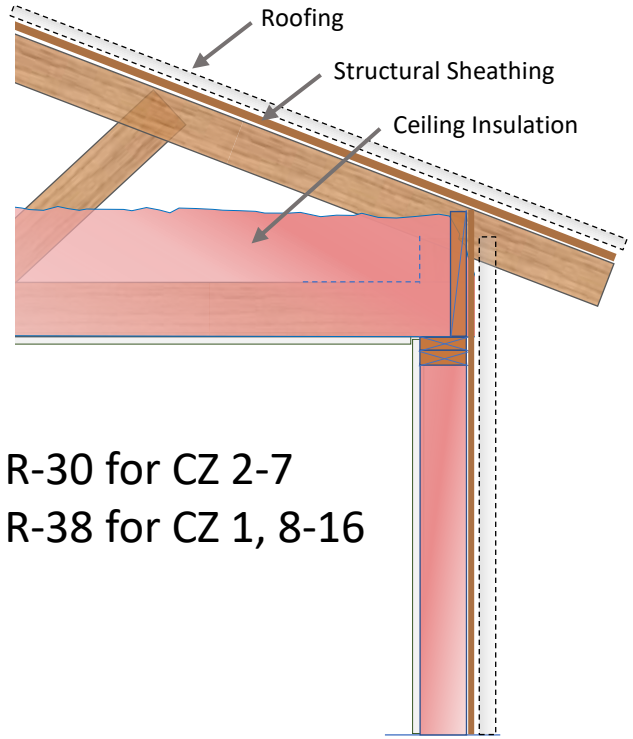
NEW CONSTRUCTION –
Roofs, Walls and Fenestration

ADDITIONS –Wall Extensions

ALTERATIONS –
Walls and Fenestration

Vented Attics and Cathedral Roof Assemblies with *Ducts in Conditioned Space*

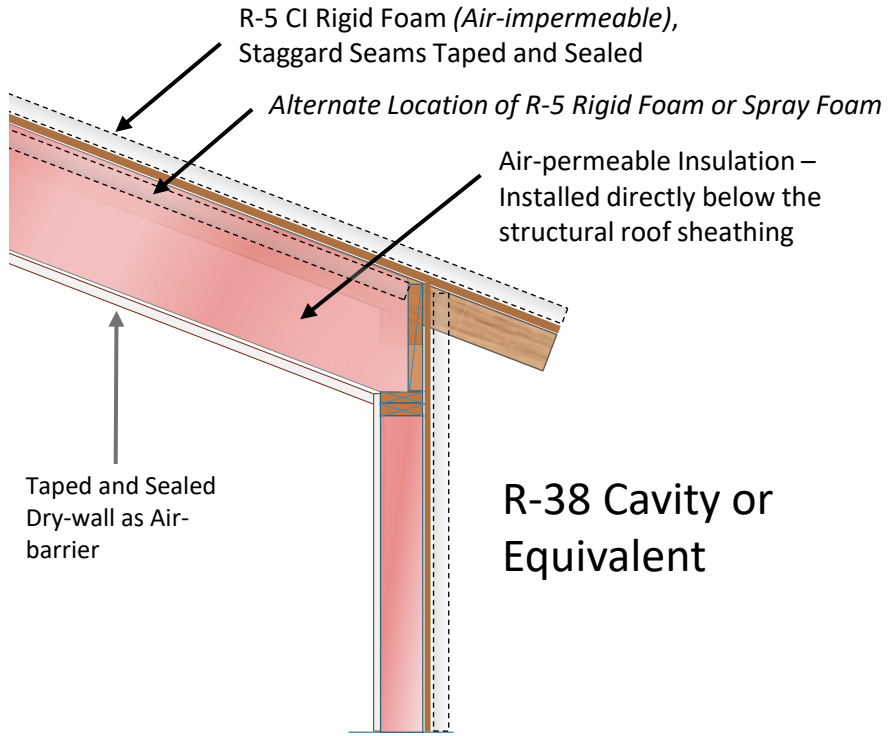
Climate Zones (CZ) 8, 9, and 10 got an upgrade to R-38



R-30 for CZ 2-7
R-38 for CZ 1, 8-16

Vented Attic with Ceiling Insulation (Option C)

New Prescriptive Option:
All Climate Zones are R-38



R-38 Cavity or Equivalent

Unvented Cathedral / Rafter Roof (Option B)

Walls

TABLE 150.1-A COMPONENT PACKAGE – Single-Family Standard Building Design

Single-Family			Climate Zone														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation																		
Walls	Above Grade	Framed3	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.065	U 0.065	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048
		Mass Wall Interior4,5	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
		Mass Wall Exterior4,5	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.077 R 13
	Below Grade	Below Grade Interior6	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.067 R 15
		Below Grade Exterior6	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19

3. Assembly U-factors for exterior framed walls can be met with cavity insulation alone or with continuous insulation alone, or with both cavity and continuous insulation that results in an assembly U-factor equal to or less than the U-factor shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to be less than or equal to the required maximum U-factor.
4. Mass wall has a heat capacity greater than or equal to 7.0 Btu/h-ft^2. "
5. "Interior" denotes insulation installed on the inside surface of the wall. "Exterior" denotes insulation installed on the exterior surface of the wall.
6. Below grade "interior" denotes insulation installed on the inside surface of the wall, and below grade "exterior" denotes insulation installed on the outside surface of the wall.

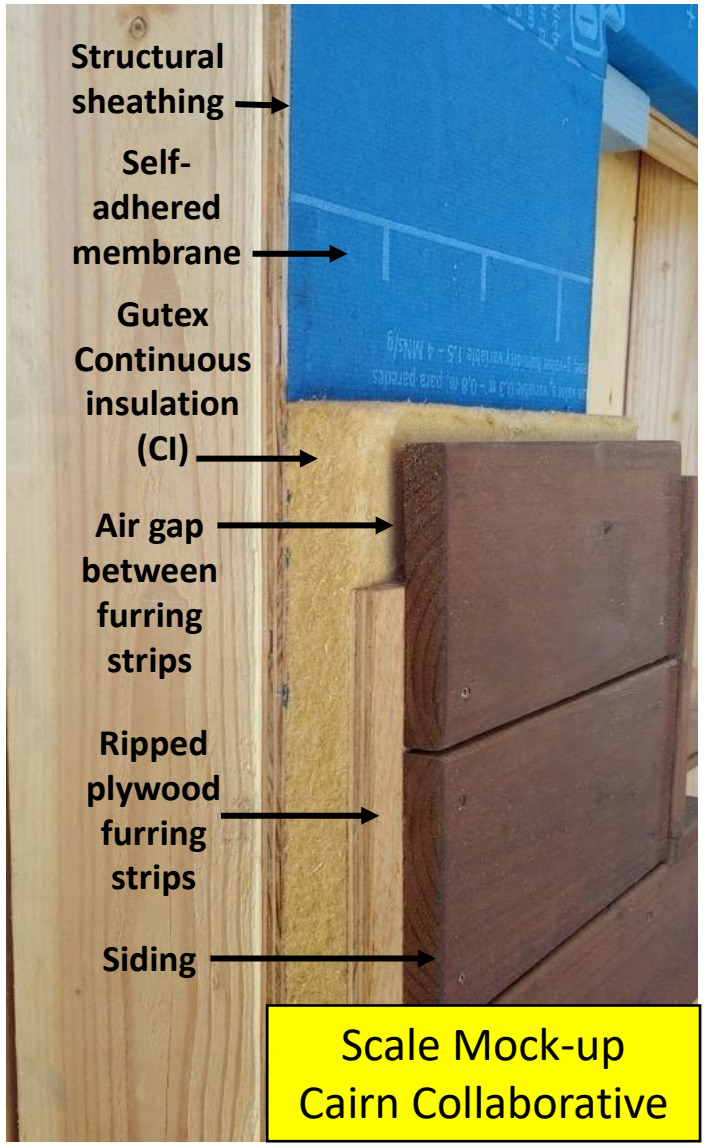
Walls Assemblies Meeting Prescriptive U-0.065 and U-0.048

Table 3-10: Examples of Wood-Framed Wall Assemblies and U-Factors, Assuming Gypsum Board Interior

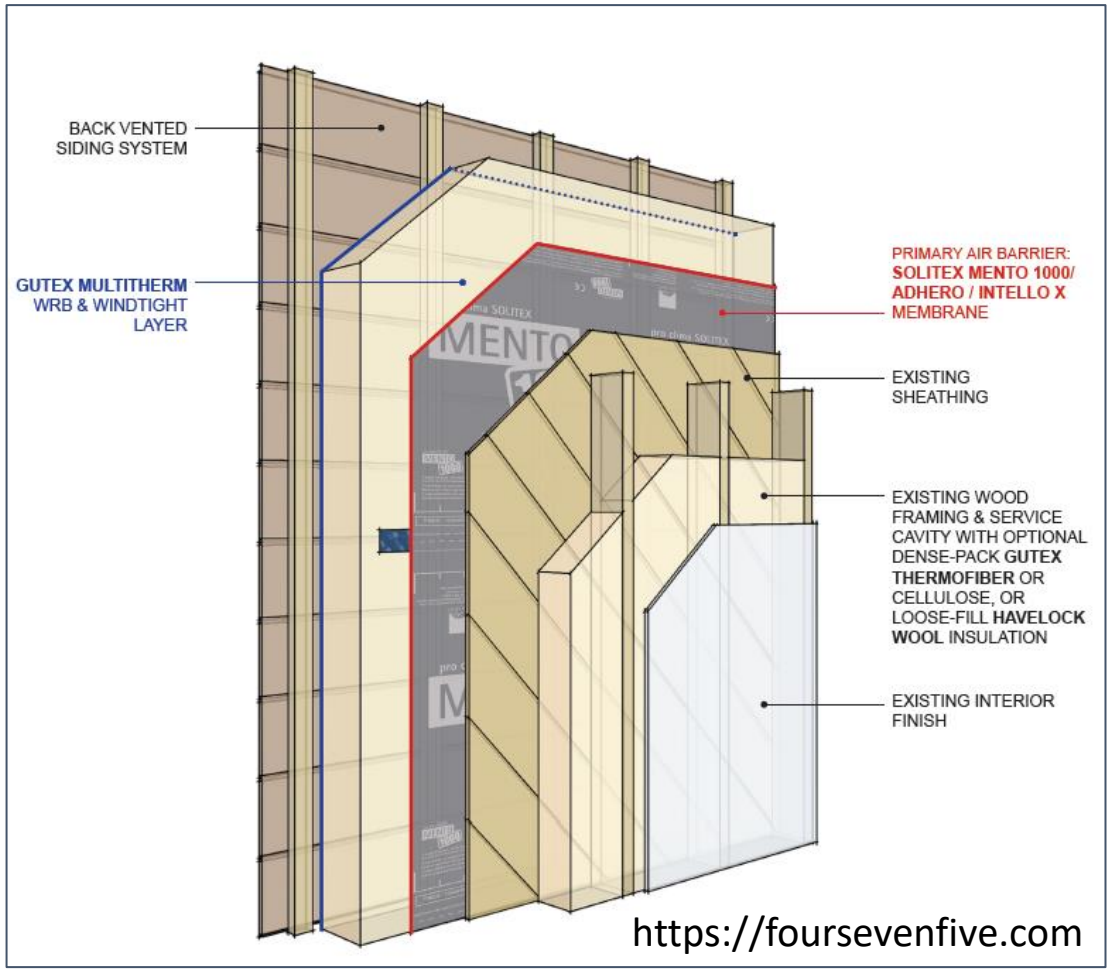
Stud (16" oc)	Cavity Insulation	Cavity Insulation Type	Exterior Insulation	U-Factor	
2x4	R15	High density batt	R4	0.065	CZ 6,7
2x4	R13	Open-cell spray foam (ocSPF)	R5	0.064	
2x4	R15	High density batt	R8	0.050	
2x6	R21	Loose-fill cellulose or high density batt	R4	0.051	
2x6	R19	Low density batt	R5	0.051	
2x6	R31	Closed-cell spray foam (ccSPF)	R2	0.049	
2x6	R23	High density batt or mineral wool	R4	0.049	
2x6	R21	Loose-fill cellulose or high density batt	R5	0.048	CZ 1-5 CZ 8-16
2x6	R19	Low density batt	R6	0.048	
2x6	R23	High density bat or mineral wool	R5	0.047	

Note: Under the Performance Method projects will have to find trade-off credit to remove the CI.

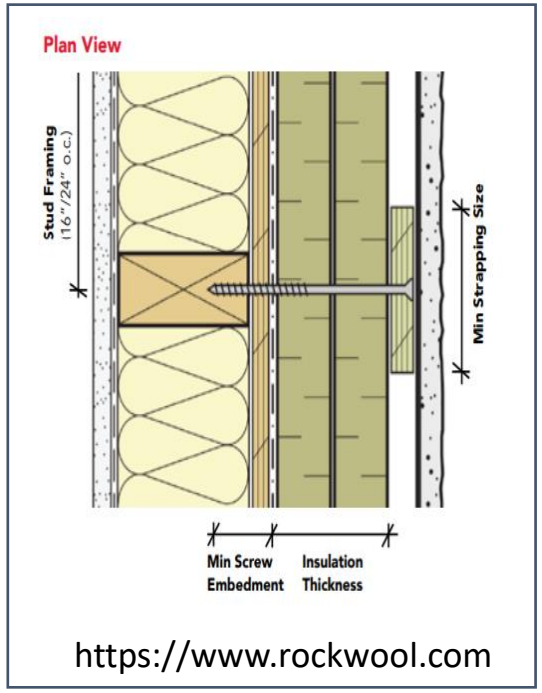
Wall Assemblies with Continuous Insulation (CI)



Scale Mock-up
Cairn Collaborative



https://foursevenfive.com



https://www.rockwool.com

Example of layered wall assembly looking from interior to exterior

Fenestration and Doors

2022 Code

TABLE 150.1-A COMPONENT PACKAGE – Single- Family Standard Building Design (continued)

		Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Fenestration	Maximum U-factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	Maximum SHGC	NR	0.23	NR	0.23	NR	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	NR
	Maximum Total Area	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Maximum West Facing Area	NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	NR
Door	Maximum U-factor	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

NR = Not Required
Fenestration Ratio (%) = Window Area to Conditioned Floor Area (CFA)

Fenestration and Doors

RED – 2025 Code update

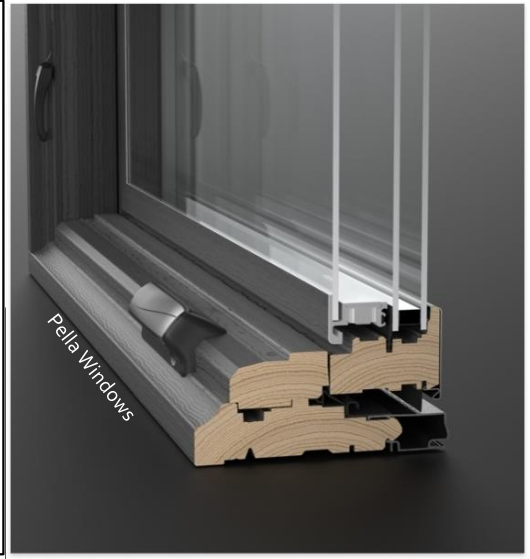
TABLE 150.1-A COMPONENT PACKAGE – Single- Family Standard Building Design (continued)

		Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Fenestration	Maximum U-factor	0.27	0.27	0.27	0.27	0.27	0.30	0.30	0.30	0.30	0.30	0.27	0.27	0.27	0.27	0.30	0.27
	Maximum SHGC	NR	0.23	NR	0.23	NR	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.20	NR
	Maximum Total Area	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Maximum West Facing Area	NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	NR
Door	Maximum U-factor	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

NR = Not Required
Fenestration Ratio (%) = Window Area to Conditioned Floor Area (CFA)

Window U-factor Updates for 2025

Just about all brands of windows offer dual or triple paned options



Options:

- Dual Paned Low-e
- Triple paned Low-e
- Air/Argon/Krypton
- Thermally Broken
- Visible Transmittance
- Sound Transfer

Note:
Many 20-min Fire-Rated Windows have U-factors around U-0.42

Mandatory:

- **U-0.40** (decrease from U-0.45 max)

Prescriptive:

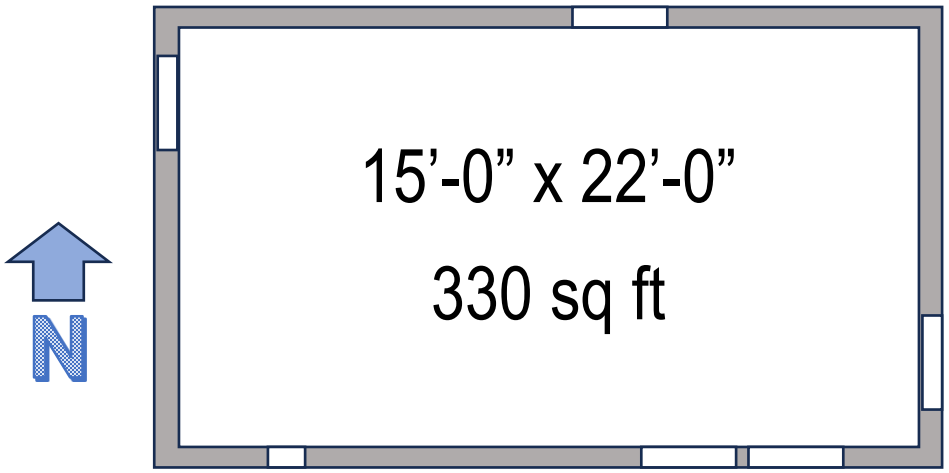
- **U-0.27** decrease for CZ 1-5, 11-14, 16
- **U-0.30** no change for CZ 6-10, 15

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**.

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.

Prescriptive Example for Window Area:



Example of Prescriptive Solution:

(3) 3.5x5 windows = 52.5 sq ft
(1) 3x3 window = 9 sq ft
(1) 3x1 window = 3 sq ft
(1) 1x1 window = 1 sq ft

Total Area = 65.5 sq ft

For all climate zones, 20% Win/Flr Ratio:

330 sq ft x 20% = **66 sq ft total allowable**

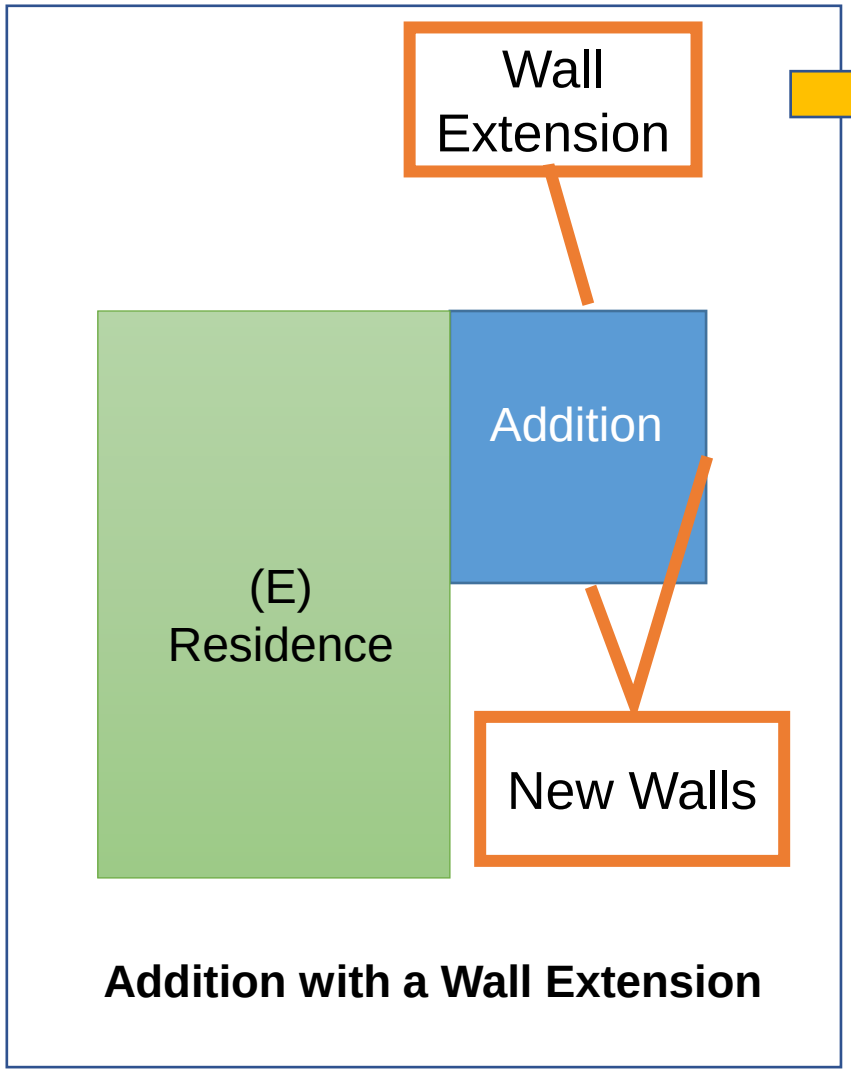
For CZ 2, 4, and 6-15, up to 5% west-facing Win/Flr Ratio

330 sq ft x 5% = **16.5 sq ft west-facing allowable**

Performance Method Trade-Offs:

Can use the Performance Method to gain more windows and/or avoid continuous insulation…

Additions –Wall Extensions and Existing Framed Walls



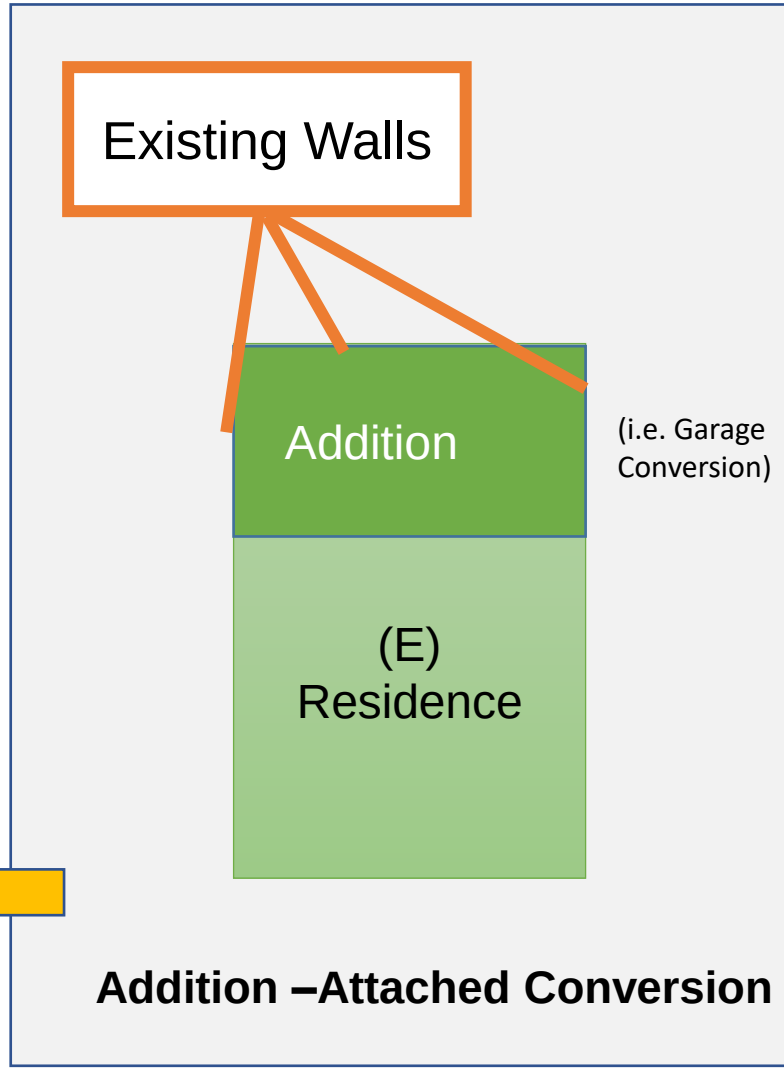
Addition with a Wall Extension

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

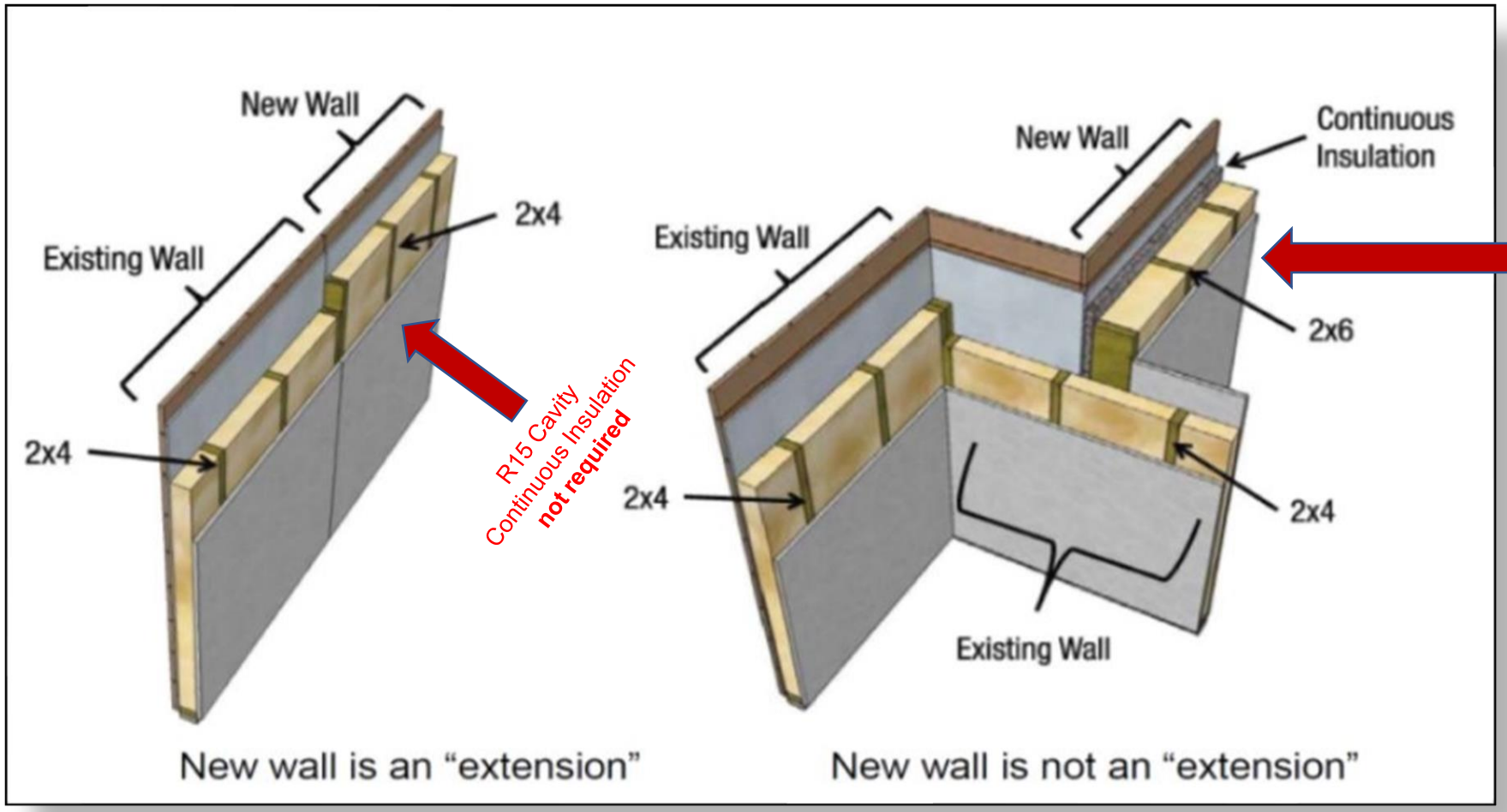


Image from CEC's BluePrint

Continuous Insulation is required Prescriptively.

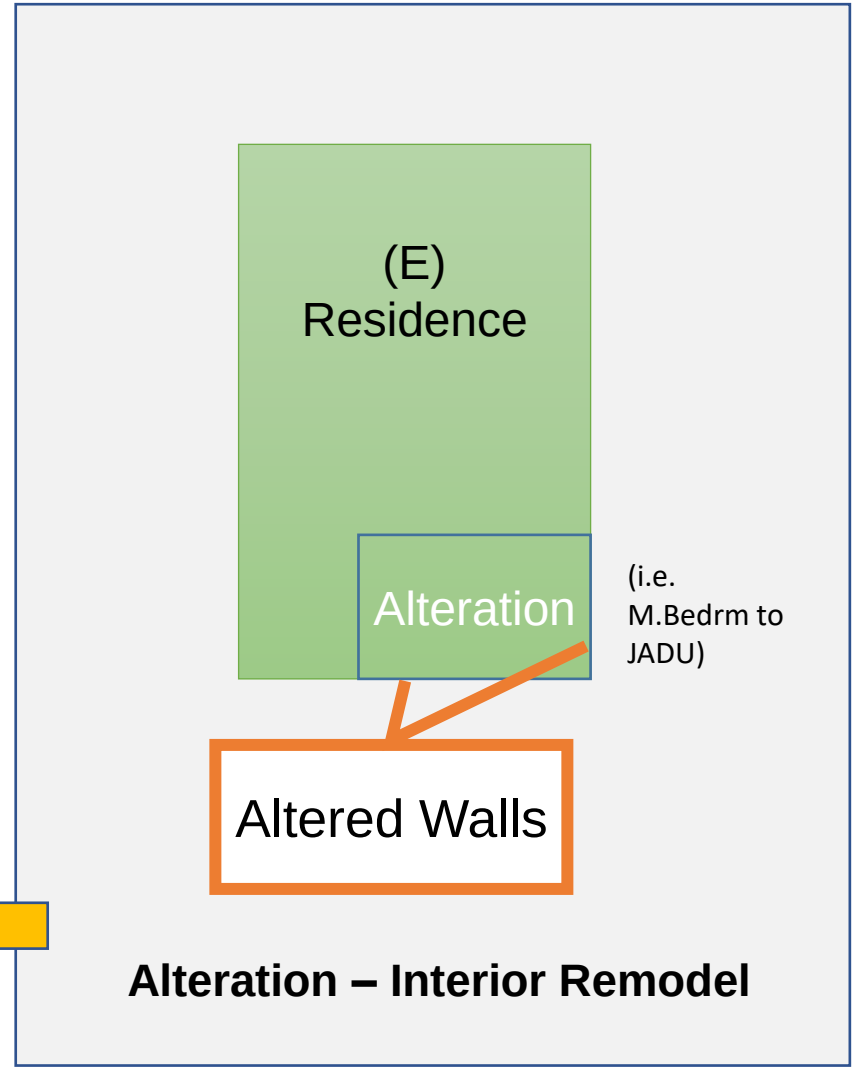
This could be a cavity filled R-21 batt with R-5 continuous. (U- 0.048)

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

Alterations –Existing Walls with Window Replacements

Fenestration (Windows and Skylights)	U-factor All CZ	SHGC CZ 2, 4, 6-15	SHGC CZ 1, 3, 5 & 16
Window Replacement 75 sq ft or less	0.40	0.35	NR
Skylight Replacement	0.55	0.30	0.30
Window Replacement > 75 sq ft or New Additional Fenestration	0.30	0.23	NR
Total Glazing as a % of Floor Area	20%		
West Facing Glazing	5%		NR

Existing Walls being Altered:
- R-13 in a 2x4 framing
- R-20 in a 2x6 framing



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

2022 Code

CZ 2, 4, 6-15		
Fenestration (Windows and Skylights)	**U-factor**	**SHGC**
Window Replacement 75 sq ft or less	0.40	0.35
Skylight Replacement	0.55	0.30
Window Replacement > 75 sq ft or **New Additional Fenestration**	0.30	0.23
Total Glazing as a % of Floor Area	20%	
West Facing Glazing	5%	

CZ 1, 3, 5, 16 2025 Update		
Fenestration (Windows and Skylights)	**U-factor**	**SHGC**
Window Replacement 75 sq ft or less	0.40	NR
Skylight Replacement	0.55	0.30
Window Replacement > 75 sq ft or **New Additional Fenestration**	0.30	NR
Total Glazing as a % of Floor Area	20%	
West Facing Glazing	NR	

EXCEPTION 1 Alterations that add up to **75 square feet of fenestration** shall not be required to meet the total fenestration area and west-facing fenestration area requirements.
EXCEPTION 2 Alterations that add up to **16 square feet of skylight with U-factor 0.55 and SHGC 0.30** 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

2025 Code Update

CZ 1, 3, 5, 16	2025 Update	
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	

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

2025 Code Update

CZ 6-10, 15	2025 Update		
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%		

*Climate zone 15 qualifies for a SHGC 0.23 exception

CZ 2, 4, 11-14	2025 Update	
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.

Indoor Air Quality Ventilation

Ventilation –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)

Section 150.0(o)

- Kitchen Hood Exhaust
- Bathroom Exhaust
- Outside Air (OA)
  - Mechanically Induced
  - Infiltration

For New Construction and Additions greater than 1,000 ft^2

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 example, a hood CE of 65% or 160 cfm minimum airflow would comply for only electric ranges.

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

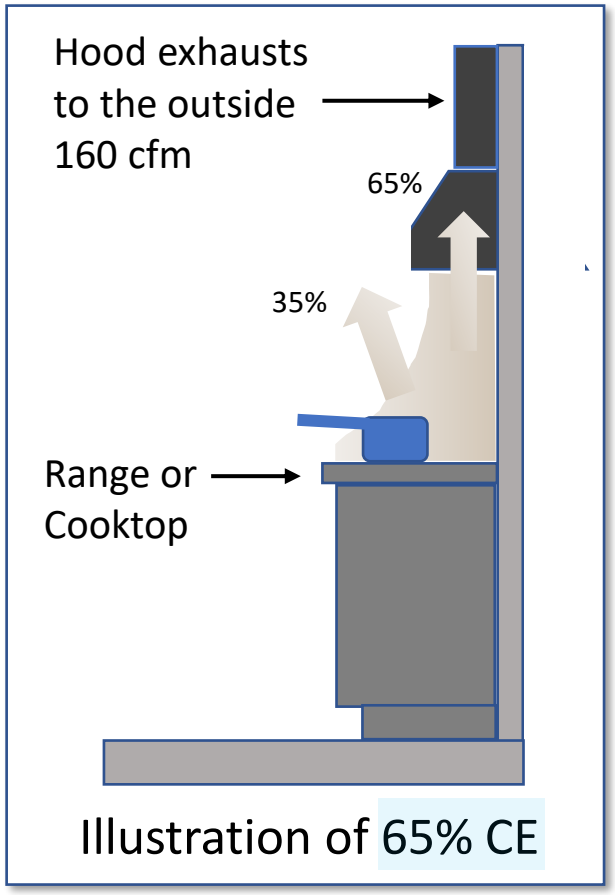


Illustration of 65% CE

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.

Requirements for Ventilation Indoor Air Quality (IAQ)

This equation is for calculating the
'*Total required ventilation rate*' for the dwelling:

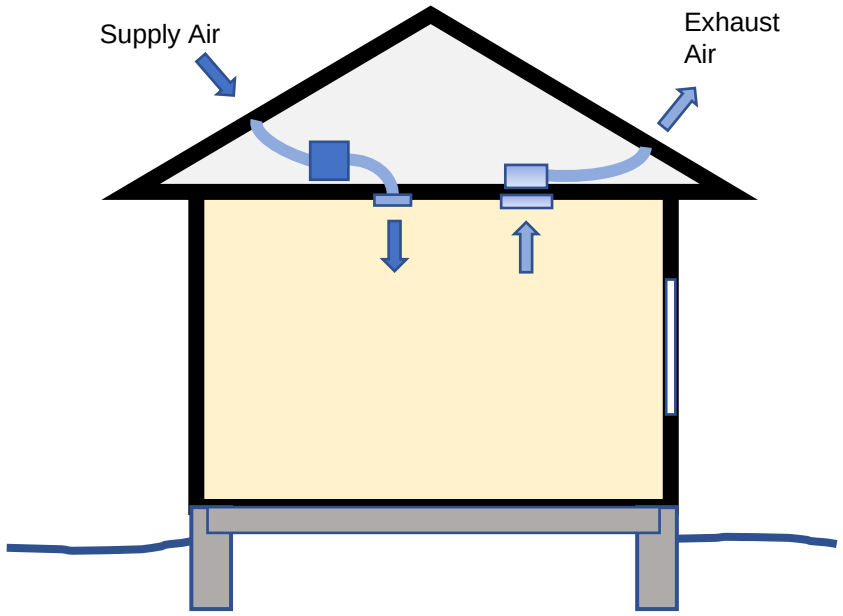
$$Q_{total} = 0.03A_{floor} + 7.5(N_{br} + 1)$$

Where:
Q_{total} = Total required ventilation rate (CFM)
A_{floor} = Conditioned floor area in square feet (ft^2)
N_{br} = Number of bedrooms (not fewer than one)

Required IAQ is based on the total required ventilation rate for the dwelling minus the calculated annually averaged infiltration rate.

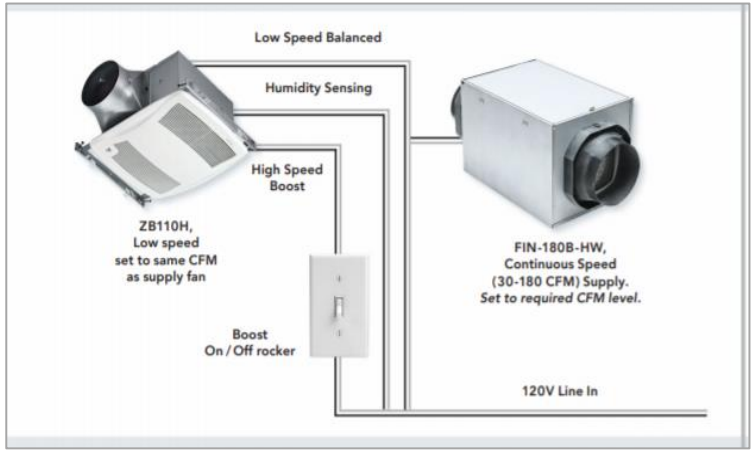
This equation can be a good *estimate* for the required IAQ Ventilation. The calculated required IAQ Ventilation is also dependent on several infiltration rate equations, which can lower the required IAQ Ventilation rate overall.

Balance Ventilation



Balanced Ventilation

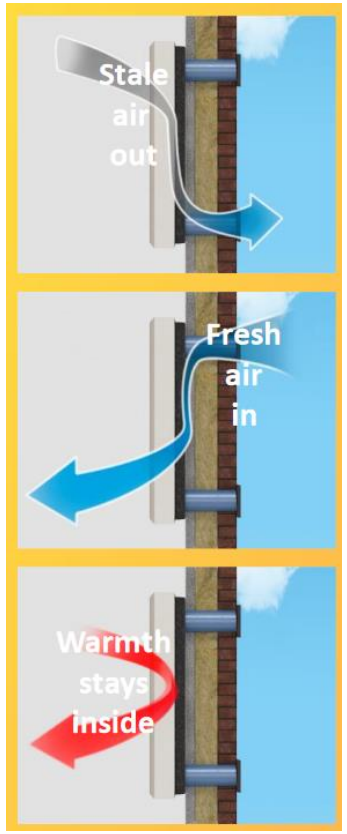
- *Avoid* uncontrolled air infiltration and/or exfiltration, i.e. leaky envelope
- Does *not* depend on construction assemblies that leak
- Air-Leakage Sealing is a Mandatory Requirement
- HERS Quality Insulation Installation (QII) – includes visual confirmation of air sealing – is now a Prescriptive Requirement



https://www.broan-nutone.com/

Balanced Ventilation with Heat Recovery

Through the Wall without Ducting



Fresh-r

TwinFresh

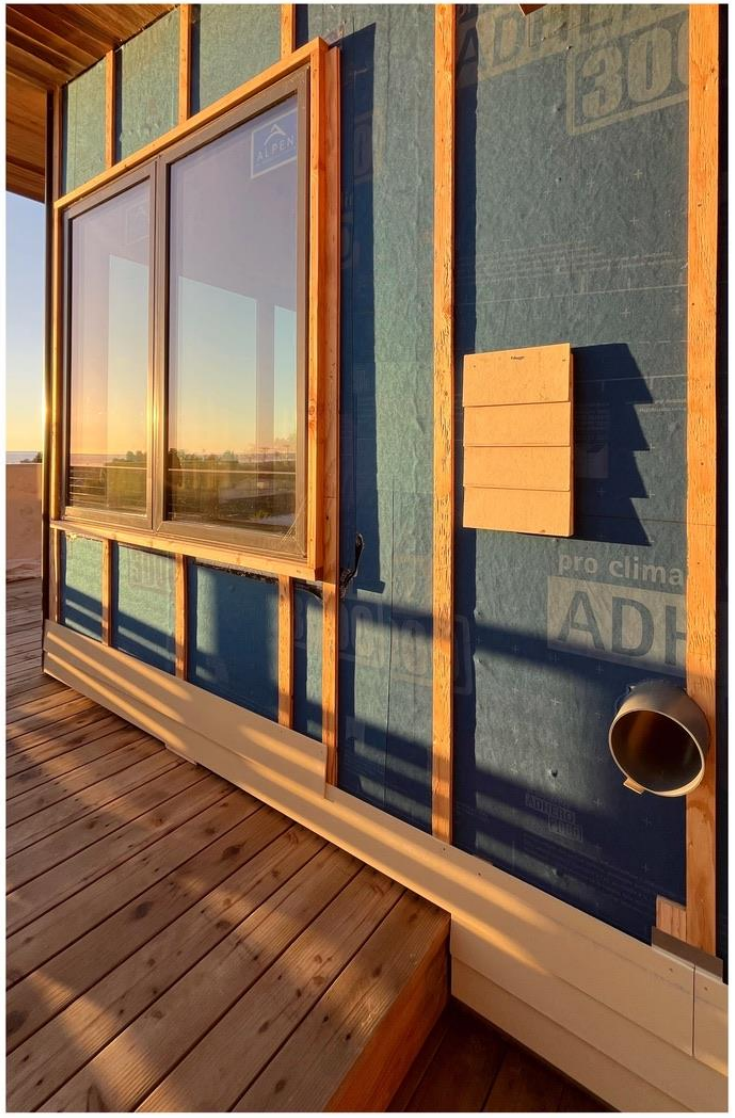
TwinFresh Comfo RA1-50-2

Lunos

Ceiling Recessed with 3” Ducts

Panasonic ERV

Through-the-Wall Spot IAQ Ventilation



Inside Cover and Exterior Opening for Spot IAQ Ventilation

Performance Credit:
Balance Ventilation with Heat/Energy Recovery

Must be HVI Certified. See Products Directory ***www.HVI.org***

Indoor Air Quality and Mechanical Ventilation

CALIFORNIA ENERGY COMMISSION — CEC-CF3R-MCH-27-H

Indoor Air Quality and Mechanical Ventilation

CALIFORNIA ENERGY COMMISSION — CEC-CF3R-MCH-27-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

C. Ventilation - Total Ventilation Rate

A mechanical supply system, exhaust system, or combination thereof shall provide whole-dwelling ventilation with outdoor air each hour at no less than the rate in 150.0(o)1Ci

01	Total Required Ventilation rate, (Q_{tot})	
02	Enclosure Leakage Rate (Q_{50})	
03	Effective Annual Average Infiltration Rate (Q_{inf})	
04	Total Exterior Envelope Surface Area	
05	Unshared Exterior Envelope Surface Area (exclude surface areas attached to garages or other dwelling units)	
06	Required Mechanical Ventilation Rate (Q_{fan})	

D. Installed Ventilation - Total Ventilation Rate

A mechanical supply system, exhaust system, or combination thereof shall provide whole-dwelling ventilation with outdoor air each hour at no less than the rate in 150.0(o)1Ci

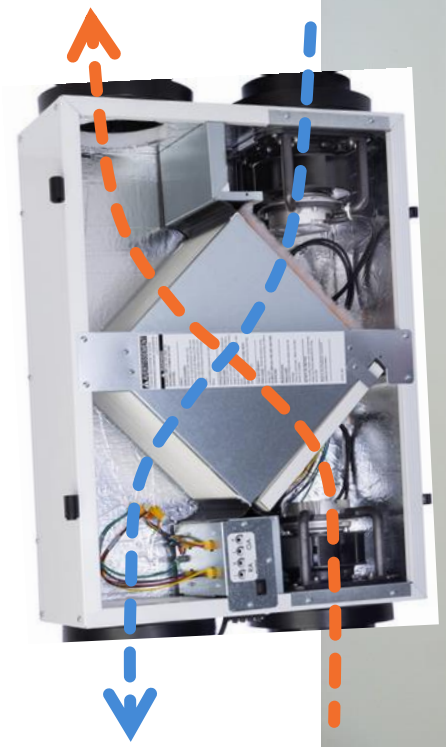
01	02	03	04	05
Fan Name	Fan Location	Runtime (Min/Hr)	Installed Mechanical Ventilation Rate (CFM)	Equivalent Continuous Ventilation (CFM)
06	Total Installed Equivalent Continuous Ventilation (CFM)			

D2. HRV or ERV Information

Balanced ventilation systems shall comply with appropriate requirements in 150.0(o)2C.

01	02	03
Manufacturer Make	Manufacturer Model Number	Fan Efficacy Performance Rating (W/CFM)

B. Single Family Attached/Detached General Information



Balanced Ventilation
ERV Provides Outside Air (OA)

Domestic Hot Water

Water Heaters – Prescriptive 2025 Update

New Construction:

- A **240V heat pump water heater*** –CZ 2-15; additional requirements apply for CZ 1 and 16.
- A **120V HPWH** may be installed in place of a 240V HPWH for **new dwelling unit with 1 bedroom or less.**
- ~~A **gas or propane instantaneous*** water heater with an input of 200 kBtu/h or smaller – CZ 3, 4, 13 and 14~~

~~*Allowable for Additions in any climate zone~~

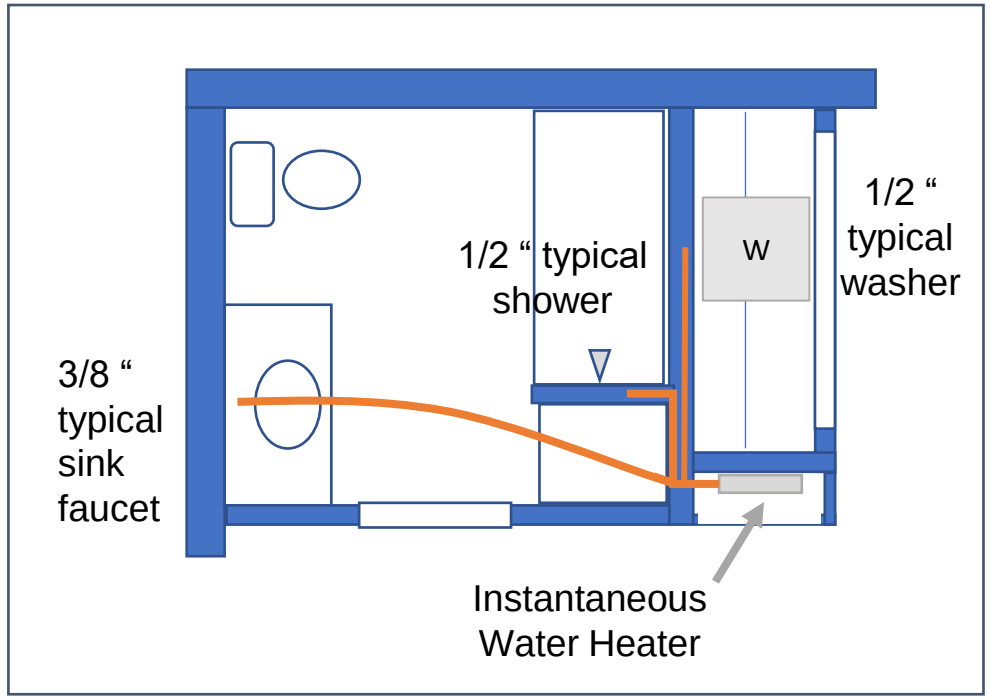
SanCO2

Key Take Away: Under 2025 code, use the Performance Method for gas/LP water heaters.

New Construction and Additions
500 sq ft or less

- An ~~**instantaneous**~~ **electric water heater** with ***point of use distribution*** as specified in RA4.4.5 is allowable

Point of Use (POU) –*Requirement* for ELEC TANKLESS



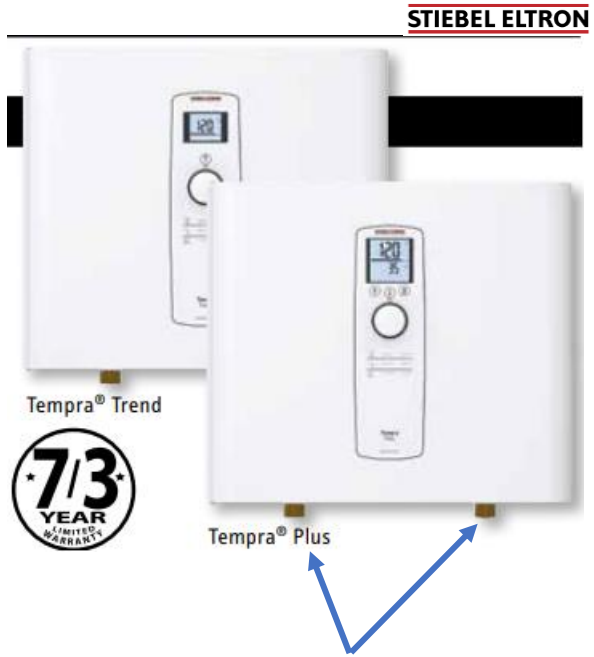
POU - Point of Use Distribution

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.

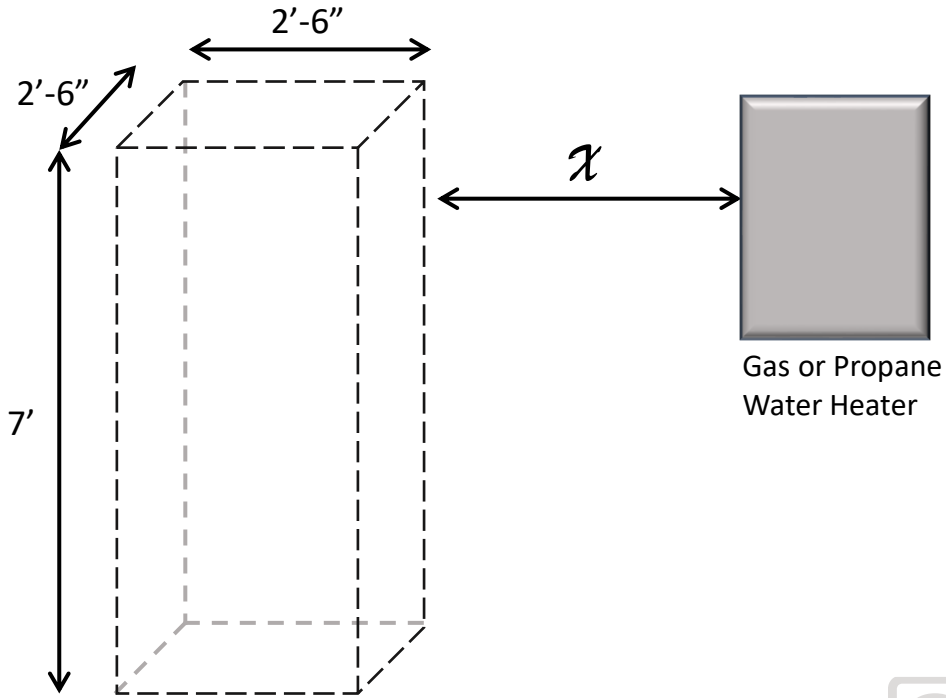


¾" lines connection typical

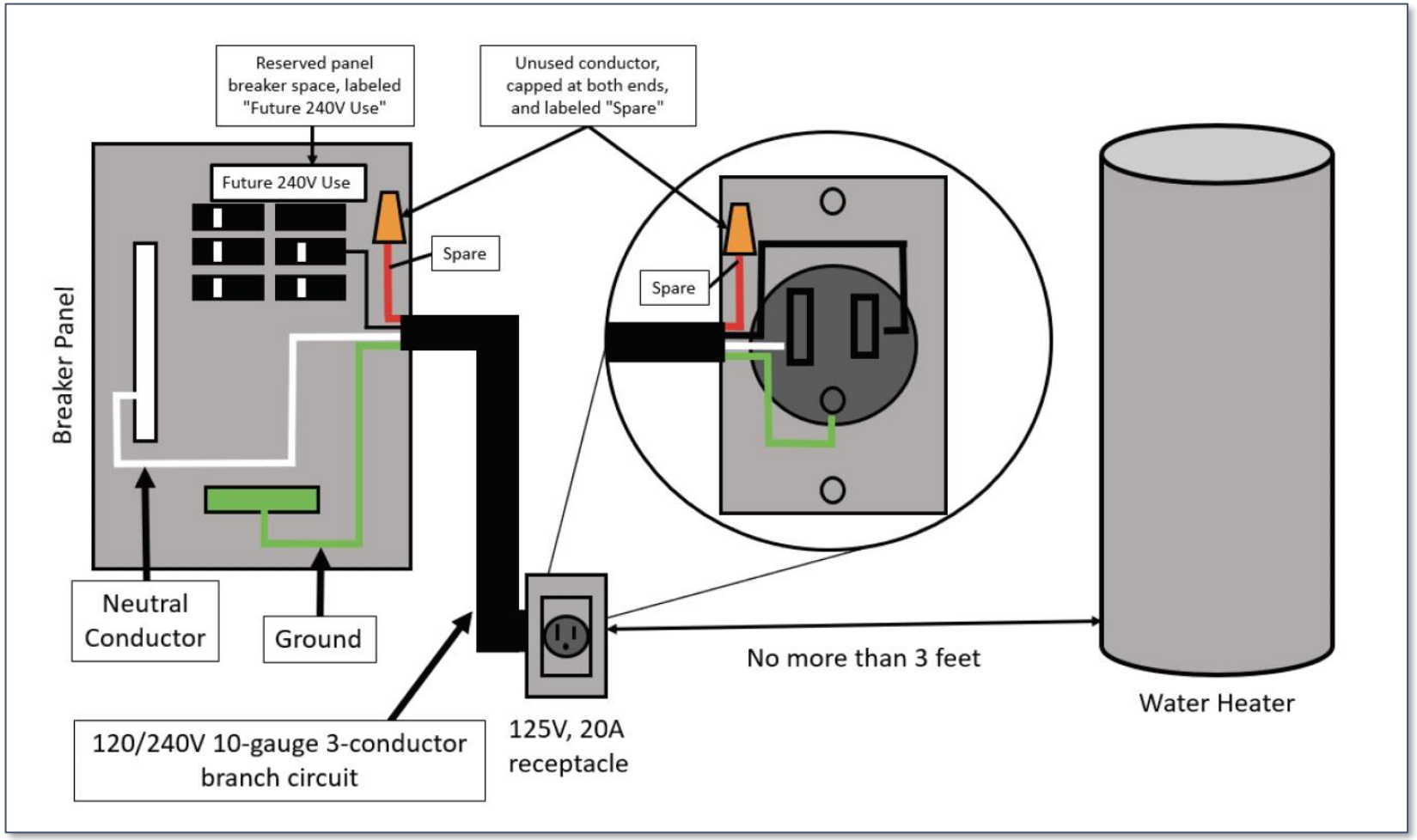
Heat Pump Water Heater (HPWH) Ready

–triggered when installing a gas or propane water heater in *new construction*

- 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**, i.e. when x is greater than 3 ft or equal to or less than 3 ft.



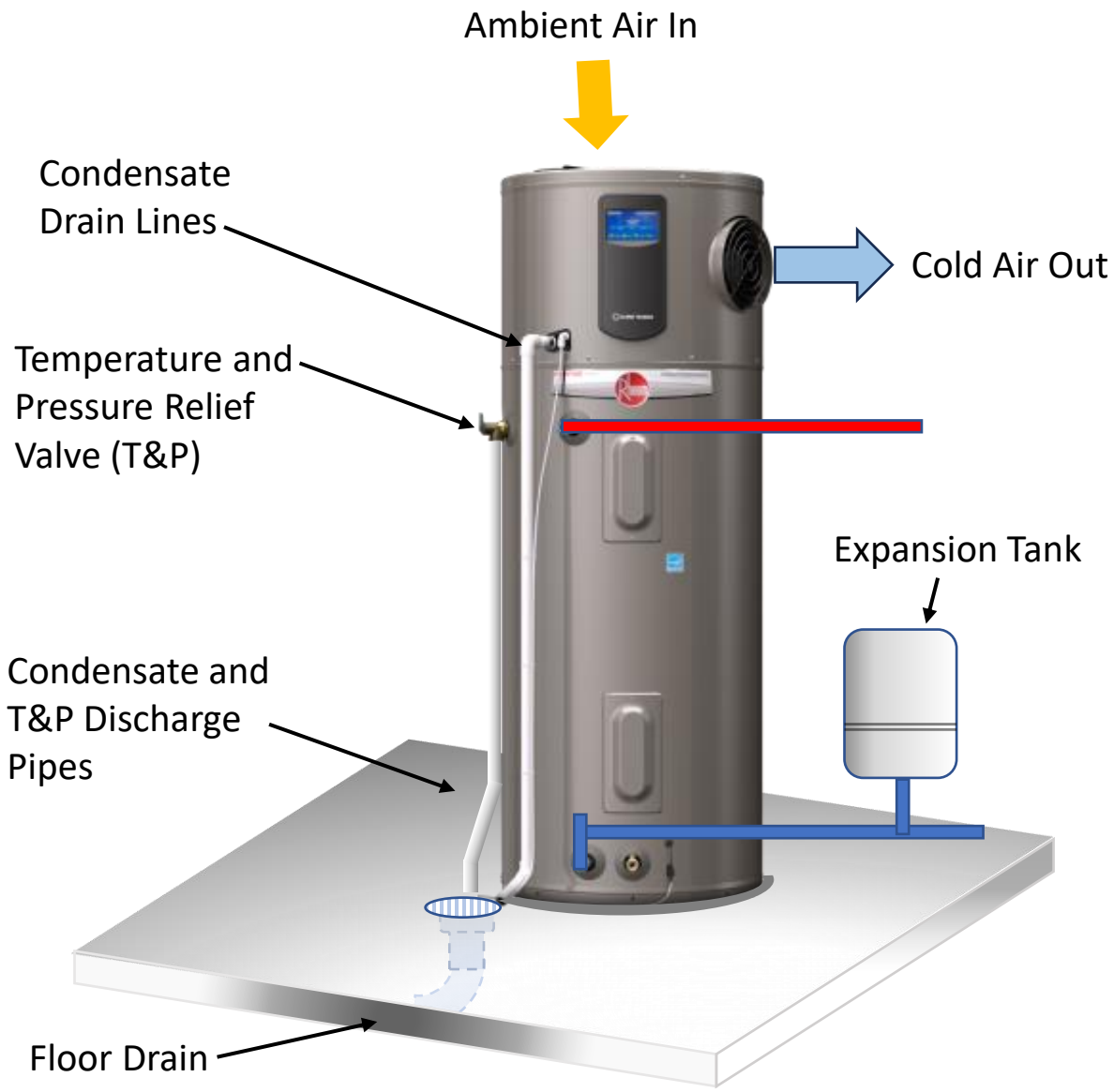
Pre-Wired for Future HPWH

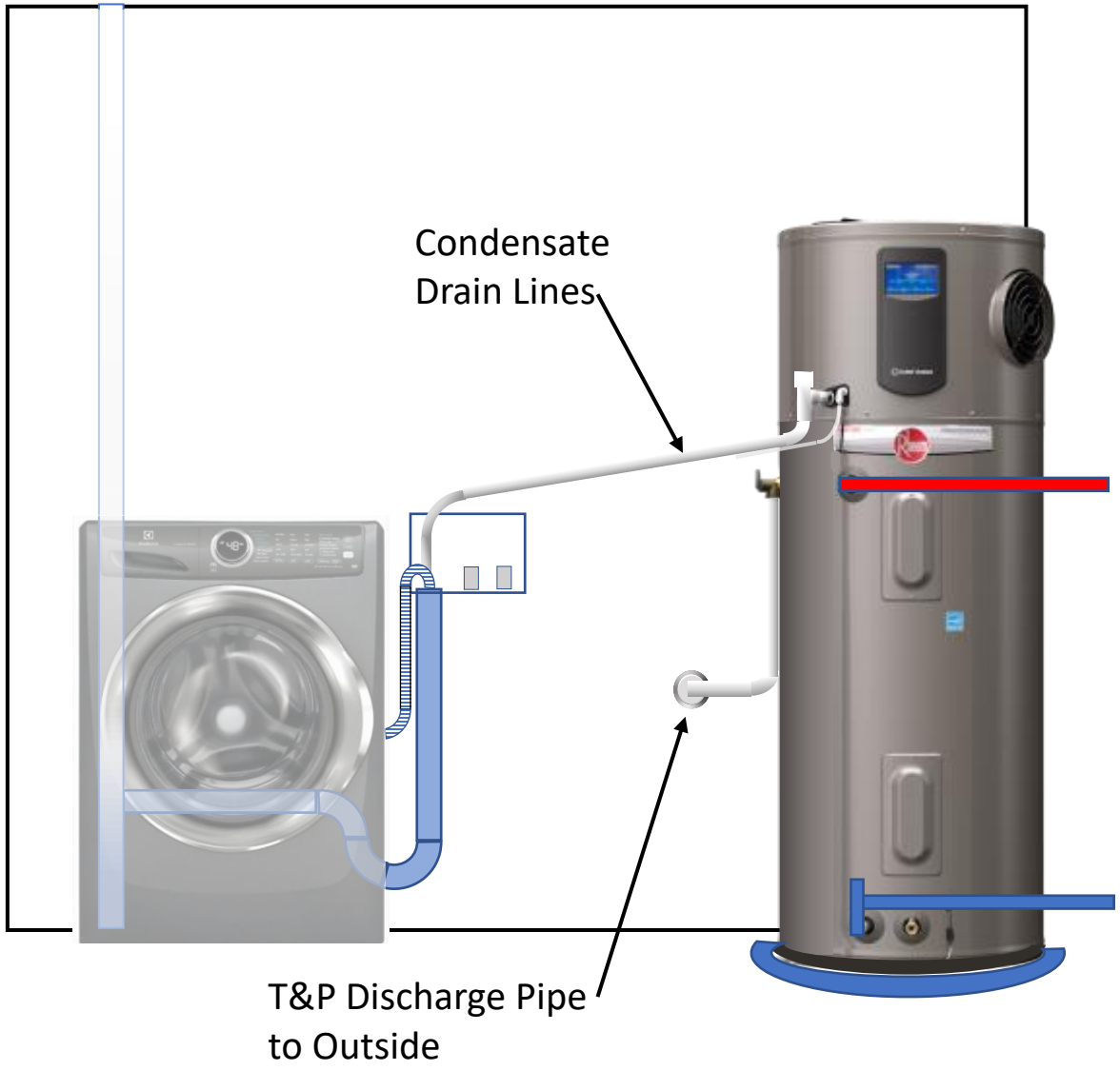


Credit: Blueprint, California Energy Commission, Issue120 Apr/June 2020

https://www.energy.ca.gov/newsroom/blueprint-newsletter

Integrated Heat Pump Water Heater (also known as a Hybrid Water Heater)

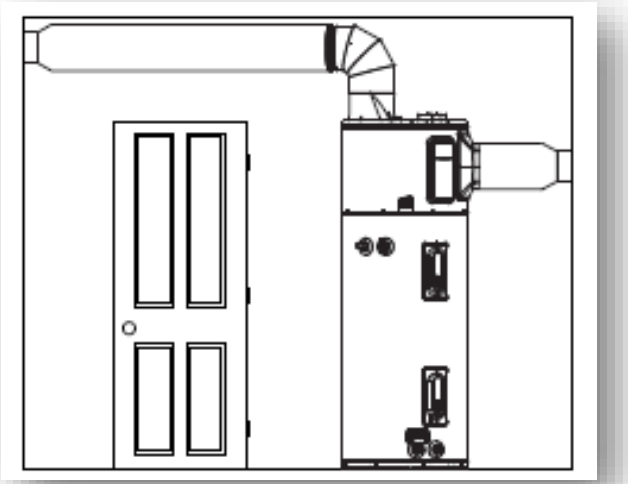




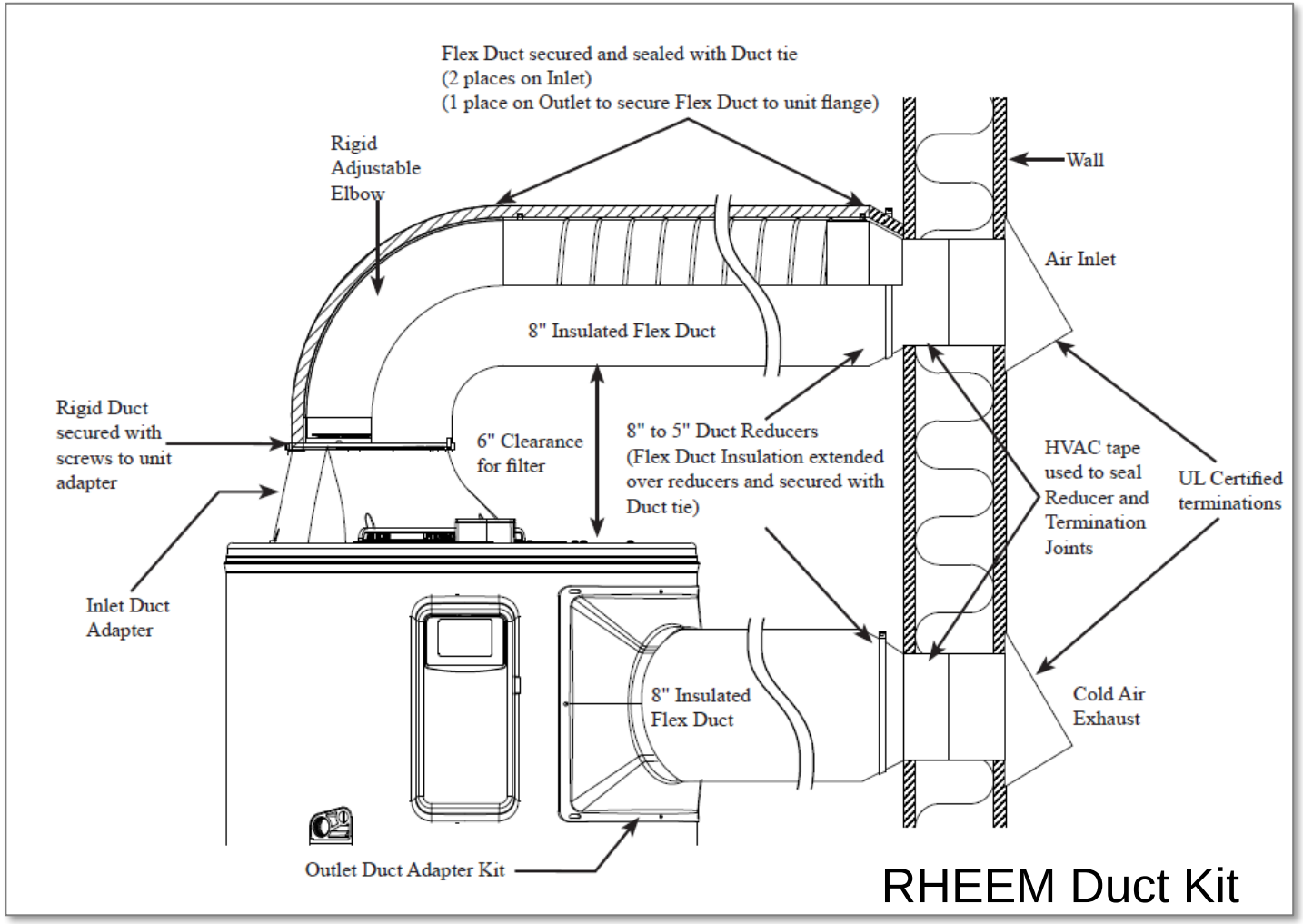
Design Considerations – Integrated HPWH

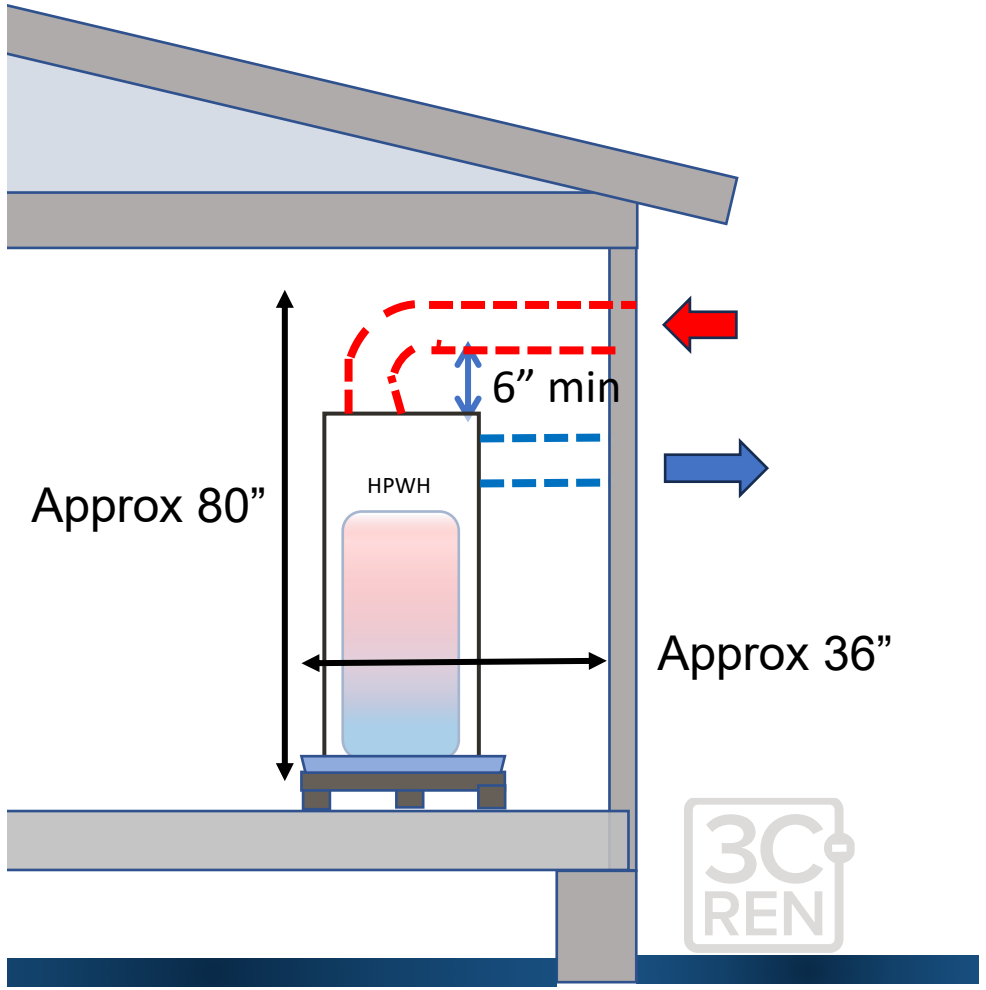
Image source: Silicon Valley Clean Energy

- Integrated HPWH tanks taller than standard gas or electric units
- Requires clearances on the sides, top and back, for air flow and access to the air filters
- Operating Temp between 45 F and 90 -110F
- New models can operate between 35 F and 120 F
- Noise typically around 50 db
- System creates cold dehumidified air and condensate
- Some need 750 – 1000 cubic feet volume, or ducted vent kit
- Some newer models only need 350 cu ft



Integrated HPWH shall be located indoors or in the garage […small homes need an indoor ducted solution]





Performance *Credit*: With GAS or HEATPUMP
Point of Use (POU) or Compact Plumbing

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION

CEC-CF3R-PLB-22-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

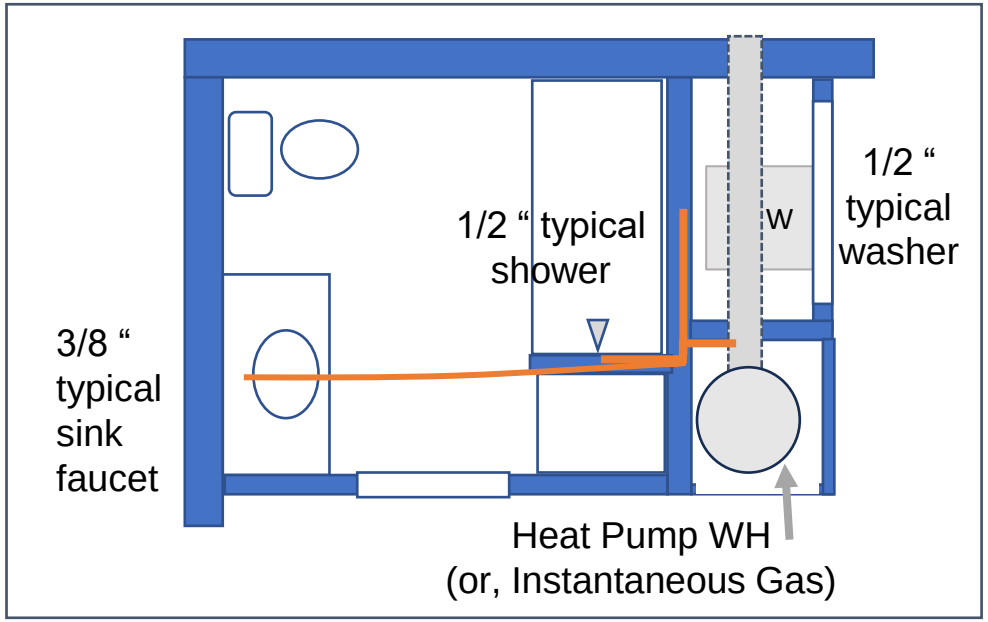
M. Point of Use Requirements (POU) (RA4.4.5)

Systems that utilize this distribution type shall comply with these requirements.

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

01	All hot water supply pipe run lengths are equal to or less than the maximum values shown below, based on the pipe diameter. If a combination of piping is used in a single run, then one half the allowed length of each size is the maximum installed length. The maximum allowed length of piping for the longest run terminating in: 3/8 inch - For only one pipe size - max length allowed is 15 feet For combination pipe sizes the max allowed length of 3/8-inch piping is 7.5 feet, of ½ inch piping is 5 feet, and ¾ inch piping is 2.5 feet. ½ inch - For only one pipe size – max length allowed is 10 feet For combination pipe sizes the allowed length of ½-inch piping is 5 feet, and ¾ inch piping is 2.5 feet. ¾ inch - For only one pipe size = 5 feet

Piping must take the most direct path with truck-branch line.



POU - Point of Use Distribution

Line size vs Length for Each Run

Table 4.4.5

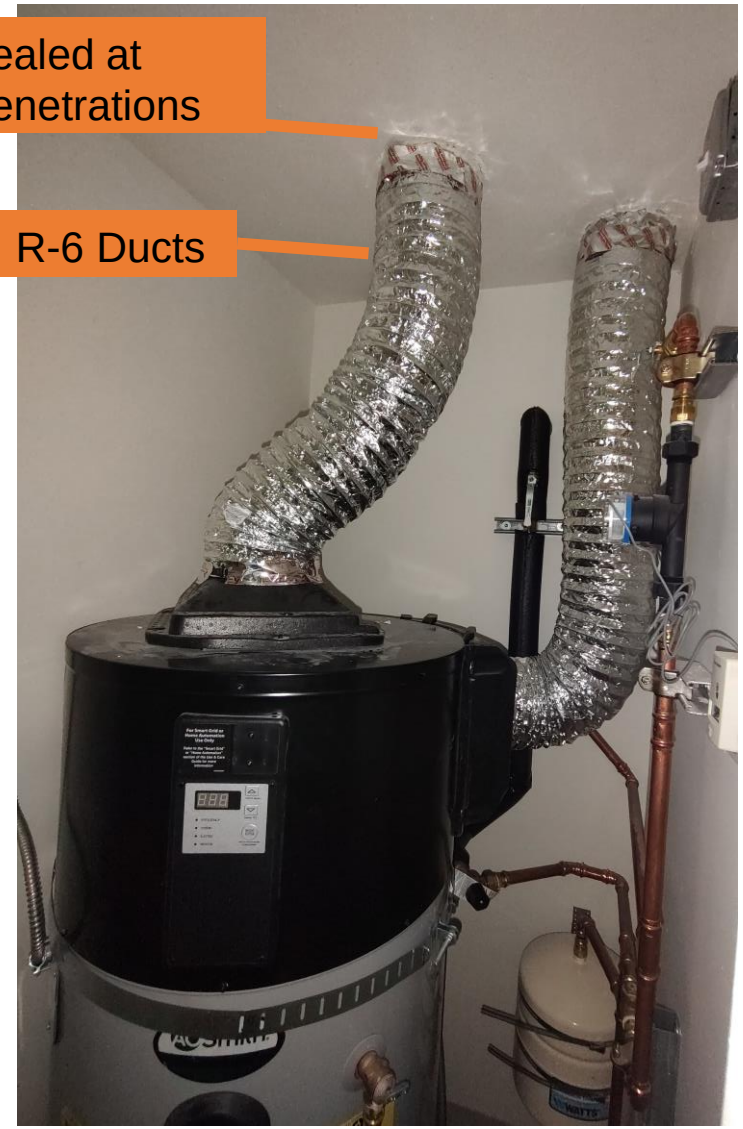
Size Nominal (Inch)	Length of Pipe (feet)
3/8"	15
1/2"	10
3/4"	5

2025 Code –New Mandatory Requirements for HPWH

Mandatory - Section 110.3

Installation Space Volume:
"…not less than the greater of 100 cubic feet per kBtu per hour of compressor capacity, or the minimum volume provided by the manufacturer…"

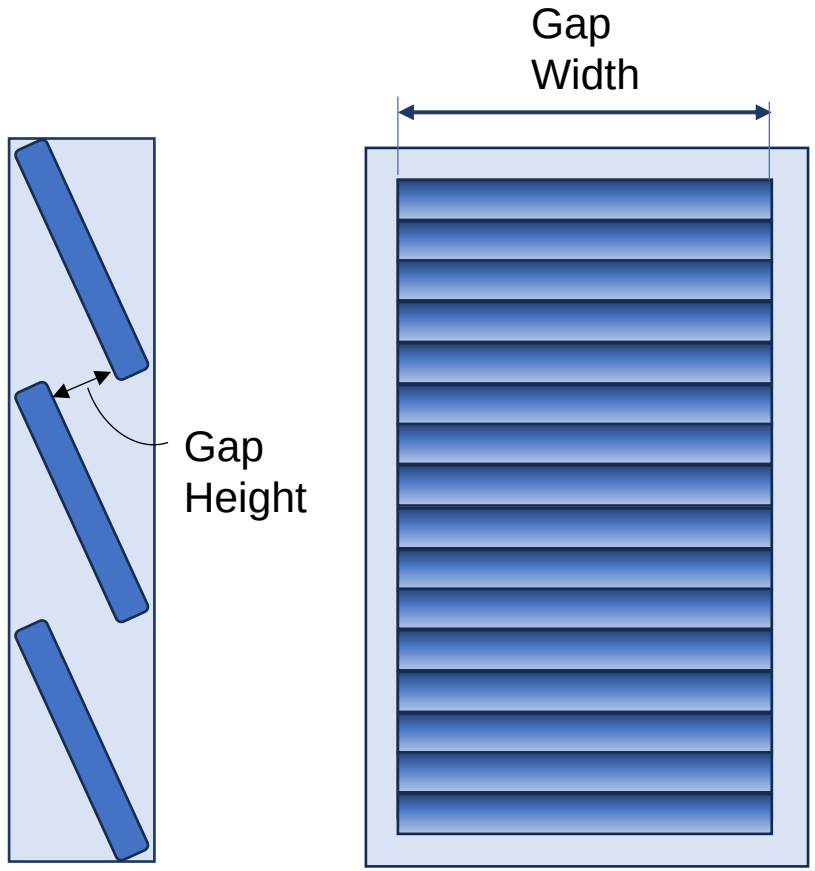
Net Free Area:
NFA = 125 sq in + 25 sq in per kBtu/h of compressor capacity or manufacturer specifications, whichever is larger.



Note:
4200 Btu/h or 4.2 kBtu/h compressor capacity is common for many residential integrated heat pump units (typ. 40-80 gal)

Sidebar: New Definition –Net Free Area (NFA)

- NET FREE AREA (NFA) is the total unobstructed area within the air gaps between louver and grille slats in a vent, allowing the passage of air. The narrowest distance between two slats, perpendicular to the surface of both slats is the air gap height. The narrowest width of the gap is the air gap width.
- The NFA is the air gap height multiplied by the air gap width multiplied by the total number of air gaps between slats in the vent.

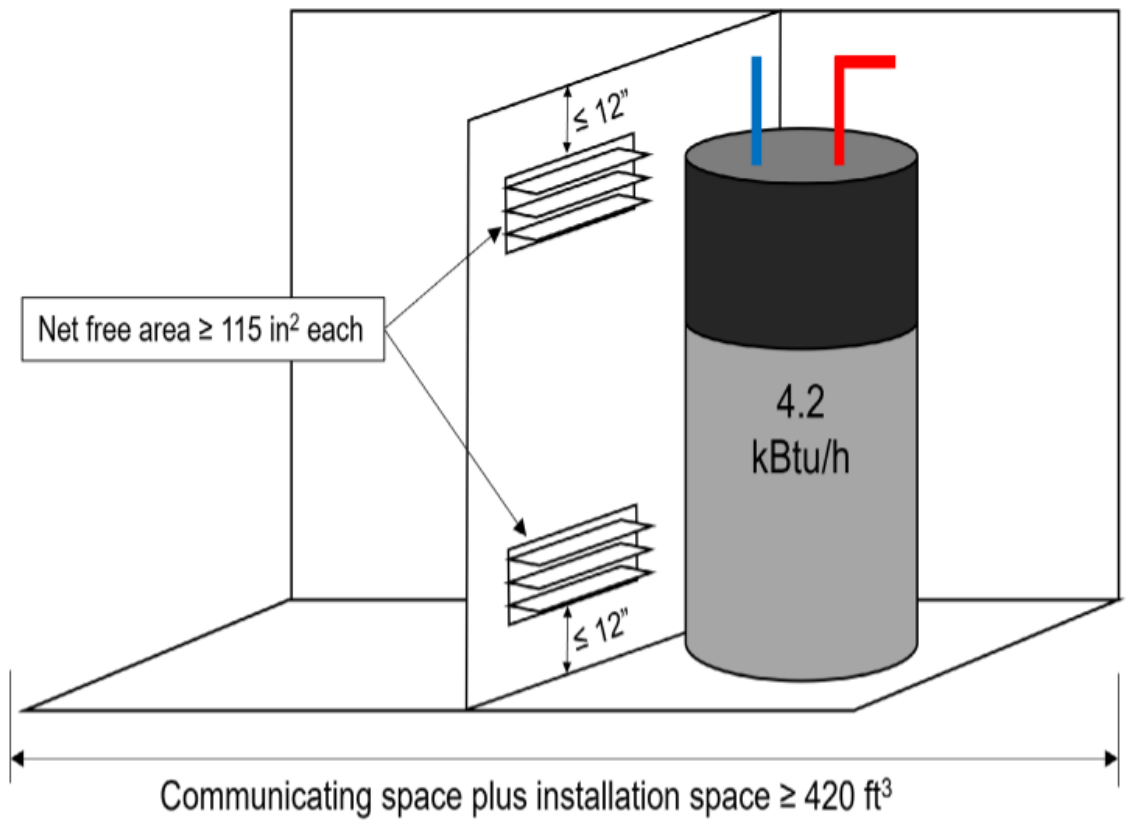


Clarifying Diagram Published by CEC

Water Heating

- Updates requirements for backup heat in heat pump water heaters (HPWH) with unconditioned inlet air, unless compressor cutoff temperature below local Heating Winter Median of Extremes. Section 110.3(c)7A
- Adds ventilation or minimum room volume required when installing HPWH (Figure 1). Section 110.3(c)7B
- Updates mandatory requirement for a future HPWH conductor to be a minimum 30A branch circuit. Section 150.0(n)1Ai

Figure 1: Example of HPWH ventilation per Section 110.3(c)7B3



Source: energy.ca.gov/newsroom/blueprint-newsletter

Math Help:

Volume Total (ft^3)
= 100 x cap
= 100 x 4.2 kBtu/h
= 230 ft^3

Note:
Many manuf. specify more vol. than 100 x cap.

NFA total (in^2)
= 125 in^2 + (25 in^2 x cap)
= 125 + (25 x 4.2)
= 125 + 105
= 230 in^2
Each vent = 230 / 2
= 115 in^2

Tank shall be located indoors, and the condenser outdoors

Under Stair Installation

eco2waterheater.com

Stainless Steel Water Tank

Temperature Communication Wire /Thermistor Cable

Outdoor Unit – Condenser CO2 R744 Refrigerant

Insulated Water Pipes

SanCO2 Heat Pump Water Heater

208/230V
15 Amp

Heat Pumps for Space Conditioning and the VCHP Credit

Additions – both JADU's and Attached ADU's

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

Indoor Unit Wall Mount

One to one heat pump with programable thermostat

Outdoor Unit / Condenser

2025 Code – all climate zones (CZ)

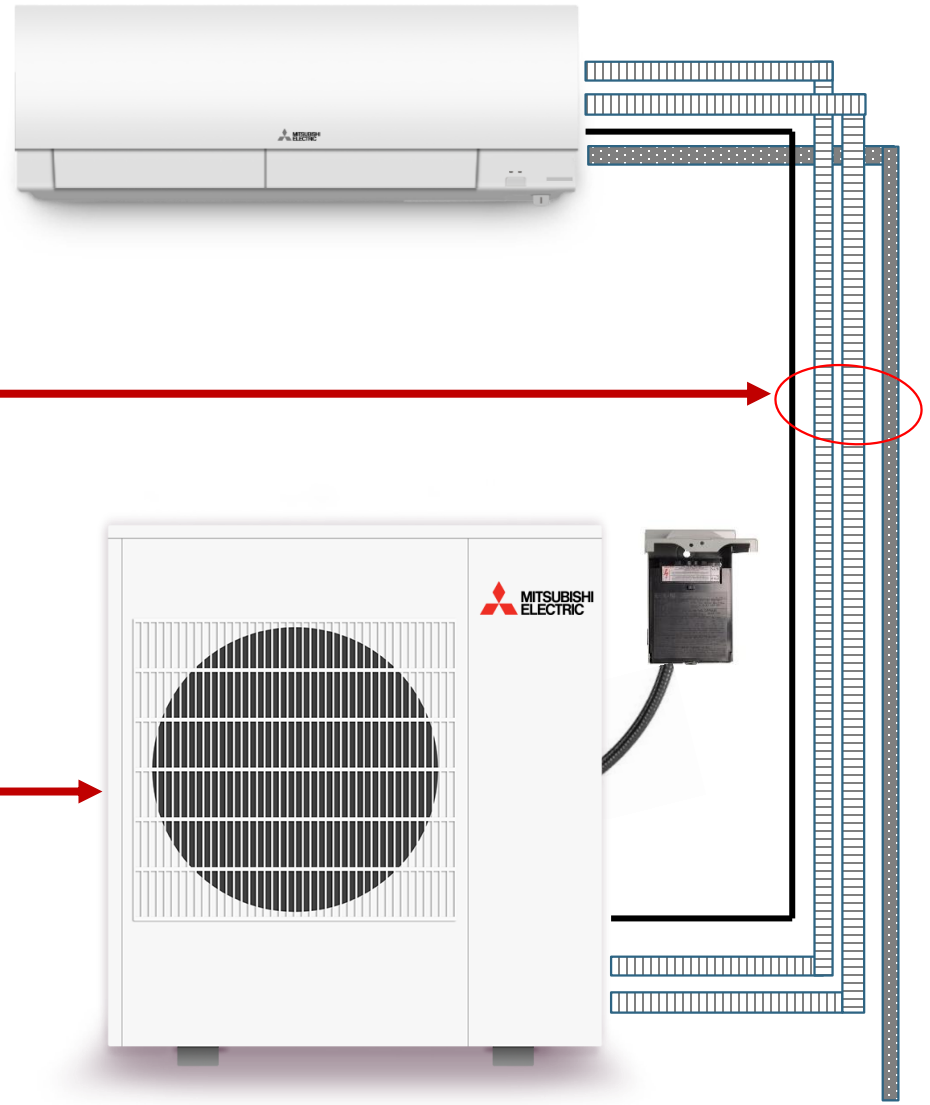
Reminder: For **New Construction** ~~(CZ 3, 4, 13, and 14)~~ heat pumps (HP) for space heating are Prescriptively required, but under the Performance pathway HP and/or Gas Furnaces are allowable.

Ductless ‘Mini-Split’ Heat Pump with Variable Capacity

Indoor Unit –Head with multi-speed fan controls

- Line Set Pair/Piping –Insulated Copper Refrigerant Tubing
- Condensate Line –Drain Hose
- Power Cord –Connecting to the Indoor Unit (aka Communication Wire)

Outdoor Unit –Compressor/Condenser Includes electronic expansion valve for variable refrigerant flow and multi-speed compressor and fan



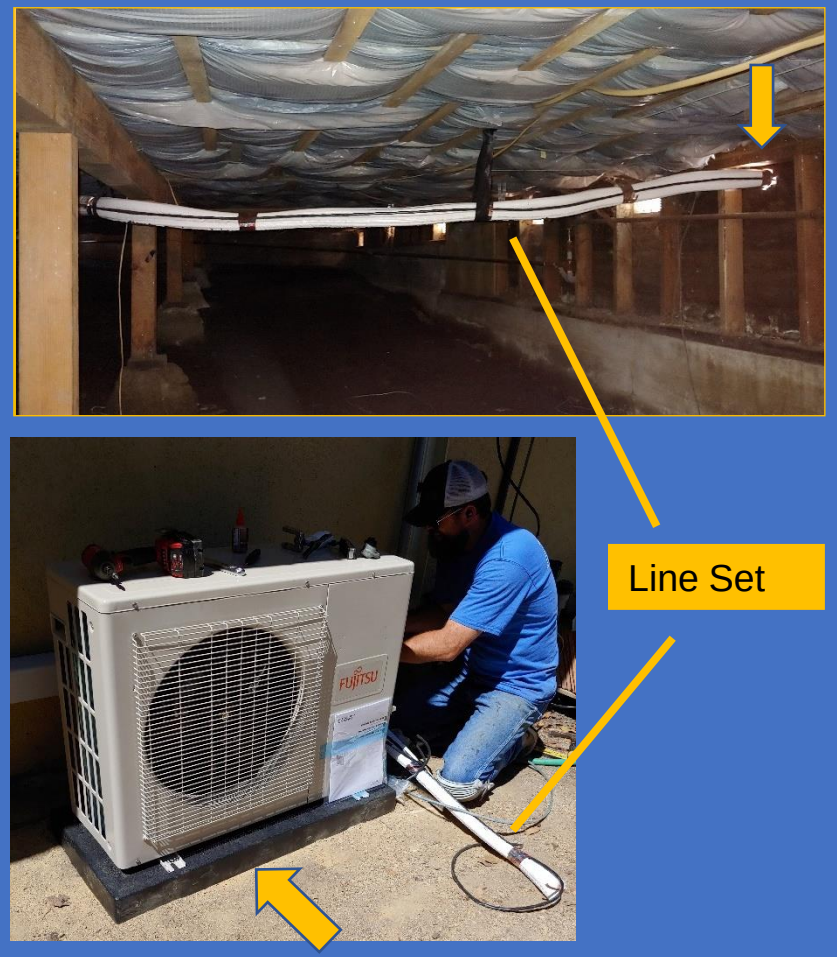
Note: Can typically have four indoor units per each outdoor unit.

Important Reminders –Heating and Cooling for ADU's

- ADU's may ***not share return air with the primary dwelling*** through the heating or cooling system.
- **Separate thermostats** are required

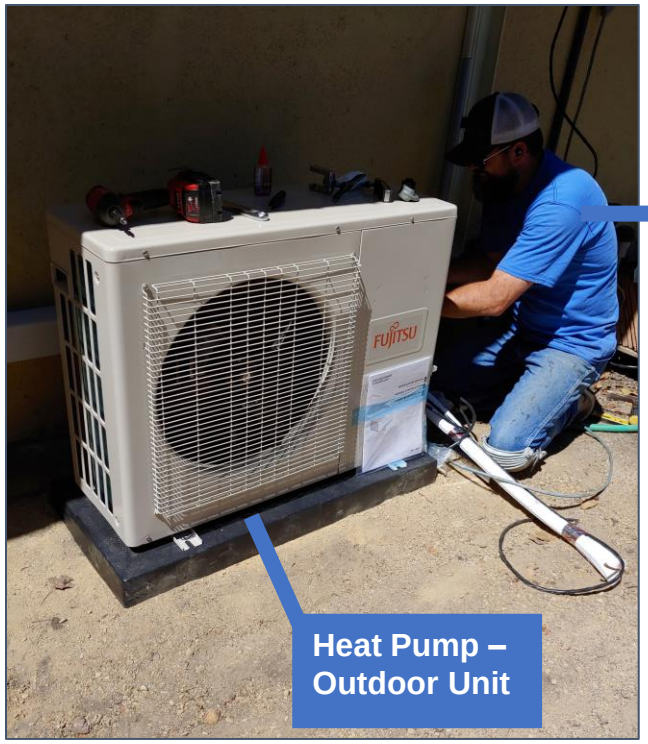
Mini-Split Raised Floor Example

- Mini-Split system heat pumps can offer a straight forward solution
- Condenser can be ground or wall mounted
- One condenser can be shared by the main dwelling and the ADU
- Each dwelling has its own indoor unit and thermostat



Heat Pumps Installation and HERS

Best time to verify refrigerant charge and equipment capacity, efficiency, etc. is during the installation



Installing Contractor

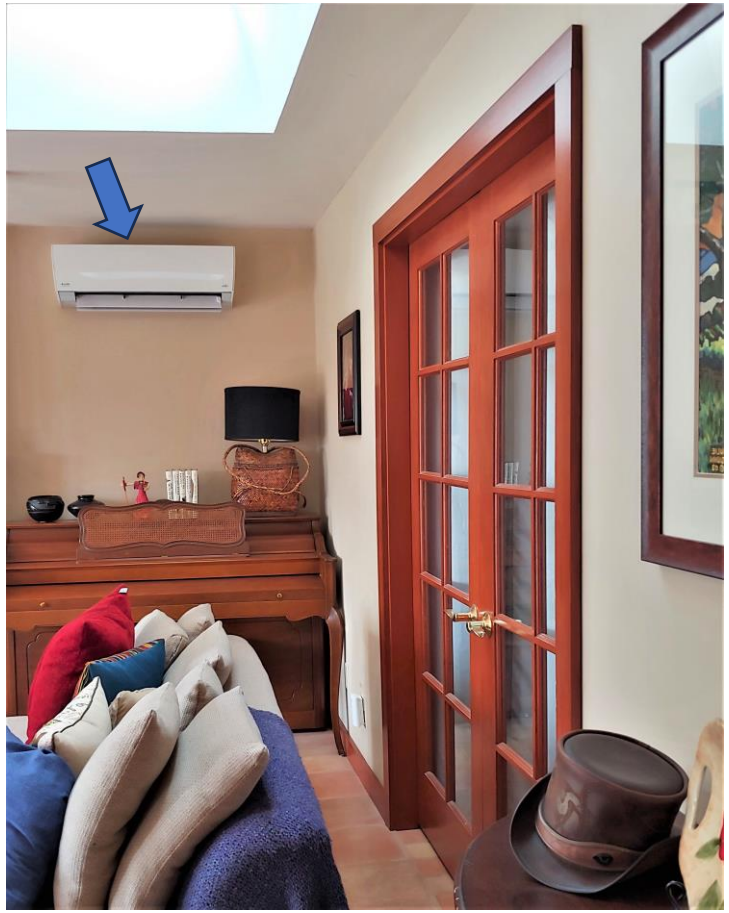
Heat Pump – Outdoor Unit

Specs in the Box Needed by HERS Rater

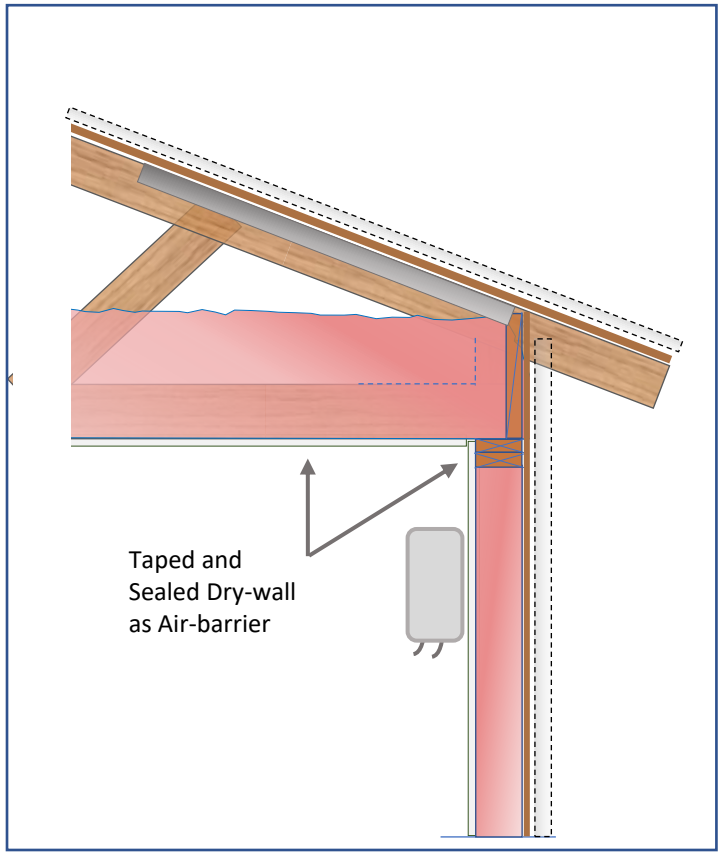
Refrigerant Line Set

Indoor units shall be installed within the air and thermal boundaries, with air flow to each habitable room, i.e. ea bedrm and living area; wall thermostats required in zones larger than 150 sq ft..

Wall and Ceiling Penetrations for the Mechanical System Refrigerant, Condensate, and Communication Lines need to be Air Sealed.



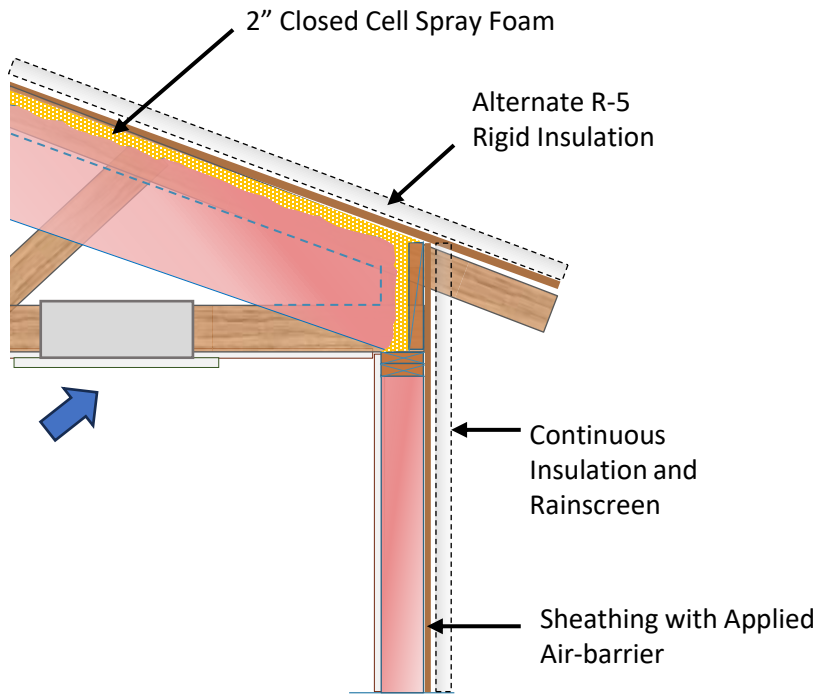
Ductless Wall Mount



Vented Attic with a Continuous Air and Thermal Boundary

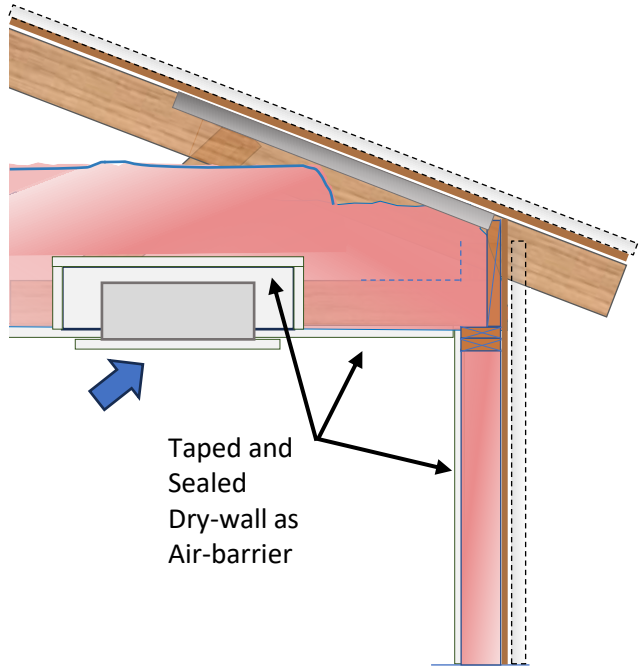
VCHP Compliance Credit Impacts the Envelope Enclosure

Indoor units shall be installed within the air and thermal boundaries



Unvented Attic with a Continuous Air and Thermal Boundary

Ductless Recessed-Ceiling



Vented Attic with a Continuous Air and Thermal Boundary

Variable Capacity Heat Pump (VCHP) Compliance Option – High Credit, Required Special Features and HERS Triggered

CF1R-PRF-01-E

REQUIRED SPECIAL FEATURES
The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.
• Variable capacity heat pump compliance option (verification details from VCHP Staff report, Appendix B, and RA3) • Compact distribution system basic credit • Northwest Energy Efficiency Alliance (NEEA) rated heat pump water heater; specific brand/model, or equivalent, must be installed

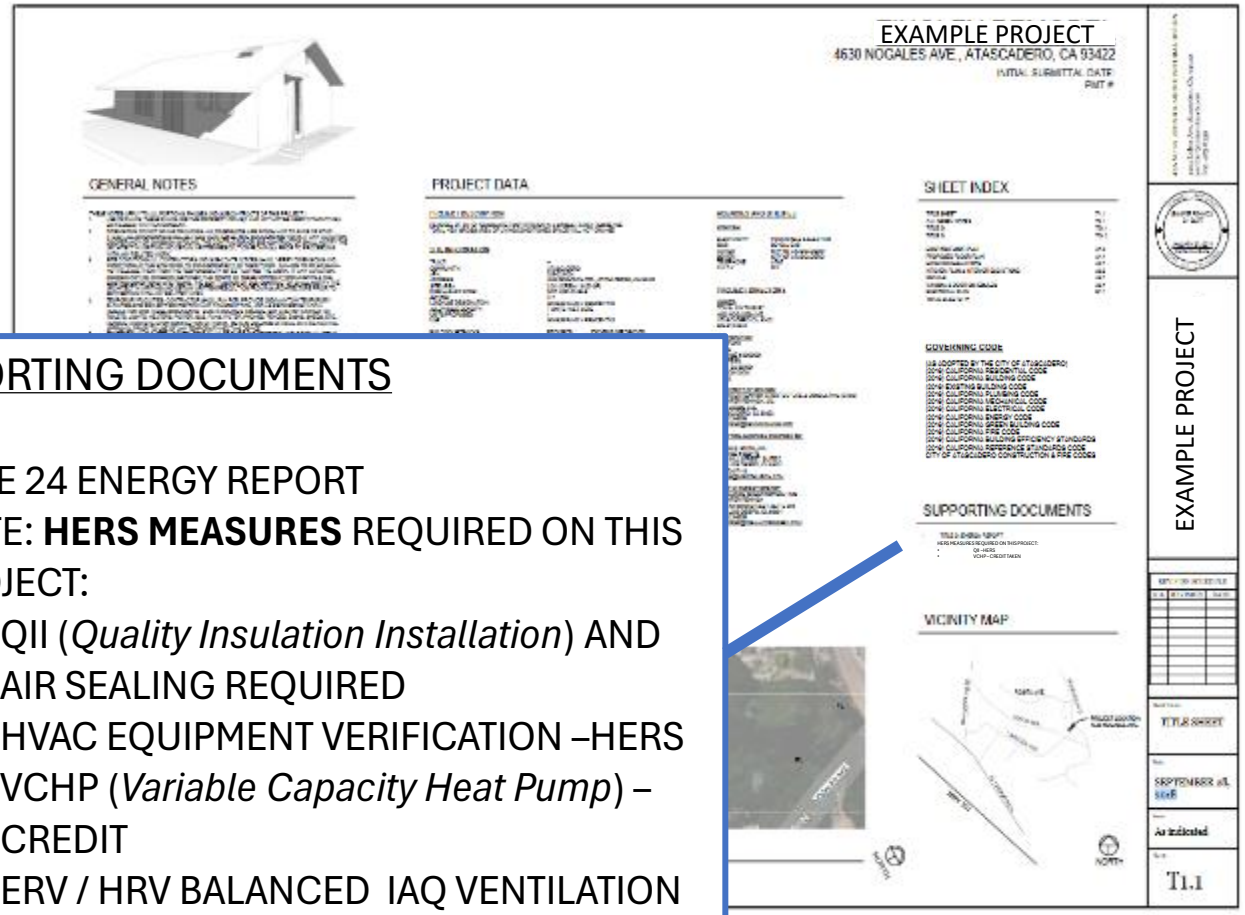
HERS FEATURE SUMMARY
The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry
• Quality insulation installation (QII) • Indoor air quality ventilation • Kitchen range hood • Verified EER/EER2 • Verified SEER/SEER2 • Verified Refrigerant Charge • Airflow in habitable rooms (SC3.1.4.1.7) • Verified HSPF2 • Verified heat pump rated heating capacity • Wall-mounted thermostat in zones greater than 150 ft2 (SC3.4.5) • Ductless indoor units located entirely in conditioned space (SC3.1.4.1.8)

Consider Including Key Energy Measures on the Cover Sheet

If a project design includes HERS measures (See CF1R or LMCC) consider calling that out on the Cover Sheet, suggested locations:

- ‘Code Summary’
- ‘Code Analysis’
- ‘Supporting Documents’
- ‘HERS Summary’

Also, consider including additional notes from the sample CF2R’s that directly address insulation and air sealing details.

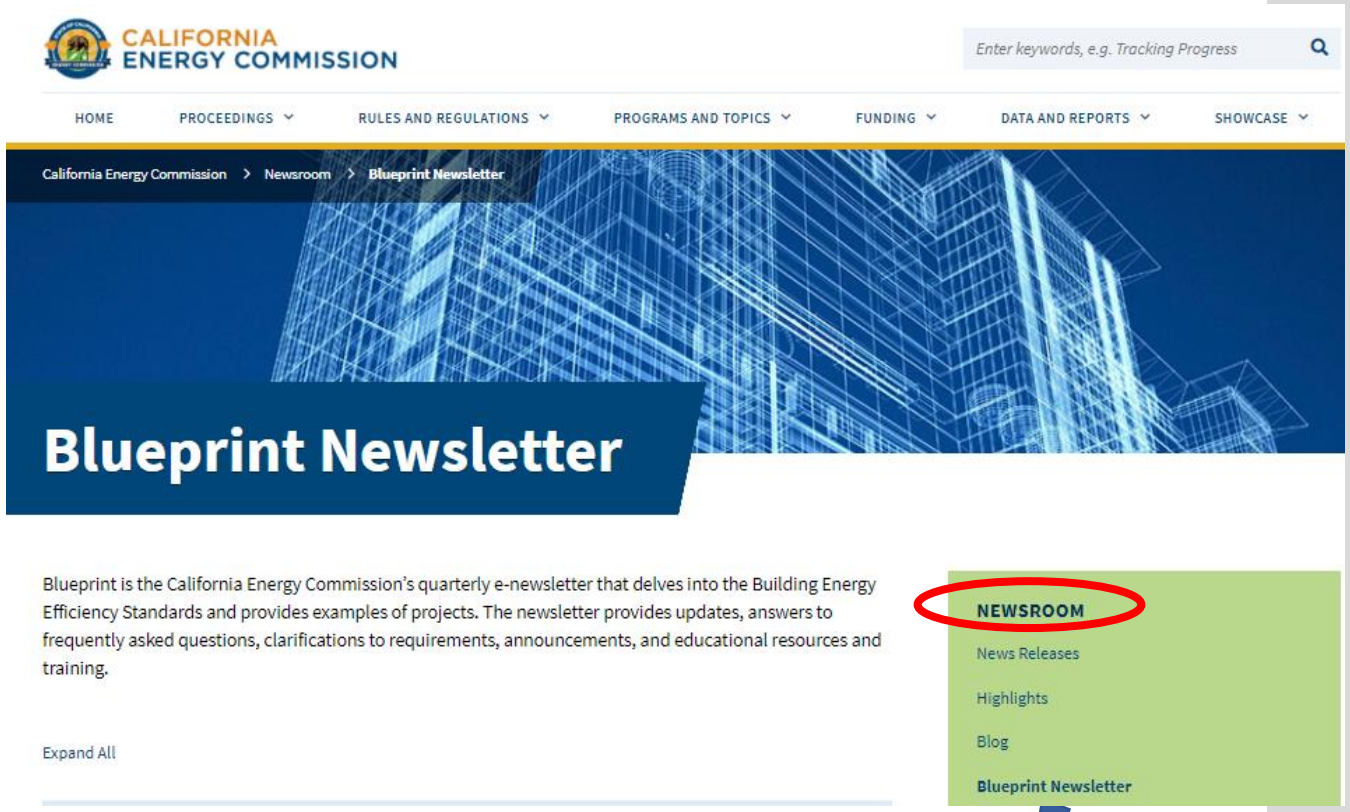


SUPPORTING DOCUMENTS

- TITLE 24 ENERGY REPORT
- NOTE: **HERS MEASURES** REQUIRED ON THIS PROJECT:
  - QII (*Quality Insulation Installation*) AND AIR SEALING REQUIRED
  - HVAC EQUIPMENT VERIFICATION –HERS VCHP (*Variable Capacity Heat Pump*) – CREDIT
  - ERV / HRV BALANCED IAQ VENTILATION –HERS CREDIT

More from the CEC... Energy.ca.gov

(https://www.energy.ca.gov/newsroom/blueprint-newsletter)

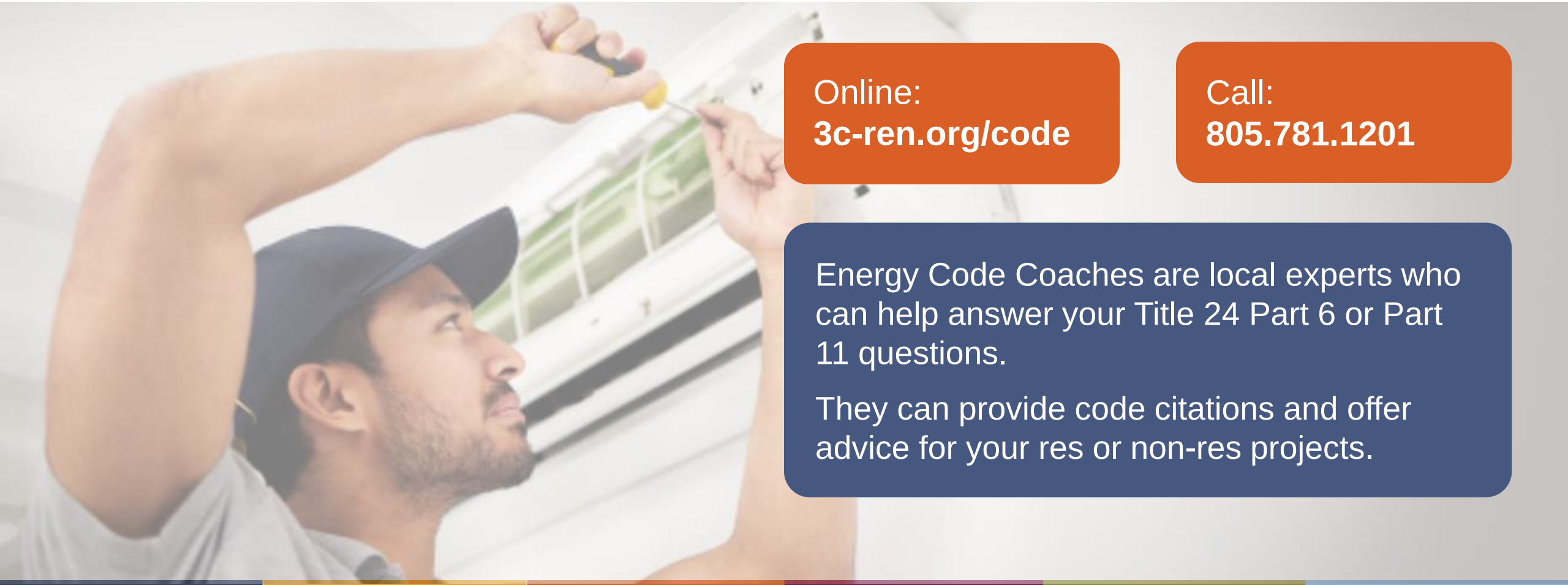


- Published quarterly
- Short –quick read with packed info
- Common Q and A for code enforcement /interpretations
- Offers clarifications on code issues
- Keeps readers up to date on latest code concerns

https://www.energy.ca.gov/newsroom/blueprint-newsletter

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 Implementation Series:

- July 23 - Multifamily
- On-demand: Single Family
- On demand: Nonresidential
- On-demand: Single Family Additions and Alterations

Upcoming Courses:

- June 26 - Mechanical Systems in Detail
- June 27 – Ask the Experts: Heat Pump Water Heater Installations

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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