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

2025 Energy Code in Practice: Multifamily Residential

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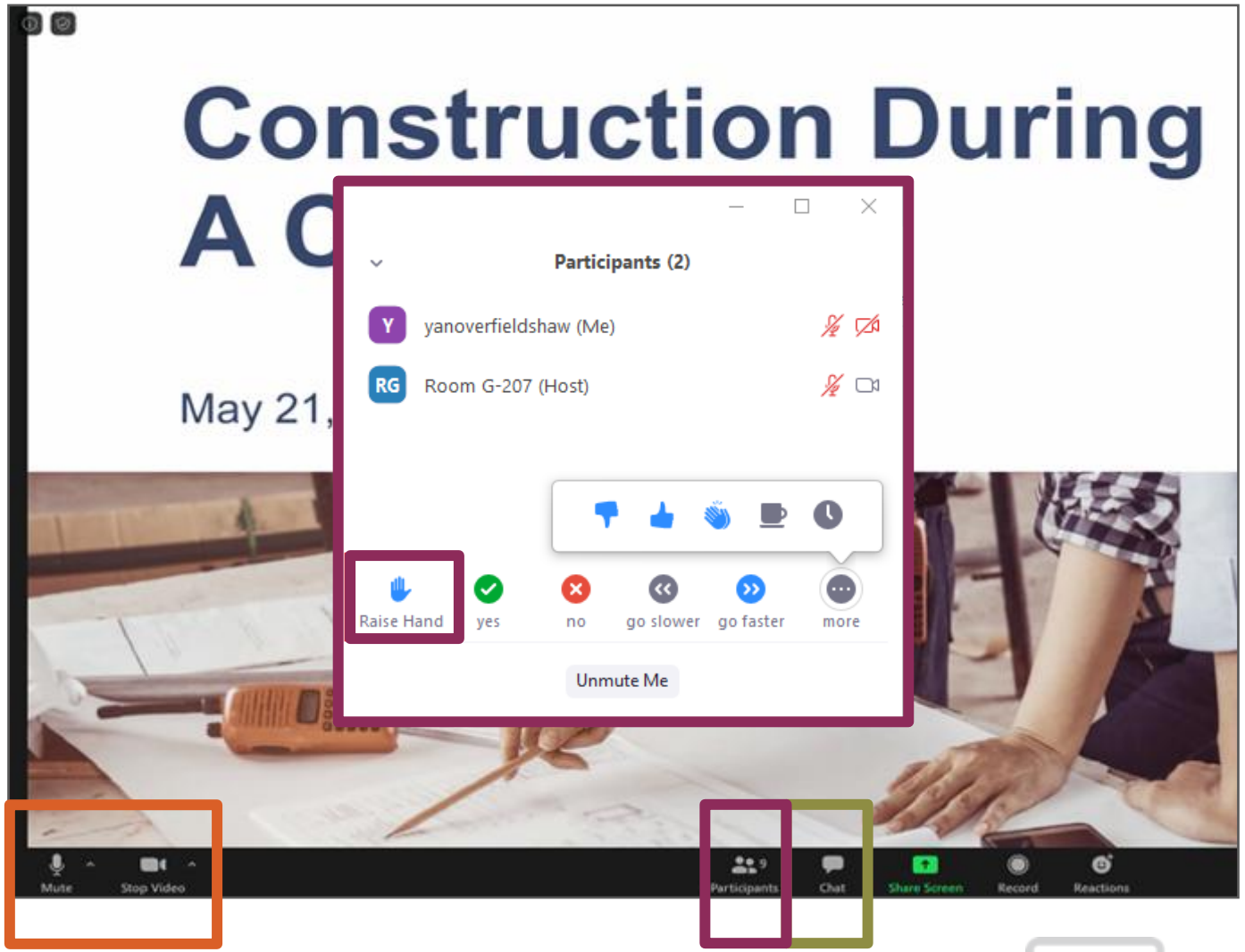
In Balance Green Consulting

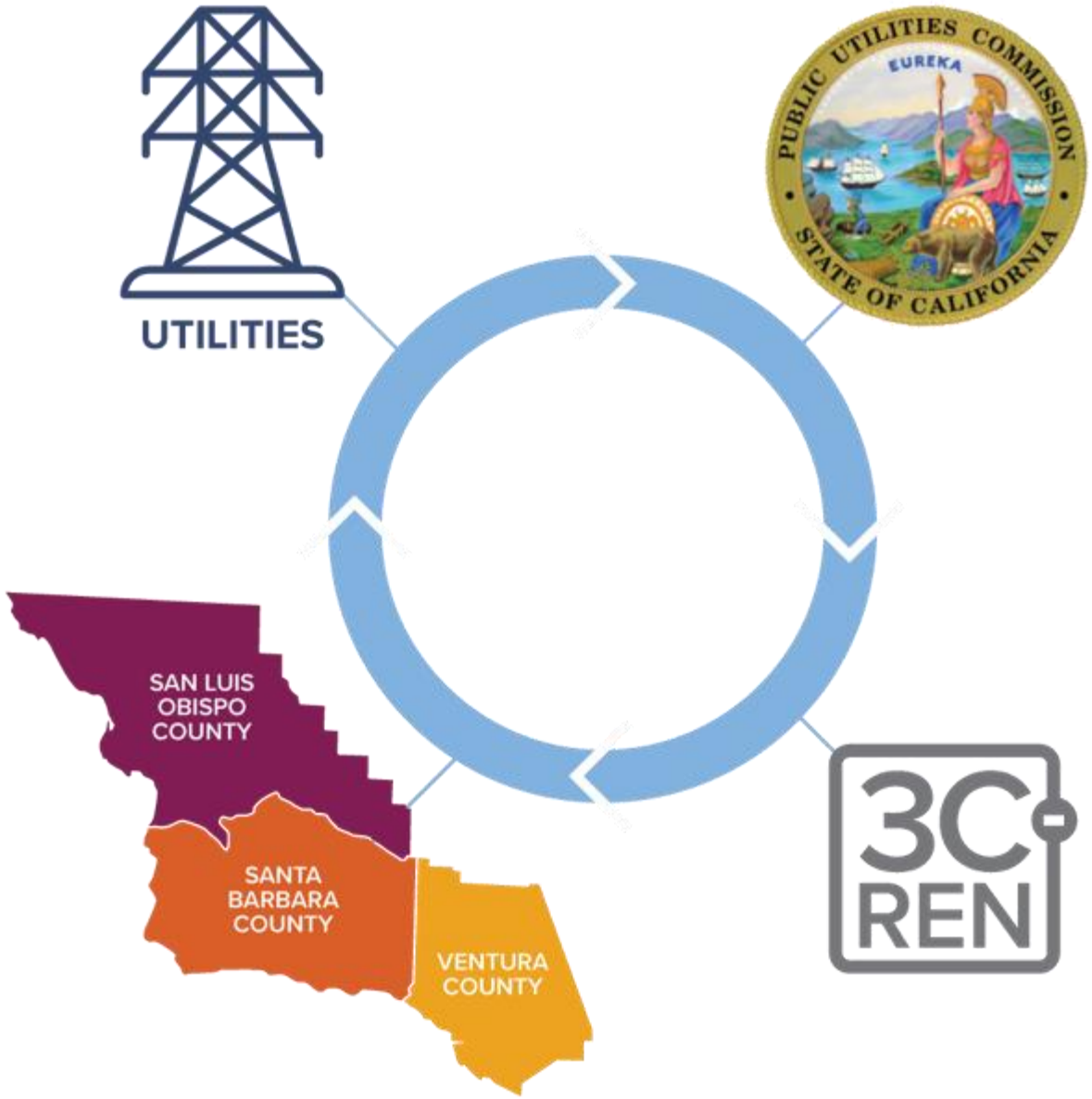
May 13, 2026

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

HOME ENERGY SAVINGS

3c-ren.org/for-residents
3c-ren.org/multifamily

COMMERCIAL ENERGY SAVINGS

3c-ren.org/commercial

Contractors can enroll at
3c-ren.org/contractors

Training

BUILDING PERFORMANCE TRAINING

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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.

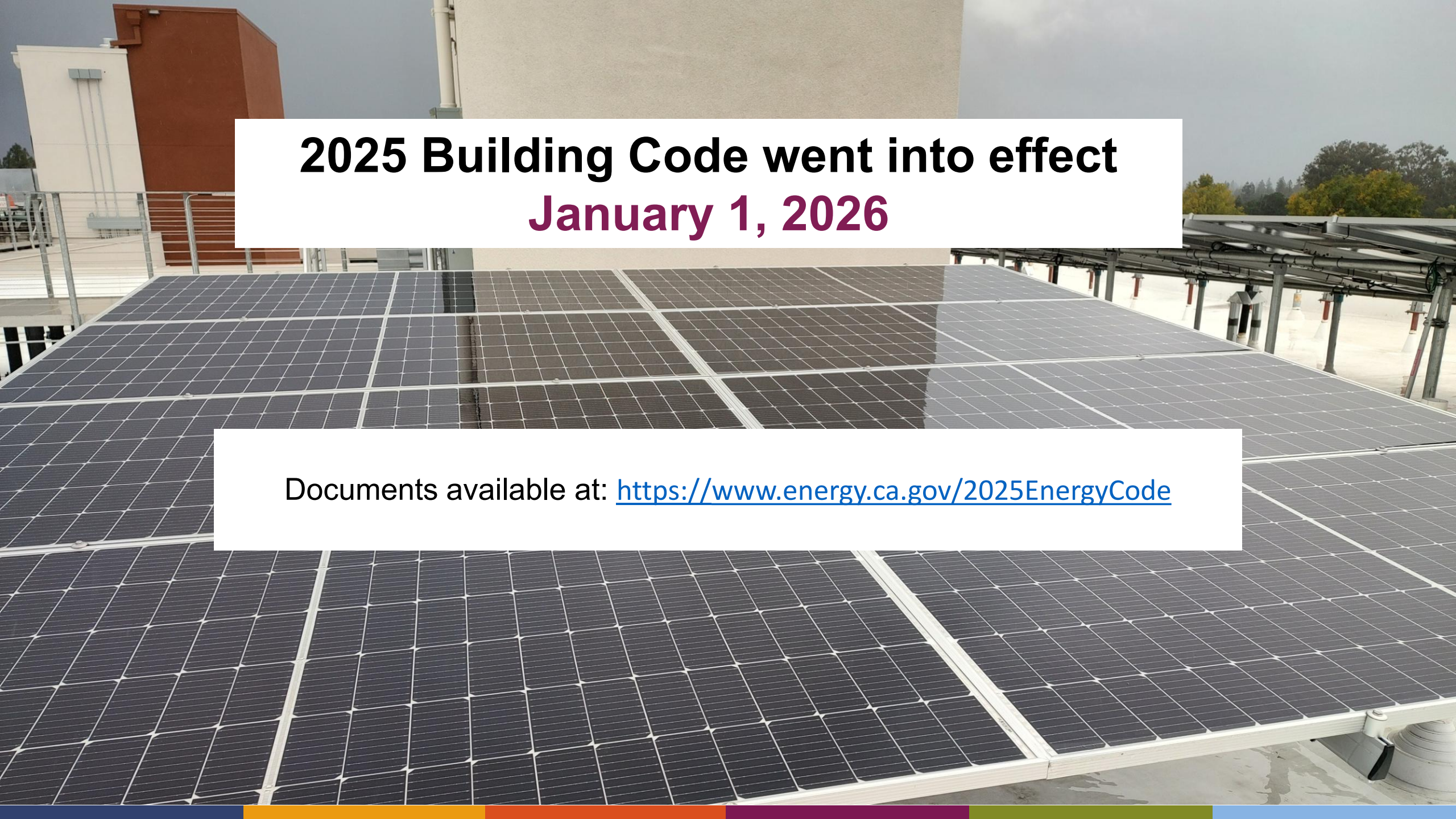
Learning Units:

- 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. Energy Code –Overview and 2025 Updates
2. Mandatory Measures: All Occupancies – Service Water Heating
3. Mandatory Measures: Multifamily – Envelope, Ventilation, Water Heating, and Electric Ready
4. Prescriptive Measures: Envelope, Ventilation, Water Heating, PV and BESS

Energy Code Overview and 2025 Updates



2025 Building Code went into effect

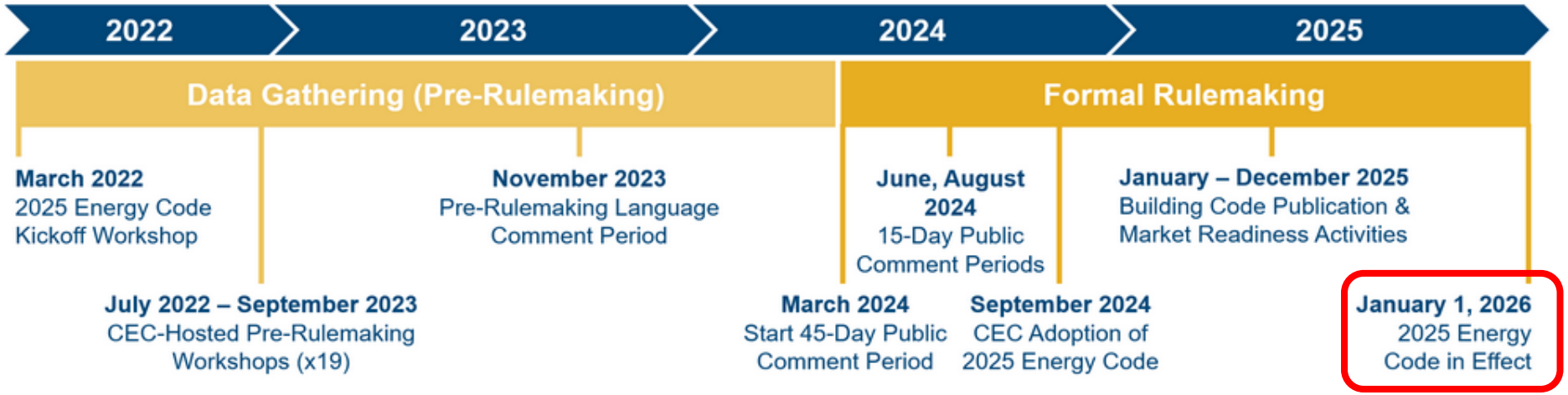
January 1, 2026

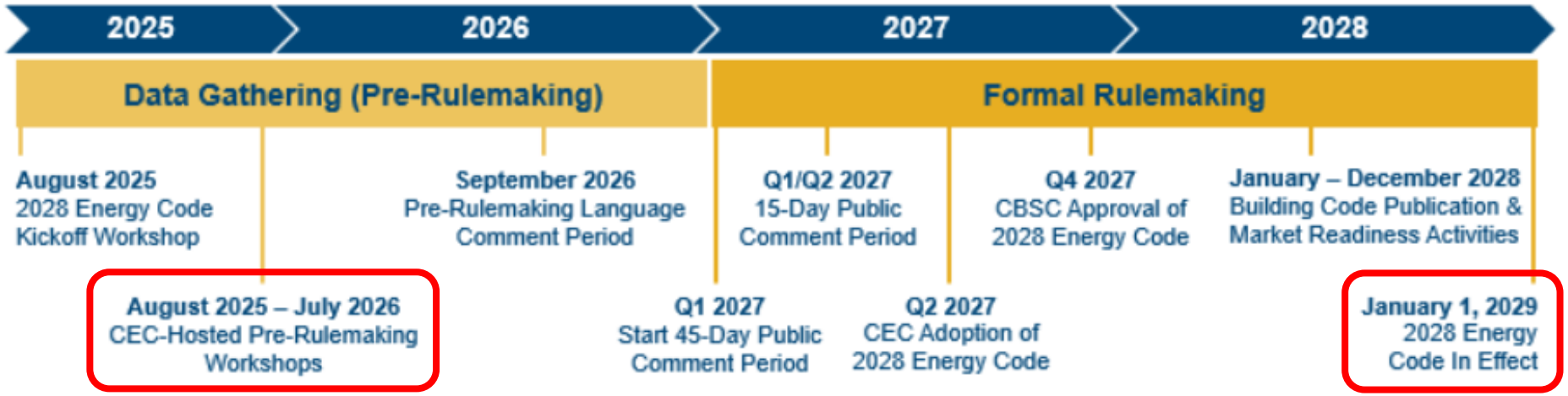
Documents available at: https://www.energy.ca.gov/2025EnergyCode

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 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*

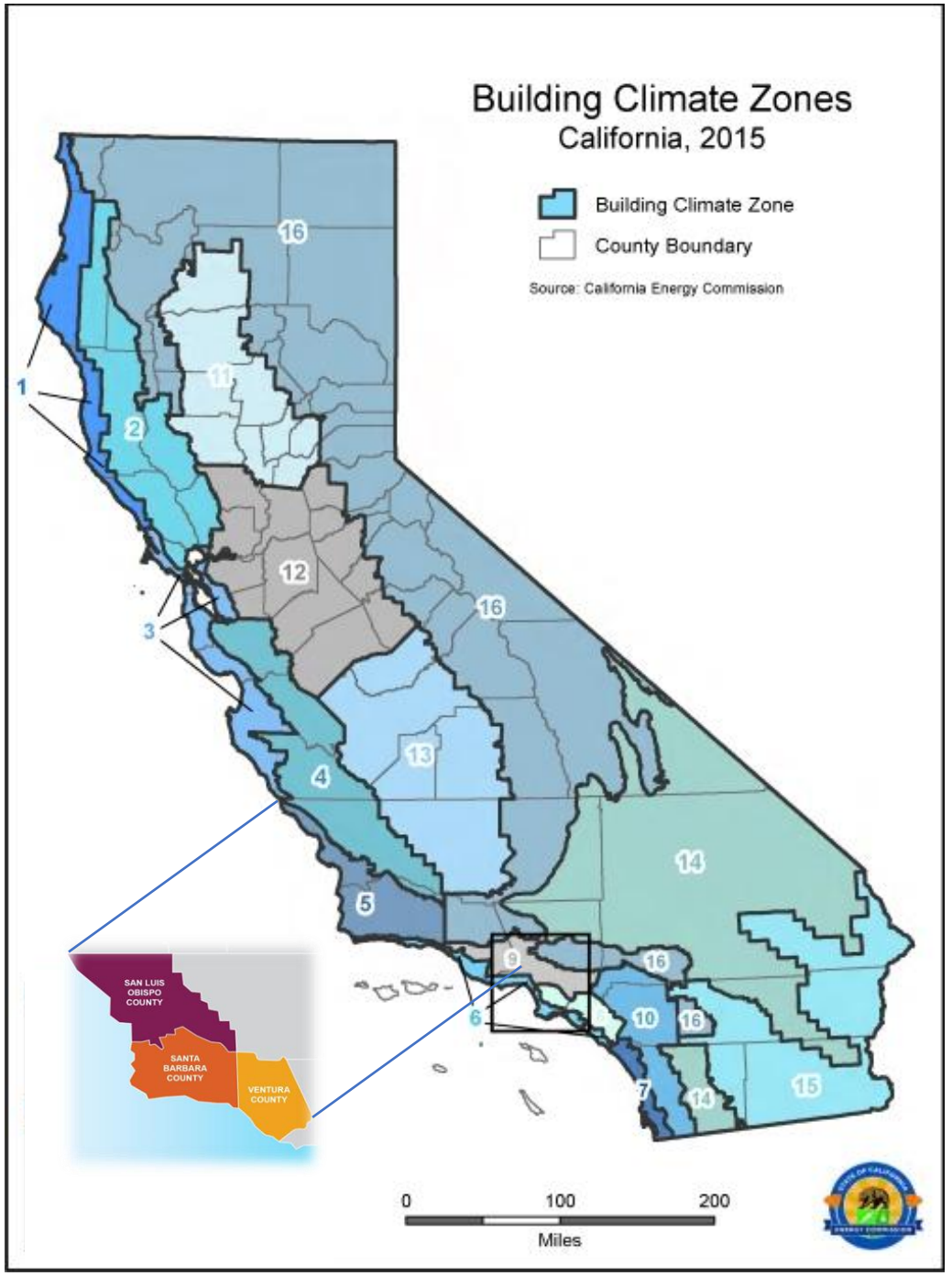
Focus on 3C-REN Tri-County Region

San Luis Obispo, Santa Barbara, and Ventura

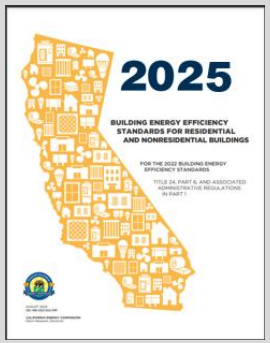
CZ's: 4, 5, 6, 9, and 16

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

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



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)

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

Single Family, Duplex and Townhomes

Multifamily Res

Subchapter 10 – Multifamily Residential Mandatory Measures

Sec 160.0-160.9

Subchapter 11 – Performance and Prescriptive [*New Construction*]

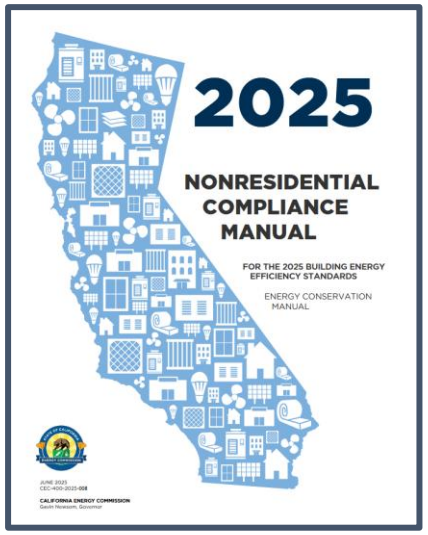
Sec 170.0-170.2

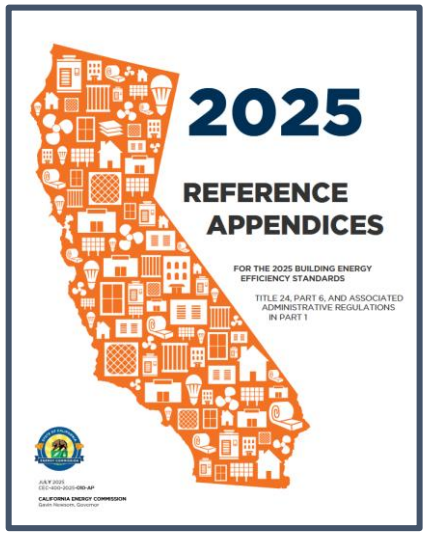
Subchapter 12 – Additions and Alterations

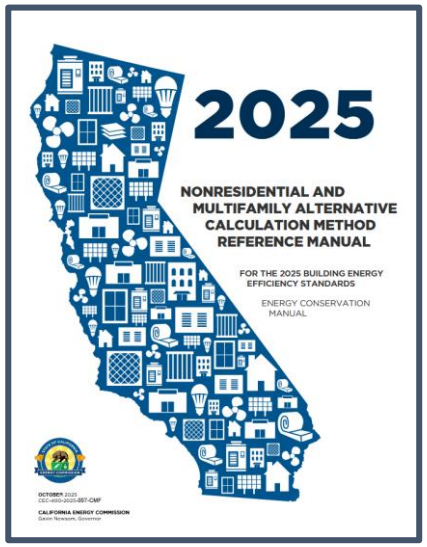
Sec 180.0-180.4

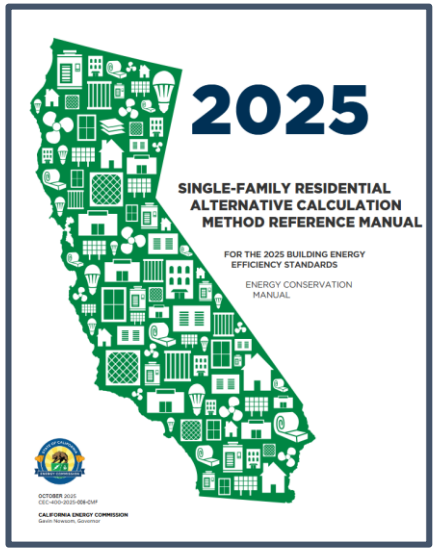
Dwelling Units and Common Use Areas

Title 24 Part 6, 2025 Standards and Manuals









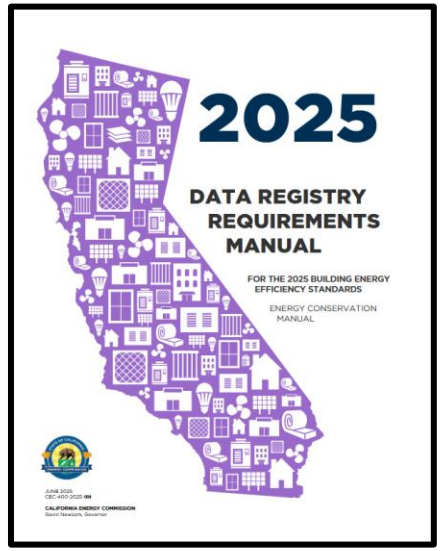


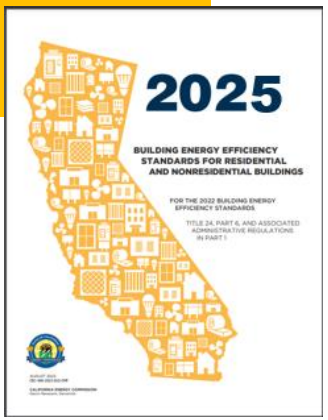
TABLE 100.0-A Application of Standards

TABLE 100.0-A APPLICATION OF STANDARDS (continued)

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions Alterations
Multifamily	General	160.0	170.2	170.1	180.0
Multifamily	Envelope (conditioned)	110.6, 110.7, 110.8, 160.1	170.1(a)	170.1	180.0
Multifamily	Ventilation and Indoor Air Quality	160.2	N.A.	170.1	180.0
Multifamily	HVAC (conditioned)	110.2, 110.5, 160.3	170.2(c)	170.1	180.0
Multifamily	Water Heating	110.3, 160.4	170.2(d)	170.1	180.0
Multifamily	Indoor Lighting	110.9, 160.5	170.2(e)	170.1	180.0
Multifamily	Outdoor Lighting	110.9, 160.5	170.2(e)	170.1	180.0
Multifamily	Electrical Power Distribution	110.11, 160.6	N.A.	N.A.	180.0
Multifamily	Pool and Spa Systems	110.4, 110.5, 160.7	N.A.	N.A.	180.0
Multifamily	Solar Ready Buildings	110.10, 160.8	N.A.	N.A.	180.0
Multifamily	Electric Ready	160.9	N.A.	N.A.	N.A.
Multifamily	Solar PV and Battery Energy Storage Systems	N.A.	170.2(f), (g), (h)	170.1	N.A.

[1] Nonresidential and hotel/motel buildings that contain covered processes may conform to the applicable requirements of both occupancy types listed in this table.

Multifamily Excerpt



The Energy Code –Three Compliance Terms

Mandatory Requirements

Energy efficiency measures that are applicable to all projects.

Performance Method	**Prescriptive Component Package**
Mandatory Requirements are applicable	Mandatory Requirements are applicable
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)	Follow all the parts of the prescriptive package
	Note: used to determine the Standard Design Building
Energy modeling approach	Essentially a **checklist** approach

HERS —Gets a New Name

ECC 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: LMCI and LMCV, etc

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.

Process for Low-Rise Multifamily Permitting

2025 Update HERS ⟶ ECC

LMCC Compliance created and uploaded to ECC Registry

LMCI Installation completed and uploaded to ECC Registry

LMCV Verification completed and uploaded to ECC Registry

Building Official Confirms forms are uploaded and signed

ECC – Energy Code Compliance

CHEERS is the Provider organization for California Title 24 compliance. They are responsible for training and certifying ECC Raters, and supporting the California Energy Code ECC Registry.

New Metrics –Long-Term System Cost (LSC) and Source

C1. COMPLIANCE SUMMARY			
COMPLIES*			
	Long-term System Cost (LSC)[1]		Source Energy Use
	Efficiency[2] ($/ft²-yr)	Total[3] ($/ft²-yr)	Total[3] (kBtu/ft²-yr)
Standard Design	30.06	18.81	13.38
Proposed Design	27.76	18.25	13.28
Compliance Margins	**2.3**	**0.56**	**0.1**
	Pass	**Pass**	**Pass**

[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 efficiency improvements such as better building envelope and more efficient mechanical equipment*

[3] *Compliance Totals include efficiency, photovoltaics and batteries*

* *New Construction: Building complies when Proposed Design is equal to or less than Standard Design in all compliance categories and unmet load hour limits are not exceeded. Complete Addition Scope and Existing, Addition and Alteration Scope: Building complies when efficiency compliance margin is greater than or equal to zero and unmet load hour limits are not exceeded.*

Excerpt from Compliance Report

E1. ECC FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified ECC Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered LMCIs and LMCVs are required to be completed in the ECC Registry.

Building-level Verifications:
- Indoor air quality ventilation
- Kitchen range hood

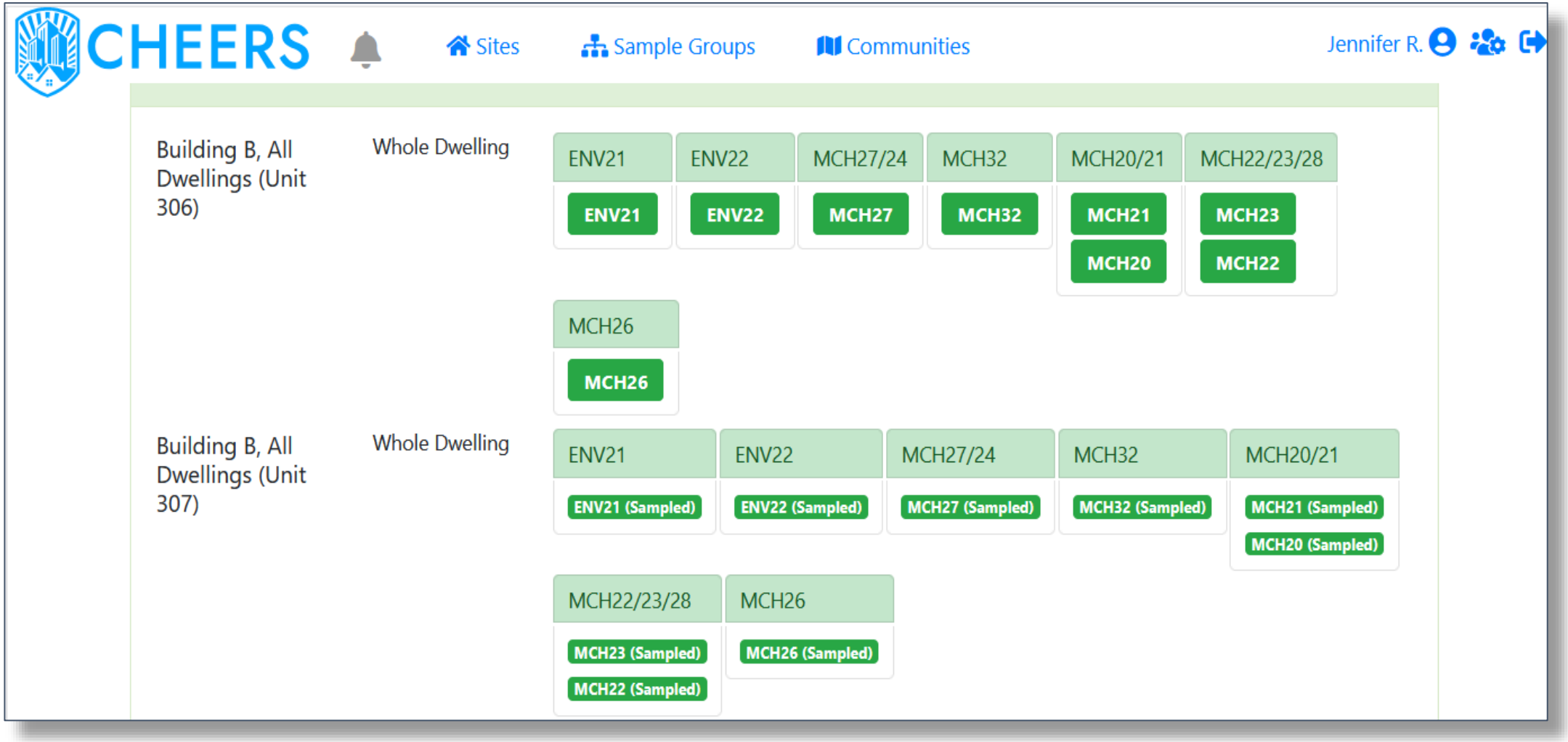
Cooling System Verifications:
- Minimum Airflow
- Verified EER
- Verified SEER
- Fan Efficacy Watts/CFM

Heating System Verifications:
- Verified HSPF
- Verified heat pump rated heating capacity

HVAC Distribution System Verifications:
- Duct leakage testing
- Ducts located entirely in conditioned space confirmed by duct leakage testing

Domestic Hot Water System Verifications:
- -- None --

Example Multifamily Project – CHEERS Registry



Mandatory Measures: All Occupancies

Service Water Heating

Heat Pump Water Heater Types Defined

WATER HEATER definitions include the following:

- **CONSUMER WATER HEATER** is a water heater that meets the definition of a consumer product under USDOE 10 CFR 430.
- **HEAT PUMP WATER HEATER (HPWH)** is a water heater that transfers thermal energy from one temperature level to another temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function.
    - **INTEGRATED** HEAT PUMP WATER HEATER is a HPWH which has all components, including fans, storage tanks, pumps, or controls necessary for the device to perform its function contained in a single factory-made assembly.
    - **SPLIT-REFRIGERANT** HEAT PUMP WATER HEATER is a HPWH which has a single outdoor section and one or more indoor sections connected to the outdoor section via a refrigerant circuit.
    - **SPLIT-HYDRONIC** HEAT PUMP WATER HEATER is a HPWH that consists of multiple separate sections. One section houses all the refrigerant components, while one or more additional sections are designated for water storage. These sections are interconnected through a hydronic circuit.
- **MULTI-PASS** WATER HEATER is a water heater which the cold water passes through multiple times. The water temperature increases with each pass, until the storage tank reaches the intended storage temperature.
- **SINGLE-PASS** WATER HEATER is a water heater which the cold water passes through once and is heated to the intended use temperature.

Integrated

A. O. Smith - Residential

AO Smith –Small Commercial

Aegis A -- Lync by Watts Large-Scale Commercial

Sanden – Multifamily – Grouped or Single Split System

Lochinvar Commercial Scale

Nyle –Industrial or Large Central Systems

3C REN

Many Brands of HPWHs are Available

Example of Split-Hydronic Heat Pump Water Heater System

Project: Harry's House – Santa Barbara County

New Mandatory Requirements for HPWH Installations

Section 110.3 Service Hot Water

110.3 (c) Installation:

1. Outlet temperature controls
2. Control for hot water distribution systems
3. Insulation
4. Water heating recirculation loops serving multiple dwelling units
5. Service water heaters in state buildings
6. Isolation valves
7. Air-Source Heat Pump Water Heaters (HPWHs)

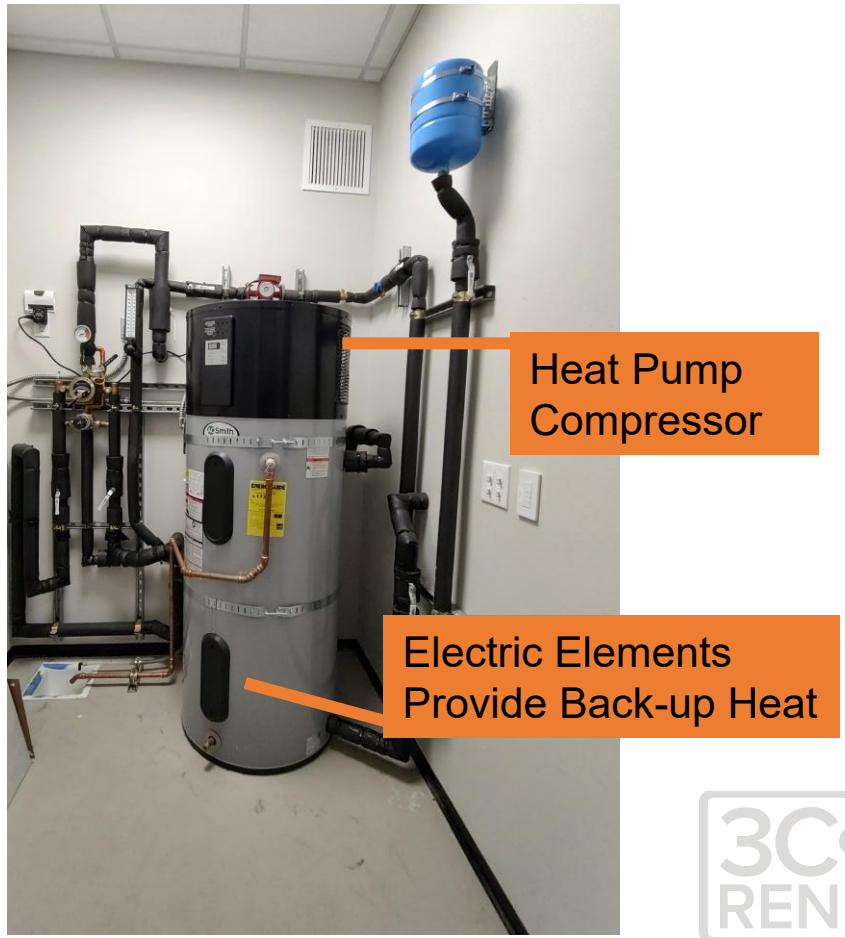
New Mandatory Requirements for HPWH

7. Air-Source Heat Pump Water Heaters (HPWHs). HPWH shall meet the following requirements:

A. Backup Heat. Backup heat is required for systems when inlet air is unconditioned, unless the compressor cut-off temperature is below the Heating Winter Median of Extremes for the closest location listed in Table 2-3 from Reference Joint Appendix JA2. Backup heat may be internal or external to the HPWH.

B. Ventilation. Consumer integrated HPWHs shall meet one of the ventilation requirements below. Minimum volume and opening size requirements shall be the sum of all HPWHs installed within the same space. Compressor capacity shall be determined using AHRI 540 Table 4 reference conditions for refrigeration with the “High” rating test point:

1. **Installed using a method provided by the manufacturer** to meet or exceed the level of performance provided by the ventilation requirements of Section 110.3(c)7B2 through Section 110.3(c)B4.



New Mandatory Requirements for HPWH *no Ducts*

2. For HPWH installation without ducts, the installation space shall have a 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 for this method; or

3. For HPWH installation without ducts, the installation space shall be vented to a communicating space via permanent openings, according to the following requirements:

i. Communicating space shall meet the minimum volume of section 110.3(c)7B2 above, minus the volume of the HPWH installation space; and

ii. Permanent openings shall consist of a single layer of fixed flat slat louvers or grilles, with a total minimum **Net Free Area (NFA)** the larger of 125 square inches plus 25 square inches per kBtu per hour of compressor capacity, or the minimum provided by the manufacturer for this method. The permanent openings shall be fully louvered doors or two openings of equal area, one in the upper half of the enclosure and one in the bottom half of the enclosure. The top of the upper opening must be 12 inches or less from the enclosure top and the bottom of the lower vent must be 12 inches or less from the enclosure bottom; or

Note:
4200 Btu/h or 4.2 kBtu/h compressor capacity is common for many residential units, i.e. 40-80 gal.

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

New Mandatory Requirements for HPWH *with Ducts*

4. **For HPWH installations with ducts**, the following requirements shall be met:

   i. The space joined to the installation space via ducts shall meet the minimum volume of section 110.3(c)7B2 above, minus the volume of the HPWH installation space; and

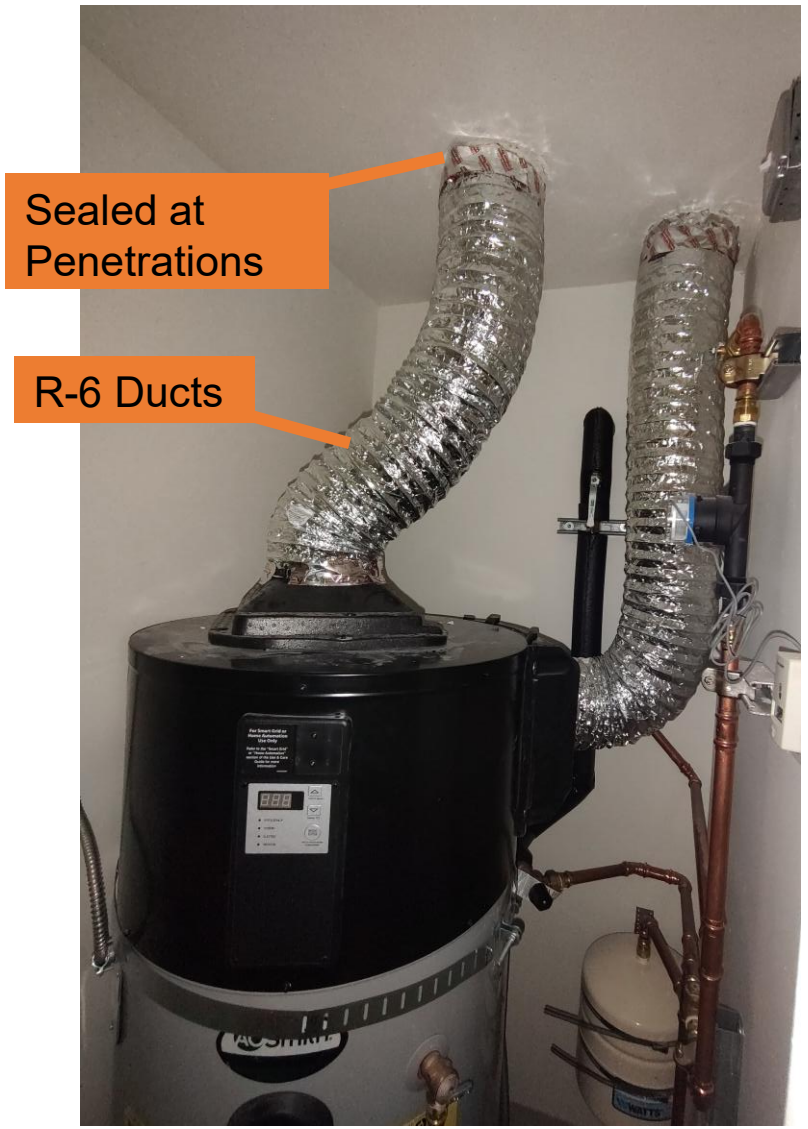
   ii. All duct connections and building penetrations shall be sealed; and

   iii. Exhaust air ducts and all ducts which cross pressure boundaries shall be insulated to minimum of R-6; and

   iv. Where only the HPWH inlet or outlet is ducted, installation space shall include permanent openings which consist of a single layer of fixed flat slat louvers or grilles in the bottom half of the room, and/or a door undercut. With a ducted inlet, the minimum NFA shall be equal to the cross-sectional area of the duct. With a ducted exhaust, the minimum NFA shall be the larger of 20 square inches or the minimum NFA provided by the manufacturer for this method; and

   v. Where the inlet and outlet ducts both terminate within the same pressure boundary, airflow from the termination points shall be diverted away from each other;

Note: Ducting only the inlet or the exhaust across the pressure boundary could interfere with balanced ventilation systems. This should be considered when specifying HPWH location and ventilation method.



Mandatory Measures: Multifamily

Envelope, Ventilation, Water Heating, and Electric Ready

Multifamily Section 160.0

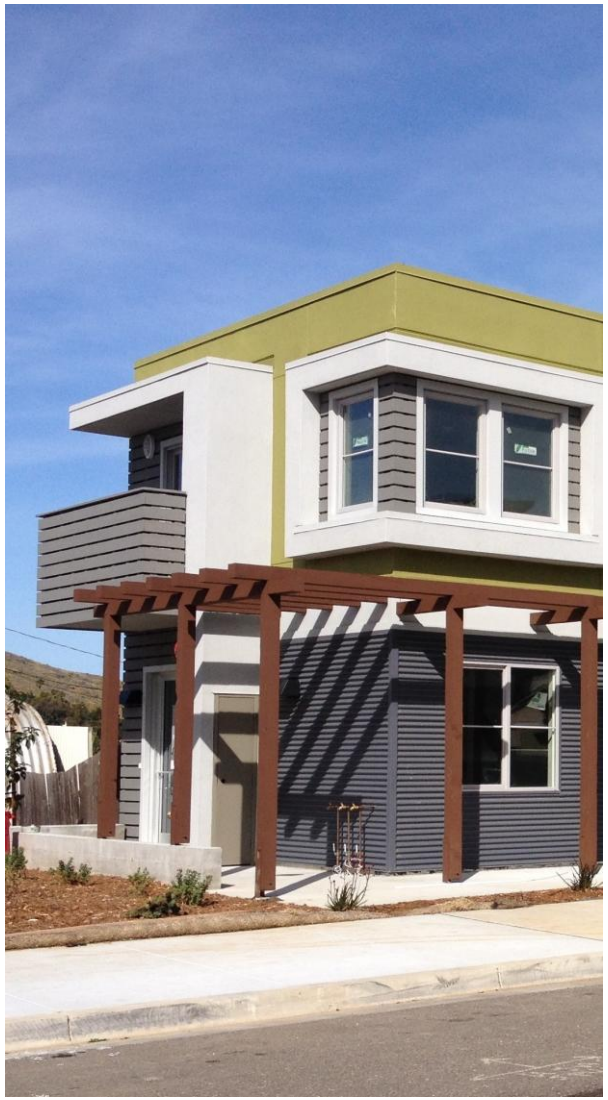
- Applies to new construction (but, is referenced for Additions and Alterations in Sec 180.0)
- Applies to dwellings units and common use areas in multifamily buildings.

Note:

- Nonresidential occupancies shall comply with Sections 120.0 through 141.1.

Section 160.0 Mandatory Requirements:

160.0 General Scope
160.1 Building Envelope
160.2 Ventilation and Indoor Air Quality
160.3 Space Conditioning Systems
160.4 Water Heating Systems
160.5 Lighting –Indoor and Outdoor
160.6 Electric Power Distribution Systems
160.7 Covered Process
160.8 Solar Ready Buildings
160.9 Electric Ready Buildings



New Window Exception for WUI

- U-0.58 continues to be the max U-factor allowable:
  - Exception: 0.5 % of the conditioned floor area
  - Exception: 30 sq ft per dwelling of dual-glazed greenhouse or garden windows
- Aligns with the new **Part 7** of Title 24

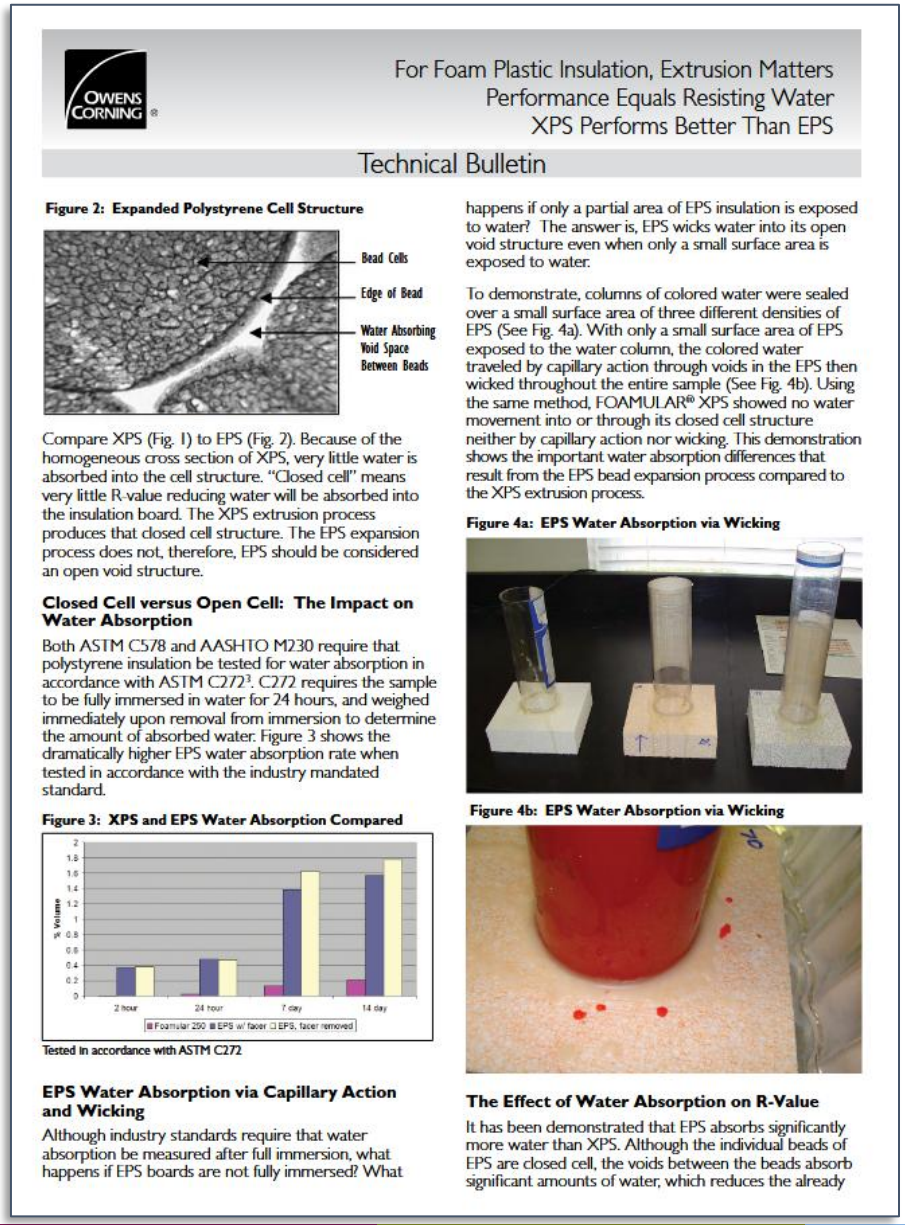
New Exception to Section 160.1(e):

Fenestration installed in buildings meeting Part 7 of the California Building Code, California Wildland-Urban Interface Code, where the building is located in *Fire Hazard Severity Zones or Wildland-Urban Interface* ***(WUI)*** *Fire Areas* as designated by the local enforcement agency.

New 2025 Item Under 160.1

(g) Slab edge Insulation. Slab edge insulation shall meet the following minimum specifications:

1. Insulation material alone without the facing shall have a water absorption rate no greater than 0.3 percent when tested in accordance with ASTM C272, Test Method A – 24-Hour-Immersion; and
2. Water vapor permeance no greater than 2.0 perm/inch when tested in accordance with ASTM C272; and
3. Concrete slab perimeter insulation shall be protected from physical damage and ultraviolet light deterioration; and
4. Insulation for a heated slab floor shall meet the requirements of Section 110.8(g).



OWENS CORNING

For Foam Plastic Insulation, Extrusion Matters
Performance Equals Resisting Water
XPS Performs Better Than EPS

Technical Bulletin

Figure 2: Expanded Polystyrene Cell Structure

Compare XPS (Fig. 1) to EPS (Fig. 2). Because of the homogeneous cross section of XPS, very little water is absorbed into the cell structure. "Closed cell" means very little R-value reducing water will be absorbed into the insulation board. The XPS extrusion process produces that closed cell structure. The EPS expansion process does not, therefore, EPS should be considered an open void structure.

Closed Cell versus Open Cell: The Impact on Water Absorption

Both ASTM C578 and AASHTO M230 require that polystyrene insulation be tested for water absorption in accordance with ASTM C272[3]. C272 requires the sample to be fully immersed in water for 24 hours, and weighed immediately upon removal from immersion to determine the amount of absorbed water. Figure 3 shows the dramatically higher EPS water absorption rate when tested in accordance with the industry mandated standard.

Figure 3: XPS and EPS Water Absorption Compared

Tested in accordance with ASTM C272

EPS Water Absorption via Capillary Action and Wicking

Although industry standards require that water absorption be measured after full immersion, what happens if EPS boards are not fully immersed? What happens if only a partial area of EPS insulation is exposed to water? The answer is, EPS wicks water into its open void structure even when only a small surface area is exposed to water.

To demonstrate, columns of colored water were sealed over a small surface area of three different densities of EPS (See Fig. 4a). With only a small surface area of EPS exposed to the water column, the colored water traveled by capillary action through voids in the EPS then wicked throughout the entire sample (See Fig. 4b). Using the same method, FOAMULAR® XPS showed no water movement into or through its closed cell structure neither by capillary action nor wicking. This demonstration shows the important water absorption differences that result from the EPS bead expansion process compared to the XPS extrusion process.

Figure 4a: EPS Water Absorption via Wicking

Figure 4b: EPS Water Absorption via Wicking

The Effect of Water Absorption on R-Value

It has been demonstrated that EPS absorbs significantly more water than XPS. Although the individual beads of EPS are closed cell, the voids between the beads absorb significant amounts of water, which reduces the already

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Ventilation and Indoor Air Quality (IAQ)

Part (a) General Requirements

- Attached **dwellings** units –follows **Residential** Code
- ECC field verification and diagnostic testing for **three habitable stories or less** –See **Residential** Appendices

- Occupiable spaces **other than** attached dwelling units –follows **Non-Res** Code
- ECC field verifications for buildings with **four or more habitable stories** –See **Non-residential** Appendices NA1 and NA2.

Big Picture Change: The Multifamily Section addresses **both** the Residential and Non-Residential occupancies

- **Reminder**: Section 160.2 is **not applicable** to townhouses or dwellings that contain two dwelling units.
- **Reminder**: The outdoor air-ventilation rate and the air-distribution system design shall be **clearly identified on the building design plans**

Requirements for Ventilation and Indoor Air Quality (IAQ)

- Includes outside air (OA) ventilation and mechanical exhaust for bathrooms and kitchens
- Part (b) –ASHRAE 62.2 continues to be the basis for dwelling unit (residential) occupancies
- Part (c) –ASHRAE 62.1 continues to be the basis for common space (non-residential) occupancies

ECC/HERS Rater testing proper air flow with a flow hood.

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)

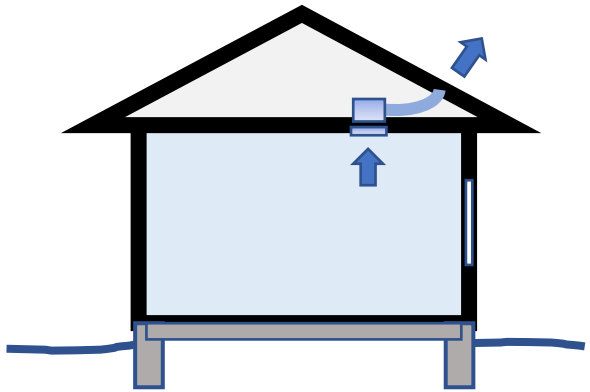
Required IAQ is based on the total required ventilation rate for the dwelling minus the calculated annually averaged infiltration rate.

This equation can be a good *estimate* for the required IAQ Ventilation.

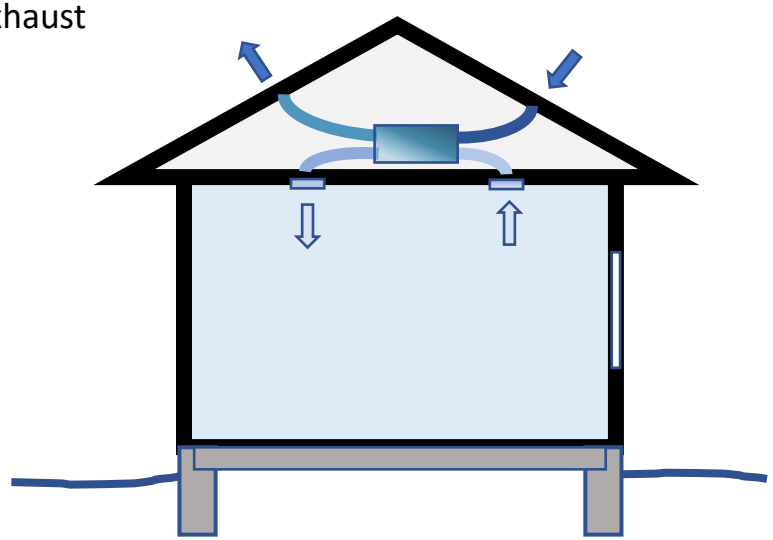
Mechanical Exhaust –Kitchens and Bathrooms

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 (Non-enclosed) Kitchens:** demand controls and meet min ventilation
- **Enclosed Kitchens and Bathrooms:** can use continuous ventilation systems that are part of ERV/HRV systems



Local Exhaust



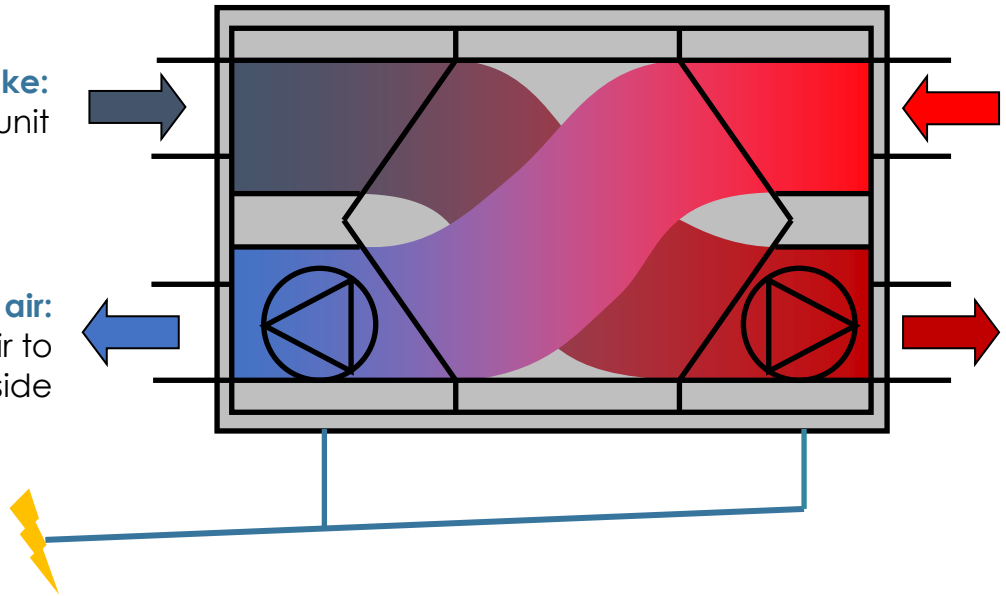
ERV/HRV Balanced Ventilation with **fan efficacy of ≤1.0 W/cfm**

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**."

Illustration of Energy / Heat Recovery Ventilation (ERV / HRV)

Outdoor air intake:
fresh air into unit

Exhaust / Extract air:
post-recovery air to outside



Exhaust / Extract air:
From inside conditioned space

Supply air (Outdoor air):
outside air into living rooms, offices, classrooms

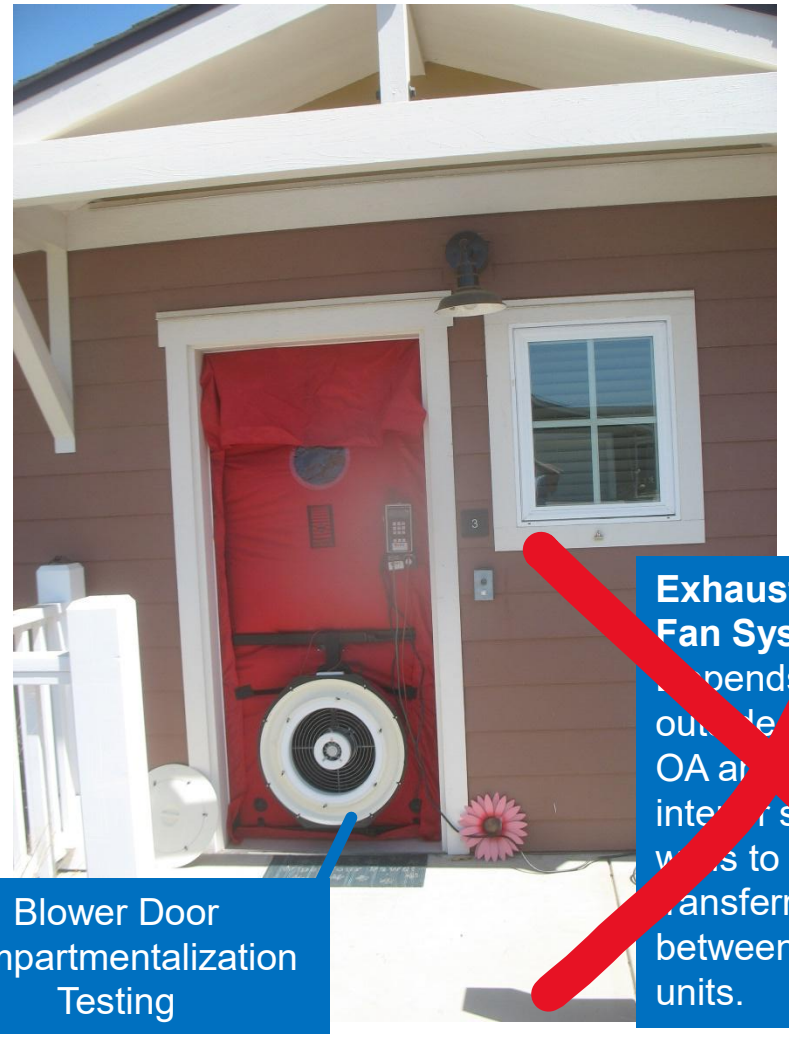
HRV –Heat Recovery Ventilator
ERV –Energy Recovery Ventilator

- Thin membrane, multi-channel pathway for the Outdoor/Supply air going in and the Exhaust/Extracted air going out
- The air pathways do not mix

Multifamily IAQ:
Balance Ventilation per Each Dwelling Unit vs Exhaust Fan only with Dwelling Unit Compartmentalization

Balanced Ventilation
ERV Provides Outside Air (OA)

VS



Blower Door Compartmentalization Testing

Exhaust Only Fan System: Depends on leaky outside walls for OA and unsealed interior spaces to eliminate transferred air between dwelling units.

2025 Update: Mechanical IAQ Ventilation

Outside air (OA) ventilation and testing:

- Balanced Ventilation, or
- Supply Only Ventilation,

and

- Compartmentalization Testing – ECC-Rater

Note:
For ***new construction,*** exhaust only IAQ ventilation is **no longer an option**.

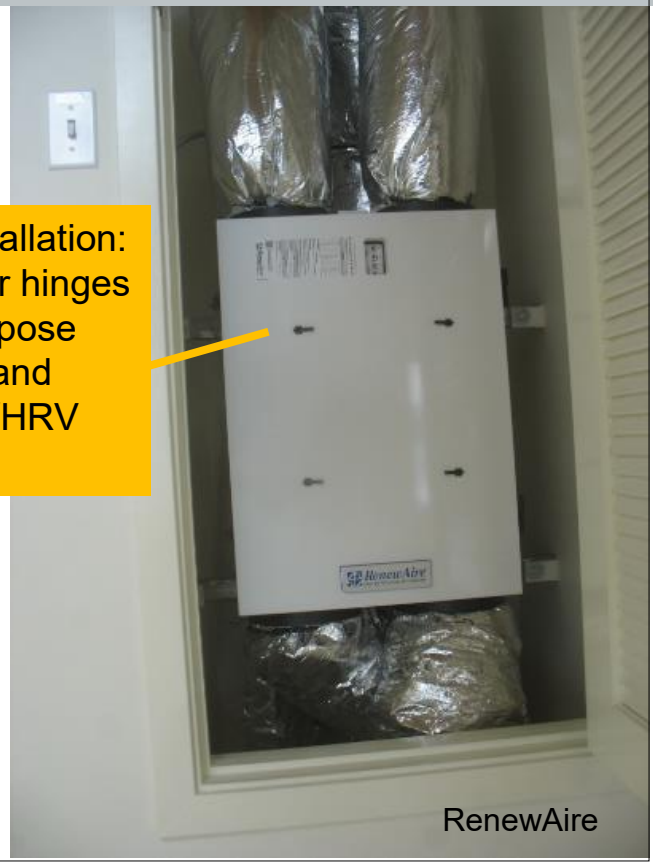
For **additions and alterations**, balanced, supply and **exhaust only** IAQ ventilation remains allowable. And compartmentalization testing is *not* triggered.

Compartmentalization Testing,
i.e. Blower Door Testing

Balanced Ventilation –Component Access

Accessible for Maintenance

Closet Installation: Front cover hinges open to expose Air Filters and Core ERV/HRV Filter



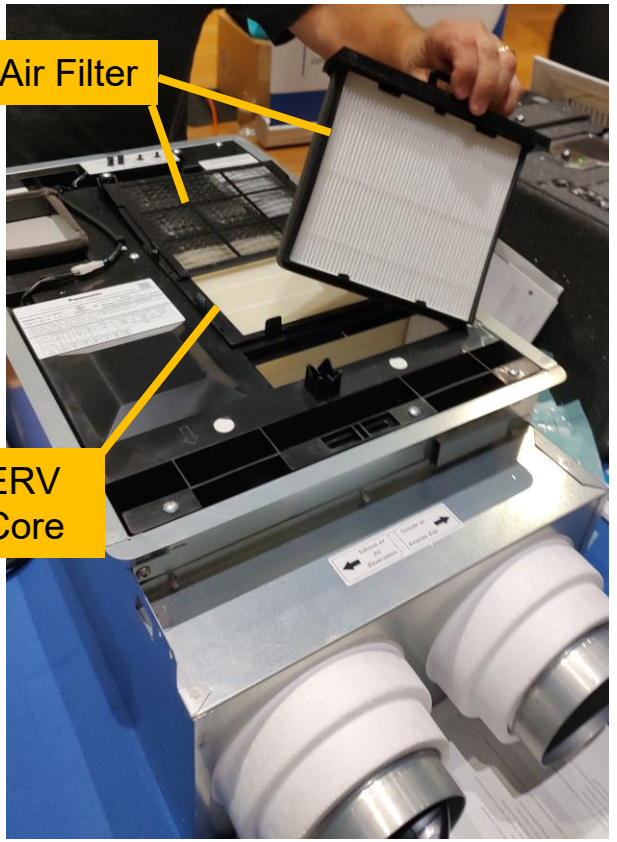
RenewAire

Fault Diagnostics

Fault Diagnostics

Fault Indicator Display (FID)

Broan AI Series



Panasonic ERV

2025 Update: Balance Ventilation

xi. **Balanced and supply ventilation component accessibility**. Balanced and supply ventilation systems shall meet the following requirements for accessibility:

a. **IAQ filter and HRV/ERV accessibility**. System air filters and HRV/ERV heat/energy recovery cores shall be located such that they are accessible for service from within occupiable spaces, basements, garages, balconies, mechanical closets or accessible rooftops. Filters and heat/energy recovery cores behind access panels, access doors, or grilles located no more than 10 feet above a walking surface inside a space specified above comply with this requirement.

Exception to Section 160.2(b)2Axia: Systems that require servicing from inside the attic shall have the following:

1. **Fault Indicator Display** (FID) meeting the requirements of Reference Appendix JA 17; and
2. **An attic access door** located in a wall or, where attic access is provided through a ceiling, an attic access hatch that includes an integrated ladder; and
3. **A walkway** from the attic access door to the HRV/ERV.

b. **IAQ system component accessibility**. Fans, motors, heat exchangers, filters and recovery cores shall meet all applicable requirements of California Mechanical Code 304.0 accessibility of service.

Indoor Air Quality Ventilation for Low-rise Multifamily LMCI-MCH-27-H

INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CALIFORNIA ENERGY COMMISSION

CEC-LMCI-MCH-27-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF INSTALLATION

Note: This table completed by ECC Registry.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

Title 24, Part 6, Section 160.2(b)2 **Ventilation and Indoor Air Quality for Attached Dwelling Units.** All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2022 Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified by Title 24, Part 6, Section 160.2(b)2A

A. Whole-Dwelling Mechanical Ventilation - General Information

01	Dwelling Unit Name	
02	Building Type	
03	Project Scope	
04	Total Conditioned Floor Area of Dwelling Unit (For addition projects the conditioned floor area equals existing area plus addition area)	
05	Number of Bedrooms in Dwelling Unit (For addition projects the number of bedrooms equals the existing bedrooms plus addition bedrooms)	
06	Ventilation System Type	
07	Ventilation Operation Schedule	
08	Fault Indicator Display (FID) Status	

B. 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 160.2(b)2Aiv

01	Total Required Ventilation rate, (Q_{tot})	

Multifamily Project

Hardworking ECC Rater

Forms are similar to Single Family. The LMCI forms are registered with CHEERS.

Indoor Air Quality Ventilation – High Rise Multifamily
NRCV-MCH-27-H

INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CALIFORNIA ENERGY COMMISSION

CEC-NRCV-MCH-27-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF VERIFICATION

Note: This table completed by ECC Registry.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

Title 24, Part 6, Section 160.2(b)2 ***Ventilation and Indoor Air Quality for Attached Dwelling Units.*** *All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2022 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings subject to the amendments specified by Title 24, Part 6, Section 160.2(b)2*

A. Whole-Dwelling Mechanical Ventilation - General Information

Note: Non-dwelling units do not meet the definition for a dwelling unit as defined in Section 100.1(b). Non-dwelling units are not designed to provide independent living facilities and do not provide permanent provisions for living, sleeping, eating, cooking and sanitation.

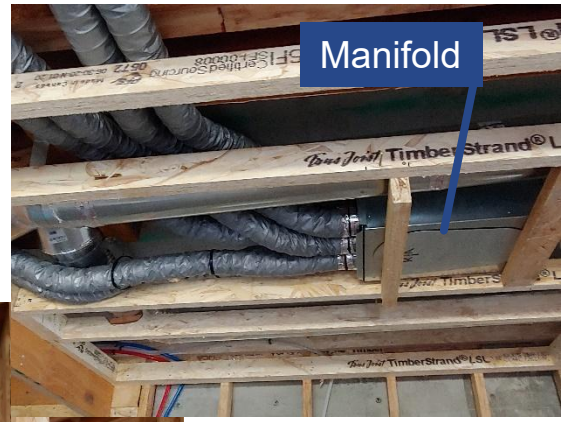
01	Dwelling Unit Name	
02	Building Type	
03	Project Scope	
04		
05		
06		
07		
08		

D. HRV or ERV serving Individual Dwelling Unit

- *Heat or Energy Recovery Systems must have a fan efficacy of ≤ 1.0 W/cfm in all climate zones (Section 160.2(b)2Biii).*
- *Heat or Energy Recovery Systems must prescriptively have a fan efficacy of ≤ 0.6 W/cfm and a minimum sensible heat recovery of 67% in climate zones 1, 2, 4 11-14 and 16 (Section 170.2(c)3Biva).*

01	02	03	04
Manufacturer Make	Manufacturer Model Number	Fan Efficacy Performance Rating (W/CFM)	Sensible Recovery Efficiency (%)

Duct System 'Home Runs' to the Heat Exchanger and Fan Unit



Heat Exchanger and Fan Unit

ERV / HRV Balanced Ventilation Example
ERV = Energy Recovery Ventilation
HRV = Heat Recovery Ventilation

High-Rise Dwellings – ATT IAQ Ventilation Testing NRCA-MCH-20c-H

Similar to Commercial Projects – '**Functional Testing**' of Systems is Required

See 'Intent' and Code References for more information

CALIFORNIA ENERGY COMMISSION **IAQ VENTILATION** 2025-CEC-NRCA-MCH-20c-H

Project Name and Address	**Authority Having Jurisdiction**
Name: Project Name	Enforcement Agency: Agency
Address: Project Address	Permit Number: Permit Number
City, Zip: City, Zip Code	Permit Application Date: Date

Building: Enter Value	Floor: Enter Value	Room: Enter Value	Control/tag: Value

☐ Construction inspection and functional testing comply ☐ Does not comply	Date Submitted to AHJ: Date

Intent:	• This form is completed only when NA1.9 Acceptance Test Technicians Alternative Procedure is used in accordance with Section 160.2(b)2Biv, where a certified ATT is allowed to perform the test that is typically performed by an ECC-Rater for multifamily buildings with four or more stories. • Submit one Certificate of Acceptance for each ventilation system installed to verify conformance with the requirements of the Energy Standards §160.2(b)2, Reference Nonresidential Appendices NA7.18.1.1 and NA2.2, and California Energy Commission adopted version of ANSI/ASHRAE Standard 62.2-2022. • NRCA-MCH-20a-H must be completed prior to beginning NRCA-MCH-20c-H. NRCA-MCH-21-H must be completed prior to beginning NRCA-MCH-20c-H.

Table B-1: Functional Testing – IAQ Ventilation System

Step	Entry	Functional Test	Code Reference
1	☐ Pass ☐ Fail ☐ N/A	If multiple fans are specified to operate simultaneously to provide the total required ventilation airflow, the measurements within this functional test must be made with all applicable fans operating simultaneously. Verify that all fans are operational. (Pass, Fail, N/A)	NA2.2.4.1

Use when an ATT (Acceptance Test Technician) is allowed to perform this test.

See Code References for more information

Domestic Hot Water Pipe Insulation

(e) Pipe Insulation

All piping for multifamily domestic hot water systems shall be insulated and meet the applicable requirements 1 through 3 below:

1. General Requirements.

A. The first 8 feet of inlet cold water piping from the storage tanks, including piping between a storage tank and a heat trap shall be insulated.

B. Insulation on the piping and domestic hot water system appurtenances shall be continuous.

C. Pipe supports, hangers, and pipe clamps shall be attached on the outside of rigid pipe insulation to prevent thermal bridges.

D. All pipe insulation seams shall be sealed.

E. Insulation for pipe elbows shall be mitered, preformed, or site fabricated with PVC covers.

F. Insulation for tees shall be notched, preformed, or site fabricated with PVC covers.

G. Extended stem isolation valves shall be installed.

H. All plumbing appurtenances on hot water piping from a heating source to heating plant…

etc.

Pipes Insulated… But there is room for improvement

Pipe Clamp should be installed over the pipe insulation to prevent thermal bridging

Joints should be sealed, taped, or covered

Electric Ready – 2025 Updates:

Section 160.9 Electric Ready Buildings:

(a) General Requirements

(b) Heat Pump Space Heating Ready

(c) Electric Cook Top Ready

(d) Electric Clothes Dryer Ready

(e) Individual Heat Pump Water Heater Ready

(f) Central Heat Pump Water Heater Ready

Note:

New Appendix JA15 –Qualification Requirements for Central Heat Pump Water Heater Ready

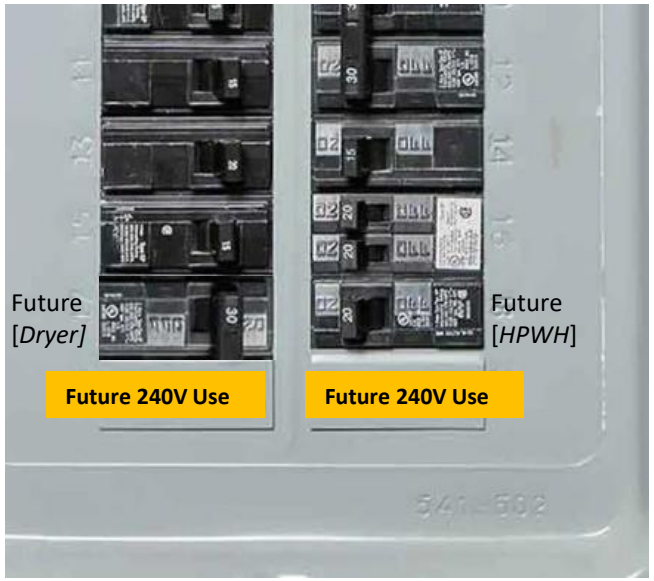
New Clarifying Language: Section (a) General Requirements:

- Building electrical system shall be sized to meet the future electric requirements of the electric ready equipment
- The following shall have sufficient capacity to supply full rated amperage at each electric ready appliance in accordance with the California Electrical Code:
  - Main service conduit,
  - Electrical system to the point specified in each subsection, and
  - Any on-site distribution transformers

Electric Ready …when installing gas appliances

- Furnaces: serving individual dwellings provide conductors rated at 240 volt/ 30 amp to within 3ft of the furnace for future heat pump installation- **160.9(b)**
- Cooktops: provide conductors rated at 240 volt/ 50 amp for future cooktop- **160.9(c)**
- Dryers –dwelling units: provide conductors rated at 240 volt/ 30 amp feed dryer - **160.9(d)1**
- Water heaters: serving individual dwellings must install 125v/20amp outlet with spare conductor to allow for a 240v circuit - **160.9(e)**

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



Example situation for a dwelling subpanel

Electric Clothes Dryer Ready –Common Space Laundry

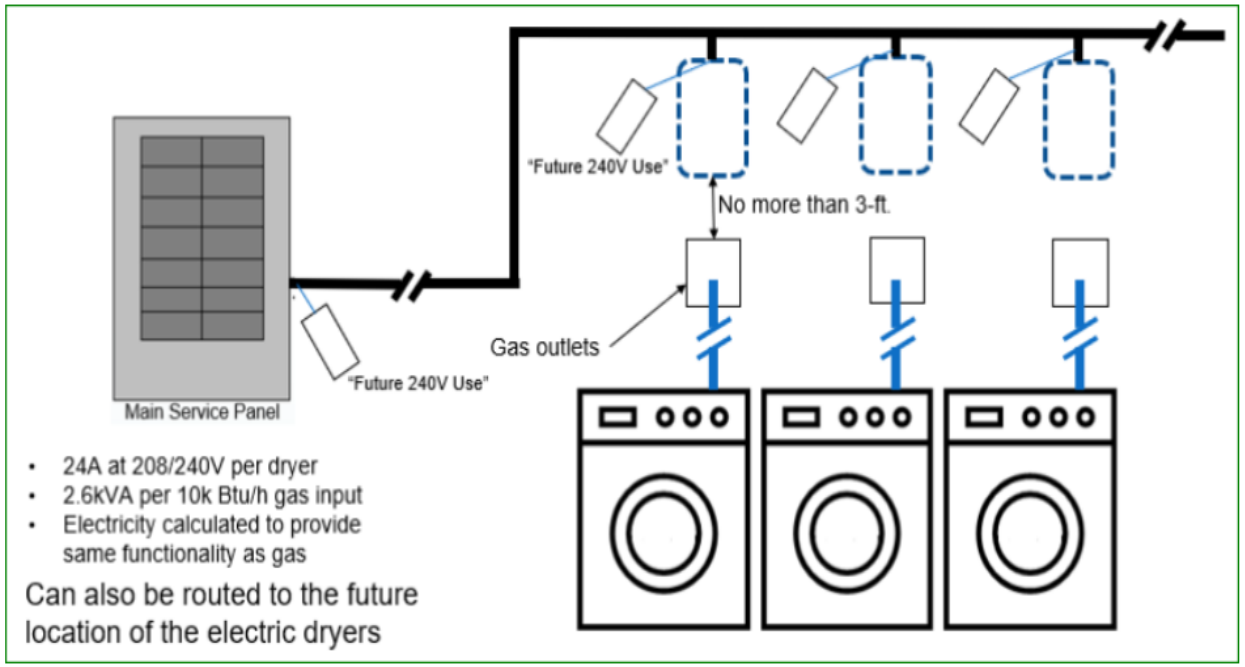


Figure 1: Example of electric ready system configuration for clothes dryers in common use area.

CALIFORNIA ENERGY COMMISSION

https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center

Electric Ready:

- Termination points for the conductors or raceways installed at the main panel, to a location 3 feet or less from each gas outlet
- Electrical conductors, raceway, panels, switchboards, and busbars must be sized to meet the future electric power requirements at the service voltage to the point at which the conductors serving the building connect to the utility distribution system
- The capacity requirements may be adjusted for demand factors in accordance with the California Electric Code and must meet one of the following:
    - 24 amps at 208V/240V per clothes dryer;
    - 2.6 kVA for each 10,000 Btu/hr of rated gas input or gas pipe capacity; or
    - The electrical power required to provide equivalent functionality of the gas-powered equipment, as calculated and documented by a project participant

Note: Gas flow rates must be determined in accordance with the California Plumbing Code

Individual Heat Pump Water Heater Ready

If a gas or propane water heater is installed:

- Designate 39”x39”x96 for future HPWH, and
- Install a condensate drain
- Specify electric panel, breaker space, and electrical feed prepared and labeled
- *Show in detail* how the ventilation strategies will be met

Plan for future plumbing needs…

Ventilation Methods

A. The designated space for the future heat pump water heater shall have a minimum volume of 700 cubic feet; or
B. If the future HPWH space is designed to vent indoors, the designated space for the future heat pump water heater shall vent to a communicating space in the same pressure boundary The total combined volume connected shall be700 cubic feet or larger and vent to the interior via:
    i. Fully louvered doors with fixed louvers consisting of a single layer of fixed flat slats and a minimum total NFA of 250 square inches; or
    ii. Two permanent openings of equal area with a minimum total NFA of 250 square inches located within 12 inches from the enclosure top and bottom; or
    iii. Two 8-inch ducts to a communicating space.
C. If the future HPWH space is designed to vent to the building exterior, the designated space for the future heat pump water heater shall vent to the exterior via:
    i. Fully louvered doors with fixed louvers consisting of a single layer of fixed flat slats and a minimum total NFA of 250 square inches; or
    ii. Two permanent openings of equal area with a minimum total NFA of 250 square inches located within 12 inches from the enclosure top and bottom; or
    iii. Two 8 inches capped ducts. All ducts that cross the pressure boundary shall be insulated to a minimum insulation level of R-6 and the ducts, connections, and building penetrations shall be sealed.

Central Heat Pump Water Heater Ready

Added electric-HPWH “Ready” requirements to Multifamily projects installing central gas water heating systems:

- Allocation of physical space for HPWH/Tanks, etc
- Provide for ventilation path/strategy
- Provide condensate drainage piping/receptacle
- Reserve physical space for electrical power and bus system of the main/distribution electrical switchboard
- References JA15 throughout

Gas Water Heating is Allowable, but …

Appendix JA15 – Qualification Requirements for Central Heat Pump Water Heater Ready

JA15.1 Purpose and Scope

Joint Appendix JA15 provides sizing requirements, for electric ready infrastructure installed with gas or propane water heating systems to meet the requirement for electric readiness specified in Title 24, Part 6, Section 160.9(f).

JA15.2 Electric Ready Requirements

JA15.2.1 Heat Pump Space Requirements

Space shall be reserved for future installation of central heat pump water heaters. The space reserved shall meet the following requirements:

(a) If the gas water heating system has an input capacity less than 200,000 Btu per hour, the minimum space reserved for the heat pump shall be 2.0 square feet per 10,000 Btu per hour input of the gas or propane water heating system, and the minimum linear dimension of the space reserved shall be 48 linear inches.

(b) If the gas water heating system has an input capacity greater than or equal to 200,000 Btu per hour, the minimum space reserved for the heat pump shall be 3.6 square feet per 10,000 Btu per hour input of the gas or propane water heating system, and the minimum linear dimension of the space reserved shall be 84 linear inches.

New Section 2025 Code

- Requirements based on size of GAS water heater, i.e.
  - < 200 kBtuh, or
  - > or equal to 200 kBtuh
- Solutions based on a factor of 10 kBtuh

JA15.2.2 Storage Tank Space Requirements

Space shall be reserved for future installation of hot water storage tanks. The space reserved shall meet the following requirements:

(a) If the input capacity of the gas water heating system is less than 200,000 Btu per hour, the minimum space reserved for the storage and temperature maintenance tanks shall be 4.4 square feet per 10,000 Btu per hour input of the gas or propane water heating system.

(b) If the input capacity of the gas water heating system is greater than or equal to 200,000 Btu per hour, the minimum physical space reserved for the storage and temperature maintenance tanks shall be 3.1 square feet per 10,000 Btu per hour input of the gas or propane water heating system.

JA15.2.3 Ventilation Requirements

The reserved pathway and penetrations through the building envelope shall meet the following requirements:

(a) If the input capacity of the gas water heating system is less than 200,000 Btu per hour, the minimum air flow rate shall be 70 CFM per 10,000 Btu per hour input of the gas or propane water heating system and the total external static pressure drop of ductwork and louvers shall not exceed 0.17 inches water column when the future heat pump water heater is installed.

(b) If the input capacity of the gas water heating system is greater than or equal to 200,000 Btu per hour, the minimum air flow rate shall be 420 CFM per 10,000 Btu per hour input of the gas or propane water heating system and the total external static pressure drop of ductwork and louvers shall not exceed 0.17 inches water column when the future heat pump water heater is installed.

JA15.2.4 Condensate Drainage Piping Requirements

The condensate drainage piping shall meet the following requirements:

(a) If the input capacity of the gas water heating system is less than 200,000 Btu per hour, condensate drainage shall be sized for 0.2 tons of refrigeration capacity per 10,000 Btu per hour input.

(b) If the input capacity of the gas water heating system is greater than or equal to 200,000 Btu per hour, condensate drainage shall be sized for 0.7 tons of refrigeration capacity per 10,000 Btu per hour input.

JA15.2.5 Electrical Requirements

The electrical system serving the heat pump shall meet the following requirements:

(a) If the input capacity of the gas water heating system is less than 200,000 Btu per hour, provide 0.1 kVA per 10,000 Btu per hour input.

(b) If the input capacity of the gas water heating system is greater than or equal to 200,000 Btu per hour, provide 1.1 kVA per 10,000 Btu per hour input.

The electrical system serving the temperature maintenance tank shall meet the following requirements:

(c) If the input capacity of the gas water heating system is less than 200,000 Btu per hour, provide 1.0 kVA per 10,000 Btu per hour input.

(d) If the input capacity of the gas water heating system is greater than or equal to 200,000 Btu per hour, provide 0.6 kVA per 10,000 Btu per hour input.

end.

New Construction Prescriptive

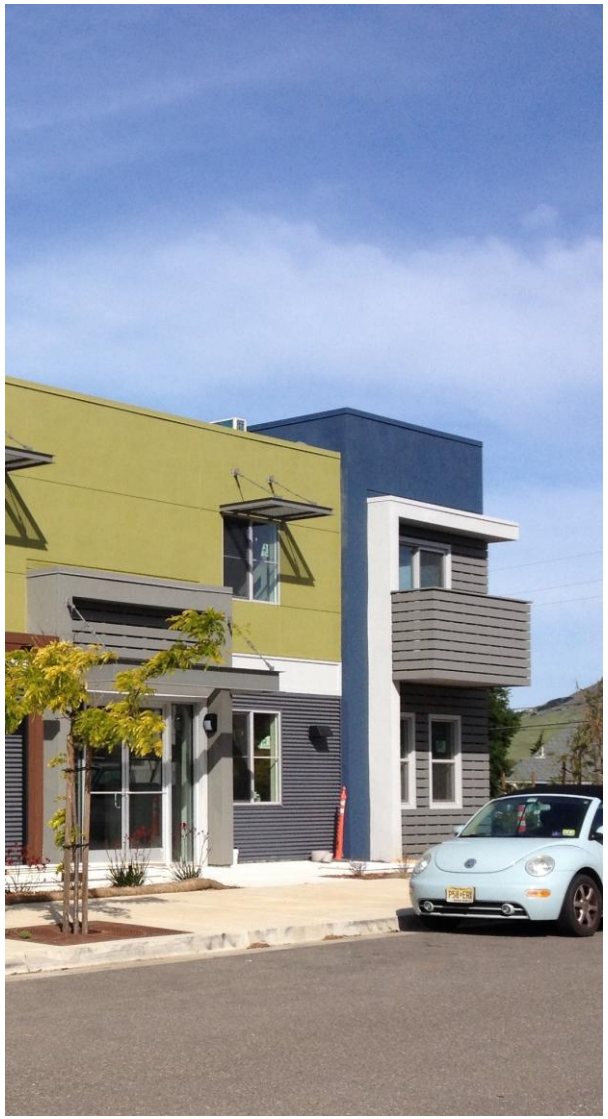
Envelope, Ventilation, Water Heating, PV and BESS

New Multifamily Section 170.0

- Section 170. –General
- Section 170.1 –Performance Approach
- Section 170.2 –Prescriptive Approach
- Apply to dwelling units and common use areas in multifamily buildings.
- Nonresidential occupancies in a mixed occupancy building shall comply with nonresidential requirements in Sections 120.0 through 141.1.

Section 170.2 Prescriptive Approach:

(a) Building Envelope
(b) Daylighting –Large Enclosed Spaces
(c) Space Conditioning and Ventilation Systems
(d) Water Heating Systems
(e) Lighting –Indoor, Outdoor, Signs
(f) Photovoltaic (PV/Solar) -3 Stories or less
(g) Photovoltaic (PV/Solar) -4 Stories or more
(h) Battery Storage Systems



Roof and Ceiling Insulation

- **Table 170.2-A** outlines prescriptive multifamily requirements by climate zone and Roof Type
- Option B: Attic –Ducts in attic
- Option C: Attic –Ducts in conditioned space
- Option D: Non-Attic Roof

Few changes between 2022 and 2025

Note: Option B and C roof types are described with R-values, but Option D is described with U-factors.

Option D –Non-Attic Roof or 'Cathedral Ceiling'

TABLE 170.2-A ENVELOPE COMPONENT PACKAGE – Multifamily Standard Building Design

Building Component - Roofs and Ceilings	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Option D[11]-Metal Building U-factor	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Option D[11]-Wood Framed and Other U-factor	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Option D[11] Low-Sloped-Aged Solar Reflectance	NR	~~NR~~0.63	NR	~~NR~~0.63	NR	~~NR~~0.63	~~NR~~0.63	~~NR~~0.63	0.63	0.63	0.63	~~NR~~0.63	0.63	0.63	0.63	NR
Option D[11] Low-Sloped-Thermal Emittance	NR	~~NR~~0.75	NR	~~NR~~0.75	NR	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	0.75	0.75	0.75	~~NR~~0.75	0.75	0.75	0.75	NR
Option D[11] Low-Sloped-Solar Reflectance Index	NR	~~NR~~75	NR	~~NR~~75	NR	~~NR~~75	~~NR~~75	~~NR~~75	75	75	75	~~NR~~75	75	75	75	NR
Option D[11] Steep-Sloped-Aged Solar Reflectance	NR	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
Option D[11] Steep-Sloped-Thermal Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR
Option D[11] Steep-Sloped-Thermal Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR

Reminder:

- Low-Sloped has rise to run ratio < 2:12
- Steep-Sloped has rise to run ration 2:12 or greater

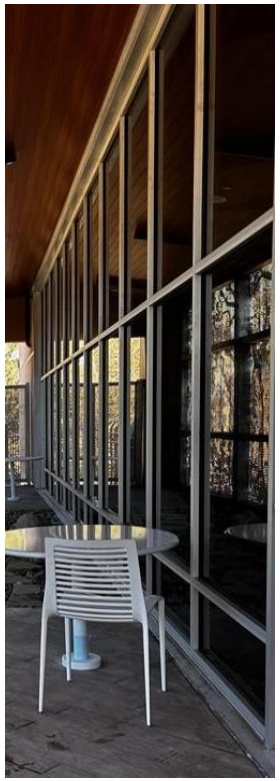
Key Take Away for 2025:
Low-Sloped –Climate Zones (CZ) 2, 4, 6-8, and 12 have new Cool Roof requirements

Window Energy Performance Values –2025 Update

Curtain Wall / Storefront Excerpt:

TABLE 170.2-A ENVELOPE COMPONENT PACKAGE – Multifamily Standard Building Design (continued)

Building Component - Fenestration	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Curtain Wall/ Storefront[7] - Maximum U-factor	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.38
Curtain Wall/ Storefront[7] - Maximum RSHGC~~, three or fewer habitable stories~~	NR	0.26	NR	0.26	NR	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.26	NR
~~Curtain Wall/ Storefront[7] - Maximum RSHGC, four or more habitable stories~~	~~0.35~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.26~~	~~0.25~~	~~0.26~~	~~0.25~~
Curtain Wall/ Storefront[7] - Minimum VT, ~~four or more habitable stories~~ common use area	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46



Other Windows UPDATES:

- **U-0.28** decrease for CZ 1, 3-5, 11, and 13-16.
- **U-0.30** no change for CZ 2, 8-10, and 12
- **U-0.34** no change for CZ 6 and 7

- **RSHGC - NR** no change for CZ 1, 3, 5, and 16
- **RSHGC-0.23** no change for CZ 2, 4, 6-15

Reminder: RSHGC = *Relative* Solar Heat Gain Coefficient

Key Take Away for 2025:

- Low-rise / high-rise distinction eliminated; most values 'rolled into' the low-rise requirements
- Some high-rise catagories became "common use area" requirements

Space Conditioning –Dwelling Units Only

- **3 Stories or less**
  - CZ 1-15: space conditioning shall be a **heat pump**
  - CZ 16: space conditioning shall be a **furnace with air conditioner**
- **4+ Stories**
  - CZ 2-15: space conditioning shall be a **heat pump**
  - CZ 1 and 16: space conditioning shall be **a dual-fuel heat pump**

Note: No space conditioning equipment requirement for the common areas

No Change for 2025

Ducts in Conditioned Space Performance Credit – LMCV-MCH-21-H

DUCT LOCATION

CALIFORNIA ENERGY COMMISSION

CEC-LMCV-MCH-21-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF INSTALLATION

Note: This table completed by ECC Registry.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

A. General Information

Note: Submit one Installation Certificate for each duct system that is taking credit for duct location.

01	SC System Identification or Name	
02	SC System Location or Area Served	
03	Indoor Unit Name or Description of Area Served	
04	Status – Less than 12 ft Ducts in Conditioned Space Performance Credit	
05	Status – Ducts Located In Conditioned Space Performance Credit	
06	Status – Duct System Located Entirely in Directly Conditioned Space, No Insulation Requirement	
07	Status – Portions of Ducts Located in Conditioned Space, R-6 Exception	

B. 12 Linear Feet or Less of Duct Located Outside of Conditioned Space - RA3.1.4.1.2

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met unless otherwise noted in the Verification Status and the Corrections Notes in this table.

01	A visual inspection shall confirm space conditioning systems with air handlers located outside the conditioned space have 12 linear feet or less of duct located outside the conditioned space including air handler and plenum.	
02	Verification Status:	☐ Pass - all applicable requirements are met; or ☐ Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or ☐ All N/A - This entire table is not applicable
03	Correction Notes:	

C. Ducts Located In Conditioned Space - RA3.1.4.1.3

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met unless otherwise noted in the Verification Status and the Corrections Notes in this table.

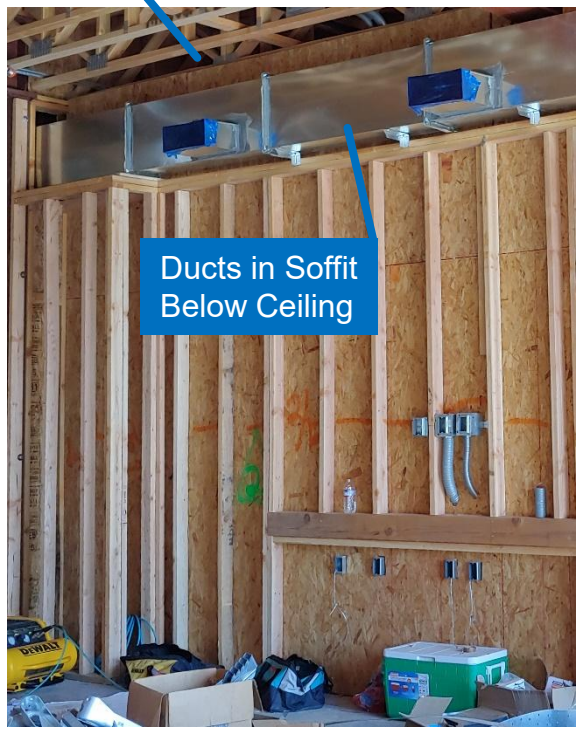
01	A visual inspection shall confirm the space conditioning duct system is located entirely in conditioned space.	
		☐ Pass - all applicable requirements are met; or

Benefits:

- Performance Method 'Credit' for improved energy efficiency
- Trade-Off 'Credit' can be used to off-set other energy losing features
- Ducts entirely in conditioned space - insulation not required

ECC Verification Scope:

- Visual Inspection of Duct Location
- Testing: Duct Leakage to Outside from Fan Pressurization of Ducts



ERV & HRV –see Table 170.2-K Mech Component Package

3 stories or less in CZ 5-10 and 15:

- **If heat pump** space conditioning system is installed to meet requirements, a balanced ventilation system without an ERV or HRV shall have a **fan efficacy ≤0.4 W/cfm**

4+ stories in CZ 1, 2, 4, 11-14 and 16:

- Balanced ventilation systems using ERV or HRV for **individual dwelling** units shall have a min sensible **recover efficiency ≥67% rated at 32ºF and fan efficacy ≤0.6 W/cfm**
- Balanced ventilation systems using ERV or HRV **serving multiple units** shall have a min sensible **recover efficiency ≥67%** rated at 32ºF; **Fan efficacy per 170.2(c)4a** (common area fans); and Recover bypass or control to directly **economize** with ventilation air based on outdoor air temperature limits per **Table 170.2-G**

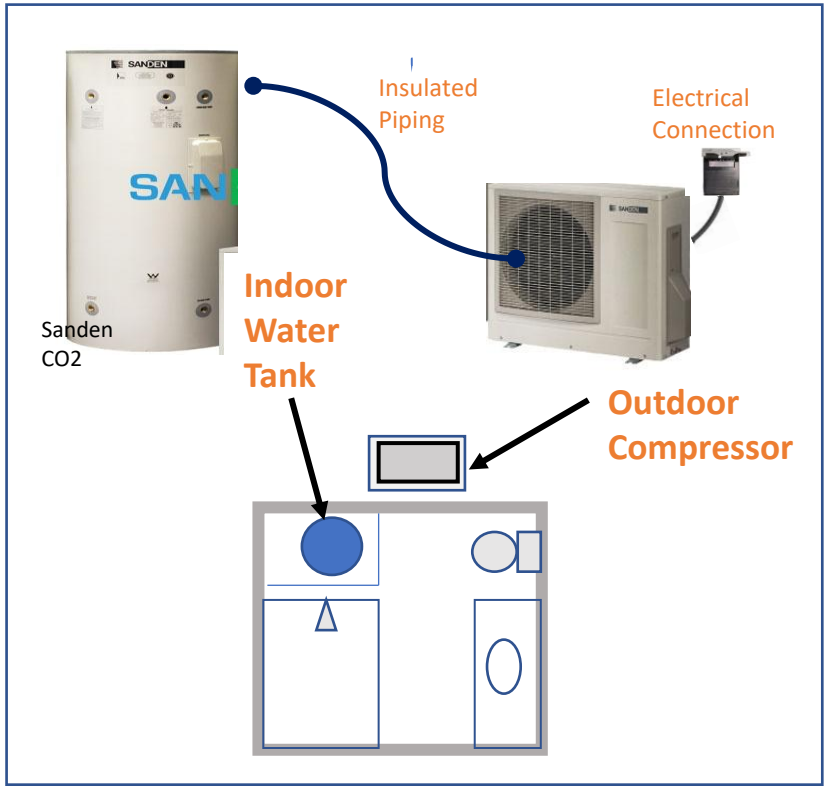
New 2025 Subsection: v. Dwelling unit ventilation system requirements.

All HRV/ERV systems serving individual dwelling units shall have a Fault Indicator Display (FID) that is manufacturer certified in compliance with the requirements in Joint Appendix JA17.4. The FID certification shall be verified by an ECC-Rater.

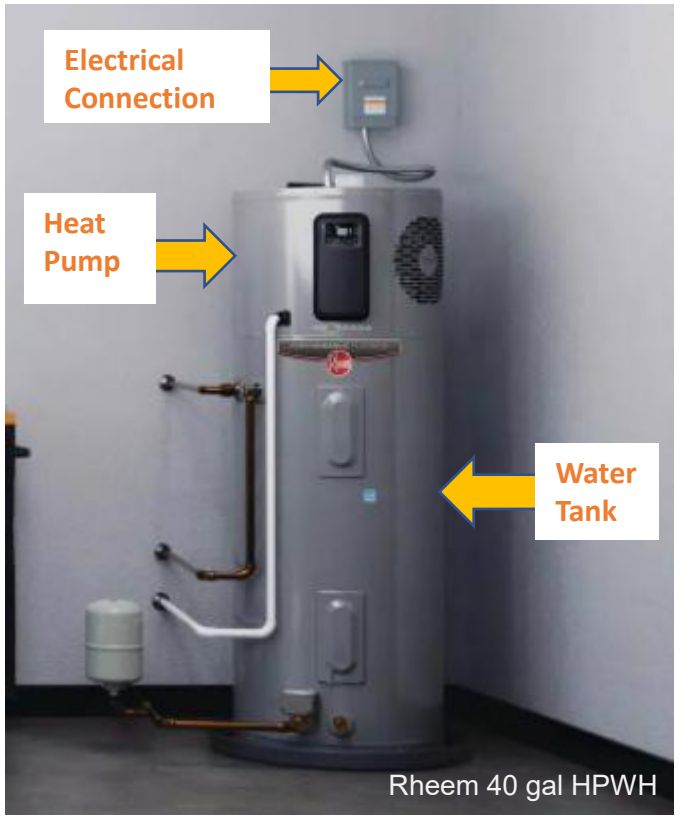
Prescriptive –Individual Dwelling Units

170.2(d)1

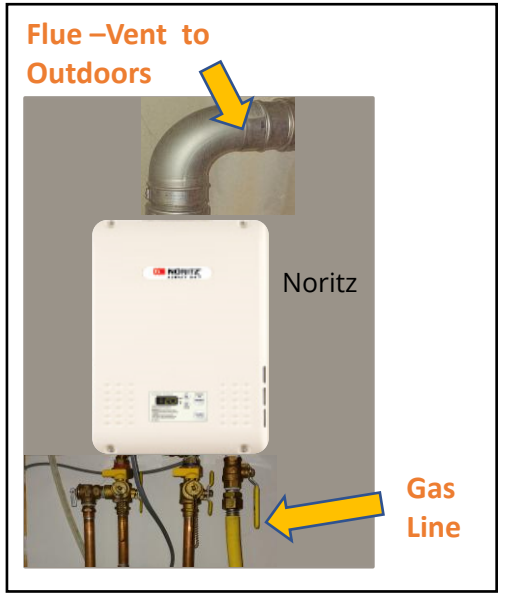
Split-System Heat Pump



Integrated Heat Pump



Gas On-Demand

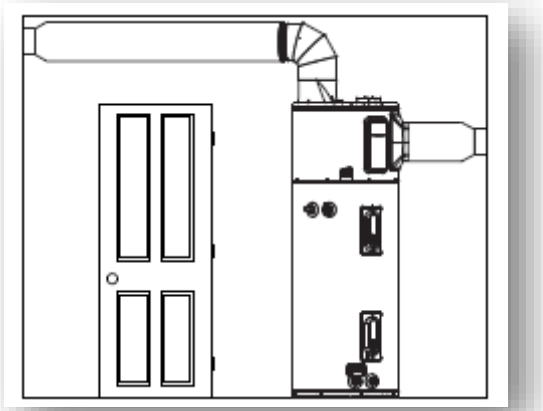


Under 2025 Code:
Allowable only for buildings 4 habitable stories or greater.

Under 2025 Code:
A 120V HPWH may be installed for new dwelling unit with one bedroom or less.

Design Considerations – Integrated HPWH

- Integrated HPWH tanks taller than standard gas or electric units
- Requires clearances at the air-outlet and top for air flow and access to the air filters; and front for control panel
- Operating Temp between 45 F and 90 -110F
- Noise typically around 50 db
- System creates cold dehumidified air and condensate
- New models need only 350-450 cubic feet of volume; many models need 700+ cu ft



Central Domestic Hot Water

Gas or propane system is allowed with the following:

- A recirculation system (does not have to be dual loop)
- CZ 1-9: Total input rating ≥1,000,000 Btu/hr with a minimum thermal efficiency of 90%
- Solar water heating system with a minimum solar savings fraction of:
  - CZ 1-9 require 0.20 SSF
  - CZ 10-16 require 0.35 SSF

Performance Method is often used to avoid the solar thermal system requirement.

New Under 2025:
The central system shall have a recirculation system with a mechanical or digital thermostatic master mixing valve on each distribution supply and return loop. Exception for building with 8 dwellings or less.

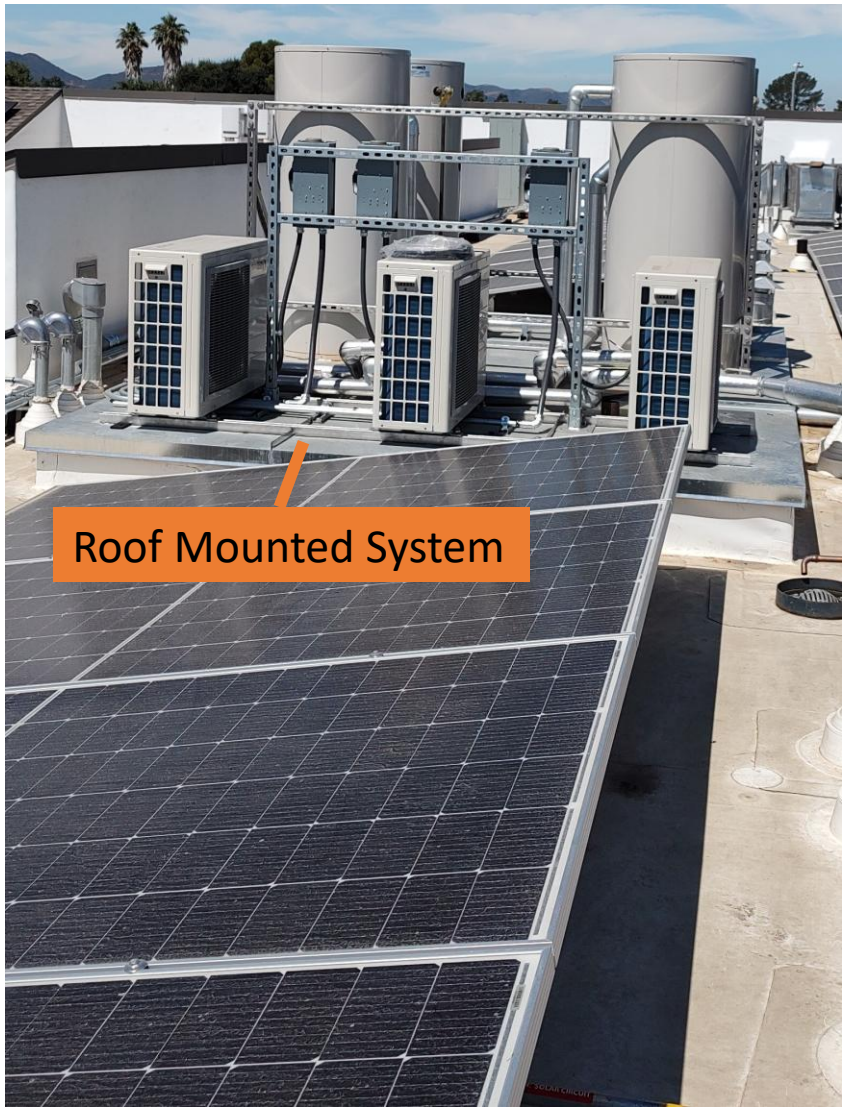
Central Domestic Hot Water

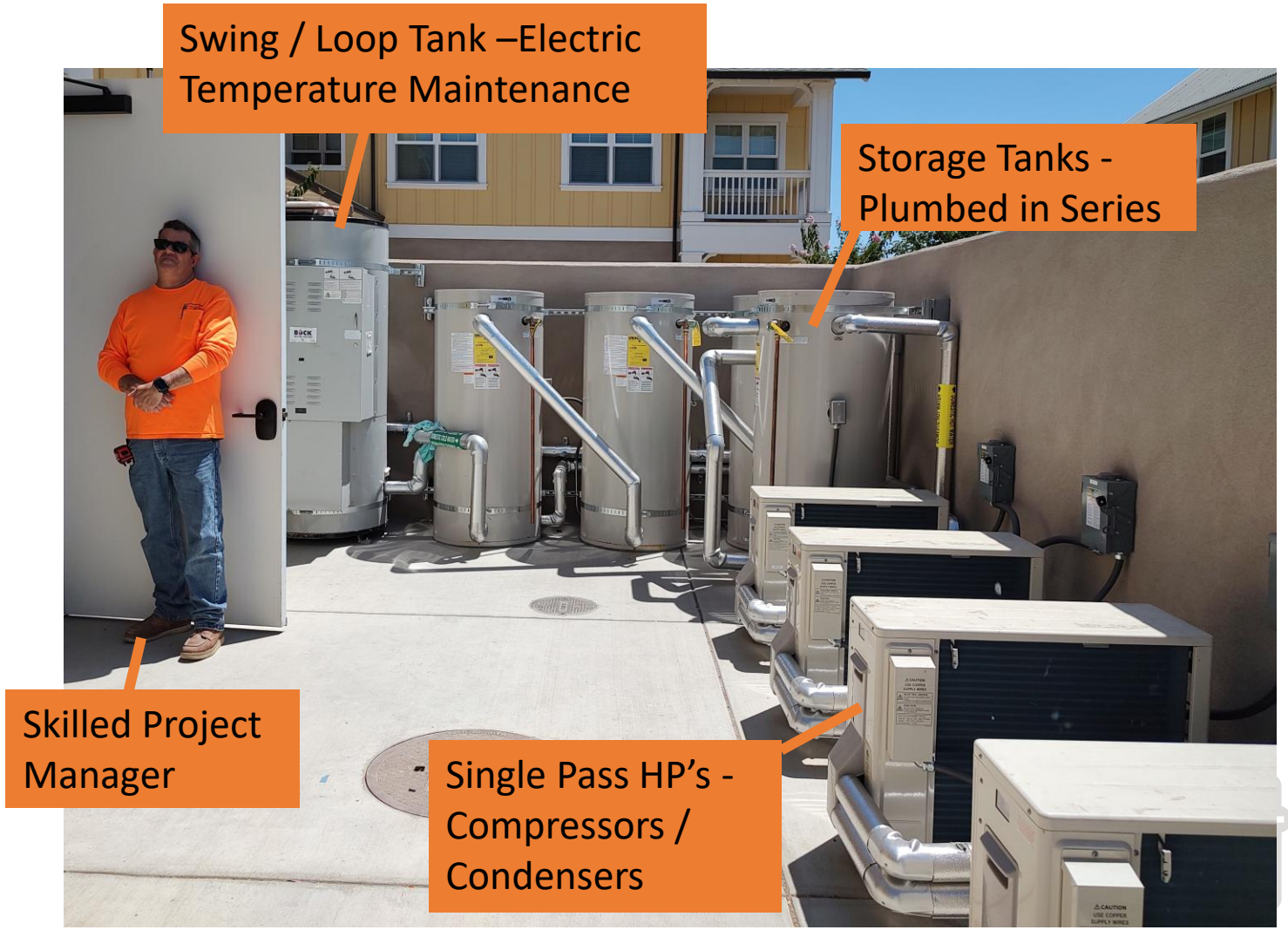
Heat Pump System with the following:

- The primary heat pump water heater shall be a single-pass heat pump water heater
- *Hot water return* from recirculation loop shall *connect to a recirculation loop tank*
- Fuel source for the recirculation *loop tank* shall be *electricity*
- Primary storage tank temp setpoint ≥135ºF
- Recirculation loop tank temp setpoint should be at least 10ºF lower than primary thermal storage tank
- Minimum HPWH compressor cut-off temp ≤ 40ºF

New Under 2025:
The central system shall have a recirculation system with a mechanical or digital thermostatic master mixing valve on each distribution supply and return loop. Exception for building with 8 dwellings or less.

Central Heat Pump System – Distributed SanCO2 Systems





Project: Harry's House – Santa Barbara County

Solar Photovoltaic (PVs) and Battery Energy Storage Systems (BESS)

Low-Rise Multifamily (3 Stories or less)

- **Solar Ready (Mandatory Measure 110.10),** if PV is *not* triggered/installed
- **Solar PV** is Prescriptive requirement; exceptions apply.
- **BESS** is optional; *credit is available* under the Performance Method

High-Rise Multifamily (4 Stories or more)

- **Solar Ready (Mandatory Measure 110.10),** if PV is *not* triggered/installed, *up to 10 story building.*
- **Solar PV** is Prescriptive requirement; exceptions apply.
- **BESS** is required when Solar PV is triggered, exceptions apply.

Note: "Battery Ready" is only for Single Family Occupancy types.

Solar Photovoltaic (PV)

PV System Size (kW dc)

Prescriptive sizing equation is determined by the number of stories, i.e. low-rise (3 stories or less) or high-rise (4 stories or more)

SARA –Solar Access Roof Area

Area of a buildings' roof space capable of supporting PV system

- Including covered parking areas, and carports and other newly constructed structures onsite that are compatible with supporting a PV system per CBC 1511.2
- Exceptions: Any roof area that has <70% annual solar access

PV System for ≤3 stories

$$kW_{PV} = \frac{CFA \times A}{1000} + (N_{DU} \times B)$$

EQUATION 170.2-C

CFA: Conditioned Floor Area

N_{DU}: Number of Dwelling Units

A: Climate Zone Factor

B: Dwelling Adjustment Factor

OR

PV size = 14 W/sq ft x SARA for low-sloped

PV size = 18 W/sq ft x SARA for steep-sloped

No PV required if:

- PV size < 1.8 kWdc;
- SARA < 80 sq ft contiguous

Bonus: Size reduction of 25% if installed with battery

Pismo Terrace Apartments, Pismo Beach, CA

CFA = 16,032 SF Climate Zone 5

N_{DU} = 27

kW_{PV} = [(16,032 x 0.585)/1000]+(27 x 1.06)

kW_{PV} = 9.378 + 28.62

kW_{PV} = 37.99 = 38 kW system

Table 170.2-T CFA and Dwelling Unit Adjustment Factors

	CFA - (A)	Dwelling Unit - (B)			
Climate Zone	A	B	**Climate Zone**	A	B
1	0.793	1.27	**9**	0.613	1.36
2	0.621	1.22	**10**	0.627	1.41
3	0.628	1.12	**11**	0.836	1.44
4	0.586	1.21	**12**	0.613	1.40
5	0.585	1.06	**13**	0.894	1.51
6	0.594	1.23	**14**	0.741	1.26
7	0.572	1.15	**15**	1.56	1.47
8	0.586	1.37	**16**	0.59	1.22

PV System for >4 stories

$$kW_{PV} = \frac{CFA \times A}{1000}$$

EQUATION 170.2-D

CFA: Conditioned Floor Area

A: Climate Zone Factor

OR

PV size = 14 W/sq ft x SARA for low-sloped

PV size = 18 W/sq ft x SARA for steep-sloped

No PV required if:

- PV size < 4 kWdc;
- SARA < 80 sq ft contiguous or < 3% of the CFA
- Snow loading parameters

VTA Housing Ohlone Station, San Jose, CA

HIGHRISE (6 Stories, 73 units)
CFA = 56,168 SF
Climate Zone 4

kW_{PV} = 56,168 x 2.21/1000
kW_{PV} = 124,131.28/1000
kW_{PV} = 124.13 = 125 kWdc

HIGHRISE (12 Stories, 190 units)
CFA = 174,483 SF
Climate Zone 4

kW_{PV} = 174,483 x 2.21/1000
kW_{PV} = 385,607.43/1000
kW_{PV} = 385.61 = 386 kWdc

Table 170.2-U PV Capacity Factors (W/ft2 of CFA)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events & Exhibits	3.48	4.28	3.66	4.32	3.77	4.05	4.28	4.83	4.63	4.8	5.04	4.44	4.95	4.36	5.48	3.38
Library	0.39	3.23	2.59	3.25	2.48	2.74	3.04	3.49	3.32	3.69	3.79	3.32	3.79	3.37	4.49	2.84
Hotel/Motel	1.69	1.9	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.2	2.3	2.05	2.3	2.02	2.72	1.73
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.8	2.59
Restaurant	8.55	9.32	8.16	9.65	8.21	8.73	9.11	10.18	9.75	10.28	10.85	9.73	10.69	9.73	12.25	8.47
Retail, Grocery	3.14	3.49	3.01	3.61	3.05	3.27	3.45	3.83	3.65	3.81	4.09	3.64	3.99	3.71	4.6	3.21
School	1.27	1.43	1.27	1.47	1.27	1.43	1.47	1.63	1.53	1.58	1.63	1.63	1.63	1.63	2.46	1.32
Warehouse	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
Religious Worship	4.25	4.65	3.49	4.57	3.72	4.29	4.46	5.89	5.3	5.67	5.89	5.89	5.78	4.63	7.22	4.99
Sports & Recreation	2.47	1.97	1.54	2.03	1.6	1.84	1.98	2.63	2.47	2.6	2.75	2.2	2.72	2.15	4.03	1.81
Multifamily > 3 stories	1.82	2.21	1.82	2.21	1.82	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.77	1.82

Battery Energy Storage –more than 3 stories

eSpire 280 Energy Storage System

Safe Technology & Multi-level Protection

The solution uses the best-in-class Tier 1 Lithium Iron Phosphate (LFP) chemistry forthe highest level of safety, thermal stability, and reliability; An integrated, multi-levelBattery Management System (BMS) monitors, optimizes, and balances the system.

Example of Commercial Scale System

Exceptions:

- If installed PV system size < 15% of the size determined by Equation 170.2-D
- In buildings with system requirements with < 10 kWh rated energy capacity

Battery Energy Storage System (BESS)

Battery system must meet both rated **energy** capacity (kWh) and the rated **power** capacity (kW)

Equation 170.2-E

Rated Energy Capacity :

$$kWh_{batt} = (CFA \times B) / (1000 \times C^{0.5})$$

CFA: Conditioned Floor Area
B: BESS Capacity Factor in Wh/sf from Table 170.2-V
C is the rated single charge-discharge cycle AC to AC efficiency of the BESS
(Between 0.80 and 0.95 is common.)

Equation 170.2-F

SARA Adjusted Rated Energy Capacity :

$$kWh_{batt} = ((CFA \times B) / (1000 \times C^{0.5})) \times (kW_{PVdc,SARA} / kW_{PVdc})$$

kW_{PVdc} : From PV Capacity calculation

Equation 170.2-G

Rated Power capacity:

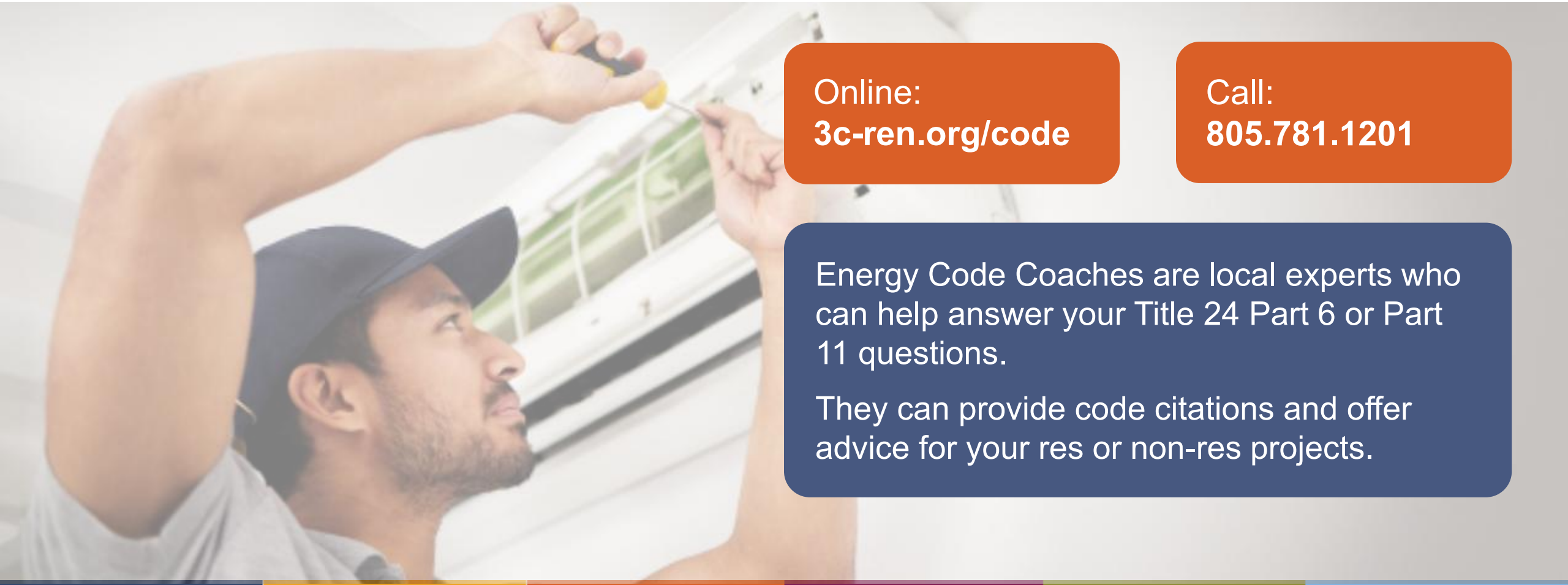
$$kW_{batt} = kWh_{batt} / 4$$

Table 170.2-V BESS Capacity Factors (W/ft2 of CFA)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Event & Exhibit	1.82	1.95	1.74	2.12	1.91	2.13	2.24	2.3	2.36	2.47	2.62	2.16	2.64	2.68	3.22	1.89
Library	0.37	7.17	5.97	6.75	5.64	6.08	6.19	7.13	7.18	7.56	7.17	6.93	6.88	6.81	7.93	6.4
Hotel/Motel	0.86	0.84	0.77	0.92	0.81	0.89	0.9	1.01	1.00	1.11	1.14	0.96	1.18	1.18	1.49	0.85
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	NR	5.26	4.35	5.26	4.35	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	6.39	4.35
Restaurant	4.36	4.11	3.78	4.37	3.89	4.02	4.11	4.49	4.47	4.82	5.05	4.43	5.05	5.24	6.23	4.11
Retail, Grocery	1.89	1.82	1.71	1.82	1.72	1.8	1.76	1.92	1.97	2.05	2.22	1.95	2.16	2.29	2.66	1.91
School	NR	3.05	2.38	3.05	2.38	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	4.6	2.38
Warehouse	NR	0.41	0.37	0.41	0.37	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.54	0.37
Religious Worship	2.21	2.25	1.74	2.42	2.08	2.75	2.94	3.37	3.17	3.37	3.58	2.72	3.62	3.21	4.89	2.37
Sports & Recreation	1.26	0.98	0.76	1.14	0.86	1.2	1.23	1.57	1.53	1.65	1.83	1.27	1.86	1.57	3.02	1.13
Multifamily > 3 stories	1.88	2.27	1.88	2.27	1.88	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.85	1.88
NR - Not Required																

Questions about Title 24?

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



Online:
3c-ren.org/code

Call:
805.781.1201

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

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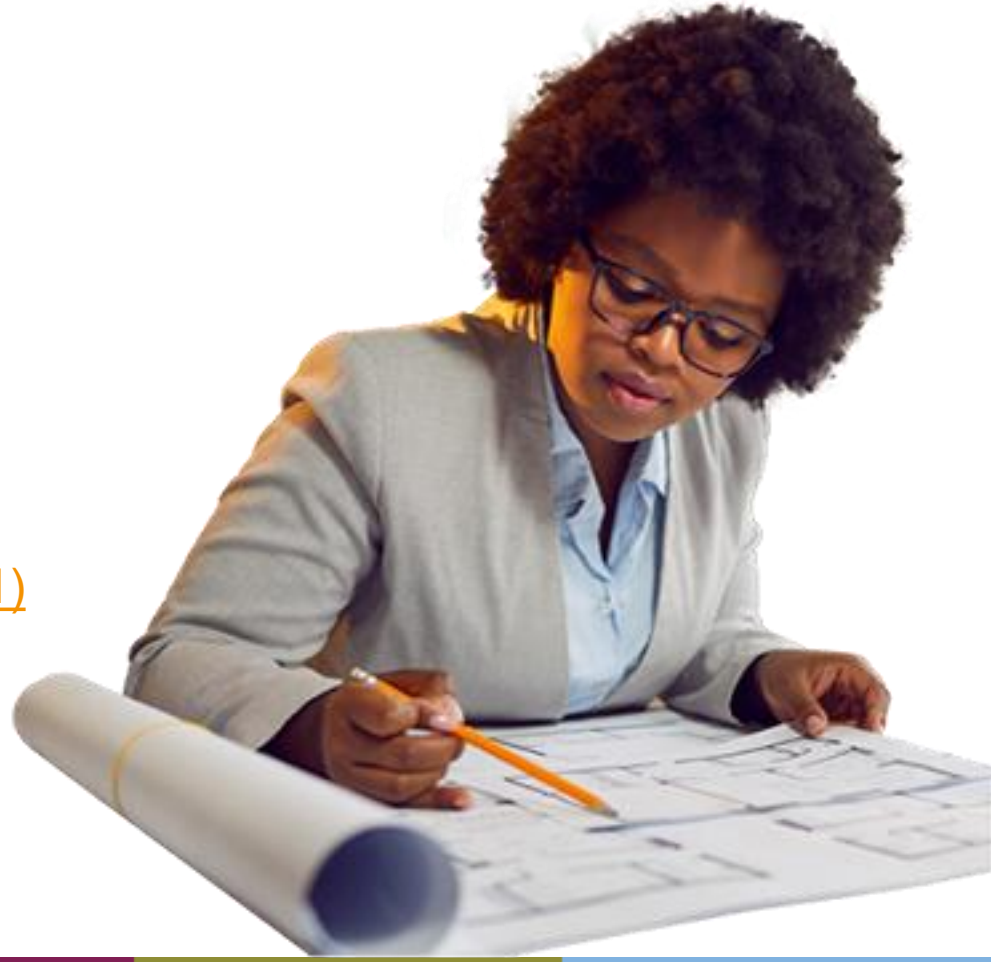

Any phone numbers who joined? Please share your name!