



2022 Energy Code Water Heating – Multifamily

Title: 2022 Energy Code, Multifamily Water Heating Overview

Presenter: Allen Wong, Associate Energy Specialist



2022 Energy Code Basics



Energy Code History

Warren-Alquist Act established CEC in 1974

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

WARREN-ALQUIST ACT

Warren-Alquist
State Energy Resources
Conservation and
Development Act

Public Resources Code
Section 25000 et seq.



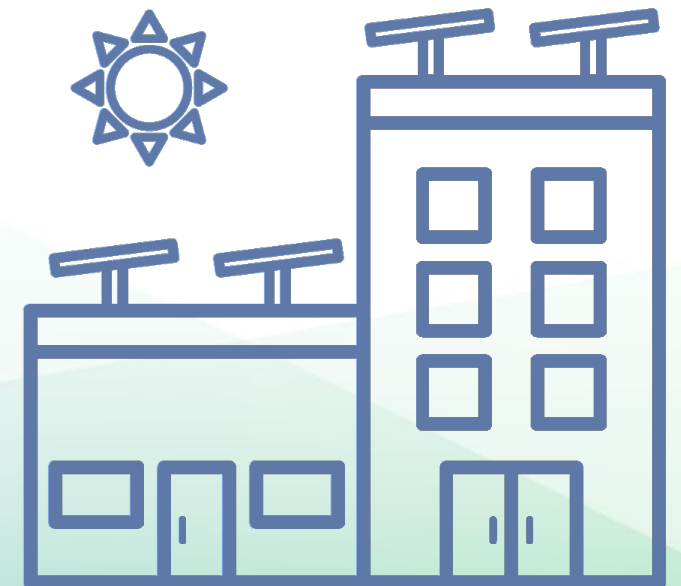
CALIFORNIA
ENERGY COMMISSION
Gavin Newsom, Governor

2022 EDITION
JANUARY 2022
CEC-140-2022-001



2022 Energy Code Goals

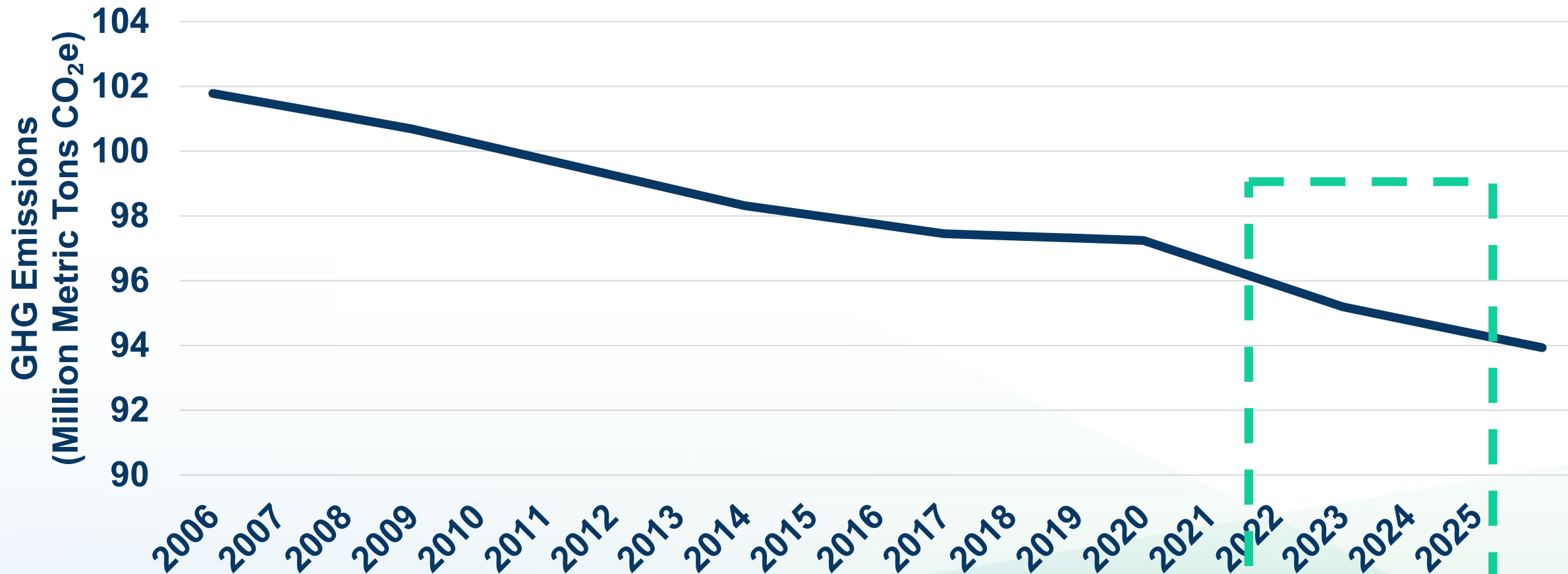
- Increase building energy efficiency cost-effectively
- Contribute to California's greenhouse gas (GHG) reduction goals
- Encourage pathways for all-electric buildings
- Reduce residential building impacts on the electricity grid
- Promote demand flexibility and self-utilization of photovoltaic (PV)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





Energy Code Environmental Benefit

Reduced Statewide Emissions



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



2022 Energy Code

Effective January 1, 2023

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





Energy Code Requirements

Mandatory requirements

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

Prescriptive requirements

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



Compliance Approaches

Prescriptive approach

- Simple approach, no trade-offs
- Defines the standard building design
- 2022 heat pump baselines

Performance approach

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





2022 Performance Metrics

- **Energy performance calculations**
- Nonresidential and multifamily
 - Hourly source energy
 - TDV Efficiency
 - TDV Total
 - Efficiency, PV + battery

New for 2022



Demonstrating Compliance

- **Compliance forms confirm Energy Code is met**
- Completed by responsible party
 - Designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification

Updated for 2022

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



2022 Compliance Software

- Performance approach must use approved compliance software versions
 - Nonresidential and multifamily
 - CBECC 2022.3.0
 - Energy Pro 9.1
 - IES Virtual Environment Title 24 2022



Table 100.0-A, Multifamily

	Mandatory	Prescriptive	Performance
New Constructed Buildings	110.3, 160.4	170.2(d)	170.1
Addition	110.3, 160.4	180.1(a)3	180.1(b)
Alterations	110.3, 160.4	180.2(b)3	180.2(c)

- Requirements relocated with additional requirements and revisions
- High-rise and low-rise multifamily requirements have moved to these sections
- Hotel/motel buildings must meet some of these requirements



Mandatory Requirements

§§110.1, 110.3 & 160.4



§110.1(a)&(b) - Mandatory Requirements; Appliances

- Water heaters meet Title 20 minimum efficiencies (Title 20, §1605.1, Table F-2 and F-5)
- Verify efficiency via
 - Modernized Appliances Efficiency Database System (MAEDbS)
 - Equivalent federal directory, or
 - Approved trade association directory

Select Fields to Display

Select/Deselect All

Manufacturer

Brand

Model Number

Regulatory Status

Energy Source

Mini Tank Water Heater less than 20 gallons, Booster Water Heater or Hot Water Dispenser? (T/F) Heaters (if Applicable)

Other Types of Water Heaters (if Applicable)

Rated Volume

Input Rating

Calculated: TypeCheckStd

Heat Traps? (T/F)

Ozone Depleting Substance in Insulation? (T/F)

Ozone Depleting Substance in Refrigerant (for heat pump water heaters only)? (T/F)

Mobile Home? (T/F)

Water Heater Type

First Hour Rating

Maximum Gallons Per Minute

Recovery Efficiency

Annual Electrical Energy Consumption

Annual Fossil Fuel Energy Consumption

Draw Pattern

Uniform Energy Factor

Uniform Energy Factor Standard

Pilot Light Energy Consumption

Add Date

Reference Number

Filters

Search Results 36 record(s) found

Export To: [Excel](#) [CSV](#)

[Search](#) [Clear](#)

<input type="checkbox"/>	Manufacturer	Brand	Model Number	Regulatory Status	Energy Source	Add Date
<input type="checkbox"/>	Lochinvar, LLC.	Lochinvar	HPA082KD-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	Lochinvar, LLC.	Lochinvar	HPA088KD-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	Lochinvar, LLC.	Lochinvar	HPA052KD-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	Lochinvar, LLC.	Lochinvar	6-80-DHPHT-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	Lochinvar, LLC.	Lochinvar	6-66-DHPHT-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	Lochinvar, LLC.	Lochinvar	6-50-DHPHT-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	A.O. Smith Corporation (American Water Heaters)	RELIANCE WATER HEATERS	10-80-DHPHTNE-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	A.O. Smith Corporation (American Water Heaters)	RELIANCE WATER HEATERS	10-66-DHPHTNE-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	A.O. Smith Corporation (American Water Heaters)	RELIANCE WATER HEATERS	10-50-DHPHTNE-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	A.O. Smith Corporation (American Water Heaters)	U.S. Craftmaster	HPHE2K80HD045VUN-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	A.O. Smith Corporation (American Water Heaters)	U.S. Craftmaster	HPHE2K66HD045VUN-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019
<input type="checkbox"/>	A.O. Smith Corporation (American Water Heaters)	U.S. Craftmaster	HPHE2K50HD045VUN-130	Federally-Regulated Consumer Product	Heat pump	08/16/2019

[Look up appliances on the Modernized Appliance Efficiency Database](#)



§110.1(c) - Mandatory Requirements; Appliances

If efficiency can't be verified for these reasons, assume mandatory efficiency or follow CEC-approved procedures when:

1. Unavailable data
2. No field testing method approved by the CEC
3. Field modification
4. DOE testing waiver, but no way to determine efficiency



§110.3(a)&(b) – Certification & Efficiency

Water heating equipment must meet/have:

- (a) Manufacturer certification as meeting §110.3
- (b) All Title 20 requirements (§1605.1(f)), per §110.1
 1. All standards
 2. All test methods
 3. All functions
 4. Min/max capacity must be made possible by controls during steady-state op

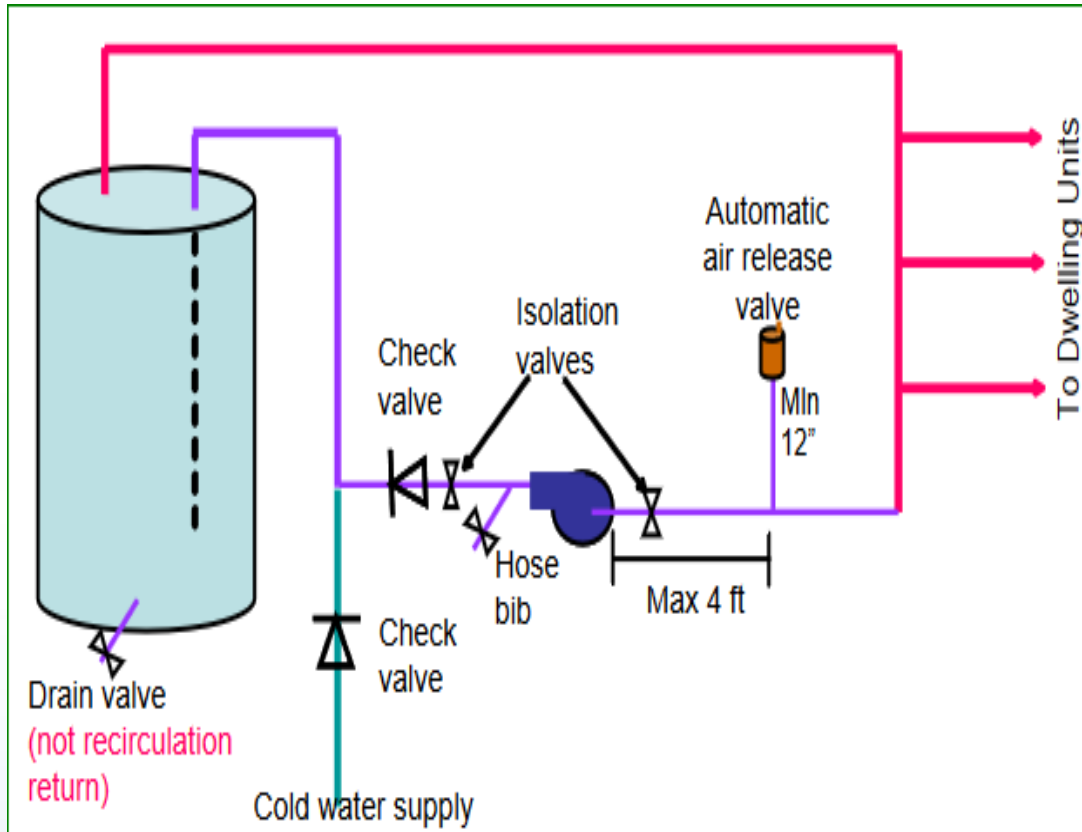


§110.3(c)1-3 – Installation

- Systems > 167,000 Btu/h – outlets requiring higher than service water temperatures (ASHRAE Handbook, Applications Volume) require separate remote heaters, heat exchangers or boosters to supply higher temperature.
- Systems with circulation pumps or heat trace – must have auto-off capability
- Unfired tanks and solar water heating backup tanks – must meet one of the following:
 - Insulation (external $R \geq 3.5$; internal + external $R \geq 16$)
 - Tank surface heat loss rating $< 6.5 \text{ Btu/h-ft}^2$ (based on water-air temperature difference of 80°F)



§110.3(c)4 – Recirculation Loop; Multiple Dwelling Units



- A. Air valve bleeds air from pipe before reaching pump – protects pump from cavitation damage
- B. (&F) Check valves stop cold water from flowing backward
- C. Hose bib “burps” air from replacement pump after installation
- D. Isolation valves close off pipes when replacing pump; no need to drain whole system
- E. Do NOT pipe cold water or loop into drain port



§110.3(c)5

State buildings – Water heating energy must be at least 60% site solar or recovered energy





§110.3(c)6

- Instantaneous (“tankless”) water heaters > 6.8 kBtu/h (2 kW) shall have isolation valves on both water lines, with fittings for maintenance flushing



Source: [homedepot.com](https://www.homedepot.com)



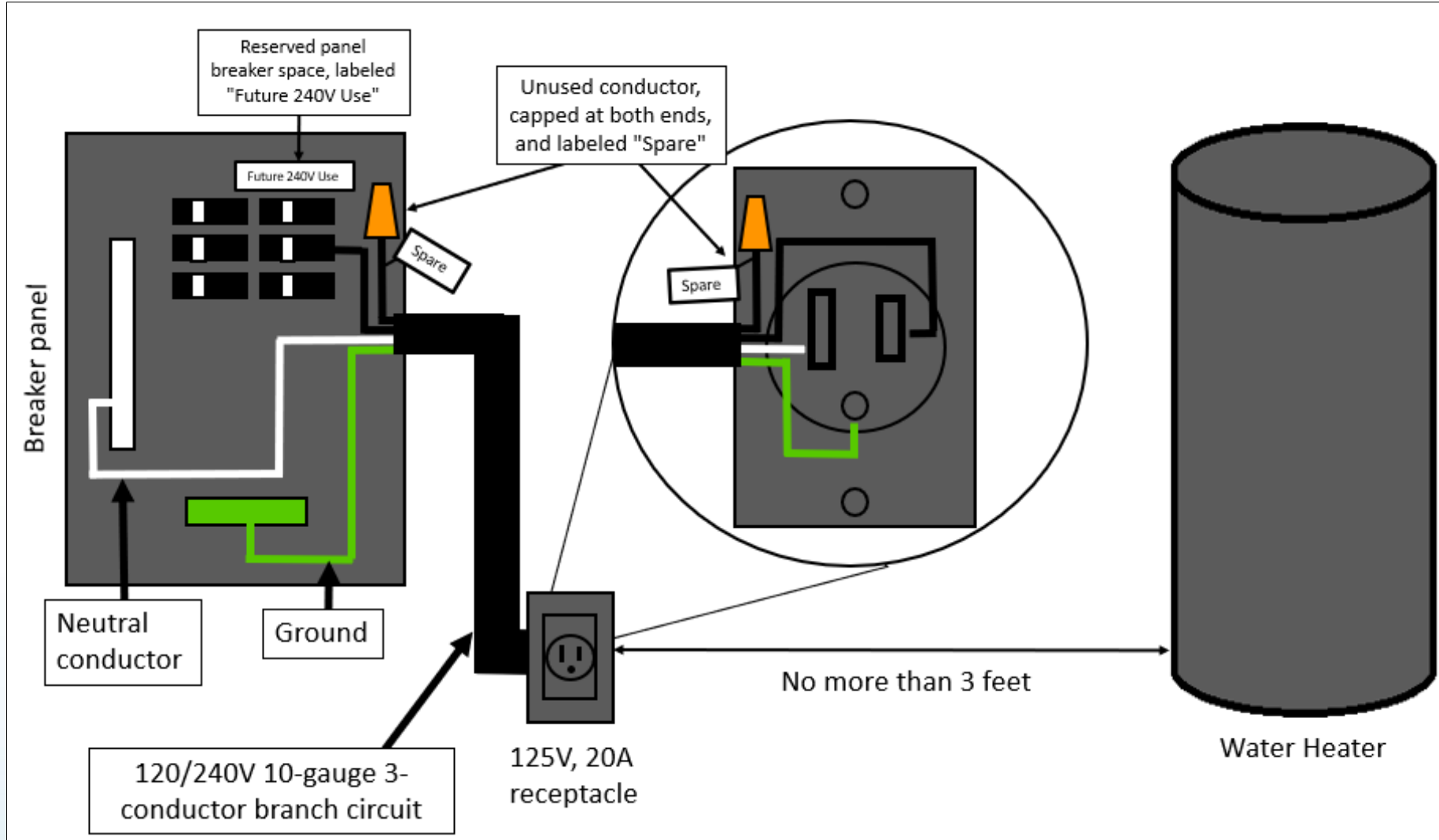
§160.4(a)1 – Gas/Propane Water Heaters, Individual Dwelling Units

Dedicated 125V, 20A receptacle connected to panel via 120/240V 3-conductor, 10 AWG copper branch circuit, within 3-ft. from water heater, unobstructed

- A. Unused conductor labeled “spare” and electrically isolated; and
- B. Reserved single-pole panel space next to branch circuit breaker, labeled “Future 240V Use”



§160.4(a)1 – Gas/Propane Water Heaters, Individual Dwelling Units (cont.)





§160.4(a)2-4 – Gas/Propane Water Heaters, Individual Dwelling Units

2. Category III or IV vent; OR Type B vent with straight pipe between the outside end and where the water heater is installed
3. Condensate drain no higher than 2 inches above the base of the installed water heater to allow natural draining without a pump
4. Gas supply line of 200,000 Btu/h or more



§160.4(b)-(d)

- b) Recirculation loops serving multiple dwelling units must meet §110.3(c)4.
- c) Solar water-heaters and collectors certified and rated by SRCC, IAPMO R&T, or Executive-Director-approved listing agency
- d) Tankless water heaters > 6.8 kBtu/h (2kW) shall have isolation valves for flushing (§110.3(c)6)



§160.4(e)1&2 – Commercial Boilers

- Combustion air positive shutoff required for newly installed boilers:
 - Natural draft boilers ≥ 2.5 MMBtu/h
 - Boilers sharing one stack (2.5 MMBtu/h, combined)
- Combustion air fan motors with 10 hp or more in newly installed boilers must meet one of the following:
 - Variable-speed drive
 - Controls to limit power demand to no more than 30% of design wattage at 50% of design air volume



§160.4(e)3 – Commercial Boilers

- Newly installed boilers, ≥ 5 MMBtu/h – maintain excess flue gas O_2 concentrations $\leq 5.0\%$ by volume (dry basis) over firing rates of 20-100%
- Combustion air controlled per firing rate or flue gas O_2 concentration
 - No common gas and combustion air control linkage, or jack shaft allowed
 - Exception – Boilers with steady state full-load combustion efficiency of 90% or higher



§160.4(f)1 – Pipe and Tank Insulation

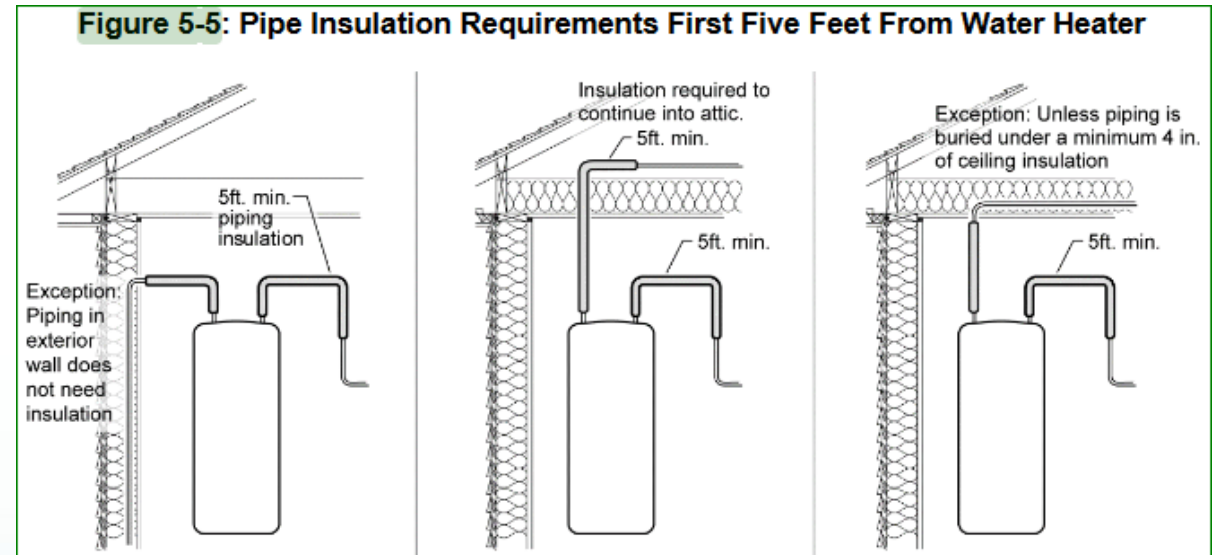
- Piping insulated per Table 160.4-A (recreated below)
 - Can meet thickness OR R-value
- Multifamily and hotel/motel DHW systems > 140°F – use Table 120.3-A

Fluid Op Temp. (F)	Conductivity (Btu-in/h-ft ² -F)	Mean Rating Temp. (F)	< 1" Pipe Diameter	1 to < 1.5" Pipe Diameter	1.5 to < 4" Pipe Diameter	4 to < 8" Pipe Diameter	≥ 8" Pipe Diameter
105-140	0.22-0.28	100	1.0"	1.5"	2.0"	2.0"	2.0"
105-140	0.22-0.28	100	R-7.7	R-12.5	R-16	R-12.5	R-11



§160.4(f)1 – Pipe and Tank Insulation, Exceptions

- Pipes penetrating framing require no insulation throughout penetration.
 - Metal framing – tight-fitting insulation to prevent contact
- Piping in walls meeting QII requirements (RA3.5)
- Piping surrounded with at least 1” of wall insulation, 2” of crawlspace insulation, or 4” of attic insulation





§160.4(f)2 – Insulation Protection

- Protect pipe insulation against damage (sunlight, moisture, equipment maintenance, wind) and at least include:
 - Exposed to weather – outdoor-suitable cover that is water retardant and shields from solar radiation. Adhesive tape cannot be used for this protection.
 - Buried below grade – waterproof and non-crushable casing/sleeve



Prescriptive Requirements

§170.2(d)



§170.2(d)1 – Newly Constructed, Individual Dwelling Units

Electric Options

- HPWH, 240V; other requirements may apply (see table below)

Gas/Propane Options

- Tankless, up to 200k Btu/h

NEEA Tier 3?	Compact Hot Water Distribution System (RA4.4.6) Required?	Drain Water Heat Recovery (RA3.6.9) Required?
No	CZs 1 & 16	CZ 16
Yes	No	CZ 16

Demand recirculation with manual on/off control (RA4.4.9) only



§170.2(d)2-4 – Newly Constructed, Multiple Dwelling Units

Electric Options

- Central HPWH (§170.2(d)2)

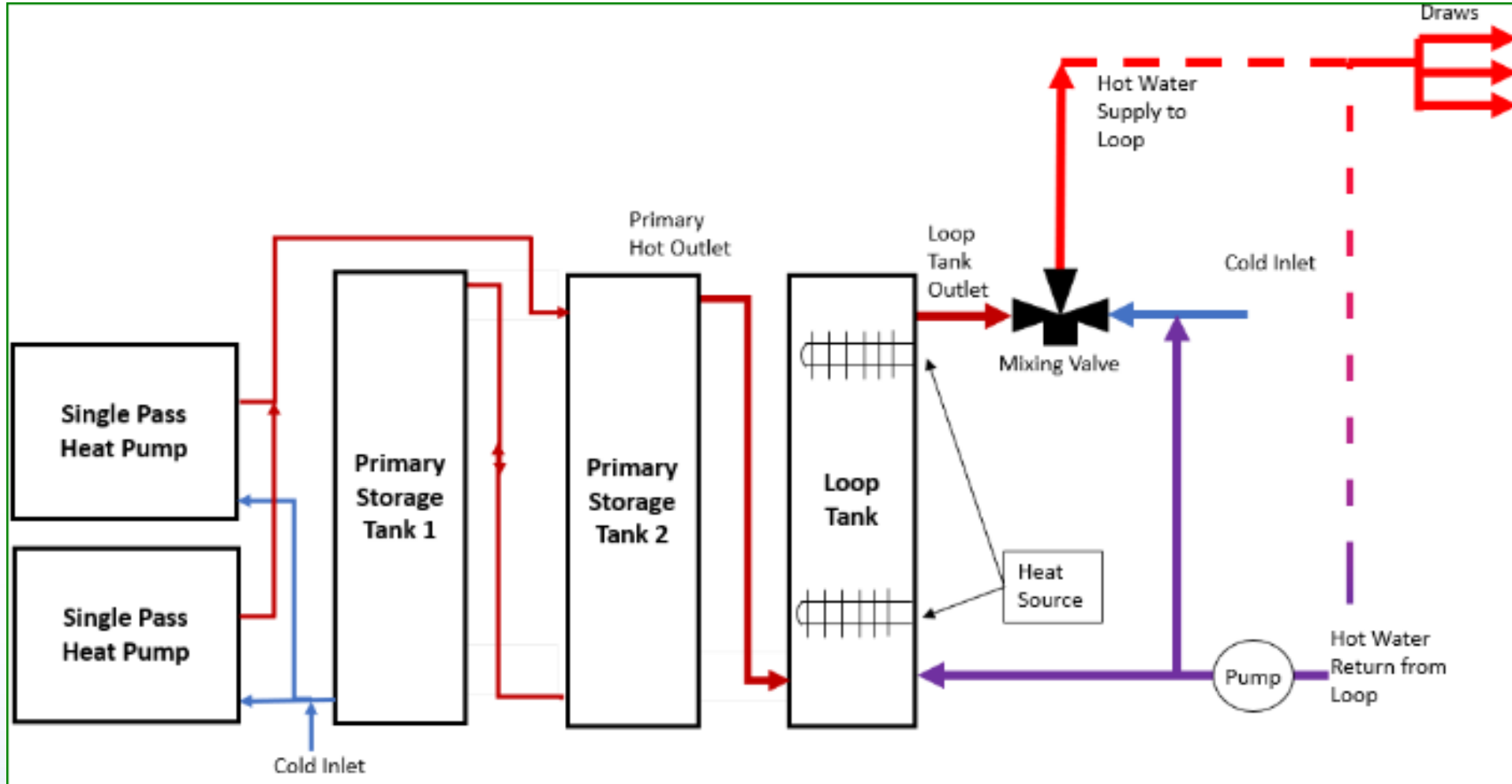
Gas/Propane Options

- Gas/propane water heater with solar water heating (RA4) (§170.2(d)3)

- Recirculation required if more than 8 dwelling units:
 - Meet §110.3(c)2&5
 - Auto-control pump per hot water demand and return temperature
- Executive Director can approve water heater systems



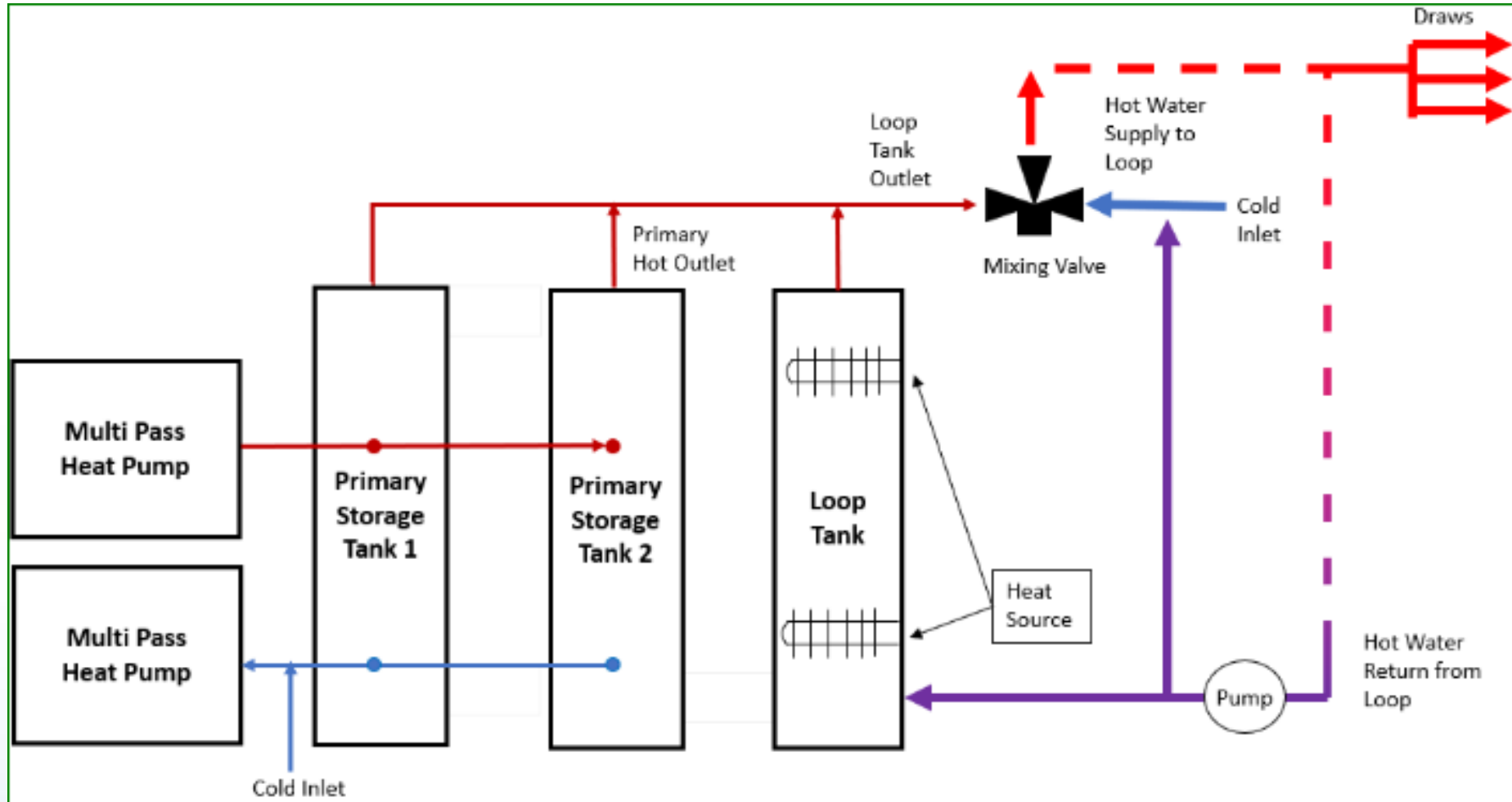
§170.2(d)2 – Central HPWH Diagram, Single-Pass



Source: [2022 CASE Report: Multifamily Domestic Hot Water – Central Heat Pump Water Heater](#)



§170.2(d)2 Diagram, Multi-Pass



Source: [2022 CASE Report: Multifamily Domestic Hot Water – Central Heat Pump Water Heater](#)



§170.2(d)3 – Newly Constructed; Multiple Dwelling Units, Gas/Propane

Central systems serving multiple dwelling units

- CZs 1-9: gas systems 1 MMBtu/h or greater:
 - Water heater thermal efficiency $\geq 90\%$; can use weighted average ([see example](#)) for systems with multiple water heaters
 - Individual gas water heaters 100,000 Btu/h or less excluded from calculations of the total system input or efficiency.
 - Exception: annual water heating energy $\geq 25\%$ site-solar or site-recovered
- Solar water heating (RA4) meeting these requirements:

Solar Savings Fraction (SSF), CZs 1-9	SSF, CZs 10-16	Additional Requirements
0.20	0.35	N/A
0.15	0.30	Drain Water Heat Recovery (RA3.6.9)



§170.2(d)3 Thermal Efficiency Calculation Example

Example: A water heating system includes these gas water heaters:

- 110k Btu/h, 85%
- 2x 300k Btu/h, 90%,
- 400k Btu/h, 95%
- 90k Btu/h, 70%

Total eligible capacity = 1.11 MMBtu/h or 1,110k Btu/h

$$\left(\frac{110}{1110}\right)(85\%) + \left(\frac{300}{1110}\right)(90\%) + \left(\frac{300}{1110}\right)(90\%) + \left(\frac{400}{1110}\right)(95\%) = 91.3\%$$

The 90k Btu/h water heater is excluded due to Exception 3, so this system complies!



Prescriptive Requirements

§§180.1(a)3, 180.2(b)3



§180.1(a)3 – Prescriptive; Additions

- When additional water heating equipment installed for dwelling unit as part of addition, must use one of the following:
 - Water-heating system meeting §170.2(d); or
 - Water-heating system approved by the Executive Director as using no more energy than one meeting §170.2(d)



§180.2(b)3 – Prescriptive; Alterations

Altered/replacement water-heating equipment for individual dwelling units must meet:

- Newly installed & existing accessible piping – §160.4(f)
- If recirculation is used, must meet RA4.4.9
- Choose one:

Option	Type	Other Requirements
i	Natural gas/propane water-heater	
ii	HPWH	<ul style="list-style-type: none">• Tank indoors, atop incompressible, rigid insulated surface (R-10 or higher)• Water heater interface that either meets §110.12(a) or has ANSI/CTA-2045-A B port
iii	HPWH, NEEA Tier 3 or higher	
iv	Consumer electric water heater	Existing system must be electric resistance
v	Approved by Executive Director as using no more energy than i-iv	Electric water heater allowed if no gas connected to existing water heater location



Performance Approach Requirements

§§170.1, 180.1(b), 180.2(c)



§170.1 – Performance Approach, Newly Constructed

	Budget Determined by	Source and TDV Energy Budgets
Standard	Mandatory and prescriptive requirements	Sum of energy for HVAC, indoor lighting, PV and battery, water heating, and covered process
Proposed	Calculated via CEC-approved compliance software	Sum of energy for HVAC, indoor lighting, PV and battery, water heating, and covered process

- Source energy and TDV energy budgets must be met separately
- LMCC-PRF or NRCC-PRF must show energy budgets do not exceed those of Standard Design
- CEC-approved community shared solar and/or battery providing benefits to permitted building may offset required solar PV or battery storage TDV



§180.1(b) – Performance Approach, Additions

- Calculations must meet §170.0-170.2(a), pursuant to:
 - Additions alone – must meet energy budgets specified in §170.1.
 - Existing plus alteration plus addition (E+A+A) – energy budgets defined per table below

	Existing	Alterations	Additions
Standard	Unaltered components to be kept	Match existing conditions, OR meet §180.2(c), whichever is more efficient	Proposed features meeting §180.1(a)
Proposed	Unaltered components to be kept	Altered components	Proposed features



§180.2(c) – Performance Approach, Alterations

- Altered component(s) and any newly equipment serving the alteration must meet §§110.0-110.9, 160.0, 160.1, 160.2(c)&(d), 160.3(a)-160.3(b)5J, 160.3(b)6, 160.3(c); & 160.5
 - When third party verification option is taken, all components to be altered for which extra credit is taken must be verified by a qualified third party.
 - Existing components to be replaced are altered and must meet standard design requirements

	Altered Components	Unaltered Components
Standard	Match existing conditions, or prescriptive requirements (§180.2(b)), whichever is more efficient	Existing conditions
Proposed	Actual values of altered components	Existing conditions



Compliance Forms



Certificates of Compliance

Low-Rise Multifamily

- LMCC-PLB-E Domestic Water Heating System
- LMCC-PRF-01-E – Low-Rise Multifamily, Performance

High-Rise Multifamily

- NRCC-PLB-E Domestic Water Heating System
- NRCC-PRF-01-E – High-Rise Multifamily & Nonresidential, Performance



LMCC-PLB-E – Table A-C

A. GENERAL INFORMATION

01	Project Location (city)		02	Climate Zone							
03	Occupancy Types Within Project (select all that apply):										
<input type="checkbox"/>	Office	<input type="checkbox"/>	Low-Rise Residential Multifamily <= 3 stories	<input type="checkbox"/>	Relocatable	<input type="checkbox"/>	School	<input type="checkbox"/>	Restaurant/ Commercial Kitchen	<input type="checkbox"/>	Religious Facility
<input type="checkbox"/>	State Building	<input type="checkbox"/>	Healthcare Facility	<input type="checkbox"/>	Hotel/ Motel	<input type="checkbox"/>	All Others	<input type="checkbox"/>	Convention Center	<input type="checkbox"/>	Medical Clinic
<input type="checkbox"/>	Auditorium	<input type="checkbox"/>	Parking Garage	<input type="checkbox"/>	Warehouse	<input type="checkbox"/>	Retail	<input type="checkbox"/>	Sports Arena	<input type="checkbox"/>	Gymnasium
<input type="checkbox"/>	Classroom	<input type="checkbox"/>	Library	<input type="checkbox"/>	Theater	<input type="checkbox"/>	Data Center	<input type="checkbox"/>	Support Areas	<input type="checkbox"/>	Financial Institution
<input type="checkbox"/>	Commercial/ Industrial	<input type="checkbox"/>	School	<input type="checkbox"/>	Grocery Store						

B. PROJECT SCOPE

This table identifies any domestic water heating systems that are within the scope of the permit application and are demonstrating compliance using the prescriptive paths outlined in §140.5/ §170.2(d), and §141.0(a)/ §180.1, or §141.0(b)2N/ §180.2 for additions or alterations. Solar water heating systems should be documented on the LMCC- SAB compliance document. Combined hydronic water heating systems should be documented on the LMCC-MCH compliance document.

01		02	03					
My project consists of (check all that apply):		System Type ^{1,2}	System Components					
<input type="checkbox"/>	New System (DHW system being installed for the first time in newly constructed building)		<input type="checkbox"/>	Equipment	<input type="checkbox"/>	Distribution	<input type="checkbox"/>	Controls
<input type="checkbox"/>	System Alteration (equipment, distribution, or controls)		<input type="checkbox"/>	Equipment	<input type="checkbox"/>	Distribution	<input type="checkbox"/>	Controls

C. COMPLIANCE RESULTS

Table Instructions: Table C will indicate if the project data input into the compliance document is compliant with water heating requirements. This table is not editable by the user. If this table says "DOES NOT COMPLY" or "COMPLIES with Exceptional Conditions" refer to Table D., or the table indicated as not compliant for guidance.

01	02	03	04
Domestic Hot Water Equipment	Distribution Systems	Controls	Compliance Results
Table F	Table G	Table H	
YES/NO	YES/NO	YES/NO	COMPLIES, COMPLIES with Exceptional Conditions or DOES NOT COMPLY

- Table A – General Info
 - Building location
 - Space/building type
- Table B – Project Scope
 - New construction, addition, or alteration
- Table C – Compliance Results



LMCC-PLB-E – Tables F&G

F. DOMESTIC HOT WATER EQUIPMENT

Table Instructions: Complete the following table to demonstrate compliance with mandatory equipment requirements in §110.1 and §110.3. Compliance with prescriptive requirements in §140.5(c)/§170.2(d) must also be demonstrated and with §141.0/§180.1/§180.2 for addition and alteration scopes.

Equipment Schedule: Water Heater Efficiency and Standby Loss

03		04				05		06		
System Name:		Exception to §140.5(c)/§170.2(d)3:				<input type="checkbox"/>	Capacity-weight efficiencies for gas systems \geq 1MMBtu/h ¹	Capacity-weighted Average Efficiency (%)		
07	08	09	10		11	12	13		14	15
Name or Item Tag	Equipment Type	Volume (gal)	Rated Input Capacity (Btu/h)	Max GPM/ First Hour Rating (FHR)	Rated Efficiency	Minimum Efficiency Required	Efficiency Unit	Designed Standby Loss	Maximum Standby Loss	

- Table F – Water heater info
 - Equipment type
 - Storage
 - Efficiency

G. DOMESTIC HOT WATER DISTRIBUTION SYSTEM

Table Instructions: Complete the following table to demonstrate compliance for nonresidential occupancies with distribution requirements in §120.3 and §140.5. For multifamily and hotel/motel occupancies, compliance is demonstrated with requirements in §110.3(c), §160.4 and §170.2(d).

Recirculation Loops in Central Systems Serving Dwelling Units or Nonresidential Spaces

	Yes	No	Not Applicable	Requirement
01				Air release valve or vertical pump installation per §110.3(c)4A
02				Check valve or similar located between recirculation pump and water heating equipment to prevent backflow per §110.3(c)4B
03				Hose bibb installed between pump and equipment and isolation valve between hose bibb and equipment per §110.3(c)4C
04				Isolation valves on both sides of the pump per §110.3(c)4D

- Table G – Distribution system
 - Recirc. Loops
 - Pipe insulation



LMCC-PLB-E – Tables H&I

H. DOMESTIC HOT WATER SYSTEM CONTROLS

Table Instructions: Complete the following table to demonstrate compliance with controls requirements in §110.3 for all occupancies. For multifamily residential and hotel/motel occupancies, compliance is demonstrated with requirements in §160.4(e) and §170.2(d).

	Yes	No	Not Applicable	Requirement
01	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Construction documents require manufacturer certification that service water-heating systems are equipped with automatic temperature controls capable of adjusting temperature settings per §110.3(a).
02	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Systems with capacity > 167,000 BTUH equipped with outlet temperature controls per §110.3(c)1 unless covered by California Plumbing Code Section 613.0.
03	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Controls for circulating pumps or electrical heat trace systems are capable of automatically turning off the system per §110.3(c)2 unless system serves healthcare facility.
04	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	For recirculation systems serving multiple dwelling units, design includes automatic pump controls per §170.2(d), or §160.4(e).

I. DECLARATION OF REQUIRED CERTIFICATES OF INSTALLATION

Low-rise Multifamily and Multifamily Mixed-use Certificates of Installation

Table Instructions: Selections have been made based on information provided in previous tables of this document. If any selection needs to be changed, please explain why in Table E. Additional Remarks. These documents must be provided to the building inspector during construction and can be found online.

Yes	No	Form/Title	Field Inspector	
			Pass	Fail
<input checked="" type="radio"/>	<input type="radio"/>	LMCI-PLB-01-E - Must be submitted for all buildings	<input type="checkbox"/>	<input type="checkbox"/>

- Table H – Controls
 - Mandatory controls
 - Recirc. Controls
 - Boiler combustion air controls
- Table I – Required Certs of Install



Certificates of Installation

Low-Rise Multifamily

- LMCI-PLB-E Domestic Water Heating System
- LMCI-PLB-01-E Multifamily Central Hot Water System Distribution
- LMCI-PLB-02-E Individual Dwelling Unit Hot Water System Distribution
- LMCI-PLB-21-H HERS Verified Multifamily Central Hot Water System Distribution
- LMCI-PLB-22-H HERS Verified Multifamily Central Hot Water System Distribution – Individual Dwelling Unit

High-Rise Multifamily

- 2022-NRCI-PLB-E Domestic Water Heating System



LMCI-PLB-E – Tables A-C, F

A. GENERAL INFORMATION

01	Project Location (city):	05	Authority Having Jurisdiction:
02	Zip Code:	06	Building Permit #:
03	Date of Permit Set used for construction:	07	Date of As-built Set:
04	Name of Permit Set used for construction:	08	Name of As-built Set:

B. INSTALLER SCOPE

This table indicates construction systems and materials documented on this Certificate of Installation.

01	02	03
<input type="checkbox"/> Water Heating Equipment	<input type="checkbox"/> Distribution (piping, valves, insulation, etc.)	<input type="checkbox"/> Controls

C. COMPLIANCE RESULTS

*This table indicates whether the as-built conditions documented in this form are equal or better than what was documented on the permitted Certificate of Compliance. If the installation is not equal or better, Section 10-103(a)2B requires the **Certificate of Compliance** to be revised accordingly to demonstrate compliance.*

01	INSTALLED FEATURES EXACTLY MATCH DESIGN ON PERMITTED CERTIFICATE OF COMPLIANCE
Documented as-built conditions should be verified by inspector from Authority Having Jurisdiction to comply.	

The Certificate of Compliance should be revised to confirm as-built conditions comply and this Certificate of Installation updated accordingly.

DOMESTIC HOT WATER EQUIPMENT EFFICIENCY

01	02	03	04	05	06	07	08	09	10	11
Name or Item Tag	Model #	Individual or Central System	Equipment Type	Volume (gal)	Rated Input Capacity (Btu/h)	Capacity Unit	Rated Efficiency	Efficiency Unit	Standby Loss	DHW Equipment Compliance
Per C of C										
As-built Conditions										

- Table A – General Info
- Table B – Installer Scope
 - Water heaters
 - Distribution
 - Controls
- Table C – Compliance Results
- Table F – Install Details
 - Model
 - Central or individual
 - Water heater type
 - Efficiency



Certificates of Verification

Low-Rise Multifamily

- LMCV-PLB-21-H HERS Verified Multifamily Central Hot Water System Distribution
- LMCV-PLB-22-H HERS Verified Multifamily Central Hot Water System Distribution – Individual Dwelling Unit

High-Rise Multifamily

- 2022-NRCV-PLB-21-H Multifamily Central Hot Water System Distribution
- 2022-NRCV-PLB-22-H HERS Verified Individual Dwelling Unit Hot Water System Distribution



LMCV-PLB-21-H – Tables A-C2

A. General Information

01	Building Name	
----	---------------	--

B. Design HERS Verified Central Water Heating Systems Information (other than HPWH)

This table reports features of the water heating system other than HPWH system that were specified on the registered LMCC compliance document for this project.

01	02	03	04	05	06	07	08	09	10	11	12
Water Heating System ID or Name	Water Heating System Type	Water Heater Type	# of Water Heaters in System	Water Heater Storage Volume (gal)	Fuel Type	Rated Input Type	Rated Input Value	Heating Efficiency Type	Heating Efficiency Value	Standby Loss (%)	Exterior Insul. R-Value

C. Installed HERS Verified Central Water Heating Systems Information

This table reports the water heating system features that were specified on the registered LMCC compliance document for this project.

01	02	03	04	05	06	07	08	09	10	11	12
Water Heating System ID or Name	Water Heating System Type	Water Heater Type	# of Water Heaters in System	Water Heater Storage Volume (gal)	Fuel Type	Rated Input Type	Rated Input Value	Heating Efficiency Type	Heating Efficiency Value	Standby Loss (%)	Exterior Insul. R-Value

- Table A – Building Name
- Tables B & B2 – Design Central WH System Info, as given on LMCC
 - WH system type
 - Number of WHs
 - Volume
 - Fuel type
- Tables C & C2 – Installed Central WH System Info, as given on LMCC



LMCV-PLB-21-H – Tables D-F

D. Design HERS Verified Central Water Heating Distribution Systems Information

This table reports the water heating distribution types specified on the registered LMCC compliance document for this project.

01	02	03
Water Heating System ID or Name	Central DHW System Distribution Type	Dwelling Unit DHW System Distribution Type

E. Installed HERS Verified Central Water Heating Distribution Systems Information

This table reports the water heating distribution types specified on the registered LMCC compliance document for this project.

01	02	03
Water Heating System ID or Name	Central DHW System Distribution Type	Dwelling Unit DHW System Distribution Type

F. Installed HERS Verified Water Heater Manufacturer Information

01	02	03
Water Heating System ID or Name	Manufacturer	Model Number

- Table D – Design Distribution System, as given on LMCC
 - Distribution type
- Table E – Installed Distribution System, as given on LMCC
- Table F – Installed WH Manufacturer Info.
 - Manufacturer
 - Model number



LMCV-PLB-21-H – Tables G-I

G. Mandatory Requirements for All Central Domestic Hot Water Systems	
01	On systems that have a total capacity greater than 167,000 Btu/hr, outlets that require higher than service water temperatures as listed in the ASHRAE Handbook have separate remote heaters, heat exchangers, or boosters to supply the outlet with the higher temperature. (Section 110.3 (c)1)
02	Systems with circulating pumps or with electrical heat trace systems shall be capable of automatically turning off the system. (Section 110.3(c) 2).
03	Unfired storage tanks are insulated with: <ul style="list-style-type: none"> • External insulation of R-3.5, or • Internal insulation of R-16, or • The heat loss of the tank surface based on an 80°F water-air temperature difference shall be less than 6.5 Btu/h/ft²

H. HERS-Verified Multiple Recirculation Loops for DHW Systems Serving Multiple Dwelling Units Requirements	
All distribution systems listed on this form shall comply with these requirements.	
01	All buildings with 8 or more dwelling units have a minimum of 2 recirculation loops.
02	Each loop roughly serves the same number of dwellings.
03	Verification Status: <ul style="list-style-type: none"> <input type="checkbox"/> <u>Pass</u> - all applicable requirements are met; or <input type="checkbox"/> <u>Fail</u> - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or <input type="checkbox"/> <u>All N/A</u> - This entire table is not applicable
04	Correction Notes:
<p>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 Correction Notes.</p>	
<p>I. Determination of HERS Verification Compliance</p> <p>All applicable sections of this document shall indicate compliance with the specified verification protocol requirements in order for this Certificate of Verification as a whole to be determined to be in compliance.</p>	
01	

- Table G – Mandatory requirements
- Table H – Recirc. Loops Serving Multiple Dwelling Units
 - Pass/Fail
- Table I – HERS Compliance



Resources



Water Heater Efficiency Guide

[Download the Water Heater Efficiency Guide](#)

CALIFORNIA ENERGY COMMISSION | EFFICIENCY DIVISION

Water Heater Efficiency Guide



These tables list the minimum uniform energy factors required by federal regulations for some of the most common types and sizes of water heaters.

Consumer Gas-Fired Instantaneous (> 50,000 Btu/h, ≤ 200,000 Btu/h) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.80	0.81	0.81	0.81

Consumer Gas-Fired Storage (≤ 75,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
30	0.29	0.54	0.60	0.65
40	0.27	0.52	0.58	0.64
50	0.25	0.50	0.56	0.63
55	0.24	0.49	0.55	0.62
60	0.61	0.74	0.77	0.79
75	0.60	0.73	0.76	0.78
80	0.60	0.73	0.76	0.78

Residential-Duty Commercial Gas-Fired Storage (> 75,000 Btu/h, ≤ 105,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
50	0.22	0.48	0.55	0.61
60	0.21	0.46	0.53	0.61
75	0.2	0.45	0.52	0.59
80	0.2	0.44	0.51	0.59

Consumer Electric Instantaneous (≤ 12 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.91	0.91	0.91	0.92

Residential-Duty Commercial Electric Instantaneous (> 12 kW, ≤ 58.6 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.80	0.80	0.80	0.80

Btu/h: British thermal units per hour kW: Kilowatt GPM: Gallons Per Minute FHR: First Hour Rating UEF: Uniform Energy Factor



Online Resource Center

www.energy.ca.gov/orc



- **Handouts**
- Fact sheets
- Guides
- **Tools**
- Checklists
- Blueprint newsletter
- **Training**
- Presentations
- Videos
- **Links**
- Internal resources
- External resources



Field Verification & Diagnostic Testing Program

Program information

- 2022 Energy Code approvals in process
- Providers and registries for 2022 Energy Code



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



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



Blueprint Newsletter

- Energy Code quarterly newsletter
- Updates
- Clarifications
- Frequently asked questions

Issue 138 | April - June 2022

BLUEPRINT

CALIFORNIA ENERGY COMMISSION
EFFICIENCY DIVISION

IN THIS ISSUE

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

2022 Energy Code: Multifamily Summary

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

Mandatory Requirements

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

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

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



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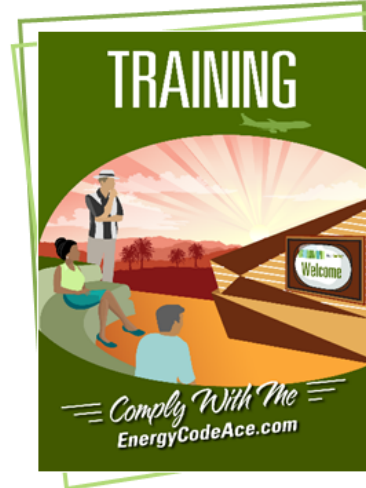
Energy Code Hotline



- Monday through Friday
 - 8:00 a.m. to 12:00 p.m.
 - 1:00 p.m. to 4:30 p.m.
- Call
 - 800-772-3300 in CA
 - 916-654-5106 outside CA
- Email
 - Title24@energy.ca.gov



Other Available Resources – Energy Code Ace



- Tools help automate tasks:**
- ✦ Energy Code Product Finder
 - ✦ Forms Ace
 - ✦ Image Ace
 - ✦ Navigator Ace
 - ✦ Nonres. Indoor Lighting Wheel
 - ✦ Q&Ace
 - ✦ Reference Ace
 - ✦ Timeline Ace
 - ✦ Virtual Compliance Assistant

- Training is activity based and delivered in a variety of formats:**
- ✦ Live Online instructor-led
 - ✦ Recorded webinars
 - ✦ Online self-study
 - ✦ YouTube — live streaming & videos

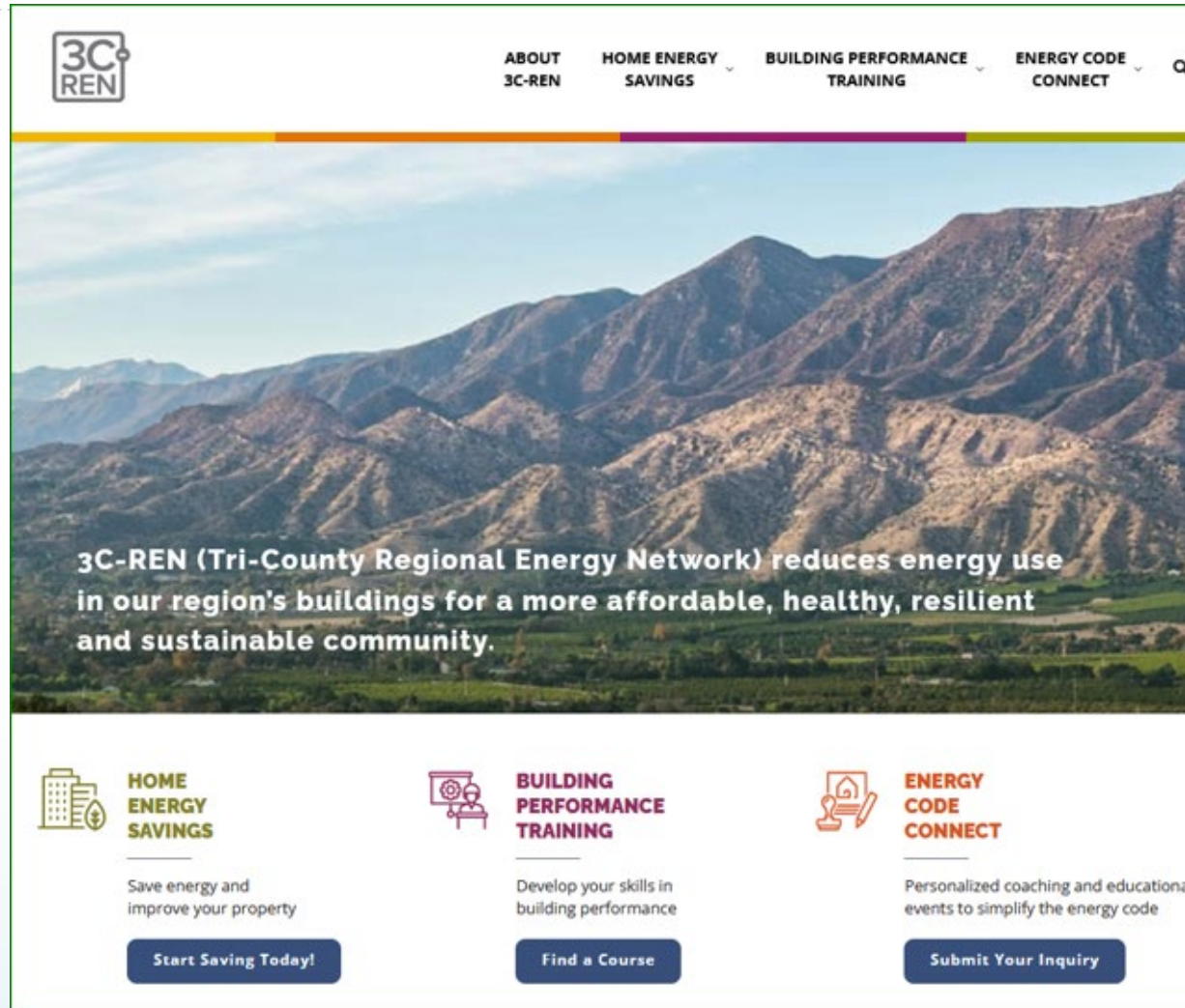
- Resources provide quick, useful guidance:**
- ✦ Fact Sheets
 - ✦ Checklists
 - ✦ Application Guides
 - ✦ Submit a Question
 - ✦ Trigger Sheets
 - ✦ Useful Links

Join us at EnergyCodeAce.com

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Other Available Resources – 3C-REN



The screenshot shows the homepage of the 3C-REN website. At the top left is the 3C-REN logo. The navigation menu includes 'ABOUT 3C-REN', 'HOME ENERGY SAVINGS', 'BUILDING PERFORMANCE TRAINING', and 'ENERGY CODE CONNECT'. A search icon is also present. The main banner features a landscape image of mountains and a text overlay: '3C-REN (Tri-County Regional Energy Network) reduces energy use in our region's buildings for a more affordable, healthy, resilient and sustainable community.' Below the banner are three service cards: 'HOME ENERGY SAVINGS' with a 'Start Saving Today!' button, 'BUILDING PERFORMANCE TRAINING' with a 'Find a Course' button, and 'ENERGY CODE CONNECT' with a 'Submit Your Inquiry' button.

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Other Available Resources – BayREN

A screenshot of the BayREN website homepage. The header is dark green with navigation links: "» HOW TO GET STARTED", "» FIND A CONTRACTOR", "» FIND AN ASSESSOR", and "» PARTNER WITH US". A search bar is in the top right. The main content area features a large image of a park with a playground and a building. A dark purple circular overlay on the right contains the text "Score big with smart energy upgrades." and "Upgrade your multifamily building and earn cash back — starting at \$750/unit." with a "Learn More" button. The left sidebar has a white background with the BayREN logo and navigation links: "REBATES & FINANCING", "HOME LEARNING CENTER", "EVENTS & TRAINING", "LOCAL GOVERNMENT RESOURCES", and "ABOUT". Social media icons for Facebook, LinkedIn, Twitter, Instagram, and YouTube are at the bottom left.

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Questions?





Thank you