We will be starting soon!

Thanks for joining us

Introduction to the Energy Code

Central Coast and Ventura ICC Chapter Series

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Andy Pease AIA, LEED AP BD+C – In Balance Green Consulting

May 10, 2023

CENTRAL COAST AND VENTURA ICC CHAPTER SERIES

Zoom Meetings
Wednesdays
2:00 pm - 3:00 pm

Partner

inBALANCE Green Consulting

Co-Sponsors

CENTRAL COAST INTERNATIONAL CODE COUNCIL

VENTURA REGION CHAPTER

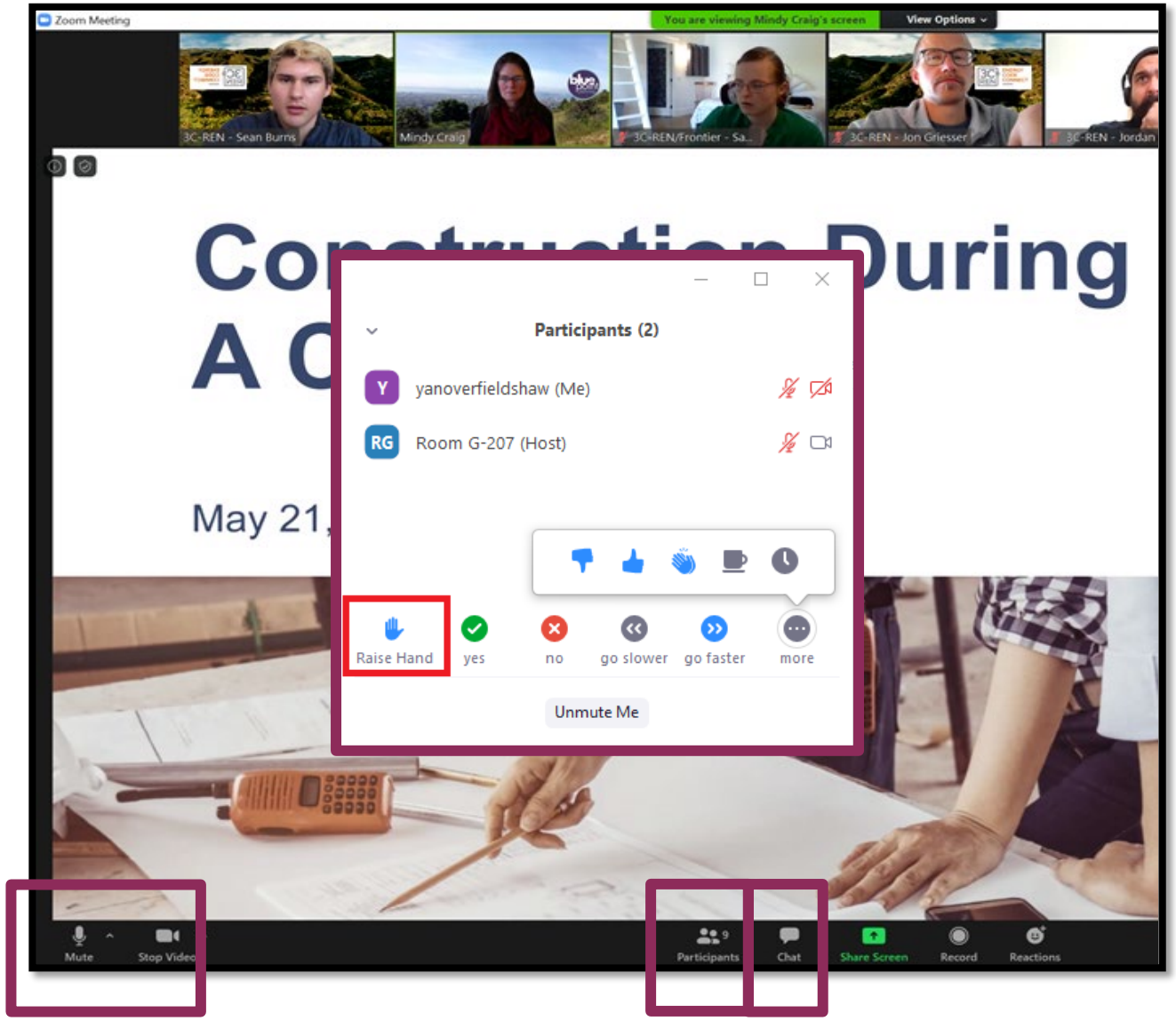
Course Schedule:

5/10	Introduction to the Energy Code
5/31	2022 Energy Code: Single Family
6/14	2022 Energy Code: Multi Family
6/28	2022 Energy Code: ADUs
7/19	2022 Energy Code: Nonresidential
8/2	CALGreen Overview and 2022 Changes

3C REN

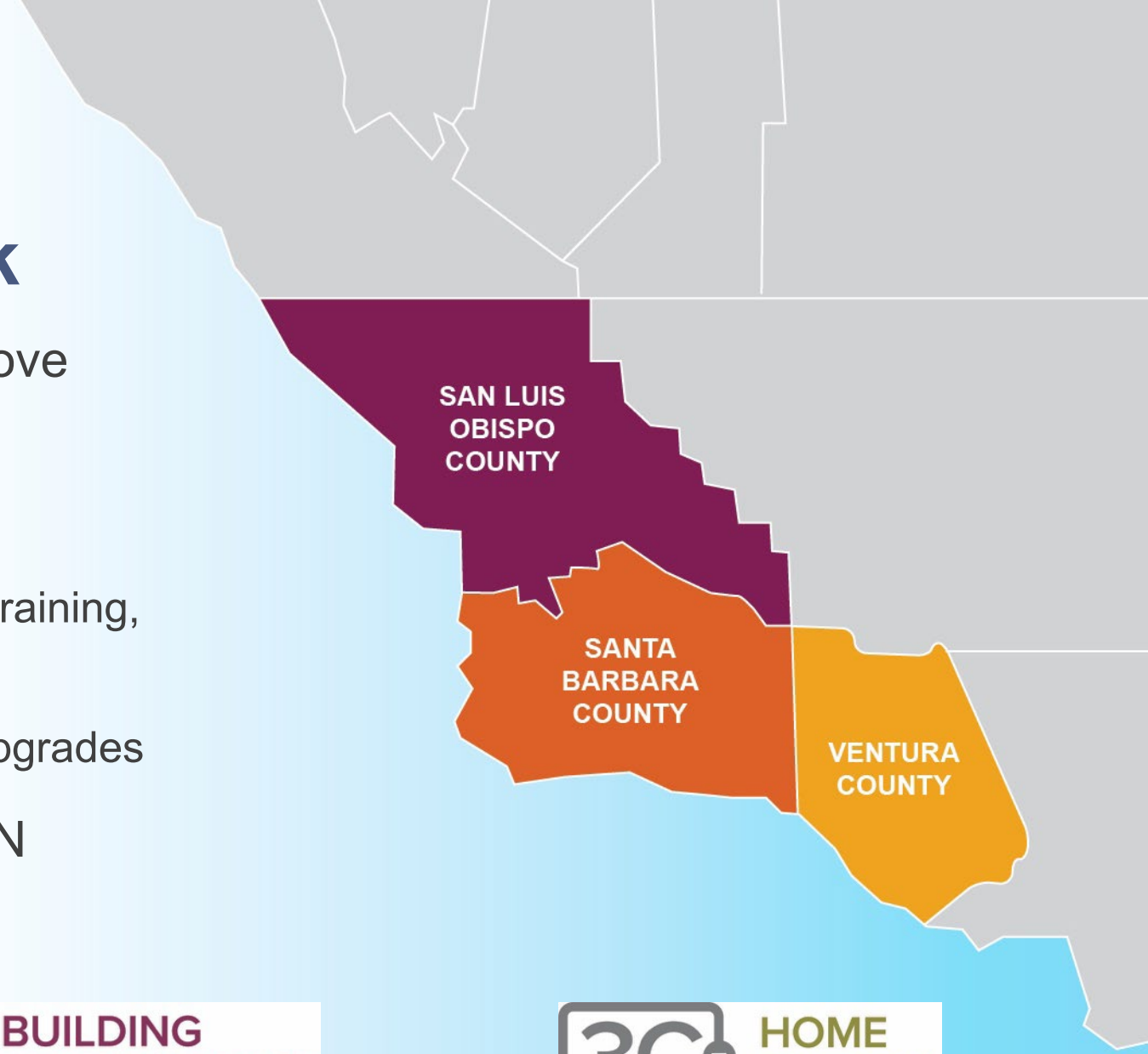
Zoom Orientation

- Please be sure your full name is displayed
- Please mute upon joining
- Use "Chat“ box to share questions or comments
- Under "Participant" select "Raise Hand" to share a question or comment verbally
- The session may be recorded and posted to 3C-REN's on-demand page. Feel free to ask questions via the chat and keep video off if you want to remain anonymous in the recording.



3C-REN: Tri-County Regional Energy Network

- Three counties working together to improve energy efficiency in the region
- Services for –
  - **Building Professionals:** industry events, training, and energy code compliance support
  - **Households:** free and discounted home upgrades
- Funded by ratepayer dollars that 3C-REN returns to the region



3C REN ENERGY CODE CONNECT

3C REN BUILDING PERFORMANCE TRAINING

3C REN HOME ENERGY SAVINGS

3C REN ENERGY CODE CONNECT

- Serves all building professionals
- Three services –
  - **Energy Code Coach**
  - **Training and Support**
  - **Regional Forums**
- Makes the Energy Code easy to follow

Energy Code Coach:
3c-ren.org/codes
805.781.4784

Event Registration:
3c-ren.org/events

BUILDING PERFORMANCE TRAINING

- Serves current and prospective building professionals
- Expert instruction:
  - **Technical skills**
  - **Soft skills**
- Helps workers to thrive in an evolving industry

Event Registration:
3c-ren.org/events

3C REN HOME ENERGY SAVINGS

Multifamily (5+ units)

- No cost technical assistance
- Rebates up to $750/apartment plus additional rebates for specialty measures like heat pumps

Single Family (up to 4 units)

- Sign up to participate!
- Get paid for the metered energy savings of your customers

Enrollment:
3C-REN.org/contractor-participation

3C-REN
Staff Online

Learning Objectives - Course Overview

Historical Context: Why we have building energy efficiency standards in California.

California's Energy Code: State, National, and local jurisdictional context.

Energy Code Triennial Cycle: The Energy code is updated regularly to keep pace with State legislature's goals and policies.

Energy Code in Design and Construction: The energy code helps to inform our decision making processes.

A Closer Look at Title 24 Part 6: The California energy efficiency standards have been organized by broad building type and energy use categories.

Additional Resources: Where to find tools and information to help you and others learn about the energy code

3C-REN Overview &Upcoming Events: 3C-REN resources and Questions and Answers

Historical Context

National Energy Crisis and the Oil Embargo

- Oil Embargo in 1973
  - US dependent on OPEC oil
  - Crisis from limited supply of gas
- The embargo helped to change attitude towards energy
  - Speed limit from 70 to 55 mph to save energy
  - Oregon turned off all hot water to state buildings
  - President Jimmy Carter asked everyone to put on a sweater and install solar panels on the roof of the White House (Ronald Reagan removed them at the start of his term)

Photos: theconversation.com, https://history.state.gov/milestones/1969-1976/oil-embargo

California Adopts Legislation Addressing its Energy Future

- California Energy Commission established 1974
- California Buildings Standards Commission created the CA Energy Code in 1978
  - To reduce CA energy consumption
  - Development of California Energy Efficiency Standards
- California adopts the most stringent energy code in the US
- Energy consumption in California levels off at 1970 energy consumption while the state grows significantly in population.
  - 1978 pop. About 23 million
  - 2020 pop. About 40 million

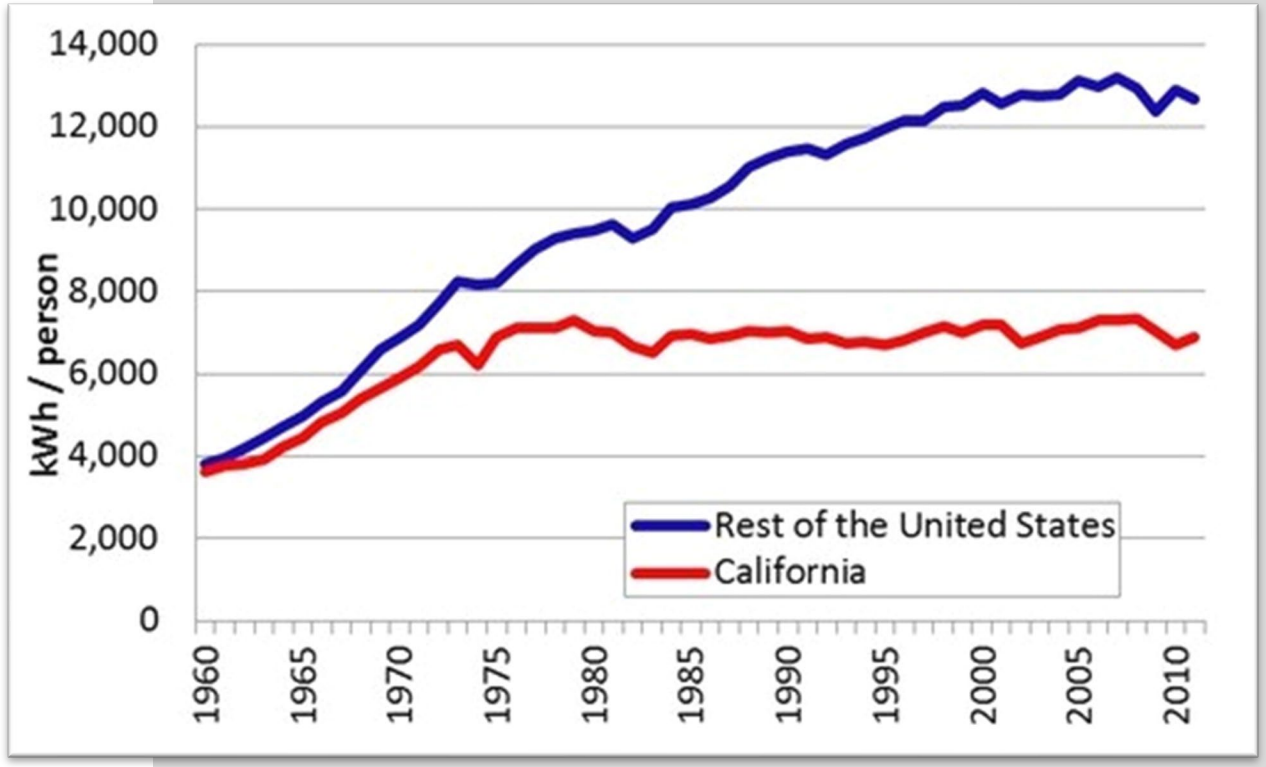


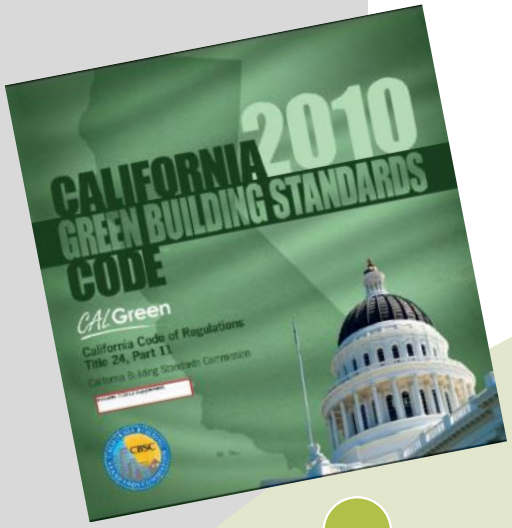
Photo: https://www.lutron.com/

Energy Efficiency Standards are Born

- Building code is a set of standards established and enforced by local government for public health, safety, and welfare related to buildings.
- Energy Code is designed to “reduce wasteful and unnecessary energy consumption” through a set of standards
- Energy code works! California has one of the lowest per capita energy consumption in the US (4th)

Credits: www.cgs.ca.gov, wakelandhdc.com/

Steady progression in California



All electric

1978

Title 24 Energy Standard

2008

Energy Efficiency Strategic Plan

2020

PV's for homes

2030

40% Reduction GHG in Buildings

2045

100% Carbon-Free Electric Generation

Current Situation in California

Move toward electrification

- Newer houses use a 1/3 less natural gas but 50% more electricity
- Studies show that new construction is half as costly as retrofit heat pump water heaters
- Over 50 cities and counties in CA require some level of all-electric new construction

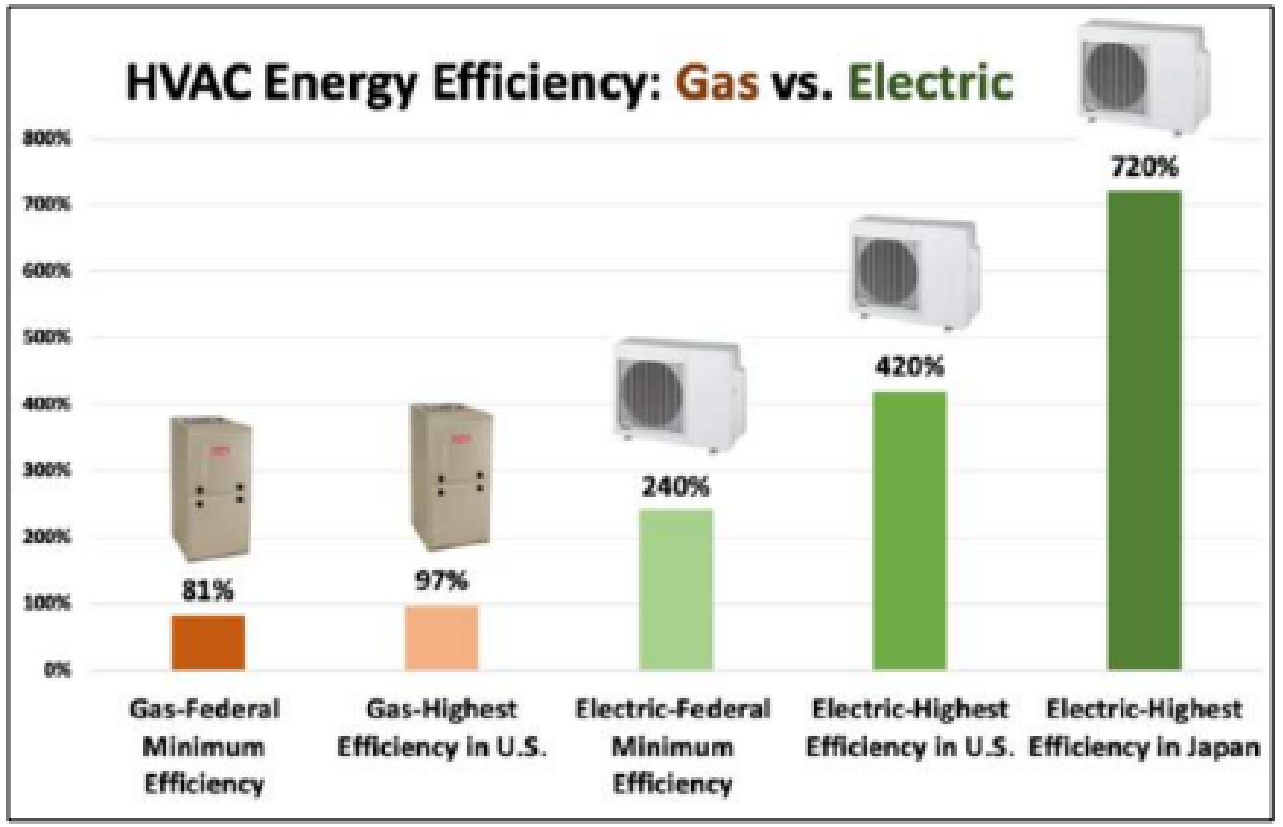


Figure 7: The relative efficiency of gas vs. electric Heating and Cooling products. Air source heat pumps collect more energy than they use. (Image by Redwood Energy).

Source: Redwood Energy ZNE MF Guide

California's Energy Code

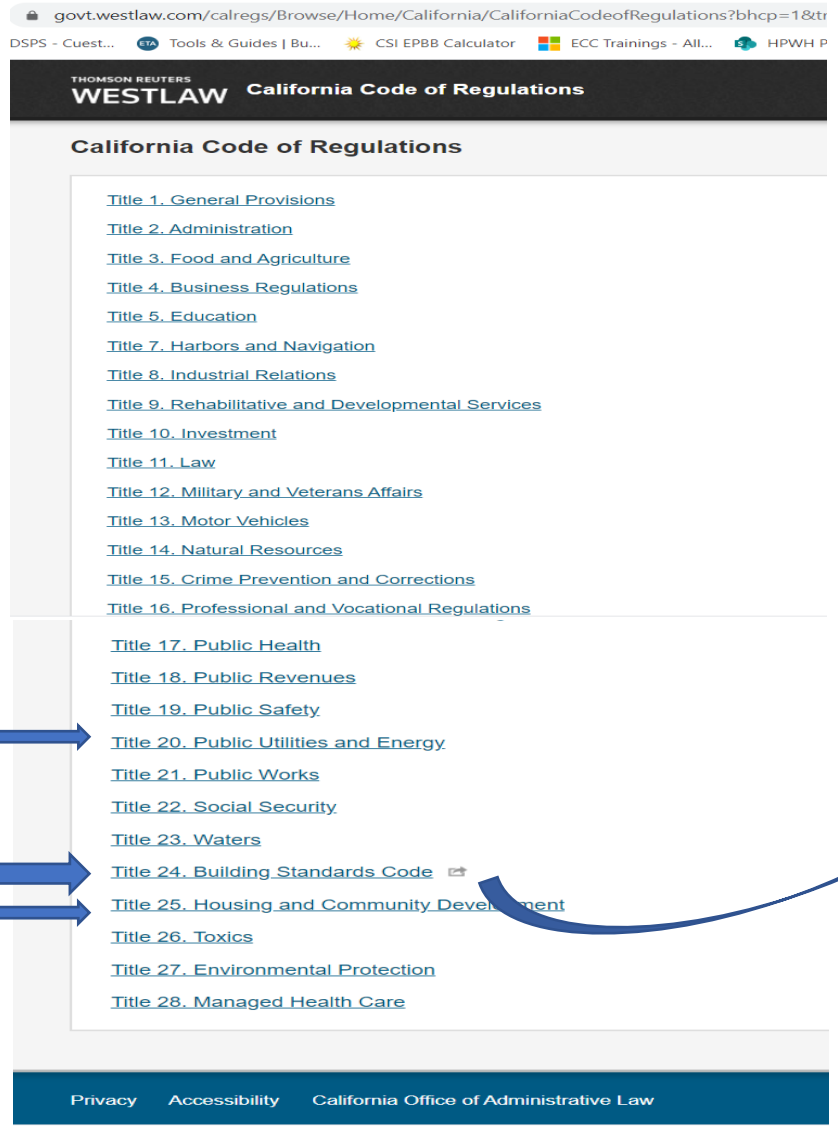
California Code of Regulations (CCR)

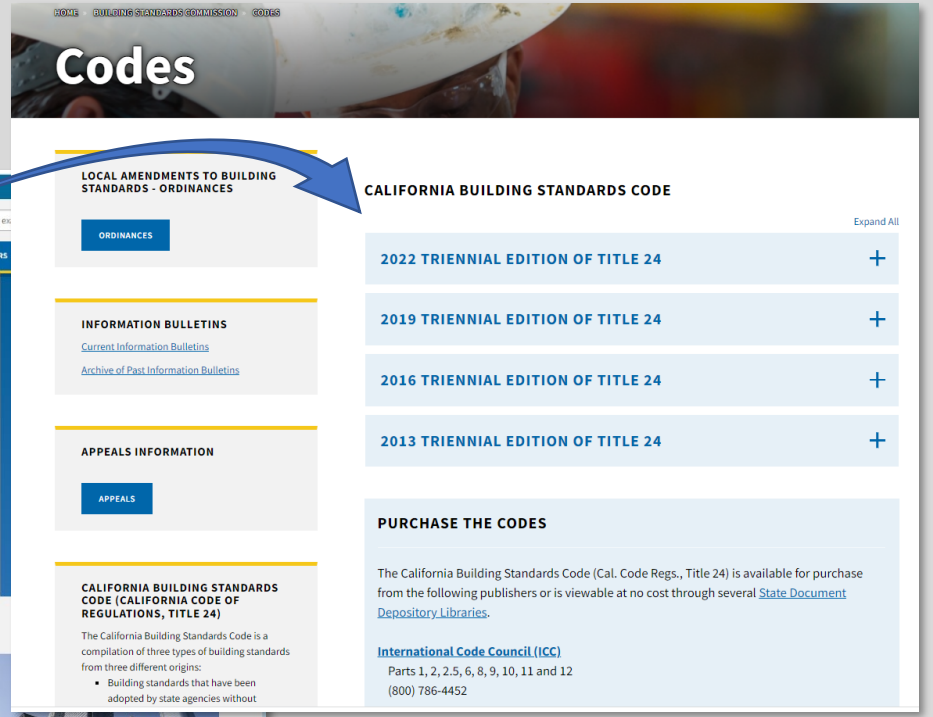
California has 28 ***Titles*** comprising the rules and regulations e.g. administrative laws, for roughly 200 regulatory agencies. The Office of Administrative Law (OAL) maintains and oversees all but Title 24 Building Standards Code, which falls under the California Building Standards Commission.

Title 1. General Provisions
Title 2. Administration
Title 3. Food and Agriculture
Title 4. Business Regulations
Title 5. Education
Title 6. Governor's Regulations (empty)
Title 7. Harbors and Navigation
Title 8. Industrial Relations
Title 9. Rehabilitative and Developmental Services
Title 10. Investment
Title 11. Law
Title 12. Military and Veterans Affairs
Title 13. Motor Vehicles
Title 14. Natural Resources
Title 15. Crime Prevention and Corrections
Title 16. Professional and Vocational Regulations
Title 17. Public Health
Title 18. Public Revenues
Title 19. Public Safety
Title 20. Public Utilities and Energy
Title 21. Public Works
Title 22. Social Security
Title 23. Waters
Title 24. Building Standards Code
Title 25. Housing and Community Development
Title 26. Toxics
Title 27. Environmental Protection
Title 28. Managed Health Care

Calif. Code of Regulations and the Building Standards Commission

Through a contract with Westlaw, the CCR Titles can be found on line at https://govt.westlaw.com/calregs





Title 24 Building Standards Codes links to the California Department of General Services: Building Standards Commission

https://www.dgs.ca.gov/BSC

Title 24 Building Standards

Part 1-California Administrative Code

Part 2-California Building Code

Part 2.5-California Residential Code

Part 3-California Electrical Code

Part 4-California Mechanical Code

Part 5-California Plumbing Code

Part 6-California Energy Code

Part 7- Reserved

Part 8 - California Historical Building Code

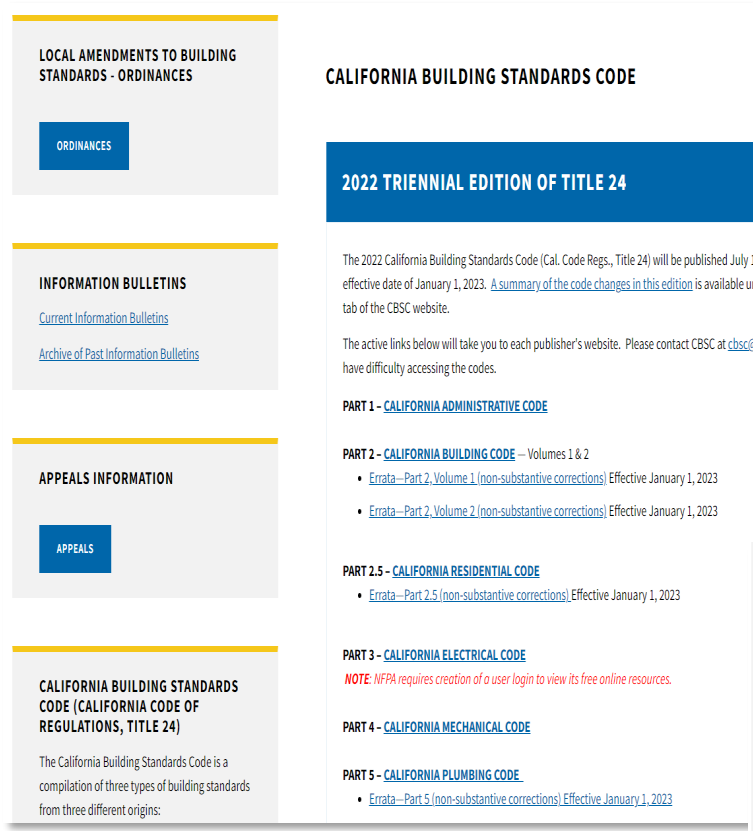
Part 9-California Fire Code

Part 10 - California Existing Building Code

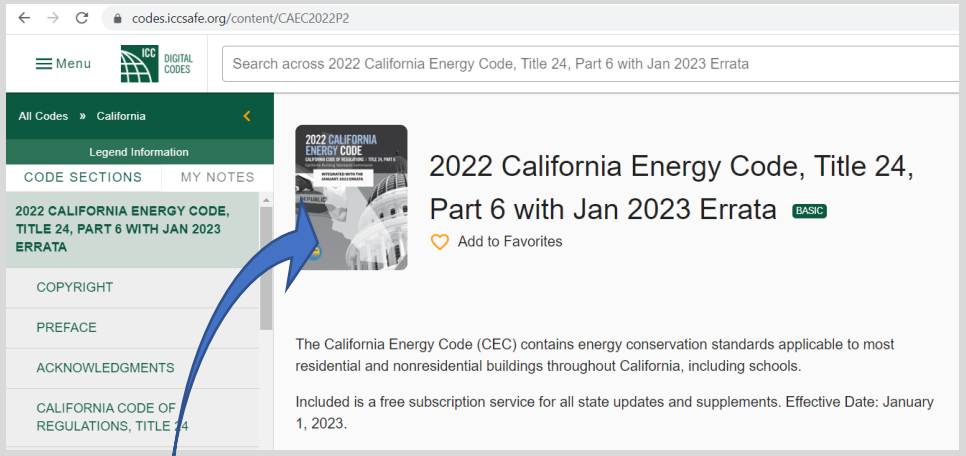
Part 11-California Green Building Standards Code

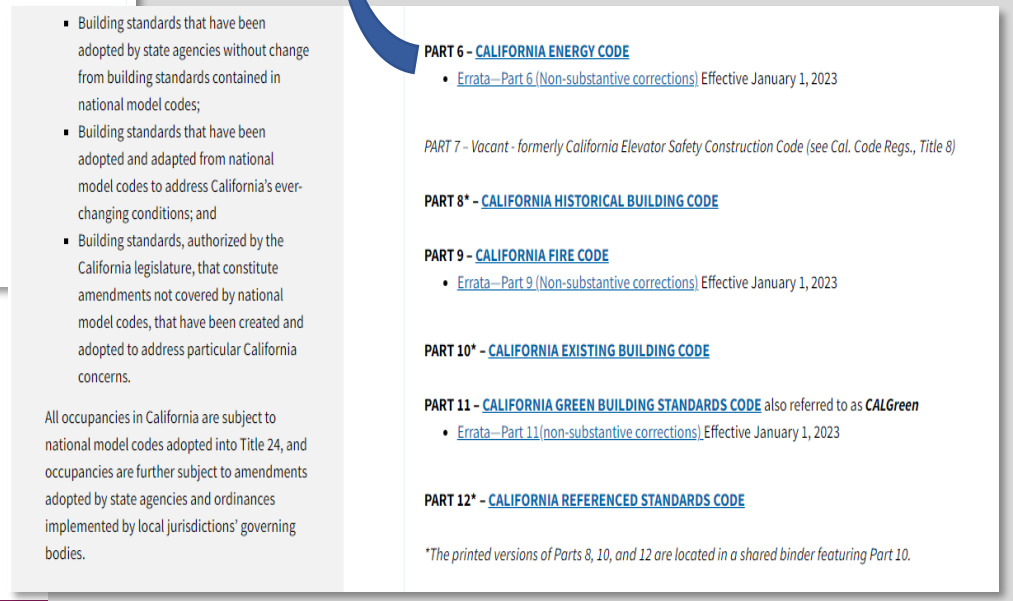
Part 12-California Referenced Standards Code

https://www.dgs.ca.gov/BSC/Codes



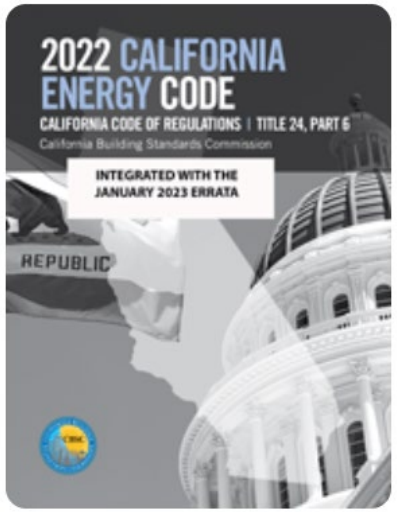
Title 24, Part 6 California Energy Code
https://codes.iccsafe.org/content/CAEC2022P2





Title 24 Part 6, *CCR / ICC*

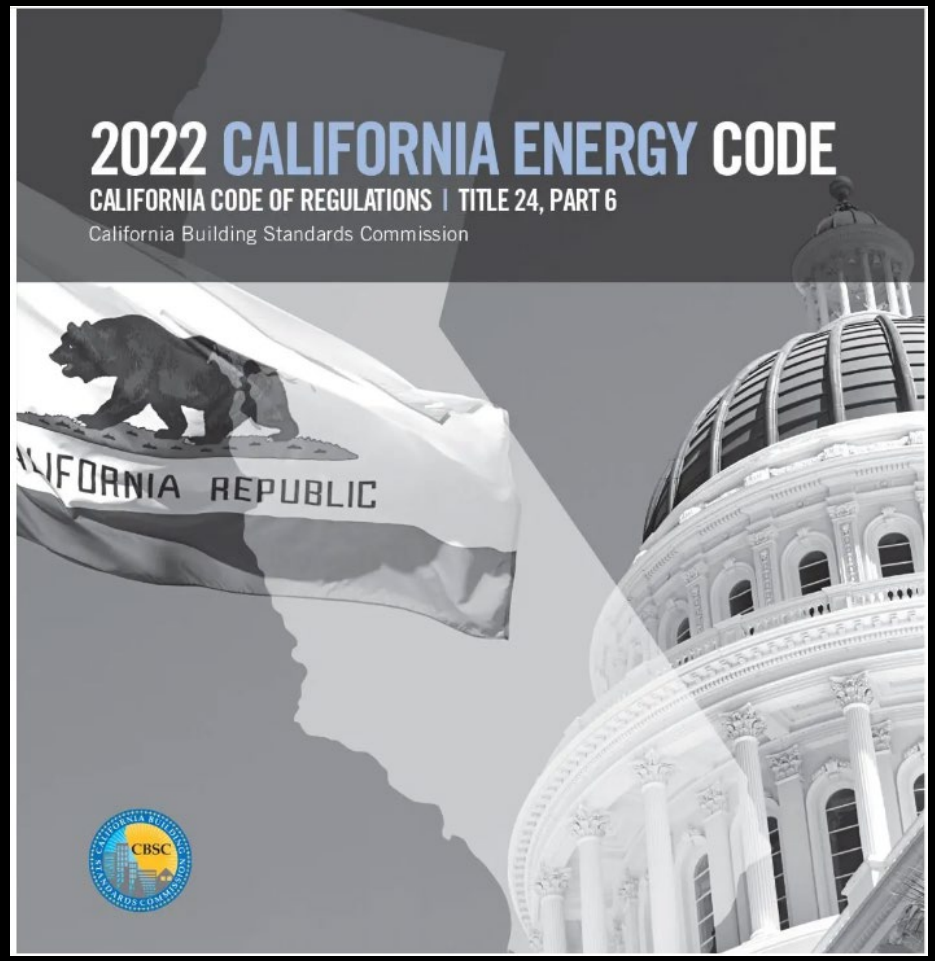
Digital Version – Basic and Premium



2022 California Energy Code, Title 24, Part 6 with Jan 2023 Errata

- SUBCHAPTER 1 ALL OCCUPANCIES—GENERAL PROVISIONS
- SUBCHAPTER 2 ALL OCCUPANCIES—MANDATORY REQUIREMENTS FOR THE MANUFACTURE, CONSTRUCTION AND INSTALLATION OF SYSTEMS, EQUIPMENT AND BUILDING COMPONENTS
- SUBCHAPTER 3 NONRESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES—MANDATORY REQUIREMENTS
- SUBCHAPTER 4 NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES—MANDATORY REQUIREMENTS FOR LIGHTING SYSTEMS AND EQUIPMENT, AND ELECTRICAL POWER DISTRIBUTION SYSTEMS
- SUBCHAPTER 5 NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY
- SUBCHAPTER 6 NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES— ADDITIONS, ALTERATIONS AND REPAIRS
- SUBCHAPTER 7 SINGLE-FAMILY RESIDENTIAL BUILDINGS— MANDATORY FEATURES AND DEVICES
- SUBCHAPTER 8 SINGLE-FAMILY RESIDENTIAL BUILDINGS—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES
- SUBCHAPTER 9 SINGLE-FAMILY RESIDENTIAL BUILDINGS—ADDITIONS AND ALTERATIONS TO EXISTING RESIDENTIAL BUILDINGS
- SUBCHAPTER 10 MULTIFAMILY BUILDINGS—MANDATORY REQUIREMENTS
- SUBCHAPTER 11 MULTIFAMILY BUILDINGS—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES
- SUBCHAPTER 12 MULTIFAMILY BUILDINGS—ADDITIONS, ALTERATIONS AND REPAIRS TO EXISTING MULTIFAMILY BUILDINGS
- APPENDIX 1-A STANDARDS AND DOCUMENTS REFERENCED IN THE ENERGY CODE
- APPENDIX 1-B ENERGY COMMISSION DOCUMENTS INCORPORATED BY REFERENCE IN THEIR ENTIRETY
- HISTORY NOTE APPENDIX

Print Version – PDF or Loose



Energy Code Triennial Cycle

California Energy Commission (CEC)
energy.ca.gov

Our Responsibilities

Advancing State Energy Policy

Achieving Energy Efficiency

Investing in Energy Innovation

Developing Renewable Energy

Transforming Transportation

Overseeing Energy Infrastructure

Preparing for Energy Emergencies

EXPLORE OUR CORE RESPONSIBILITIES >

PUBLIC RECORDS ACT REQUESTS. Use the online form to submit a Public Records Act Request.

ABOUT

The California Energy Commission is leading the state to a 100 percent clean energy future for all. As the state's primary energy policy and planning agency, the Energy Commission is committed to reducing energy costs and environmental impacts of energy use while ensuring a safe, resilient, and reliable supply of energy.

About the Energy Commission
CEC's 45th Anniversary Events

DIVISIONS

Efficiency

Energy Assessments

Energy Research and Development

Fuels and Transportation

Reliability, Renewable Energy & Decarbonization Incentives

Siting, Transmission, and Environmental Protection

LEADERSHIP

Gavin Newsom
California Governor

Wade Crowfoot
Secretary for Natural Resources

David Hochschild
Chair, California Energy Commission

NEWS

California's Clean Energy Research and Development Program Delivers 10x Return on Investment
May 03, 2023

CEC Adopts Resolution Supporting California Tribal Energy Sovereignty
March 06, 2023

CEC Determines Diablo Canyon Power Plant Needed to Support Grid Reliability
February 28, 2023

State Energy Agencies to Meet with Tribal Leaders to Advance Clean Energy Partnerships
February 27, 2023

$30 Million in Incentives Now Available for Shovel-Ready EV Charging Projects Across California
February 13, 2023

More News >

EVENTS

MAY 08
On with the Wind: Toward 25 GW of Offshore Wind Energy by 2045
May 8, 2023 | 09:00 AM - 05:00 PM
Zoom and In Person

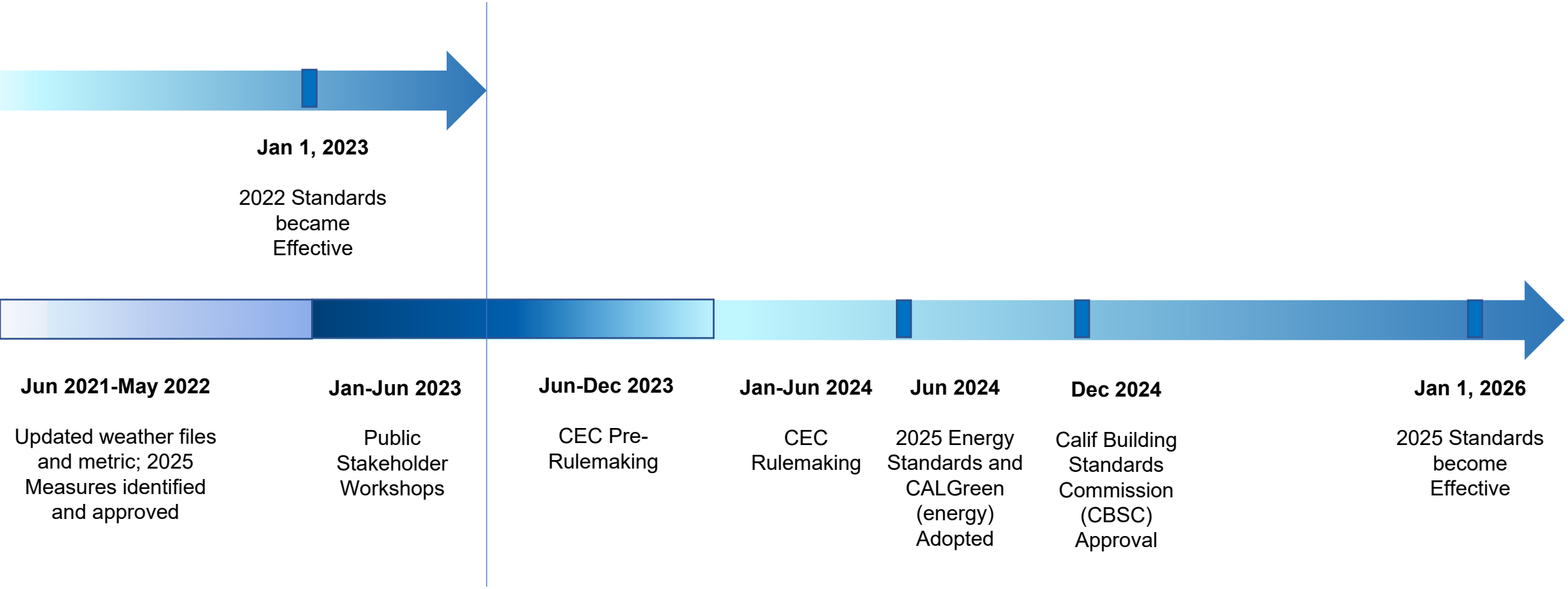
MAY 09
Work Group Meeting #2 to Discuss the FY 22-23 Incentives for Zero-Emission Public School Buses and Supporting Infrastructure
May 9, 2023 | 09:00 AM - 11:00 AM
Remote Access Only

MAY 09
Commissioner Workshop on Clean Energy Interconnection – Electric Distribution Grid
May 9, 2023 | 10:00 AM - 05:00 PM
Remote Access Only

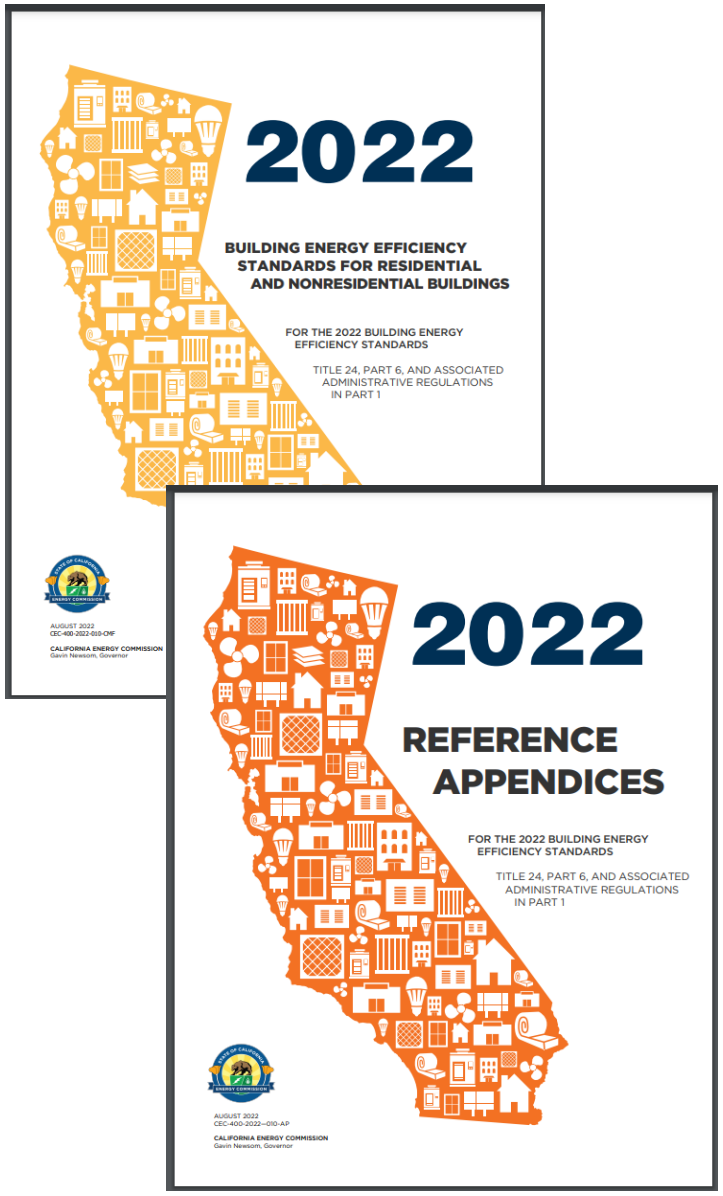
MAY 09
Staff Workshop on Long Duration Energy Storage Analysis
May 9, 2023 | 10:00 AM - 12:00 PM
Remote Access Only

More Events >

Energy Standards –Adoption Timeline



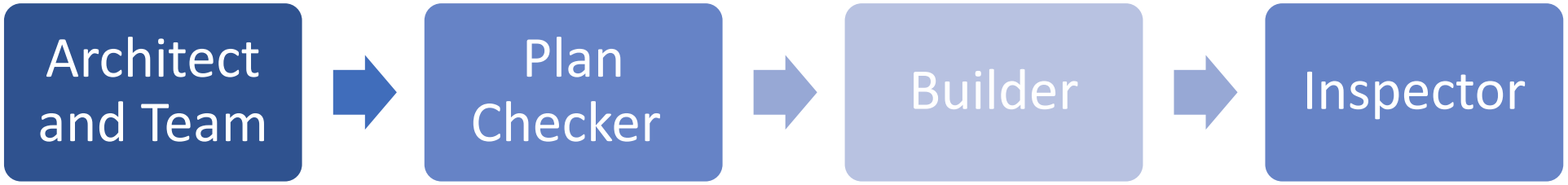
Title 24 Part 6, 2022 Standards and Manuals



https://www.energy.ca.gov/publications/2022/

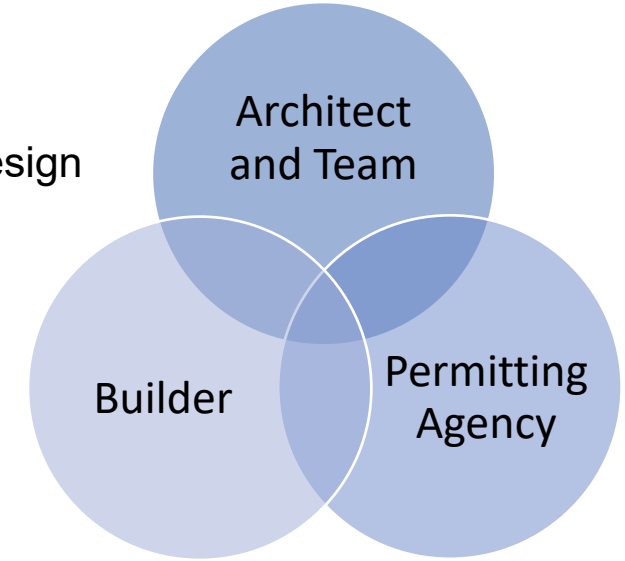
The Energy Code in Design and Construction

Plan and Design for Energy Code Compliance



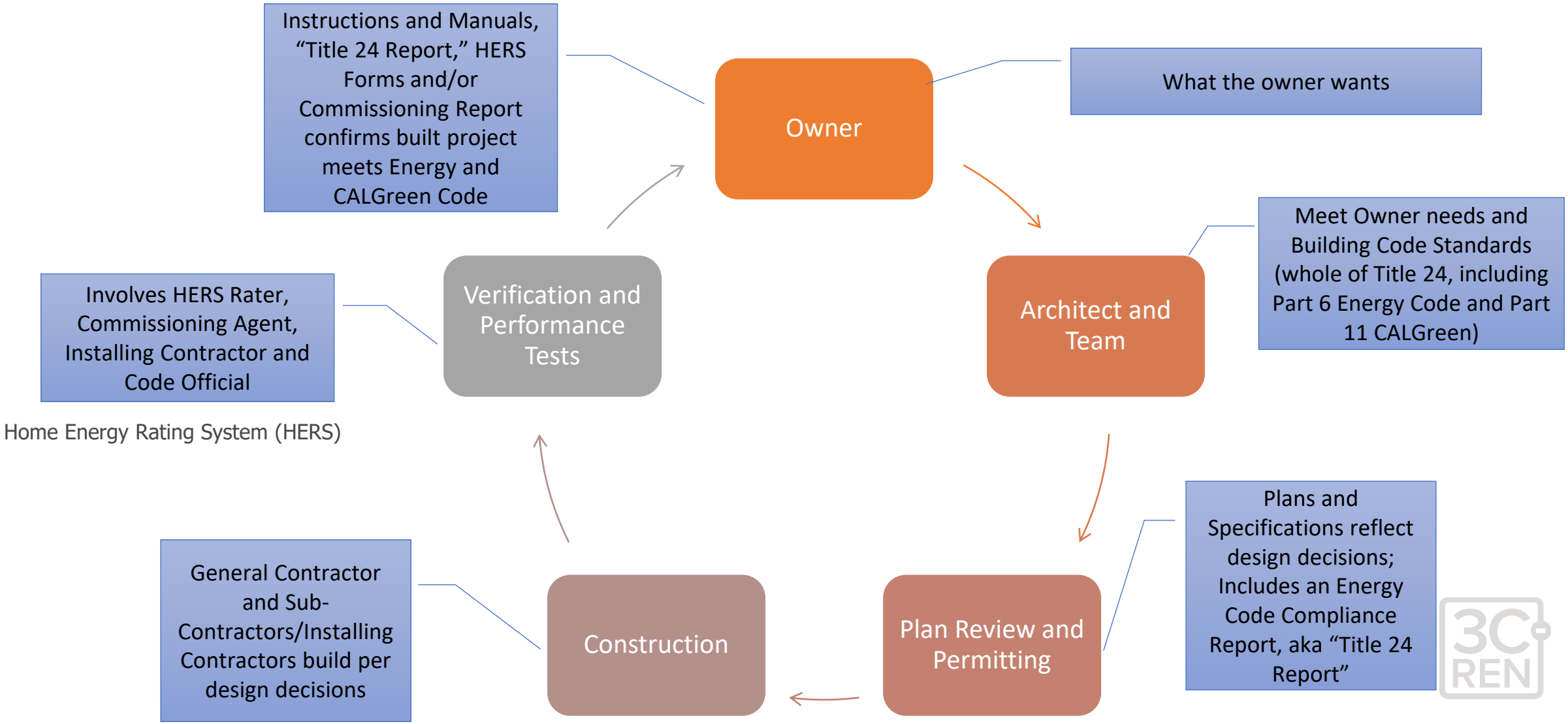
Linear Approach to Design

Integrated Approach to Design



Integrated approach identifies issues early and enables efficiencies

Design and Construction – When do the Energy Code (and Green Code) come into play?



Closer Look into Title 24 Part 6

The Energy Code –Three Compliance Terms

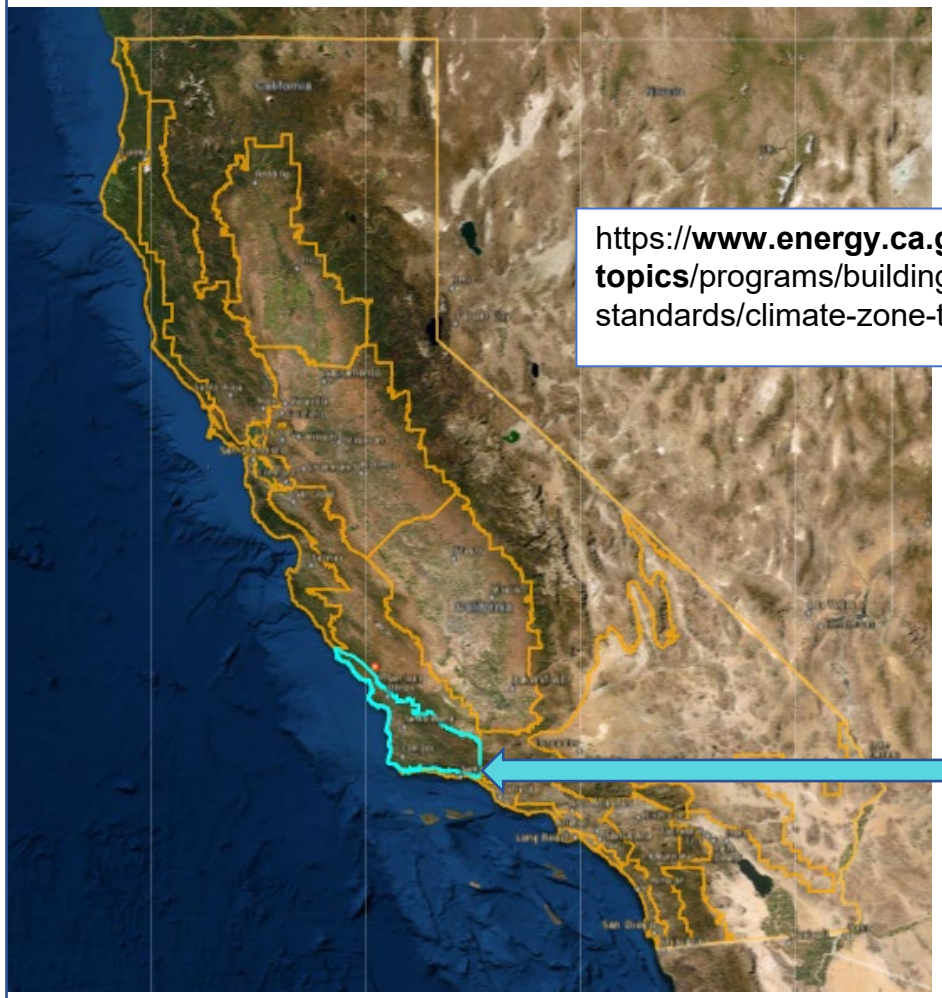
Mandatory Requirements

Energy efficiency measures that are applicable to all projects.

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

Energy Code is based on Climate Zones (CZ) and Typical Meteorological Year Data (TMY)

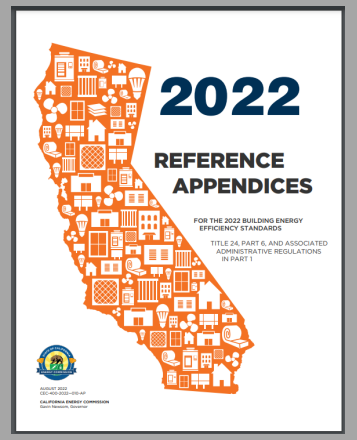
The California Energy Commission has an on-line tool:
EZ Building Climate Zone Finder

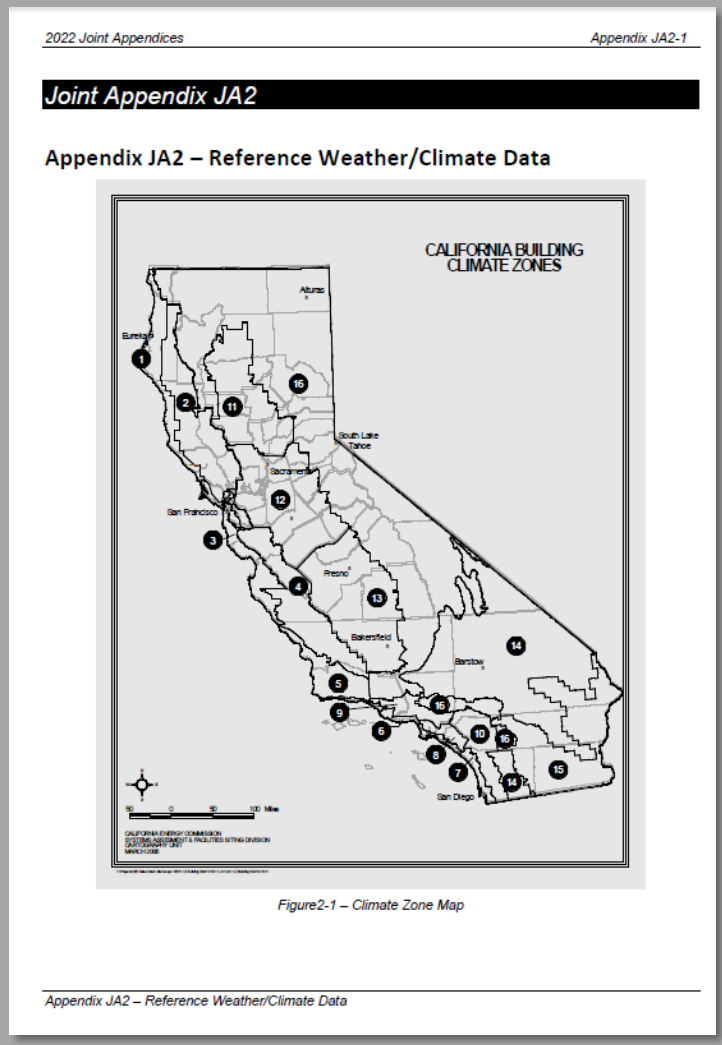


https://**www.energy.ca.gov/programs-and-topics**/programs/building-energy-efficiency-standards/climate-zone-tool-maps-and

Example of CZ 5

16 Climate Zones (CZ) in California





T24 Part 6 Energy Code – Subchapter Organization

All [*regulated] Occupancies*

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

Subchapter 1 –All Occupancy –Scope, Definition

Subchapter 2 –All Occupancies – Mandatory Requirements

Sec 100.0-100.3 & Sec 110.0-110.12

Not Low-Rise Res

Subchapter 3 –Nonresidential, High-Rise Res, Hotel/Motel, Covered Process –Mandatory Requirements

[*HVAC and Ventilation*]

Sec 120.0-120.9

Subchapter 4 –Nonresidential, High-Rise Res, 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

Low-Rise Res

Subchapter 7 –Low-Rise Residential Mandatory Measures

Sec 150.0

Subchapter 8 – Performance and Prescriptive

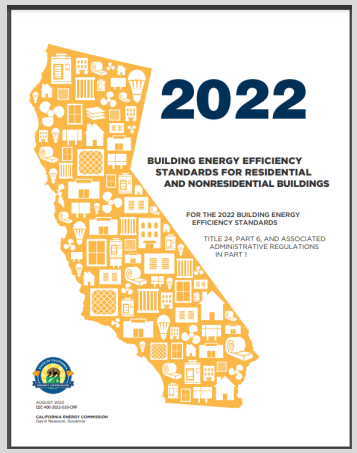
[*New Construction*]

Sec 150.1

Subchapter 9 – Additions and Alterations

Sec 150.2

T24 Part 6 Energy Code – Subchapter Organization



All [*regulated*] Occupancies

(A, B, E, F, H, I 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

Not Residential

Subchapter 3 – Nonresidential, Hotel/Motel, Covered Process –Mandatory Requirements [*HVAC and Ventilation*]

Sec 120.0-120.9

Subchapter 4 – Nonresidential, Hotel/Motel –Mandatory Requirements [*Lighting and Power*]

Sec 130.0-130.5

Subchapter 5 –Performance and Prescriptive [*New Construction*]

Sec 140.0-140.9

Subchapter 6 – Additions and Alterations

Sec 141.0-141.1

Single Family Res

Subchapter 7 –Single Family Residential Mandatory Measures

Sec 150.0

Subchapter 8 – Performance and Prescriptive [*New Construction*]

Sec 150.1

Subchapter 9 – Additions and Alterations

Sec 150.2

Multifamily Res

Subchapter 10 – Multifamily Residential Mandatory Measures

Sec 160.0-160.9

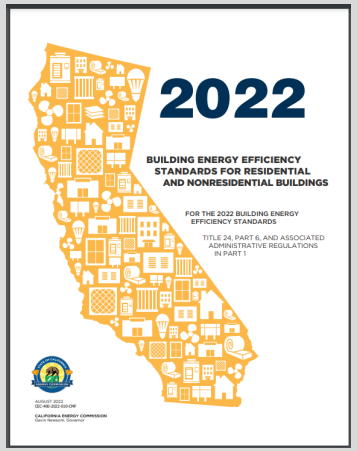
Subchapter 11 – Performance and Prescriptive [*New Construction*]

Sec 170.0-170.2

Subchapter 12 – Additions and Alterations

Sec 180.0-180.4

Subchapter 1 –Application of the Standards



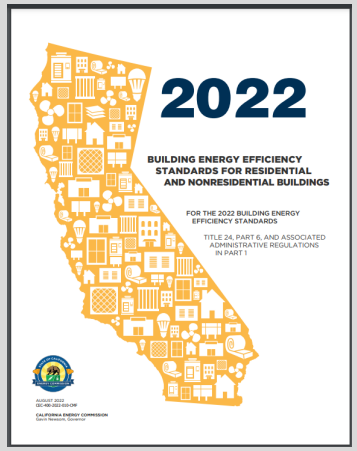
Subchapter 1
Table 100.0-A

Useful way of looking at how the Energy Code Sections apply to particular applications

TABLE 100.0-A— APPLICATION OF STANDARDS

OCCUPANCIES	APPLICATION	MANDATORY	PRESCRIPTIVE	PERFORMANCE	ADDITIONS/ ALTERATIONS
All Buildings	General	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0
Nonresidential and Hotels/Motels	General	120.0	140.0, 140.2	140.0, 140.1	141.0
	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3		
	Envelope (unconditioned, process spaces)	N.A.	140.3(c)		
	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3, 120.4, 120.5, 120.8	140.4		
	Water Heating	110.3, 120.3, 120.8, 120.9	140.5		
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6		
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.	
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7		
	Electrical Power Distribution	110.11, 130.5	N.A.		
	Pool and Spa Systems	110.4, 110.5, 150.0(p)			
	Solar Ready Buildings	110.10			141.0(a)
	Solar PV and Battery Storage Systems	N.A.	141.10	140.0, 140.1	N.A.
Covered Processes[1]	Envelope, Ventilation, Process Loads	110.2, 120.6	140.9	140.1	120.6, 140.9, 141.1
Signs	Indoor and Outdoor	110.9, 130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H

Subchapter 1 –Application of the Standards



Example:

- Single-family,
- Envelope (walls, floor, roof, windows, etc),
- Mandatory Measures, and
- Prescriptive Requirements

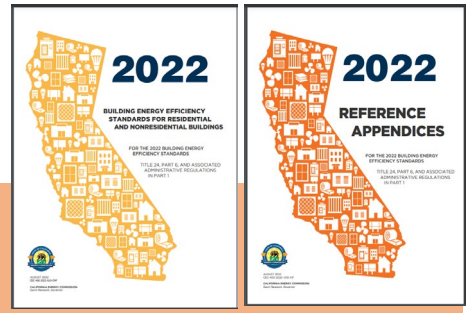
TABLE 100.0-A— APPLICATION OF STANDARDS

OCCUPANCIES	APPLICATION	MANDATORY	PRESCRIPTIVE	PERFORMANCE	ADDITIONS/ ALTERATIONS
Single-family	General	150.0		150.1(a), (b)	150.2(a), (b)
	Envelope (conditioned)	110.6, 110.7, 110.8, 150(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g), 150.0(q)			
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)	150.1(a), (c)		
	Water Heating	110.3, 150.0(j, n)			
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)			
	Outdoor Lighting	110.9, 130.0, 150.0(k)			
	Pool and Spa Systems	110.4, 150.0(p)	N.A.	N.A.	
	Solar Ready Buildings	110.10	N.A.	N.A.	N.A.
	Electric Ready	150.0(s), 150.0(t), 150.0(u), 150.0(v)	N.A.	N.A.	N.A.
	Solar PV Systems	N.A.	150.0(c)14	150.1(a), (b)	N.A.
Multifamily	General	160.0	170.2	170.1	180.0
	HVAC (conditioned)	110.6, 110.7, 110.8, 160.1	170.1(a)		
	Ventilation and Indoor Air Quality	160.2	N.A.		
	HVAC (conditioned)	110.2, 110.5, 160.3	170.2(c)		
	Water Heating	110.3, 160.4	170.2(d)		
	Indoor Lighting	110.9, 160.5	170.2(e)		
	Outdoor Lighting	110.9, 160.5	170.2(e)		
	Electrical Power Distribution	110.11, 160.6	N.A.	N.A.	
	Pool and Spa Systems	110.4, 110.5, 160.7			
	Solar Ready Buildings	110.10, 160.8			
	Electric Ready	160.9			N.A.
	Solar PV and Battery 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.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, *Public Resources Code*.

Low Rise Residential –Prescriptive Example



Single Family (Townhomes and Duplexes)

Subchapter 7

150.0 Mandatory Measures

Applies to all :

(a) Ceiling and Roof Insulation
(b) Loose-fill Insulation
(c) Wall Insulation
(d) Raised-floor Insulation
(e) Fireplaces
(f) Slab Edge Insulation
(g) Vapor Retarder
(h) Space Conditioning Equip
(i) Thermostats
(j) Insulation for Piping and Tanks
(k) Residential Lighting
(l) not used
(m) Air Distribution...System...Fans
(n) Water Heating System
(o) Ventilation and Indoor Air Quality
(p) Pool Equip
(q) Fenestration [windows/skylights]
(r) Solar Ready Buildings

Subchapter 8

150.1 Performance and Prescriptive [*New Construction*]

Climate Zone dependent

Applies to

- Hot water heating System
- Mechanical space conditioning system
- Indoor Air Quality Ventilation
- Building Envelope

Show Compliance

- Prescriptive (akin to following a checklist) or
- Performance Method, i.e. detailed computer modeling analysis

Subchapter 9

150.2 Additions and Alterations

Climate Zone dependent

Applies to

- Hot water heating System
- Mechanical space conditioning system
- Indoor Air Quality Ventilation
- Building Envelope

Show Compliance

- Prescriptive (akin to following a checklist) or
- Performance Method, i.e. detailed computer modeling analysis

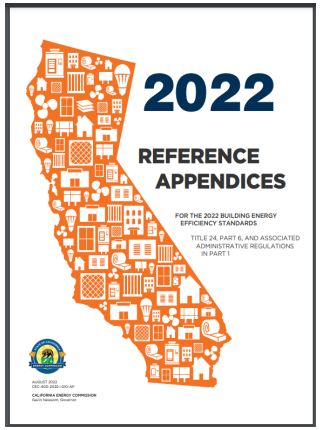
Prescriptive Wall Example

Example 1: Single-family New Construction, **Thousand Oaks area (CZ9)**, wood framed walls

TABLE 150.1-A COMPONENT PACKAGE—SINGLE-FAMILY STANDARD BUILDING DESIGN

SINGLE FAMILY				CLIMATE ZONE														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation																			
Building Envelope	Roofs/Ceilings	Option B (meets §150.1(c)9A)	Below Roof Deck Insulation[1,2] (With Air Space)	NR	NR	NR	R-19	NR	NR	NR	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19
			Ceiling Insulation	R-38	R-38	R-30	R-38	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38
			Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets §150.1(c)9B)	Ceiling Insulation	R-38	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38
			Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
	Walls	Above Grade	Framed [3]	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.065	U 0.065	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048
			Mass Wall Interior [4,5]	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.059 R-17
			Mass Wall Exterior [4,5]	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0	U 0.077 R-13
		Below Grade	Below Grade Interior [6]	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.077 R-13	U 0.067 R-15
			Below Grade Exterior [6]	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.200 R-5.0	U 0.100 R-10	U 0.100 R-10	U 0.053 R-19
			Slab Perimeter	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R-7.0

Translation...Walls Assemblies Meeting Prescriptive U-0.065 and U-0.048



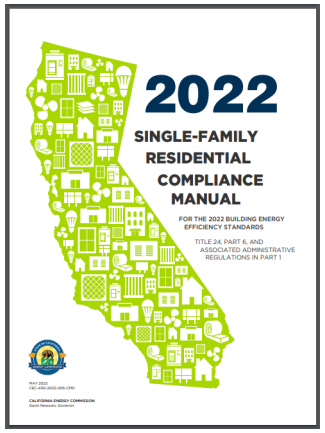
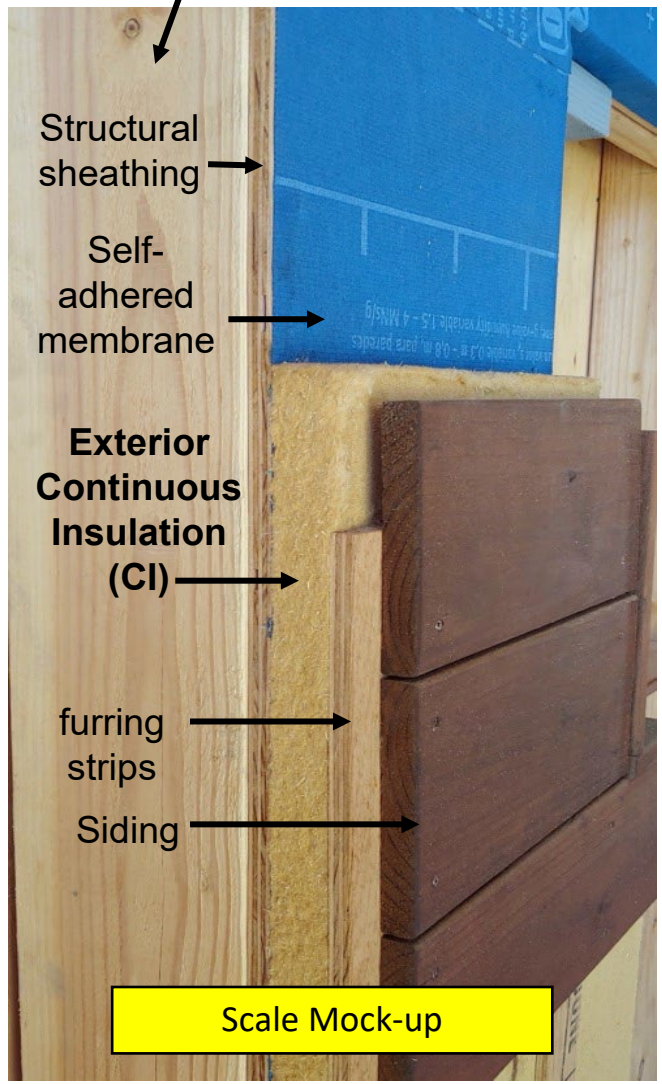


Table 3-10: Examples of Wood-Framed Wall Assemblies and U-Factors, Assuming Gypsum Board Interior

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

CZ 9

Wood Stud Framing with Cavity Insulation

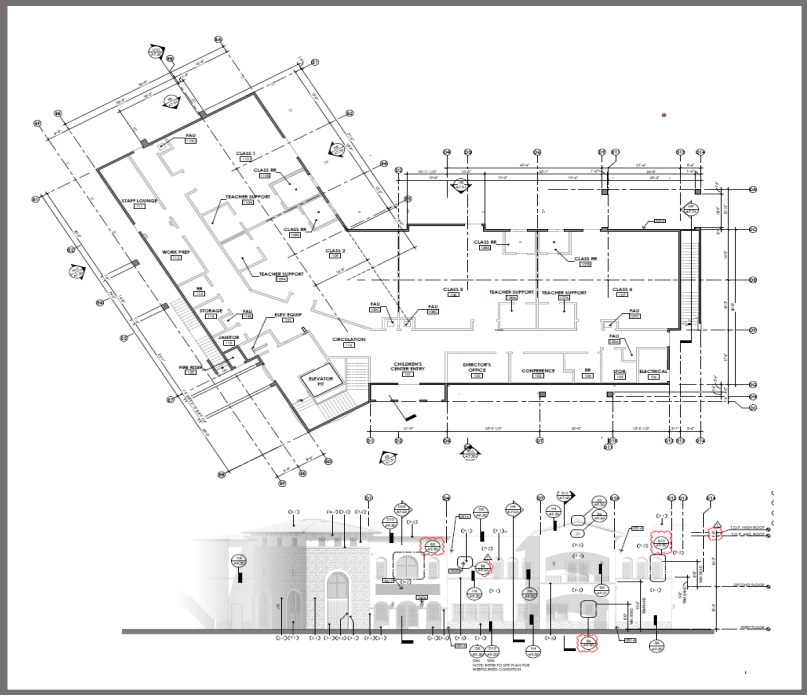


Prescriptive Nonresidential Example

Climate Zone (CZ) 5				Translation -Ref Joint Appendices
Opaque Envelope	Roofs/Ceilings	Wood Framed (U-factor)	0.034	2x12 Rafter w/ R-30
	Walls	Wood Framed (U-factor)	0.102	2x4 Stud w/ R-13
		Metal Framed (U-factors)	0.055	24" o.c. 2x6 mtl stud R-19 + R-12 CI
	Floors/Soffits	Wood Framed (U-factor)	0.071	2x6 Joist w/ R-11
Roofing Products	Low-sloped	Aged Solar Reflectance	0.63	Table 140.3 Insulation Trade-off
		Thermal Emittance	0.75	
Fenestration Products	Vertical	Windows Fixed	0.36	Thermally-Broken Dual-Glazed Typ
		Windows Operable	0.46	
		WWR	40%	Window to Wall Ratio

CZ 4, 9, or 16				Translation -Ref Joint Appendices
Opaque Envelope	Walls	Wood Framed (U-factor)	0.059	2x6 Stud w/ R-21 + R-2 CI

CZ 6 or 7				Translation -Ref Joint Appendices
Opaque Envelope	Walls	Wood Framed (U-factor)	0.110	2x4 Stud w/ R-11

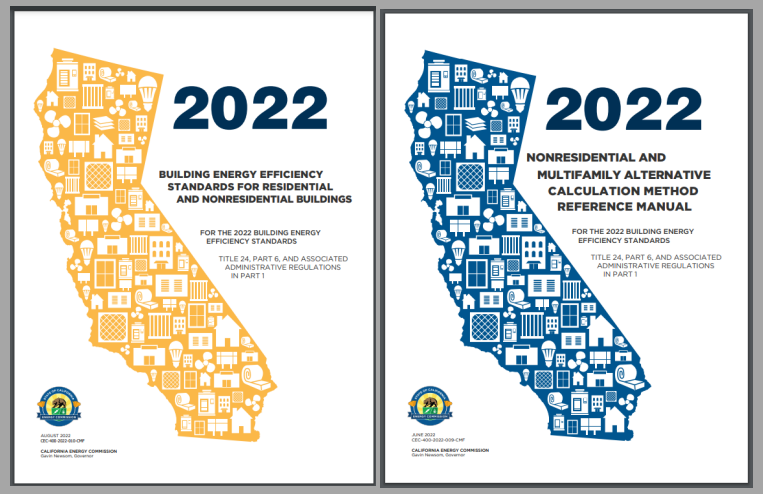


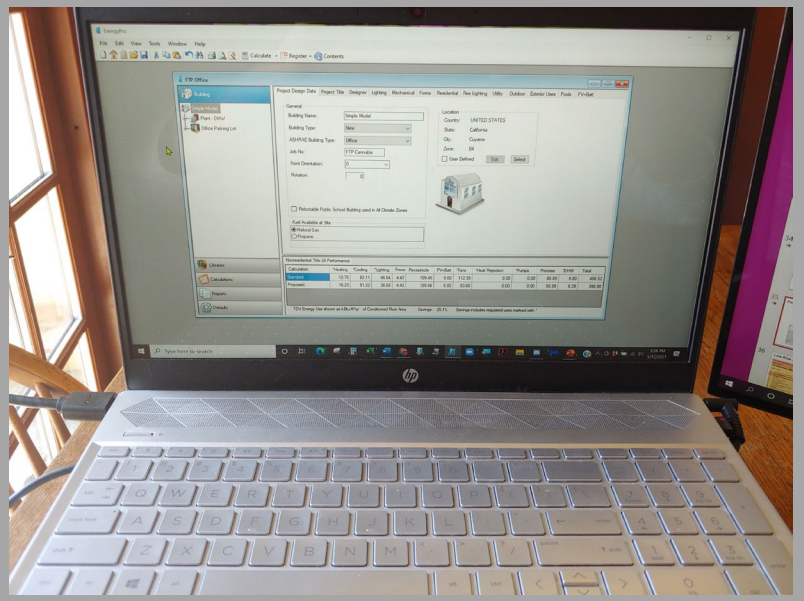
Envelope Example : Two story commercial building Santa Maria area (CZ5)

Walls: Design team is considering **metal** stud walls, but might use **wood** stud walls... What is the implication of this decision?

Side Note: Notice the difference location or a **climate zone (CZ)** could make for a wood stud wall assembly

Performance Method Results





TDV --Time Dependent Valuation represents the annual energy used in the building plus the additional amount of energy that went into delivering energy to the building. Based on a typical meteorologically year, expressed as “energy” (kbtu) use per square foot of building floor area.

Small Office Building Example in CBECC-Com 2022

Overall Result[3]: **COMPLIES**

	Time Dependent Valuation: Efficiency[1] (kBtu/ft²-yr)	Time Dependent Valuation: Total[2] (kBtu/ft²-yr)	Source Energy use: Total[2] (kBtu/ft²-yr)
Standard Design	134.03	12.73	6.13
Proposed Design	131.10	1.06	5.66
Compliance Margins	**2.93**	**11.67**	**0.47**
	Pass	Pass	Pass

[1] Efficiency measures include improvements like a better building envelope and more efficient equipment
[2] Compliance Totals include efficiency, photovoltaics and batteries
[3] Building complies when all efficiency and total compliance margins are greater than or equal to zero and unmet load hour limits are not exceeded

Standard Design PV Capacity: 167.9 kWdc / Battery System Capacity: 296.8 kWh (power 70.50 kW)

Source Energy represents the annual impact on carbon emissions for the creation and delivery of the energy used. This value is also expressed as kbtu per square foot of building floor area as a proxy for carbon.

Performance Method "Trade-offs" –TDV

"Regulated Loads" Can be traded-off with each other.

Minimum PV and Battery Requirement

End Use	Standard Design TDV (kBtu/ft²-yr)	Proposed Design TDV (kBtu/ft²-yr)	Compliance TDV Margin (kBtu/ft²-yr)	
Space Heating	16.35	16.50	-0.15	
Space Cooling	59.32	58.49	0.83	
Indoor Fans	16.50	14.26	2.24	
Heat Rejection	--	--	--	
Pumps & Misc.	0.12	0.12	--	
Domestic Hot Water	6.89	6.88	0.01	
Indoor Lighting	34.85	34.85	--	
Efficiency Compliance	134.03	131.10	**2.93**	**2.2 %**
Photovoltaics	-109.03	-116.92	7.89	
Battery	-12.27	-13.12	0.85	
Total Compliance	12.73	1.06	**11.67**	**91.7 %**
Receptacle	108.58	108.58	--	
Process	--	--	--	
Other Ltg	--	--	--	
Process Motors	--	--	--	
TOTAL	121.31	109.64	11.67	9.6 %

Performance Method “Trade-offs” –Source

“Regulated Loads” Can be traded-off with each other.

Minimum PV and Battery Requirement

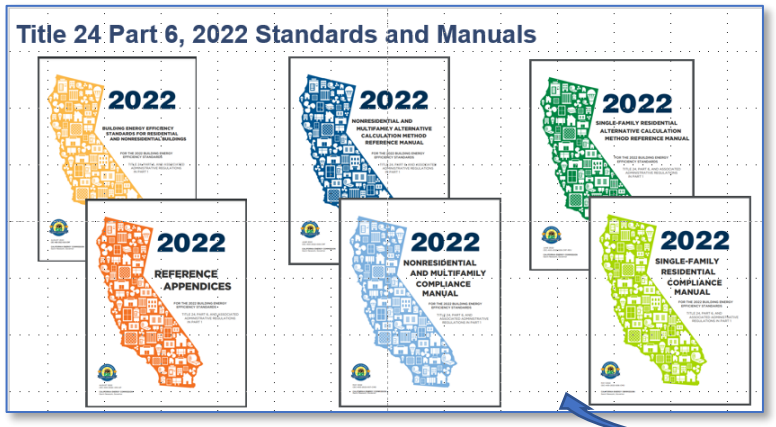
End Use	Standard Source Energy (kBtu/ft²-yr)	Proposed Source Energy (kBtu/ft²-yr)	Compliance Src Margin (kBtu/ft²-yr)	
Space Heating	5.53	5.58	-0.05	−
Space Cooling	2.40	2.38	0.02	+
Indoor Fans	1.08	1.07	0.01	+
Heat Rejection	--	--	--	
Pumps & Misc.	0.02	0.02	--	
Domestic Hot Water	0.54	0.54	--	
Indoor Lighting	2.65	2.65	--	
Efficiency Compliance	12.22	12.24	-0.02	-0.2 %
Photovoltaics	-3.92	-4.21	0.29	+
Battery	-2.17	-2.37	0.20	+
Total Compliance	6.13	5.66	**0.47**	**7.7 %**
Receptacle	7.72	7.72	--	
Process	--	--	--	
Other Ltg	--	--	--	
Process Motors	--	--	--	
TOTAL	13.85	13.38	0.47	3.4 %

Additional Resources

California Energy Commission
Energy.ca.gov

Forms, Trainings, Videos

Climate Zone Finder



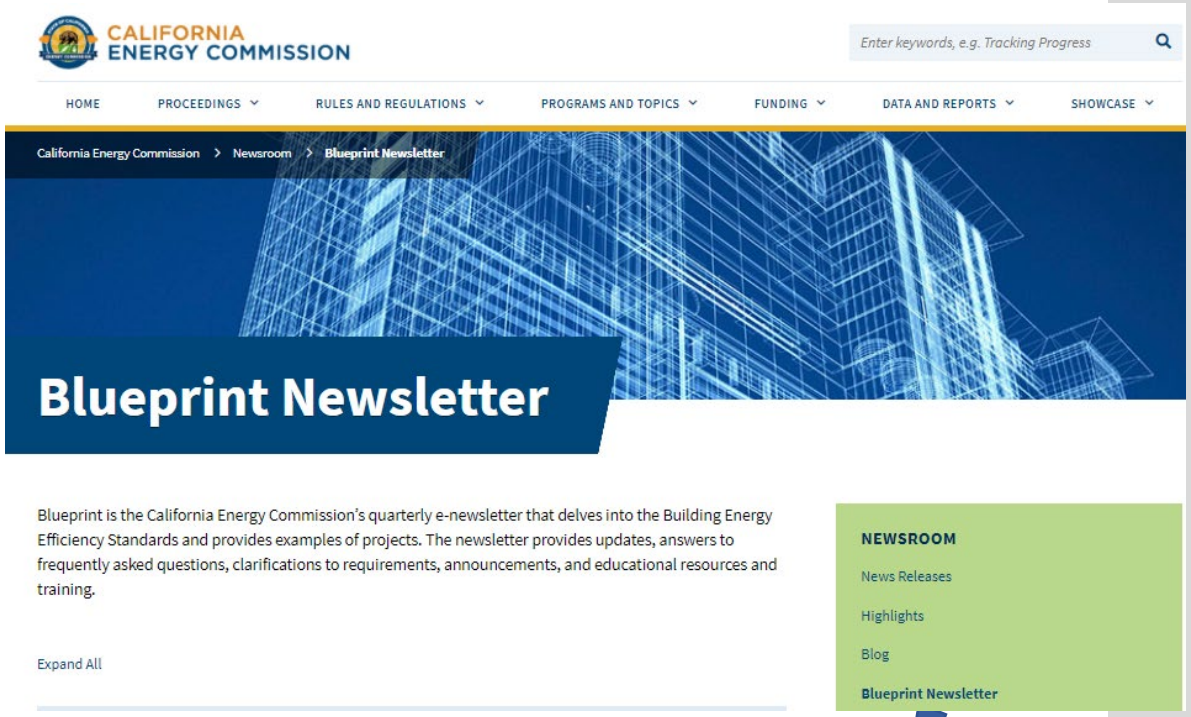
Regulatory Advisory: Low-Rise Multifamily Compliance Forms for the 2022 Energy Code

The 2022 Building Energy Efficiency Standards (Energy Code), which goes into effect January 1, 2023, introduced new requirements for low-rise multifamily (LRMF) buildings and includes the registration of new LRMF compliance documentation.

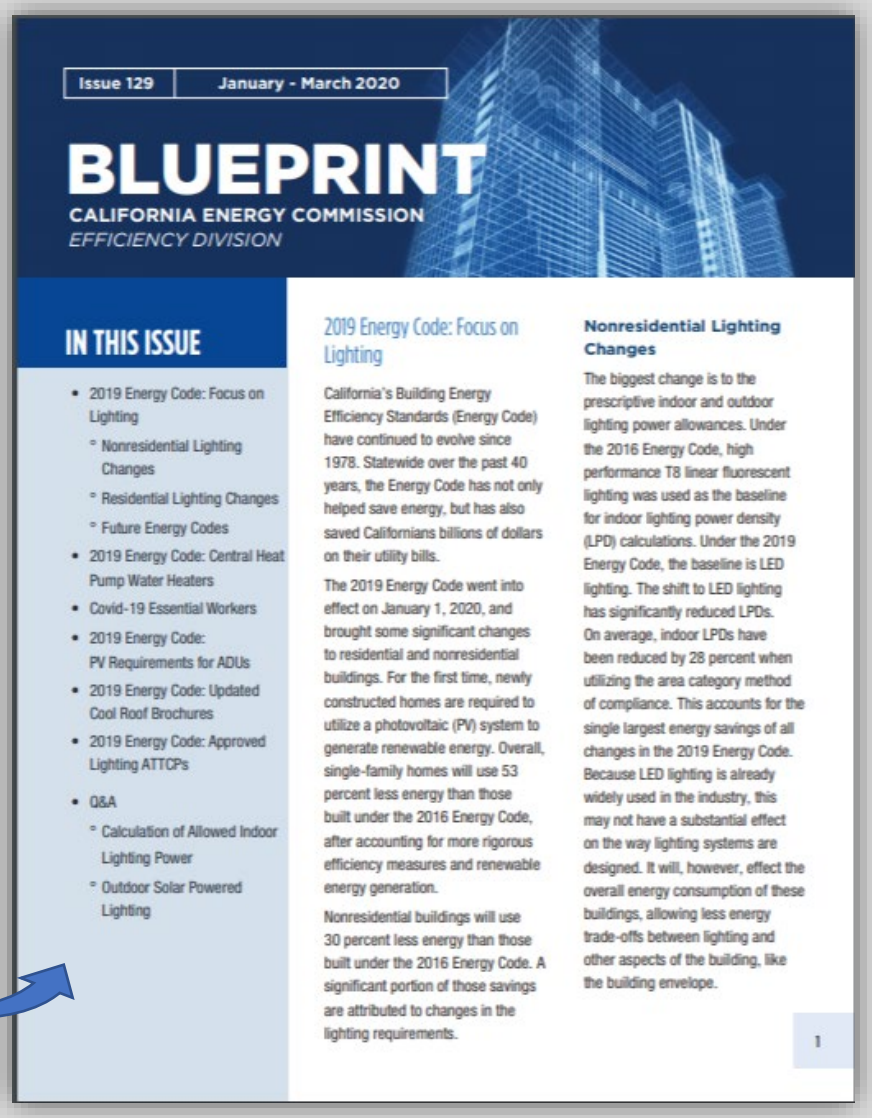
The two companies certified as residential data registries are creating systems to process and register the new required LRMF compliance documents. Development is ongoing but will not be ready when the 2022 Energy Code goes into effect. As a result, for LRMF buildings only, there will be no approved data registry capable of registering compliance documentation for this building type until a later date.

The California Energy Commission staff recommends local authorities having jurisdiction (AHJs) take several steps to ensure that permitting for LRMF buildings under the 2022 Energy Code is not delayed. Read the full Regulatory Advisory issued November 18, 2022, published in the 2022 Energy Code Compliance Manuals and Forms docket (21-BSTD-04). Check back here or in the docket for possible updates or more information.

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

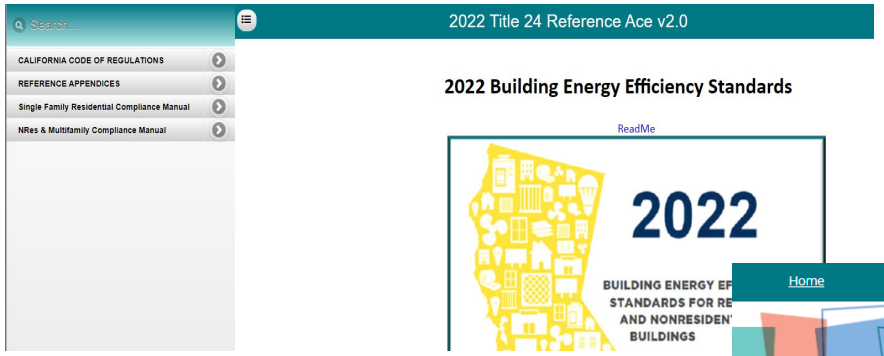


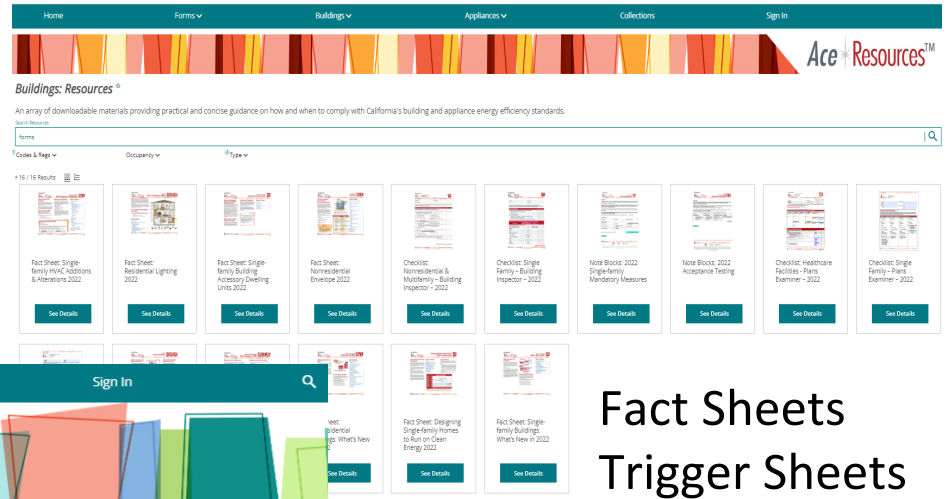
- Published quarterly
- Short –quick read with packed info
- Common Q and A for code enforcement /interpretations
- Offers clarifications on code issues
- Keeps readers up to date on latest code concerns



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

Energy Code Ace
energycodeace.com





Title 24 Part 6 Energy Code
Title 20 Appliance Standards
Res and Non-Res Manuals

Fact Sheets
Trigger Sheets
Checklists
...and more

Your one-stop shop for no-cost tools, training and resources to help you comply with California's Title 24, Part 6 building energy code and Title 20 appliance standards. We're powered by the California Statewide Codes & Standards Program and vetted by the California Energy Commission.

Ace Tools™
A suite of interactive tools to help you understand the compliance process, required forms, installation techniques and energy efficiency regulations applicable to building projects and appliances in California.
Find Tools

Ace Training™
A portfolio of on-demand, and live in-person and online training alternatives on California's Energy Code and Title 20 regulations, tailored to a variety of industry professionals and addressing key measures.
Find Training

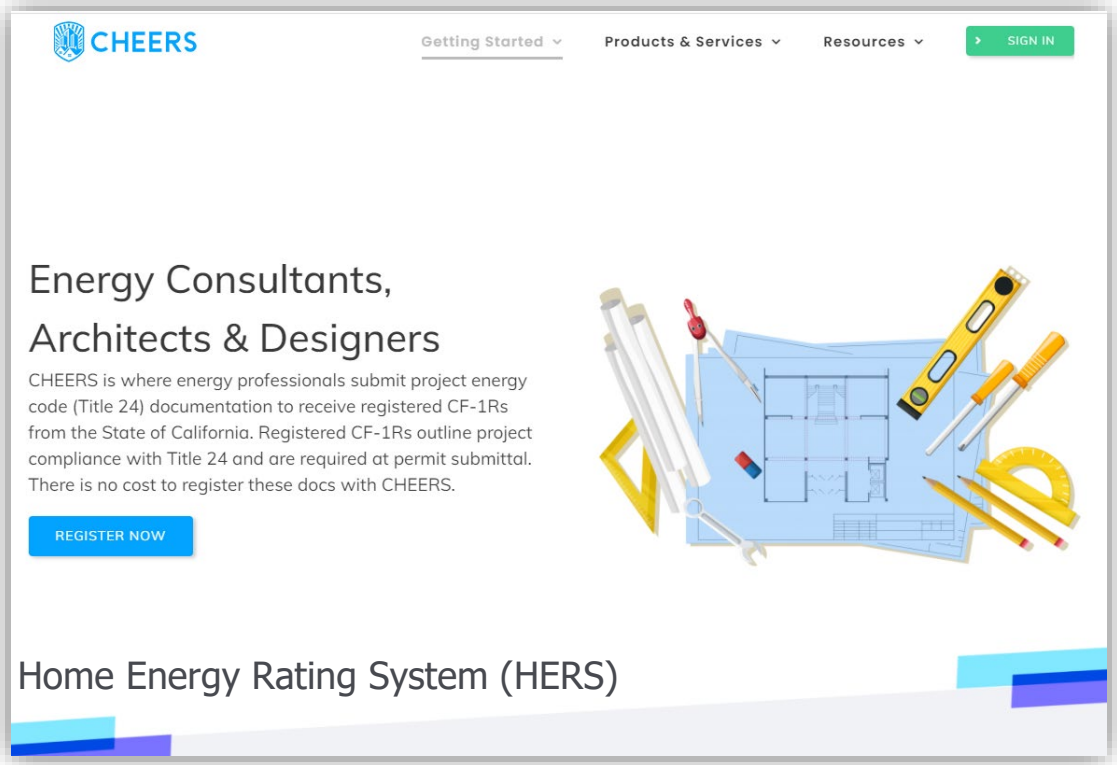
Ace Resources™
An array of downloadable materials providing practical and concise guidance on how and when to comply with California's building and appliance energy efficiency standards.
Find Resources

3C REN

CalCERTS
www.calcerts.com

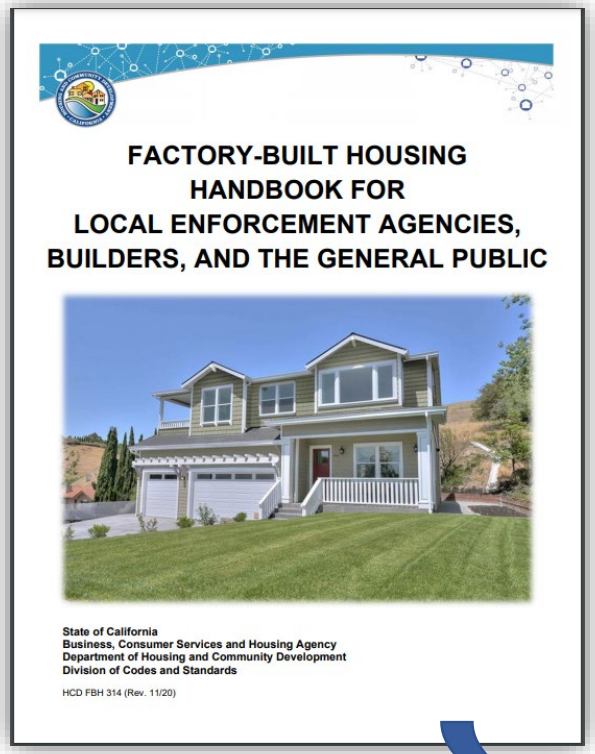
Home Energy Rating System (HERS)

CHEERS
www.cheers.org



Organizations specializing in HERS services and “Title 24” low rise residential documentation registration needed for building permit approval and construction verifications.

Housing and Community Development (Title 25)
www.hcd.ca.gov/building-standards


FACTORY-BUILT HOUSING
HANDBOOK FOR
LOCAL ENFORCEMENT AGENCIES,
BUILDERS, AND THE GENERAL PUBLIC

State of California
Business, Consumer Services and Housing Agency
Department of Housing and Community Development
Division of Codes and Standards

HCD FBH 314 (Rev. 11/20)

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Housing and Community Development

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Home › Building Standards › Manufactured & Factory-Built › Factory-Built Housing

Factory-Built Housing

The purposes of the Factory-Built Housing (FBH) Program are to ensure the health and safety of persons using or purchasing factory-built homes or FBH building components, and to provide California residents with reduced housing costs through mass production techniques resulting from a factory production environment.

In order to achieve these responsibilities, the following activities are conducted by the Department of Housing and Community Development (HCD) pursuant to the Health and Safety Code, commencing with Section 19960.

- Plan check of FBH designs through HCD-approved Design Approval Agencies.

ce Agencies.

nd perform plan checking on behalf of

cy or Quality Assurance Inspector and

lity Assurance Inspectors, and local

Applicable Laws, Regulations and Construction Standards

Factory-Built Housing Code Matrix

Laws and Regulations	Construction Standards (Ref. HSC Section 19990, Title 25, CCR Section 3070)	Building Accessibility
Laws: California Health and Safety Code, Division 13, Part 6, section 19960, et seq. **Regulations:** Title 25, California Code of Regulations, Division 1, Chapter 3, Subchapter 1, section 3000, et seq.	Title 24, California Code of Regulations, California Building Standards Code Part 2 California Building Code Part 2.5 California Residential Code Part 3 California Electrical Code Part 4 California Mechanical Code Part 5 California Plumbing Code Part 6 California Energy Code Part 11 California Green Building Standards Code	Title 24, California Code of Regulations, Part 2 (California Building Code), Chapters 2, 11A[4] and 11B[5]


Factory-Built Housing (FBH)

FBH is a factory-constructed version of a site-built residential building that is manufactured and then transported to its permanent installation location.

FBH may include:
- Single-family dwellings
- Multifamily dwellings
- Dormitories
- Hotels
- Motels
- FBH components

FBH Program purpose:
- To ensure the health and safety of persons using or purchasing FBH or FBH building components, and
- To provide California residents with affordable housing through mass production techniques.

CALIFORNIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

WHERE FOUNDATIONS BEGIN

State of California
Department of Housing and Community Development
Division of Codes and Standards
Factory-Built Housing Program

P.O. Box 278180
Sacramento, California 95827
P: 800.952.8356
F: 916.854.2564
www.hcd.ca.gov

Factory-Built Housing

FREQUENTLY ASKED QUESTIONS

Where can Factory-Built Housing (FBH) be installed?
FBH can be installed where other similar types of dwelling units are built or exist.

To what standards are FBH products designed statewide?
The California Building Standards Code: Parts 2, 2.5, 3, 4, 5, 6, and 11 of Title 24, California Code of Regulations.

What FBH requirements are entirely reserved for the Local Enforcement Agency (LEA) to apply to FBH projects?
Local use zone requirements, local snow load requirements, local wind pressure requirements, local fire zones, building setback, side and rear yard requirements, site development and property line requirements, as well as the review and regulation of architectural and aesthetic requirements.

Who reviews and approves FBH designs?
A Design Approval Agency (DAA) approved by the Department of Housing and Community Development (HCD) reviews and approves FBH plans.

Who inspects FBH during construction in the manufacturing facility?
A Quality Assurance Agency (QAA) approved by HCD inspects FBH during construction in the factory or at an off-site location.

Can the LEA charge to inspect the installation of FBH?
Yes, by local ordinance.

Who inspects the installation of FBH on-site?
The LEA, or building department, is responsible for inspecting the assembly and installation of FBH products on-site.

How does the LEA know what to inspect during the installation of FBH?
The LEA utilizes DAA-approved plans and a resume of work that is pertinent to FBH installation to inspect FBH.

How does the LEA know FBH structures have been inspected and approved?
Approved FBH must bear a California Insignia of Approval on each FBH system or component approved.

Where are FBH laws and regulations?
FBH laws are found in Division 13, Part 6 of the California Health and Safety Code. FBH regulations are found in Title 25, California Code of Regulations, Division 1, Chapter 3, Subchapter 1.

Can FBH be altered during or after installation on-site?
Only when approval for such modifications is first obtained from the DAA before installation, or from the LEA during or after installation.

How can I stay up-to-date on FBH news and information from HCD?
Sign up for HCD's email distribution list at the following link: www.hcd.ca.gov. Click on CONTACT at the top right, then click on the "Email Sign-up" button.

FBH benefits:
- Time savings
- Built year-round without typical weather constraints
- Manufactured in a controlled environment
- Less material waste
- Cost savings
- Ease of design customization

(Benefits vary with each FBH project)

hcd.ca.gov 800.952.8356

Energy Code Coach
www.3c-ren.org

3C-REN offers a Code Coach Service

3C REN ENERGY CODE COACH

Call anytime, response within one business day

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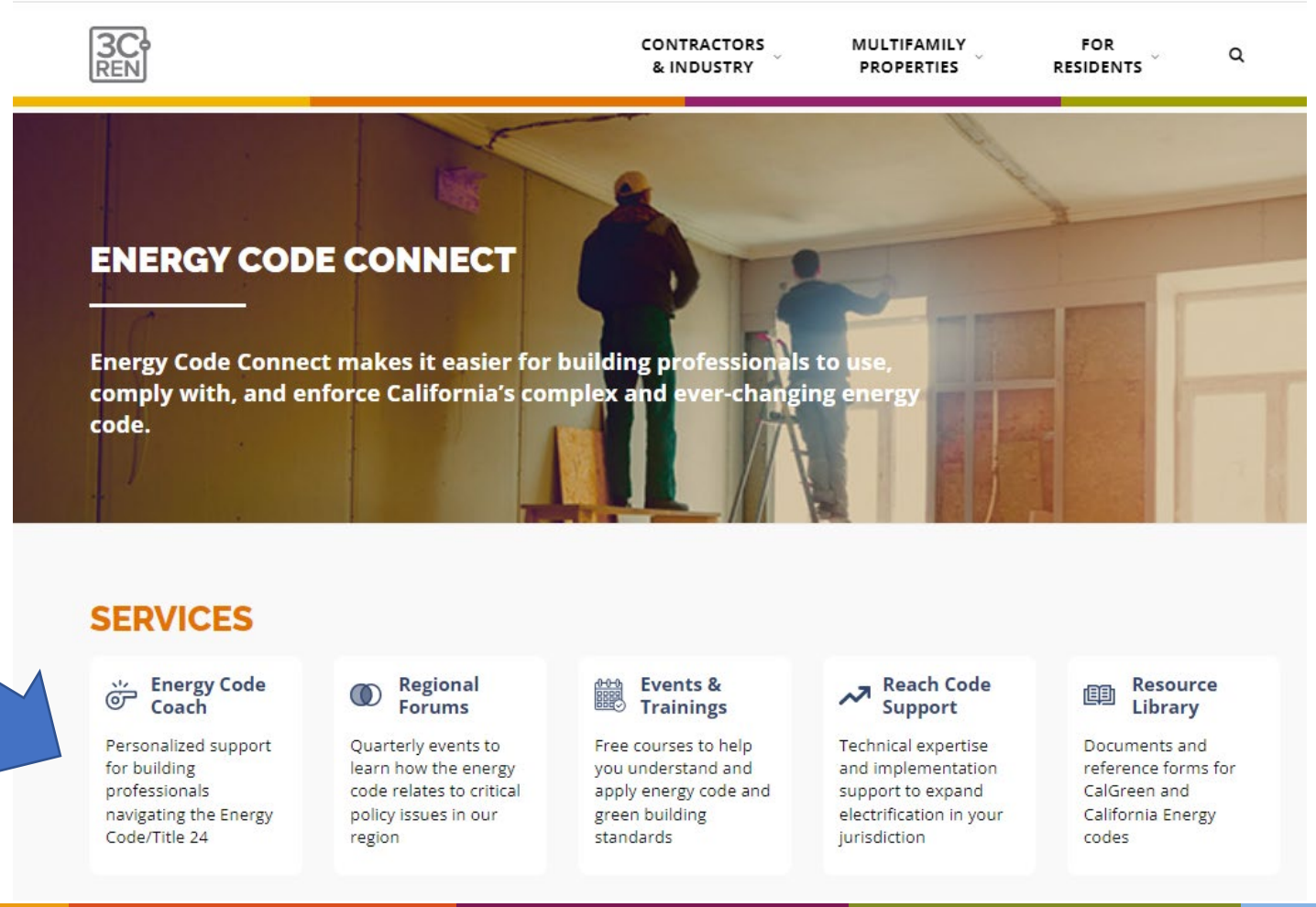
Or submit online:

www.3c-ren.org/ecc



Questions?

Closing

- Upcoming ICC Chapter Energy Code Courses:
  - May 31 – 2022 Energy Code: Single Family
  - June 14 – 2022 Energy Code: Multi Family
  - June 28 – 2022 Energy Code: ADUs
  - July 19 – 2022 Energy Code: Nonresidential
  - August 2 – CALGreen Overview and 2022 Changes
- Other Upcoming Courses:
  - May 17 – 2022 Energy Code: Nonresidential
  - May 23 – Targeting Zero Net Carbon Design – Class 1: ZNCD Series
  - June 8 - Acceptance Testing and Commissioning for Nonresidential
  - June 20 - Energy Performance for ZNC Operations – Class 2: Zero Net Carbon Design Series

Continuing Education Units Available

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

Coming to Your Inbox Soon!

- Slides, Recording, & Survey – Please Take It and Help Us Out!

Thank you!

For more info:
3c-ren.org

For questions:
info@3c-ren.org

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TRI-COUNTY REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA