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

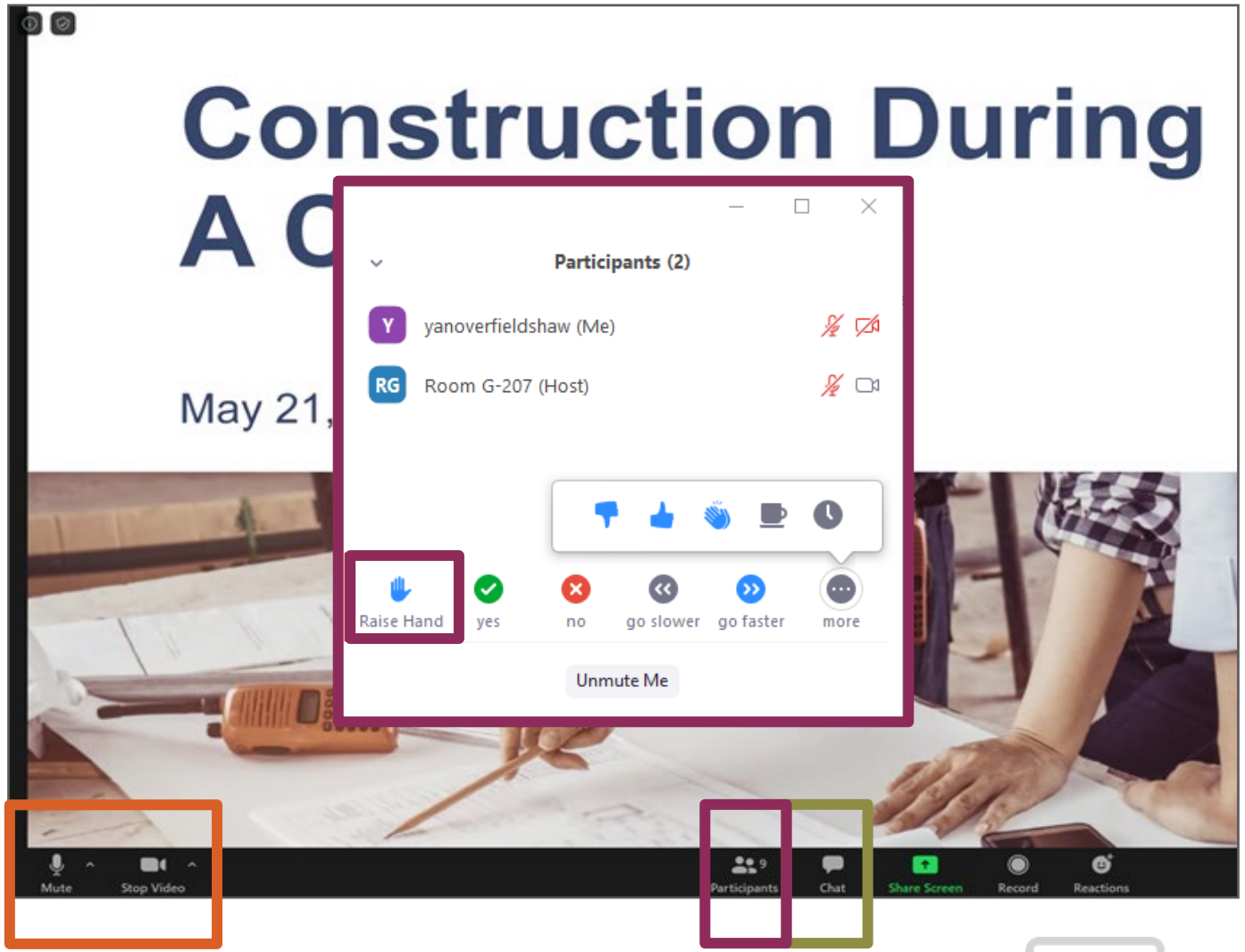
# Introduction to the Energy Code

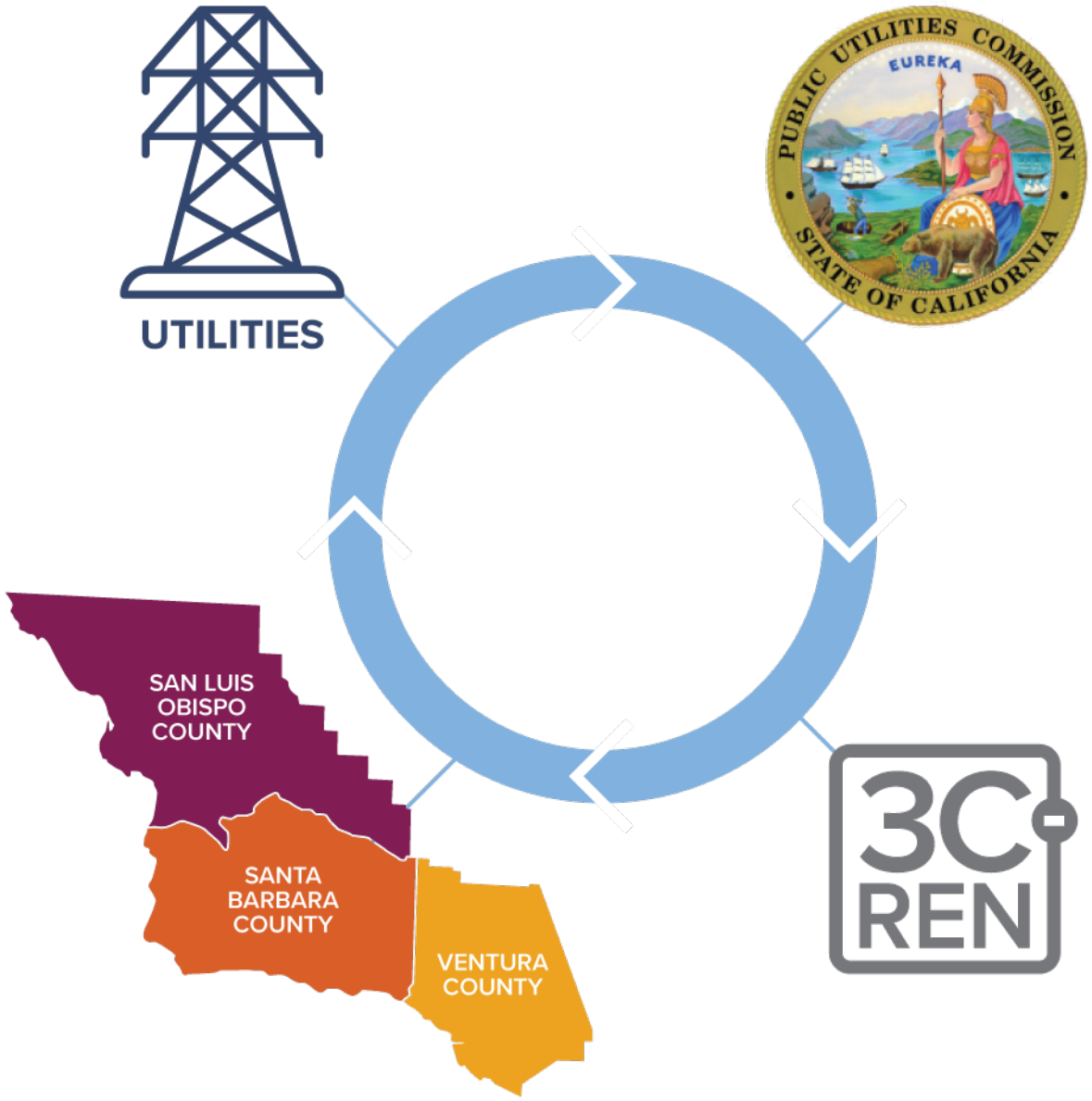
*Jennifer Rennick, AIA, CEA – In Balance Green Consulting*
*Grant Murphy, CEA – In Balance Green Consulting*

January 22, 2025

# Zoom Orientation

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






# 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

**3c-ren.org/events**
**3c-ren.org/building**

### ENERGY CODE CONNECT

**3c-ren.org/code**

View past trainings at
**3c-ren.org/on-demand**

## Technical Assistance

### AGRICULTURE ENERGY SOLUTIONS

**3c-ren.org/agriculture**

### ENERGY ASSURANCE SERVICES

**3c-ren.org/assurance**

# 3C-REN Achievements

**4,000+**

**Individuals Attended Training**

**1,374**

**Energy-Saving Projects Completed**

**334**

**Title 24/CalGreen Questions Answered**

**$155M**

**Secured for investment in the tri-county region through 2028**

*Data from 2019-2022 for BPT, ECC, and HES programs*

# Learning Objectives

- Understand what the [building] energy code is and why we have one in California
- Learn how the energy code is organized and where to find the information you need
- Recognize key energy codes that can inform your building design and construction decisions
- Know where to get help quickly for your energy code questions

## Learning Units

- 1.5 AIA HSW LUs approved for this course
- 0.15 ICC CEUs approved for this course

# Agenda

1. Historical Context and California's Clean Energy Goals
2. California's Energy Code
3. Energy Code Triennial Cycle
4. The Energy Code in Design and Construction
5. A Closer Look at Title 24 Part 6

# Historical Context

- National Energy Crisis and the Oil Embargo
- California Adopts Legislation Addressing its Energy Future
- Energy Efficiency Standards are Born
- Current Context in California

# 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

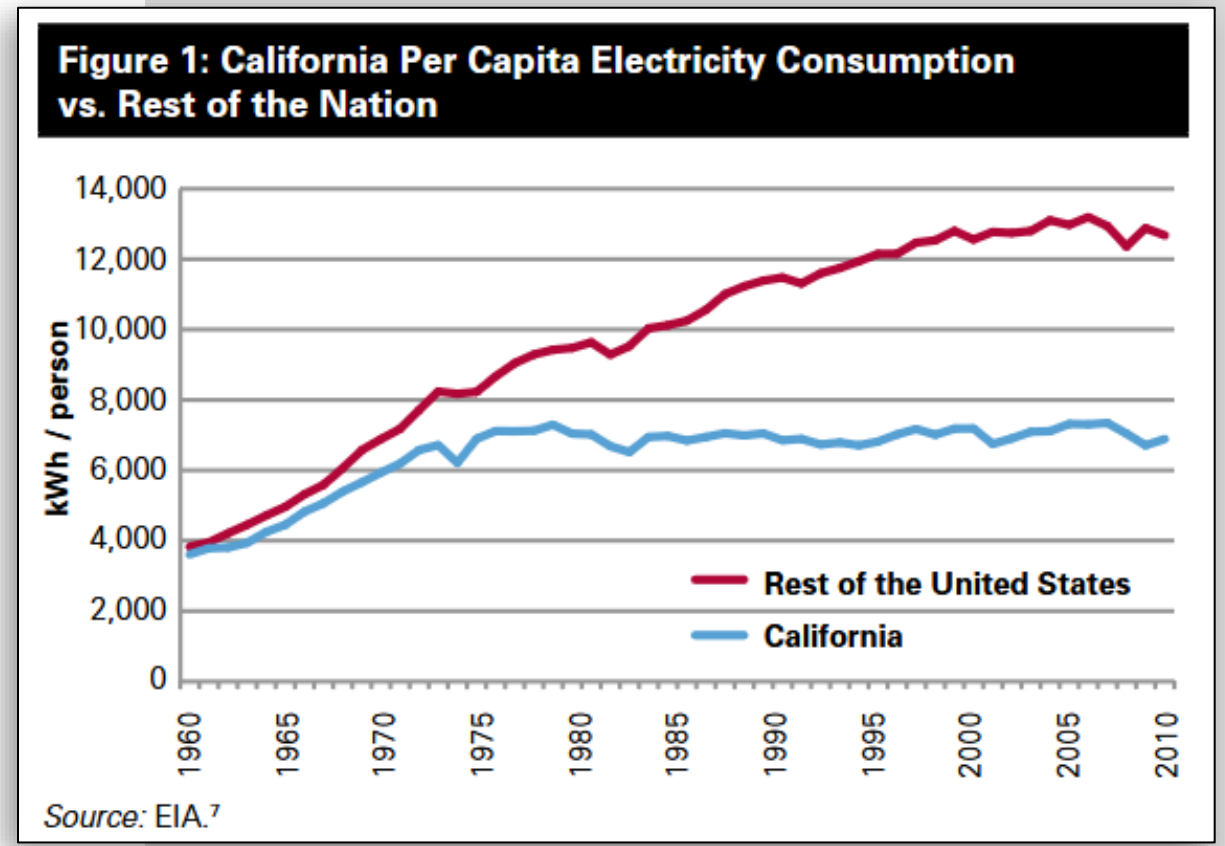
# California Adopts Legislation Addressing its Energy Future

- California 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
  - 2024 pop. About 40 million

NRDC FACT SHEET

JULY 2013
FS:13-06-A

**California's Energy Efficiency Success Story:**
Saving Billions of Dollars and Curbing Tons of Pollution




https://www.nrdc.org/sites/default/files/ca-success-story-FS.pdf

# Energy Efficiency Standards are Born

- Building code is a set of standards established and enforced by local government for the structural safety of buildings
  - A set of rules (standards) for the construction of buildings focusing on public health, safety, and welfare
- 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 (3rd –Table C14, 2022 EIA.gov)

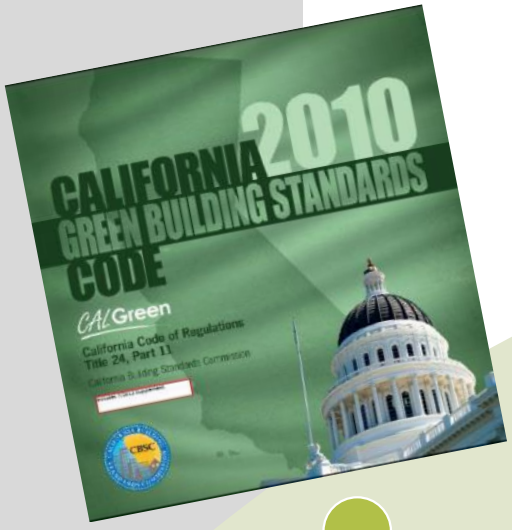
Credits: www.dgs.ca.gov, wakelandhdc.com/

# Steady Progress in California

All electric

1978

Title 24 Energy Standard




2008

Energy Efficiency Strategic Plan

2020

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

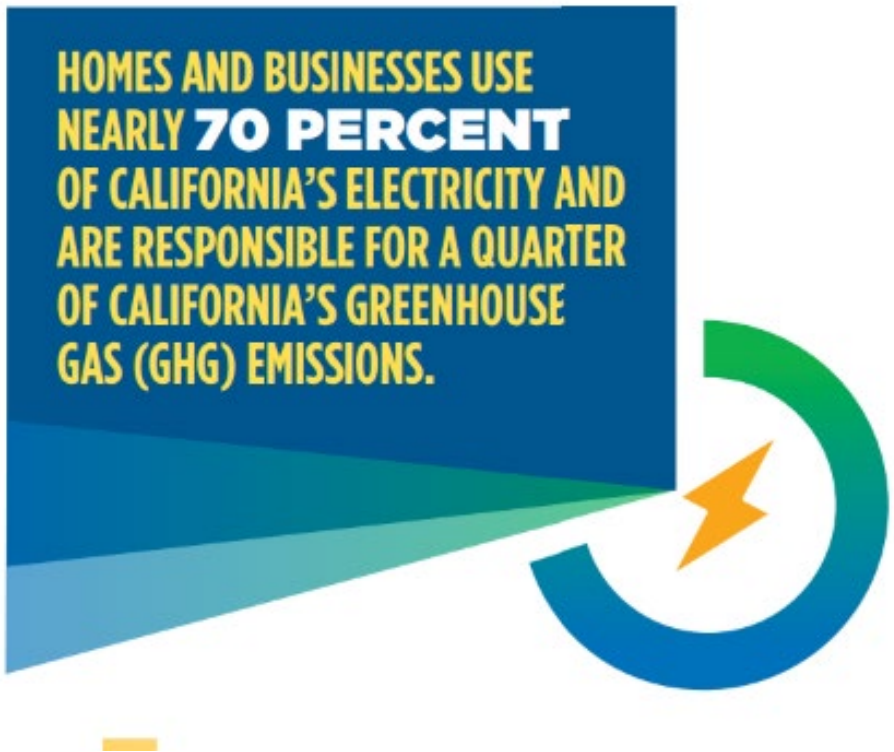

2030

40% Reduction GHG in Buildings

2045

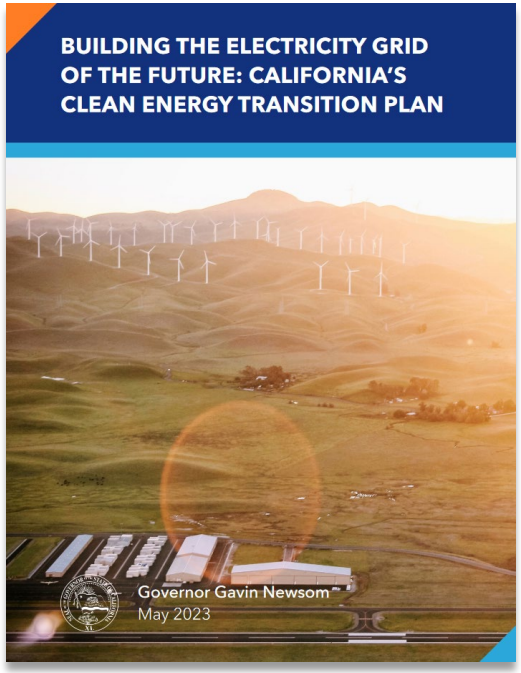
100% Carbon-Free Electric Generation

# Big Picture Goals for the 2022 Code (and 2025…)




- Encourage heat pump technology for space and water heating
- Establish electric-ready requirements for single family homes
- Expand PV systems and battery storage standards
- Improve indoor air quality by strengthening ventilation standards

# California's Plan for Clean Energy Future




https://www.gov.ca.gov/wp-content/uploads/2023/05/CAEnergyTransitionPlan.pdf

**A carbon-free electric grid where:**

- **Buildings** are increasingly decarbonized.
- **The Industrial Sector** is powered by clean electricity, and by clean fuels, such as green hydrogen.
- **Transportation** choices are zero-emission and able to plug into the electric grid at places of convenience for all customers

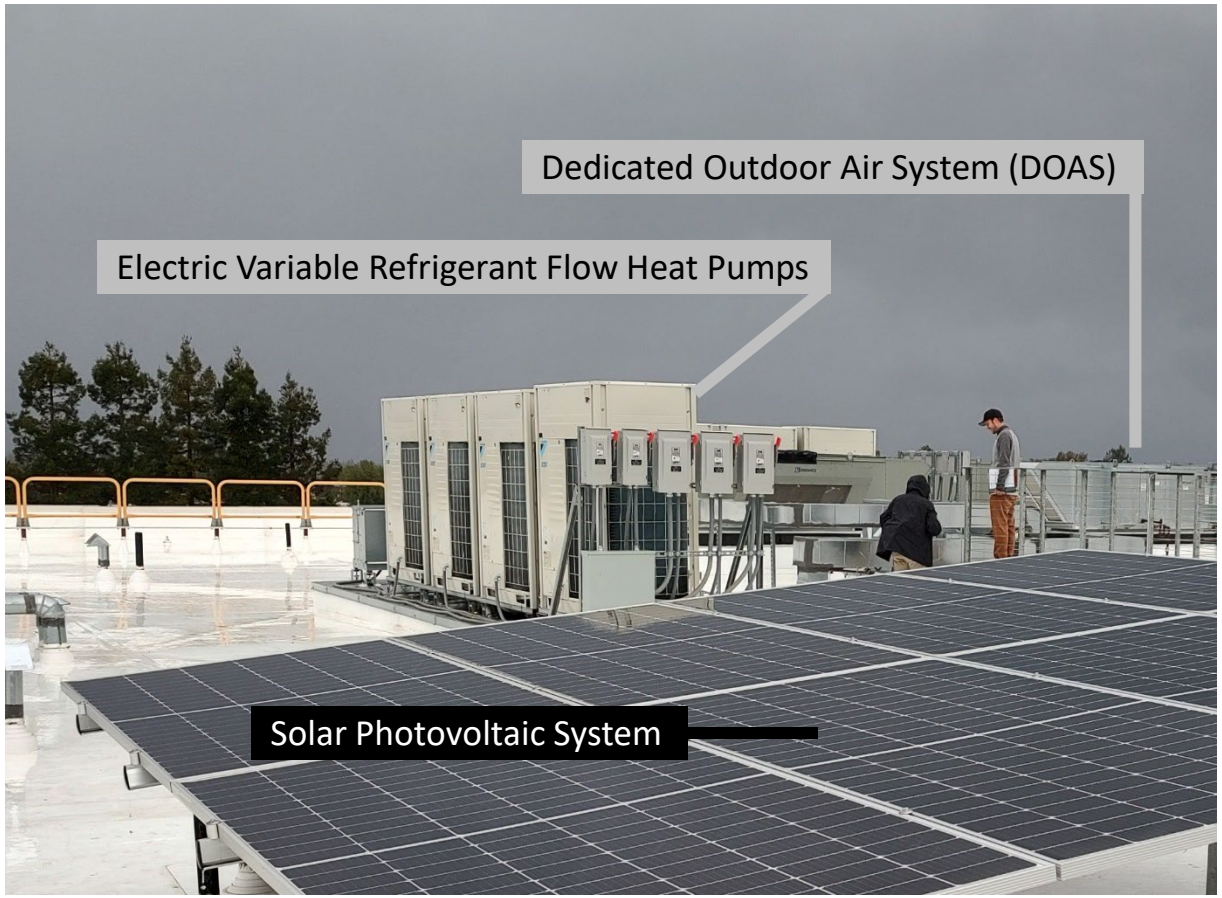
California Air Resources Board (CARB) - Mary D. Nichols Campus

# All-Electric (and *Nearly* All-Electric) Buildings

- **New Construction** All-Electric is relatively easy, with some exceptions for large scale buildings and industrial applications

- **Existing Buildings** – Incremental opportunities for
  - HVAC Replacement
  - Appliance Replacement
  - On-site Solar and Batteries
  - Envelope Improvements

- **Existing Communities** – Infrastructure Approach
  - Decarbonize the Grid
  - Reduce Natural Gas Carbon Footprint
  - Support Electric Transportation




Morning Star Senior Living, San Jose, CA

# California's Energy Code

- California Code of Regulations
- Calif Code of Reg and the Building Standards Commission
- Title 24 Building Standards
- Title 24 Part 6 (ICC Format)

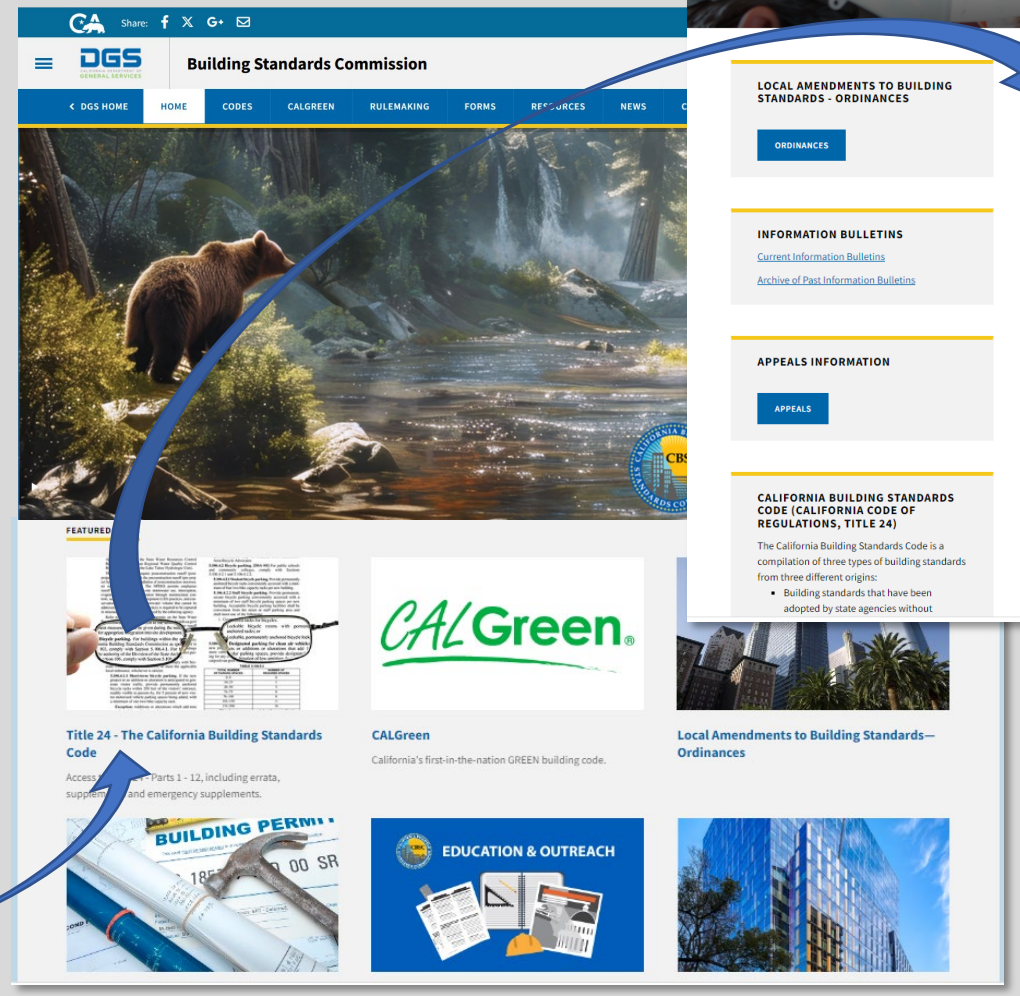
# California Code of Regulations (CCR)

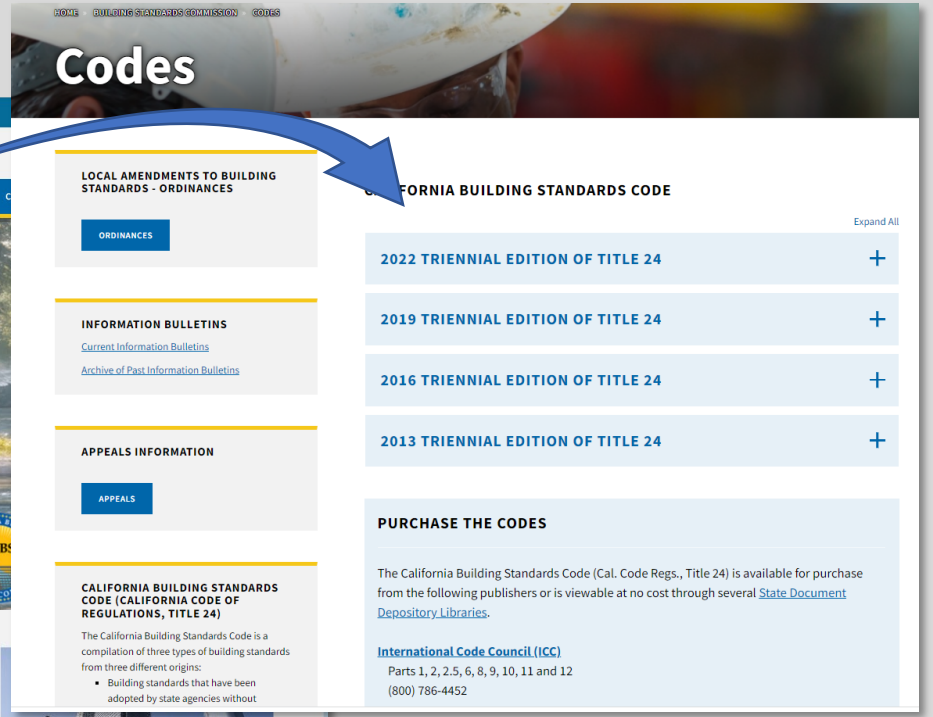
California has 28 ***Titles*** comprising the rules and regulations e.g. administrative laws, for roughly 200 regulatory agencies. The Office of Administrative Law (OAL) maintains and oversees all but Title 24 Building Standards Code, which falls under the California Building Standards Commission.

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**

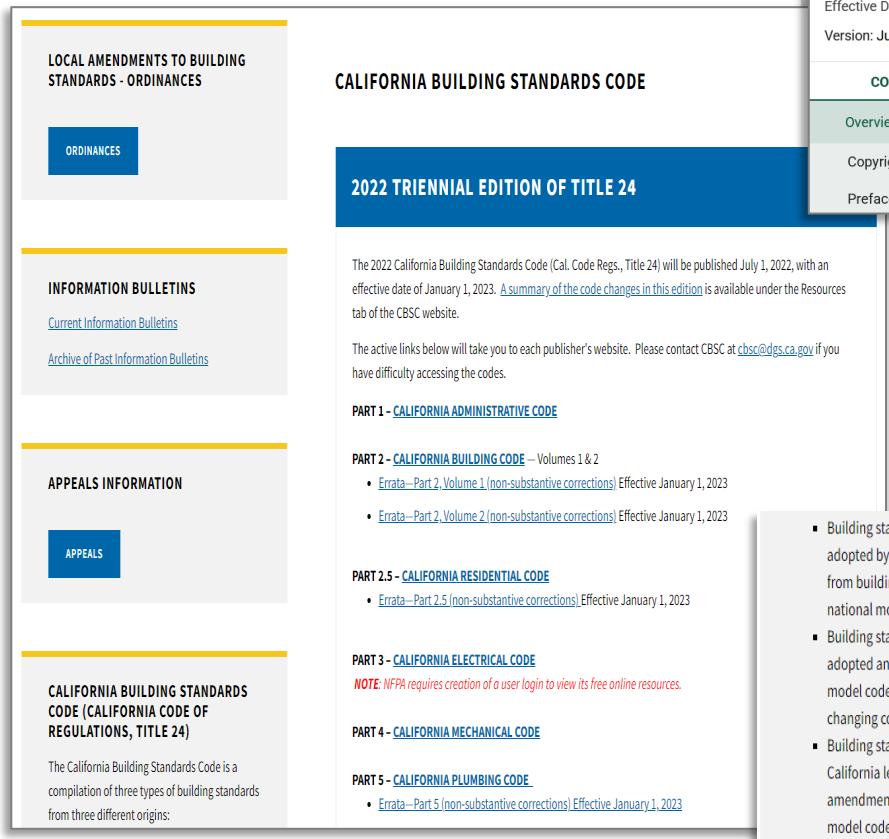
**Part 9-California Fire Code**

**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



LOCAL AMENDMENTS TO BUILDING STANDARDS - ORDINANCES

ORDINANCES

INFORMATION BULLETINS

Current Information Bulletins

Archive of Past Information Bulletins

APPEALS INFORMATION

APPEALS

CALIFORNIA BUILDING STANDARDS CODE (CALIFORNIA CODE OF REGULATIONS, TITLE 24)

The California Building Standards Code is a compilation of three types of building standards from three different origins:

CALIFORNIA BUILDING STANDARDS CODE

2022 TRIENNIAL EDITION OF TITLE 24

The 2022 California Building Standards Code (Cal. Code Regs., Title 24) will be published July 1, 2022, with an effective date of January 1, 2023. A summary of the code changes in this edition is available under the Resources tab of the CBSC website.

The active links below will take you to each publisher's website. Please contact CBSC at cbsc@dgs.ca.gov if you have difficulty accessing the codes.

PART 1 – CALIFORNIA ADMINISTRATIVE CODE

PART 2 – CALIFORNIA BUILDING CODE – Volumes 1 & 2

- Errata—Part 2, Volume 1 (non-substantive corrections) Effective January 1, 2023
- Errata—Part 2, Volume 2 (non-substantive corrections) Effective January 1, 2023

PART 2.5 – CALIFORNIA RESIDENTIAL CODE

- Errata—Part 2.5 (non-substantive corrections) Effective January 1, 2023

PART 3 – CALIFORNIA ELECTRICAL CODE

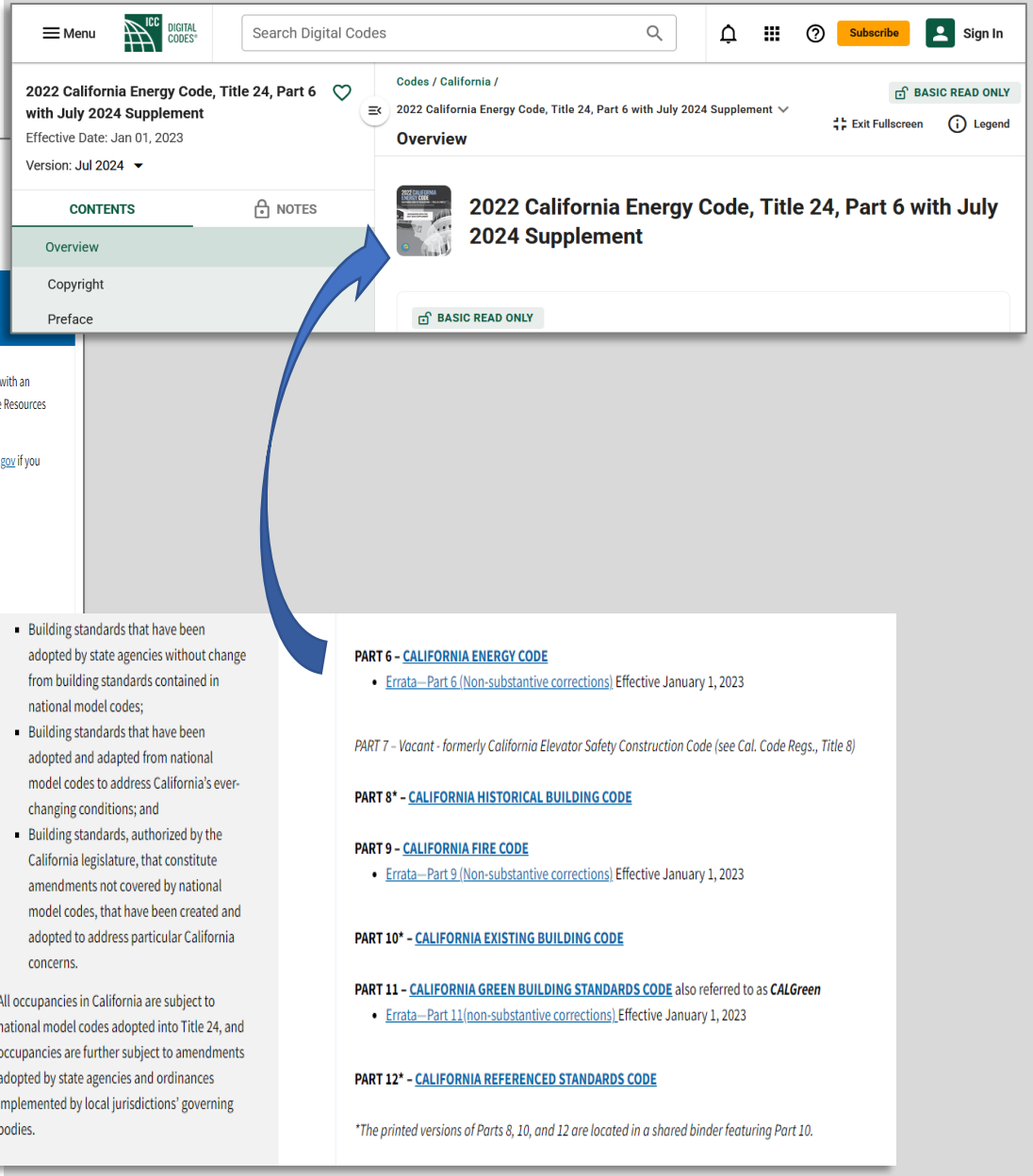
*NOTE: NFPA requires creation of a user login to view its free online resources.*

PART 4 – CALIFORNIA MECHANICAL CODE

PART 5 – CALIFORNIA PLUMBING CODE

- Errata—Part 5 (non-substantive corrections) Effective January 1, 2023

**Title 24, Part 6 California Energy Code**
https://codes.iccsafe.org/content/CAEC2022P3



Menu | ICC DIGITAL CODES | Search Digital Codes | Subscribe | Sign In

2022 California Energy Code, Title 24, Part 6 with July 2024 Supplement

Effective Date: Jan 01, 2023

Version: Jul 2024

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Copyright

Preface

Codes / California /

2022 California Energy Code, Title 24, Part 6 with July 2024 Supplement

BASIC READ ONLY

Exit Fullscreen | Legend

Overview

2022 California Energy Code, Title 24, Part 6 with July 2024 Supplement

BASIC READ ONLY

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes;
- Building standards that have been adopted and adapted from national model codes to address California's ever-changing conditions; and
- Building standards, authorized by the California legislature, that constitute amendments not covered by national model codes, that have been created and adopted to address particular California concerns.

All occupancies in California are subject to national model codes adopted into Title 24, and occupancies are further subject to amendments adopted by state agencies and ordinances implemented by local jurisdictions' governing bodies.

PART 6 – CALIFORNIA ENERGY CODE

- Errata—Part 6 (Non-substantive corrections) Effective January 1, 2023

*PART 7 – Vacant - formerly California Elevator Safety Construction Code (see Cal. Code Regs., Title 8)*

PART 8* – CALIFORNIA HISTORICAL BUILDING CODE

PART 9 – CALIFORNIA FIRE CODE

- Errata—Part 9 (Non-substantive corrections) Effective January 1, 2023

PART 10* – CALIFORNIA EXISTING BUILDING CODE

PART 11 – CALIFORNIA GREEN BUILDING STANDARDS CODE also referred to as ***CALGreen***

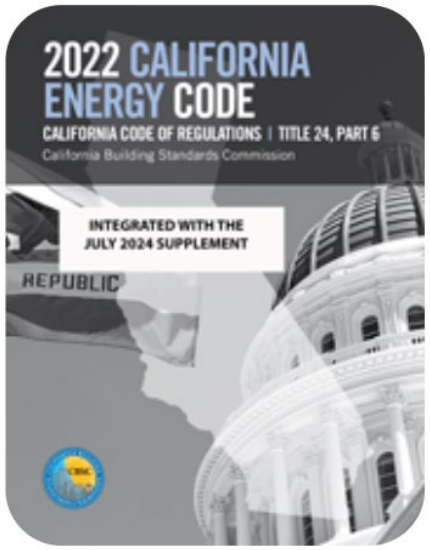
- Errata—Part 11 (non-substantive corrections) Effective January 1, 2023

PART 12* – CALIFORNIA REFERENCED STANDARDS CODE

**The printed versions of Parts 8, 10, and 12 are located in a shared binder featuring Part 10.*

# Title 24 Part 6, *CCR / ICC*

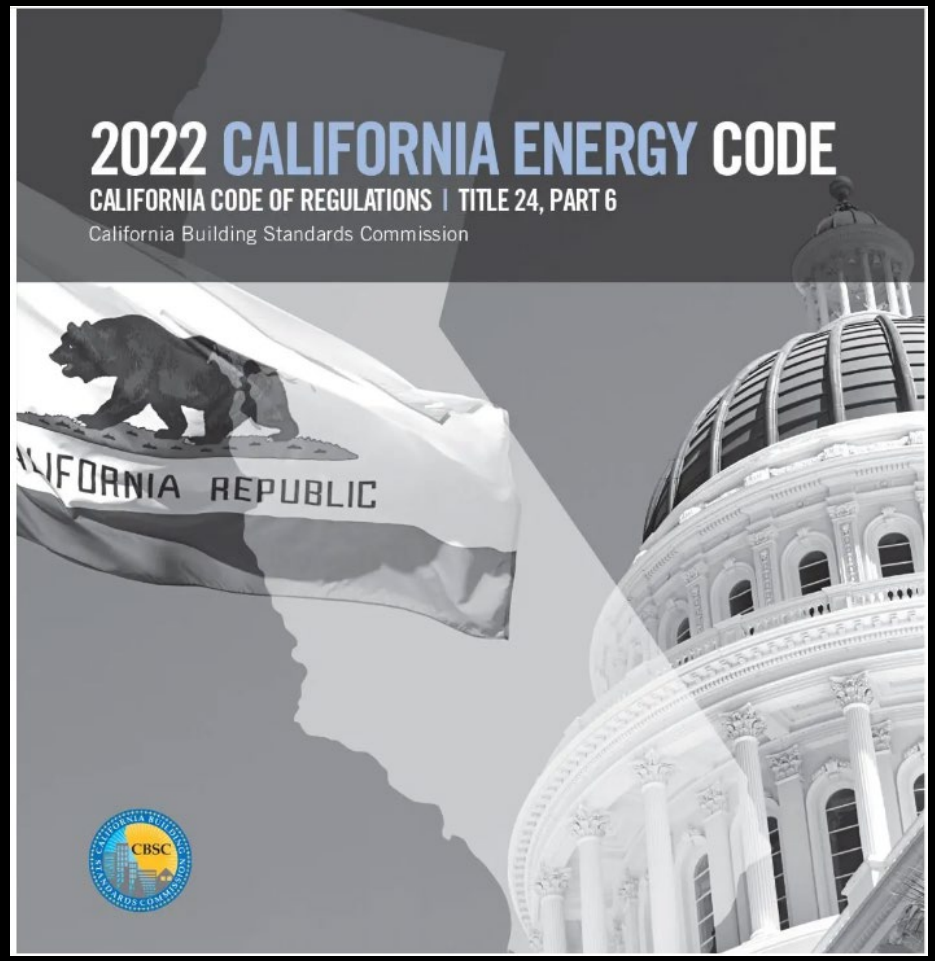
## Digital Version – Basic and Premium




2022 California Energy Code, Title 24 Part 6 with July 2024 Supplement

- 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

- Title 24 Part 6, California Energy Commission – Responsibilities
- Code Adoption Timeline
- Current Code (2022) Standards and Manuals

# California Energy Commission (CEC) energy.ca.gov

## Core Responsibility Fact Sheets

These fact sheets address the seven core responsibilities of the California Energy Commission and California's leading energy policies.

About the California Energy Commission

Advancing State Energy Policy

Achieving Energy Efficiency

Investing in Energy Innovation

**ABOUT**

- Commissioners
- Executives
- Divisions and Offices
- Division of Petroleum Market Oversight
- **Core Responsibility Fact Sheets**
  - — Achieving Energy Efficiency
  - — Advancing State Energy Policy
  - — Developing Renewable Energy
  - — Investing in Energy Innovation
  - — Overseeing Energy Infrastructure
  - — Preparing for Energy Emergencies
  - — Transforming Transportation

**EVENTS**

**JAN 20** — State Holiday - Martin Luther King Jr. Day

January 20, 2025 | 08:00 AM - 05:00 PM
California Energy Commission

**JAN 21** — Energy Commission Business Meeting

January 21, 2025 | 10:00 AM - 03:30 PM
Remote Access or In-Person

**JAN 24** — IEPR Commissioner Workshop on Regional Electricity Markets and Coordination

January 24, 2025 | 09:00 AM - 04:00 PM
Remote or In-Person

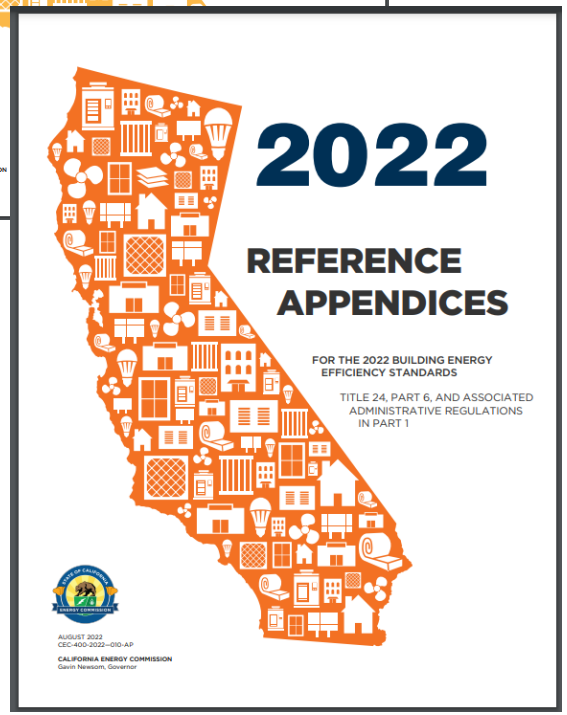
**JAN 29** — Notice of Availability, Request for Comments, and Staff Workshop on the Draft 2024 Zero-Emission Vehicle

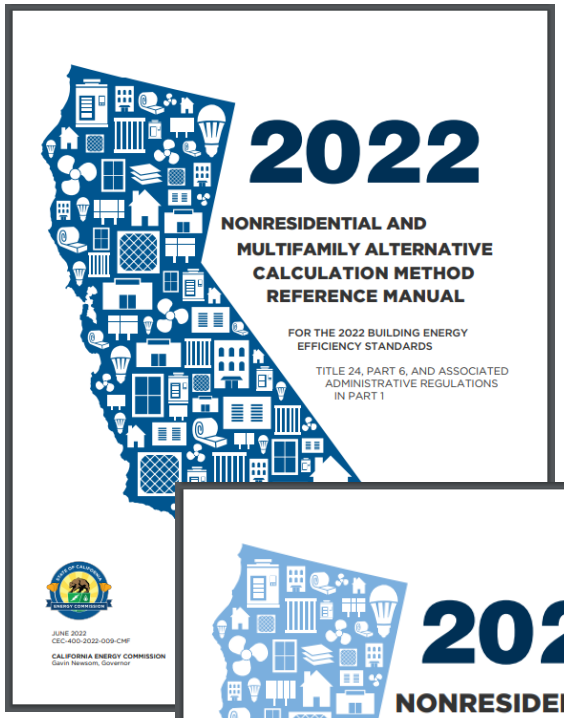
3C REN

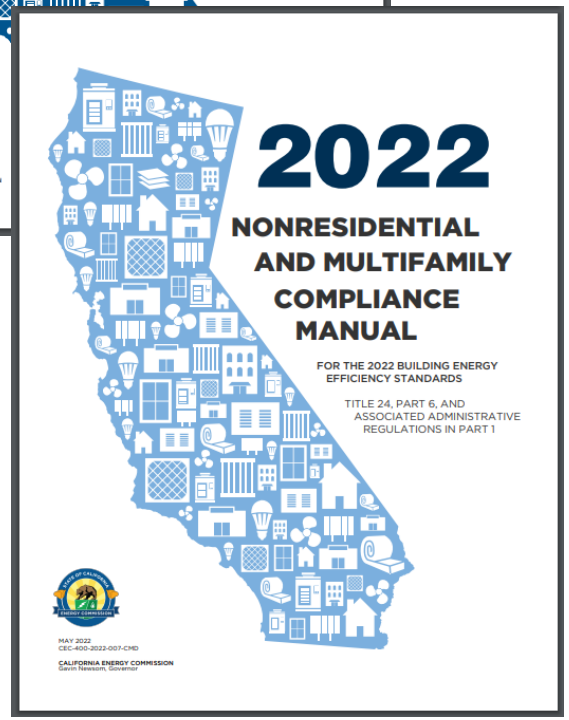
# *Multi-year Process –Adoption Timeline for the 2025 Energy Code*

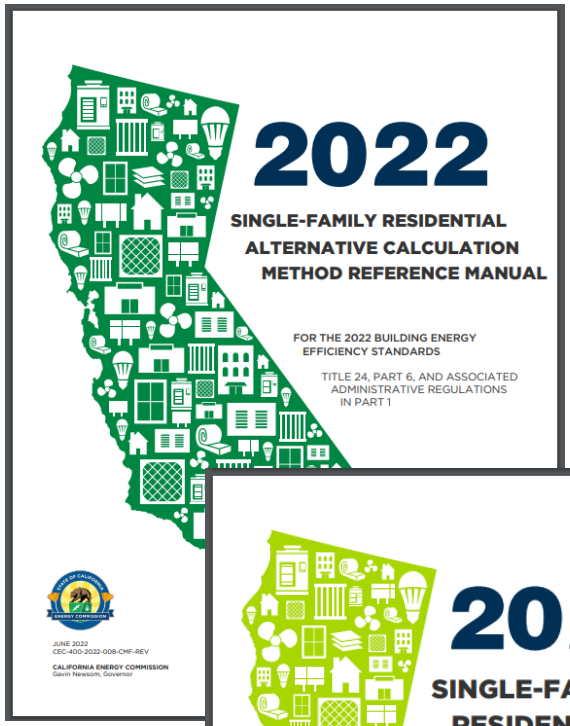

For more information visit
energy.ca.gov

# Title 24 Part 6, 2022 Standards and Manuals

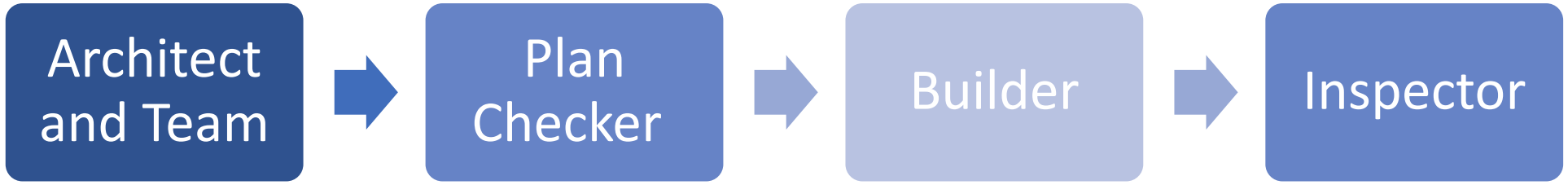


https://www.energy.ca.gov/publications/2022/

# The Energy Code in Design and Construction

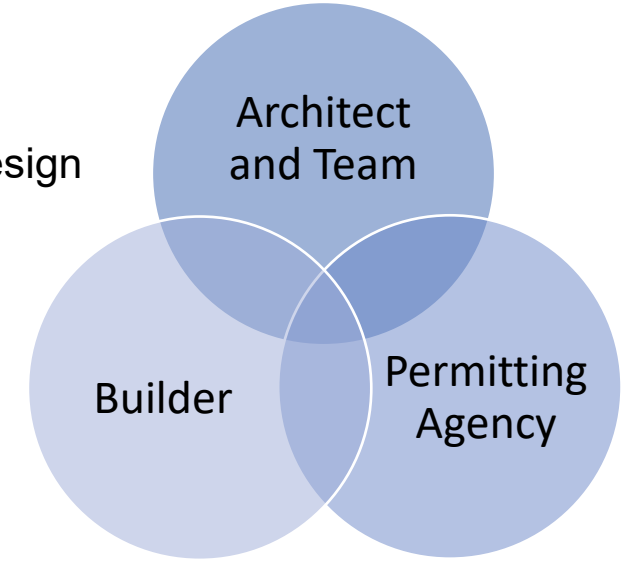
- Plan and Design for Code Compliance
- When does the Energy Code Come into Play?

# Plan and Design for Energy Code Compliance



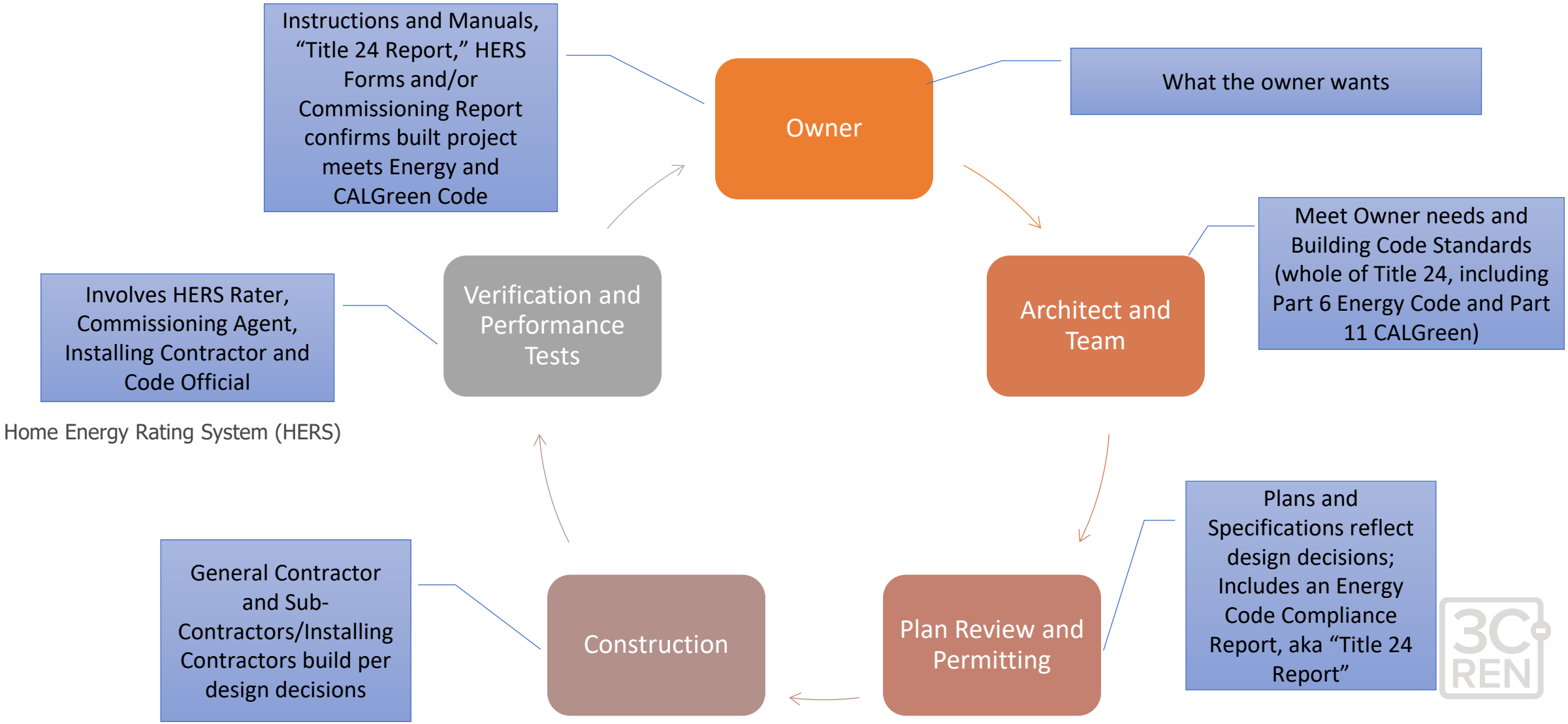

Linear Approach to Design

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

Key Concepts Behind the Energy Code:

- Three Important Compliance Terms
- Climate Zones of California
- General Structure of Energy Standards
- Prescriptive Wall Example for a New Home
- Example from a Nonresidential Project

# The Energy Code –Three Compliance Terms

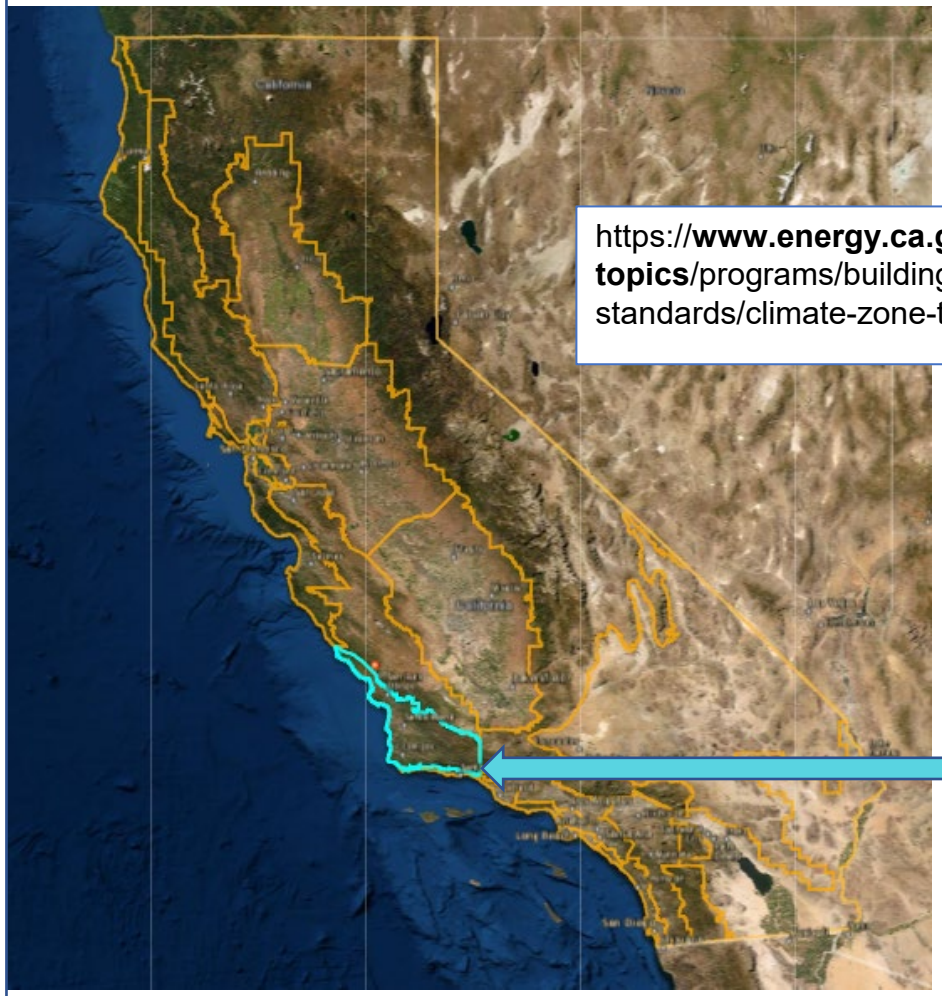
## Mandatory Requirements

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)

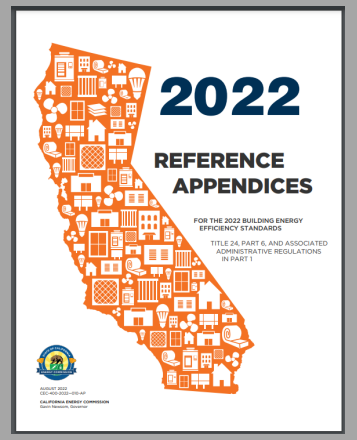
The California Energy Commission has an on-line tool:
EZ Building Climate Zone Finder

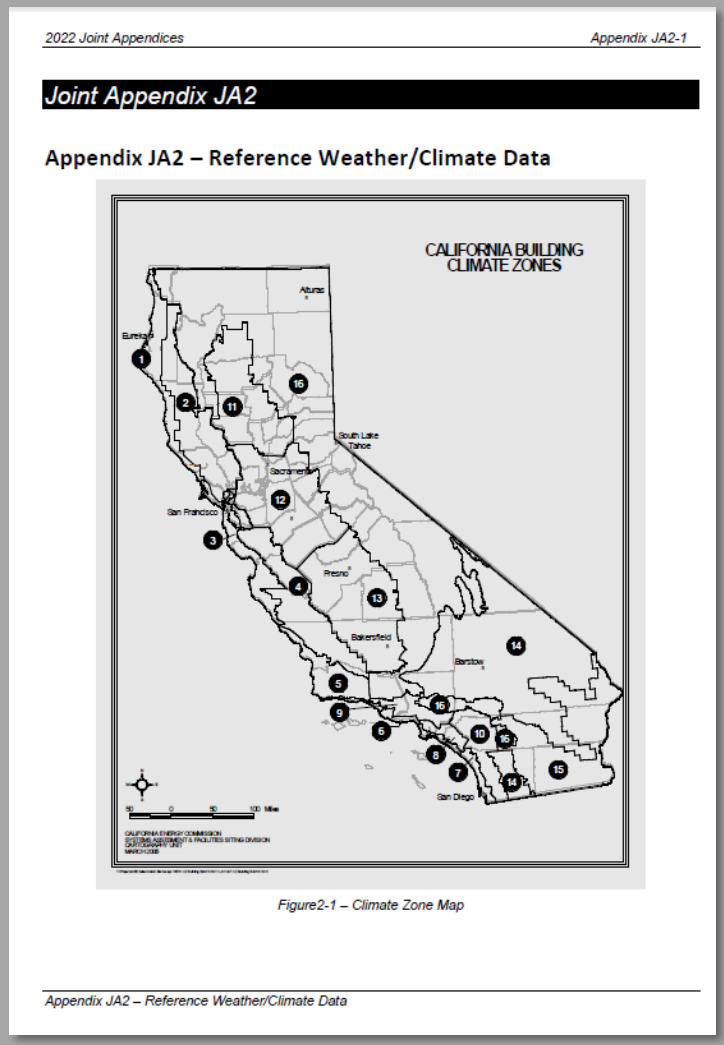


https://**www.energy.ca.gov/programs-and-topics**/programs/building-energy-efficiency-standards/climate-zone-tool-maps-and

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

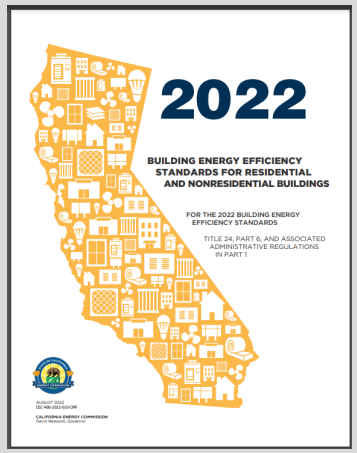
[*New Construction*]

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

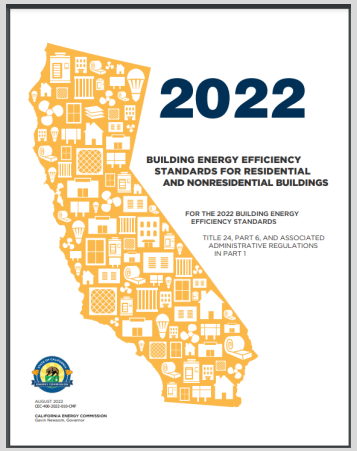
**Subchapter 11** – Performance and Prescriptive [*New Construction]*

Sec 170.0-170.2

**Subchapter 12** – Additions and Alterations

Sec 180.0-180.4

# Subchapter 1 –Application of the Standards



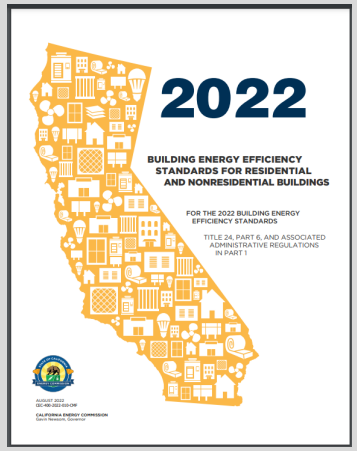

## Subchapter 1
## Table 100.0-A

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 | | 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 |
| | | Above Grade | 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

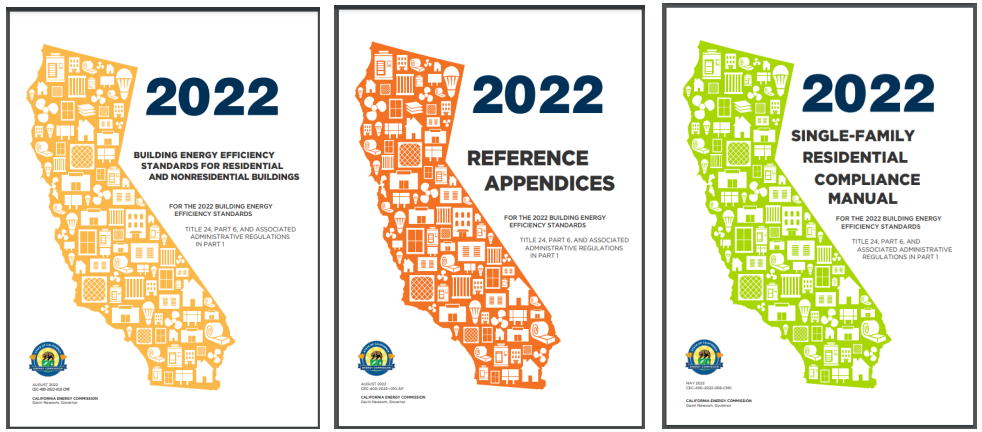
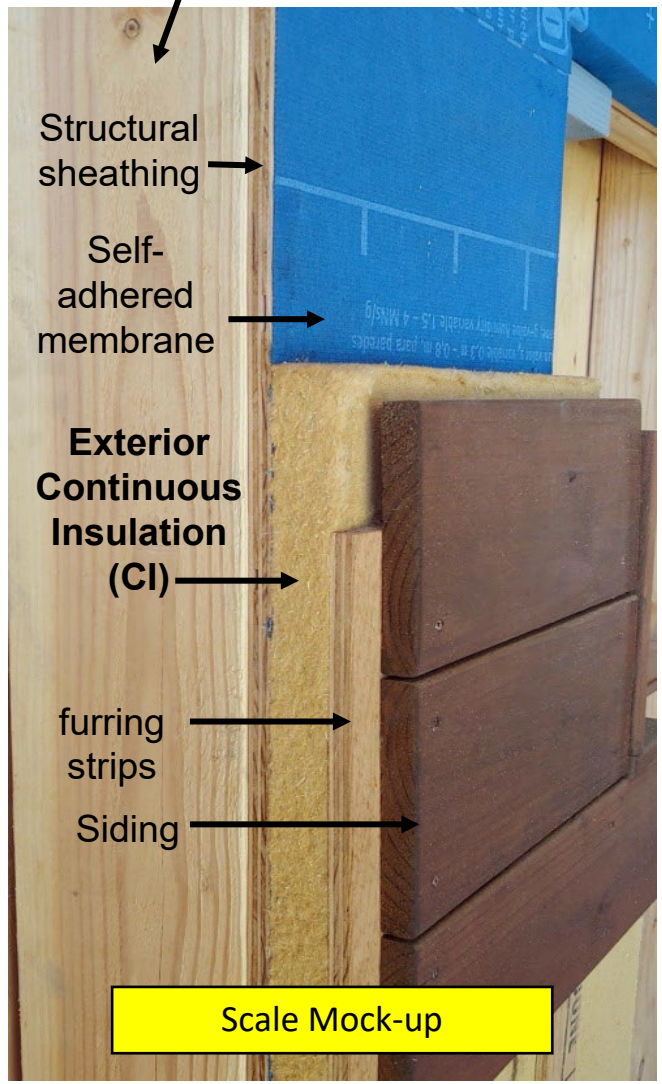



**Table 3-10: Examples of Wood-Framed Wall Assemblies and U-Factors, Assuming Gypsum Board Interior**

| 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**

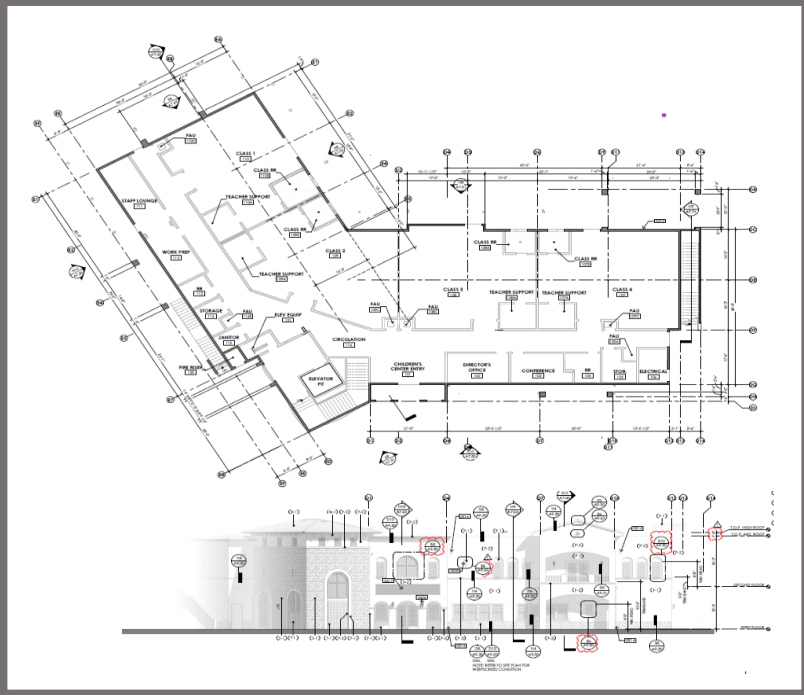


# Prescriptive Nonresidential Example


| 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 |

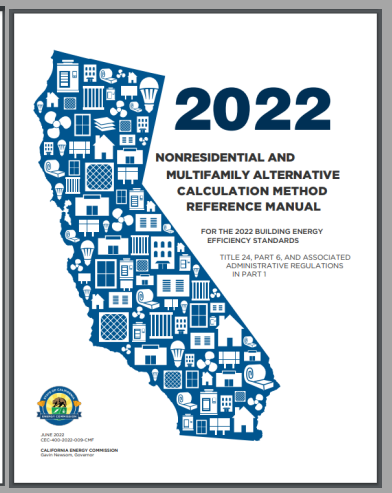


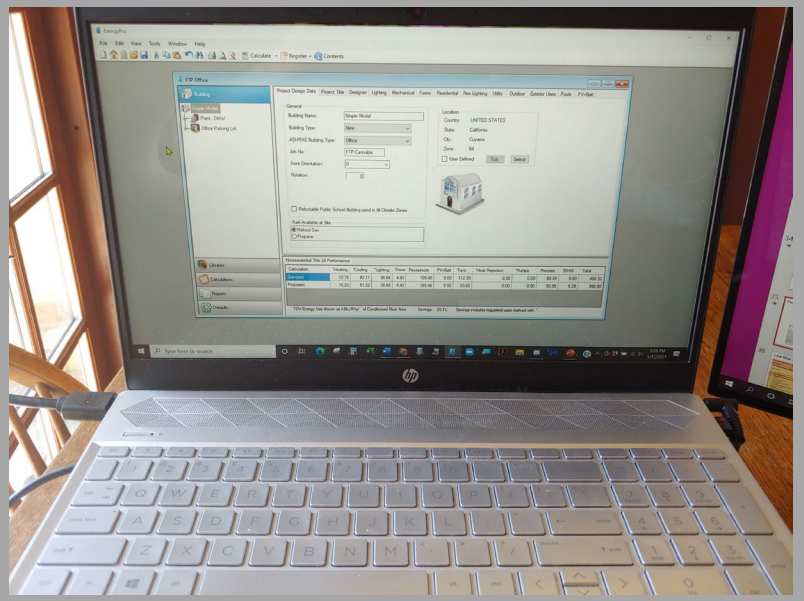
**Envelope Example : Two story commercial building Santa Maria area (CZ5)**

**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 % |

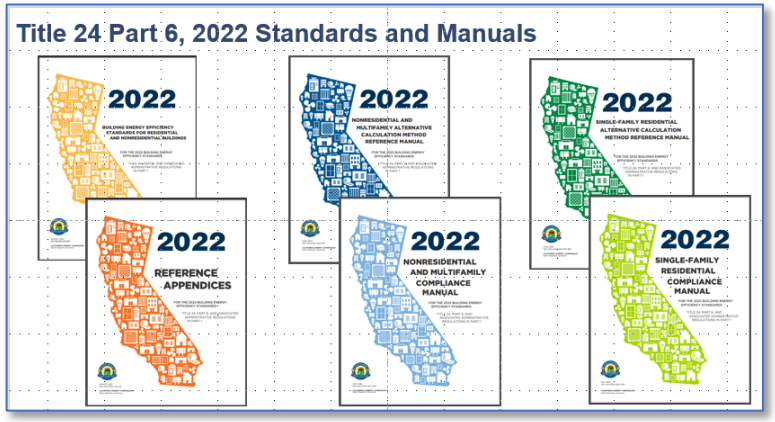
# Additional Resources

- California Energy Commission
- Blueprint
- Energy Code Ace
- CalCERTS and CHEERS
- Housing and Community Development
- Code Coach Service

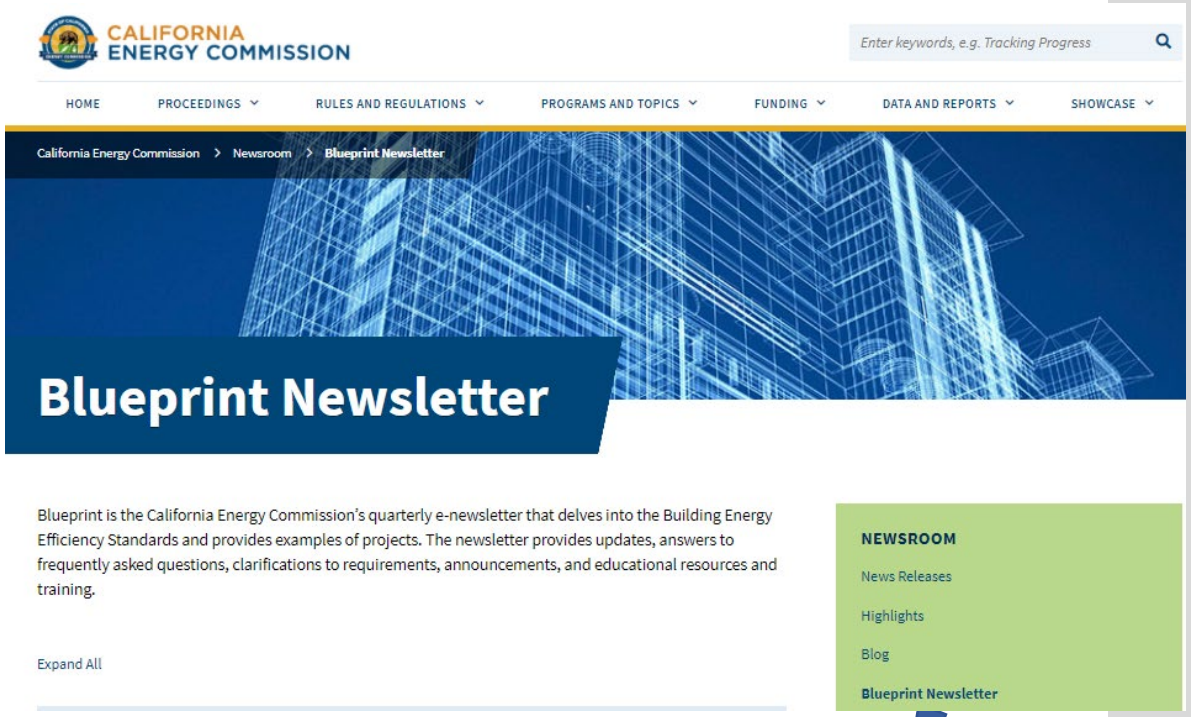
# California Energy Commission
# Energy.ca.gov


Forms, Trainings, Videos

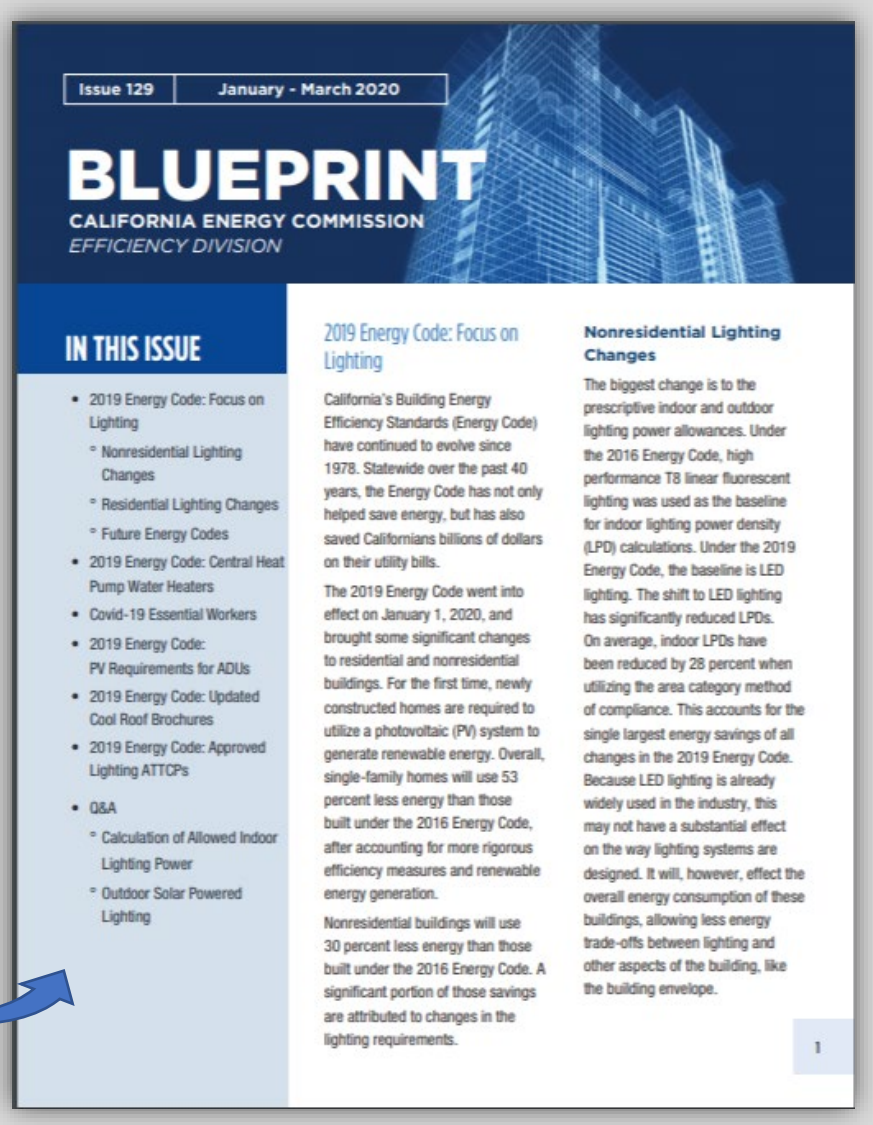

Climate Zone Finder



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

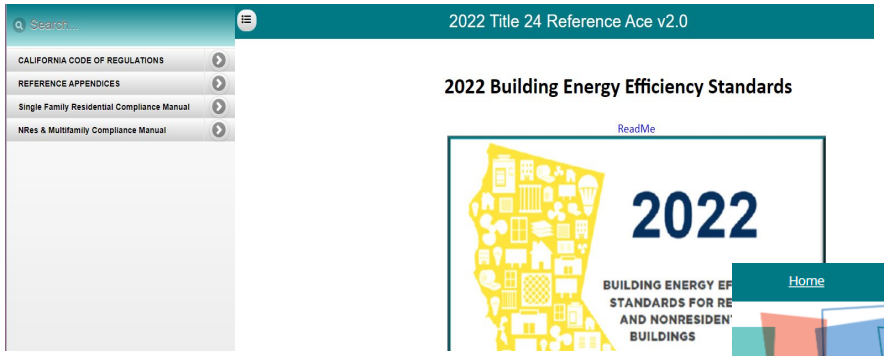


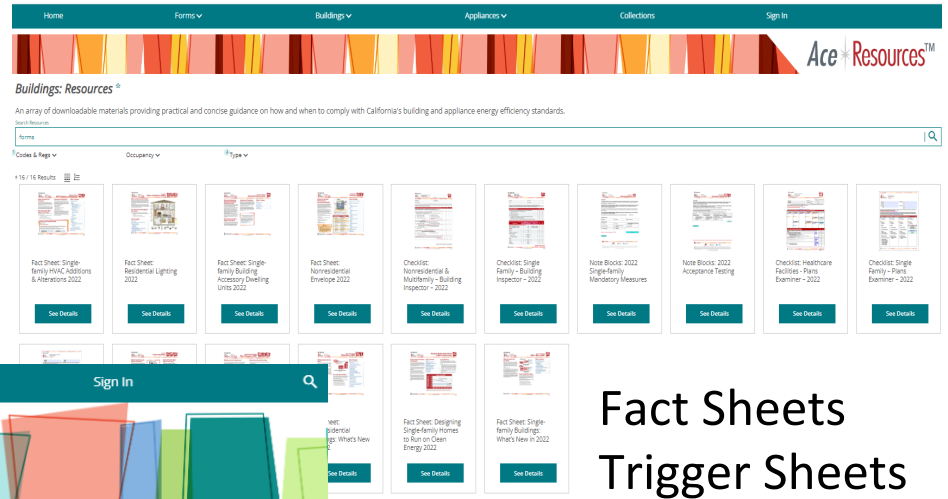

- Published quarterly
- Short –quick read with packed info
- Common Q and A for code enforcement /interpretations
- Offers clarifications on code issues
- Keeps readers up to date on latest code concerns




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.*
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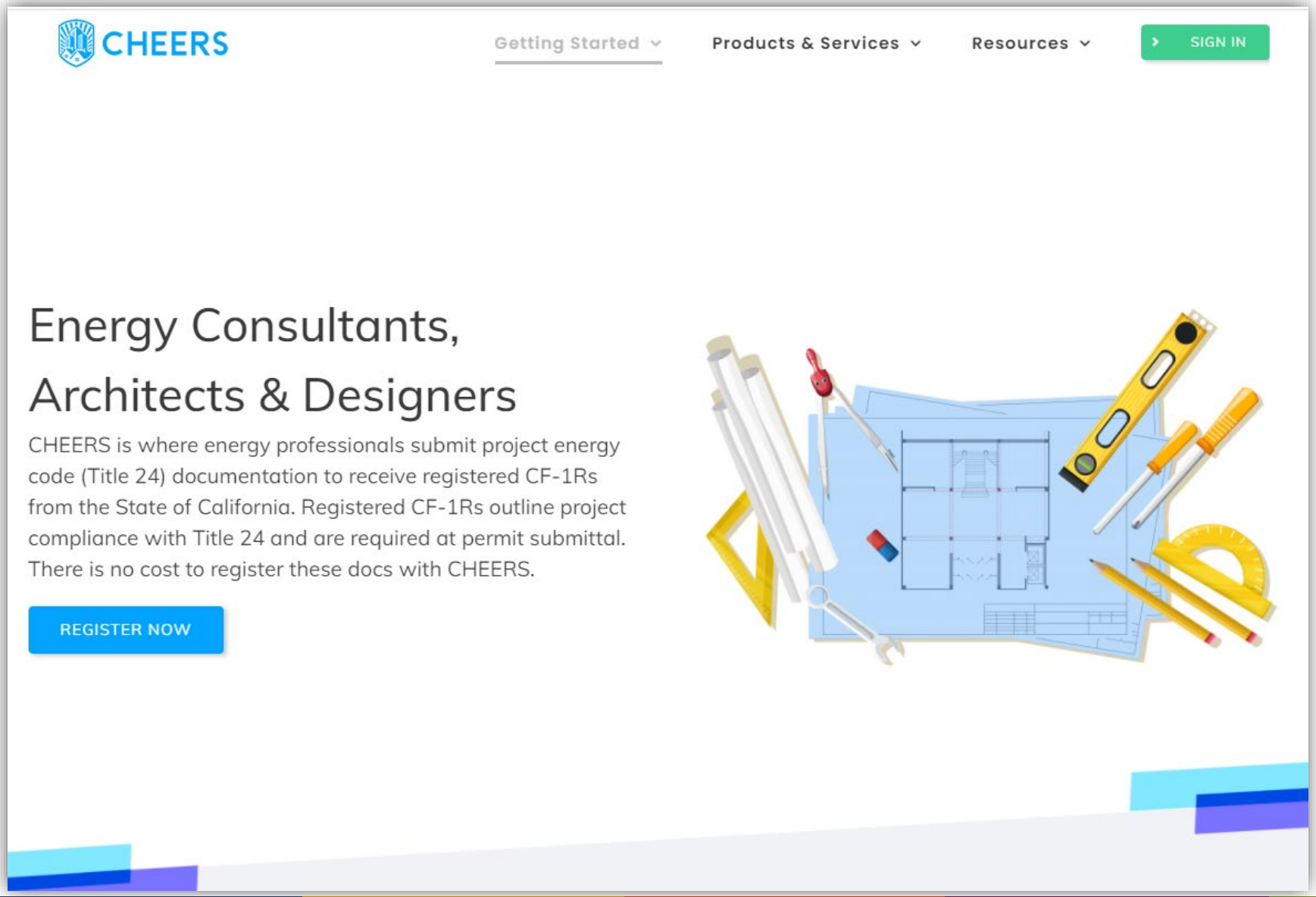
3C REN

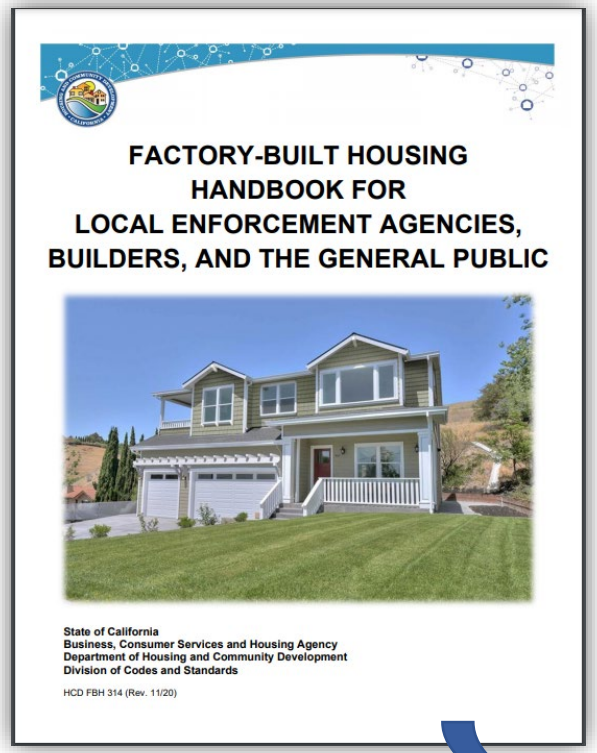
# Low-Rise Residential –Title 24 Energy Documentation Registry




**CHEERS**
**www.cheers.org**

CHEERS is a **HERS Provider** (training programs and certification)
and **Registry** for single family residential Energy Compliance Documentation

# 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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California Department of
**Housing and Community Development**

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# 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.

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**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.<br><br>**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<br><br>Part 2 California Building Code<br>Part 2.5 California Residential Code<br>Part 3 California Electrical Code<br>Part 4 California Mechanical Code<br>Part 5 California Plumbing Code<br>Part 6 California Energy Code<br>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.

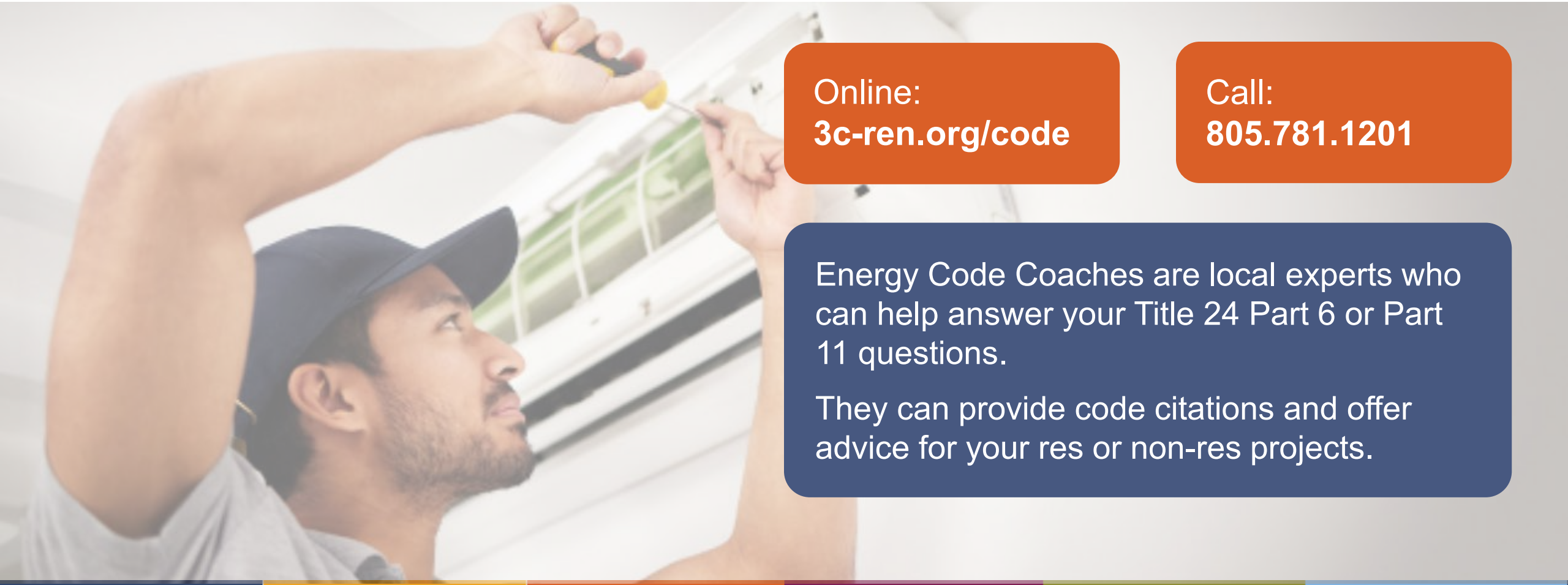
FBH benefits:
- Time savings
- Built year-round without typical weather constraints
- Manufactured in a controlled environment
- Less material waste
- Cost savings
- Ease of design customization

(Benefits vary with each FBH project)

hcd.ca.gov 800.952.8356

# Questions about Title 24?

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



Online:
**3c-ren.org/code**

Call:
**805.781.1201**

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

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

# Closing

## Continuing Education Units Available

- Contact 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!

## Upcoming Courses:

- Feb 6 & 7 - Home Electrification Contractor Boot Camp in Oxnard
- Feb 11 - Green Building Construction Tour in San Luis Obispo
- Feb 12 - 2025 Energy Code Update for the Building Industry
- Feb 19 - What Energy Consultants Need to Know About HERS Measures
- Feb 20 - High Performance Buildings: Designing for Utility Costs & Carbon Emissions

**Any phone numbers who joined? Please share your name!**

# Thank you!

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

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

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

3C REN

TRI-COUNTY REGIONAL ENERGY NETWORK

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