2025 Energy Code
Nonresidential Significant Changes

California Energy Commission
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Agenda

- 2025 Energy Code basics
- Envelope
- Solar PV and battery energy storage system ready
- HVAC
- Water heating, pools and spas
- Lighting
- Resources

2025 Energy Code Basics

2025 Energy Code Goals

State goals

- Contribute to GHG reduction
- Increase building energy efficiency cost-effectively

2025 Energy Code goals

- Increase heat pump baselines
- Promote demand flexibility, solar PV, and battery energy storage systems
- Reduce covered process load efficiencies
- Promote equity and affordable housing program
- Focus on existing building and ADUs

2025 Energy Code Benefits by the Numbers

Energy cost savings: $4.8B	Avoided GHG Emissions: 4.1M MT CO_2e	Benefit to Cost Ratio: 7
Electricity Savings: 392 GWh/yr	Natural Gas Savings: 23 MM Therms/yr	Water Savings: 68+ MM gallons/yr

Heat pumps:
Leads to installation of over 500k heat pumps over 3 years

PV/Battery:
Saves on average 300 GWh/year; reduces power demand on average 0.88MW/year. Minimizes grid exports.

Electric-ready:
Sets up owners of newly constructed commercial kitchens to use cleaner electric equipment when they are ready

2025 Energy Code Fact Sheet

CALIFORNIA ENERGY COMMISSION

2025 California Energy Code FACT SHEET

The Energy Code Background

As California's primary energy policy and planning agency, the California Energy Commission (CEC) was mandated by the Warren-Alquist Act to update and adopt building standards that reduce wasteful, uneconomic, inefficient, or unnecessary energy consumption and reduce greenhouse gas (GHG) emissions. That's because homes and businesses use nearly 70 percent of California's electricity! They are also responsible for about 25 percent of the state's GHG emissions. Every three years, the CEC updates the Energy Code, which is published by the California Building Standards Commission as part of the California Building Standards Code (itself, known as Title 24 of the California Code of Regulations). The CEC's efficiency standards for buildings and appliances together have saved Californians more than $100 billion in avoided energy costs over the last 50 years. Thanks to efficiency measures, California — the U.S. state with the highest population and largest economy (almost $3.9 trillion GDP in 2023) — has the second-lowest per capita energy use in both the residential and commercial sectors.[1]

Meeting State Climate Goals Through Better Buildings for Californians

The Energy Code governs the energy-saving features of newly constructed buildings, building additions, and alterations to existing buildings. The proposed standards for 2025 are cost-effective and are estimated to provide over $4 billion in statewide energy cost savings.

The 2025 updates strongly contribute to California's efforts to "decarbonize" its buildings: reducing their carbon emissions. The Energy Code reduces emissions by making buildings more energy efficient; encouraging the use of energy efficient heat pumps for space and water heating; using clean energy generated onsite by solar panels in combination with battery storage; and shifting times of energy use to avoid peak periods of the day when dirty and inefficient powerplants are supplying more power to the grid.

The 2025 Energy Code Update Focuses on:

- Expanding the use of heat pumps for space conditioning and water heating in newly constructed single-family, multifamily, and select nonresidential buildings. The standards also allow for flexibility in taking alternative but equally efficient approaches.
  - For homes, use heat pumps for both space heating and water heating, expanding on the single heat pump baselines in the 2022 update.
  - For nonresidential building types, expanding on the single-zone heat pump baselines in the 2022 update.
  - For low-rise multifamily buildings with individual water heaters in dwelling units, use heat pump water heater baselines, expanding on the space heating heat pump baselines in the 2022 update.
- Encouraging electric-ready buildings to set up owners to use cleaner electric water heating and cooking when they are ready to invest in those technologies.
- Updating photovoltaic and battery energy storage system standards for low-rise and high-rise multifamily and nonresidential buildings to achieve cost effective installations in consideration of revised net billing and virtual net billing rules.
- Updating space conditioning system efficiency and control standards for homes and nonresidential buildings.
- Updating ventilation requirements in multifamily buildings to improve indoor air quality.

Reminder: The CEC does not mandate specific fuel types. California's Energy Code is founded on the principle of enabling building designers to use a range of options for complying with energy requirements.

[1] US Energy Information Administration

Process and Timeline

The Energy Code measures are updated with extensive input from the public, many stakeholders, and experts who participate in the CEC's process. Over the course of each three-year cycle, CEC staff and technical consultants evaluate each measure. The standards must be technologically feasible and cost-effective over the life of the building. The measures are discussed in public workshops and in online comments before being revised. This year, the proposed standards are slated to go to a CEC business meeting for adoption in September of 2024. It will then go to the California Building Standards Commission for approval as part of California's Building Standards Code before the end of 2024.

After approval, there is a one-year period for the CEC to provide supporting information, training, and technical assistance that brings builders, code officials, and technicians up to speed on the updates before they take effect. Local building departments start enforcing the 2025 Energy Code on January 1, 2026. These measures not only save energy and reduce energy bills, but also help Californians breathe easier and be more comfortable where they live and work. They are a critically important tool for advancing the state's climate and energy goals.

BY THE NUMBERS

$100 BILLION
avoided energy costs over the last 50 years from the CEC's efficiency standards for buildings and appliances

70% amount of California's electricity used by homes and businesses

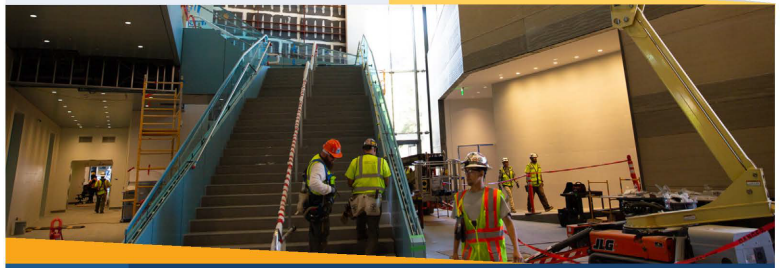
25% amount of the state's total greenhouse gas (GHG) emissions that homes and businesses are responsible for

$4 BILLION
statewide energy cost savings expected from the proposed standards for 2025

For more information on:

The current Energy Code updates, please go to www.energy.ca.gov/2025EnergyCode

Please direct media questions to mediaoffice@energy.ca.gov



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2025 Energy Code

Effective January 1, 2026

- Building permit applications submitted on or after effective date
- Must use 2025 software and forms

2025 Energy Code Webpage

- Final Express Terms
- Final Statement of Reasons
- Responses to comments
- Hard copies available July 2025

Nonresidential Defined

All buildings § 100.0, 100.1

Updated for 2025

Nonresidential building

- All buildings in California Building Code (CBC) occupancies of group A, B, E, F, H, I, L, M, S, U
- Adds L occupancy for laboratory
- Updates definition for healthcare facility
- Adds definitions for commercial kitchens
- Updates definitions for nonresidential building types:
  - Events & exhibits, sports & recreation, warehouse
  - Functions areas for laboratories

Performance Approach Summary

All buildings § 100.2, 140.1

Updated for 2025

Performance energy budget

- Energy budget includes source energy and long-term system cost (LSC)
  - Compliance determined by applying mandatory and prescriptive requirements of standard design to proposed design building
- Updates long-term system cost (LSC) energy budget with two components
  - Efficiency LSC - includes space-conditioning, water heating, mechanical ventilation, lighting, and other plug loads
  - Total LSC - includes efficiency LSC plus LSC energy from PV system, battery energy storage systems (BESS), demand flexibility
- Source energy is the total annual source energy

2025 Envelope Changes

Fenestration Mandatory Requirements

Nonresidential § 120.7(d)

New for 2025

Exterior windows

- Vertical fenestration area-weighted average maximum U- factor 0.47
- Exception: Buildings meeting CBC Part 7, California Wildland-Urban Interface (WUI) Code, and located in Fire Hazard Severity Zones or WUI Fire Areas as designated by local enforcement agency

Fenestration - Vestibules Mandatory Requirements

Nonresidential § 120.7(e)

New for 2025

Vestibules

Public entrances in occupancy of assembly, business, education, institutional, and mercantile

- All doors opening into and out of vestibule equipped with self-closing devices
  - Design so that interior and exterior doors not open at same time
  - Required on main entrance doors adjacent to revolving doors in building entrance
- If conditioned - heating system and air curtains with integral heating must have controls to shut off heating when outdoor air is above 45°F
  - Heating and cooling systems controlled by thermostat located in vestibule to limit heating to maximum 60°F and cooling to minimum 85°F

Fenestration - Vestibules Mandatory Requirements

Nonresidential § 120.7(e)

New for 2025

Vestibule exceptions

- Doors not intended to be used by public
- Doors opening directly from sleeping unit or dwelling unit
- Doors that open directly from space less than 3,000 square feet
- Revolving doors installed where public entrance to newly constructed building is required
- Doors primarily for vehicular movement or material handling and adjacent personnel doors
- Doors with air curtain velocity of at least 6.56 feet per second at floor per ANSI/AMCA 220
- Public entrances in buildings in Climate Zones 2 through 13
    - Less than four stories above grade and less than 10,000 square feet CFA
- Buildings with building plans submitted to local planning department prior to January 1, 2026

Fenestration Alterations Mandatory Requirements

Nonresidential § 141.0(b)1E

New for 2025

Replacing existing fenestration over 150 square feet

- Vertical windows
  - Maximum U-factor 0.58

Additional fenestration over 50 square feet

- Vertical windows
  - Meet Section 120.7(d) maximum U-factor 0.47

Roof and Ceiling Insulation Prescriptive Requirements

Nonresidential § 140.3(a)1B, Tables 140.3-B, C

Updated for 2025

- Maximum U-factor for roofs and ceilings
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-B Roof and Ceiling Insulation Maximum U-Factors for Nonresidential Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Metal Building	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Wood Framed and Other	0.028	0.028	0.028	0.028	0.028	0.047	0.047	0.047	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028

TABLE 140.3-C Roof and Ceiling Insulation Maximum U-Factors for Guest Rooms of Hotel or Motel Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Metal Building	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Wood Framed and Other	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028

Wall Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Tables 140.3-B

Updated for 2025

- Wall maximum U-factors for nonresidential buildings
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-B Wall Insulation Maximum U-Factors for Nonresidential Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Metal Building	0.098	0.053	0.098	0.053	0.053	0.098	0.098	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.050	0.053
Metal-framed	0.060	0.055	0.071	0.055	0.055	0.060	0.060	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Mass Light[1]	0.170	0.138	0.227	0.196	0.364	0.364	0.364	0.364	0.364	0.138	0.138	0.138	0.138	0.138	0.138	0.138
Mass Heavy[1]	0.211	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.160	0.211	0.184	0.160	0.160	0.153
Wood-framed and Other	0.078	0.053	0.102	0.053	0.095	0.102	0.102	0.095	0.053	0.053	0.042	0.053	0.053	0.053	0.038	0.053

Envelope Summary of Changes

Nonresidential §§ 120.7, 140.3, 141.0

New for 2025

Fenestration

- § 120.7(d) – For newly constructed buildings and additions, adds mandatory weighted average U-factor 0.47 for vertical fenestration
- § 141.0(b)1E – For alterations to existing buildings, adds mandatory requirements for vertical fenestration replacements over 150 ft^2, weighted average of U-factor 0.58

Vestibules

- § 120.7(e) – adds mandatory requirements for vestibules at public entrances that open into spaces 3,000 ft^2 or more for newly constructed occupancies types A, B, E, I, M

Insulation

- 140.3(a) - updates prescriptive U-factors for roofs/ceilings and walls in Table 140.3-B

2025 Solar PV and Battery Energy Storage System Changes

Solar Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a)

Updated for 2025

- Newly constructed building types specified in Table 140.10-A
  - Newly installed PV system meets JA11
  - Mixed occupancy buildings where ≥ 80% of the floor area of the building serves one or more of these building types
- Minimum PV system capacity (kWdc) = whichever is smaller
  - Equation 140.10-A
  - Total of all available solar access roof areas (SARA)
    - SARA x 18 Watts per ft^2 for steep slope roofs
    - SARA x 14 Watts per ft^2 for low slope roofs
- Mixed occupancy buildings
  - Minimum rated PV system capacity
    - Apply Equation 140.10-A to CFA of each listed building type and sum capacities

Solar Photovoltaic Prescriptive Requirements

Nonresidential Equation 140.10-A

Updated for 2025

$$kW_{PVdc} = \frac{CFA\ x\ A}{1000}$$

- kW_{PVdc} = Minimum rated PV capacity (kW)
- CFA = Conditioned floor area (ft^2)
- A = PV capacity factor per Table 140.10-A (W/ft^2)

Solar Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a)2

Updated for 2025

- SARA excludes roof area(s)
  - Less than 70% annual solar access
    - $$Annual\ solar\ access = \frac{[annual\ solar\ insolation, minus\ shading\ from\ obstructions]}{[annual\ solar\ insolation\ if\ unshaded]}$$
    - Shading from all obstructions counted in SARA calculations
  - Occupied per CBC §503.1.4
  - Roof area otherwise unavailable
    - Other state building code requirements
    - Local building code requirements confirmed by Executive Director

Solar Photovoltaic Prescriptive Requirements

Nonresidential § 140.10, Table 140.10-A

Updated for 2025

Table 140.10-A – PV Capacity Factors (W/ft² of conditioned floor area)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events & Exhibits	3.48	4.28	3.66	4.32	3.77	4.05	4.28	4.83	4.63	4.80	5.04	4.44	4.95	4.36	5.48	3.38
Library	0.39	3.23	2.59	3.25	2.48	2.74	3.04	3.49	3.32	3.69	3.79	3.32	3.79	3.37	4.49	2.84
Hotel/Motel	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.73
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.59
Restaurants	8.55	9.32	8.16	9.65	8.21	8.73	9.11	10.18	9.75	10.28	10.85	9.73	10.69	9.73	12.25	8.47
Retail, Grocery	3.14	3.49	3.01	3.61	3.05	3.27	3.45	3.83	3.65	3.81	4.09	3.64	3.99	3.71	4.60	3.21
School	1.27	1.63	1.27	1.63	1.27	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	2.46	1.27
Warehouse	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
Religious Worship	4.25	4.65	3.49	4.52	3.72	4.29	4.64	5.89	5.30	5.67	5.89	4.99	5.78	4.63	7.57	3.90
Sports & Recreation	2.47	1.97	1.54	2.03	1.60	1.84	1.98	2.63	2.47	2.60	2.75	2.20	2.72	2.15	4.03	1.81
Multifamily > 3 stories	1.82	2.21	1.82	2.21	1.82	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.77	1.82

Solar Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a)

Exceptions - No PV system if

- Total available SARA less than 3% of CFA
- Required PV system capacity less than 4 kWdc
- SARA less then 80 contiguous ft^2
- AHJ determines PV system cannot meet ASCE 7-16, Chapter 7, Snow Loads

Solar Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a)

Updated for 2025

Exception for multitenant buildings

- PV capacity to be calculated excluding tenant spaces
  - 2,000 ft^2 or less of condition floor space
  - Individual HVAC system
  - Individual utility meter
  - Does not apply
    - CEC approved community solar program per §10-115
    - Load-serving entity program compensates PV generation through virtual energy bill credits for occupants from netting of energy generation and consumption

Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10(b)

Updated for 2025

- All buildings with PV system per §140.10(a) must have battery energy storage system (BESS) meeting JA12
- Minimum rated energy capacity determined by
  - Equation 140.10-B
  - Equation 140.10-C if SARA was used
  - Mixed occupancy to determine total battery system capacity by applying minimum rated energy capacity to each listed building type and summing
- Minimum power capacity determined by Equation 140.10-D

Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10(a), Equation 140.10-B, C

Updated for 2025

Equation 140.10-B	Equation 140.10-C
$kWh_{batt} = \frac{CFA \; x \; B}{1000 \; x \; C^{0.5}}$	$kWh_{batt} = \frac{CFA \; x \; B}{1000 \; x \; C^{0.5}} \text{ x } \frac{\text{kW}_{\text{PVdc, SARA}}}{\text{kW}_{\text{PVdc}}}$

- kWh_{batt} = Min. Rated usable Energy Capacity (kWh)
- kW_{PVdc} = Min. Rated PV System Capacity, Equation 140.10-A (kW)
- $kW_{PVdc,SARA}$ = Min. Rated PV System Capacity, SARA calculation (kW)
- CFA = Conditioned floor area subject to §140.10(a) (ft^2)
- B = BESS Capacity Factor, Table 140.10-B (Wh/ft^2)
- C = Rated single charge-discharge cycle AC-to-AC (round-trip) efficiency of BESS
  - Value < 1
  - From manufacturer specifications

Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10(b), Equation 140.10-D

Updated for 2025

Equation 140.10-D for minimum power capacity

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

- kW_{batt} = Minimum rated power capacity of BESS (kWdc)
- kWh_{batt} = Minimum rated usable energy capacity of BESS (kWh)

Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10, Table 140.10-B

Updated for 2025

Table 140.10-B –BESS Capacity Factors (Wh/ft² of conditioned floor area)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events & Exhibits	1.82	1.95	1.74	2.12	1.91	2.13	2.24	2.30	2.36	2.47	2.62	2.16	2.64	2.68	3.22	1.89
Library	0.37	7.17	5.97	6.75	5.64	6.08	6.19	7.13	7.18	7.56	7.17	6.93	6.88	6.81	7.93	6.40
Hotel/Motel	0.86	0.84	0.77	0.92	0.81	0.89	0.90	1.01	1.00	1.11	1.14	0.96	1.18	1.18	1.49	0.85
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	NR[1]	5.26	4.35	5.26	4.35	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	6.39	4.35
Restaurants	4.36	4.11	3.78	4.37	3.89	4.02	4.11	4.49	4.47	4.82	5.05	4.43	5.05	5.24	6.23	4.11
Retail, Grocery	1.89	1.82	2.70	1.82	1.72	1.80	1.76	1.92	1.97	2.05	2.22	1.95	2.16	2.29	2.66	1.91
School	NR[1]	3.05	2.38	3.05	2.38	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	4.60	2.38
Warehouse	0.37	0.41	0.37	0.41	0.37	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.54	0.37
Religious Worship	2.21	2.25	1.74	2.42	2.08	2.75	2.94	3.37	3.17	3.37	3.58	2.72	3.62	3.21	4.89	2.37
Sports & Recreation	1.26	0.98	0.76	1.14	0.86	1.20	1.23	1.57	1.53	1.65	1.83	1.27	1.86	1.57	3.02	1.13
Multifamily > 3 stories	1.88	2.27	1.88	2.27	1.88	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.85	1.88

Footnote to TABLE 140.10-B:

1. NR = Not Required

Solar PV and Battery Summary of Changes

Nonresidential § 140.10

Updated for 2025

- § 140.10(a) - Updates PV sizing using solar access roof area (SARA) for steep and low slope roofs
  - Exception 5 – Updates for multitenant building tenant spaces < 2000 ft^2 with separate meter and HVAC to be excluded from PV calculation
- Tables 140.10-A and B – Adds building types
  - Events and exhibits, religious worship, sports and recreation
- Table 140.10-A - Increases PV capacity factors
  - Libraries in climate zones 2-16
  - Hotel/motel, medical office building/clinic, restaurants, retail, and grocery in all climate zones
- Equations 140.10-B, C, and D – updates PV sizing equations
- § 140.10(b) Table 140.10-B
  - Updates BESS capacity factors for all building types and climate zones
  - No requirements in climate zone 1 for schools and offices, financial institutions, unleased tenant space, and medical office buildings/clinics

2025 HVAC Changes

Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2(e)

Updated for 2025

Open and closed-circuit cooling towers

- All cooling towers 150 tons or more must have conductivity controls
- Maximum achievable cycles of concentration per Table 110.2-A-1 and based on local water supply quality.
  - Documented on NRCC-MCH-E Table M
  - Signed by Professional Engineer (PE)
- Blowdown not allowed until one or more parameters reaches maximum value in Table 110.2-A-1
- Conductivity controls and overflow alarm verified per NA 7.5.18

Space-Conditioning Equipment Mandatory Requirements

All buildings Table 110.2-A-1

New for 2025

Table 110.2-A-1 Recirculating Water Properties

Recirculating Water Parameters	**Maximum Values**
Conductivity (micro-siemens/cm)	2970 micro-siemens/cm
Total dissolved solids (ppm)	1845 ppm
Total alkalinity as $CaCO_{23}$ (ppm) excluding galvanized steel	540 ppm
Total alkalinity as CaCO3 (ppm) galvanized steel (passivated)	450 ppm
Calcium hardness as CACO3 (ppm)	540 ppm
Chlorides as Cl (ppm)	270 ppm
Sulfates (ppm)	225 ppm
Silica (ppm)	135 ppm
Langelier saturation index (LSI)	2.5 (LSI)

Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2

Updated for 2025

Removes Tables with federal minimum values

- Table 110.2-E – Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps Minimum Efficiency Requirements
- Table 110.2-I - Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters
- Table 110.2-J - Gas- and Oil-Fired Boilers, Minimum Efficiency Requirements
- Table 110.2-L - Floor-Mounted Air Conditioners and Condensing Units Serving Computer Rooms – Minimum Efficiency Requirements
- Table 110.2-M - Ceiling-Mounted Air Conditioners and Condensing Units Serving Computer Rooms – Minimum Efficiency Requirements

Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2

Updated for 2025

Adds Tables

- Table 110.2-J – Heat Pump and Heat Recovery Chiller Packages, Heat Pump, Heating Operation – Minimum Efficiency Requirements
- Table 110.2-K - Heat Pump and Heat Recovery Chiller Packages, Simultaneous Cooling and Heating, Heating Operation– Minimum Efficiency Requirements
- Table 110.2-L - Heat Pump and Heat Recovery Chiller Packages, Heat Recovery, Heating Operation– Minimum Efficiency Requirements

Demand Management Mandatory Requirements

All buildings § 110.12(a)1

Updated for 2025

Demand responsive controls

- When meeting demand management requirements, thermostats meet JA5 requirements, if no EMCS
- Spelled out communication protocols either
  - Must be certified as Open ADR 2.0a or b Virtual End Node (VEN)
  - Must be capable of responding to open ADR 2.0b VEN
  - Must be Open ADR 3.0 Virtual End Node

Ventilation and Indoor Air Quality Mandatory Requirements

Nonresidential § 120.1(c)3

Updated for 2025

Mechanical ventilation

- Outdoor ventilation rate determined by Equation 120.1-F

$$V_z = \textit{the larger of } R_p \times P_z \textit{ or } R_a \times A_z$$

Where:

V_z = Required outdoor airflow rate (cfm)

R_p = 15 cubic feet per minute of outdoor airflow per person

P_z = The expected number of occupants

R_a = The area-based minimum ventilation airflow rate in Table 120.1-A

A_z = The net occupiable floor area of the ventilation zone in square feet

Ventilation and Indoor Air Quality Mandatory Requirements

Nonresidential Table 120.1-B

Updated for 2025

Adds categories for minimum exhaust rates to Table 120.1-B

Table 120.1-B – Minimum Exhaust Rates [ASHRAE 62.1: Table 6.-25]

Occupancy Category	Exhaust Rate cfm/unit	Exhaust Rate cfm/ft^2	Air Class	Notes
Animal imaging(MRI/CT/PET)	-	0.9	3	-
Animal operating rooms	-	3.00	3	-
Animal postoperative recovery room	-	1.5	3	-
Animal preparation rooms	-	1.5	3	-
Animal procedure room	-	2.25	3	-
Animal surgery scrub	-	1.50	3	-
Large-animal holding room	-	2.25	3	-
Animal Necropsy	-	2.25	3	-
Small-animal-cage room (static cages)	-	2.25	3	-
Small-animal-cage room (ventilated cages)	-	1.50	3	-

Space-Conditioning System Controls Mandatory Requirements

Nonresidential § 120.2.(l)

New for 2025

- **HVAC hot water temperature**
  - Zones that use hot water for space heating designed for hot water supply temperature no greater than 130 °F

Ducts and Plenums Mandatory Requirements

Nonresidential § 120.4(g)

Updated for 2025

Duct sealing - either

- Leakage rate < 6% of nominal air handler airflow rate for new ducts systems confirmed by acceptance testing
  - Does not serve healthcare facility
  - Provides conditioned air to an occupiable space for constant volume, single zone, and space conditioning system
  - Serves single zone < 5,000 square ft of conditioned floor area
  - Ducts outdoors or unconditioned space combined surface area > 25% of entire duct system
- Meet testing requirements per CMC §603.10.1

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3

New for 2025

Sizing, equipment selection, and type

- Multi-zone space-conditioning system types
  - Space conditioning systems in office and school buildings not covered by Section 140.4(a)2 must meet Section 140.4(a)3
  - Exception
    - Buildings greater than 150,000 sq feet or greater than 5 habitable stories
    - School buildings in climate zones 6 and 7

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3Ai-ii

New for 2025

Multi-zone space-conditioning system types in offices and schools

- Space conditioning must meet one (i-v)
  - VRF heat pump system that incorporates refrigerant loop heat recovery
    - All zones ventilated by dedicated outdoor air system (DOAS)
    - Indoor fans must meet 140.4(a)3D
    - DOAS must comply with 140.4(a)3E
  - Four-pipe fan coil (FPFC) terminal units with DOAS providing ventilation to all zones
    - FPFC coils supplied by air to water heat pump (AWHP)
    - Indoor fans meet Section 140.4(a)3D
    - DOAS meet Section 140.4(a)3E

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3Aiiia

New for 2025

Multi-zone space-conditioning system types in offices

- Space conditioning must meet one (i-v)
  - Space conditioning systems for office buildings in all climate zones must be variable air volume (VAV) system that utilizes heating supplied by hot water loop served by AWHP which meets section 140.4(a)3C and
  - For office buildings
    - Portion of perimeter zone terminal unit heating capacity utilizing parallel fan-powered boxes per Section 140.4(a)3E must be 100% in climate zones 1-6, 16 and 25% in climate zones 7-15
    - Ventilation system in climate zones 1, 3, 5 must have heat recovery system per 140.4(q)
    - Maximum allowed fan power in climate zones 3 and 5 must be 15% lower than specified in Section 140.4(c)1

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3Aiiib

New for 2025

Multi-zone space-conditioning system types in schools

- Space conditioning must meet one (i-v)
  - Space conditioning systems for schools in climate zones 2, 4, and 8-16 must be variable air volume (VAV) system which utilizes heating supplied by hot water loop served by AWHP that meets Section 140.4(a)3C and
  - For school buildings
    - All perimeter zone terminal units meet Section 140.4(a)3E
    - Ventilation system in climate zones 2, 4, and 11-16 have heat recovery system per Section 140.4(q)
    - Maximum allowed fan power in climate zone 2 must be 15% lower than specified in Section 140.4(c)1
    - Design leaving water temperature of heating loop no greater than 120°F in climate zone 2

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3Aiv

New for 2025

Multi-zone space-conditioning system types in offices and schools

- Space conditioning must meet one (i-v)
  - Space conditioning systems must be a dual fan dual duct (DFDD) system with hot and cold decks served by separate fan systems and
    - Economizer must be in cold deck when required by Section 140.4(e)
    - Hot deck must supply 100% return air
      - Outdoor air may be supplied as required to supplement cold deck to maintain design minimum outdoor air rate
    - Hot deck heating must be heat pump
    - DFDD and terminal unit control sequence meet ASHRAE Guideline G36

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3Av

New for 2025

Multi-zone space-conditioning system types in offices and schools

- Space conditioning must meet one (i-v)
  - Space conditioning system determined by Executive Director to use no more energy than systems specified in Section 140.4(a)3

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3C

Updated for 2025

Multi-zone space-conditioning system types

- Air to water heat pump (AWHP) space-heating hot water loop
  - AWHP used for space-heating hot water meeting Section 140.4(a)3Aii, 140.4(a)3Aiii, or 140.4(a)3B
    - Efficiency per Table 110.2-J
    - If AWHP is used for space cooling
      - Heat recovery system meet Section 140.4(s)
    - Supplemental heat be provided by electric resistance boiler with capacity of maximum 50% of design space-heating hot water loop heating capacity

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3D

Updated for 2025

Multi-zone space-conditioning system types

- Indoor fans meeting Section 140.4(a)3Ai or Section 140.4(a)3Aiii
  - Maximum fan power of 0.35W/cfm at design airflow
  - Minimum of three speeds
  - Turn off when there is no demand of cooling or heating in space

Space Conditioning Systems Prescriptive Requirements – Multizone Heat Pumps

Nonresidential § 140.4(a)3E

Updated for 2025

Multi-zone space-conditioning system types

- DOAS meeting Section 140.4(a)3Ai or Section 140.4(a)3Aii
  - Meet section 140.4(p)
  - Equipped with heat recovery system meeting section 140.4(q)
  - Maximum fan power of 0.77 W/cfm at design airflow
- DOAS units that provide active heating or cooling meet either
  - For hydronic heating or cooling
    - DOAS heating coils must be hydronic heating coils utilizing AWHP space-heating hot water loop
    - DOAS cooling coils must be hydronic cooling coils utilizing space-cooling chilled water loop
  - Other heating or cooling must be heat pump
    - Electric resistance heating not allowed

Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(r)

New for 2025

DDC controller logic per ASHRAE Guideline 36

- HVAC systems with DDC controllers must use controller logic originating from a programming library based on sequences of operation from ASHRAE Guideline 36
  - All controllers capable of being field programmed
  - Entirety or all applicable portions of equipment control for configurations included in programming library
  - Programming library must be certified to Energy Commission as meeting Reference Joint Appendix JA18

Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(s)1B

Updated for 2025

Mechanical heat recovery

- Heat recovery system must include heat recovery chiller, or other means, capable of transferring the lesser of the following from spaces in cooling to spaces in heating and/or to the service water heating (SWP) system
  - 25% of the peak heat rejection of the cooling system
  - 25% of (SWHCAP + HCAP)
  - Where:
    - SWHCAP = design capacity of all service water heating (SWH) systems, excluding systems expected to operate less than 5 hours per week, such as instant-hot water systems for emergency eyewash stations
    - HCAP = design capacity of all space heating systems
- **Exceptions**
  - Laboratory buildings with exhaust air heat recovery systems meeting Section 140.9(c)6
  - Buildings in climate zone 15 with SWHCAP < 600 kBtuh

Space Conditioning Systems Alterations Prescriptive Requirements – Heat Pump RTUs

Nonresidential § 141.0(b)2C

Updated for 2025

New or replacement space-conditioning systems or components –

- New systems or components except ducts meet Section §140.4
  - Additional fan power allowances per Table 141.0-D
  - New or replacement single zone packaged rooftop systems with direct expansion cooling with rated cooling capacity less than 65,000 Btu/h either
    - Meet Table 141.0-E-1
    - Meet performance requirements of Section 141.0(b)3
    - Exception: Section 141.0(b)2Cii not applicable if alteration exceeds existing main service panel or service transformer capacity, electrical load calculation submitted by registered professional engineer per Article 220 of California Electrical Code

Space Conditioning Systems Alterations Prescriptive Requirements – Heat Pump RTUs

Nonresidential Table 141.0-E.1

Updated for 2025

- SZHP – Single zone heat pump + economizer per Section 140.4(e)
- SZAC1 – Single zone air conditioner with furnace + variable speed fan + economizer per Section 140.4(e) or dual fuel heat pump + variable speed fan + economizer per Section 140.4(e)
- NR – No requirement

Table 141.0-E-1 – New Or Replacement Single Zone Air Conditioner Or Heat Pump Requirement

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Retail and grocery	NR	NR	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	NR	SZHP or SZAC1	NR
School	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC12	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	NR
Office, financial institution	NR	NR	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	NR	SZHP or SZAC1	NR
Library	SZHP or SZAC1	NR	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	SZHP or SZAC1	NR

Space Conditioning Systems Alterations Prescriptive Requirements – Heat Pump RTUs

Nonresidential § 141.0(b)2C

New for 2025

Exceptions

- Requirements for ASHRAE Guideline 36 in Sections 140.4(c)2Bii, 140.4(d)2Av, 140.4(e)2D, and 140.4(f)3, and 140.4(r) do not apply to individual new or replacement components unless entire space conditioning-systems are new or replaced
- Section 140.4(e) not applicable to:
    - Systems with cooling capacity < 54,000 btu/h which are not single package air-cooled commercial unitary air conditioner or heat pump

Mechanical Summary of Changes

Nonresidential §§ 120.1, 120.3, 140.4, 141.0

Updated for 2025

- §120.1 - Updates mandatory requirements for ventilation and indoor air quality
- Table 120.1-B - Adds mandatory exhaust rates for laboratory categories
- Table 120.3-A – Splits into Tables 120.3-A1 & -A2 for mandatory pipe insulation thickness
- §140.4 – Updates prescriptive requirements per ASHRAE 36 for variable air volume (VAV) systems, economizers, supply air temperature reset controls, DDC control logic
- §140.4(a)3 – Adds prescriptive requirements for multizone HVAC in offices and schools not greater than 150,000 ft^2 or 5 habitable stories in most climate zones
- §140.4(h)5 - Revises prescriptive requirements for cooling tower efficiency
- §140.4(r) – Adds ASHRAE G36 requirements for DDC controllers
- §140.4(s) - Revises prescriptive requirements for heat recovery
- §141.0(b)2Cii – Updates requirements for HVAC RTU alterations: Single Zone Heat Pump or Single Zone Air conditioner per Table 141.0-E-1 with some exceptions

2025 Water Heating Changes

Water Heating Mandatory Requirements

All buildings § 110.3(c)7

New for 2025

Air-source heat pump water heaters (HPWH)

- Adds external or internal backup heat required when
  - Inlet air unconditioned
  - Compressor cutoff temperature > winter median of extremes (JA2 Table 2-3)
- Adds ventilation/minimum volume requirements for closets
  - Louvered doors,
  - Ducted,
  - ≥ 420 ft^3, or
  - According to manufacturer instructions

2025 Lighting changes

Lighting Summary of Changes

Nonresidential §§ 130.1, 130.2, 130.4, 140.6, 140.8

Updated for 2025

- §130.1(b) – Removes multilevel control uniformity Table 130.1-A
  - Dimming 10%-100% required
- §130.1(d) - Lowers trigger for mandatory daylighting controls to 75W; adds daylighting control exception for secondary sidelit daylit zones < 85W; updates linear luminaires controllable in up to 8-ft segments
- §140.6 – Removes prescriptive tailored method; moves mounted and wall display lighting allowances to prescriptive area category method
- §140.8(b) – Removes most automatically compliant sign light sources; may use LED or neon

Resources

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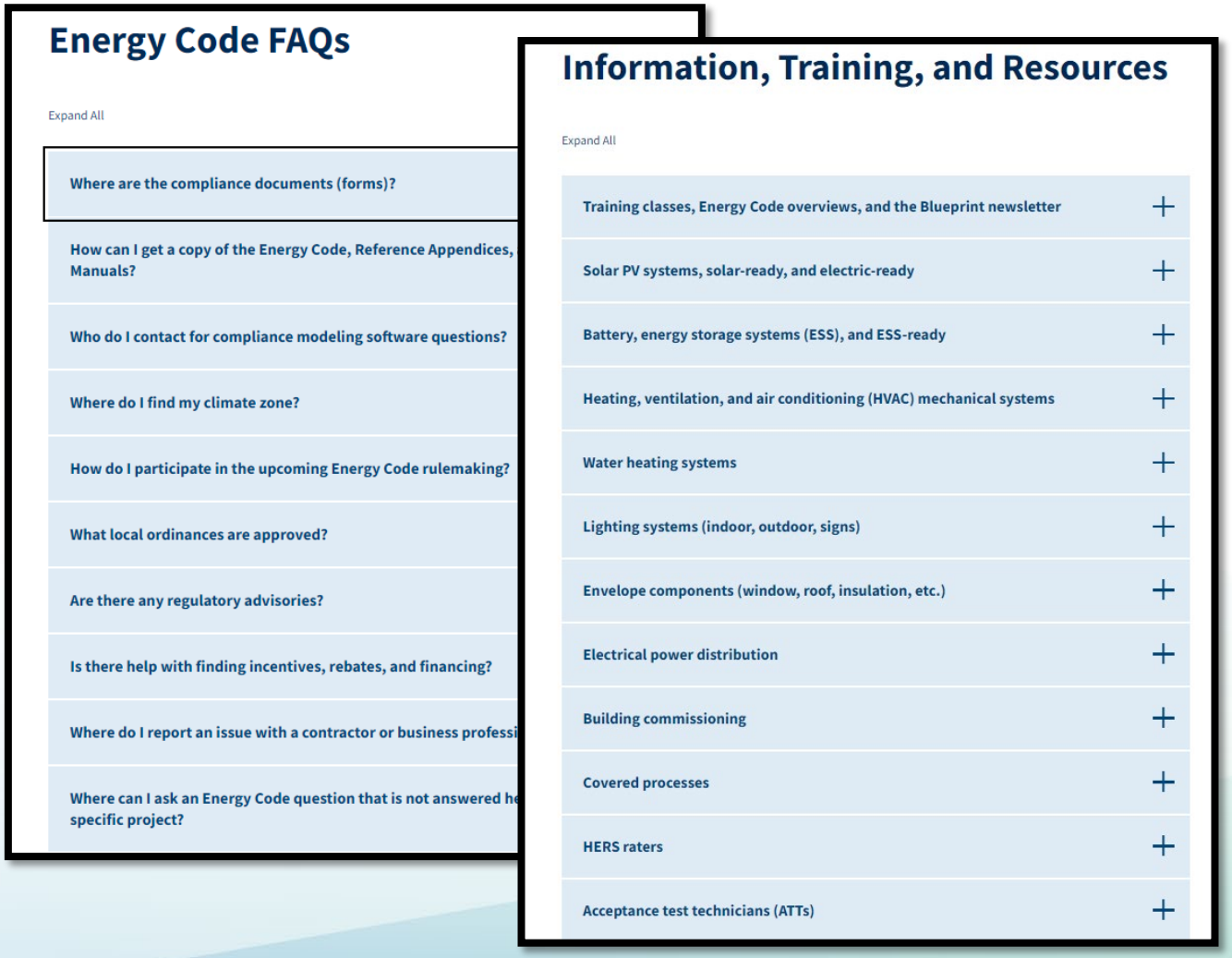
https://www.energy.ca.gov/energy-code-support-center



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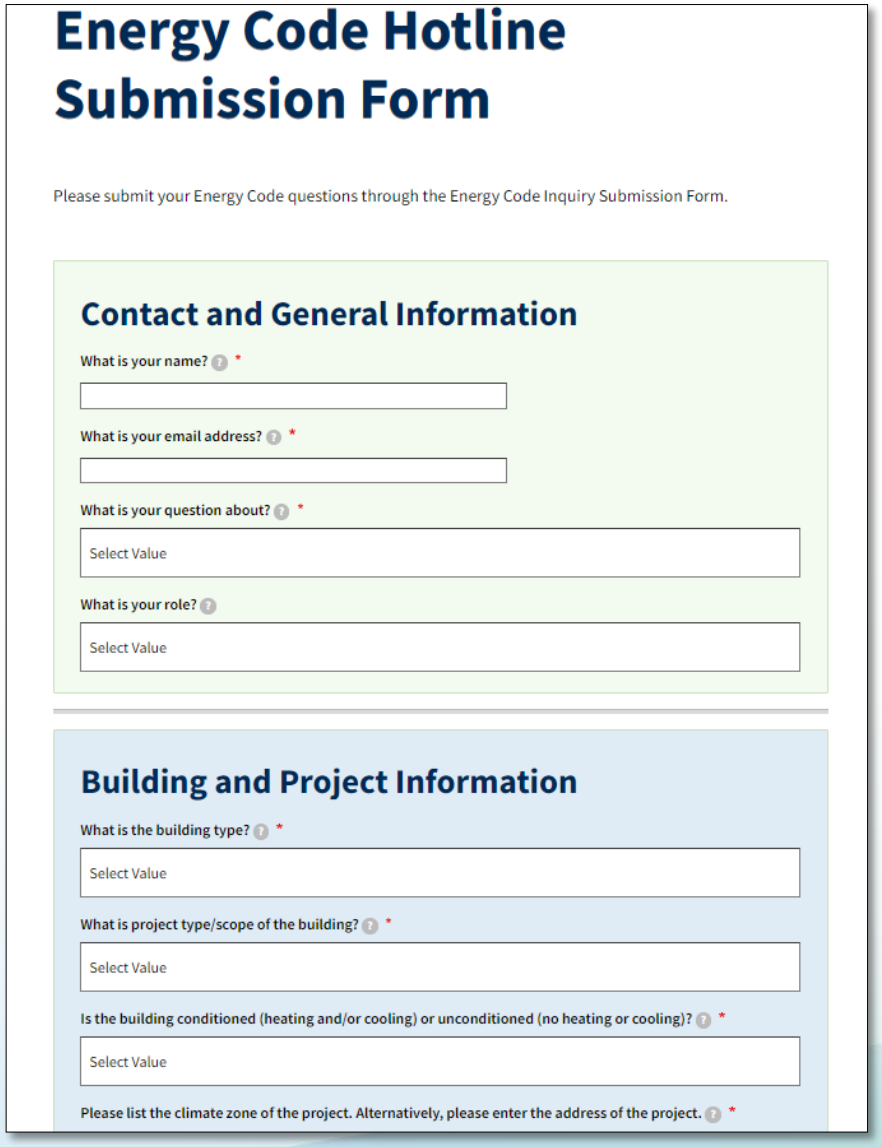

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Issue 146 | April - June 2024

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

EFFICIENCY DIVISION

In This Issue

- Nonresidential and Multifamily Water Chiller Packages
- Updated Lighting Videos
- New Training Presentations
- Online Fact Sheets Updated
- Energy Code Support Center
- ASHRAE Resources
- Q&A
  - Nonresidential Chiller Alterations
  - Nonresidential Electric Resistance Heating
  - Solar PV for Campus Projects
  - Multifamily Lighting
  - Unpermitted ADUs

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

Nonresidential and Multifamily Water Chiller Packages

The 2022 Energy Code lists efficiency requirements for water chiller packages in **Table 110.2-D**. This table separates equipment by type and size. Equipment type is categorized as water or air-cooled, which refers to the method used for cooling the refrigerant in the condenser. Per the prescriptive requirements in **Section 140.4(i)** and **Section 170.2(c)4G**, chillers must meet the efficiency requirements shown in the Path B Efficiency column.

The exceptions are:

- Chillers with an electrical service greater than 600 volts
- Chillers attached to a heat recovery system with a design heat recovery capacity greater than 40% of the design chiller cooling capacity
- Chillers used to charge thermal energy storage systems where the charging temperature is less than 40 degrees Fahrenheit
- In a building with more than three chillers, only three chillers are required to meet path B efficiencies

In addition, the Energy Code provides a prescriptive requirement for chilled water plants in **Section 140.4(j)** and **Section 170.2(c)4H**. No more than 300 tons of cooling for a chilled water plant can be provided by air-cooled chillers when using the prescriptive compliance approach. The exceptions are:

- Where the water quality of the building site fails to meet the manufacturer's specifications for the use of water-cooled chillers
- Chillers that are used to charge a thermal energy storage system with a design temperature of less than 40 degrees Fahrenheit
- Nonresidential systems serving healthcare facilities.

New or replacement space-conditioning systems or components, including water chillers, must meet the prescriptive requirements that are applicable to the system or component being altered or replaced. For example, the maximum 300-ton air-cooled chiller requirement in **Section 140.4(j)** and **Section 170.2(c)4H** only applies to HVAC alterations when additional cooling tower tonnage is added to

1

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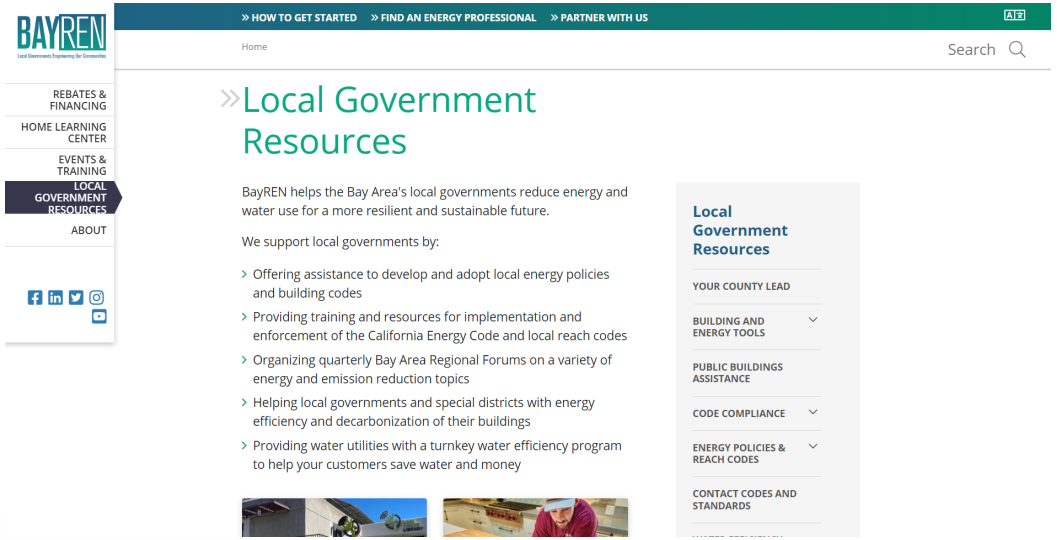
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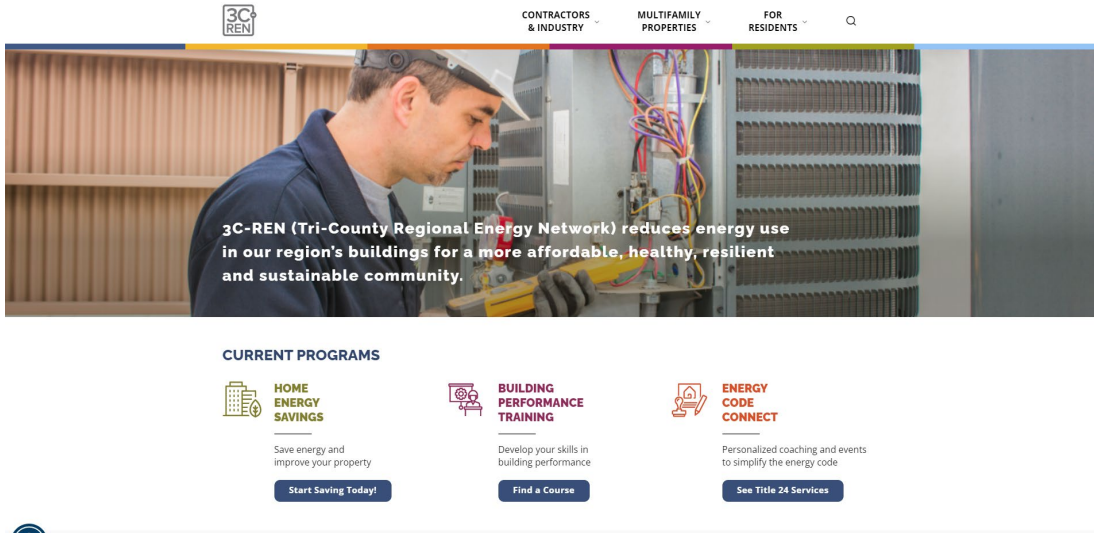
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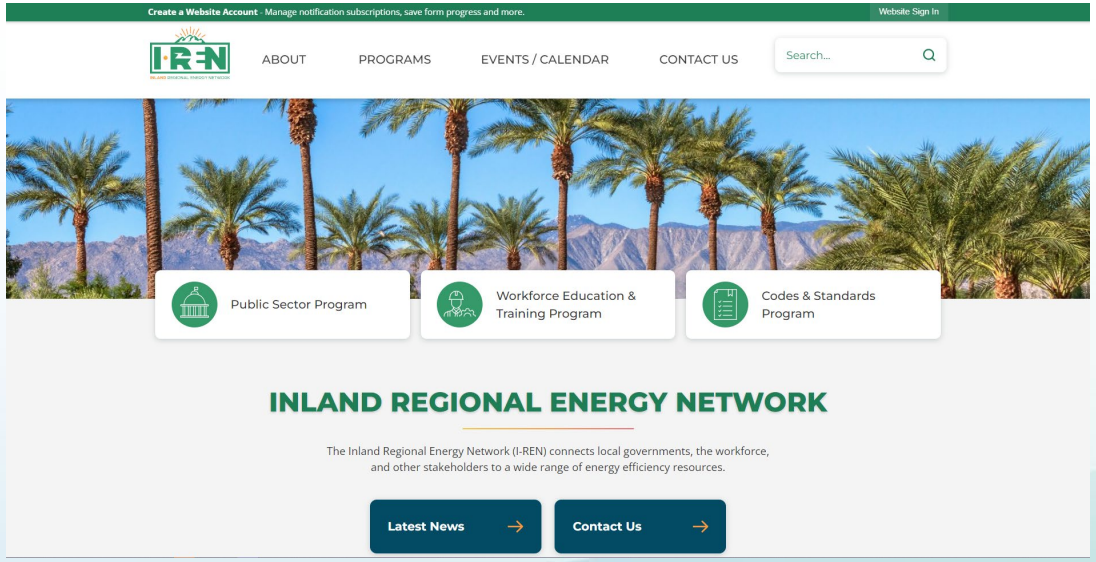
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