

2022 Energy Code

Nonresidential Significant Changes



California Energy Commission
April 2023



Agenda

- 2022 Energy Code basics
- Navigating the 2022 Energy Code
- All buildings significant changes
- Nonresidential significant changes
 - Mandatory
 - Prescriptive
 - Additions and alterations
- Resources



2022 Energy Code Basics





Energy Code History

Warren-Alquist Act established CEC in 1974

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

WARREN-ALQUIST ACT

Warren-Alquist
State Energy Resources
Conservation and
Development Act

Public Resources Code
Section 25000 et seq.



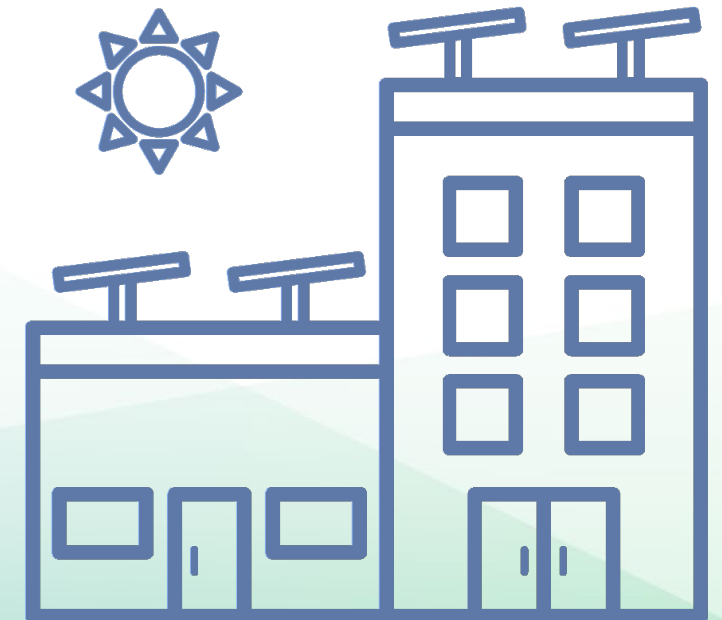
CALIFORNIA
ENERGY COMMISSION
Gavin Newsom, Governor

2020 EDITION
JANUARY 2020
CEC-140-2020-001



2022 Energy Code Goals

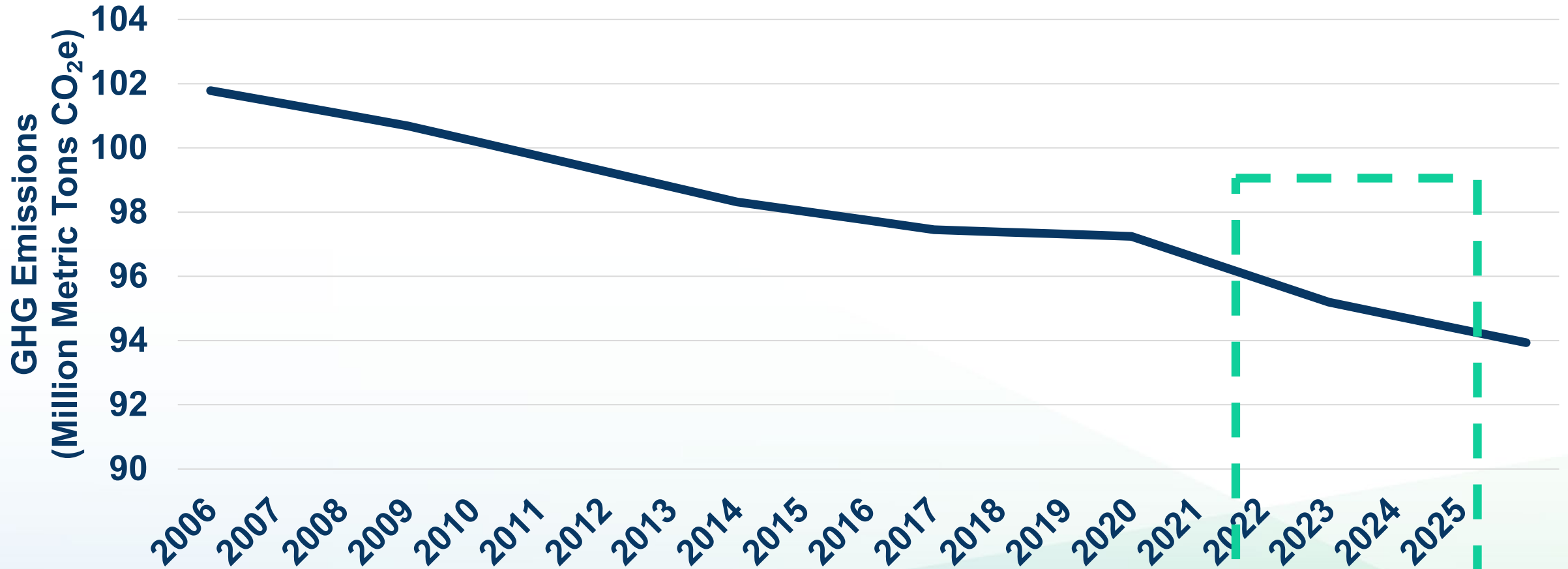
- Increase building energy efficiency cost-effectively
- Contribute to California's GHG reduction goals
- Enable pathways for all-electric buildings
- Reduce residential building impacts on the electricity grid
- Promote demand flexibility and self-utilization of PV
- Provide tools for local government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





Energy Code Environmental Benefit

Reduced Statewide Emissions



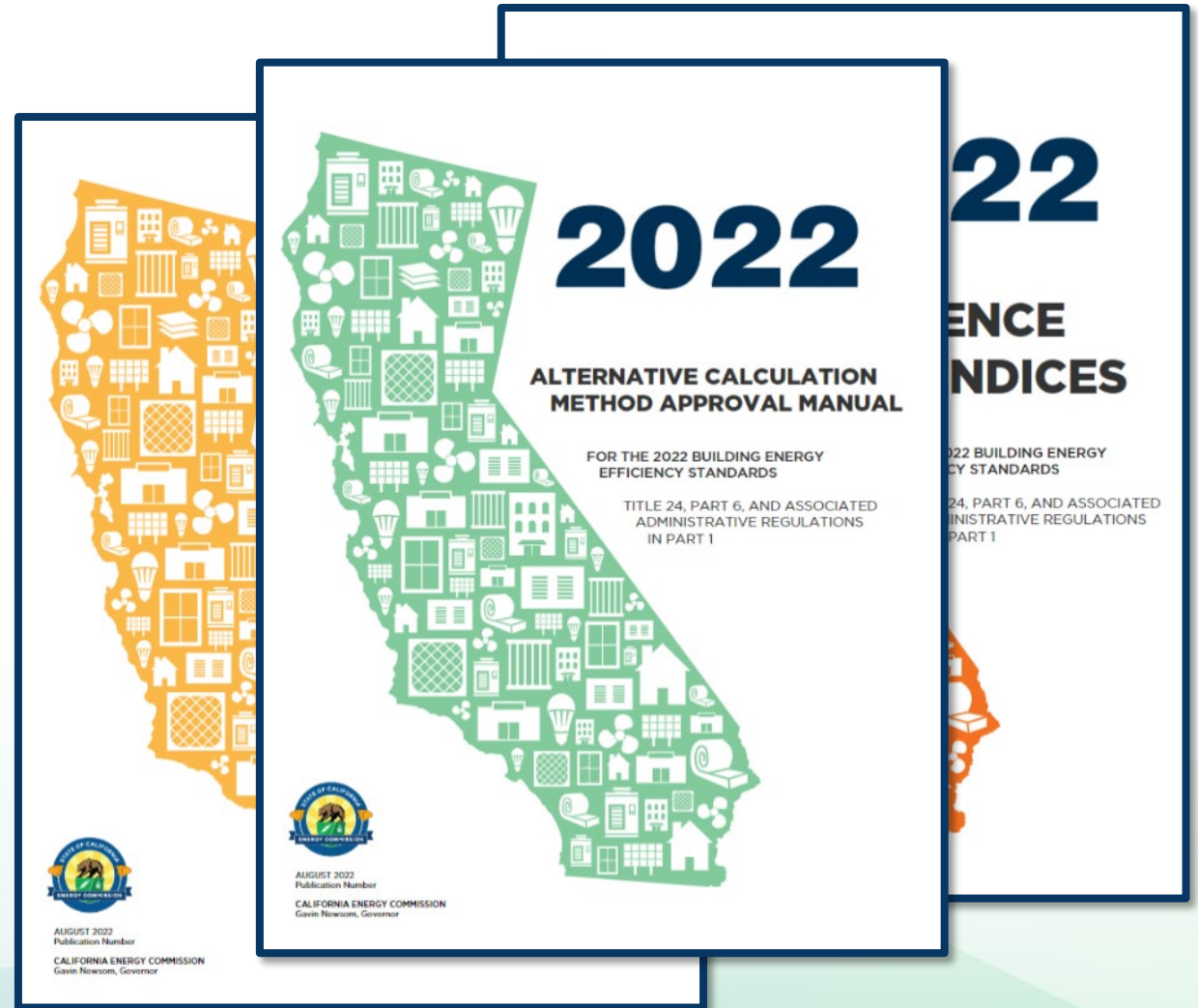
Source: CEC Impact Analysis 2005, 2008, 2013, 2016, 2019, 2022



2022 Energy Code

Effective January 1, 2023

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





2022 Documents Online

2022 Building Energy Efficiency Standards

The Building Energy Efficiency Standards (Energy Code) apply to newly constructed buildings, additions, and alterations. They are a vital pillar of California's climate action plan. The 2022 Energy Code will produce benefits to support the state's public health, climate, and clean energy goals.

The California Energy Commission (CEC) updates the Energy Code every three years. On August 11, 2021, the CEC adopted the 2022 Energy Code. In December, it was approved by the California Building Standards Commission for inclusion into the California Building Standards Code. The 2022 Energy Code encourages efficient electric heat pumps, establishes electric-ready requirements for new homes, expands solar photovoltaic and battery storage standards, strengthens ventilation standards, and more. Buildings whose permit applications are applied for on or after January 1, 2023, must comply with the 2022 Energy Code.

2022 Energy Code for Residential and Nonresidential Buildings

2022 ENERGY CODE >



Expand All

- Supporting Documents – Appendices, Compliance Manuals, and Forms +
- Software – Compliance Software, Manuals, and Tools +

BUILDING ENERGY EFFICIENCY STANDARDS - TITLE 24

2025 Building Energy Efficiency Standards

2022 Building Energy Efficiency Standards

^

— Workshops, Notices, and Documents

2019 Building Energy Efficiency Standards

2016 Building Energy Efficiency Standards

Past Building Energy Efficiency Standards

Climate Zone tool, maps, and information supporting the California Energy Code

Online Resource Center

Solar Assessment Tools

RELATED LINKS

Workshops, Notices, and Documents

CONTACT

[Building Energy Efficiency Standards - Title 24](#)

Toll-free in California: 800-772-3300

Outside California: 916-654-5106

SUBSCRIBE

Building Energy Efficiency Standards

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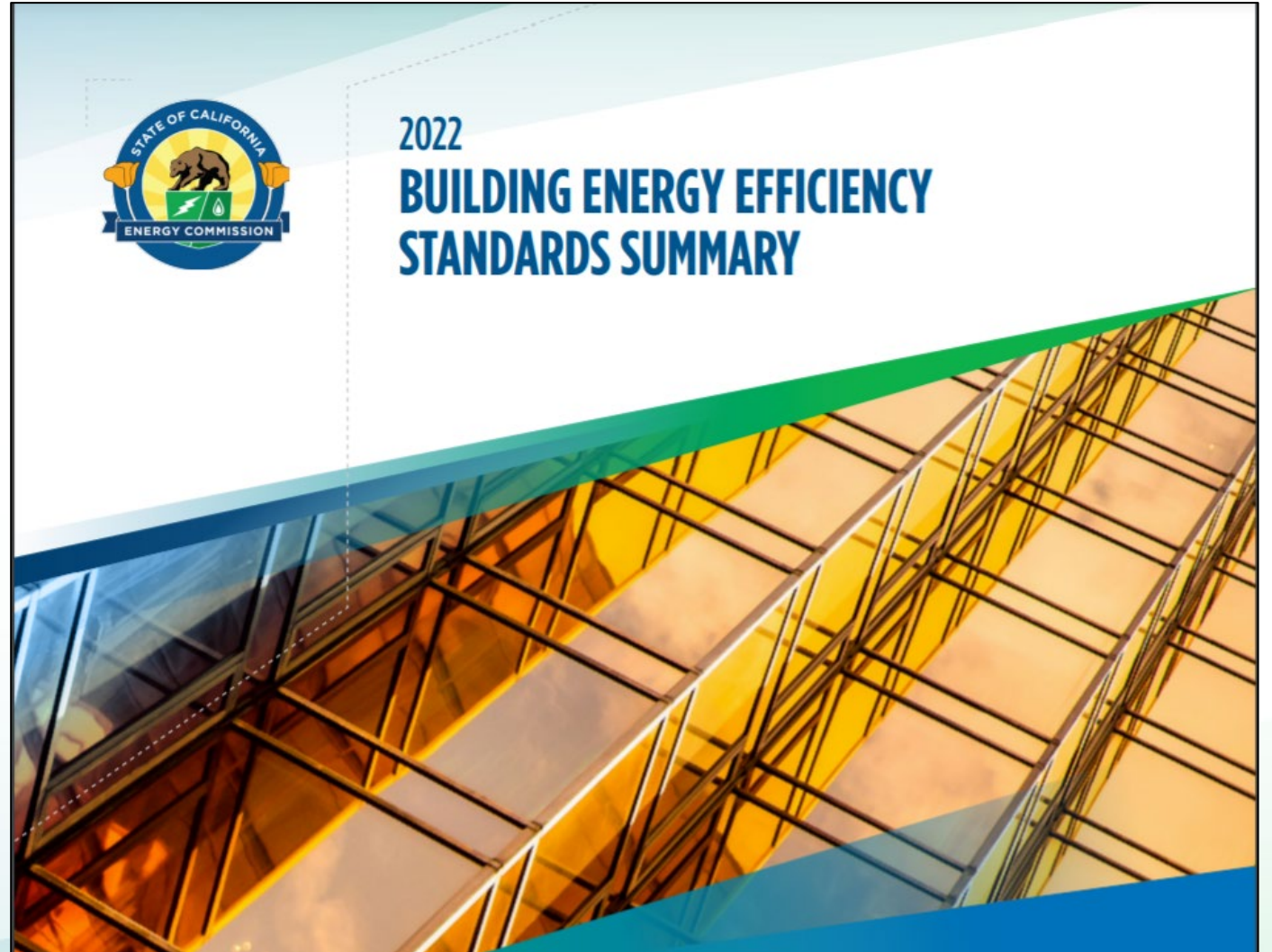
SUBSCRIBE

- Energy Code
- Reference Appendices
- Compliance Manuals
- Software
- Forms



2022 Energy Code Highlights

- Heat pump baselines
- Solar and battery storage
- Ventilation requirements
- Lighting LED baselines
- Multifamily restructuring





Energy Code Requirements

Mandatory requirements

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

Prescriptive requirements

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



Compliance Approaches

Prescriptive approach

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

Performance approach

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





2022 Performance Metrics

New for 2022

Energy performance calculations

- Nonresidential
 - Hourly source energy
 - TDV Efficiency
 - TDV Total
 - Efficiency, PV + battery



Demonstrating Compliance

Compliance forms confirm Energy Code is met

Updated for 2022

- Completed by responsible party
 - Designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification

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



2022 Compliance Software

Performance approach must use approved compliance software versions

- Nonresidential and multifamily
 - CBECC 2022.2.1
 - EnergyPro 9.1
 - IES 1.0



Nonresidential Defined

All Buildings § 100.1

Nonresidential building

- All buildings in California Building Code (CBC) occupancies of group A, B, E, F, H, I, M, S, U
 - Not occupancy group I-3 or I-4
- No longer includes high-rise residential multifamily

- Assembly and conference areas
- Commercial or industrial storage
- Financial institutions
- Hotels and motels
- Healthcare facilities
- Industrial and manufacturing
- Museums
- Offices
- Retail and wholesale stores
- Restaurants
- Schools and churches
- Theaters



Navigating the 2022 Energy Code



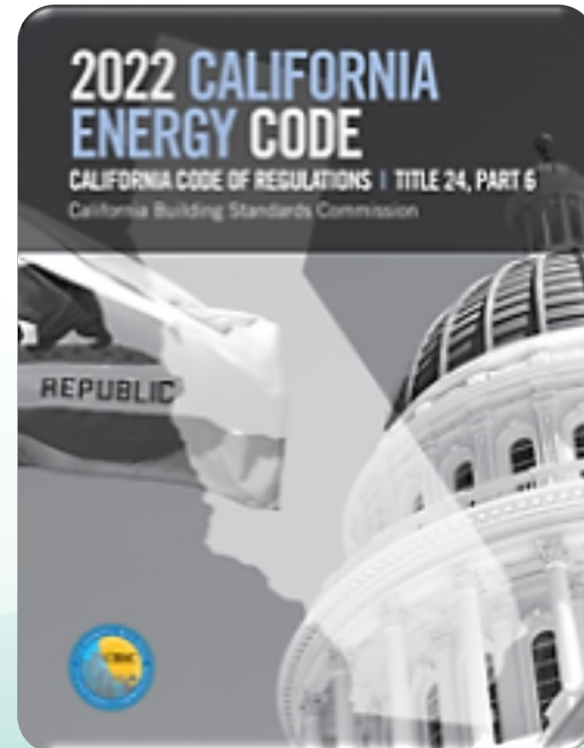
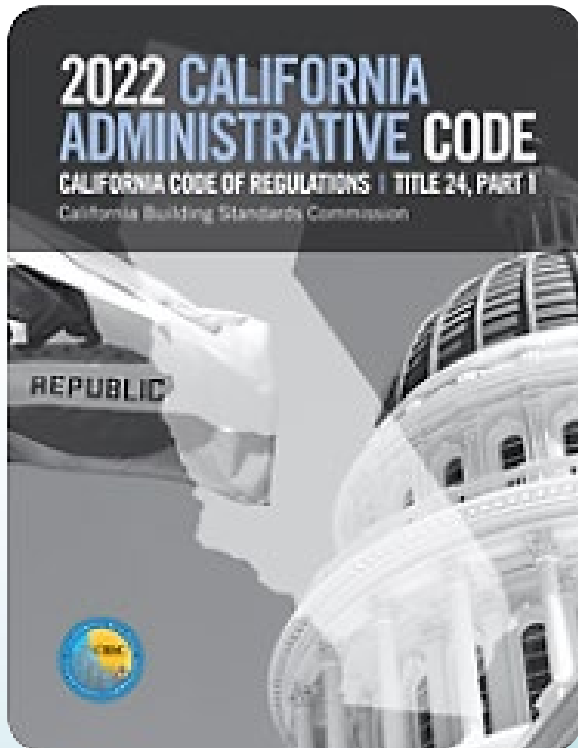
Title 24 – California Building Code

Part 1 - Administrative Code

- Chapter 10
- §§ 10-101 – 10-115
- Administrative requirements

Part 6 - Energy Code

- Subchapters 1 – 9
- §§ 100.0 – 180.4
- Technical requirements





2022 Energy Code Table 100.0-A

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
Nonresidential, And Hotels/Motels	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3	140.0, 140.1	141.0
Nonresidential, And Hotels/Motels	Envelope (unconditioned process spaces)	N.A.	140.3 (c)	140.0, 140.1	141.0
Nonresidential, And Hotels/Motels	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3 120.4, 120.5, 120.8	140.4	140.0, 140.1	141.0
Nonresidential, And Hotels/Motels	Water Heating	110.3, 120.3, 120.8, 120.9	140.5	140.0, 140.1	141.0
Nonresidential, And Hotels/Motels	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	140.0, 140.1	141.0
Nonresidential, And Hotels/Motels	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.	141.0
Nonresidential, And Hotels/Motels	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7	N.A.	141.0
Nonresidential, And Hotels/Motels	Electrical Power Distribution	110.11, 130.5	N.A.	N.A.	141.0
Nonresidential, And Hotels/Motels	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N. A.	N.A.	141.0
Nonresidential, And Hotels/Motels	Solar Ready Buildings	110.10	N.A.	N.A.	141.0(a)
Nonresidential, And Hotels/Motels	Solar PV and Battery Storage Systems	N.A.	140.1 0	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

Nonresidential relevant sections

§ 100.1 Definitions

§ 110.0-110.12 All buildings

§ 120.0-130.5 Mandatory requirements

§ 140.0-140.10 Prescriptive requirements

§ 141.0-141.1 Additions and alterations



All Buildings Significant Changes

Administrative §§ 10-103, 10-114, 10-115

Mandatory §§ 110.2, 110.12



Forms Registration and Certification

All Buildings § 10-103

Updated for 2022

Multifamily buildings 3 or less habitable stories

- When HERS verification is required all LMCC, LMCI, and LMCV forms must be registered with HERS provider data registry

Multifamily buildings 4 or more habitable stories

- NRCV must be registered with HERS provider when required
- When lighting or mechanical acceptance test is required all NRCC, NRCI, and NRCA forms must be recorded with ATTCP



Outdoor Lighting Zones Administrative Requirements

All Buildings § 10-114

- Updates outdoor lighting zones
- Establishes state default values
- Removes reporting criteria for amendments

TABLE 10-114-A Lighting Zone Characteristics And Rules For Amendments By Local Jurisdictions

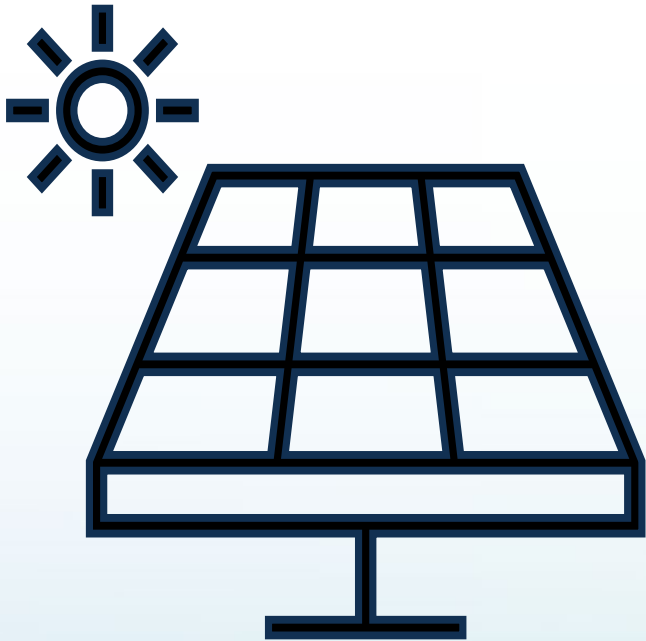
Zone	Ambient Illumination	State wide Default Location	Moving Up to Higher Zones	Moving Down to Lower Zones
LZ0	Very Low	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves.	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves can be designated as LZ1 or LZ2 if they are contained within such a zone.	Not applicable
LZ1	Low	Rural areas, as defined by the 2010 U.S. Census. These areas include: single or dual family residential areas, parks, and agricultural zone districts, developed portion of government designated parks, recreation areas, and wildlife preserves. Those that are wholly contained within a higher lighting zone may be considered by the local government as part of that lighting zone.	Developed portion of a government designated park, recreation area, or wildlife preserve, can be designated as LZ2 or LZ3 if they are contained within such a zone. Retail stores, located in a residential neighborhood, and rural town centers, as defined by the 2010 U.S. Census, can be designated as LZ2 if the business operates during hours of darkness.	Not applicable.
LZ2	Moderate	Urban clusters, as defined by the 2010 U.S. Census. The following building types may occur here: multifamily housing, mixed use residential neighborhoods, religious facilities, schools, and light commercial business districts or industrial zoning districts.	Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction. Examples include special commercial districts or areas with special security considerations located within a mixed-use residential area or city center.	Special districts may be designated as LZ1 by the local jurisdiction, without any size limits.
LZ3	Moderately High	Urban areas, as defined by the 2010 U.S. Census. The following building types may occur here: high intensity commercial corridors, entertainment centers, and heavy industrial or manufacturing zone districts.	Special districts within a default LZ3 may be designated as a LZ4 by local jurisdiction for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.	Special districts may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.
LZ4	High	None.	Not applicable.	Not applicable.



Community Shared Solar Administrative Requirements

All Buildings § 10-115

Updated for 2022



- Updates to enhance community-scale projects as alternative to on-site installation of PV and energy storage systems
- Adds requirements
 - Participation period
 - CC&Rs
 - Ability to opt out
 - Size no larger than 20 megawatts
 - Reporting



Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2(a), Tables 110.2-A-J

Revises various efficiencies to match federal requirements in Tables

Updated for 2022

- 110.2-A Air conditioners and condensing units
- 110.2-B Heat pumps
- 110.2-C Air-cooled gas engine heat pumps
- 110.2-D Water chilling packages
- 110.2-E Packaged terminal air conditioners and packaged terminal heat pumps
- 110.2-F (formerly 110.2-G) Heat rejection equipment
- 110.2-G (formerly 110.2-H) Variable refrigerant flow (VRF) air conditioners
- 110.2-H (formerly 110.2-I) Electrically operated variable refrigerant flow air-to-air and applied heat pumps
- 110.2-I (formerly 110.2-J) Warm-air furnaces and combination warm-air furnaces/air-conditioning units
- 110.2-J (formerly 110.2-K) Gas and oil-fired boilers



HVAC Efficiency Mandatory Requirements

All Buildings § 110.2, Table 110.2-B

Updated for 2022

TABLE 110.2-B Heat Pumps, Minimum Efficiency Requirements

Equipment Type	Size Category	Rating Condition	Efficiency ^a	Test Procedure ^b
Air Cooled (Cooling Mode), both split system and single package	≥ 65,000 Btu/h and < 135,000 Btu/h		11.0 EER <u>14.1</u> IEER	AHRI 340/360
<u>Air Cooled</u> <u>(Cooling Mode), both split</u> <u>system and single package</u>	≥ 135,000 Btu/h and < 240,000 Btu/h		10.6 EER <u>13.5</u> IEER	<u>AHRI 340/360</u>
<u>Air Cooled</u> <u>(Cooling Mode), both split</u> <u>system and single package</u>	≥ 240,000 Btu/h		9.5 EER <u>12.5</u> IEER	<u>AHRI 340/360</u>
Water source (cooling mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	86°F entering water	13.0 EER	ISO-13256-1
Groundwater source (cooling mode)	< 135,000 Btu/h	59°F entering water	18.0 EER	ISO-13256-1
Ground source (cooling mode)	< 135,000 Btu/h	77°F entering water	14.1 EER	ISO-13256-1
Water source water-to-water (cooling mode)	< 135,000 Btu/h	86°F entering water	10.6 EER	ISO-13256-2
Groundwater source water-to-water (cooling mode)	< 135,000 Btu/h	59°F entering water	16.3 EER	ISO-13256- <u>2</u>



Mandatory Requirements for Space-Conditioning Equipment

All buildings § 110.2(a), Tables 110.2-K-N

New for 2022

Adds new tables

- 110.2-K DX-DOAS units, single package and remote condenser
- 110.2-L Floor-mounted air conditioners and condensing units for computer rooms
- 110.2-M Ceiling-mounted air conditioners and condensing units for computer rooms
- 110.2-N Heat pump and heat recovery chillers





Mandatory Requirements for Space-Conditioning Equipment

Federal Requirement EERE-2014-BT-STD-0048-0102

Department of Energy (DOE)

- Equipment meets new EER2, SEER2, HSPF2 federal requirements after January 1, 2023
 - Split AC based on install date
 - Package AC and split heat pump based on manufacture date





Demand Management Mandatory Requirements

All Buildings § 110.12(c, e)

Updated for 2022

- Revises demand responsive lighting controls trigger to 4,000 watts or greater of total installed lighting power subject to § 130.1(b)
 - Meet lighting acceptance per NA7.6.3
- Adds demand responsive requirements for controlled receptacles
 - Exceptions
 - When demand responsive lighting controls is not required
 - Health or life safety



Nonresidential Significant Changes

Mandatory §§ 120.1, 120.2, 120.4, 120.6, 120.10, 130.1



Ventilation and Indoor Air Quality Mandatory Requirements

Nonresidential § 120.1(c)1

Air filtration

Updated for 2022

- Systems that must have air filters
 - HVAC systems with ducts greater than 10 feet long
 - Supply-only ventilation and make-up air systems
 - Supply side of balanced ventilation systems
 - HRV and ERV
- Air filter efficiency MERV 13 or greater
- Systems equipped with air filter either
 - Nominal 2" minimum depth filter
 - Nominal 1" minimum depth filter if system sized per equation 120.1-A
- Use gaskets, sealing or other means to close gaps around filters



Ventilation Controls Mandatory Requirements

Nonresidential § 120.1(d)5

Updated for 2022

Demand control ventilation devices

- Adds occupant sensor ventilation controls when both
 - HVAC zones where ventilation air is reduced to zero in occupied standby mode per Table 120.1-A
 - Requires occupant sensors lighting controls per § 130.1(c)5-7
- Updates occupant sensors controls
 - Indicate vacant room in 20 minutes or less of unoccupancy
 - If scheduled occupied when vacant, place in occupied standby mode
 - In 5 minutes or less of occupied standby mode
 - Turn off ventilation until occupied
 - If providing space conditioning, set-points shall reset per § 120.2(e)3



Ventilation and Indoor Air Quality Mandatory Requirements

Nonresidential § 120.1(f-h)

Design and control for quantities of outdoor air

- Design outdoor air rates operated at minimum levels per § 120.1(c)3 or at rate required for exempted or covered process make-up system
- VAV capable of maintaining measured outside air rates within 10% of designed minimum
- All mechanical ventilation and space conditioning systems to operate within 10% of design minimum outside air rate

Ventilation only mechanical systems

- Systems without mechanical cooling or heating shall meet § 120.2(f)



HVAC Controls Mandatory Requirements

Nonresidential § 120.2(e)3

Updated for 2022

Space conditioning occupant-sensing zone controls

- If space conditioning system provides ventilation
 - Standby mode per § 120.1(d)
 - Within 5 min entering standby mode mechanical ventilation remains off when temperature is between setpoints



HVAC Controls Mandatory Requirements

Nonresidential § 120.2(i-j)

Updated for 2022

Space conditioning economizer fault detection

- Expands economizer fault detection and diagnostics
 - New air handlers with mechanical cooling capacity over 33,000 Btu per hour
 - Air economizer include stand-alone or integrated fault detection and diagnostics (FDD) system per § 120.2(i)1-8
- Additional mandatory requirements for direct digital controls (DDC)
 - Per § 110.12(a-b)



HVAC Duct Leakage Mandatory Requirements

Nonresidential § 120.4(b, g)

Updated for 2022

- Duct and plenum materials: all ductwork and plenums constructed to Seal A
 - Seal A not required for exposed ductwork in occupied space
- New duct system leakage meet either
 - Sealed to leakage rate 6% or less with HERS testing per Reference Nonresidential Appendix NA7.5.3
 - Does not serve healthcare facility
 - Provides conditioned air to occupiable space for constant volume, single zone, space-conditioning system
 - Serves less than 5,000 ft² CFA
 - More than 25% of ducts located outdoors or unconditioned space
 - Meet duct leakage per CMC § 603.9.2



Refrigerated Warehouse Mandatory Requirements

Covered Processes § 120.6(a)5, 9

Updated for 2022

Compressors serving refrigerated warehouses

- Minimum condensing 70°F or less for non transcritical CO₂ systems
- Minimum condensing 60°F or less for transcritical CO₂ systems
 - Exception: minimum 70°F if design saturated suction 30°F or greater

Adds automatic door closers

- Between freezers and higher temperature spaces
- Between coolers and nonrefrigerated spaces



Refrigerated Warehouse Mandatory Requirements

Covered Processes § 120.6(a)7, 8

New for 2022

Adds transcritical CO₂ gas coolers

- Not allowed in climate zones 9-15
- Air cooled gas coolers: design leaving gas not more than design dry bulb temp plus 6°F
 - Exception: climate zones 2, 4, 8 not more than design dry bulb temp plus 8°F
- Adiabatic gas coolers: design leaving gas not more than design dry bulb temp plus 15°F
- All gas coolers fans must have continuously variable speed
- When operating below critical point gas coolers controlled per § 120.6(a)4F
- When operating above critical point gas coolers pressure setpoint reset based on ambient conditions
- Minimum condensing setpoint not more than 60°F for systems with air-cooled, evaporative-cooled, and adiabatic gas coolers, air-cooled or water-cooled fluid coolers, or cooling towers for heat rejection
- Fan-powered gas coolers follow efficiency requirements per Table 120.6-C

Refrigerated warehouse acceptance

- Transcritical CO₂ refrigeration systems tested per NA7.20.1



Commercial Refrigeration Mandatory Requirements

Covered Processes § 120.6(b)2, 4

Updated for 2022

Compressors

- Designed to operate at a minimum condensing temp not more than 60°F for transcritical CO₂ refrigeration systems
 - Exception: minimum 70°F if design saturated suction 30°F or greater

Refrigeration heat recovery

- Adds exception for stores with design total heat of rejection of all refrigeration systems with no more than 500,000 Btu/hour



Commercial Refrigeration Mandatory Requirements

Covered Processes § 120.6(b)5, 6

New for 2022

Transcritical CO₂ gas coolers

- Not allowed in climate zones 10-15
- Air cooled gas coolers: design leaving gas not more than design dry bulb temp plus 6°F
- Adiabatic gas coolers: design leaving gas not more than design dry bulb temp plus 15°F
- All gas coolers must have continuously variable speed
- When operating below critical point gas coolers controlled per § 120.6(b)1A
- When operating above critical point gas coolers pressure setpoint reset based on ambient conditions
- Minimum condensing setpoint not more than 60°F for systems with air-cooled, evaporative-cooled, and adiabatic gas coolers, air-cooled or water-cooled fluid coolers, or cooling towers for heat rejection
- Fan powered gas coolers follow efficiency requirements per Table 120.6-E

Commercial warehouse acceptance

- Transcritical CO₂ refrigeration systems tested per NA7.20.1



Covered Processes

Mandatory Requirements

Process Boilers § 120.6(d)

Process boilers

- New process boilers with input capacity more than 5 MMBtu/h
 - Maintain stack gas oxygen concentration to 3% or less
 - Exception: boilers with steady full-load combustion efficiency 90% or higher are exempted



Compressed Air Systems Mandatory Requirements

Covered Processes § 120.6(e)3-5

New for 2022

Compressed air systems

- Monitoring for systems 100hp or more
 - Measurement of system pressure, amps or power, total airflow cfm
 - Data logging and storage
 - Visual display
- Systems with piping 50 feet or more
 - Pipe leak testing
 - Pipe sizing



Controlled Environmental Horticulture Mandatory Requirements

Covered Processes § 120.6(h)1

New for 2022

Indoor growing

- Dehumidification equipment shall either
 - Meet federal appliance standards
 - HVAC with on-site heat recovery fulfill at least 75% of annual energy for dehumidification reheat
 - Chilled water system with on-site heat recovery fulfill at least 75% of annual energy for dehumidification reheat
 - Solid or liquid desiccant dehumidification system for system designs for dewpoint not more than 50°F



Controlled Environmental Horticulture Mandatory Requirements

Covered Processes § 120.6(h)2-3

New for 2022

Indoor growing

- Horticulture lighting systems more than 40kW lighting load
 - Photosynthetic photon efficacy (PPE) rated per ANSI/ASBE S640 for wavelengths from 400-700 nanometers
 - Integrated, nonserviceable luminaires, or removable or serviceable luminaires rated PPE at least 1.9 micromoles per joule
 - Time switch lighting control per §§ 110.9(b)1, 130.4(a)4, NA7.6.2
 - Multilevel lighting per § 130.1(b)
- Electrical power distribution systems have measurement device to monitor energy usage



Controlled Environmental Horticulture Mandatory Requirements

Covered Processes § 120.6(h)4-6

New for 2022

Conditioned greenhouses

- Building envelope
 - Opaque wall and roof meet § 120.7
 - Nonopaque envelopes must have two or more glazings separated by air or gas fill
- Space conditioning systems meet applicable requirements
- Horticulture lighting systems more than 40kw lighting load
 - PPE rated per ANSI/ASBE S640 for wavelengths from 400-700 nanometers
 - Integrated, nonserviceable luminaires, or removable or serviceable lamps rated PPE at least 1.7 micromoles per joule
 - Time switch lighting control per §§ 110.9(b)1, 130.4(a)4, NA7.6.2
 - Multilevel lighting per § 130.1(b)



Steam Traps Mandatory Requirements

Covered Processes § 120.6(i)

New for 2022

Steam traps with pressure greater than 15 psig and 5 million btu/hour

- Fault detection diagnostics (FDD) monitoring
 - Provide status update in 8-hour intervals
 - Automatically display alarm to identify steam trap with fault
- Equipped with automatic fault detection sensors
- Strainer must be equipped with either
 - Integral strainer and blow-off valve
 - Installed downstream within 3 feet of strainer and blow-off valve
- Steam trap acceptance testing per NA7.19



Computer Rooms Mandatory Requirements

Covered Processes § 120.6(j)

New for 2022

Computer rooms space conditioning systems

- Controls must prevent reheating, recooling, mixing
- Humidification shall be adiabatic
 - Nonadiabatic is prohibited
- Fan controls with variable rates
 - Cooling capacity more than 60,000 Btu/hour
 - Chilled water fan system
 - Fan motor demand must not be greater than 50% of design wattage at 66% of design fan speed



Fans

Mandatory Requirements

Nonresidential § 120.10(a)

New for 2022

Adds new section for fans

- Fan energy index (FEI) of 1.0 or higher for each fan or fan array either
 - Combined motor nameplate more than 1.0 hp
 - Combined fan nameplate electrical input power more than 0.89 kW
- Variable air volume per §140.4(c)2
 - FEI of 0.95 or higher
- Fan arrays calculation per ANSI/AMCA 208-18 Annex C
- All FEI values provided by the manufacturer and third party verified
 - Embedded fans exempt from third party verification
- Exceptions for embedded, circulation, ceiling, air curtains, and emergency fans



Indoor Lighting Controls Mandatory Requirements

Nonresidential § 130.1(c)5

Updated for 2022

- Occupancy sensing controls turn off lighting in 20 minutes or less after vacated
 - Offices 250 ft² or less
 - Multipurpose rooms less than 1,000 ft²
 - Classrooms, conference rooms, and restrooms of any size

If multilevel lighting controls required by 130.1(b)	If multilevel lighting controls not required by 130.1(b)
Partial-ON (activate 50-70% power); or Vacancy sensor	Partial-ON; or Vacancy sensor; or Occupancy sensor (auto ON/OFF)



Indoor Lighting Controls Mandatory Requirements

Nonresidential § 130.1(c)6

New for 2022

Occupant sensing controls in offices more than 250 ft²

- Lighting controlled separately in zones no larger than 600 ft²
- Reduce lighting power by at least 80% in each zone 20 minutes or less after zone is vacated
- Automatically turn off lighting in all control zones 20 minutes or less after entire office space is vacated
- Each zone may turn on up to full power at occupancy, other unoccupied zones not more than 20% of full power



Indoor Lighting Controls Mandatory Requirements

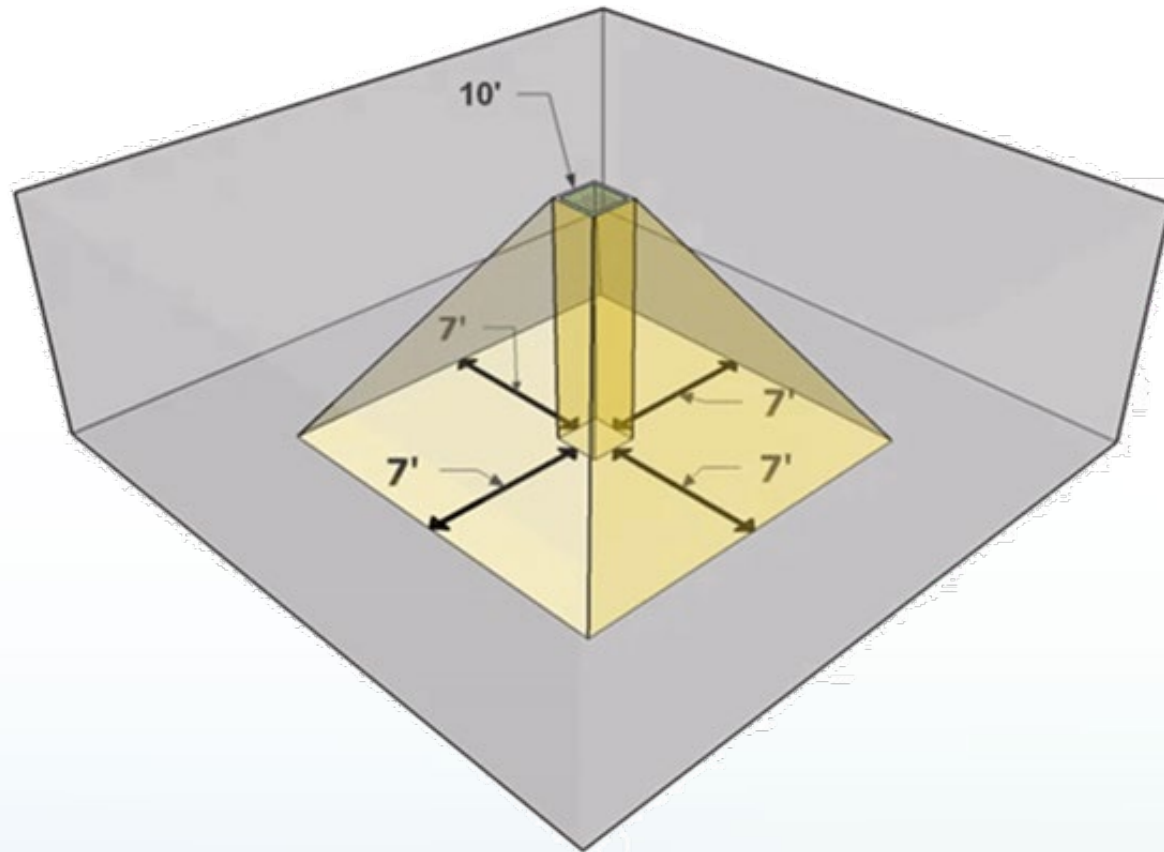
Nonresidential § 130.1(d)2

Updated for 2022

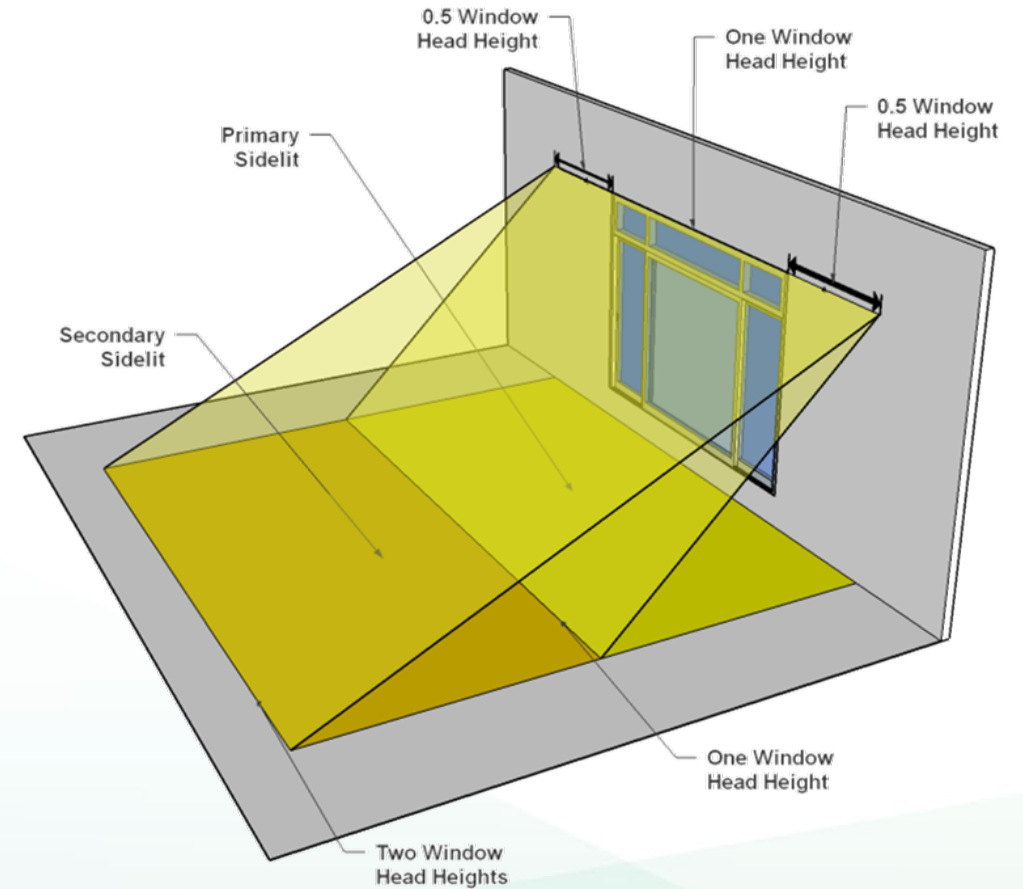
- Automatically control general lighting in each type of daylight zone separately
 - General lighting in overlapping skylit daylight zone and sidelit daylight zone controlled as part of skylit daylight zone
 - General lighting in overlapping primary and secondary sidelit daylight zones controlled as part of primary sidelit daylight zone
 - Linear solid state lighting
 - Treated as linear lamps in increments of 4 feet or less
 - Each segment separately controlled based on daylight zone



Daylighting Zones



Skylit daylit zone



Sidelit daylit zones



Indoor Lighting Controls Mandatory Requirements

Nonresidential § 130.1(f)9

New for 2022

Control interactions

- Space conditioning system controlled by occupancy sensing controls per § 120.2(e)3
 - Space conditioning system zones with occupant sensing lighting controls per § 130.1(c)5, 6, 7
 - Table 120.1-A allows zero ventilation air when space in occupied-standby mode

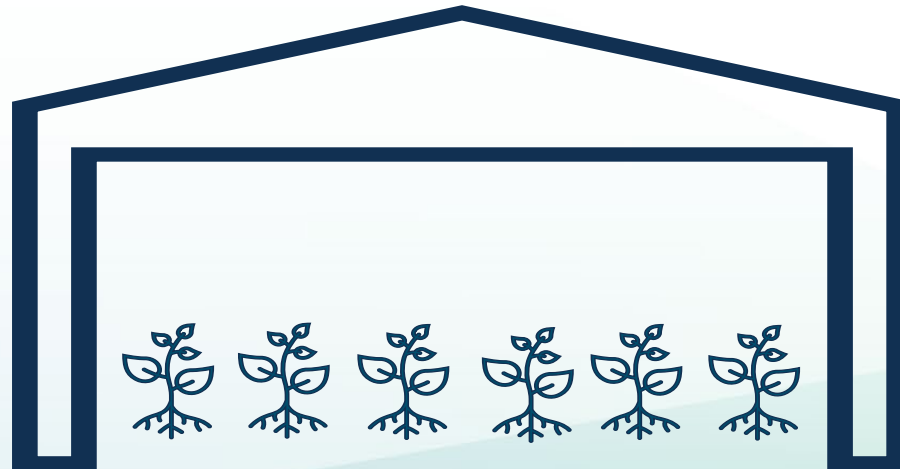


Check Your Understanding

Horticulture spaces

Do indoor growing spaces need to meet the Energy code?

- Yes. New mandatory requirements were added to the covered processes § 120.6(h)
- There are also new requirements for alterations to these spaces





Nonresidential Significant Changes

Prescriptive: §§ 140.3, 140.4, 140.5, 140.10



Insulation Prescriptive Requirements

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

Updated for 2022

- Lowers maximum U-factor for metal-framed walls
 - Varies by climate zone

TABLE 140.3-B Walls

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Metal Building	0.113	0.061	0.113	0.061	0.061	0.113	0.113	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.061
Metal-framed	<u>0.060</u>	<u>0.055</u>	<u>0.071</u>	<u>0.055</u>	<u>0.055</u>	<u>0.060</u>	<u>0.060</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>	<u>0.055</u>
Mass Light ¹	0.196	0.170	0.278	0.227	0.440	0.440	0.440	0.440	0.440	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Mass Heavy ¹	0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160
Wood-framed and Other	0.095	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.045	0.059	0.059	0.059	0.042	0.059



Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5, Table 140.3-B

Updated for 2022

- Adds climate zones and updates efficiencies

TABLE 140.3-B Vertical Fenestration Area-weighted Performance Rating

<u>Climate Zone</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>
	<u>Fixed Window</u>															
<u>Max U-factor</u>	<u>0.36</u>	<u>0.36</u>	<u>0.36</u>	<u>0.36</u>	<u>0.36</u>	<u>0.36</u>	<u>0.36</u>	<u>0.36</u>	<u>0.34</u>	<u>0.36</u>	<u>0.34</u>	<u>0.34</u>	<u>0.34</u>	<u>0.34</u>	<u>0.34</u>	<u>0.36</u>
<u>Max RSHGC</u>	<u>0.25</u>	<u>0.25</u>	<u>0.25</u>	<u>0.25</u>	<u>0.25</u>	<u>0.25</u>	<u>0.25</u>	<u>0.25</u>	<u>0.22</u>	<u>0.25</u>	<u>0.22</u>	<u>0.22</u>	<u>0.22</u>	<u>0.22</u>	<u>0.22</u>	<u>0.25</u>
<u>Min VT</u>	<u>0.42</u>															
	<u>Curtainwall or Storefront</u>															
<u>Max U-factor</u>	<u>0.38</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.38</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>	<u>0.41</u>
<u>Max RSHGC</u>	<u>0.25</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.25</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>	<u>0.26</u>
<u>Min VT</u>	<u>0.46</u>															
	<u>Operable Window</u>															
<u>Max U-factor</u>	<u>0.46</u>															
<u>Max RSHGC</u>	<u>0.22</u>															
<u>Min VT</u>	<u>0.32</u>															



Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9, Tables 140.3-B, C

Continuous air barrier

- Expands to all climate zones
 - Except hotel/motels in climate zone 7 and relocatable public schools
- Design construction documents include air barrier boundaries, interconnections, penetrations, and calculations for all sides of air barrier
- All joints sealed and materials installed per manufacturer
- Meet one of these:
 - Materials with maximum air permeance of 0.004 cfm/ft², or per Table 140.3-A
 - Assemblies average air leakage not to exceed 0.04 cfm/ft², or these materials
 - Concrete masonry walls with two coatings of paint or sealer, or with integral rigid board insulation
 - Structurally insulated panels (SIPS)
 - Portland cement, sand parge, stucco, or gypsum plaster with minimum 1/2"

Updated for 2022



Air Barrier Prescriptive Requirements

Nonresidential Table 140.3-A

Updated for 2022

Materials	Minimum Thickness
Plywood	Minimum 3/8 inches thickness
Oriented strand board	Minimum 3/8 inches thickness
Extruded polystyrene insulation board	Minimum 1/2 inches thickness
Foil-backed polyisocyanurate insulation board	Minimum 1/2 inches thickness
Closed cell spray foam: minimum density of 2.0 pcf	Minimum 2 inches thickness
Open cell spray foam: density between 0.4 pcf and 1.5 pcf	Minimum 5-1/2 inches thickness
Exterior and interior gypsum board	Minimum 1/2 inches thickness
Cement board	Minimum 1/2 inches thickness
Built up roofing membrane	No minimum thickness
Modified bituminous roof membrane	No minimum thickness
Fully adhered single-ply roof membrane	No minimum thickness
Portland cement or Portland sand parge, or gypsum plaster	Each with Minimum 5/8 inches thickness
Cast-in-place concrete, or precast concrete	No minimum thickness
Fully grouted concrete block masonry	No minimum thickness
Sheet steel or sheet aluminum	No minimum thickness



Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9C

New for 2022

If air barrier verification performed meet either

- Air leakage rate not exceeding 0.40 cfm per ft² when the entire building is tested, after completion of construction, in accordance with NA5.1.
- Buildings more than 50,000 ft² of CFA sectional test method of co-pressurizing representative test floors per NA5.2 to NA5.7
 - Representative test floors conditions
 - Entire floor area of all stories with any spaces directly under a roof
 - Entire floor area of all stories with building entrance or loading dock
 - Representative above-grade wall sections totaling at least 25% wall area enclosing remaining conditioned space, floor areas above shall not be included
- If air leakage not met
 - Visual inspection and diagnostic evaluation per NA5.7
 - All observed leaks shall be sealed where possible
 - Buildings re-tested to confirm leakage is below 0.6 cfm per ft²



HVAC

Prescriptive Requirements

Nonresidential § 140.4(a)2

New for 2022

Single-zone space conditioning systems with direct expansion (DX) cooling, 240,000 Btu/hr or less

- Retail, grocery
 - Climate zones 2-15: heat pump
 - Climate zones 1, 16 cooling capacity less than 65,000 Btu/hr: air conditioner with furnace
 - Climate zones 1, 16 cooling capacity 65,000 Btu/hr or greater: dual-fuel heat pump
- Schools
 - Climate zones 2-15: heat pump
 - Climate zones 1, 16: dual-fuel heat pump
- Office, financial institution, library
 - Climate zones 1-15: heat pump
 - Climate zones 16 cooling capacity less than 65,000 Btu/hr: air conditioner with furnace
 - Climate zones 16 cooling capacity 65,000 Btu/hr or greater: dual-fuel heat pump
- Office spaces in warehouses
 - All climate zones: heat pump



HVAC

Prescriptive Requirements

Nonresidential § 140.4(c)1A

New for 2022

Fan systems with electrical input power 1kW or higher

- Fan power budget (kw)
 - $(\text{Fan system airflow} \times \text{sum of fan power allowance}) / 1,000$
 - Building elevations > 3,000 feet use correction factor in Table 140.4-C
- Fan power allowance dependent on system type

Fan System Type	Fan System Power Allowance
Single-cabinet	Table 140.4-A and Table 140.4-B
Supply-only	Table 140.4-A
Relief	Table 140.4-B
Exhaust, return, transfer	Table 140.4-B
Complex	Fan power – Table 140.4-A Supply airflow – Table 140.4-A for each fan Return, exhaust airflow – Table 140.4-B for each fan



HVAC

Prescriptive Requirements

Nonresidential § 140.4(c)1B

New for 2022

Fan systems

- Fan system input power depends on
 - Designed fan power for each fan or fan array in system
 - Efficiency losses of variable speed drives
 - Clean pressure drop
- Designed fan power methods
 - Table 140.4-D
 - Provided by manufacturer
 - Maximum electrical input power on motor nameplate



HVAC Prescriptive Requirements

Nonresidential § 140.4(e), Table 140.4-E

Updated for 2022

Economizers

- Cooling air handler with mechanical cooling capacity over 33,000 Btu/hr or chilled-water cooling systems per Table 140.4-E shall include air or water economizer
- Exceptions
 - Ventilation provided by DOAS with exhaust air heat recovery per § 140.4(p)
 - DOAS meets exhaust air heat recovery ratio per § 140.4(q)1 and includes bypass or control per 140.4(q)2
 - DOAS provides minimum ventilation air flow rate per § 120.1(c)3 and minimum 0.3 cfm/ft² during economizer conditions
 - If air economizer in controlled horticulture spaces will affect CO₂ enrichment systems

Table 140.4-E Chilled Water System Cooling Capacity

Climate Zones	Total Building Chilled Water System Capacity, Minus Capacity of the Cooling units with Air Economizers	
	Building Water-Cooled Chilled Water System	Air-Cooled Chilled Water Systems or District Chilled Water Systems
15	≥ 960,000 Btu/h (280 kW)	≥ 1,250,000 Btu/h (365 kW)
1-14	≥720,000 Btu/h (210 kW)	≥940,000 Btu/h (275 kW)
16	≥1,320,000 Btu/h (385 kW)	≥1,720,000 Bu/h (505 kW)



HVAC

Prescriptive Requirements

Nonresidential § 140.4(k)8

New for 2022

High-capacity space heating gas boiler systems

- Gas hot water boiler system for space heating in climate zones 1-6, 9-14, 16 with total system input range from 1-10 MMBtu/h
 - Minimum thermal efficiency of 90%
 - Water entering boiler not more than 120°F or flow rate of supply hot water not more than 20% of design flow
- Exceptions
 - Space heating boilers in individual dwelling units
 - 25% of annual space heating provided by on-site renewable, site-recovered energy or heat recovery chillers
 - 50% or more of design heating load uses perimeter convective heating, radiant ceiling panels or both
 - Individual gas boilers with capacity less than 300,000 btu/h not included in calculations of total system input or efficiency



HVAC

Prescriptive Requirements

Nonresidential § 140.4(p)

New for 2022

Dedicate outdoor air systems (DOAS)

- DOAS unit fan system power less than 1kW not exceed total combined fan power 1.0 per cfm
- DOAS with fan power 1kW or more must meet § 140.4(c)
- DOAS supply air delivered directly to occupied space or at outlet of any terminal heating or cooling coils
 - Equipment fans shut off when heat or cooling not needed
 - Active chilled beam systems exempted
- Supply and exhaust fans have minimum 3 speeds
- System must not use heat recovery or heating to warm the supply air above 60°F when majority of zones require cooling



HVAC Prescriptive Requirements

Nonresidential § 140.4(q), Table 140.4-K

New for 2022

Table 140.4-K: Energy Recovery Requirements by Climate Zone and Percent Outdoor Air at Full Design Airflow (≥ 8,000 hours per year)

% Outdoor Air at Full Design Airflow	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
≥10% and <20%	≥10,000	≥10,000	NR	NR	NR	NR	NR	NR	NR	≥40,000	≥40,000	≥20,000	≥10,000	≥10,000	≥10,000	≥10,000
≥20% and <30%	≥2,000	≥5,000	≥13,000	≥9,000	≥9,000	NR	NR	NR	NR	≥15,000	≥15,000	≥5,000	≥5,000	≥5,000	≥5,000	≥5,000
≥30% and <40%	≥2,000	≥3,000	≥10,000	≥6,500	≥6,500	NR	NR	NR	≥15,000	≥7,500	≥7,500	≥3,000	≥3,000	≥3,000	≥3,000	≥3,000
≥40% and <50%	≥2,000	≥2,000	≥8,000	≥6,000	≥6,000	NR	NR	NR	≥12,000	≥6,000	≥6,000	≥2,000	≥2,000	≥2,000	≥2,000	≥2,000
≥50% and <60%	≥2,000	≥2,000	≥7,000	≥6,000	≥6,000	NR	NR	≥20,000	≥10,000	≥5,000	≥5,000	≥2,000	≥2,000	≥2,000	≥2,000	≥2,000
≥60% and <70%	≥2,000	≥2,000	≥6,000	≥6,000	≥6,000	NR	NR	≥18,000	≥9,000	≥4,000	≥4,000	≥2,000	≥2,000	≥2,000	≥2,000	≥2,000
≥70% and <80%	≥2,000	≥2,000	≥6,000	≥5,000	≥5,000	NR	NR	≥15,000	≥8,000	≥3,000	≥3,000	≥2,000	≥2,000	≥2,000	≥2,000	≥2,000
≥80%	≥2,000	≥2,000	≥6,000	≥5,000	≥5,000	NR	NR	≥12,000	≥7,000	≥3,000	≥3,000	≥2,000	≥2,000	≥2,000	≥2,000	≥2,000



Water Heating Prescriptive Requirements

Nonresidential § 140.5(a-c)

New for 2022

School buildings

- Less than 25,000 ft² and less than four stories in climate zones 2-15
 - Heat pump water heating system
 - Exception: instantaneous electric water heater for individual bathroom space

All other occupancies

- High-capacity gas service water-heating systems with total capacity 1 MMBtu/h or greater
 - Minimum thermal efficiency of 90%
 - Multiple units use weighted average of at least 90%
 - Some exceptions



Covered Processes

Prescriptive Requirements

Nonresidential §§ 140.9(a)1,2

Computer rooms with power density greater than 20W per ft²

- Economizers
 - When partial cooling is required for additional mechanical cooling and economizer can provide at 65°F to 80.6°F supply air temperature at
 - Outside air temp 65°F dry bulb and below or 50°F wet bulb and below for integrated air economizer , OR
 - Outside air temp 50°F dry bulb and below or 45°F wet bulb and below for integrated water economizer
- Power consumptions of fans
 - Total fan power must not exceed 27 W/kBtuh of net sensible cooling capacity



Covered Processes

Prescriptive Requirements

Nonresidential §§ 140.9(a)3,4

Computer rooms with power density greater than 20W per ft²

- Air containment
 - Rooms with air cooled computers with a ITE design load > 10 kW(2.8 ton) per must include air
 - Exceptions
 - Expansions of existing rooms
 - Racks with design load less than 1 kW (0.28 ton) per rack
 - Equivalent energy performance based on computational fluid dynamics or other analysis
- Alternating current-output uninterruptible power supplies (UPS)
 - AC output UPS for a room must meet or exceed minimum efficiencies in Table 140.9-B and calculation and testing requirements identified in ENERGY STAR program requirements



Covered Processes Prescriptive Requirements

Nonresidential §§ 140.9(c)3C

Laboratory and factory exhaust systems

- At least one sonic or two other types anemometer
- EMCS or fault management for all contaminants
- Wind readings at least 10 times per minute



PV and Battery Storage Prescriptive Requirements

Nonresidential § 140.10(a-b)

New for 2022



- Adds new section for PV and battery
- PV and battery storage requirements per Tables 140.10-A, 140.10-B
 - Varies by building type and climate zone
 - Mixed-use
 - One or more building types is at least 80% of floor area
 - Each occupancy system size combined for total system size



PV and Battery Storage Prescriptive Requirements

Nonresidential § 140.10(a)1-2

New for 2022

Solar access roof areas (SARA)

- Includes area of building's roof space, area of roof space on covered parking areas, carports, and other newly constructed structures on site that can structurally support PV system
- Does not include
 - Roof area with less than 70% annual solar access
 - Divides total annual solar insolation with shading, by total annual solar insolation without shading
 - Occupied roofs
 - Roof areas not available due to other building codes
- Approved solar access tools available per JA11



Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a), Table 140.10-A

New for 2022

- PV no less than smaller of either
 - kW DC rating = $(CFA \times A) / 1000$
 - CFA = Conditioned floor area in ft²
 - A = PV capacity factor for building type and climate zone
 - SARA x 14 Watts per ft²

Table 140.10-A – PV Capacity Factors

Building Type	Factor A – Minimum PV Capacity (W/ft ² of conditioned floor area) Climate Zones 1, 3, 5, 16	Factor A – Minimum PV Capacity (W/ft ² of conditioned floor area) Climate Zones 2, 4, 6-14	Factor A – Minimum PV Capacity (W/ft ² of conditioned floor area) Climate Zone 15
Grocery	2.62	2.91	3.53
High-Rise Multifamily	1.82	2.21	2.77
Office, Financial Institutions, Unleased Tenant Space	2.59	3.13	3.80
Retail	2.62	2.91	3.53
School	1.27	1.63	2.46
Warehouse	0.39	0.44	0.58
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.39	0.44	0.58



Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a)

New for 2022

Exceptions

- No PV when
 - Total SARA is less than 3% of CFA
 - Required PV system is less than 4 kWdc
 - SARA is less than 80 contiguous ft²
 - Approved roof design not possible for PV system to meet snow loads per ASCE 7-16, Chapter 7
 - Multi-tenant buildings in areas where utility does not provide virtual net metering (VNEM) or community solar program



Battery Storage Prescriptive Requirements

Nonresidential § 140.10(b)

New for 2022

Battery storage

- All buildings required to have PV system must have battery storage system
- Meet Reference Joint Appendix JA12
- Rated energy capacity and rated power capacity no less than Equation 140.10-B and Equation 140.10-C
- Mixed-use
 - Each occupancy system size combined for total battery storage system size



Battery Storage Prescriptive Requirements

Nonresidential Table 140.10-B

New for 2022

Table 140.10-B Battery Storage Capacity Factors

	Factor B – Energy Capacity	Factor C – Power Capacity
Storage-to-PV Ratio	Wh/W	W/W
Grocery	1.03	0.26
High-Rise Multifamily	1.03	0.26
Office, Financial Institutions, Unleased Tenant Space	1.68	0.42
Retail	1.03	0.26
School	1.87	0.46
Warehouse	0.93	0.23
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.93	0.23



Battery Storage Prescriptive Requirements

Nonresidential § 140.10(b)

New for 2022

Minimum rated energy capacity (Equation 140.10-B)

- $kWh = kW_{PVdc} \times B / D^{0.5}$
 - kWh_{batt} = Rated useable energy capacity of battery storage system in kWh
 - kW_{PVdc} = PV system capacity per § 140.10(a) in kWdc
 - B = Battery energy capacity factor per Table 140.10-B for building type
 - D = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of battery storage system



Battery Storage Prescriptive Requirements

Nonresidential § 140.10(b)

New for 2022

Minimum rated power capacity (Equation 140.10-C)

- $kW = kW_{PVdc} \times C$
 - kW_{batt} = Power capacity of battery storage system in kWdc
 - kW_{PVdc} = PV system capacity per § 140.10(a) in kWdc
 - C = Battery power capacity factor per Table 140.10-B for building type



Battery Storage Prescriptive Requirements

Nonresidential § 140.10(b)

New for 2022

Exceptions

- No battery storage when
 - Installed PV system size less than 15% of size determined by Equation 140.10-A
 - Buildings with battery storage system requirements less than 10 kWh rated capacity
 - Single-tenant buildings less than 5,000 ft² of CFA
 - Climate zone 1 for offices, schools, warehouses
- Multi-tenant buildings
 - Energy capacity and power capacity of system based on tenant spaces more than 5,000 ft² of CFA



Check Your Understanding

PV and battery storage

Are PV and battery storage mandatory for all nonresidential buildings?

- Not mandatory requirement
- PV and battery storage are prescriptive requirements for certain nonresidential spaces
- Not likely to trade-off
- Some exceptions





Nonresidential Significant Changes

Additions and Alterations: §§ 141.0, 141.1



Roof Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2Bi, Table 141.0-B

Updated for 2022

Table 141.0-B Roof/Ceiling Insulation Tradeoff for
Low-Sloped Aged Solar Reflectance

Aged Solar Reflectance	Climate Zones 6, 7, & 8 U-factor	All Other Climate Zones U-factor
0.62- 0.60	<u>0.043</u>	<u>0.035</u>
0.59-0.55	<u>0.041</u>	<u>0.034</u>
0.54-0.50	<u>0.038</u>	<u>0.031</u>
0.49-0.45	<u>0.034</u>	<u>0.029</u>
0.44-0.40	<u>0.032</u>	<u>0.028</u>
0.39-0.35	<u>0.029</u>	<u>0.026</u>
0.34-0.30	<u>0.028</u>	<u>0.025</u>
0.29-0.25	<u>0.026</u>	<u>0.024</u>

Roof alterations more than 50% or 2,000 ft² of roof area

- Meet updated prescriptive roof product efficiencies in § 140.3(a)1A
 - Updates U-factors for low-sloped insulation trade-off in Table 141.0-B
 - Updates exceptions



Roof Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2Bii, Table 141.0-C

New for 2022

Roof alterations more than 50% or 2,000 ft² of roof area

- Adds continuous above roof deck insulation for low-sloped roofs
- Updates Table 141.0-C
- Adds exceptions

Table 141.0-C Insulation Requirements For Roof Alterations

<u>Climate Zone</u>	<u>Continuous Insulation R-value</u>	<u>U-factor</u>
<u>1-5, 9-16</u>	<u>R-23</u>	<u>0.037, with at least R-10 above deck</u>
<u>6-8</u>	<u>R-17</u>	<u>0.047, with at least R-10 above deck</u>

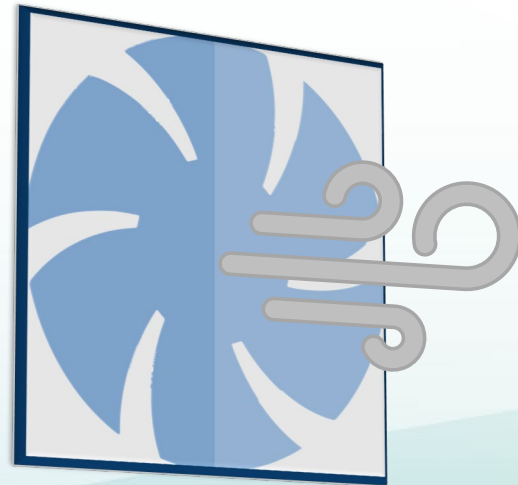


HVAC Alterations Mandatory Requirements

Nonresidential § 141.0(b)1D

Updated for 2022

- Fan energy index
 - New fan systems serving an existing building must meet requirements per § 120.10





HVAC Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2C, Table 141.0-D

Updated for 2022

- New or replacement HVAC
 - Additional fan power allowances available to determine fan power budget per Table 141.0-D

Table 141.0-D: Additional Fan Power Allowances

Airflow	Multi-Zone VAV Systems ¹ ≤5,000 cfm	Multi-Zone VAV Systems ¹ >5,000 and ≤10,000 cfm	Multi-Zone VAV Systems ¹ >10,000 cfm	All Other Fan Systems ≤5,000 cfm	All Other Fan Systems >5,000 and ≤10,000 cfm	All Other Fan Systems >10,000 cfm
Supply Fan System Additional Allowance	0.135	0.114	0.105	0.139	0.12	0.107
Supply Fan System Additional Allowance In Unit with Adapter Curb	0.033	0.033	0.043	0.000	0.000	0.000
Exhaust/ Relief/ Return/ Transfer Fan System Additional Allowance	0.07	0.061	0.054	0.07	0.062	0.055
Exhaust/ Relief/ Return/ Transfer Fan System Additional Allowance In Unit with Adapter Curb	0.016	0.017	0.022	0.000	0.000	0.000



HVAC Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2D

Updated for 2022

Altered duct systems meet mandatory requirements in § 120.4(a-f) and meet either

- Entirely new or complete replacement duct system with at least 75% new duct material
 - Up to 25% may be reused parts from existing system
 - Leak tested per § 120.4(g)
- New duct extensions and existing duct meet all
 - Leakage rate not more than 15% of nominal air handler airflow tested per NA7.5.3
 - Does not serve healthcare facility
 - Provides conditioned air to occupiable space for constant volume, single zone, space-conditioning system
 - Serves less than 5,000 ft² of conditioned floor area
 - Combined surface area of ducts outdoors or unconditioned space more than 25% of total surface area
- If exempt from §§ 141.0(b)2Di or 141.0(b)2Dii
 - New ducts meet duct leakage testing requirements per CMC § 603.9.2



Computer Room Alterations Mandatory Requirements

Covered Processes § 141.1(b)

New for 2022

Adds computer rooms

- Newly installed cooling systems and uniterable power supply systems meet §§ 120.6(j), 140.9(a)2, 140.9(a)4
- Economizers
 - When partial cooling is required for additional mechanical cooling and economizer can provide at 80°F supply air temperature at either
 - Outside air temp 55°F dry bulb and below or 50°F wet bulb and below for integrated air economizer
 - Outside air temp 40°F dry bulb and below or 35°F wet bulb and below for integrated water economizer



Horticulture Additions and Alterations Requirements

Covered Processes § 141.1(c)

Updated for 2022

Adds controlled environment horticulture spaces

- Newly installed heating, ventilation, air conditioning, or dehumidification systems for indoor growing meet §§ 120.6(h)1 and 120.6(h)2
- Additions to greenhouse or conversion to conditioned greenhouse meet §§ 120.6(h)5 and 120.6(h)6
- Newly installed, replaced, or altered lighting meet § 120.6(h)3 for indoor growing and § 120.6(h)7 for greenhouses



Check Your Understanding

Nonresidential additions and alterations

Does an addition or alteration to an existing nonresidential building trigger PV and battery requirements?

- No. PV and battery only apply to newly constructed buildings
- May add PV to an existing building, but not required by Energy Code





Resources





Nonresidential Summary

What's New for Nonresidential

- Summary of significant changes
- Code references
- Download from the [Online Resource Center](#)



California Energy Commission
2022 Building Energy Efficiency Standards
What's New for Nonresidential

Nonresidential What's New for 2022 Summary

Under the 2022 Building Energy Efficiency Standards (Energy Code), major changes to nonresidential and hotel/ motel building requirements include new photovoltaic (PV) and energy storage system requirements, a prescriptive heat pump space-conditioning baseline for certain climate zones, requirements for DOAS, and the addition of new covered processes, including controlled environment horticulture spaces. A definition for "Multifamily Building" was added, and multifamily buildings now have their own sections, beginning with §160.0.

Administrative Regulations:

- Lighting controls and mechanical systems acceptance test technician certification providers must record related Certificates of Compliance, Installation, and Acceptance Testing in an electronic database. §10-103.1(c)3H and §10-103.2(c)3H
- Outdoor lighting zones (LZ) updated and rural areas moved to LZ1 and urban clusters added to LZ2. Building types added to state defaults, and notification requirements for LZ amendments were removed. §10-114
- Energy Commission-approved community shared solar or renewable system and energy storage system qualification requirements updated. §10-115

PV and Energy Storage Systems (ESS)

- New prescriptive requirements added for PV and battery storage systems for specific building types. §140.10
- Energy Commission-approved shared solar PV, other renewable electric generation system, or ESS may be used to meet PV or ESS requirements using the performance method. §140.1(b)

Envelope

- The default calculations in Reference Nonresidential Appendix NA6 for U-factor, solar heat gain coefficient, and visible transmittance is limited to nonresidential buildings with skylight area less than 200 square feet (SF). §110.6
- For steep-sloped roofs in climate zones 2 and 4–16, minimum aged solar reflectance, thermal emittance, and SRI increased to 0.25, 0.80, and 23, respectively. (No change for hotel/ motel.) §140.3(a)1A1b2
- Prescriptive metal-framed wall U-factor maximums decreased in all climate zones. §140.3(a)2 and Table 140.3-B
- Vertical glazing efficiency values are more stringent and now climate zone dependent for fixed windows, curtainwalls, and storefronts. §140.3(a)5 and Table 140.3-B
- Exterior doors with 25 percent or more glazing are considered glazed doors. §140.3(a)7
- Prescriptive air barrier requirements expanded to all climate zones. Language added to include specifications on construction documents, and verification requirements updated and clarified. §140.3(a)9 and Table 140.3-A
- Altered roofs must meet requirements from 140.3(b) for minimum aged solar reflectance and thermal emittance, or SRI. The U-factors in Table 141.0-B were decreased. §140.0(b)2B1
- Existing building envelope wall where 25 percent or more of the wall area is being altered must comply with §140.3(a)9. §141.0(b)2Q
- Alterations that add exterior door area must meet prescriptive U-factor requirements. §141.0(b)2R

Indoor Lighting

- New mandatory occupant sensing control requirements for office spaces greater than 250 SF. §130.1(c)6D
- Automatic daylighting controls for secondary sidelit daylight zones now mandatory. §130.1(d)
- Power adjustment factor for continuous dimming plus off control expanded to include luminaires in secondary sidelit daylight zone. §140.6(a)2 and Table 140.6-A
- Prescriptive lighting power density allowances reduced for specific uses for complete building method, area category method, and tailored method. Prescriptive lighting power density allowances increased for specific detailed task work for area category method. Tables 140.6-B, -C, -D, and -G

Outdoor Lighting

- General hardscape lighting power allowances decreased, and asphalt/ concrete distinction removed. Table 140.7-A



Online Resource Center

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Handouts

- Fact sheets
- Guides

Tools

- Checklists
- Blueprint newsletter

Training

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Links

- Internal resources
- External resources



HERS Program

HERS Program information



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



CHEERS

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



ATTCP Program

ATTCP Program information

Lighting Controls

- National Lighting Contractors Association of America (NLCAA)
- California Advanced Lighting Controls Training Program (CALCTP)



National Lighting Contractors
Association of America



California Advanced Lighting
Controls Training Program

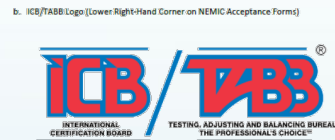


ATTCP Program

ATTCP Program information

Mechanical Systems

- California State Pipe Trades Council (CSPTC)
- National Energy Management Institute Committee (NEMIC)
- National Environmental Balancing Bureau (NEBB)
- Refrigeration Service Engineers Society (RSES)





Blueprint Newsletter

Energy Code quarterly newsletter

- Updates
- Clarifications
- Frequently asked questions

Issue 138 | April - June 2022

BLUEPRINT

CALIFORNIA ENERGY COMMISSION
EFFICIENCY DIVISION

IN THIS ISSUE

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

2022 Energy Code: Multifamily Summary

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

Mandatory Requirements

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

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

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



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- 916-654-5106 outside CA

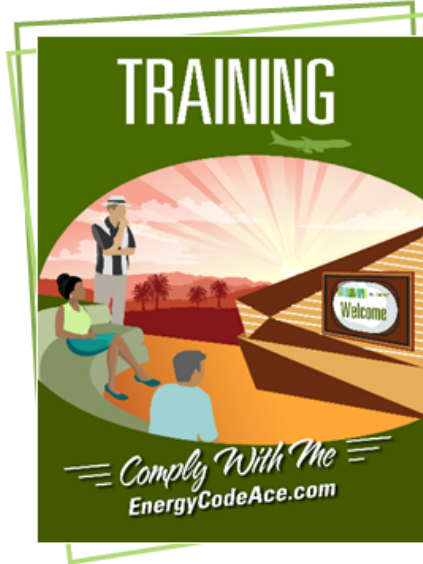


Email

- Title24@energy.ca.gov



Energy Code Ace



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

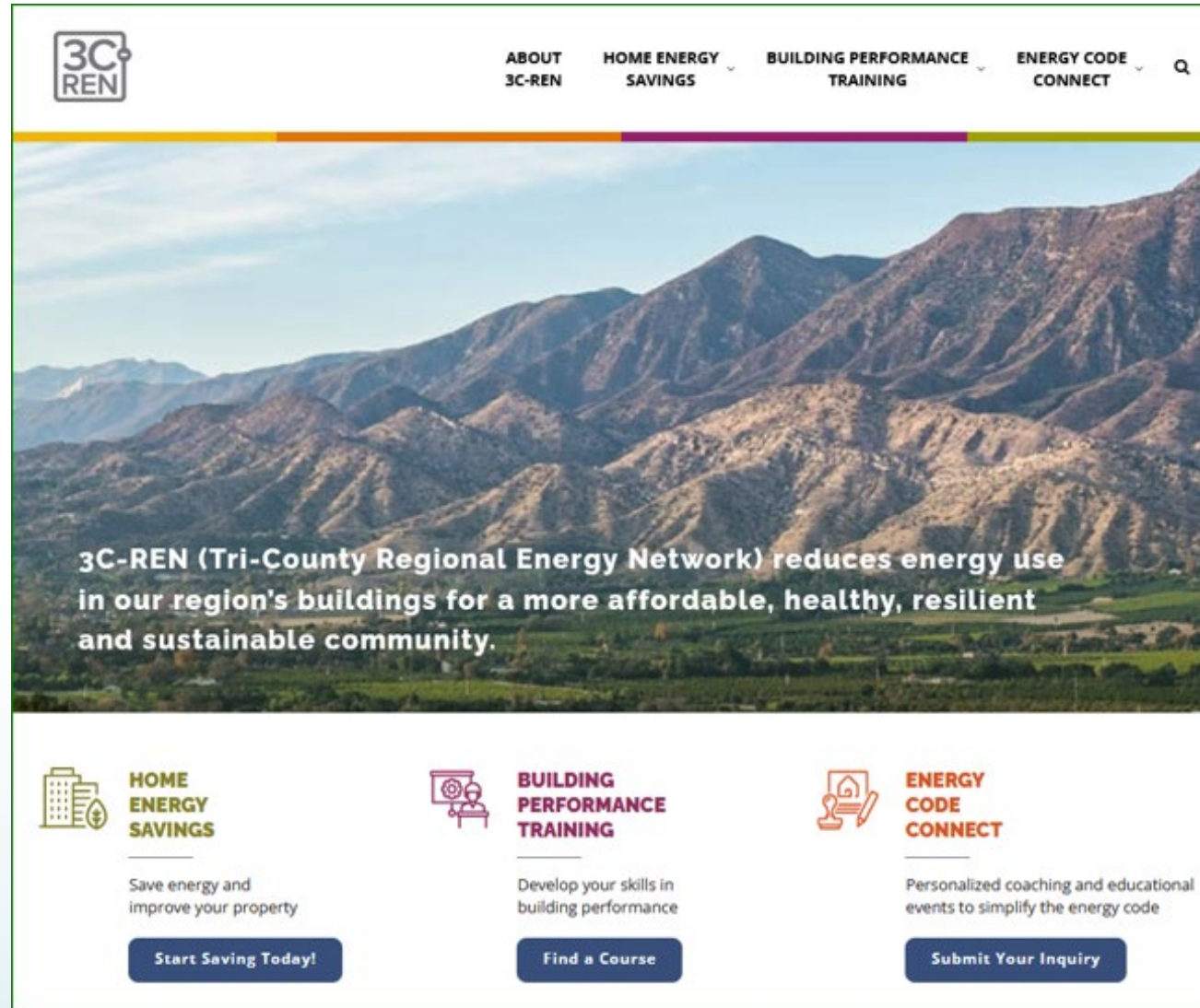
- Training is activity based and delivered in a variety of formats:**
- ✦ Live Online instructor-led
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- Resources provide quick, useful guidance:**
- ✦ Fact Sheets
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3C-REN



The screenshot shows the homepage of the 3C-REN website. At the top left is the 3C-REN logo. To its right is a navigation menu with four items: 'ABOUT 3C-REN', 'HOME ENERGY SAVINGS', 'BUILDING PERFORMANCE TRAINING', and 'ENERGY CODE CONNECT'. A search icon is located to the right of the menu. Below the navigation is a large banner image of a mountain range. Overlaid on the bottom of the banner is the text: '3C-REN (Tri-County Regional Energy Network) reduces energy use in our region's buildings for a more affordable, healthy, resilient and sustainable community.' Below the banner are three columns of content. The first column is titled 'HOME ENERGY SAVINGS' with a house icon and the text 'Save energy and improve your property', followed by a 'Start Saving Today!' button. The second column is titled 'BUILDING PERFORMANCE TRAINING' with a person at a computer icon and the text 'Develop your skills in building performance', followed by a 'Find a Course' button. The third column is titled 'ENERGY CODE CONNECT' with a house and document icon and the text 'Personalized coaching and educational events to simplify the energy code', followed by a 'Submit Your Inquiry' button.

3C-REN

ABOUT 3C-REN | **HOME ENERGY SAVINGS** | **BUILDING PERFORMANCE TRAINING** | **ENERGY CODE CONNECT** 🔍

3C-REN (Tri-County Regional Energy Network) reduces energy use in our region's buildings for a more affordable, healthy, resilient and sustainable community.

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[Start Saving Today!](#)

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ENERGY CODE CONNECT
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[Submit Your Inquiry](#)



BayREN

The screenshot shows the BayREN website homepage. At the top left is the BayREN logo with the tagline "Local Governments Empowering Our Communities". To the right of the logo is a navigation bar with links: "» HOW TO GET STARTED", "» FIND A CONTRACTOR", "» FIND AN ASSESSOR", and "» PARTNER WITH US". In the top right corner, there is an accessibility icon (A) and a search icon (Q).

On the left side, there is a vertical menu with the following items: "REBATES & FINANCING", "HOME LEARNING CENTER", "EVENTS & TRAINING", "LOCAL GOVERNMENT RESOURCES", and "ABOUT". Below the menu are social media icons for Facebook, LinkedIn, Twitter, Instagram, and YouTube.

The main content area features a large background image of a park with people sitting at tables. Overlaid on the right side of this image is a dark purple circular banner. Inside the banner, there is a yellow icon of a stack of coins with a dollar sign. The text in the banner reads: "Score big with smart energy upgrades." Below this, it says: "Upgrade your multifamily building and earn cash back — starting at \$750/unit." At the bottom of the banner is a yellow button that says "Learn More".



Thank you