2022 Energy Code

Nonresidential Outdoor Lighting Requirements

California Energy Commission

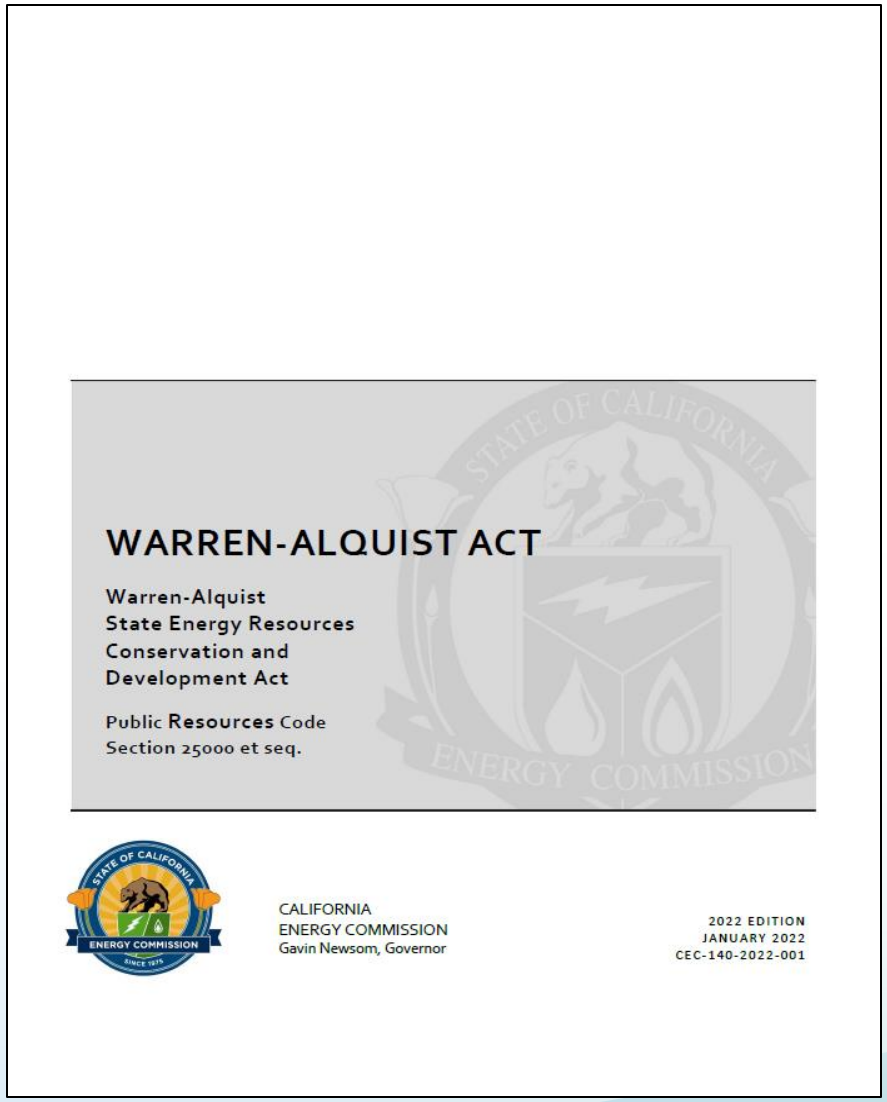
March 2024

Agenda

- 2022 Energy Code basics
- Nonresidential requirements
  - Administrative
  - Mandatory
  - Prescriptive
  - Additions and alterations
- Resources

2022 Energy Code Basics

Energy Code History

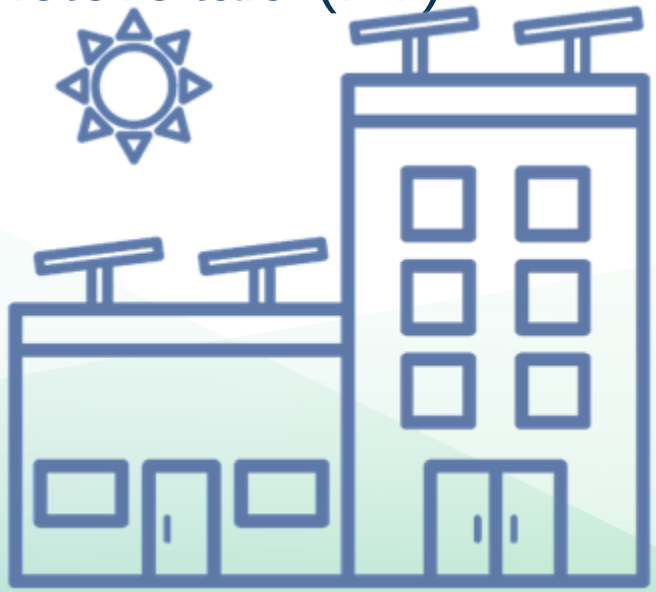


Warren-Alquist Act established CEC in 1974

- 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

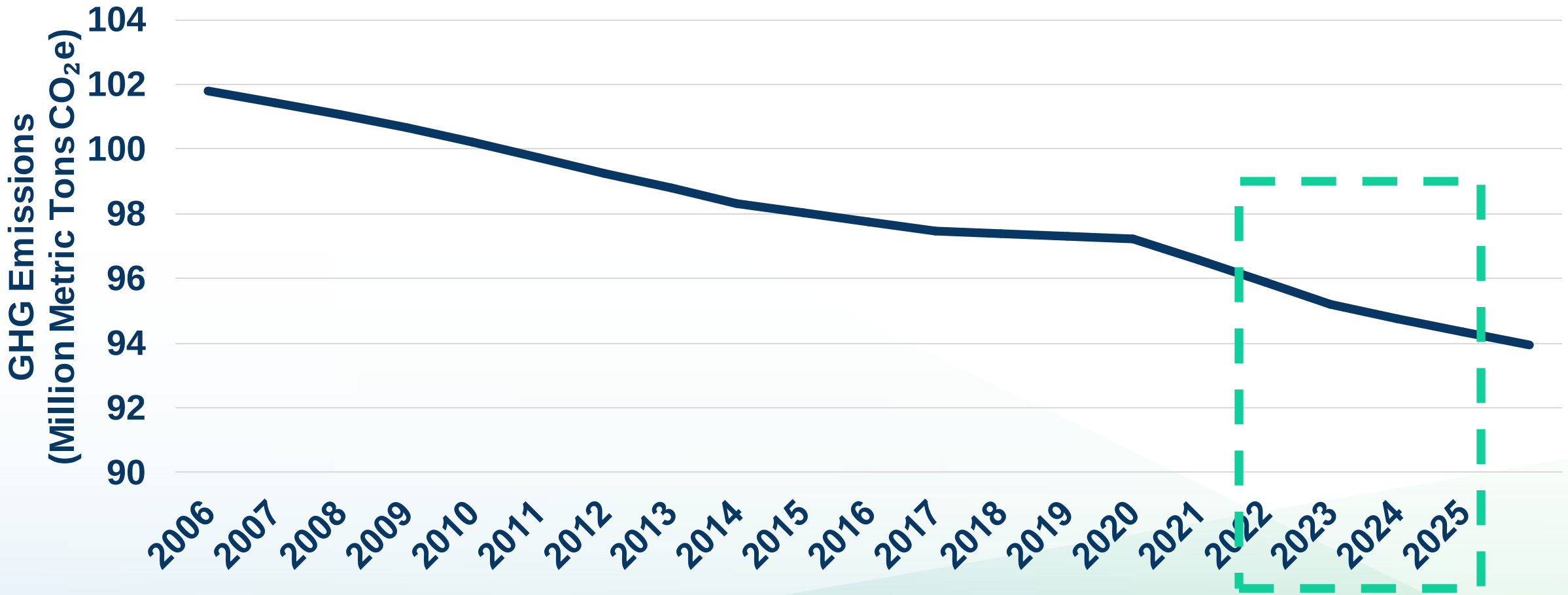
2022 Energy Code Goals

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



Energy Code Environmental Benefit

Reduced Statewide Emissions

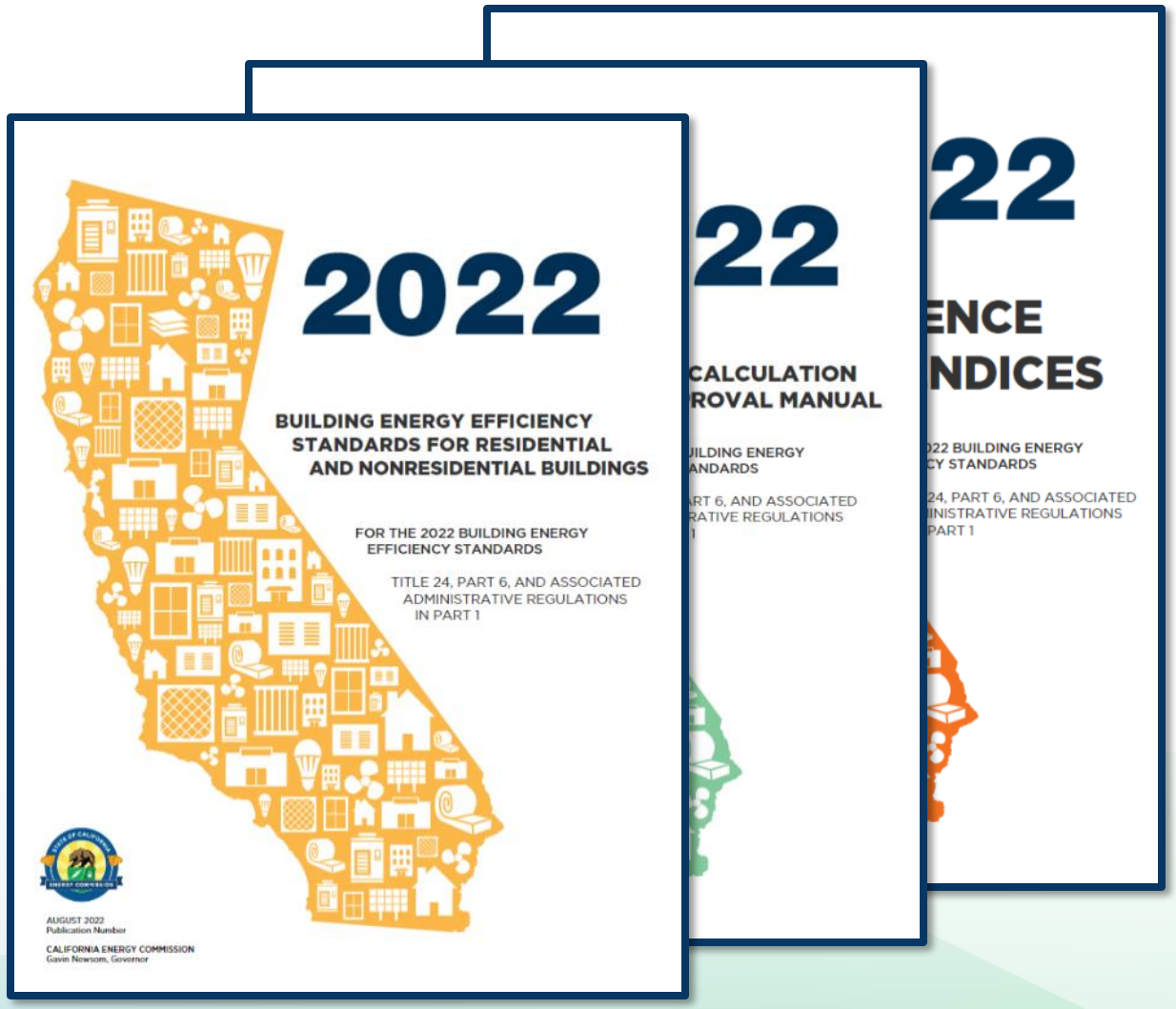


Source: CEC Impact Analysis 2005, 2008, 2013, 2016, 2019, 2022

2022 Energy Code

Effective January 1, 2023

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

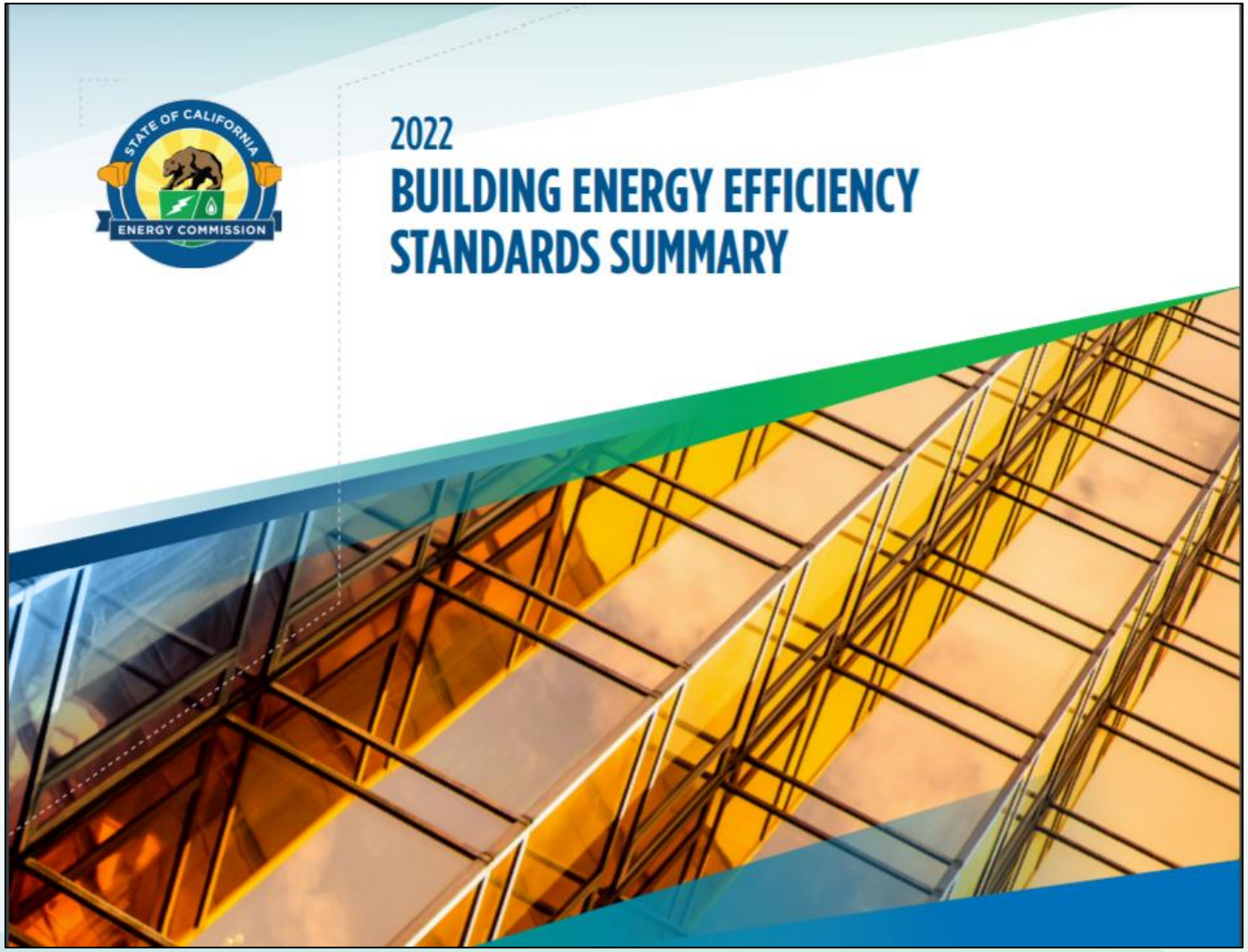


2022 Documents Online

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

2022 Energy Code Highlights

- Heat pump baselines
- Solar and battery storage
- Ventilation requirements
- Lighting
- 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 the standard building design
- 2022 heat pump baselines

Performance approach

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

2022 Performance Metrics

New for 2022

- **Source energy performance calculations**
- Nonresidential and multifamily
  - 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

Forms Registration and Certification

All Buildings § 10-103

Multifamily buildings 3 or fewer habitable stories

Updated for 2022

- 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

2022 Compliance Software

Performance approach must use approved compliance software versions

- Nonresidential and multifamily
  - CBECC 2022.3.0
  - EnergyPro 9.2
  - IES 2.0

Administrative Requirements

10-114 Outdoor Lighting Zones

Lighting zones determine outdoor lighting power allowances: lowest in LZ0, highest in LZ4.

Prevents over lighting of outdoor areas:

- Reduces glare
- Reduces light pollution
- Saves energy

10-114 Outdoor Lighting Zones Continued

Descriptions (see Table 10-114-A):

- LZ0 (Very Low) – Undeveloped areas of government designated parks, recreation areas, and wildlife preserves
- LZ1 (Low) – Rural areas
- LZ 2 (Moderate) – Urban clusters
- LZ3 (Moderately high) – Urban areas
- LZ4 (High) - None

Mandatory Requirements

110.9 Mandatory Requirements for Lighting Controls

Requirements for:

- Time-switch lighting controls
- Daylighting controls
- Dimmers
- Occupant sensing controls
- Sensors used to detect occupants
- Indicator lights

May be individual devices or systems.

130.2(b) Luminaire Shielding Requirements

Outdoor luminaires 6,200 initial lumens or greater must comply with Backlight, Uplight, and Glare (BUG) requirements in accordance with Title 24, Part 11, Section 5.106.8 (Light Pollution Reduction).

See 130.2(b) for exceptions.

130.2(c) Controls for Outdoor Lighting

- **Daylight availability -** All outdoor lighting must be controlled by one of the following:
  - Photo control
  - Astronomical time-switch control
  - Other control capable of automatically shutting off outdoor lighting when daylight is available.
- **Automatic scheduling –** All outdoor lighting must be equipped with controls that are capable of:
  - Reducing outdoor lighting power by 50% - 90%
  - Turning lighting off during scheduled unoccupied periods
  - Allowing to schedule at least two nighttime periods with independent lighting levels

130.2(c) Controls for Outdoor Lighting Cont.

- **Motion sensing controls required for:**
  - Outdoor luminaires other than those providing Building Façade, Ornamental Hardscape, Outdoor Dining, or Outdoor Sales Frontage lighting, where the bottom of the luminaire is mounted 24 feet above grade or lower.
  - Bilaterally symmetric outdoor wall mounted luminaires (wall packs) providing Building Façade, Ornamental Hardscape, or Outdoor Dining lighting that are mounted 24 feet above grade or lower.

130.2(c) Controls for Outdoor Lighting Cont.

- **Motion sensing controls must be capable of:**
  - Reducing lighting power of each controlled luminaire by 50 – 90%.
  - Separately turning luminaire off during unoccupied periods.
  - Reducing lighting to dim or off state no longer than 15 minutes after the area has been vacated, and returning the lighting to its on state when the area becomes occupied.
- **No more than 1,500 watts of lighting power may be controlled by a single sensor or as a single zone.**

130.2(c) Controls for Outdoor Lighting Cont.

- **Exceptions to lighting control requirements:**
  - Outdoor lighting not permitted by a health or life safety statute, ordinance, or regulation to be turned off or reduced.
  - Lighting in tunnels required to be illuminated 24 hours per day and 365 days per year.
- **Exceptions to motion sensing control requirements:**
  - Luminaires with maximum rated wattage of 40 watts each.
  - Applications listed as Exceptions to §140.7(a).
  - Lighting subject to a health or life safety statute, ordinance, or regulation may have a minimum time-out period longer than 15 minutes or a minimum dimming level above 50 percent when necessary to comply with the applicable law.

130.4 Acceptance and Installation Certificate Requirements

Acceptance testing required for outdoor lighting controls as described in NA7.8. Section 130.4 Lighting Control Acceptance and Installation Certificate Requirements:

A. Lighting and receptacle control acceptance requirements: prior to occupancy permit issued, indoor and outdoor lighting and receptacle controls for the building, site, or area shall comply with Section 110.12, 130.1, 130.2, 1305, or 140.6 shall be certified for the Acceptance Requirements (130.4(a)(3), (4), (5), (6), (7), and (8).

B. Lighting control installation certificate requirements: for compliance with Part 6, an installation certificate shall be submitted based on Section 10-103(a) and applicable requirements of 130.4(b)(1), (2), (5), (6), and (7).

C. The acceptance testing shall be performed by a Certified Lighting Controls Acceptance Test Technician (CLCATT) and complete documentation as required in Section 10-103(a)4.

Prescriptive Requirements

140.7(d)1 Calculation of Allowed Lighting Power

General hardscape allowances listed in **TABLE 140.7-A**

How to calculate general hardscape allowance and initial wattage allowance:

- Outdoor lighting zone (LZ)
- Illuminated hardscape area
- Hardscape area (ft^2)
- Hardscape perimeter length (ft)

Table 140.7-A

TABLE 140.7-A GENERAL HARDSCAPE LIGHTING POWER ALLOWANCE

Type of Power Allowance	Lighting Zone 0[3]	Lighting Zone 1[3]	Lighting Zone 2[3]	Lighting Zone 3[3]	Lighting Zone 4[3]
Area Wattage Allowance (AWA)	No allowance[1]	0.016 W/ft^2	0.019 W/ft^2	0.021 W/ft^2	0.024 W/ft^2
Linear Wattage Allowance (LWA)	No allowance[1]	0.13 W/lf	0.15 W/lf	0.20 W/lf	0.29 W/lf
Initial Wattage Allowance (IWA)	No allowance[1]	150 W	200 W	250 W	320 W

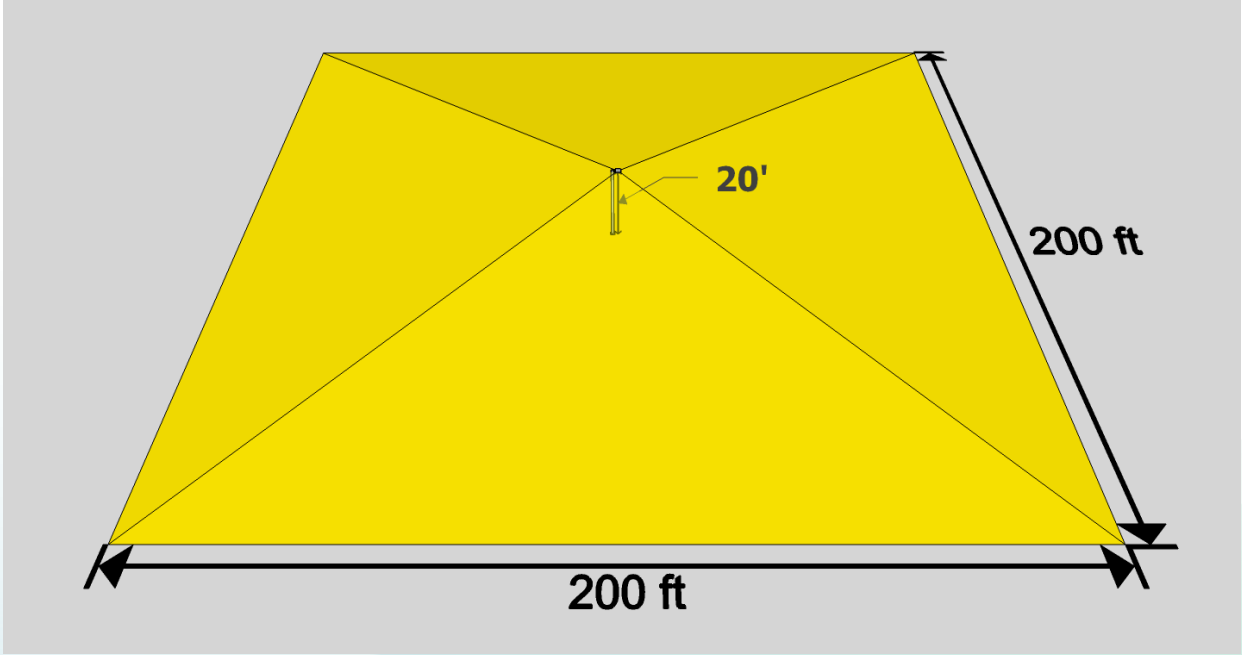
[1] Continuous lighting is explicitly prohibited in Lighting Zone 0. A single luminaire of 15 Watts or less may be installed at an entrance to a parking area, trail head, fee payment kiosk, outhouse, or toilet facility, as required to provide safe navigation of the site infrastructure. Luminaires installed shall meet the maximum zonal lumen limits as specified in Section 130.2(b).

[2] RESERVED.

[3] Narrow band spectrum light sources with a dominant peak wavelength greater than 580 nm – as mandated by local, state, or federal agencies to minimize the impact on local, active professional astronomy or nocturnal habitat of specific local fauna – shall be allowed a 2.0 lighting power allowance multiplier.

140.7(d)1 General Hardscape Lighting Power Allowance cont.

Illuminated hardscape area: hardscape area within a square pattern around each luminaire that is ten times the luminaire mounting height with the luminaire in the middle of the pattern



140.7(d)2 Allowance for Specific Applications

Additional Lighting Power Allowance is “use it or lose it”

- Cannot claim additional lighting power if lighting for the specific application is not installed
- Cannot tradeoff additional lighting power

TABLE 140.7-B lists additional lighting power allowances for specific applications.

TABLE 140.7-B

TABLE 140.7-B ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS
All area and distance measurements in plan view unless otherwise noted.

Lighting Application	Lighting Zone 0	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
WATTAGE ALLOWANCE PER APPLICATION. Use all that apply as appropriate.					
Building Entrances or Exits. Allowance per door. Luminaires qualifying for this allowance shall be within 20 feet of the door.	Not applicable	9 watts	15 watts	19 watts	21 watts
Primary Entrances to Senior Care Facilities, Police Stations, Healthcare Facilities, Fire Stations, and Emergency Vehicle Facilities. Allowance per primary entrance(s) only. Primary entrances shall provide access for the general public and shall not be used exclusively for staff or service personnel. This allowance shall be in addition to the building entrance or exit allowance above. Luminaires qualifying for this allowance shall be within 100 feet of the primary entrance.	Not applicable	20 watts	40 watts	57 watts	60 watts
Drive Up Windows. Allowance per customer service location. Luminaires qualifying for this allowance shall be within 2 mounting heights of the sill of the window.	Not applicable	16 watts	30 watts	50 watts	75 watts
Vehicle Service Station Uncovered Fuel Dispenser. Allowance per fueling dispenser. Luminaires qualifying for this allowance shall be within 2 mounting heights of the dispenser.	Not applicable	55 watts	77 watts	81 watts	135 watts
ATM Machine Lighting. Allowance per ATM machine. Luminaires qualifying for this allowance shall be within 50 feet of the dispenser.	Not applicable	100 watts for first ATM machine, 35 watts for each additional ATM machine.			
WATTAGE ALLOWANCE PER UNIT LENGTH (w/linear ft). May be used for one or two frontage side(s) per site.					
Outdoor Sales Frontage. Allowance for frontage immediately adjacent to the principal viewing location(s) and unobstructed for its viewing length. A corner sales lot may include two adjacent sides provided that a different principal viewing location exists for each side. Luminaires qualifying for this allowance shall be located between the principal viewing location and the frontage outdoor sales area.	Not applicable	No Allowance	11 W/linear ft	19 W/linear ft	25 W/linear ft
WATTAGE ALLOWANCE PER HARDSCAPE AREA (W/ft²). May be used for any illuminated hardscape area on the site.					
Hardscape Ornamental Lighting. Allowance for the total site illuminated hardscape area. Luminaires qualifying for this allowance shall be rated for 100 watts or less as determined in accordance with Section	Not	No	0.007	0.013	0.019

Additions and Alterations

141.0(b)2L Outdoor Lighting Alterations

Three scenarios for outdoor lighting alterations:

Alterations of existing outdoor lighting systems as listed in TABLE 140.7-A or B, must meet requirements of Sections 130.0, 130.2(b), and 130.4.

- Increase connected lighting load
- Replacement of ≥ 10% of existing luminaires
- Replacement of ≥ 50% of existing luminaires

Requirements triggered when **replacing, increasing connected lighting load, or adding new luminaires**

- Typically does not include altering or retrofitting existing luminaires

141.0(b)2L Outdoor Lighting Alterations Cont.

Replacement of ≥ 10% of existing luminaires

- Altered parking lot and outdoor sales lot luminaires mounted ≤ 24 ft above ground:
  - Photocell or astronomical time-switch, and motion sensor
- For all other applications and where the altered luminaire is mounted > 24 ft above ground:
  - Photocell or astronomical time-switch, and automatic scheduling control or other control capable of reducing outdoor lighting power by 40% when the area is vacant

Exception: Replacing < 5 existing luminaires.

141.0(b)2L Outdoor Lighting Alterations Cont.

Replacement of ≥ 50% of existing luminaires

- Altered parking lot and outdoor sales lot luminaires mounted ≤ 24 ft above ground:
  - Photocell or astronomical time-switch, and motion sensor
- For all other applications and where the altered luminaire is mounted ≥ 24 ft above ground
  - Photocell or astronomical time-switch, and automatic scheduling control or other control capable of reducing outdoor lighting power by 40% when the area is vacant

Meet power allowance in 140.7, unless replacement luminaires reduce power by ≥ 40%

Exception: Replacing < 5 existing luminaires.

141.0(b)2L Outdoor Lighting Alterations cont.

Acceptance testing is required for lighting alterations if installing controls for more than 20 luminaires for the entire project

Resources

Online Resource Center

www.energy.ca.gov/orc

Handouts

- Fact sheets
- Guides

Tools

- Checklists
- Blueprint newsletter

Training

- Presentations
- Videos

Links

- Internal resources
- External resources

New Resource Hub

Homeowners and renters

- Information about water and space heating, cooking, EV charging, incentives

Contractors

- Information about training, tools, incentives

Local government representatives

- Information about model policies, permitting, training, incentives

Links on the Building and Home Energy Resource Hub

ATTCP Program - Lighting

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

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

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

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)

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Call

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- 916-654-5106 outside CA

Email

- Title24@energy.ca.gov

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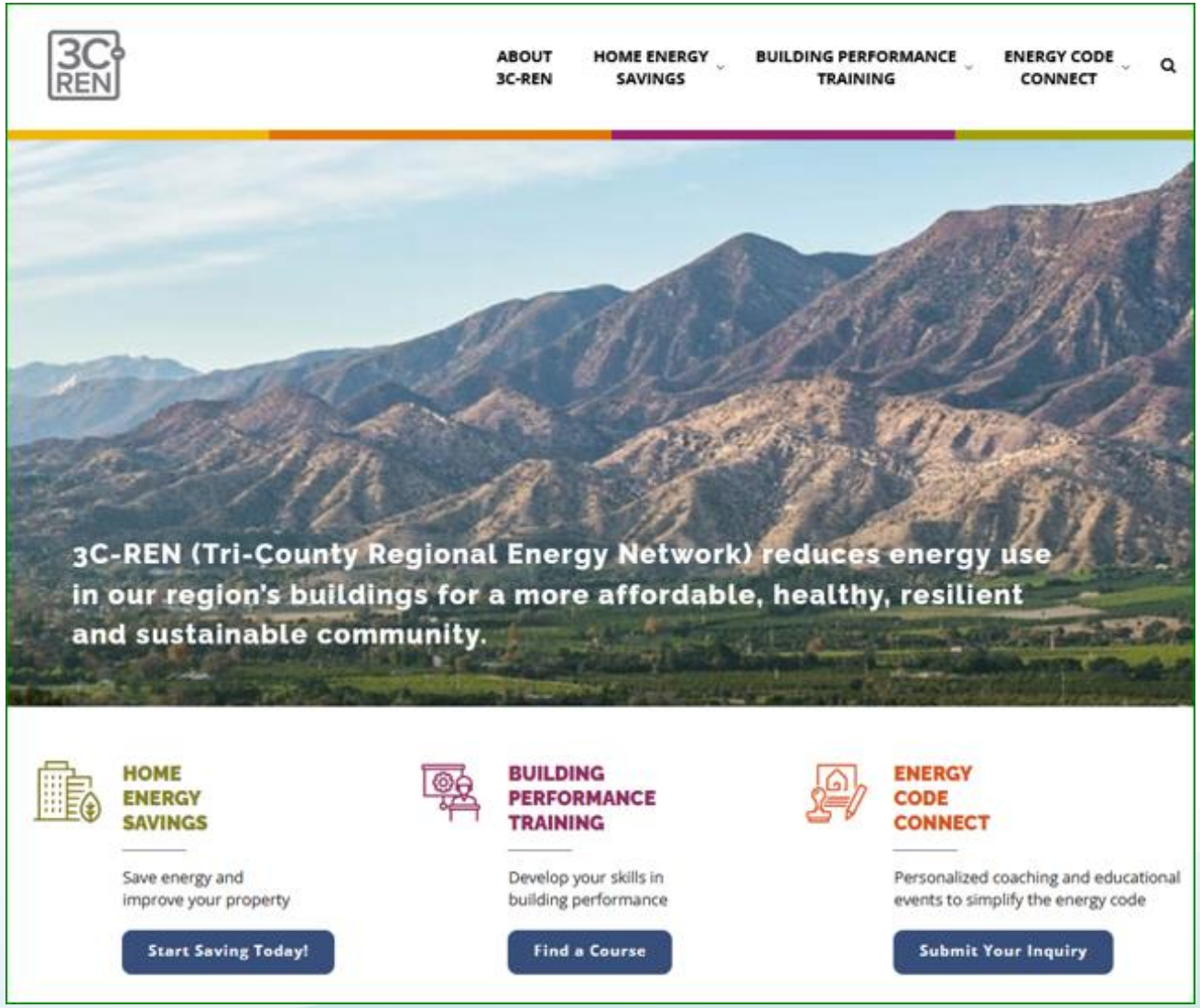
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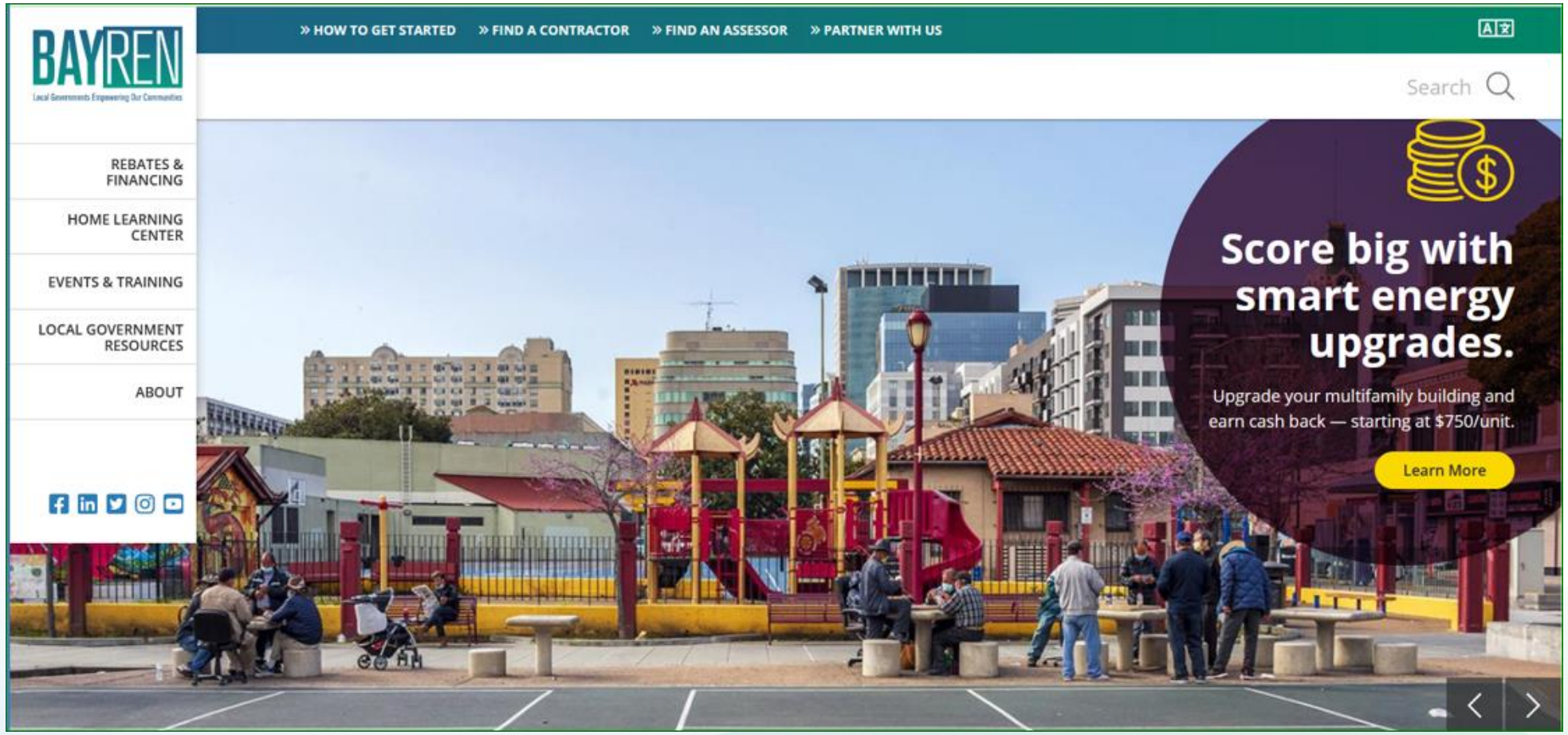
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Codes and Standards

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- Free ICC-approved training sessions for 2022 Energy Code (Title 24, Part 6) requirements → www.iren.gov/161/CS-Trainings
- Requested training courses can also be scheduled

C&S Technical Support Program

Request Free Technical Assistance from Local Code Experts—Reach Code Development, Permit Guides, Etc. → www.iren.gov/162/CS-Technical-Support

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Submit queries online and receive a personalized response addressed by energy code experts within two business days! → www.iren.gov/162/CS-Technical-Support

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