



2022 Energy Code

Nonresidential Indoor Lighting Requirements

California Energy Commission

March 2024



Agenda

- 2022 Energy Code basics
- Nonresidential requirements
 - 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

2022 EDITION
JANUARY 2022
CEC-140-2022-001



2022 Energy Code Goals

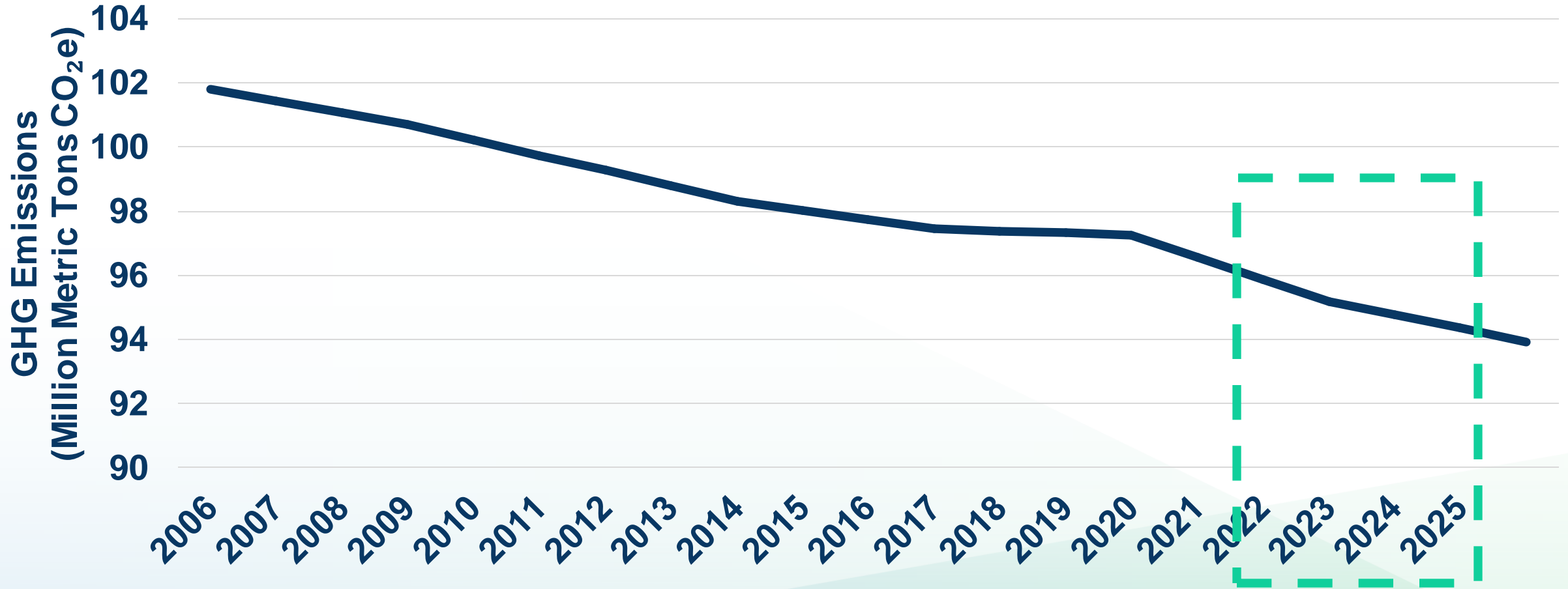
- Increase building energy efficiency cost-effectively
- Contribute to California's greenhouse gas (GHG) reduction goals
- Enable pathways for all-electric buildings
- Reduce residential building impacts on the electricity grid
- Promote demand flexibility and self-utilization of photovoltaic (PV)
-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





Energy Code Environmental Benefit

Reduced Statewide Emissions



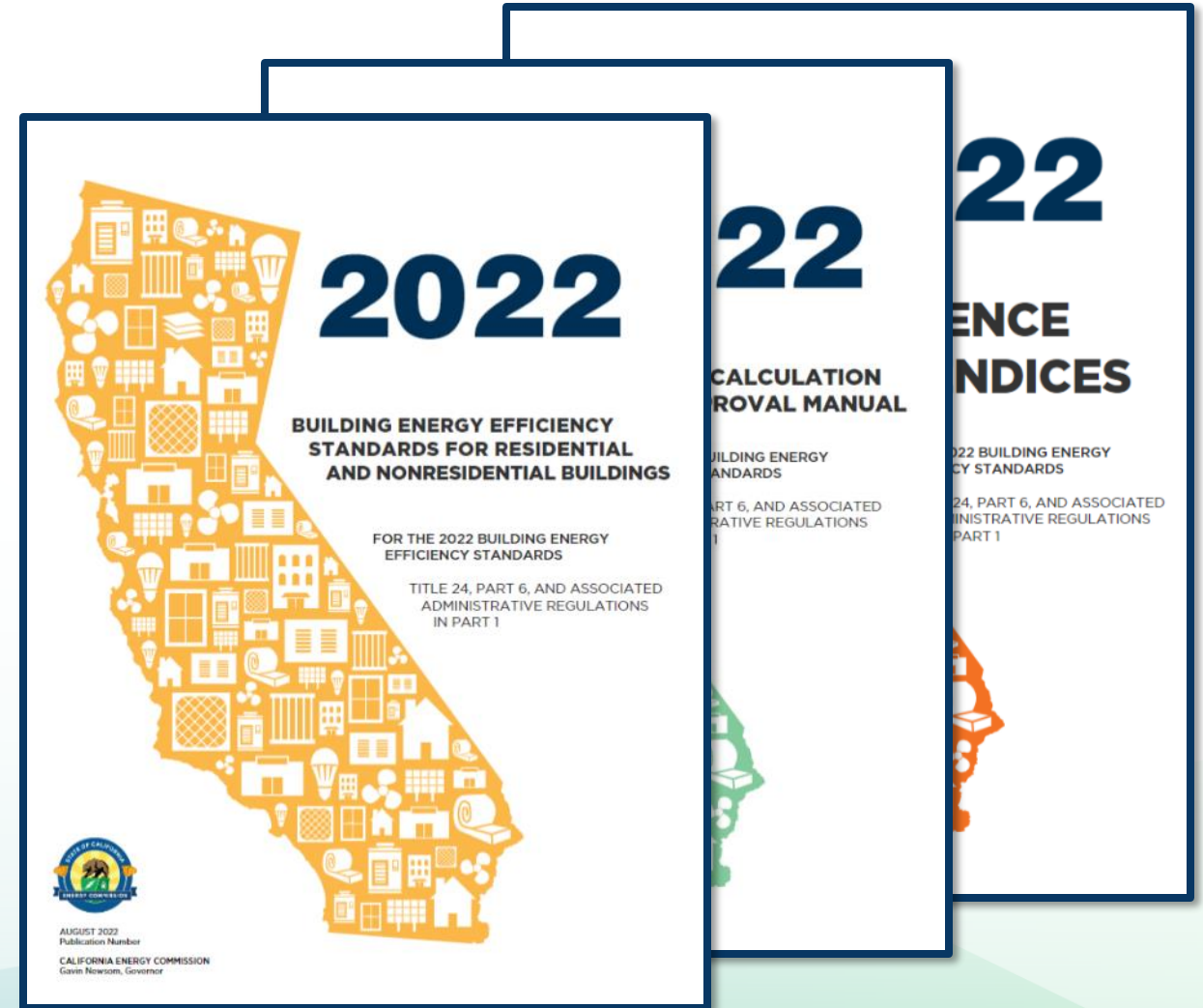
Source: CEC Impact Analysis 2005, 2008, 2013, 2016, 2019, 2022



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

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

Email *

SUBSCRIBE

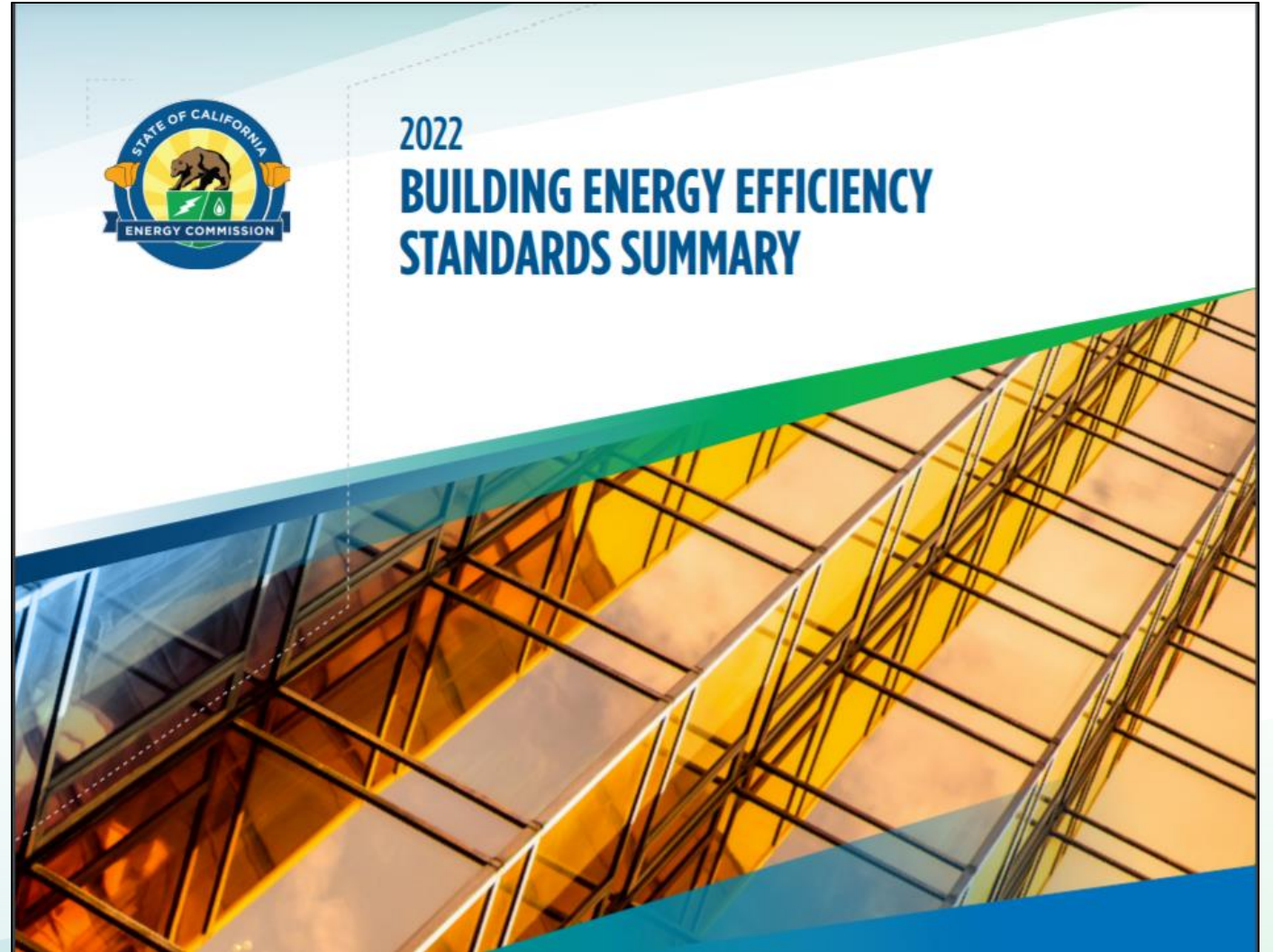
- Energy Code
- Reference Appendices
- Compliance Manuals
- Software
- Forms





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

Updated for 2022

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

Updated for 2022

Multifamily buildings 3 or fewer 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



2022 Compliance Software

- Performance approach must use approved compliance software versions
- Nonresidential and multifamily
 - CBECC 2022.3.0
 - EnergyPro 9.2
 - IES 2.0



Mandatory Requirements





130.0(c) Luminaire Classification and Power

1. Maximum rated wattage must be listed on a permanent, preprinted, factory-installed label
2. Luminaires with line voltage lamp holders not served by drivers, ballasts, or transformers: Maximum rated wattage as labeled in accordance with 130.0(c)1
3. For luminaires with permanently installed or remotely installed ballasts: Wattage of the rated lamp-ballast combination published in ballast manufacturer's catalog based on lab testing
4. For inseparable SSL luminaires and SSL luminaires with remotely mounted drivers: Maximum rated input wattage of the luminaire when tested in accordance with UL 1598, 2108, or 8750, or IES LM-79



130.0(c) Luminaire Classification and Power Continued

5. LED tape lighting:
 - Maximum rated input wattage of driver or power supply; or
 - Installed length times rated watts/ft
6. Modular lighting systems, greater of:
 - 30 watts per linear foot; or
 - Rated wattage of all luminaires in the system
7. All other lighting equipment: Maximum rated wattage of the equipment, or operating input wattage of the system.



130.1(a) Area Controls (ON/OFF)

- a) Manual on/off controls required in each space:
 1. Readily accessible.
 2. Located in same space as lights being controlled.
 3. Separate for general, display, ornamental, and special effects. Scene controllers may be used if one scene controls general lighting only, and there is a means to manually turn off all lighting.



130.1(a) Area Controls (ON/OFF) Cont.

Exceptions:

- Controls do not need to be readily accessible to unauthorized personnel in:
 - Public restrooms with 2 or more stalls
 - Parking areas
 - Stairwells
 - Corridors
 - Areas of a building intended for access or use by the public



130.1(a) Area Controls (ON/OFF) Cont.

Exceptions (Continued):

- Spaces where controls do not need to be located in the same space as lighting: malls, atria, main entry lobbies, auditoriums, dining, retail and wholesale sales, storage, commercial and industrial work, convention, arenas, psychiatric and secure areas in healthcare facilities, and other areas that pose a health and safety hazard, as long as the person using the control can see the lights or area controlled by that control, or visually signal or display showing the current state of controlled lighting.



130.1(a) Area Controls (ON/OFF) Cont.

Exceptions (Continued):

- In restrooms in healthcare facilities intended for a single occupant, the control may be located outside the enclosed area, directly adjacent to the door.
- Up to 0.1 W/ft² may be continuously illuminated if the area is a designated means of egress and controls are not readily accessible to unauthorized personnel.



130.1(b) Multilevel Controls

For general lighting in enclosed spaces $\geq 100 \text{ ft}^2$ with an LPD $> 0.5 \text{ W/ft}^2$:

Provide the number of control steps and uniformity requirements specified in Table 130.1-A

TABLE 130.1-A MULTILEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS

Luminaire Type	Minimum Required Control Steps (percent of full rated power ¹)	Uniform level of illuminance shall be achieved by:
LED luminaires and LED light source systems	Continuous dimming 10-100 percent	Continuous dimming 10-100 percent
Line-voltage sockets except GU-24	Continuous dimming 10-100 percent	Continuous dimming 10-100 percent
Low-voltage incandescent systems	Continuous dimming 10-100 percent	Continuous dimming 10-100 percent
Fluorescent luminaires	Continuous dimming 20-100 percent	Continuous dimming 20-100 percent
GU-24 sockets rated for fluorescent ≤ 20 watts; Pin-based compact fluorescent ≤ 20 watts ² Linear fluorescent and U-bent fluorescent ≤ 13 watts	Minimum one step between 30-70 percent	Continuous dimming; or Stepped dimming; or Switching alternate lamps in a luminaire.
Track Lighting	Minimum one step between 30-70 percent	Continuous dimming; or Stepped dimming; or Separately switching circuits in multi-circuit track with a minimum of two circuits.
Linear fluorescent and U-bent fluorescent > 13 watts	Minimum one step in each range: 20 - 40 percent 50 - 70 percent 75 - 85 percent 100 percent	Stepped dimming; or Continuous dimming; or Switching alternate lamps in each luminaire, having a minimum of 4 lamps per luminaire illuminating the same area and in the same manner
Other light sources, including HID and Induction	Minimum one step between 50 - 70 percent	Stepped dimming; or Continuous dimming; or Switching alternate lamps in each luminaire, having a minimum of 2 lamps per luminaire, illuminating the same area and in the same manner.

1. Full rated input power of driver, ballast and lamp, corresponding to maximum ballast factor

2. Includes only pin based lamps: twin tube, multiple twin tube, and spiral lamps



130.1(b) Multilevel Controls Continued

Exceptions:

- Classrooms with general lighting load ≤ 0.6 W/ft² shall have a minimum of one control step between 30-70% full rated power.
- Enclosed spaces with one luminaire and no more than two lamps or only one inseparable SSL luminaire
- Restrooms
- Healthcare facilities



130.1(c)1, 3, 4 Shut-OFF Controls

All indoor lighting must have an automatic shut-OFF control

- Occupant sensing or automatic time-switch with 2 hour-override and holiday shut-off feature
- Separate controls for each floor other than stairwells
- Separate controls for up to 5,000 ft² in an enclosed space (up to 20,000 ft² in malls, auditoriums, single-tenant retail, industrial, convention centers, and arenas)



130.1(c)1, 3, 4 Shut-OFF Controls Cont.

Exceptions

- Healthcare facilities
- Spaces in use 24/7/365
- Lighting complying with 130.1(c)5 or 7
- Egress lighting: Up to 0.1 W/ft² may be continuously illuminated if area is designated for means of egress on plans. Egress lighting shall provide no less light than required by CA Building Code §1008 while in partial-off mode



130.1(c)1, 3, 4 Shut-OFF Controls Cont.

Exceptions (Continued):

- Electrical equipment rooms subject to CA Electrical Code Article 110.26(D)
- Emergency lighting connected to an emergency power source/battery and intended to function only when normal power is absent
- Holiday shut-off feature not required for retail stores and associated malls, restaurants, grocery stores, churches, and theaters



130.1(c)5 Occupant Sensing Controls

Occupant sensors must turn off lighting 20 minutes or less after control zone unoccupied for:

- Offices $\leq 250 \text{ ft}^2$
- Multipurpose rooms $< 1,000 \text{ ft}^2$
- Classrooms
- Conference rooms
- Restrooms

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)



130.1(c)6 Shut-OFF Controls

Areas requiring **full-OFF** or **partial-OFF** occupant sensing controls:

- A. Aisle ways and open areas in warehouses
- B. Library stack aisles depending on length
- C. Corridors and stairwells
- D. Office spaces > 250 square feet

Must also have an automatic shut-OFF control to turn off part of the lighting when the space is typically unoccupied.





130.1(c)7 Partial-OFF Controls

Areas requiring partial-OFF occupant sensing controls:

- A. Stairwells and common area corridors providing access to guest rooms of hotel/motels: lighting must automatically reduce by at least 50%*
- B. Parking garages, parking areas, loading areas: general lighting must have at least one control step between 20% and 50% of design lighting power*

*Exceptions apply



130.1(c)8 Shut-OFF Controls for Hotel/Motel Guest Rooms

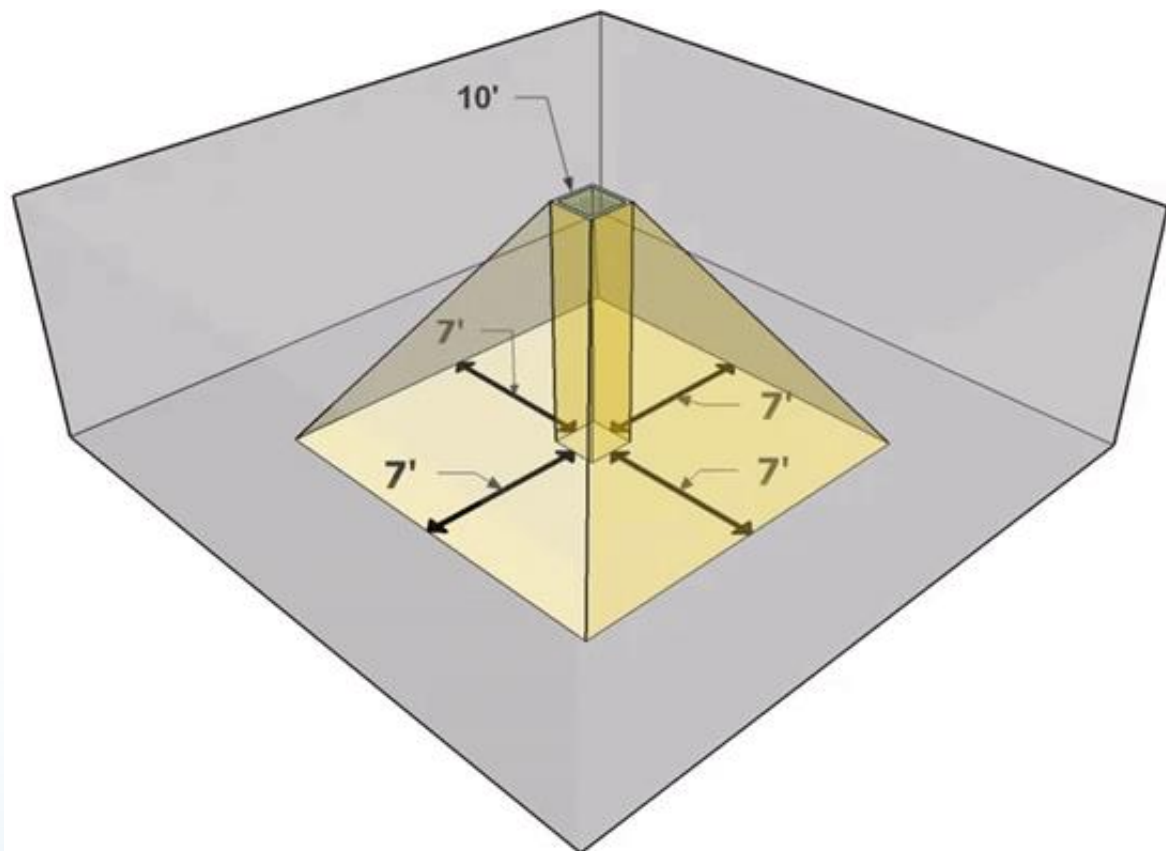
Hotel and motel guest rooms must turn off lighting power within 20 minutes after the room has been vacated by one of the following methods:

- i. Captive card key controls
- ii. Occupant sensing controls
- iii. Other automatic controls

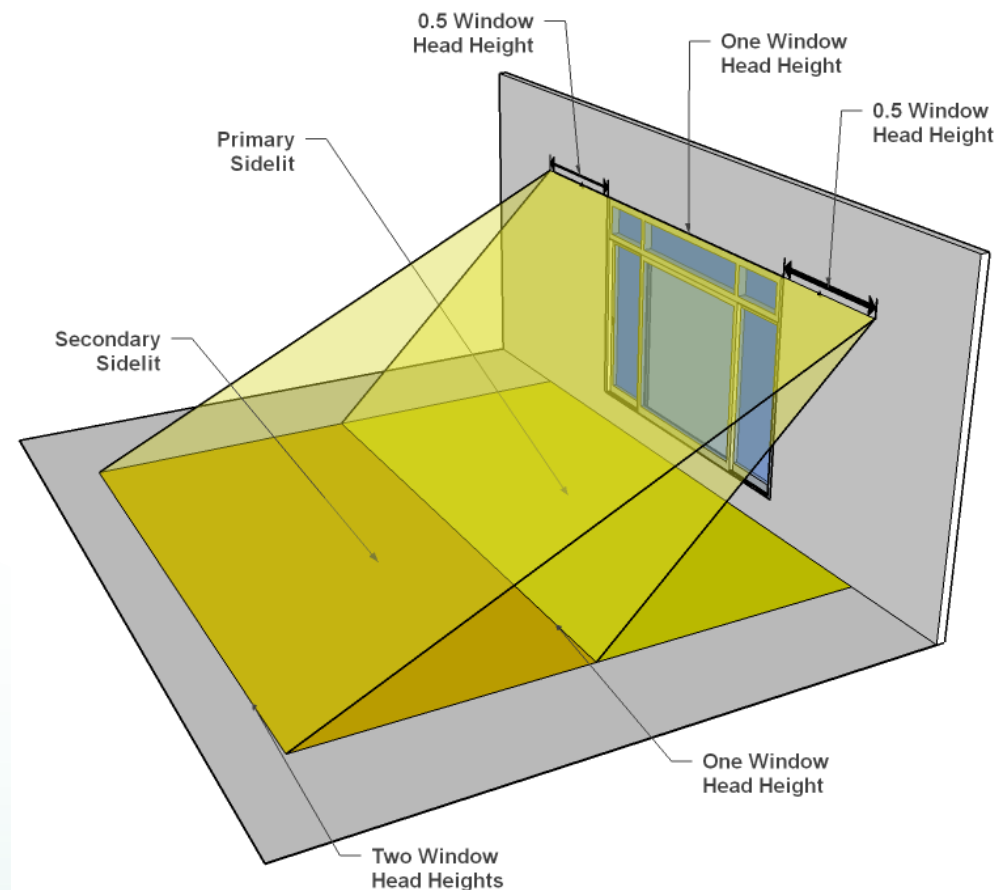
Exception: One high efficacy luminaire (as defined in Table 150.0-A) that is switched separately and where the switch is located within 6 feet of the entry door.



130.1(d) Daylighting Controls



Skylit daylit zone



Sidelit daylit zones



130.1(d) Daylighting Controls Cont.

1. Daylit zones must be shown on plans
2. Automatically control general lighting in each type of daylit zone separately.
 - General lighting in overlapping skylit daylit zone and sidelit daylit zone shall be controlled as part of the skylit daylit zone.
 - General lighting in overlapping primary and secondary sidelit daylit zones shall be controlled as part of primary sidelit daylit zone.
 - Linear solid state lighting may be treated as linear lamps in increments of 4 feet segments or smaller, and each segment is separately controlled based on the type of daylit zone in which the segment is primarily located.



130.1(d)3 Daylighting Controls Cont.

- A. Adjust lighting via continuous dimming or the number of control steps provided by multilevel controls
- B. Illuminance from controlled lighting and daylight must not be less than that from controlled lighting when no daylight is available
- C. Except for parking garages, when daylight is greater than 150% of illuminance provided by controlled lighting when no daylight is available, reduce controlled lighting power in daylight zone by $\geq 90\%$.
- D. For parking garages, when daylight illuminance at edge of secondary daylit zone farthest from glazing or opening are greater than 150% of the illuminance provided by controlled lighting when no daylight is available, reduce controlled lighting power in combined primary and secondary sidelit daylit zones by 100%.



130.1(d)4 & 5 Daylighting Controls

4. Photosensors shall not be readily accessible to unauthorized personnel.
5. The location where calibration adjustments are made to automatic daylighting controls shall be readily accessible to authorized personnel.



Daylighting Controls Exceptions

Exceptions:

- Luminaires in sidelit daylit zones in retail merchandise sales and wholesale showroom areas
- For parking garages, luminaires located in the daylight adaptation zone
- Areas under skylights where existing adjacent structures or natural objects block direct sunlight for more than 1,500 hours/year between 8 a.m. and 4p.m.
- Rooms that have a total glazing area less than 24 square feet, or parking garages with a combined total of less than 36 square feet of glazing or opening.



Daylighting Controls Exceptions Cont.

Exceptions (Continued)

- Rooms where combined total installed wattage of general lighting in skylit and primary sidelit zones is less than 120 watts are not required to have daylighting controls for those zones
- Rooms where total installed wattage of general lighting in secondary sidelit zones is less than 120 watts are not required to have daylighting controls for that zone
- Parking garages where the total installed wattage of the general lighting in the primary and secondary daylit zones is less than 60 watts do not require automatic daylighting controls in the daylit zones

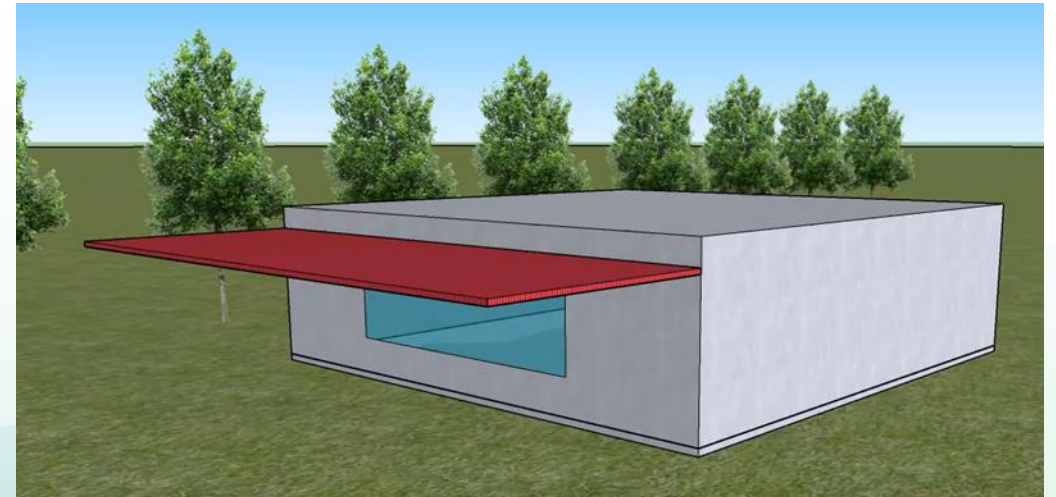


Daylighting Controls Exceptions Cont.

Exceptions (Continued)

Areas adjacent to vertical glazing below an overhang where all of the following apply:

- The overhang covers the entire width of the vertical glazing
- No vertical glazing is above the overhang
- The ratio of overhang projection to the overhang rise is greater than:
 - 1.5 for South, East, and West orientations, **or**
 - 1 for North orientations





130.1(e) & 110.12 Demand Responsive Controls

For buildings with installed lighting power $\geq 4,000$ watts subject to 130.1(b):

- Certified OpenADR 2.0a or 2.0b. List available at [OpenADR webpage](#)
- Certified capable of responding to OpenADR 2.0b Virtual End Node
- Able to reduce total lighting power by $\geq 15\%$ as described in NA 7.6.3
- When demand response controls are required, such controls must control general lighting subject to 130.1(b) and may control additional lighting
- General lighting shall be reduced consistent with uniform level of illumination requirements in TABLE 130.1-A



130.1(e) & 110.12 Demand Responsive Controls Continued

Exception:

- Spaces where a health or life safety statute, ordinance, or regulation does not permit the general lighting to be reduced are not required to install demand responsive controls and do not count toward the 4,000 watt threshold.



130.1(f) Control Interactions

1. For general lighting, the manual area control shall permit the level or amount of light provided while the lighting is on to be set or adjusted by the controls specified in Section 130.1(b), (c), (d), and (e).
2. The manual area control shall permit the shut-off control to turn the lighting down or off.
3. The multilevel lighting control shall permit the automatic daylighting control to adjust the electric lighting level in response to changes in the amount of daylight in the daylit zone.
4. The multilevel lighting control shall permit the demand responsive control to adjust the lighting during a demand response event and to return it to the level set by the multilevel control after the event.



130.1(f) Control Interactions Cont.

5. The shut-off control shall permit the manual area control to turn the lighting on. If the on request occurs while an automatic time switch control would turn the lighting off, then the on request shall be treated as an override request consistent with Section 130.1(c)3.
6. The automatic daylighting control shall permit the multilevel lighting control to adjust the level of lighting.
7. For lighting controlled by multilevel lighting controls and by occupant sensing controls that provide an automatic-on function, the controls shall provide a partial-on function that is capable of automatically activating between 50-70 percent of controlled lighting power.



130.4 Acceptance Testing

- a) Acceptance testing per NA 7.6 and 7.8 required for:
3. Automatic daylighting controls
 4. Automatic shut-OFF controls
 5. Demand responsive lighting controls
 6. Outdoor Lighting
 7. Systems receiving the institutional tuning power adjustment factor
 8. Demand responsive controlled receptacles
- c) Must use certified ATTs from an approved Acceptance Test Technician Certification Provider (ATTCP)

More information available at the CEC's [ATTCP](#) webpage



130.1(f) Control Interactions Cont.

8. Reserved
9. For space conditioning system zones serving only spaces that are required to have occupant sensing controls as specified in Section 130.1(c)5, 6, and 7, and where Table 120.1-A allows the ventilation air to be reduced to zero when the space is in occupied-standby mode, the space conditioning system shall be controlled by occupancy sensing controls as specified in Section 120.2(e)3.



Prescriptive Requirements



140.6(a)2 Power Adjustment Factors

Additional lighting power allowance for installing controls or features beyond mandatory requirements listed in TABLE 140.6-A

TABLE 140.6-A LIGHTING POWER ADJUSTMENT FACTORS (PAF)

TYPE OF CONTROL	TYPE OF AREA	FACTOR	
a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2 b. Only one PAF may be used for each qualifying luminaire unless combined below. c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF			
1. Daylight Dimming plus OFF Control	Luminaires in skylit daylit zone or primary sidelit daylit zone	0.10	
2. Occupant Sensing Controls in Large Open Plan Offices	In open plan offices > 250 square feet: One sensor controlling an area that is:	No larger than 125 square feet	0.40
		From 126 to 250 square feet	0.30
		From 251 to 500 square feet	0.20
3. Institutional Tuning	Luminaires in non-daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.	0.10	
	Luminaires in daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.	0.05	
4. Demand Responsive Control	All building types of 10,000 square feet or smaller. Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF	0.05	
5. Clerestory Fenestration	Luminaires in daylit areas adjacent to the clerestory. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.05	
6. Horizontal Slats	Luminaires in daylit areas adjacent to vertical fenestration with interior or exterior horizontal slats. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.05	
7. Light Shelves	Luminaires in daylit areas adjacent to clerestory fenestration with interior or exterior light shelves. This PAF may be combined with the PAF for clerestory fenestration. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF	0.10	

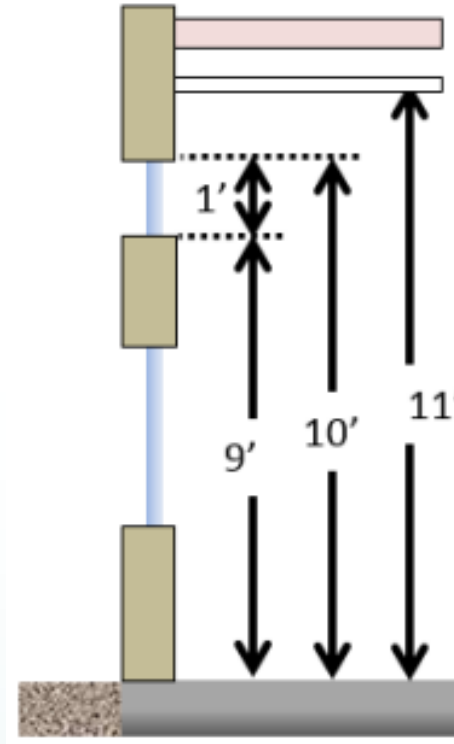


140.6(a)2 Power Adjustment Factors cont.

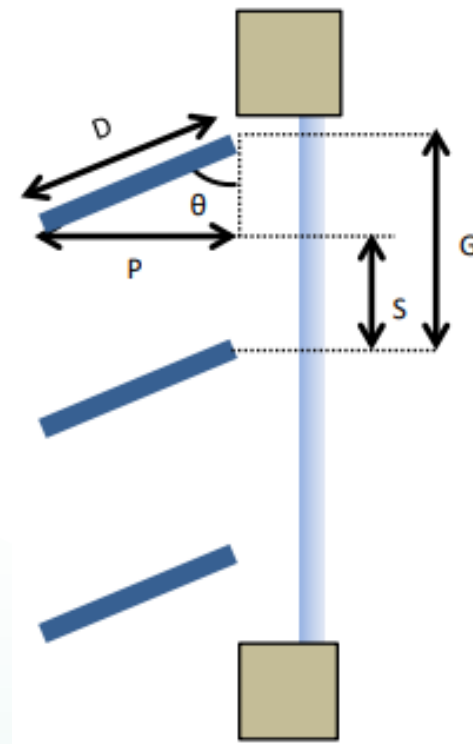
PAF for increasing daylight potential

- Clearstory fenestration – 5%
- Horizontal slats – 5%
- Interior and exterior light shelves – 10%

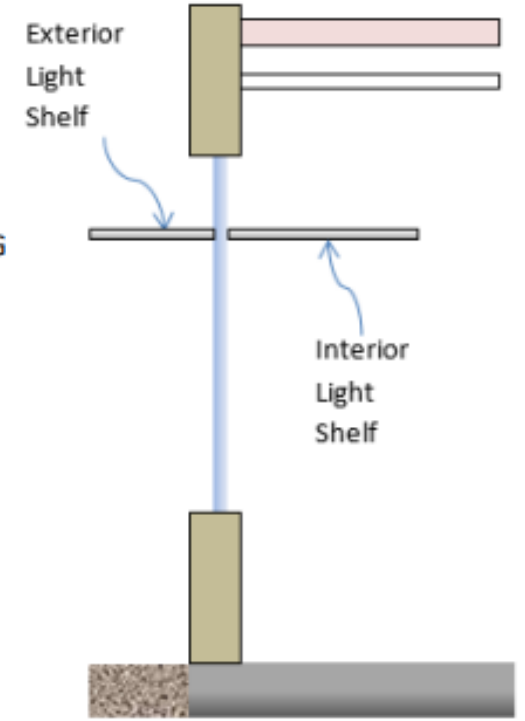
PAF for qualifying small aperture tunable-white and dim-to-warm LED luminaires



Clerestory



Horizontal slats



Light shelves



140.6(c) Calculation of Allowed Indoor Lighting Power

Three methods to calculate lighting power allowance:

- Complete Building Method
- Area Category Method
- Tailored Method



140.6(c)1 Complete Building Method

- TABLE 140.6-B lists building types and corresponding LPDs
- Single LPD for entire building or tenant space
- Building or tenant space must be at least 90 percent one use type

TABLE 140.6-B COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES

TYPE OF BUILDING	ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)
Assembly Building	0.65
Bank or Financial Institution Building	0.65
Grocery Store Building	0.90
Gymnasium Building	0.60
Healthcare Facility	0.90
Industrial/Manufacturing Facility Building	0.60
Library Building	0.70
Motion Picture Theater Building	0.60
Museum Building	0.65
Office Building	0.60
Parking Garage Building	0.13
Performing Arts Theater Building	0.75
Religious Facility Building	0.70
Restaurant Building	0.65
Retail Store Building	0.90
School Building	0.60
Sports Arena Building	0.75
All other buildings	0.40



140.6(c)2 Area Category Method

- TABLE 140.6-C lists function areas and corresponding LPDs
- Each area calculated separately
- Sum allowed lighting power for all areas combined
- Additional allowance for specific lighting



Excerpt From TABLE 140.6-C

Primary Function Area		Allowed Lighting Power Density for General Lighting (W/ft ²)	Additional Lighting Power	
			Qualified Lighting Systems	Additional Allowance (W/ft ² , unless noted otherwise)
Aging Eye/Low-vision ¹¹	Corridor Area	0.70	Decorative/Display	0.30
	Dining	0.80	Decorative/Display	0.30
			Tunable white or dim-to-warm ¹⁰	0.10
	Lobby, Main Entry	0.85	Decorative/Display	0.30
			Transition Lighting OFF at night ¹²	0.95
			Tunable white or dim-to-warm ¹⁰	0.10
	Lounge/Waiting Area	0.80	Decorative/Display	0.30
			Tunable white or dim-to-warm ¹⁰	0.10
	Multipurpose Room	0.85	Decorative/Display	0.30
			Tunable white or dim-to-warm ¹⁰	0.10



140.6(c)3 Tailored Method

- TABLE 140.6-D lists function areas and target illumination levels
- Provides general lighting power allowance
- Provides additional allowance for specialized lighting if needed:
 - Wall display
 - Floor display
 - Ornamental that is decorative or special effects



Source: Acuity Brands Lighting, Inc.



TABLES 140.6-D through G

TABLE 140.6-D TAILORED METHOD LIGHTING POWER ALLOWANCE

1	2	3	4
Primary Function Area	General Illumination Level (Lux)	Wall Display Lighting Power Density (W/ft ²)	Allowed Combined Floor Display Power and Task Lighting Power Density (W/ft ²)
Auditorium Area	300	3.00	0.20
Convention, Conference, Multipurpose, and Meeting Center Areas	300	2.00	0.30
Dining Areas	200	1.25	0.45
Exhibit, Museum Areas	150	11.20	0.70
Hotel Area:			
Ballroom/Events	400	1.80	0.12
Lobby	200	3.40	0.20
Lobby, Main entry	200	3.40	0.20
Religious Worship Area	300	1.30	0.40
Retail Sales			
Grocery	600	6.60	0.60
Merchandise Sales, and Showroom Areas	500	11.50	0.70
Theater Area:			
Motion picture	200	2.00	0.20
Performance Arts	200	7.30	0.20

TABLE 140.6-E TAILORED WALL AND FLOOR DISPLAY MOUNTING HEIGHT ADJUSTMENT FACTORS

Height in feet above finished floor and bottom of luminaire(s)	Floor Display or Wall Display Mounting Height Adjustment Factor
≤ 10'-6"	1.00
> 10'-6" to 14'-0"	0.85
> 14'-0" to 18'-0"	0.75
> 18'-0"	0.70

TABLE 140.6-F ROOM CAVITY RATIO (RCR) EQUATIONS

Determine the Room Cavity Ratio for TABLE 140.6-G using one of the following equations.

Room cavity ratio for rectangular rooms

$$RCR = \frac{5 \times H \times (L + W)}{L \times W}$$

Room cavity ratio for irregular-shaped rooms

$$RCR = \frac{2.5 \times H \times P}{A}$$

Where: L = Length
P = Perimeter of room

General Lighting Power Density (W/ft²) for the following RCR values^b

General Illuminance Level (lux) ^a	RCR ≤ 2.0	RCR > 2.0 and ≤ 3.5	RCR > 3.5 and ≤ 7.0	RCR > 7.0
150	0.35	0.40	0.50	0.65
200	0.40	0.50	0.65	0.85
300	0.55	0.70	0.85	1.20
400	0.65	0.80	1.05	1.25
500	0.80	0.90	1.25	1.55
600	0.90	1.05	1.40	2.00

^a Illuminance values from Column 2 of TABLE 140.6-D.

^b RCR values are calculated using applicable equations in TABLE 140.6-F.



Additions and Alterations





141.0(b)2I Indoor Lighting Alterations

Altered Indoor Lighting Systems

- Include 10% or more of the luminaires serving an enclosed space

Exceptions

- Spaces with one luminaire
- One-for-one alteration of 50 luminaires per year or less



141.0(b)2I Indoor Lighting Alterations Cont.

Reduction of existing lighting power

- All space types – 40% reduction
- One-for-one alterations
- Limited to alterations 5,000 ft² or less





141.0(b)2I Indoor Lighting Alterations Cont.

- Alteration requirements apply if $\geq 10\%$ of luminaires in an enclosed space are altered
- Control requirements depend on the proposed lighting power:
 - Lighting power $\leq 80\%$: Area controls and shut-off controls
 - Lighting power $> 80\%$: All mandatory controls
 - See TABLE 141.0-F
- **One-for-one luminaire alteration** and building or tenant space $\leq 5,000 \text{ ft}^2$
 - If wattage of altered luminaires is at least 40% lower than existing: area controls and shut-off controls



141.0(b)2I Indoor Lighting Alterations Cont.

Table 141.0-F – Control Requirements for Indoor Lighting System Alterations

Control Specifications		Projects complying with Section 141.0(b)2Ii	Projects complying with Sections 141.0(b)2Iii or 141.0(b)2Iiii
Manual Area Controls	130.1(a)1	Required	Required
Manual Area Controls	130.1(a)2	Required	Required
Manual Area Controls	130.1(a)3	Only required for new or completely replaced circuits	Only required for new or completely replaced circuits
Multilevel Controls	130.1(b)	Required	Not Required
Automatic Shut Off Controls	130.1(c)1	Required; 130.1(c)1D only required for new or completely replaced circuits	Required; 130.1(c)1D only required for new or completely replaced circuits
Automatic Shut Off Controls	130.1(c)2	Required	Required

Automatic Shut Off Controls	130.1(c)3	Required	Required
Automatic Shut Off Controls	130.1(c)4	Required	Required
Automatic Shut Off Controls	130.1(c)5	Required	Required
Automatic Shut Off Controls	130.1(c)6	Required	Required; except for 130.1(c)6D
Automatic Shut Off Controls	130.1(c)7	Required	Required
Automatic Shut Off Controls	130.1(c)8	Required	Required
Daylighting Controls	130.1(d)	Required	Not Required
Demand Responsive Controls	110.12(a) and 110.12(c)	Required	Not Required



141.0(b)2I Indoor Lighting Alterations Cont.

Exceptions

- Alteration of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded per Section 140.6(a)3
- An enclosed space with only one luminaire
- An alteration that would directly cause the disturbance of asbestos, unless the alteration is made in conjunction with asbestos abatement
- Acceptance testing requirements of Section 130.4 do not apply to alterations where lighting controls are added to control 20 or fewer luminaires



141.0(b)2I Indoor Lighting Alterations Cont.

Exceptions (Continued)

- Alterations limited to adding lighting controls or replacing lamps, ballasts, or drivers
- One-for-one luminaire alteration of up to 50 luminaires per complete floor of the building or per complete tenant space, per annum



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)

1



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Energy Code Hotline



Monday through Friday

- 8:00 a.m. to 12:00 p.m.
- 1:00 p.m. to 4:30 p.m.

Call

- 800-772-3300 in CA
- 916-654-5106 outside CA

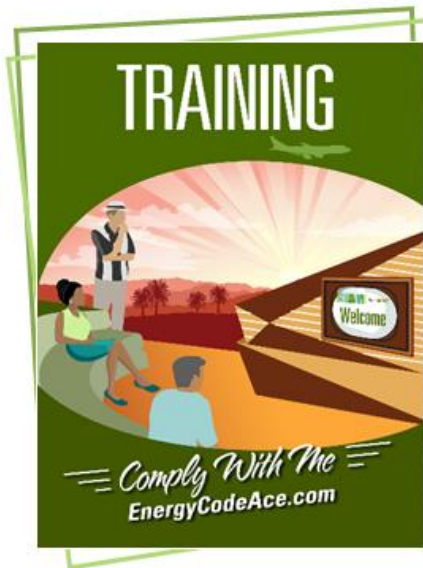
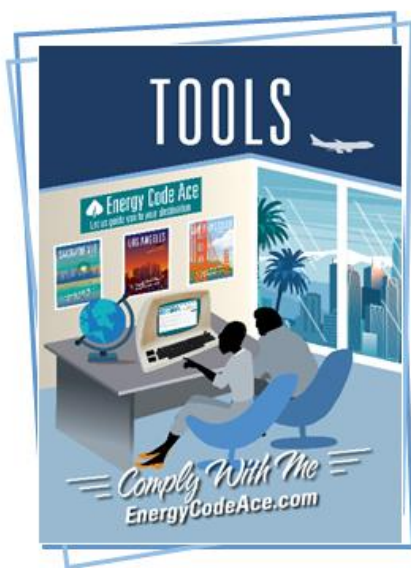


Email

- 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

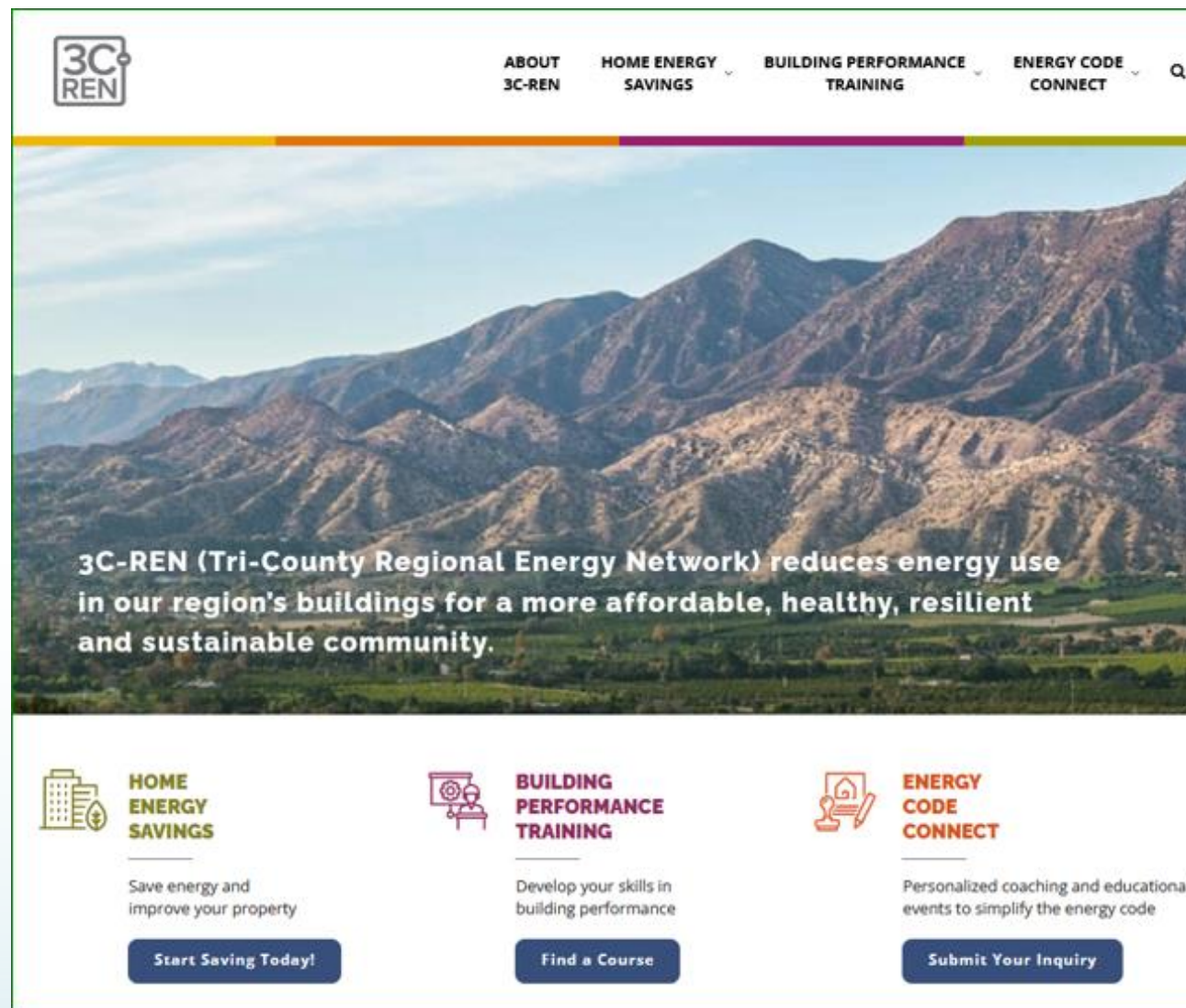
- Training is activity based and delivered in a variety of formats:**
- ✦ Live Online instructor-led
 - ✦ Recorded webinars
 - ✦ Online self-study
 - ✦ YouTube — live streaming & videos

- Resources provide quick, useful guidance:**
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 - ✦ Application Guides
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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' and includes the subtext 'Save energy and improve your property' and a 'Start Saving Today!' button. The second column is titled 'BUILDING PERFORMANCE TRAINING' and includes the subtext 'Develop your skills in building performance' and a 'Find a Course' button. The third column is titled 'ENERGY CODE CONNECT' and includes the subtext 'Personalized coaching and educational events to simplify the energy code' and 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.

HOME ENERGY SAVINGS
Save energy and improve your property
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BUILDING PERFORMANCE TRAINING
Develop your skills in building performance
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ENERGY CODE CONNECT
Personalized coaching and educational events to simplify the energy code
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BayREN

The screenshot displays the BayREN website interface. On the left is a vertical navigation 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 top navigation bar includes links for **HOW TO GET STARTED**, **FIND A CONTRACTOR**, **FIND AN ASSESSOR**, and **PARTNER WITH US**, along with an accessibility icon. A search bar is located in the top right corner. The main content area features a large background image of a park with a playground and people sitting at tables. Overlaid on the right side of this image is a dark purple circular call-to-action box. Inside the box, there is an icon of a stack of coins with a dollar sign. The text reads: **Score big with smart energy upgrades.** Below this, it says: *Upgrade your multifamily building and earn cash back — starting at \$750/unit.* A yellow button labeled **Learn More** is positioned at the bottom right of the call-to-action box. Navigation arrows are visible at the bottom right of the main image area.



Inland Regional Energy Network (I-REN)



iren.gov
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Codes and Standards

Training and Education Program

- 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

Ask a Code Mentor an Energy Code Question

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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Thank you