



WHAT'S NEW IN THE 2013 CODE?

Changes to mandatory Title 24 lighting requirements

California's new Building Energy Efficiency Standards take effect in 2014. They improve the energy efficiency of homes by 25 percent and make nonresidential buildings 30 percent more efficient than the previous 2008 standards. This brief guide offers an overview of important requirements and major updates to the lighting code.

New requirements for lighting controls constitute one of the biggest changes to Title 24 standards. The latest version of the standards also includes more stringent requirements for the testing and certification of controls commissioning.

All lighting control systems with two or more components—in both residential and non-residential spaces—must meet the requirements of 2013 Title 24 standards, **Section 110.9**. Both stand-alone and luminaire-integrated lighting controls, such as vacancy sensors and photocontrols, must now comply with Title 20 regulations.

NON-RESIDENTIAL INDOOR LIGHTING REQUIREMENTS

All interior luminaires in non-residential buildings must have manual on/off controls, and each area must be independently controlled. Dimmer switches must allow manual on/off functionality, with some exceptions such as public restrooms with two or more stalls, which do not need a publicly accessible switch.

MULTI-LEVEL LIGHTING CONTROLS

In areas larger than 100 ft², installed luminaires must:

- Incorporate multi-level lighting controls or continuous dimming, depending on the lamp type
- Meet the uniformity requirements in **Table 130.1-A**
- Have at least one of the following types of controls for each luminaire:
 - » Manual continuous dimming and on/off control (**Section 130.1(a)**)
 - » Lumen maintenance (**Section 100.1**)
 - » Tuning (**Section 100.1**)
 - » Automatic daylighting controls (**Section 130.1(d)**)
 - » Demand response controls (**Section 130.1(e)**)

Classrooms are one of the rare exceptions to the multi-level requirements. Instead, if they have a connected general lighting load $\leq 0.7 \text{ W/ft}^2$, they must have at least one control step between 30% and 70% of full-rated power.



More retrofit projects will be required to meet new-construction standards for both lighting power density (LPD) and controls. The only exceptions are buildings with fewer than 40 ballasts being replaced and spaces where less than 10% of the lighting is affected.

AUTOMATIC DAYLIGHTING CONTROLS

Under **Section 140.3 (c)** of the 2008 code, just 50% of the floor area in buildings over 8,000 ft² was required to be in daylighting zones. **Section 140.3 (c)** of the 2013 code requires that floor plans have 75% of their total area in daylight zones, and it applies the rule more broadly, to buildings > 5,000 ft².

In these daylighting zones, controls requirements have also become more stringent. Before, only sky-lit spaces $\geq 2,500$ ft² and side-lit spaces ≥ 250 ft² had to have daylighting controls. **Section 130.1 (d)** now requires multi-level automatic daylighting controls in all sky-lit or side-lit zones where the installed general lighting power is ≥ 120 W.

New daylighting controls requirements for parking garages are addressed on page 4 of this guide.

OCCUPANT-SENSING LIGHTING CONTROLS

Section 130.1 of the 2013 code requires occupant-sensing controls that automatically turn off all lighting in the following areas during vacant periods:

- Offices ≤ 250 ft²
- Conference rooms of any size
- Multipurpose rooms < 1000 ft²
- Classrooms of any size
- Secondary spaces
- Indoor parking areas

Indoor parking areas, including parking garages, and secondary spaces are new additions.

SECONDARY SPACES

Under the 2013 code, occupant-sensing controls must automatically reduce lighting power by 50% in these areas when they are unoccupied:

- Corridors and stairwells
- Warehouse aisles and open areas
- Library book stack aisles ≥ 10 ft in length and accessible from only one end and those ≥ 20 ft in length and accessible from both ends

SECURITY AND EGRESS LIGHTING

Under the 2008 code, most buildings had a lighting allowance of 0.3 W/ft² for security and egress purposes, at all times. **Section 130.1** of the 2013 standards includes the following new requirements:

- Maximum security and egress lighting allowance of 0.2 W/ft² when a building is occupied
- General and egress lighting must be shut off during unoccupied times

Exception

Offices are allowed up to 0.05 W/ft² for lighting during unoccupied periods, but only along emergency egress areas designated on the building plans.

TABLE 130.1 - A

NON-RESIDENTIAL MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS		
Luminaire Type	Minimum Required Control Steps (Percent of Full Rated Power)	Uniform Level of Illuminance Shall Be Achieved by:
Line-voltage sockets except GU-24	Continuous dimming 10–100%	
Low-voltage incandescent systems		
LED luminaires and LED source systems		
GU-24 rated for LED		
GU-24 sockets rated for fluorescent > 20W	Continuous dimming 20–100%	
Pin-based compact fluorescent > 20W		
GU-24 sockets rated for fluorescent ≤ 20W	Minimum one step between 30–70%	<ul style="list-style-type: none"> ▪ Stepped dimming or ▪ Continuous dimming or ▪ Switching alternate lamps in a luminaire
Pin-based compact fluorescent ≤ 20W		
Linear fluorescent and U-bent fluorescent ≤ 13W		
Linear fluorescent and U-bent fluorescent > 13W	Minimum one step in each range: 20–40% 50–70% 80–85% 100%	<ul style="list-style-type: none"> ▪ 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
Track lighting	Minimum one step between 30–70%	<ul style="list-style-type: none"> ▪ Step dimming or ▪ Continuous dimming or ▪ Separately switching circuits in multi-circuit track with a minimum of two circuits
HID > 20W	Minimum one step between 50–70%	<ul style="list-style-type: none"> ▪ 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
Induction > 25W		
Other light sources		

DEMAND RESPONSE CONTROLS

The 2008 code only required DR capability in retail buildings with sales floor areas $\geq 50,000$ ft². The 2013 code expands this considerably, requiring that all non-residential buildings $\geq 10,000$ ft² be capable of automatically responding to a DR signal, so that:

- Total energy use for lighting can automatically drop to a level at least 15% below the building's maximum total lighting power
- Lighting is reduced in a manner consistent with requirements for uniform illumination levels (listed in **Table 130.1-A**)

Non-habitable spaces must not be used to comply with this requirement, and spaces with a lighting power density ≤ 0.5 W/ft² are not counted toward the building's total lighting power. Designers are still responsible for specifying automated controls that are compatible with the local utility's DR protocol.

PARKING GARAGES & AREAS

Parking garages are classified as indoor spaces under Title 24 lighting regulations and must comply with **Section 130.1(c)7B**. Top-level roof areas are the exception; these are classified as outdoor hardscape and must comply with the applicable provisions in **Section 130.2**. The following regulations are new for parking garages:

- In parking garages, other indoor parking areas, and loading and unloading areas, general lighting must be controlled by occupant-sensing controls having at least one control step between 20% and 50% of design lighting power
- In a parking garage area with a combined total of 36 ft² or more of glazing or opening, luminaires providing general lighting that are in the combined primary and secondary sidelit daylight zones must be controlled independently by automatic photocontrols
- Automatic daylighting controls must be multi-level, continuous dimming or on/off
- When primary sidelit zones receive sufficient daylight to reach illuminance levels above 150% of that provided by electric lighting when no daylight is available, controls must reduce lighting power consumption to zero

NON-RESIDENTIAL OUTDOOR LIGHTING REQUIREMENTS

Outdoor lighting must be circuited and independently controlled from other electric loads.

All outdoor luminaires rated for use with lamps ≥ 150 W must comply with the IES BUG system for assessing and limiting uplight and glare. There are no backlight requirements in this iteration of the code. This marks a change from the cutoff system used for the 2008 standards, which only applied to luminaires ≥ 175 W.

AUTOMATIC DAYLIGHTING CONTROLS

Title 24 2008 required photocontrol devices for all outdoor lighting. In addition to photocontrols, the 2013 standards require automatic scheduling controls; astronomical time-switch controls that automatically turn lights off during daylight hours are allowed as an alternative to photocontrol devices. **Section 130.2(c)** addresses these requirements.

LUMINAIRES MOUNTED ≤ 24 FEET ABOVE THE GROUND

In addition to photocontrols and automatic scheduling, **Section 130.2(c)** also requires occupant-sensing controls for certain outdoor lighting applications. No more than 1,500 W of lighting power may be controlled together for outdoor lighting of this type. Automatic lighting controls for these luminaires must:

- Utilize motion sensors or another automatic lighting control system, in addition to photocontrols and automatic scheduling controls (or astronomical time-switch controls)
- Be capable of automatically reducing the lighting power of each luminaire by at least 40%, but not more than 80%, or provide continuous dimming through a range that includes 40–80%, during vacant periods
- Switch on automatically when the area becomes occupied

Exceptions

These types of lighting constitute exceptions to the above requirements:

- Pole-mounted luminaires with a maximum rated wattage of 75 W
- Non-pole-mounted luminaires with a maximum rated wattage of 30 W
- Linear lighting with a maximum wattage of 4 W per linear foot of luminaire
- Outdoor sales: frontage, lots and canopies

372 GWh/year

*The amount of electricity that can be saved by the 2013 improvements to non-residential standards alone.**

California Energy Commission Staff Presentation (May 31, 2012) *Includes HVAC, water heating, etc. in addition to lighting

OUTDOOR SALES LIGHTING

The 2013 code adds occupant-sensing controls to the requirements for outdoor sales lighting for frontage areas, lots and canopies. Lighting controls in these areas must meet the requirements that apply to all outdoor lighting, and they must automatically:

- Reduce lighting power by at least 40%, but not more than 80%, during vacant periods
- Switch to the higher lighting level when the space becomes occupied

BUILDING FACADES, ORNAMENTAL HARDSCAPE & OUTDOOR DINING AREAS

Like outdoor sales areas, these areas must have lighting controls that reduce energy use during unoccupied periods and automatically increase light levels when the space becomes occupied. One or both of the following control strategies is allowed:

- Motion sensors capable of automatically reducing lighting power by at least 40%, but not more than 80%, during vacant periods
- A centralized time-based zone lighting control capable of automatically reducing lighting power by at least 50%

Wall packs (defined by the IES Handbook as outdoor wall-mounted luminaires having a bilaterally symmetric distribution) must comply with the applicable requirements in **Section 130.2(c)3** where the bottom of the luminaire is mounted \leq 24 ft above the ground.

OUTDOOR INCANDESCENT LIGHTING

Per **Section 130.2(a)**, all outdoor incandescent luminaires rated over 100 W installed for non-residential use must be controlled by a motion sensor.

NON-RESIDENTIAL COMMISSIONING & ACCEPTANCE TESTING REQUIREMENTS

Title 24 now requires that a commissioning report be completed and provided to each building owner. This includes reports on all functional performance tests completed as part of the acceptance test process.

Projects issued a building permit on or after January 1, 2014 must undergo acceptance testing for:

- Automatic daylighting controls
- Automatic time switch controls
- Occupancy sensors
- Outdoor lighting shut-off controls
- Outdoor motion sensors
- Demand response (DR) controls

Testing of DR controls is a new requirement under Title 24 2013. Building commissioning requirements are addressed in **Section 120.8**.

As soon as July 1, 2014, lighting controls acceptance test technicians will have to be certified through an approved training program, such as the California Advanced Lighting Controls Training Program (CALCTP), and registered with the State of California. Technicians' employers will also have to be certified. Technician training and certification requirements are addressed in **Section 13.11** (page 1049) of the *Non-Residential Compliance Manual*.



RESIDENTIAL INDOOR LIGHTING REQUIREMENTS

The 2013 residential code increases energy efficiency standards for skylights and windows, and it updates and clarifies requirements for lighting in kitchens, bathrooms, garages, utility rooms, and other spaces. The new mandatory requirements are outlined in this section.

ELECTRONIC BALLASTS

Ballasts for fluorescent lamps rated ≥ 13 W must be electronic and have an output frequency ≥ 20 kHz.

HIGH EFFICACY CRITERIA

To qualify as high-efficacy, luminaires must be certified to the California Energy Commission. Luminaires that can accept low-efficacy lamps and LED luminaires that have not been certified do not qualify as high efficacy. With the exception of decorative, monochromatic LEDs, **Joint Appendix JA8** requires that LED luminaires designed for indoor residential use have a minimum CRI of 90 and a CCT of 2700K–4000K in order to qualify as high efficacy. Full criteria are in **Table 150.0-A** and **Joint Appendix JA8**.

Luminaires not described in **Table 150.0-A** must meet high-efficacy requirements listed in **Table 150.0-B**:

≤ 5 W	30 lm/W
> 5 W – 15 W	45 lm/W
> 15 W – 40 W	60 lm/W
> 40 W	90 lm/W

Joint Appendix JA8 of the 2013 code sets new quality standards for LED luminaires designed for general indoor residential lighting. To qualify as high efficacy, these sources must offer accurate color rendering, with a CRI ≥ 90 , and a CCT of 2700K–4000K.

SWITCHING DEVICES AND CONTROLS

The following are mandatory requirements:

- High-efficacy luminaires must be switched separately from low-efficacy luminaires
- Exhaust fans must be switched separately from lighting systems
- Luminaires must be switched with readily accessible controls that permit manual on/off switching
- No controls may bypass a dimmer or vacancy sensor function where that dimmer or vacancy sensor has been installed to comply with **Section 150.0(k)**

BATHROOMS

Section 150.0(k) requires at least one high-efficacy luminaire in each bathroom. All other lighting must be high efficacy or controlled by vacancy sensors.



KITCHENS

A minimum of 50% of the total rated wattage of permanently installed lighting in kitchens must be high-efficacy lighting.

Lighting permanently installed inside cabinets may use a maximum of 20W per linear foot of illuminated cabinet.

Regardless of the number of shelves or doors per cabinet section, the length of an illuminated cabinet must be determined using one of the following measurements:

- One horizontal length of illuminated cabinet
- One vertical length per illuminated cabinet section
- No more than one vertical length per every 40 horizontal inches of illuminated cabinet

GARAGES, LAUNDRY ROOMS AND UTILITY ROOMS

Lighting installed in attached and detached garages, laundry rooms and utility rooms must be high-efficacy and controlled by a vacancy sensor.

OTHER AREAS

Lighting installed in any rooms or areas other than those above must be high efficacy or must be controlled by either dimmers or vacancy sensors.

Night lights permanently installed or integral to installed luminaires or exhaust fans must be rated to consume no more than 5W of power per luminaire and may not be controlled by vacancy sensors.

RESIDENTIAL OUTDOOR LIGHTING REQUIREMENTS

CONTROLS

For single-family residential buildings, outdoor lighting permanently attached to a residential building or other buildings on the same lot must generally be high efficacy.

Low-efficacy outdoor lighting must be controlled by all of the following:

- A manual on/off switch that does not override to on
- A motion sensor not having an override or bypass switch that disables the motion sensor, or a motion sensor with an override switch that temporarily bypasses the motion sensing function and automatically reactivates the motion sensor within 6 hours
- A photocontrol, astronomical time clock or energy management control system that does not have an override or bypass switch disabling the control and is programmed to automatically turn the outdoor lighting off during daylight hours.

LED QUALITY REQUIREMENTS

Outdoor LED luminaires do not have to meet the CRI requirement in **Joint Appendix JA8**, but those permanently attached to residential buildings must have a CCT of 2700K–5000K in order to qualify as high efficacy. Decorative, monochromatic LEDs are the exception to this rule. LED landscape luminaires are also not required to be certified to the Commission for compliance with **Joint Appendix JA8**.

ADDITIONAL RESOURCES

CALIFORNIA ENERGY COMMISSION

www.energy.ca.gov/title24/2013standards

For nearly 35 years, the California Energy Commission has saved Californians more than \$66 billion in energy costs through its standards for energy-efficient buildings and appliances. These same standards have improved windows, lighting, air conditioning and insulation while reducing greenhouse gas emissions by more than 250 million metric tons.

CALIFORNIA'S 2013 BUILDING ENERGY EFFICIENCY STANDARDS: AN INFOGRAPHIC

www.energy.ca.gov/title24/2013standards/rulemaking/documents/2013_Building_Energy_Efficiency_Standards_infographics.pdf

A quick look at some of the most important changes to both the residential and non-residential standards.

FREQUENTLY ASKED QUESTIONS

www.energy.ca.gov/title24/2013standards/rulemaking/documents/2013_Building_Energy_Efficiency_Standards_FAQ.pdf

Answers to some of the most commonly asked questions about the Building Energy Efficiency Standards.

2013 BUILDING ENERGY EFFICIENCY STANDARDS

www.energy.ca.gov/title24/2013standards/rulemaking/documents/final_rulemaking_documents/44_Final_Express_Terms/2013_Standards_FINAL.pdf

The most up-to-date version of the 2013 Building Energy Efficiency Standards: Title 24, Part 6, and Associated Administrative Regulations in Part 1.

ADOPTION HEARING PRESENTATION

www.energy.ca.gov/title24/2013standards/rulemaking/documents/2012-05-31_2013_standards_adoption_hearing_presentation.pdf

A recent presentation on the new standards' potential impacts and their benefits to Californians.

CALIFORNIA LIGHTING TECHNOLOGY CENTER

cltc.ucdavis.edu/title24

Visit the CLTC website for additional resources regarding Title 24, including technology updates and lighting design guides for retail, office and residential spaces.

NOTE: This guide is not a substitute for the code itself or the California Energy Commission's 2013 Residential and Nonresidential Compliance Manuals. It is intended to offer basic help to those familiarizing themselves with the latest code requirements.

ABOUT THE CALIFORNIA LIGHTING TECHNOLOGY CENTER: *The California Lighting Technology Center was created in 2003 by the California Energy Commission in collaboration with the U.S. Department of Energy and the National Electrical Manufacturers Association. Part of the Department of Design at the University of California, Davis, CLTC is dedicated to accelerating the development and deployment of energy-efficient lighting and daylighting technologies.*