What's New in the 2016 Standards?

Changes to the Mandatory Title 24 lighting requirements

California's new Building Energy Efficiency Standards took effect in 2014. They improve the energy efficiency of homes by 25 percent and make non-residential 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 2016 Title 24 standards, Section 110.9. Both stand-alone and luminaire-integrated lighting controls, such as vacancy sensors and photo-controls, must now comply with Title 20 regulations.

NON-RESIDENTIAL

INDOOR LIGHTING REQUIREMENTS

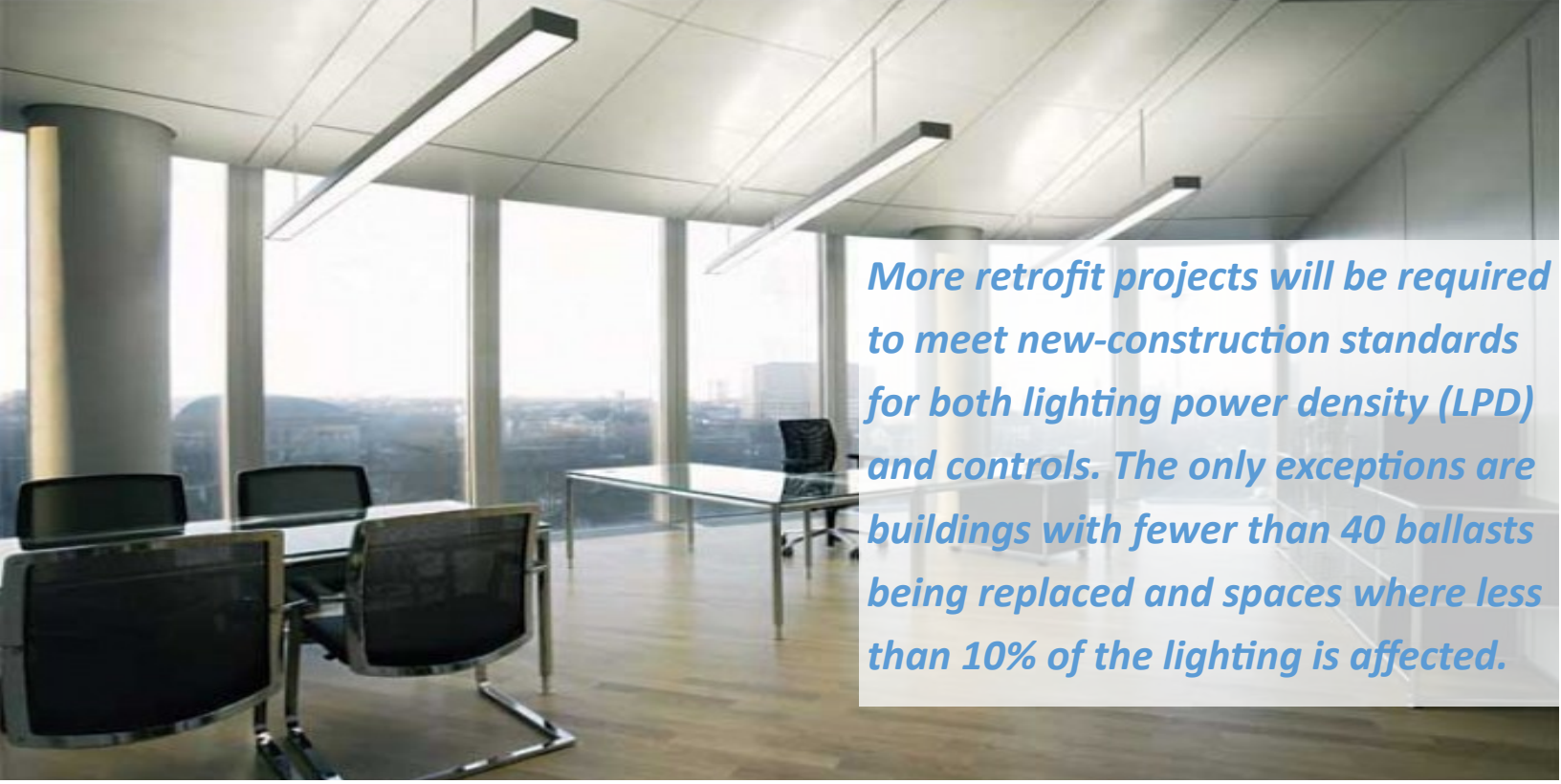
All interior luminaires in non-residential buildings must have manual on / off controls, and each area must be independently controlled. Dimmer switches must allow manual on / off functionality, with some exceptions such as public restrooms with two or more stalls, which do not need a publicly accessible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

MULTI-LEVEL LIGHTING CONTROL

In areas larger than 100sf., 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.
  - ⇒ Tuning
  - ⇒ Automatic daylighting controls
  - ⇒ Demand response controls

Classrooms are one of the rare exceptions to the multi-level requirements. Instead, if they have a connected general lighting load ≤ 0.7 W / sf., 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 sf. 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 sf.

In these daylighting zones, controls requirements have also become more stringent. Before, only sky-lit spaces ≥ 2,500 sf. and side-lit spaces ≥ 250 sf. 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 ≥ 120W.

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

AUTOMATIC SHUTOFF (OCC. SENSOR)

Section 130.1c of the 2016 code requires occupant sensing controls that automatically turn off all lighting in the following areas during vacant periods. Additionally, these spaces must be either manual on or a step of partial on between 50%-70%.

- Offices < 250 sf.
- Multi-purpose rooms < 1000 sf.
- Classrooms of any size.
- Conference rooms of any size.

SECONDARY SPACES

Under the 2016 code, occupant-sensing controls must automatically reduce lighting power by at least 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 / sf. for security and egress purposes, at all times. Section 130.1 of the 2016 standards includes the following new requirements:

- Maximum security and egress lighting allowance of 0.1 W/ sf. when a building is occupied.
- General and egress lighting must be shut off during unoccupied times.

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

DEMAND RESPONSE

The 2008 code only required DR capability in retail buildings with sales floor areas ≥ 50,000 sf. The 2016 code expands this considerably, requiring that all non-residential buildings ≥ 10,000 sf. 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% and not more than 50% 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 / sf. 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. 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 sf. or more of glazing or opening, luminaires providing general lighting that are in the combined primary and secondary side-lit day-lit zones are over 60w. The area must be controlled independently by automatic photo-controls.
- Automatic daylighting controls must be multi-level, continuous dimming or on / off.
- When primary side-lit 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 REQUIRMENTS

Outdoor lighting must be circuited and independently controlled from other electric loads. All outdoor luminaires rated for use with lamps ≥ 150W 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 ≥ 175W.

AUTOMATIC DAYLIGHTING CONTROLS

Title 24 2008 required photo-control devices for all outdoor lighting. In addition to photo-controls, the 2016 standards require automatic scheduling controls; astronomical time-switch controls that automatically turn lights off during daylight hours are allowed as an alternative to photo-control devices. Section 130.2(c) addresses these requirements.

LUMINAIRES MOUNTED ≤ 24 FEET ABOVE THE GROUND

In addition to photo-controls 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 photo-controls 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 90%, or provide continuous dimming through a range that includes 40 – 90%, during vacant periods.
- Switch on automatically when the area becomes occupied .

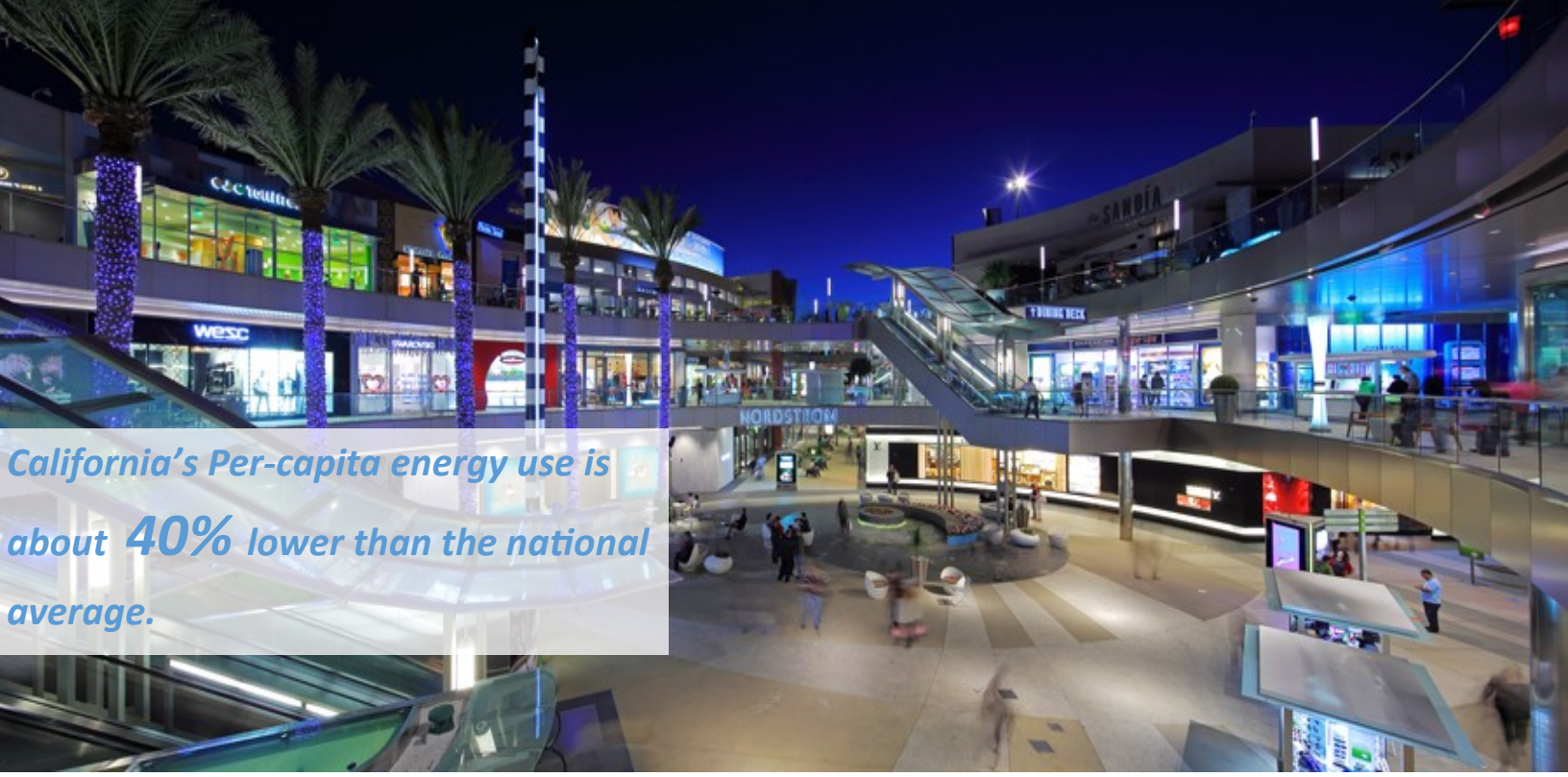
  Exceptions:

  ⇒ Pole-mounted luminaires with a maximum rated wattage of 75W

  ⇒ Non-pole-mounted luminaires with a maximum rated wattage of 30W

  ⇒ Outdoor sales: frontage, lots and canopies

TABLE 130.1-A	NON-RESIDENTIAL MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS	
Luminaire Type	Minimum Required Control Steps	Uniform Level of Illuminance Shall Be Achieved by:
• Line-voltage sockets except GU-24 • Low-voltage incandescent systems • LED luminaires and LED source systems • GU-24 rated for LED	Continuous dimming 10 – 100%	
• GU-24 sockets rated for fluorescent >20W • Pin-based compact fluorescent > 20W	Continuous dimming 20 – 100%	
• GU-24 sockets rated for fluorescent ≤ 20W • Pin-based compact fluorescent ≤ 20W • Linear fluorescent and U-bent fluorescent ≤ 13W	Minimum one step between 30 – 70%	• Stepped dimming or • Continuous dimming or • Switching alternate lamps in a luminaire
• Linear fluorescent and U-bent fluorescent >13W	Minimum one step in each range: 20 – 40% 50 – 70% 80 – 85% 100%	• 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 %	• Step dimming or • Continuous dimming or • Separately switching circuits in multi-circuit track with a minimum of two circuits
• HID >20W • Induction >25W • Other light sources	Minimum one step between 50 – 70%	• 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



California's Per-capita energy use is about 40% lower than the national average.

OUTDOOR SALES LIGHTING

The 2016 code employ's 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 90%, 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 90%, during vacant periods.
- A centralized time-based zone lighting control capable of automatically reducing lighting power by at least 50%.

NON-RESIDENTIAL

LIGHTING CONTROLS ACCEPTANCE TESTING

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 July 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 of July 1, 2014, lighting controls acceptance test technicians 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 also have to be certified. Technician training and certification requirements are addressed in Section 13.11