

## WHAT'S NEW IN THE 2016 CODE?

# RESIDENTIAL LIGHTING

Changes to mandatory lighting requirements in California's 2016 Building Energy Efficiency Standards

California's new residential Building Energy Efficiency Standards take effect on January 1, 2017. The 2016 Standards focus on several key areas to improve the energy efficiency of newly constructed buildings, additions and alterations to existing buildings. The most significant efficiency improvements address attics, walls, water heating and lighting. The California Energy Commission estimates that the 2016 standards will deliver approximately 281 gigawatt-hours of electricity savings annually and reduce statewide greenhouse gas emissions by 160,000 metric tons. This is enough electricity to power 500,000 California homes each year.

These standards represent a major step towards meeting California's residential Zero Net Energy (ZNE) goal by the year 2020. Updates enhance and simplify previous requirements and lay the foundation for additional efficiency improvements slated for 2019 code. This publication offers an overview of important requirements and major updates to the 2016 residential lighting energy efficiency code.

## MAJOR CHANGES



### ALL HIGH EFFICACY LIGHTING

Indoor and outdoor lighting for new homes must be high efficacy.



### JA8 UPDATED

Joint Appendix JA8 regulations now contain requirements for more types of residential high efficacy lamps and luminaires. In the 2013 Standards, JA8 regulations only applied to LED sources.



### SIMPLIFIED CONTROL REQUIREMENTS

Lighting control requirements for indoor spaces are now simpler. Control requirements are based, in nearly all cases, on the type of lamp or luminaire installed, not the space.

*This guide is not intended to be used in lieu of California's Building Energy Efficiency Standards, and it is not a substitute for the code itself. Please visit [energy.ca.gov/title24/2016standards](http://energy.ca.gov/title24/2016standards) to download the official 2016 Title 24 Building Energy Efficiency Standards, Errata, Reference Appendices, and the Nonresidential Compliance Manual.*

# INDOOR LIGHTING REQUIREMENTS

## High Efficacy Lighting

New regulations require that lighting in new homes be high efficacy, while also expanding the types of lighting that qualify as high efficacy. This change eliminates most space by space requirements and ensures that a variety of lighting technologies and techniques are available to builders and contractors. This also removes the need for calculating the wattage of low versus high efficacy luminaires in kitchens.

### JA8 COMPLIANT LAMPS & LUMINAIRES

The definition of “high efficacy luminaires” includes all light sources identified as “efficient” under the 2013 Standards. This includes linear fluorescent, pin based compact fluorescent, GU-24 base CFL, HID, and induction. High efficacy products include any luminaire that contains a JA8-compliant lamp or other light source. In other words, any luminaire can qualify as high efficacy as long as it meets the requirements of **Section 150.0 (k)** and **Joint Appendix JA8**. Manufacturers must test their products at an accredited test laboratory and submit the results to the California Energy Commission to gain JA8 certification. A list of compliant products may be found at <https://cacertappliances.energy.ca.gov>.

For lamps to qualify as high efficacy under JA8, they must be certified and marked as either JA8-2016 or JA8-2016-E. These markings mean the light source meets the requirements of **Joint Appendix JA8**, and the product is listed in the Energy Commission product database. Requirements assure lamps and luminaires provide high color quality, have a long life and are energy efficient.

JA8 compliance markings are located on the lamp bulb or base. The marking “JA8-2016-E” indicates that the light source has been tested to provide long life at elevated temperatures in addition to the requirements listed for JA8-2016. Only “JA8-2016-E” lamps may be used in enclosed and recessed luminaires.

## Construction & Inspection

The builder must now provide new homeowners with a luminaire schedule that includes a list of installed lamps and luminaries. This ensures that homeowners know what lighting products they are entitled to when they take possession of a new home.

This also makes lighting inspections much more straight forward as all luminaires are high efficacy, and there is a completed luminaire schedule for the owner.

### Appendix JA8: Qualification Requirements for High Efficacy Light Sources – Partial List

Specification	Requirement
<b>Initial Efficacy</b>	≥ 45 lumens/Watt
<b>Power Factor at Full Rated Power</b>	≥ 0.90
<b>Correlated Color Temperature (CCT)</b>	For inseparable SSL luminaires, LED light engines and GU24 LED lamps, ≤4000 Kelvin. For all other sources, ≤3000 Kelvin.
<b>Color Rendering Index (CRI)</b>	≥90
<b>R9</b>	≥50
<b>Rated Life</b>	≥ 15,000 hours
<b>Minimum Dimming Level</b>	≤ 10%
<b>Flicker</b>	< 30% for frequencies of 200 Hz or below, at 100% and 20% light output.

This table contains a partial list of requirements. Additional qualification requirements may be found in JA8.



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### Switching Devices & Controls

Lighting control requirements for indoor spaces are now simpler. Control requirements are based, in nearly all cases, on the type of lamp or luminaire installed. Any JA8-compliant lamp or luminaire must be controlled by a vacancy sensor or dimmer. In practice, this requirement translates to any screw-base luminaire, ceiling recessed downlight, dedicated LED luminaire, or luminaire with an LED lamp. In addition, all undercabinet lighting must be switched separately from other lighting in the home.

### Screw-Base Luminaires

Under the 2016 Standards, all luminaires that utilize a screw-based socket, excluding hard-wired ballasted HID, must contain lamps that comply with JA8 high efficacy requirements. All enclosed, screw-base luminaires, must utilize a compliant lamp rated for elevated temperatures. Recessed downlight luminaires with screw based sockets are no longer permitted under the 2016 Standards.

### 2016 Indoor Residential Lighting Requirements: Luminaires

Mandatory Measure	Screw-Base Luminaire	Pin-Base <sup>1</sup> Luminaire	Recessed Downlight	Inseparable SSL <sup>5</sup> Luminaire (LED)	Night Lights <sup>2</sup>	All Other
<b>High Efficacy (required)</b>	Yes—All	Yes—All	Yes—All	Yes—All	No	Yes—All
<b>High Efficacy Qualification via JA8 lamps and luminaires<sup>3</sup></b>	All, excluding hard-wired ballasted HID	Only GU-24 LED lamps	All types, and certified compliant for elevated temperatures	All, except colored-decorative	No	All types
<b>Automatic Qualification as High Efficacy: Listed in Table 150.0-A, Column 1 (JA8 compliance not required)</b>	Hard-wired, ballasted HID only	All types, excluding GU-24 LED	None	Colored-decorative	No	None
<b>Dimmer, Vacancy Control or EMCS<sup>4</sup></b>	Yes—All	Not mandatory, except for GU-24 LED	Yes—All	All, except colored-decorative	No	All
<b>Other Requirements</b>	Cannot be a recessed downlight	Must use an electronic ballast	Airtight, IC-rated and maintenance per § 150(k)1.C	None	Must consume 5W or less	None

<sup>1</sup> Excludes recessed downlights

<sup>2</sup> Permanently installed or integral to luminaire or exhaust fan

<sup>3</sup> Enclosed luminaires must use JA8 lamps certified for use at elevated temperatures

<sup>4</sup> Excludes luminaires in closets less than 70 ft<sup>2</sup> and hallways

<sup>5</sup> Solid-state lighting such as LED where the LED source is permanently attached to the luminaire

## Control Requirements by Space

Most space-specific indoor control requirements have been eliminated with one exception. Now, at least one luminaire in the bathroom, garage, laundry room and utility room must be controlled

by a vacancy sensor. Preset scene controllers and EMCS can take the place of dimmers as long as the functionality meets code requirements.

## 2016 Indoor Residential Lighting Requirements: Spaces & Lighting Controls

Residential Space	Manual ON/OFF Controls	Vacancy Sensor or Dimmer <sup>1</sup>	Separate Switching: Exhaust Fans	Separate Switching: Undercabinet Lighting
Hallways & Closets <sup>2</sup>	Required for all spaces	Not required	Exhaust fans must be switched separate from lighting or utilize a device where lighting can be turned OFF while the fan is running. Excludes kitchen exhaust hoods.	Undercabinet lighting must be switched separate from all other lighting.
Kitchens		Based on installed luminaire or lamp type <sup>3</sup>		
Bathrooms		At least one luminaire controlled by a vacancy sensor and all other based on installed lamp or luminaire type		
Laundry Rooms / Utility Rooms				
Garage				
All Other		Based on installed luminaire or lamp type <sup>3</sup>		

<sup>1</sup> May be achieved with an EMCS or programmable scene controller with required functionality.

<sup>2</sup> Closets less than 70ft<sup>2</sup>. For all other closets, requirements based on installed lamp or luminaire type.

<sup>3</sup> See page 3 for a list of requirements by lamp and luminaire type.

## OUTDOOR LIGHTING REQUIREMENTS

All outdoor lighting must now be high efficacy. In addition, for single family homes, lighting mounted to any building on the lot must be controlled by one of the following combinations:

1. Photocell and motion sensor
2. Photocell and time switch
3. Astronomical time clock
4. EMCS with features of astronomical time clock, does not allow the luminaire to be ON during the day, and may be programmed to automatically turn lighting OFF at night.

For low-rise, multifamily residential buildings, outdoor lighting for private patios, balconies, entrances, and porches must also meet these requirements or comply with the applicable nonresidential standards.

Requirements for carports and parking lots vary based on the number of parking spaces they contain. Carports, parking garages and parking lots with eight or more spaces must comply with the nonresidential standards. Smaller parking areas may comply with either the residential or nonresidential standards.

**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.*

**ABOUT ENERGY CODE ACE:** *Developed and provided by the California Statewide Codes & Standards Program, Energy Code Ace offers free energy code training, tools and resources for those who need to understand and meet the requirements of Title 24, Part 6 and Title 20. The program aims to advance the adoption and effective implementation of energy efficiency measures and building practices to lock in long-term energy savings. For more information, visit [energycodeace.com](http://energycodeace.com).*

