# What's New in Title 24, Part 6 2016 and Title 20?

## Lighting Updates

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## Did you Know?

### Permits Can Save Energy

*Statewide gross savings from Codes & Standards realized between now and 2020 is approximately equivalent to:*

- Deferring the need to run a 500 MW power plant for 16 years
- Removing 2.6 million cars from the road

Click here for more information.

### Permits Can Save Money

*and Protect the Value of Your Home Investment:*

- Non-permitted home improvements may not retain their value when you sell

### Permits Can Save Reputations

*Clients value quality and integrity.*

# We offer FREE:

**Ace Tools™**

A variety of tools to help you identify the forms, installation techniques, and standards relevant to building projects in California.

**Ace Training™**

Classroom and online trainings on Title 24, Part 6. Additional 2013 classes coming soon!

**Ace Resources™**

Fact Sheets, Trigger Sheets and Checklists to help you understand when Title 24, Part 6 is "triggered" and how to correctly comply when it is.

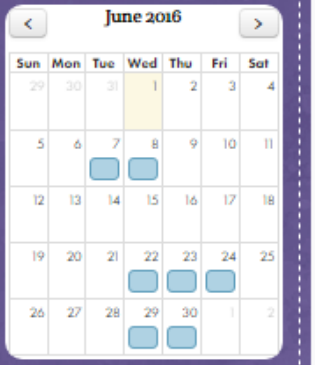
### Want to learn how to be an Energy Code Ace?

Our FREE Training courses can help you decode Title 24, Part 6 and Title 20 standards!

Check out our calendar below for Ace Training dates and registration information.

## Calendar

Click on the blue dates to view event details



# Why do we have CA Standards?

- Section 25402 of the Public Resources Code (known as the **Warren Alquist Act**)
- The act created the Energy Commission in 1974 and gave it authority to develop and maintain Building Energy Efficiency Standards
- Requires the Standards and new requirements to be cost effective over the economic life of the structure
- Requires the Energy Commission to update the Standards periodically (about every 3 years)


4231

# Intent behind the 2016 code


## 2008: California Energy Action Plan adopted

- Efficiency 1st choice in meeting future energy needs

## Zero Net Energy Goals

- 2020 Net Zero "New" Residential Homes
- 2030 Net Zero "New" Nonresidential buildings

# Key State Policy Goals

| Focus Area | Goal | Now | 2020 | 2025 | 2030 | 2050 |
|---|---|---|---|---|---|---|
| Residential Buildings | New Construction ZNE[1] | | 100% | | | |
| | Existing Homes (reduction relative existing stock)[1] | | 40% | | | |
| Commercial Buildings | New Construction ZNE[1] | | | | 100% | |
| | Existing ZNE[1] | | | | 50% | |
| State Buildings | New Construction & Major Retrofit ZNE[2] | | 50% | 100% | | |
| | Existing ZNE (by square footage)[2] | | | 50% | | |
| SB 350 | Increase energy efficiency in existing buildings | | | | 50% | |
| Existing Buildings | New and enhanced codes & standards, code simplification, increased compliance, asset ratings, purchase agreements, etc. [3] | X | X | X | X | |
| GHG Emissions | Statewide GHG Emissions (all sources) [4] | | 1990 Levels | | 40% Below 1990 | 80% Below 1990 |
| Water Efficiency | 25 percent reduction in urban water use[5] | X | | | | |

1. California's *Long Term Energy Efficiency Strategic Plan*.
2. Executive Order B-18-12
3. Assembly Bill 758; Existing Buildings Action Plan
4. Assembly Bill 32 for 2020; Executive Order B-30-15 for 2030 and 2050
5. Executive Order B-29-15

***Supporting Agencies***

# What's New in the 2016 Code?

## MAJOR CHANGES

### REDUCTION TO LIGHTING POWER DENSITY VALUES

Lighting power density allotments have been reduced for many indoor and outdoor spaces including spaces in auditoriums, libraries, and schools. Reductions affect building, area and tailored methods of compliance.

### UPDATED POWER ADJUSTMENT FACTORS

The 2016 Standards contain two new power adjustment factors (PAF) that address institutional tuning and daylight harvesting. Three other PAF have been eliminated.

### MULTILEVEL LIGHTING & OCCUPANCY CONTROLS

Multilevel lighting control requirements have been simplified. In addition, spaces that utilize certain types of occupancy controls are no longer required to also include multilevel control. Other occupancy control requirements are now to apply in practice.

### ALTERATIONS

The line between maintenance and retrofit has been redrawn. More projects are now exempt from alteration requirements. Those that are required to comply now have more options including some with reduced control requirements.

# CALIFORNIA'S 2016 — NONRESIDENTIAL
# BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in reduced electricity and natural gas bills. The building standards include better windows, insulation, lighting, air conditioning systems and other features that reduce energy consumption in homes and businesses. Since 1978 these standards have helped protect the environment by reducing more than 250 million metric tons of greenhouse gas emissions (or the equivalent of removing 37 million cars off California roads).

# 5% More Stringent

## DOOR AND WINDOW INTERLOCKS

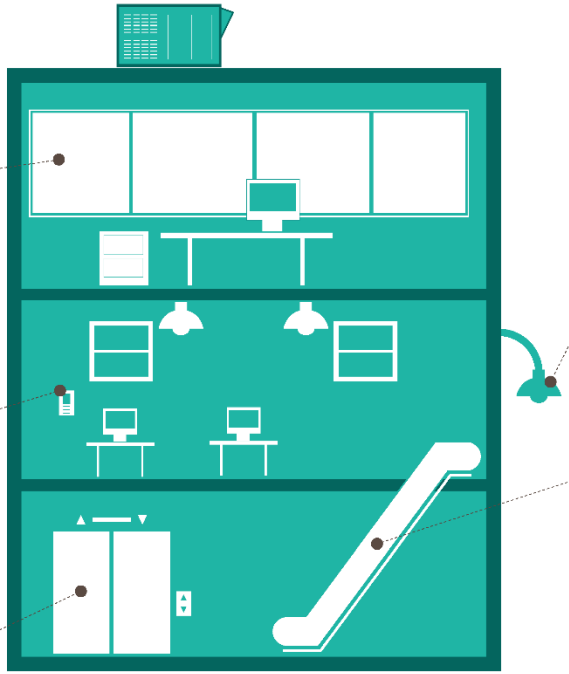
Sensors on doors and windows adjust the thermostat to turn off the heating or cooling if a door or window is left open for more than five minutes. This allows occupants to take advantage of outside temperatures and save on heating and cooling costs.

## DIRECT DIGITAL CONTROLS

For larger heating, ventilation and air conditioning systems, installing digital controls enables communication with building energy management systems, allowing managers to tailor the building's heating and cooling demands and prevent waste.

## ELEVATORS

Efficient ventilation fans and lighting sources installed within the elevator, along with controls that turn off the cab lighting and fans when the elevator is empty, save energy both when the elevator is in use and when empty.



These are cost effective measures that builders may consider to achieve new levels of efficiency. They can be traded for other efficient technologies such as higher efficiency HVAC units, higher efficiency water heaters, etc.

## OUTDOOR LIGHTING

The general power allowance for outdoor lighting has been lowered to include newer, more efficient luminaires which are widely available and commonly used for outdoor lighting applications.

## ESCALATORS

Requires escalators and moving walkways in transit areas to run at a lower, less energy-consuming speed when not in use.

# When does Title 24, Part 6 2016 go into effect?

# Mandatory Indoor Controls

| Section | Control |
|---|---|
| §130.1(a) | Area Controls |
| §130.1(b) | Multi-Level Lighting Control |
| §130.1(c) | Shut-OFF Control |
| §130.1(d) | Automatic Daylighting Control |
| §130.1(e) | Demand Responsive Control |

# Area Controls 130.1(a)

**On/off switch does not need to be accessible to public in:**

- Public restrooms with more than 2 stalls, parking areas, stairwells and corridors


# Mandatory Controls §130.1

**Multi Level Controls 130.1(b)**

**If dimming is required, pair with a dimmer (+ on/off)**

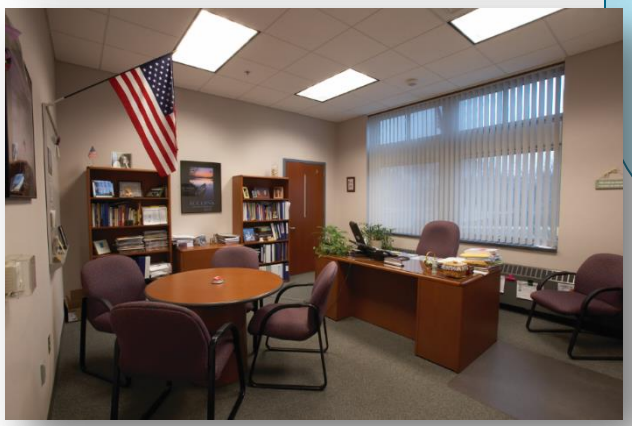
Public restrooms and areas required to utilize full or partial-OFF occupancy sensors are now *exempt*

**Source + Luminaire + Controls**

Image: CLTC, UC Davis

# Mandatory Controls §130.1

## Auto Shut-Off 130.1(c)



**Stairwells can be controlled per building** (not per floor as required in 2013)

**0.10 w/ft$^2$ exempt for egress lighting *ALL* building types**

**IF an office < 250ft$^2$, multipurpose room < 1,000 ft$^2$, classroom or conference room trigger multilevel control, then;**

- partial-on OR vacancy sensor is required
- If the space does NOT trigger a multi-level control, then occupancy sensor is allowed

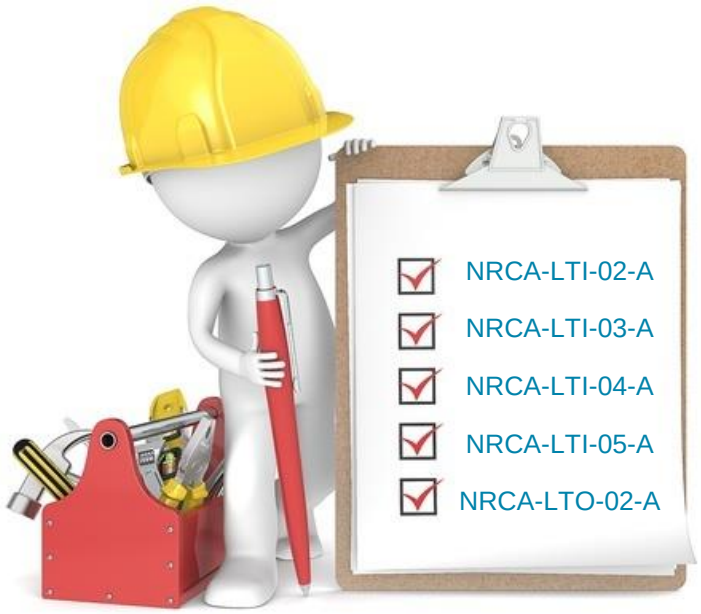
# Mandatory Controls §130.1

**Auto Daylighting 130.1(d)**

Auto daylighting has minor changes on how illuminance levels are measure in parking garages

**Demand Response 130.1(e)**

Non habitable spaces no longer exempt from the 10,000 $ft^2$ trigger (spaces less than 0.5 w/sf still excluded)




Acceptance testing not required for alteration projects where controls added to control **20 or less luminaires** for entire project.

# Mandatory Outdoor Lighting Controls and Equipment

| Section | Control |
|---|---|
| §130.2(a) | Incandescent Lighting (no change) |
| §130.2(b) | Cutoff Requirements (no change) |
| §130.2(c) | Controls **(new requirements)** |

# Controls for Outdoor Lighting §130.2(c)

## All outdoor luminaires (§130.2(c)1):

- Controlled by photocontrol and time-switch, or
- Astronomical time-switch control

## Outdoor lighting mounted ≤ 24 feet above the ground (§130.2(c)3):

- Motion sensor that automatically reduces lighting power by **40 - 90% (new)**
- Outdoor sales  lots and sales canopies **(new)**
- Exceptions:
  - poles with max of 75W
  - non-poles with max 30 W
  - linear lighting with max of 4 W/ft

# Prescriptive Lighting Measures §140.6, §140.7

| Section | Control |
|---|---|
| §140.6(a) | Power Adjustment Factors |
| §140.6(b), §140.6(c) | Lighting Power Allowance |
| §140.6(d) | Automatic Daylighting Controls in Secondary Daylit Zones |
| §140.7 | Outdoor Lighting |

# Prescriptive Indoor Lighting Req. §140.6

## New for 2016:

### Some LPD allowances reduced

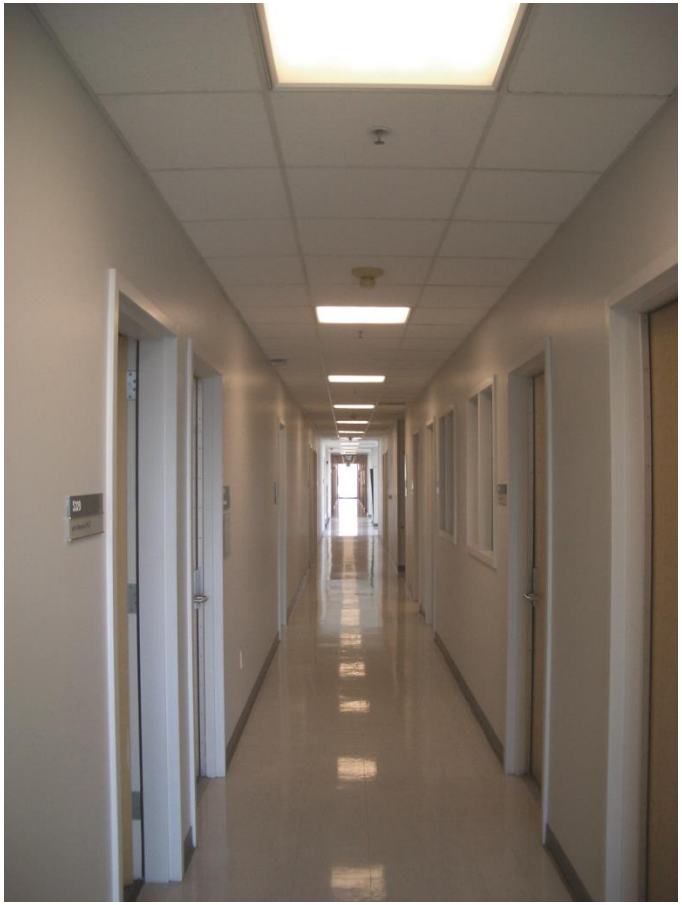
- Complete Building: 9 reductions
- Area Category:
  16 reductions, 2 removals

### New PAFs added for

- Daylight dimming plus OFF
- Institutionalized Tuning

### PAFs removed

- Partial-ON occupancy sensors
- Manual Dimming/Multiscene programmable control
- Combined manual dimming plus partial-ON occ. sensor



## 2016 TABLE 140.6-C AREA CATEGORY METHOD *Lighting Power Density (LPD) (Watt/Ft²) / <85% of LPD for Alteration Control Exceptions*

| PRIMARY FUNCTION AREA | | 2013 100% | 2016 100% | 2016 85% |
|---|---|---|---|---|
| Auditorium Area | | 1.5 [3] | 1.4 [3] | 1.19 |
| Auto Repair Area | | | 0.9 [2] | 0.77 |
| Beauty Salon Area | | | 1.7 | 1.45 |
| Civic Meeting Place Area | | | 1.3 [3] | 1.11 |
| Classroom, Lecture, Training, Vocational Areas | | | 1.2 [5] | 1.02 |
| Commercial and Industrial Storage Areas (conditioned and unconditioned) | | | 0.6 | 0.51 |
| Commercial and Industrial Storage Areas (refrigerated) | | | 0.7 | 0.60 |
| Convention, Conference, Multipurpose and Meeting Center Areas | | 1.4 [3] | 1.2 [3] | 1.02 |
| Corridor, Restroom, Stair, and Support Areas | | | 0.6 | 0.51 |
| Dining Area | | 1.1 [3] | 1.0 [3] | 0.85 |
| Electrical, Mechanical, Telephone Rooms | | 0.7 [2] | 0.55 [2] | 0.47 |
| Exercise Center, Gymnasium Areas | | | 1.0 | 0.85 |
| Exhibit, Museum Areas | | 2.0 | 1.8 | 1.5 |
| Financial Transaction Area | | 1.2 [3] | 1.0 [3] | 0.85 |
| General Commercial and Industrial Work Areas | Low bay | | 0.9 [2] | 0.77 |
| | High bay | | 1.0 [2] | 0.85 |
| | Precision | | 1.2 [4] | 1.02 |
| Grocery Sales Area | | | 1.2 [6 and 7] | 1.02 |
| Hotel Function Area | | 1.5 [3] | 1.2 [3] | 1.19 |
| Kitchen, Food Preparation Areas | | 1.6 | 1.2 | 1.02 |
| Laboratory Area, Scientific | | | 1.4 [1] | 1.19 |
| Laundry Area | | 0.9 | 0.7 | 0.60 |

| PRIMARY FUNCTION AREA | | 2013 100% | 2016 100% | 2016 85% |
|---|---|---|---|---|
| Library Area | Reading areas | 1.2 [3] | 1.1 [3] | 0.94 |
| | Stack areas | | 1.5 [3] | 1.28 |
| Lobby Area | Hotel lobby | 1.1 [3] | 0.95 [3] | 0.81 |
| | Main entry lobby | 1.5 [3] | 0.95 [3] | 0.81 |
| Locker/Dressing Room | | 0.8 | 0.7 | 0.60 |
| Lounge Area | | 1.1 [3] | 0.90 [3] | 0.77 |
| Malls and Atria | | 1.2 [3] | 0.95 [3] | 0.81 |
| Medical and Clinical Care Area | | | 1.2 | 1.02 |
| Office Area | > 250 square feet | | 0.75 | 0.64 |
| | ≤ 250 square feet | | 1.0 | 0.85 |
| Parking Garage Area | Parking Area | | 0.14 | N/A |
| | Dedicated Ramps | | 0.3 | N/A |
| | Daylight Adaptation Zn 9 | | 0.6 | N/A |
| Religious Worship Area | | | 1.5 [3] | 1.28 |
| Retail Merchandise Sales, Wholesale Showroom Areas | | | 1.2 [6 and 7] | 1.02 |
| Theater Area | Motion picture | | 0.9 [3] | 0.77 |
| | Performance | | 1.4 [3] | 1.19 |
| Transportation Function Area | Concourse & Baggage | | 0.5 | 0.43 |
| | Ticketing | 1.2 | 1.0 | 0.85 |
| Videoconferencing Studio | | | 1.2 [8] | 1.02 |
| Waiting Area | | 1.1 [3] | 0.8 [3] | 0.68 |
| All other areas | | 0.6 | 0.5 | 0.43 |

| Footnote # | Type of lighting system allowed | Maximum allowed added lighting power. |
|---|---|---|
| 1 | Specialized task work | 0.2 W/ft² |
| 2 | Specialized task work | 0.5 W/ft² |
| 3 | Ornamental lighting as defined in Section 100.1 and in accordance with Section 140.6.(c)2. | 0.5 W/ft² |
| 4 | Precision commercial and industrial work | 1.0 W/ft² |
| 5 | Per linear foot of white board or chalk board. | 5.5 W per linear foot |
| 6 | Accent, display and feature lighting - luminaires shall be adjustable or directional | 0.3 W/ft² |
| 7 | Decorative lighting - primary function shall be decorative and shall be in addition to general illumination | 0.2 W/ft² |
| 8 | Additional Videoconferencing Studio lighting complying with all of the requirements in Section 140.6(c)2Gvii | 1.5 W/ft² |
| 9 | Daylight Adaptation Zones shall be no longer than 66 feet from the entrance to the parking garage | |
| 10 | Additional allowance for ATM locations in Parking Garages (allowance per ATM) | 200 watts for the 1st ATM location; 50 watts for each additional ATM locations in a group |

# 2016
# Power Adjustment Factors

AKA: Control Credits

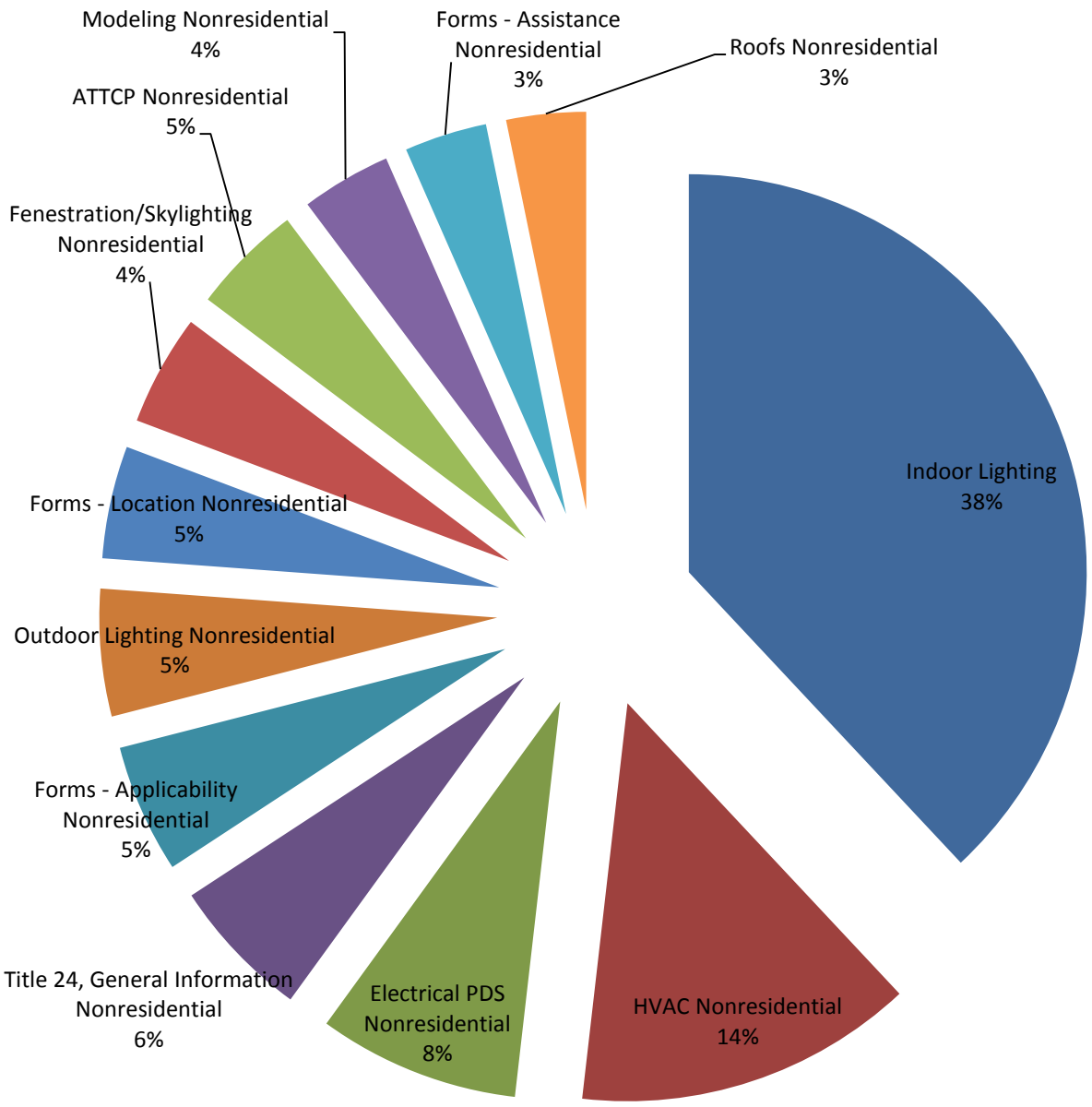
| TABLE 140.6-A LIGHTING POWER ADJUSTMENT FACTORS (PAF) | | | |
|---|---|---|---|
| **TYPE OF CONTROL** | TYPE OF AREA | | **FACTOR** |
| **Daylight Dimming plus OFF Control** | Luminaires in skylit daylit zone or primary sidelit daylit zone | | **0.10** |
| **Occupant Sensing Controls in Large Open 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** |
| **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** |
| **Demand Responsive Control** | **All building types less than 10,000 square feet. Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF** | | **0.05** |

# Indoor Lighting Alterations §141.0(b)2

| Section | Control |
|---|---|
| §141.0(b)2I | Entire Luminaire Alteration |
| §141.0(b)2J | Luminaire Component Modification |
| §141.0(b)2K | Lighting Wiring Alteration |
| §141.0(b)2L | Outdoor Lighting Alteration |

# Hotline Data

## 7/1/14 to 3/11/16




- Indoor Lighting
- HVAC Nonresidential
- Electrical PDS Nonresidential
- Title 24, General Information Nonresidential
- Forms - Applicability Nonresidential
- Outdoor Lighting Nonresidential
- Forms - Location Nonresidential
- Fenestration/Skylighting Nonresidential
- ATTCP Nonresidential
- Modeling Nonresidential
- Forms - Assistance Nonresidential
- Roofs Nonresidential

**Is installing tubular LEDs that require the removal of the ballast (tube connects direct to line voltage) in 148 luminaires an alteration or a repair?**

# Indoor Lighting Alterations §141.0(b)2I, J

| Applicable Section 130.1 control requirements | Resulting lighting power, compared to the lighting power allowance in Section 140.6(c)2, Area Category Method | | |
|---|---|---|---|
| | EXISTING OPTION 1<br>Lighting power density is<br>> 85% of allowance | EXISTING OPTION 2<br>Lighting power density is<br>≤ 85% of allowance | NEW OPTION<br>Existing lighting power is reduced by<br>50/35% |
| Section 130.1(a)1, 2, and 3<br>Area Controls | Yes | Yes | Yes |
| Section 130.1(b)<br>Multi-Level Lighting Controls<br>– only for alterations to general lighting of enclosed spaces 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot | Yes | Two level lighting control for each altered luminaire, with at least one step between 30-70 percent of lighting power regardless of luminaire type, or meet Section 130.1(b) | Not Required |
| Section 130.1(c)<br>Shut-Off Controls | Yes | Yes | [1]Yes |
| Section 130.1(d)<br>Automatic Daylight Controls | Yes | Not Required | Not Required |
| Section 130.1(e) Demand Responsive Controls<br>– only for alterations where the area of all altered enclosed spaces is greater than 10,000 square feet in a single building, where the alteration also changes the area of the space, the occupancy type of the space, or increases the lighting power | Yes | Not Required | Not Required |

# Lighting Alterations §141.0(b)2 I, J, K

## Entire Luminaire Alteration

- Removing and reinstalling luminaires ≥ 10% existing
- Replacing/adding luminaires **(3 or more)**
- Adding, removing, replacing walls along with redesign of lighting system **(3 or more)**

## Luminaire Component Modification

- Replacing ballast/driver and lamps
- Changing the light source
- Changing the optical system
- **≥ 70 existing luminaires modified**

**Exception:** Acceptance testing not required when controls are added to control 20 or fewer luminaires

# Indoor Lighting Alterations §141.0(b)2I, J

**Two options for meeting Alteration requirements:**

## 1. Meet LPD & controls per TABLE 141.0-E

- Area control
- Multilevel lighting control
- Shutoff control
- Automatic daylight control
- Demand responsive control

Similar to 2013

## 2. Reduce existing lighting power by

- 50% in *hotel*, *office* and *retail* with manual area and shut-off controls
- 35% in *all other spaces* with manual area and shut-off controls

**New for 2013 & 2016!**

# Lighting Alterations Quick Reference

| | LPD | area switch | area switch | not override cntrls | separate switch display | dimming | bi-level switching | auto-shut-off either | auto-shut-off, separate display | countdown switches | timeclock timed override | holiday feature time clock | occ sensor only - class, conf rm | motion partial off: warehouse | motion partial off: library | motion partial off: corridor, stair | motion partial off hotel corridors | motion partial off garage | guestroom key card/occ sensor | auto daylighting controls - primary sidelit and skylit | auto daylighting parking garage | demand response > 10,000 sf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 140.6 | 130.1(a)1 | 130.1(a)2 | 130.1(a)3 | 130.1(a)4 | 130.1(b) | Multi-level | 130.1(c)1A-C | 130.1(c)1D | 130.1(c)2 | 130.1(c)3 | 130.1(c)4 | 130.1(c)5 | 130.1(c)6A | 130.1(c)6B | 130.1(c)6C | 130.1(c)7A | 130.1(c)7B | 130.1(c)8 | 130.1(d)2 | 130.1(d)3 | 130.1(e) |
| **2016 Adopted** | | | | | | | | | | | | | | | | | | | | | | |
| Entire Luminaire 141.0(b)2Ii > 10%/space | > 85% <100% | Y | Y | Y | | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 120 W | 60 W | Y |
| Entire Luminaire 141.0(b)2Ii > 10%/space | < 85% | Y | Y | Y | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NR | NR | |
| Entire Luminaire 141.0(b)2Iii: **50% less power than existing office, retail, hotel, 35% other** | NA | Y | Y | Y | | | | Y | | Y | Y | Y | Y | Y | | | | Y | | NR | NR | |
| Component Modification, 141.0(b)2Ji: > 70 luminaires/project, > 10%/space | > 85% <100% | Y | Y | Y | | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 120 W | 60 W | Y |
| Component Modification, 141.0(b)2Ji: > 70 luminaires/project, > 10%/space | < 85% | Y | Y | Y | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NR | NR | |
| Component Modification, 141.0(b)2Jii: > 70 luminaires/project, **50% less power than existing office, retail, hotel, 35% other** | NA | Y | Y | Y | | | | Y | | Y | Y | Y | Y | Y | | | | Y | | NR | NR | |
| Wiring Alterations 140.1(b)2K > 2 luminaires | <100% | Y | Y | Y | | | Y | Y | | | Y | Y | | | | | | | | > 10 Luminaires | > 10 Luminaires | |
| | | | | | | | | | | | | | | | | | | | | | | |
| **2013 Standard** | | | | | | | | | | | | | | | | | | | | | | |
| Luminaire Alterations 140.1(b)2Iii | > 85% <100% | Y | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 120 W | 60 W | |
| Luminaire Alterations 140.1(b)2Iii | < 85% | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NR | NR | |
| Luminaire Alterations 140.1(b)2Iii Increase wattage | <100% | Y | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 120 W | 60 W | Y |
| Luminaire Mod-in-place and 1 for 1 replacement 140.1(b)2Iiii | > 85% <100% | Y | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 120 W | 60 W | |
| Luminaire Mod-in-place and 1 for 1 replacement 140.1(b)2Iiii | < 85% | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NR | NR | |
| Wiring Alterations 140.1(b)2Iiv | NA | Y | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 120 W | 60 W | Y |

**Table: Jon McHugh**

NR = not required

**To use the new compliance pathway in a K-12 school, what % reduction must the new lighting system achieve over the existing?**

# Indoor Lighting Wiring Alterations §141.0(b)2K

## Lighting Wiring Alterations

- New lighting circuit
- Replace, modify, or relocated wiring between switch or panelboard and luminaire
- Replace lighting control panels, panelboards, or branch circuit wiring

## Applicable Lighting Wiring Alteration req. for the enclosed space:

- Area controls, shut-OFF controls
- Multilevel lighting controls: one control step between 30 – 70% or meet §130.1(b)
- Daylighting controls §130.1(d) (if ≥ 10 luminaires in the daylit zone)

# Prescriptive Outdoor Lighting Req. §140.7

## New for 2016:

General Hardscape LPDs reduced

Lighting for ATMs, tunnels, and bridges is no longer exempt, included in power allowance calculations.

# CALIFORNIA'S 2016 — RESIDENTIAL
# BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in reduced electricity and natural gas bills. The building standards include better windows, insulation, lighting, air conditioning systems and other features that reduce energy consumption in homes and businesses. Since 1978 these standards have helped protect the environment by reducing more than 250 million metric tons of greenhouse gas emissions (or the equivalent of removing 37 million cars off California roads).

**$7,400** SAVINGS OVER A 30 YR. MORTGAGE | INITIAL COST $2,700

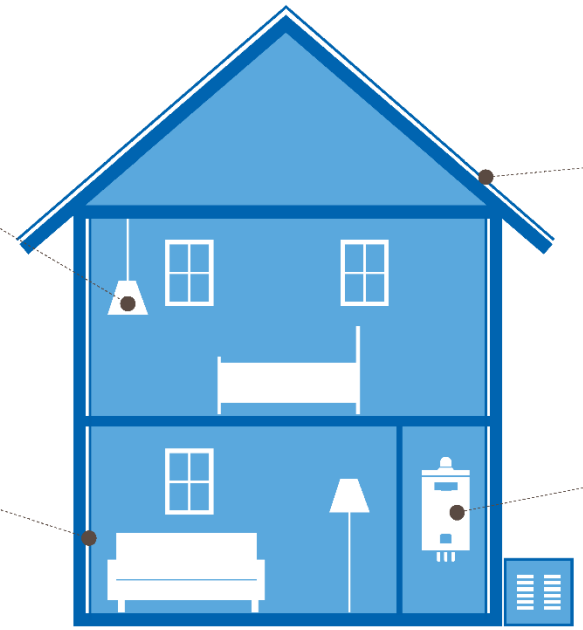
# 28% More Stringent

## HIGH EFFICACY LIGHTING

All lighting in new homes must be efficient. Installation of high quality lighting with controls that nearly halve the energy required for lights in new homes.

## HIGH PERFORMANCE WALLS

Increased wall insulation keeps the sun's heat out of your home during hot summer months and warm air in during winter months, improving comfort and reducing energy consumption.



## HIGH PERFORMANCE ATTICS

Attics with additional insulation at the roof deck keep attic temperatures closer to ambient, improving the home's heating and cooling performance. Extra insulation at the roof deck, in addition to the ceiling insulation, will reduce the attic temperature by 35 degrees or more during hot summer days.

## IMPROVED WATER HEATING SYSTEM EFFICIENCY

Installing tankless water heating technology and better distribution systems reduces the energy needed to provide hot water to the home by about 35 percent.

These are cost effective measures that home builders may consider to achieve new levels of efficiency. They can be traded for other efficient technologies such as higher efficiency HVAC units, higher efficiency water heaters, etc.

**Could this luminaire be considered high-efficacy under the 2016 standards?**

# Residential Lighting

## MAJOR CHANGES

### ALL HIGH-EFFICACY LIGHTING
Indoor and outdoor lighting for new homes must be high efficacy.

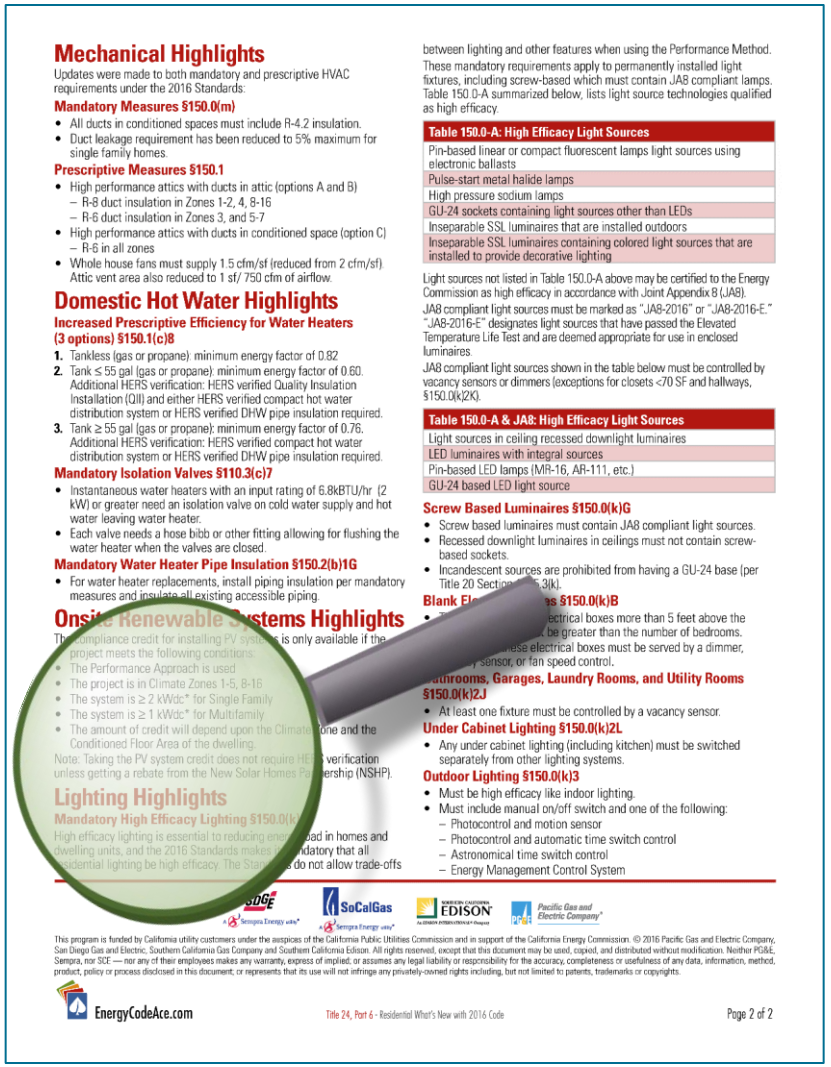
### JA-8 UPDATED
Joint Appendix JA8 regulations now contain requirements for more types of residential high-efficacy lamps and luminaires. In the 2013 code, JA-8 regulations only applied to LED sources.

### 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.

# Residential "What's New?" Fact Sheet

# Residential "What's Changed?" Fact Sheet

energycodeace.com



## Mechanical Highlights

Updates were made to both mandatory and prescriptive HVAC requirements under the 2016 Standards:

**Mandatory Measures §150.0(m)**

- All ducts in conditioned spaces must include R-4.2 insulation.
- Duct leakage requirement has been reduced to 5% maximum for single family homes.

**Prescriptive Measures §150.1**

- High performance attics with ducts in attic (options A and B)
  - R-8 duct insulation in Zones 1-2, 4, 8-16
  - R-6 duct insulation in Zones 3, and 5-7
- High performance attics with ducts in conditioned space (option C)
  - R-6 in all zones
- Whole house fans must supply 1.5 cfm/sf (reduced from 2 cfm/sf). Attic vent area also reduced to 1 sf/ 750 cfm of airflow.

## Domestic Hot Water Highlights

**Increased Prescriptive Efficiency for Water Heaters (3 options) §150.1(c)8**

1. Tankless (gas or propane): minimum energy factor of 0.82
2. Tank ≤ 55 gal (gas or propane): minimum energy factor of 0.60. Additional HERS verification: HERS verified Quality Insulation Installation (QII) and either HERS verified compact hot water distribution system or HERS verified DHW pipe insulation required.
3. Tank ≥ 55 gal (gas or propane): minimum energy factor of 0.76. Additional HERS verification: HERS verified compact hot water distribution system or HERS verified DHW pipe insulation required.

**Mandatory Isolation Valves §110.3(c)7**

- Instantaneous water heaters with an input rating of 6.8kBTU/hr (2 kW) or greater need an isolation valve on cold water supply and hot water leaving water heater.
- Each valve needs a hose bibb or other fitting allowing for flushing the water heater when the valves are closed.

**Mandatory Water Heater Pipe Insulation §150.2(b)1G**

- For water heater replacements, install piping insulation per mandatory measures and insulate all existing accessible piping.

## Onsite Renewable Systems Highlights

The compliance credit for installing PV system is only available if the project meets the following conditions:

- The Performance Approach is used
- The project is in Climate Zones 1-5, 8-16
- The system is ≥ 2 kWdc* for Single Family
- The system is ≥ 1 kWdc* for Multifamily
- The amount of credit will depend upon the Climate Zone and the Conditioned Floor Area of the dwelling.

Note: Taking the PV system credit does not require HERS verification unless getting a rebate from the New Solar Homes Partnership (NSHP).

## Lighting Highlights

**Mandatory High Efficacy Lighting §150.0(k)**

High efficacy lighting is essential to reducing energy load in homes and dwelling units, and the 2016 Standards makes it mandatory that all residential lighting be high efficacy. The Standards do not allow trade-offs between lighting and other features when using the Performance Method.

These mandatory requirements apply to permanently installed light fixtures, including screw-based which must contain JA8 compliant lamps. Table 150.0-A summarized below, lists light source technologies qualified as high efficacy.

| Table 150.0-A: High Efficacy Light Sources |
|---|
| Pin-based linear or compact fluorescent lamps light sources using electronic ballasts |
| Pulse-start metal halide lamps |
| High pressure sodium lamps |
| GU-24 sockets containing light sources other than LEDs |
| Inseparable SSL luminaires that are installed outdoors |
| Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting |

Light sources not listed in Table 150.0-A above may be certified to the Energy Commission as high efficacy in accordance with Joint Appendix 8 (JA8).

JA8 compliant light sources must be marked as "JA8-2016" or "JA8-2016-E." "JA8-2016-E" designates light sources that have passed the Elevated Temperature Life Test and are deemed appropriate for use in enclosed luminaires.

JA8 compliant light sources shown in the table below must be controlled by vacancy sensors or dimmers (exceptions for closets <70 SF and hallways, §150.0(k)2K).

| Table 150.0-A & JA8: High Efficacy Light Sources |
|---|
| Light sources in ceiling recessed downlight luminaires |
| LED luminaires with integral sources |
| Pin-based LED lamps (MR-16, AR-111, etc.) |
| GU-24 based LED light source |

**Screw Based Luminaires §150.0(k)G**

- Screw based luminaires must contain JA8 compliant light sources.
- Recessed downlight luminaires in ceilings must not contain screw-based sockets.
- Incandescent sources are prohibited from having a GU-24 base (per Title 20 Section [illegible].3(k).

**Blank El… §150.0(k)B**

- …ectrical boxes more than 5 feet above the … be greater than the number of bedrooms. …ese electrical boxes must be served by a dimmer, …y sensor, or fan speed control.

**…athrooms, Garages, Laundry Rooms, and Utility Rooms §150.0(k)2J**

- At least one fixture must be controlled by a vacancy sensor.

**Under Cabinet Lighting §150.0(k)2L**

- Any under cabinet lighting (including kitchen) must be switched separately from other lighting systems.

**Outdoor Lighting §150.0(k)3**

- Must be high efficacy like indoor lighting.
- Must include manual on/off switch and one of the following:
  - Photocontrol and motion sensor
  - Photocontrol and automatic time switch control
  - Astronomical time switch control
  - Energy Management Control System

SDGE SoCalGas Southern California Edison Pacific Gas and Electric Company

## High Efficacy Luminaires

- Pin-based linear fluorescent
- Pin-based compact fluorescent
- GU-24 other than LEDs
- Inseparable SSL luminaires with colored light sources for decorative lighting purpose

**Outdoor**

- Pulse-start metal halide
- High pressure sodium
- Inseparable SSL luminaires installed outdoors

## JA8 High Efficacy Lighting: Lamps and Light Sources

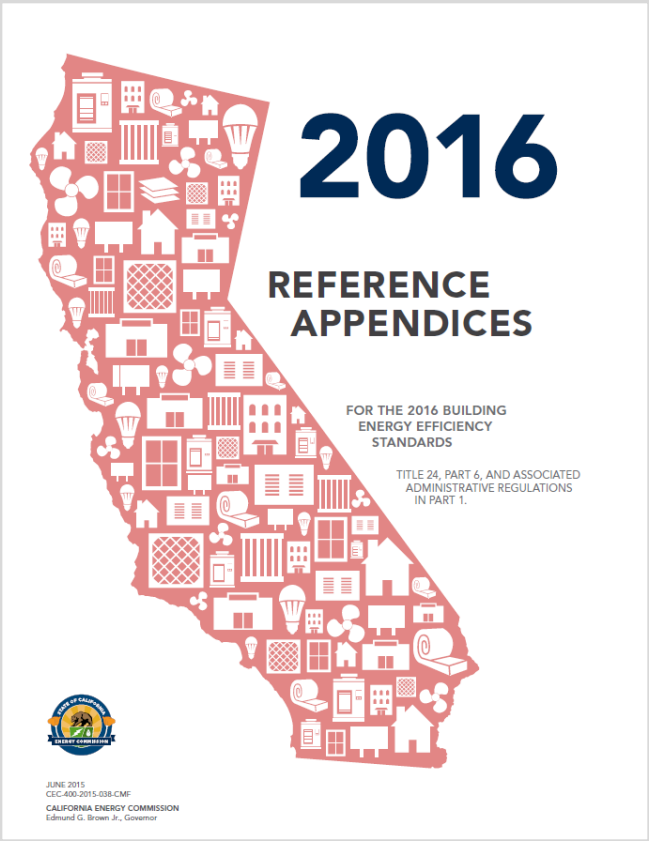
- Light sources in ceiling recessed downlight luminaires.*
- LED luminaires with integral sources
- Screw-based LED lamps (A-lamps, PAR lamps, etc.)
- Pin-based LED lamps (MR-16, AR-111, etc.)
- GU-24 based LED light source
- Any source or luminaire not listed elsewhere on this table

## Recessed Downlight Luminaires in Ceilings

- Shall not have screw based sockets
- Shall contain JA8- certified light sources
- Shall meet all performance requirements in §150.0(k)1C

# Joint Appendices Chapter 8

## "JA8-2016" or "JA8-2016-E" LAMP



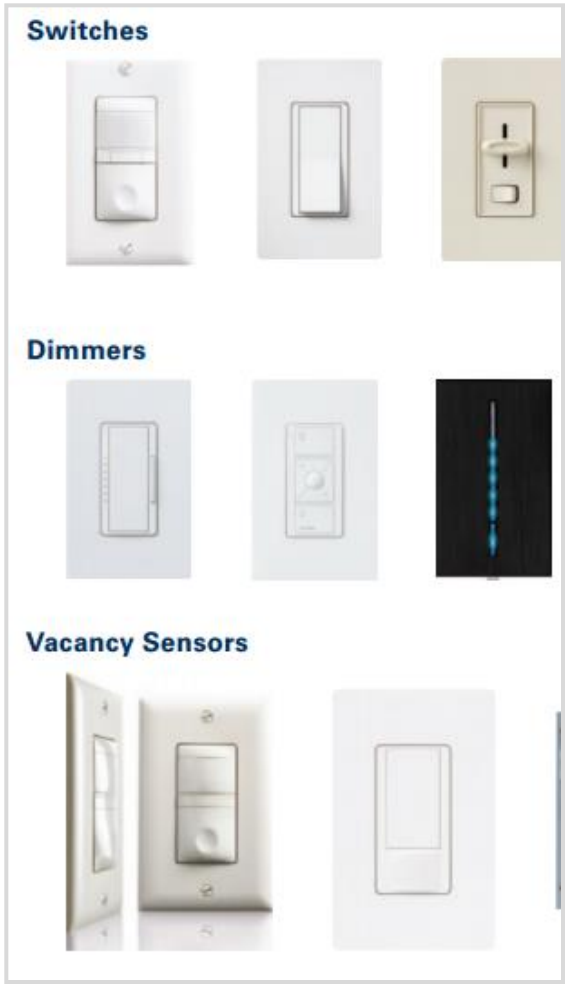

A list of compliant products will be found at:
https://cacertappliances.energy.ca.gov

**Appendix JA8: Qualification Requirements for High Efficacy Light Sources — Partial List**

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

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

# Lighting Controls




## Rooms in Home

### Hallways & Closets

- Switch, dimmer or vacancy sensor

### Kitchens

- Under cabinet lighting switched separately*
- **High efficacy:** Switch, dimmer or vacancy sensor
- **JA8-2016/JA-2016-E:** Dimmer or vacancy sensor

### Bathrooms, Utility/Laundry Rooms, Garage

- One luminaire must be on vacancy sensor
- 2nd luminaire:
  - **High efficacy:** Switch, dimmer or vacancy
  - **JA8-2016/JA-2016-E:** Dimmer or vacancy

### All Other

- **High efficacy:** Switch, dimmer or vacancy sensor
- **JA8-2016/JA-2016-E:** Dimmer or vacancy sensor

***Applies to all rooms types**

**Can an LED A-19 installed in a downlight be considered compliant if it is certified to the Energy Commission as appropriate for enclosed luminaires? (JA8-2016-E)**

# Outdoor Lighting

**Must be high efficacy**

**Must have manual ON/OFF control**

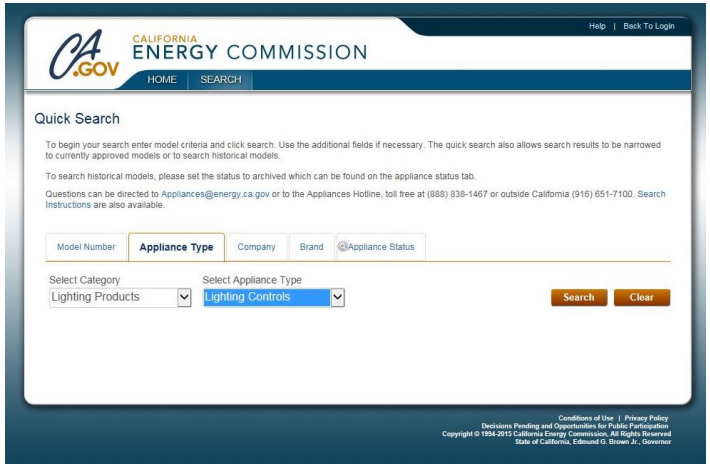
**Must be controlled by either:**

1. Photocell and motion sensor (6 hour override allowed); or
2. Astronomical time clock (6 hour override allowed)
3. EMCS with same functionality as astronomical time clock (no override allowed)

# Appliance Efficiency Regulations (Title 20)

Prior to sale, regulated appliances within the scope of Title 20 requiring the submission of certification data must meet all the applicable requirements found in Sections 1601-1609 of the California Appliance Efficiency Regulations and be listed in the appliance efficiency database.

(**cacertappliances.energy.ca.gov)**



# T20 Regulated Lighting Products

| Section 1605.1<br>Federal and State Standards for<br>Federally-Regulated Appliances | Section 1605.3<br>State Standards for<br>Non-Federally-Regulated Appliances |
|---|---|
| Fluorescent Lamp Ballasts | State-Regulated Incandescent Reflector Lamps |
| General Service Fluorescent Lamps | State-Regulated General Service Incandescent Lamps, General Service Lamps, and Modified Spectrum Incandescent Lamps |
| Incandescent Reflector Lamps | GU-24 Base Lamps |
| Medium Base Compact Fluorescent Lamps | Illuminated Exit Signs |
| General Service Incandescent Lamps and Modified Spectrum General Service Incandescent Lamps | Self-Contained Lighting Controls |
| Candelabra Base Incandescent Lamps and Intermediate Base Incandescent Lamps | Metal Halide Luminaires |
| Emergency Lighting and Self-Contained Lighting Controls | Under-Cabinet Luminaires (commercial office only) |
| Traffic Signal Modules and Traffic Signal Lamps | Portable Luminaires |
| Torchieres | GU-24 Adaptors |
| Metal Halide Lamp Fixtures | |

# General Service LED Lamps

**1605.3(k)(2):** All state-regulated LED lamps

| Effective Date | Minimum Compliance Score | Minimum Efficacy Lumens per Watt |
|---|---|---|
| January 1, 2018 (Tier 1) | 282 | 68 |
| July 1, 2019 (Tier 2) | 297 | 80 |

Compliance score:

**Efficacy + (2.3 x CRI)**

# State-regulated LED lamps

**Base:** E12, E17, E26, or GU-24

**Output:** less than 2,600 lumens

**CCT:** between 2200 K and 7000 K

**Duv:** between -0.012 and 0.012


# Selected Spec Comparison: A19

| | Energy Star 2.0 | JA8, T24 2016 | Title 20 | CA Quality Spec |
|---|---|---|---|---|
| Effective date | June 1, 2016 | January 1, 2017 | Tier 1: January 1, 2018 Tier 2: July 1, 2019 | November 21, 2014 |
| CRI | CRI ≥ 80 | CRI ≥ 90 | Lamps ≥ 150 lumens: CRI ≥ 82 | CRI ≥ 90 |
| R1 – R8 | - | - | Minimum score of 72 for each individual color sample R1-R8. | - |
| R9 | > 0 | ≥50 | | > 50 |
| Flicker | No minimum flicker performance requirement | Percent flicker <30% at frequencies less than 200Hz, when tested at 100% and 20% light output, with test method | Dimmability not required for all lamps. Products claiming incandescent equivalency must be dimmable. Products claiming dimmability must comply with JA10. | "Flicker free" from 10% to 100%, no specific test method or criteria |

# Small Diameter Directional Lamps (SDDLs)

## Sections 1605.3 (k)

## Effective January 1, 2018

Minimum rated life: 25,000 hours based on lumen maintenance and time to failure test procedure

Meet one of the following requirements:

- Luminous efficacy of ≥ 80 lumens per watt.
- Luminous efficacy ≥ 70 lumens per watt and CRI + Efficacy ≥ 165

# EnergyCode Ace™

Helping you play your cards right

A website developed by the Statewide Codes & Standards Program to help you meet the requirements of Title 24, Part 6. We offer **FREE:**

## Ace Tools™

A variety of tools to help you identify the forms, installation techniques, and building energy standards relevant to building projects in California

## Ace Training™

Classroom and online trainings on Title 24, Part 6.

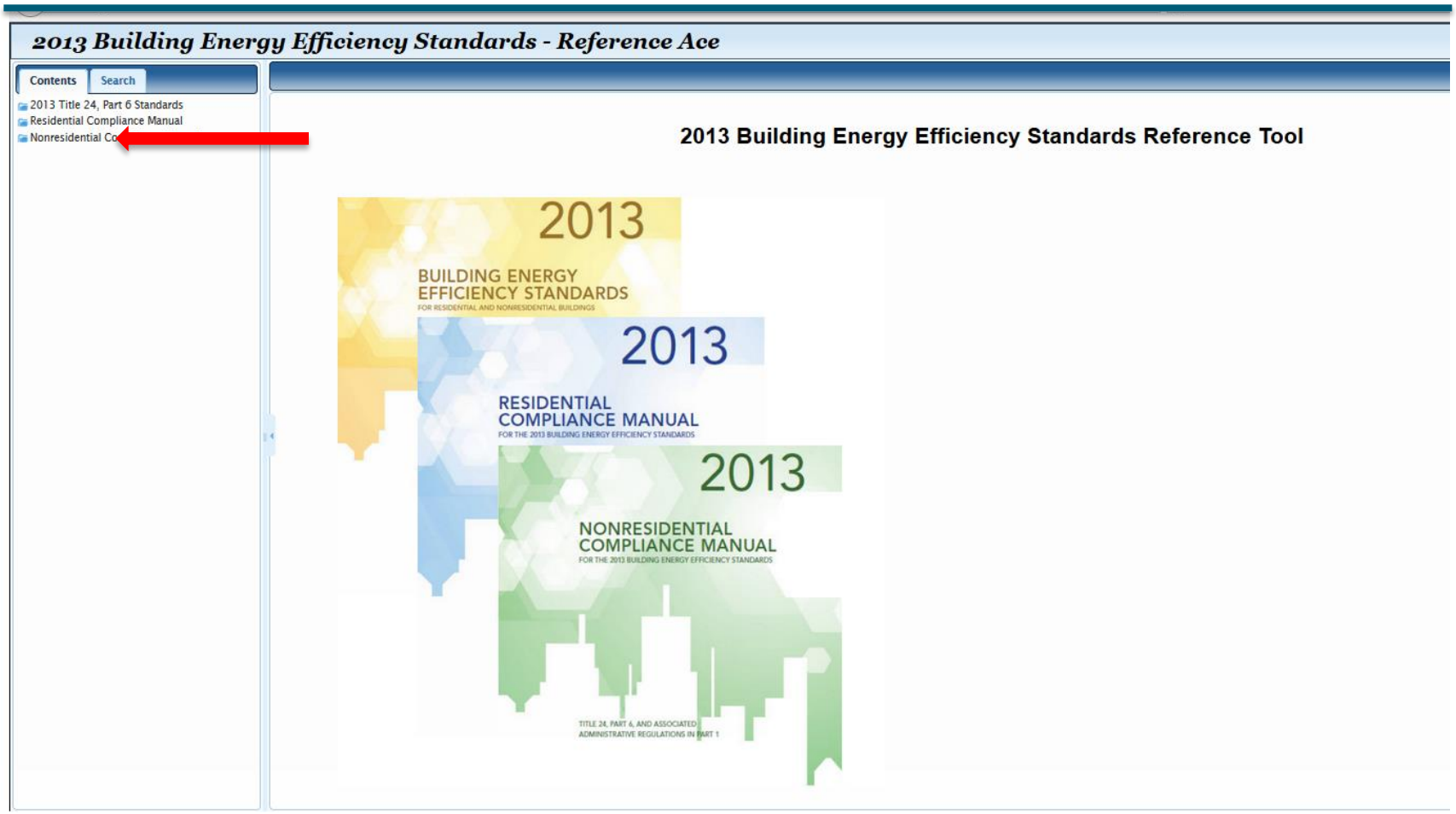
## Ace Resources™

Fact Sheets, Trigger Sheets, Checklists, and FAQs to help you understand when Title 24, Part 6 is "triggered" and how to correctly comply when it is

# Ace Tools™

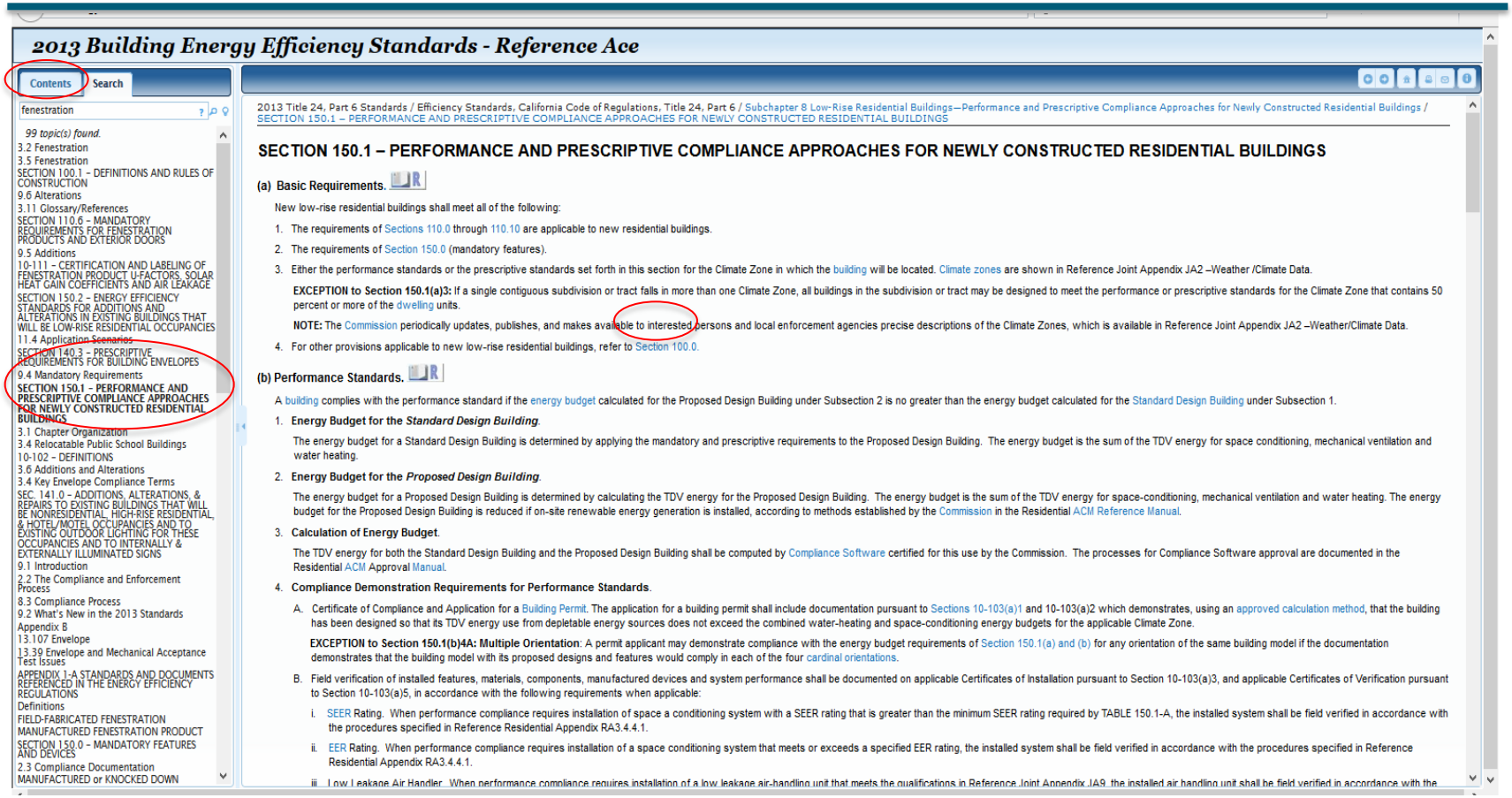
| | |
|---|---|
| Ace Navigator™ | Step-by-step guide to the Title 24, Part 6 compliance process in easy-to-follow flowchart format |
| Ace Forms™ | Aids in determining which compliance forms are applicable to your specific project |
| Ace Reference™ | Helps you navigate the Standards using key word search capabilities, hyperlinked tables and related sections |
| Ace Installation™ | A “field guide” to assist you in identifying proper installation techniques and visual aides for some components commonly installed incorrectly |
| Crack TheCode Industry Workshop™ | Workshop packages to help Building Departments facilitate trainings for local installation contractors |

Ace Reference™




EnergyCodeAce.com/content/reference-ace/

Ace Reference™




EnergyCodeAce.com/content/reference-ace/

# Ace Training™

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In-Person Class - Available via training centers or we'll bring them to you at your and schedule at your convenience

## Ace Training Virtual Classroom™

Online, Real-time Class - Delivered by an Ace instructor

## Ace Training Online Self-Study™

Online, On-demand Training - Take them at your own pace

## Ace Training Decoding Talks™

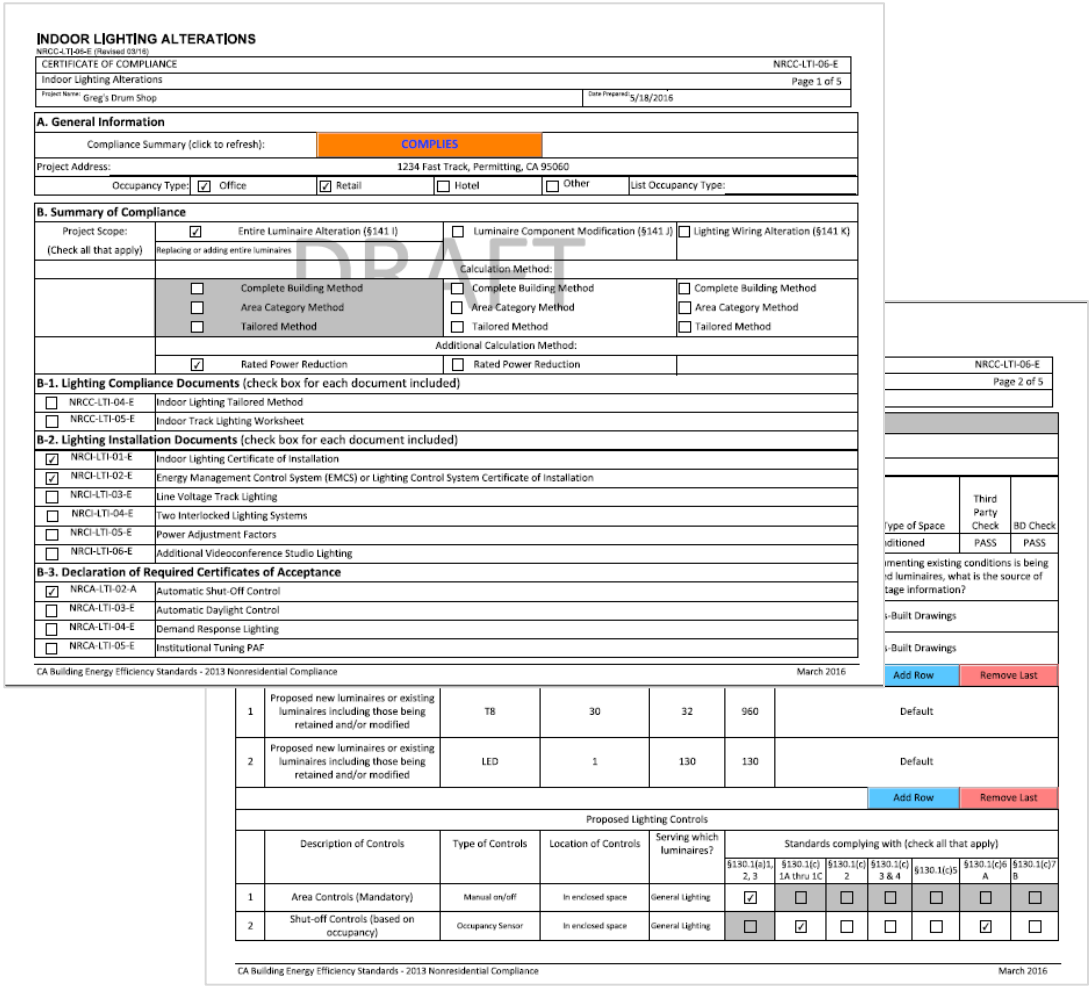
Facilitated Online Discussion – Experts lead conversations on key code topics

# Ace Resources™

| | |
|---|---|
| Ace Resources Trigger Sheets | "Quick reference" component-by-component summaries of sections of 2013 Title 24, Part 6 "triggered" based on project scope. |
| Ace Resources Fact Sheets | "Quick reference" summaries of key requirements, forms, definitions and resources for implementing 2013 Title 24, Part 6 |
| Ace Resources Checklists | Step-by-step guidance for plans checks and field inspections |
| Ace Resources Useful Links | A list of useful links, telephone numbers and handy documents |
| Ace Resources FAQ | FAQs on the program, the site and the code, and a place to submit your own questions |

**EnergyCodeAce.com/resources**

# Non-res Lighting ALT Form



INDOOR LIGHTING ALTERATIONS

NRCC-LTI-06-E (Revised 03/16)

CERTIFICATE OF COMPLIANCE — NRCC-LTI-06-E

Indoor Lighting Alterations — Page 1 of 5

Project Name: Greg's Drum Shop — Date Prepared: 5/18/2016

**A. General Information**

Compliance Summary (click to refresh): COMPLIES

Project Address: 1234 Fast Track, Permitting, CA 95060

Occupancy Type: ☑ Office ☑ Retail ☐ Hotel ☐ Other — List Occupancy Type:

**B. Summary of Compliance**

| Project Scope: (Check all that apply) | Entire Luminaire Alteration (§141 I) | Luminaire Component Modification (§141 J) | Lighting Wiring Alteration (§141 K) |
|---|---|---|---|
| | Replacing or adding entire luminaires | | |
| | Calculation Method: | | |
| | ☐ Complete Building Method<br>☐ Area Category Method<br>☐ Tailored Method | ☐ Complete Building Method<br>☐ Area Category Method<br>☐ Tailored Method | ☐ Complete Building Method<br>☐ Area Category Method<br>☐ Tailored Method |
| | Additional Calculation Method: | | |
| | ☑ Rated Power Reduction | ☐ Rated Power Reduction | |

DRAFT

**B-1. Lighting Compliance Documents** (check box for each document included)

| | |
|---|---|
| ☐ NRCC-LTI-04-E | Indoor Lighting Tailored Method |
| ☐ NRCC-LTI-05-E | Indoor Track Lighting Worksheet |

**B-2. Lighting Installation Documents** (check box for each document included)

| | |
|---|---|
| ☑ NRCI-LTI-01-E | Indoor Lighting Certificate of Installation |
| ☑ NRCI-LTI-02-E | Energy Management Control System (EMCS) or Lighting Control System Certificate of Installation |
| ☐ NRCI-LTI-03-E | Line Voltage Track Lighting |
| ☐ NRCI-LTI-04-E | Two Interlocked Lighting Systems |
| ☐ NRCI-LTI-05-E | Power Adjustment Factors |
| ☐ NRCI-LTI-06-E | Additional Videoconference Studio Lighting |

**B-3. Declaration of Required Certificates of Acceptance**

| | |
|---|---|
| ☑ NRCA-LTI-02-A | Automatic Shut-Off Control |
| ☐ NRCA-LTI-03-E | Automatic Daylight Control |
| ☐ NRCA-LTI-04-E | Demand Response Lighting |
| ☐ NRCA-LTI-05-E | Institutional Tuning PAF |

CA Building Energy Efficiency Standards - 2013 Nonresidential Compliance — March 2016

NRCC-LTI-06-E — Page 2 of 5

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Type of Space | Third Party Check / BD Check |
| | | | | | Additioned | PASS / PASS |
| | | | | | | Implementing existing conditions is being ed luminaires, what is the source of tage information? |
| | | | | | | As-Built Drawings |
| | | | | | | As-Built Drawings |
| 1 | Proposed new luminaires or existing luminaires including those being retained and/or modified | T8 | 30 | 32 | 960 | Default |
| 2 | Proposed new luminaires or existing luminaires including those being retained and/or modified | LED | 1 | 130 | 130 | Default |

Add Row | Remove Last

Proposed Lighting Controls

| | Description of Controls | Type of Controls | Location of Controls | Serving which luminaires? | Standards complying with (check all that apply) §130.1(a)1, 2, 3 | §130.1(c) 1A thru 1C | §130.1(c) 2 | §130.1(c) 3 & 4 | §130.1(c)5 | §130.1(c)6 A | §130.1(c)7 B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Area Controls (Mandatory) | Manual on/off | In enclosed space | General Lighting | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Shut-off Controls (based on occupancy) | Occupancy Sensor | In enclosed space | General Lighting | ☐ | ☑ | ☐ | ☐ | ☐ | ☑ | ☐ |

CA Building Energy Efficiency Standards - 2013 Nonresidential Compliance — March 2016

## Coming soon!

- Dynamic
- Adobe Reader required
- Organized to help with Title 24, Part 6 lighting alteration compliance

# Nonresidential "What's New"

2016 ENERGY CODE

Ace Resources Title 24, Part 6 Fact Sheet

Nonresidential

## What's New with 2016 Code?

### Overview

Changes to the nonresidential requirements in the 2016 Building Energy Efficiency Standards (Energy Standards) largely follow ASHRAE 90.1 national standards and include energy conservation measures related to the building systems shown in Figure 1. The standards have been adopted, and once approved, will be implemented for projects permitted on or after January 1, 2017. For more detailed information, see the CEC FAQ Sheet.


*Figure 1: 2016 Energy Standards Update Infographic by CEC*

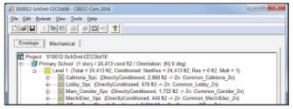
In addition, the 2016 Energy Standards have set out to simplify and clarify several areas that were new in the 2013 Energy Standards, which were identified during the public comment period as needing clarification.

### Compliance Tools

The Compliance Manuals and other related manuals are being updated to reflect the adopted 2016 Energy Standards and are planned to be available in early 2016 on the CEC's website.

In addition, Energy Code Ace is working with the California Energy Commission (CEC) to produce a suite of 2016 Energy Standards Application Guides, which will provide project examples and other information that may be helpful in applying the energy code requirements. Look for these and other new tools, training and resources on EnergyCodeAce.com during the summer of 2016.

CBECC-Com, the state-funded nonresidential computer simulation tool, has been updated for the 2016 Energy Standards as well. A certified version is publicly available for free download now. This was developed early in order to give users time to utilize the software prior to the January 2017 implementation date.



### Envelope Highlights

Prescriptive insulation requirements for roofs and ceilings have become more stringent under the 2016 Energy Standards. Additionally, prescriptive insulation requirements have become more stringent for metal and wood-framed walls in certain climate zones.

**Mandatory Measures – Section 120.7**

Wall Insulation levels have been changed to the following:

- Metal framed: U-factor = 0.151 (R-13 w/R-2)
- Metal demising: U-factor = 0.151 (R-13 w/R-2)

All other mandatory insulation levels are unchanged. Additional exceptions apply for dedicated data centers.

**Prescriptive Measures – Section 140.3**

- Prescriptive envelope requirements in Table 140.3-B have been updated for Nonresidential buildings.
- Prescriptive envelope requirements in Table 140.3-C have been updated for High-Rise Residential and Hotel/Motels.
- The prescriptive Roof/Ceiling Insulation Tradeoff for Aged Solar Reflectance Table 140.3 has been updated as shown below. Requirements apply to roof replacements as well as new installations.

**Table 140.3 Nonresidential Roof U-Factor**

| Aged Solar Reflectance | Metal Building | Wood Framed and Other | |
|---|---|---|---|
| | All Zones | Zones 6 & 7 | All other Zones |
| 0.62-0.56 | 0.038 | 0.045 | 0.032 |
| 0.55-0.46 | 0.035 | 0.042 | 0.030 |
| 0.45-0.36 | 0.033 | 0.039 | 0.029 |
| 0.35-0.25 | 0.031 | 0.037 | 0.028 |

*Table 140.3 Nonresidential Roof U-Factor*



### Process Equipment Highlights

New to the 2016 Energy Standards are mandatory energy saving requirements for escalators and elevators. Acceptance testing will be required for controls requirements.

**Escalators and Moving Walkways – Section 120.6(g)**

- Escalators and moving walkways will be required to run at lower speeds when unoccupied (and thus a lower energy consuming state) while not in use in high traffic areas like airports, hotels, and transportation function areas.

**Elevators – Section 120.6(f)**

- Energy efficient lighting: Lighting Power Density (LPD) of 0.6 w/ft2 maximum
- Energy efficient fans: Ventilation fans for cabs without space conditioning shall not exceed 0.33 w/cfm
- Automatic shut-off controls on cab lighting and fans after 15 minutes of no service (stopped, unoccupied with doors closed)
- Lighting and ventilation must be operational during emergency stop situations while occupied with passengers.

### Mechanical Highlights

**Mandatory Equipment Efficiencies – Section 110.2**

Mandatory equipment efficiencies for air conditioning units have increased as of 1/1/2016. Chiller and DX equipment efficiencies have become more stringent.

**Economizers – Section 120.2 (i)**

New mandatory requirements for Fault Detection and Diagnostics (FDD) on all economizers installed on new air-cooled packaged DX units with cooling capacity of 54,000 Btu/hr or greater. Stand alone or integrated FDD accepted per Section 120.2(i) of the 2016 Energy Standards.

**HVAC System Controls - Sections 120.2 & 140.4**

- **Mandatory Direct Digital Controls (DDC):** DDC shall be applied per Section 120.2(j) of the 2016 Energy Standards, Table A for new construction, additions, and alterations. Control logic must be capable of monitoring several points including fan pressure, pump pressure, heating and cooling, have optimum start/stop controls, and perform automatic information transfer among other requirements.
- **Mandatory Optimum Start/Stop Controls:** The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint, the outdoor air temperature, and the amount of time prior to scheduled occupancy. Additional requirements for mass radiant floor slab systems. Requirements per Section 120.2 (k) of the 2016 Energy Standards.
- **Prescriptive HVAC Shut-off Sensors for Windows and Doors:** If windows or doors are left open for more than five minutes, sensors will adjust thermostats to disable the HVAC equipment by resetting the temperature setpoint to 55°F for mechanical heating and 90°F for mechanical cooling. Exemptions for doors with automatic closers or any space without thermostatic controls. Requirements per Section 140.4 (n) of the 2016 Energy Standards.

### Commissioning Highlights

A few important clarifications were made to the commissioning requirements in Section 120.8 of the 2016 Energy Standards:

- Commissioning is required for all new buildings with nonresidential conditioned space, including nonresidential spaces in hotel/motel and high-rise residential buildings. The Owner's Project Requirements (OPR) must include building envelope performance expectations under the 2016 Energy Standards.
- Section 10-103 in Part 1 specifies that the Design Reviewer may be a licensed architect or licensed contractor in addition to a professional engineer.

### Indoor Lighting Highlights

The interior lighting mandatory and prescriptive measures, as well as updates to the calculation methodologies are included below.

**Prescriptive Calculation Methodology – Section 140.6**

- **Complete Building Method:** Allowed Lighting Power Densities are reduced by 0.1 or less for half of building types listed in Table 140.6-B.
- **Area Category Method:** Allowed Lighting Power Densities are reduced by 0.2 or less for a third of functional areas in Table 140.6-C.
- **Tailored Method:** Lighting Power Density Values updated per Table 140.6-G. Allowances in Table 140.6-D remain unchanged.

**Indoor Lighting Controls – Sections 130.1 & 140.6**

- **Mandatory Shut-OFF Controls:** Additional exception of 0.1 w/ft2 for egress in any building.
- **Mandatory Multi-level Controls:** Enclosed areas 100 ft2 or greater with a general lighting load greater than 0.5 w/ft2 must have multi-level controls as shown in Table 130.1-A. Some exceptions apply for classrooms, public restrooms, and areas with one luminaire.
- **Mandatory Partial-ON Occupancy Sensor:** For areas requiring occupant sensing controls per Section 130.1(c)5 of the Standards (offices ≤ 250 ft2, multipurpose rooms < 1,000 ft2, classrooms, and conference rooms), and multilevel controls per Section130.1(b)of the 2016 Energy Standards, the occupant sensing controls shall function as partial-ON (for 50-70% of controlled power) OR vacancy sensor (only manual ON). Where no multi-level controls are required per Section 130.1(b) of the 2016 Energy Standards, an automatic full-on occupancy sensor is acceptable.
- **Control Credits:** Power Adjustment Factors (PAF) listed in Table 140.6-A have been updated and the following options have been added:
- **Institutional Tuning:** Limits maximum output or power draw of controlled lighting to 85% or less of full light output/draw.
- **Daylight dimming plus OFF control:** Turns lighting completely OFF when daylight in the daylit zone is greater than 150% of general lighting system at full power.

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# Thank You

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