



2016 Title 24, Part 6

# Highlights of What's New with the 2016 Nonresidential Energy Code

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**Statewide Energy Efficiency Forum**



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# Overall Changes in Scope and Application

## Welcome

### Overall Changes in Scope and Application

- Schedule
- Additional Scope of Coverage
- Commissioning

Low-rise Residential Envelope

Nonresidential Envelope

Low-rise Residential Mechanical

Nonresidential Mechanical

Residential Lighting

Nonresidential Indoor Lighting

Nonresidential Outdoor Lighting

# Update Schedule

- **Jan 1, 2017 Implementation Date**

Any projects that apply for permit on or after Jan 1, 2017 will be subject to the 2016 Standards.

- Information and Documents available at:

<http://www.energy.ca.gov/title24/2016standards/>

<http://energycodeace.com/>

# 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% Increased Stringency



### 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.



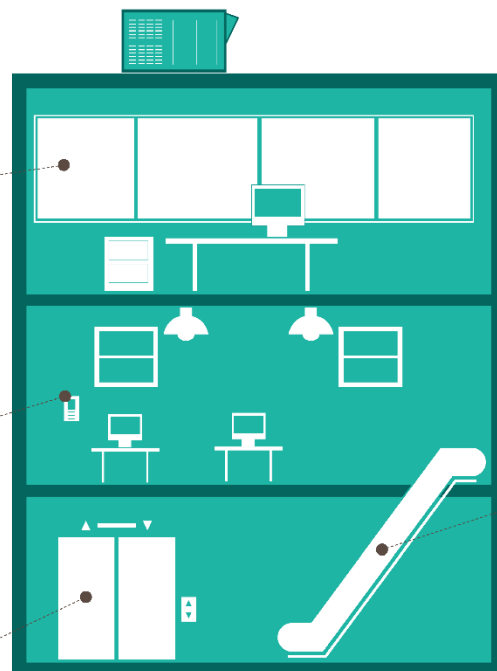
### DIRECT DIGITAL CONTROLS

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.



### 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.

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.



# Process Equipment



## Elevators & Escalators

- Elevator cab LPD 0.6 w/sqft maximum
  - Elevator ventilation fans 0.33 w/cfm
  - Auto-shutoff of lights and fans after 15 minutes
  - Escalators slow down when not conveying passengers
  - Escalators in Airports, Hotels and Transportation function areas
- Mandatory Measures
  - Elevators – 120.6(f)
  - Escalators – 120.6(g)
    - Includes moving walkways



- Section 110.11: Mandatory Requirements For Electrical Power Distribution System
- Low-voltage dry-type transformer meets Title 20
- 600 volts or less, air cooled, does not use oil
- Exceptions:
  - autotransformer
  - drive (isolation) transformer
  - grounding transformer
  - machine-tool (control) transformer
  - non-ventilated transformer
  - rectifier transformer
  - regulating transformer
  - sealed transformer
  - special-impedance transformer
  - testing transformer
  - transformer with tap range of 20 percent or more
  - uninterruptible power supply transformer
  - welding transformer

# Design Review



- Buildings less than 10,000 sq ft may be the engineer / **architect** / contractor of record.
- Buildings greater than 10,000 sq ft but less than 50,000 sq ft, shall be a qualified in-house engineer / **architect** / contractor with no other project involvement or a third party.
- Buildings greater than 50,000 sq ft or buildings with complex mechanical systems, the signer shall be a third party engineer / **architect**.

# Commissioning



- Triggered for New Buildings with 10,000 sqft or more of Nonresidential Conditioned Space
- Owner's Project Requirements (OPR) now requires Building envelope performance expectations.

# Nonresidential Envelope

Welcome

Overall Changes in Scope and Application

Low-rise Residential Envelope

## Nonresidential Envelope

- Mandatory Measures
- Insulation
- Cool Roofs

Low-rise Residential Mechanical

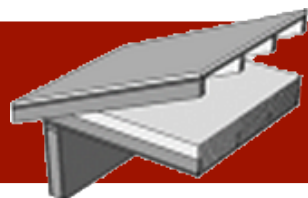
Nonresidential Mechanical

Residential Lighting

Nonresidential Indoor Lighting

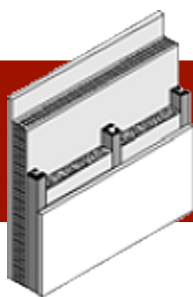
Nonresidential Outdoor Lighting

# Envelope: New Construction Mandatory Insulation



**Roof**

Metal building:	U-factor = 0.098 (R-19)
Wood framed/other:	U-factor = 0.075 (R-13)



**Wall**

Metal building:	U-factor = 0.113 (R-13)
<b>Metal framed:</b>	<b>U-factor = 0.151 (R-13 w/R-2)</b>
Light mass:	U-factor = 0.440
Heavy mass:	U-factor = 0.690
Wood framed/other:	U-factor = 0.110 (R-11)
Spandrel/curtain wall:	U-factor = 0.280 (none)
Wood Demising:	U-Factor = 0.099 (R-13)
<b>Metal Demising:</b>	<b>U-Factor = 0.151 (R-13 w/R-2)</b>



**Floor**

Raised mass:	U-factor = 0.269 (none)
Other:	U-factor = 0.071 (R-11)
Heated slab:	CZ 1-15 = R-5; CZ 16 = R-10 or R-10 vertical + R-7 horizontal (see Table 110.8-A)

Exception: A dedicated data center that has a total covered process load exceeding 750 kW

# Nonresidential Mechanical

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Low-rise Residential Envelope

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## Nonresidential Mechanical

- Equipment
- Economizers
- Controls

Residential Lighting

Nonresidential Indoor Lighting

Nonresidential Outdoor Lighting



- Section 110.2 Mandatory Requirements for Space Conditioning Equipment
- Effective Jan 1, 2016
- New efficiencies for DX equipment
- New efficiencies for chillers

**TABLE 110.2-A ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS – MINIMUM EFFICIENCY REQUIREMENTS**

Equipment Type	Size Category	Efficiency <sup>a, b</sup>		Test Procedure <sup>c</sup>
		Before 1/1/2016 <del>5</del>	After 1/1/2016 <del>5</del>	
Air conditioners, air cooled both split system and single package	≥ 65,000 Btu/h and < 135,000 Btu/h	11.2 EER <sup>b</sup> 11.4 IEER <sup>b</sup>	<u>11.2 EER</u> <u>12.9 IEER</u>	ANSI/AHRI 340/360
	≥ 135,000 Btu/h and < 240,000 Btu/h	11.0 EER <sup>b</sup> 11.2 IEER <sup>b</sup>	<u>11.0 EER</u> <u>12.4 IEER</u>	ANSI/AHRI 340/360
	≥ 240,000 Btu/h and < 760,000 Btu/h	10.0 EER <sup>b</sup> 10.1 IEER <sup>b</sup>	<u>10.0 EER</u> <u>11.6 IEER</u>	



# Fault Detection and Diagnostics on Economizers



- Section 120.2(i) Mandatory Fault Detection and Diagnostics (FDD)
- All air-cooled unitary packaged DX units
- Mechanical cooling capacity  $\geq 54,000$  Btuh (4.5 tons)
- Must include a Fault Detection and Diagnostics (FDD) system



# Direct Digital Controls



Photo by Advanced Telemetry  
<http://www.flickr.com/photos/41831077@N08/3870721152>

- Section 120.2(j) Direct Digital Controls (DDC)
- New Construction, Additions & Alterations
- Installed per Table 120.2-A

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2016 Building Energy Efficiency Standards

TABLE 120.2-A DDC APPLICATIONS AND QUALIFICATIONS

BUILDING STATUS	APPLICATIONS	QUALIFICATIONS
Newly Constructed Buildings	Air handling system and all zones served by the system	Individual systems supplying more than three zones and with design heating or cooling capacity of 300 kBtu/h and larger
Newly Constructed Buildings	Chilled water plant and all coils and terminal units served by the system	Individual plants supplying more than three zones and with design cooling capacity of 300 kBtu/h (87.9 kW) and larger
Newly Constructed Buildings	Hot water plant and all coils and terminal units served by the system	Individual plants supplying more than three zones and with design heating capacity of 300 kBtu/h (87.9 kW) and larger
Additions or Alterations	Zone terminal unit such as VAV box	Where existing zones served by the same air handling, chilled water, or hot water systems that have DDC
Additions or Alterations	Air handling system or fan coil	Where existing air handling system(s) and fan coil(s) carried by the same

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**Nonresidential Indoor Lighting**

- Power Adjustment Factors
- Complete Building Method
- Area Category Method
- Tailored Method
- Alterations

Nonresidential Outdoor Lighting

# Control Credits



## Table 140.6-A Lighting Power Adjustment Factors (PAFs)

### Institutional Tuning

- The lighting controls shall limit the maximum output or maximum power draw of the controlled lighting to 85% or less of full light output or full power draw

### Daylight Dimming plus OFF control

- Lighting control systems shall meet all of the requirements of §130.1(d) – Daylighting Controls
- The lighting control system shall turn lights completely OFF when the daylight available in the daylit zone is greater than 150 percent of the illuminance received from the general lighting system at full power.



# Multi-level Controls



## Section 130.1(b)

- Multi-level controls required in areas  $> 0.5 \text{ w/sqft}$  and  $\geq 100 \text{ sqft}$
- Lighting shall meet requirements of Table 130.1-A
- This eliminates other options from prior code, more or less means dimming.



## Exceptions to Section 130.1(b)

- Classrooms, with a connected general lighting load of 0.7 watts per square feet and less **and public restrooms**
  - Can have at one control step between 30-70 percent of full rated power.
- An area enclosed by ceiling height partitions that has only one luminaire with no more than two lamps.



# Shut-OFF Controls §130.1(c)



- Automatically shuts off or reduces light when the space is typically unoccupied
  - Occupancy sensor
  - Automatic time-switch
  - Signal from another building
  - Other control
- Separate controls for each enclosed space, lighting in each floor and for general, display, ornamental and display case lighting

## Exceptions:

- ✦ Emergency egress lighting during occupied times
- ✦ 0.1 W/ft<sup>2</sup> for egress in ANY building
- ✦ Continuous use lighting and electrical equipment rooms



# Entire Luminaire Alterations



- For each enclosed space, alterations that consist of either
  - Removing and reinstalling a total of 10% or more of the existing luminaires; or
  - Replacing or adding entire luminaires; or
  - Adding, removing, or replacing walls or ceilings along with any redesign of the lighting system.
- Required to comply with 140.6 LPD requirements for new construction and control requirements of Table 141.0-E





# Entire Luminaire Alterations



- Alterations where existing luminaires are replaced with new luminaires, and that do not include adding, removing, or replacing walls or ceilings along with redesign of the lighting system
- Replacement luminaires shall collectively have at least 50% lower rated power as compared to the existing luminaires being replaced for Office, Retail and Hotel Occupancies.
- All other Occupancies shall be at least a 35% reduction.
- Must also meet the applicable requirements of Sections 130.1(a) Area Controls and 130.1(c) Automatic Shutoff Controls

# Luminaire Component Modifications



- Replacing the ballasts or drivers and the associated lamps in the luminaire
- Permanently changing the light source of the luminaire
- Changing the optical system of the luminaire
- 70 or more existing luminaires are modified either on any single floor of a building or, where multiple tenants inhabit the same floor, in any single tenant space, in any single year



# Luminaire Component Modifications

- Shall meet the applicable requirements of Sections:
  - 130.1(a) Area Controls
  - 130.1(c) Automatic Shutoff Controls
- Required to comply with 140.6 LPD requirements for new construction; or
- Modified luminaires shall collectively have at least 50% lower rated power as compared to the existing luminaires being modified for Office, Retail and Hotel Occupancies.
- 35% reduction required for all other Occupancies.
- Lamp replacements alone and ballast replacements alone shall not be considered a modification of the luminaire provided that the replacement lamps or ballasts are installed and powered without modifying the luminaire

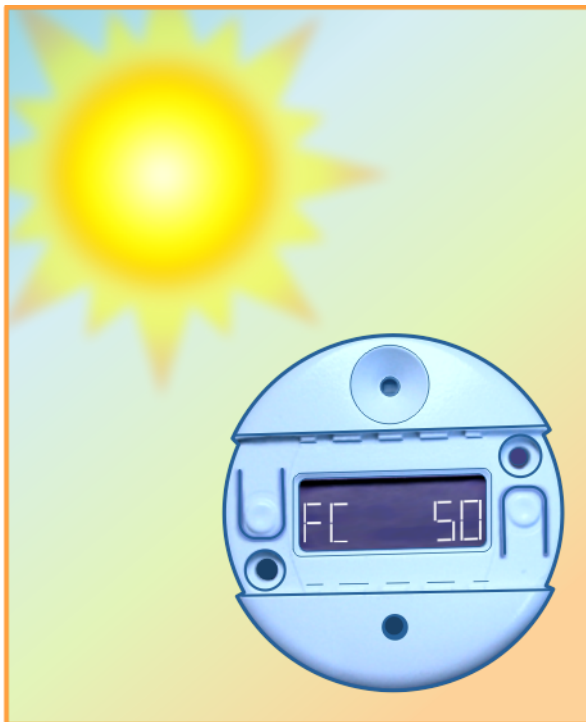


# Wiring Alterations



- For each enclosed space, wiring alterations that
  - Add a circuit feeding luminaires; or
  - Replace, modify, or relocate wiring between a switch or panelboard and luminaires; or
  - Replace lighting control panels, panelboards, or branch circuit wiring;
- Meet the LPD 140.6;
- Shall be meet the applicable requirements of Sections:
  - 130.1(a) Area Controls
  - 130.1(c) Automatic Shutoff Controls

# Wiring Alterations (cont)



- Each enclosed space, be wired to create a minimum of one step between 30% to 70% of lighting power; and
- Each enclosed space where wiring alterations include 20 or more luminaires that are located within the primary sidelit daylit zone or the skylit daylit zone
  - 130.1(d) - Daylighting controls

**EXCEPTION** - Alterations strictly limited to addition of lighting controls.

**EXCEPTION** - In an enclosed space where wiring alterations involve two or fewer luminaires.

**EXCEPTION** - Alterations that would directly cause the disturbance of asbestos, unless the alterations are made in conjunction with asbestos abatement.

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**Nonresidential Outdoor Lighting**

- General
- Hardscape Lighting Power
- Specific Applications Lighting Power
- Controls





# Hardscape Lighting Power



- Table 140.7-A
- Hardscape Allowances
- Reductions in Lighting Allowances (shown in red)

Type of Power Allowance	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Area Wattage Allowance (AWA)	0.020 W/ft <sup>2</sup>	0.030 W/ft <sup>2</sup>	0.040 W/ft <sup>2</sup>	0.050 W/ft <sup>2</sup>
Linear Wattage Allowance (LWA)	0.15 W/lf	0.25 W/lf	0.35 W/lf	0.45 W/lf
Initial Wattage Allowance (IWA)	340 W	450 W	520 W	640 W



# Motion Sensors



- All luminaires with mounting heights less than 24' above the ground
- Motion sensor required
- Reduce lighting power of each luminaire by at least 40 percent but not exceeding 80 percent

*OR*

- Provide continuous dimming
- Shall employ auto-on functionality
- Maximum of 1,500 watts of lighting power shall be controlled together

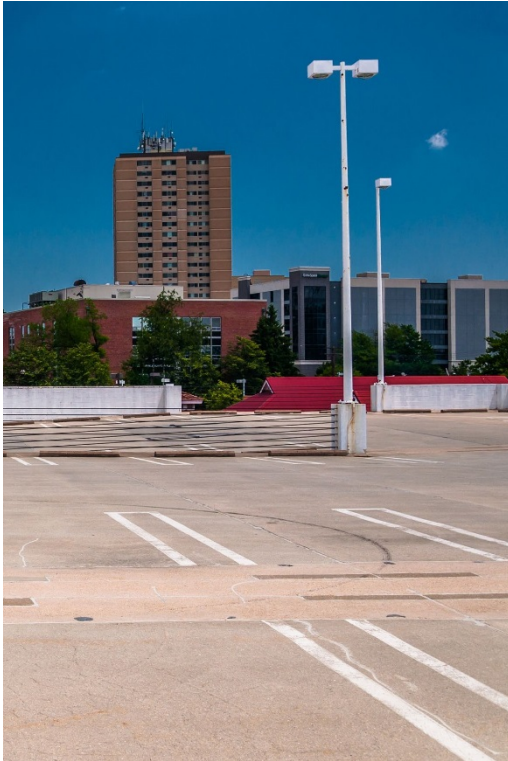


# Alterations



- Increase in connected lighting load
  - 130.2(c) Mandatory Controls
  - 140.7 Power Allowances

# Alterations



- No increase in connected lighting load, where the greater of 5 luminaires or 10% of the existing luminaires are replaced
- Parking lots/outdoor sales lots with luminaires  $\leq 24$  feet include
  - Photocontrol or Astro Timeclock
  - Motion Sensor
- All other luminaires include
  - Photocontrol or Astro Timeclock
  - Independently controlled or have Motion Sensor

# Alterations



- No increase in connected lighting load, where the greater of 5 luminaires or 50% of the existing luminaires are replaced
  - 140.7 Power Allowances

**EXCEPTION** - Alterations where the replacement luminaires have at least 40% lower power consumption compared to the original luminaires



# EnergyCodeAce.com

The screenshot shows the EnergyCodeAce.com website. The header includes the logo, a search bar, and links for 'About' and 'Contact'. A banner states: 'A new site developed by the California Statewide Codes & Standards Program here to help you meet the requirements of Title 24, Part 6'. The navigation menu has links for Home, Tools Ace, Training Ace, Resources Ace, and Outreach. The main content area is divided into several sections: 'Did you Know?' with bullet points about energy savings, money, and permit quality; 'Comply With Me' featuring a video of a marching band; 'Log In or Register' with a form; 'It's time to comply - the 2013 Building Energy Code is now in effect' with a countdown to July 1; 'We offer FREE:' section with three categories: Tools (Ace Tools™), Training (Ace Training™), and Resources (Ace Resources™); and a 'Calendar' section for viewing events. The footer contains a Privacy Policy link, Terms of Use link, and logos for the California Statewide Codes & Standards Program, the Department of Industrial Relations, and PG&E Corporation.

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