

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 related California Energy Commission (Energy Commission) FAQ sheet.

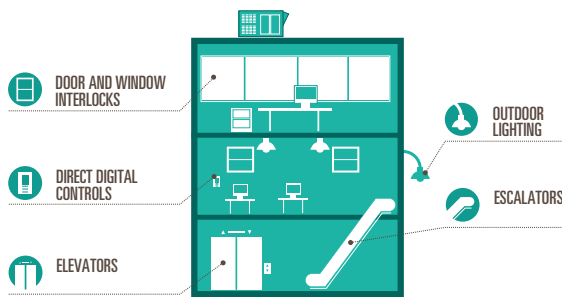


Figure 1: 2016 Energy Standards Update Infographic by the Energy Commission

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 Energy Commission's website.

In addition, Energy Code Ace is working with the Energy Commission 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.

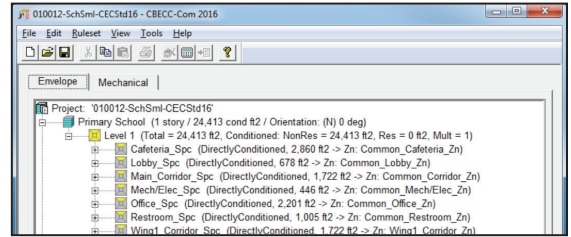


Figure 2: CBECC-Com 2016 Interface

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 Requirements – 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 Requirements – 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

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 requirements, 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 Section 130.1(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.

Lighting Alterations

The lighting alterations language for the prescriptive approach is included in the following sections. Lamp replacements or ballast replacements alone are not considered lighting alterations, provided that replacement lamps and/or ballasts are installed and powered without modifying the luminaire.

Entire Luminaire Alterations – Section 141.2I

Lighting shall meet the lighting power allowance in Section 140.6 of the 2016 Energy Standards and altered permanently installed luminaries shall meet the applicable requirements in Table 141.0-E if the following options occur:

- Removing/reinstalling 10% or more of the existing luminaires (if there are more than 2) in a space, or
- Replacing or adding entire luminaires, or
- Adding, removing, or replacing walls or ceilings along with lighting redesign (changing the area or space type)

When replacing existing luminaries and the alteration is not in conjunction with adding, removing or replacing walls or ceilings, the new luminaries must:

- Reduce rated power by 50% for office, retail and hotel occupancies and 35% for all others, compared to the original luminaires, at full light output, and
- Meet all the requirements in Sections listed in Lighting Alterations (see list below)

Luminaire Component Modifications – Section 141.2J

Definition: Alterations that replace the ballasts or drivers and the associated lamps in the luminaire, or permanently change the light source or the optical system of the luminaire.

Modifying the components of fewer than 70 existing luminaires on a single floor or within a tenant space within a year, does not trigger code. If there are 70 or more modifications per year on a single floor or tenant space, then the project needs to meet one of the following criteria:

- Meet lighting power allowance in Section 140.6 of the 2016 Energy Standards, and comply with Table 141.0-E or
- Reduce rated power by 50% for office, retail and hotel occupancies and 35% for all others, compared to the original luminaires, at full light output, and meet the requirements in Lighting Alterations Sections List.

In addition, the modification should not prevent or disable multi-level, shut-off, or daylight controls.

Lighting Wiring Alterations – Section 141.0(b)2K

Definition: Alterations that add a circuit feeding luminaires, that replace, modify or relocate wiring between a switch or panelboard and luminaires, or replace lighting control panels, panelboards, or branch circuit wiring.

Wiring alterations (unless strictly to add lighting controls) in each enclosed space shall meet the requirements in the following sections:

- Lighting Power Allowance in Section 140.6
- Section 130.1 (a) 1, 2 and 3
- Section 130.1 (c)1A through C
- Section 130.1 (c)3 and Section 130.1 (c)4

And meet the following criteria:

- Each enclosed space must be wired to create a min. of one step between 30-70% of the lighting power or meet Section 130.1(c)4 of the 2016 Energy Standards.
- For each enclosed space where alterations include 10 or more luminaires that provide general lighting and are located in the primary sidelit daylit or skylit daylit zone, also meet the requirements of Section 130.1(d) of the 2016 Energy Standards.

Exceptions for all lighting alterations:

- Alterations that would cause the disturbance of asbestos.
- Alterations affecting two or fewer luminaires in an enclosed space.
- Lighting control acceptance testing (per Section 130.4 of the 2016 Energy Standards) is not required for alterations of a total of 20 or fewer controlled luminaires.

Table 141.0-E Requirements for Entire Luminaire Alterations

Control Requirements	Lighting power <85% of allowance	Lighting power is >85% of allowance
Section 130.1 (a)1,2 and 3 Area controls	Yes	Yes
Section 130.1 (b) Multi-level controls*	For each space, min. one step between 30-70% or meet 130.1 (b)	Yes
Section 130.1 (c) Shut-off Controls	Yes	Yes
Section 130.1 (d) auto daylight controls	Not Required	Yes
Section 130.1 (e) Demand Responsive Controls	Not Required	Yes

*The 2016 Energy Standards now allow A/B or checkerboard switching. The previously required multilevel lighting per luminaire is no longer applicable.

Lighting Alterations Sections List:

- Section 130.1 (a) 1, 2 and 3
- Section 130.1 (c)1A through C
- Section 130.1 (c)2 through Section 130.1(c)6A
- Section 130.1 (c)7B (for parking garages only)

Outdoor Lighting Highlights

- **Outdoor Lighting Zone 0:** New lighting zone added for undeveloped areas of state or national parks. No continuous hardscape lighting allowed. A single luminaire of 15 watts or less may be installed in certain areas.
- **Hardscape Lighting Power:** Several reductions in lighting allowances have been included in Table 140.7-A, for each lighting zone (LZ). Additional wattage allowances are applicable for instances where hardscape is more than 50% concrete in LZ2 and LZ3.
- **Specific Applications in Lighting Power:** Lighting power allowances for building entrances/exits for LZs 1-4 have been reduced (Table 140.7-B). Lighting for ATM machines is now 250 watts for the first ATM and 70 watts for each additional machine, across all LZs.
- **Motion Sensors:** Motion sensor capabilities must be able to reduce lighting power of each luminaire by at least 40% but not exceeding 90%. Sales lots and sales canopies are no longer exceptions under Section 130.2(c)3 of the 2016 Energy Standards.

Outdoor Lighting Alterations Section 141.0(b)2L

Alterations to existing outdoor lighting shall meet the mandatory requirements in the following sections in the 2016 Energy Standards:

- Section 130.0
- Section 130.2(a) and (b)
- Section 130.4

For alterations that increase the connecting lighting load:

- Added or altered luminaires must meet the applicable requirements in 2016 Energy Standards of Section 130.2(c) and the requirements of Section 140.7 for general hardscape lighting or for the specific lighting applications contained the alterations.

For alterations that do not increase the connecting lighting load but where the greater of 5 luminaires or 10% of existing luminaires are replaced, the following requirements apply:

- Parking lots/ outdoor sales lots: For replacement of luminaires mounted 24 ft or less above the ground, alteration must comply with Section 130.2(c)1 and Section 130.2(c)3 of the 2016 Energy Standards.
- For all other applications (except parking lots/outdoor sales lots) and where the replacement luminaires are mounted above 24 ft (parking lots & sales areas), alteration must comply with Section 130.2(c)1 and either Section 130.2(c)2 or be controlled by lighting controls (motion sensors) that automatically reduce power by $\geq 40\%$ when unoccupied.

For alterations that do not increase the connecting lighting load but where the greater of 5 luminaires or 50% of existing luminaires are replaced, the following requirements apply:

- Must meet all above requirements for 10% replacement
- Section 140.7 (except when alterations reduce power consumption by 40% compared to the original luminaires)

Exceptions for all lighting alterations:

- Lighting control acceptance testing (per Section 130.4 of the 2016 Energy Standards) is not required for alterations of a total of 20 or fewer controlled luminaires.



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