



ENERGY & SUSTAINABLE SOLUTIONS

California Energy Commission

DOCKETED

15-BSTD-01

TN # 75501

MAR 20 2015

Prepared For:

Matthew Hargrove

California Business Properties Association

1121 L Street, Suite 809

Sacramento, CA 95814



**CPBA'S COMMENTS ON
NONRESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS
CALIFORNIA CODE OF REGULATIONS
TITLE 24, PART 6**

Prepared By:

ConSol

Ignacio Robles, P. E.

5757 Pacific Avenue, Suite 220

Stockton, California 95207

March 18, 2015

TABLE OF CONTENTS

SECTION 1. EXECUTIVE SUMMARY.....	3
SECTION 2. CRITICAL CHANGES IN 2016 CODE.....	4
SECTION 3. INDUSTRY COMMENTS ON CEC PROPOSED INDOOR ALTERATIONS VERSION 9.....	18
SECTION 4. INDUSTRY COMMENTS ON PROPOSED EXTERIOR LIGHTING EXEMPTIONS.....	23
SECTION 5 TABLE SUMMARY OF CRITICAL CHANGES IN 2016 CODE.....	25

SECTION 1

EXECUTIVE SUMMARY

The 2016 California Energy Code (CEC) is the Efficiency Standards of the California Code of Regulations Title 24, Part 6. The CECs 45-Day Language for Proposed Revisions were summed up and analyzed.

This report summarizes the findings of the previous CEC (strike out) version. There were 201 revisions identified. Of these 31 were considered significant changes, 59 moderate changes and the rest 111 are considered to have little to no impact. The measures were review to analyze the potential impact they may have on the commercial building industry. Of the 31 significant changes, 7 were considered to be critical.

The 7 critical changes are shown in Table 1 along with a brief summary of the changes and section number in the code. These changes may have material cost implications, increase in installation cost or methods of implementation. Some may have some or all of these.

The changes that have critical impact are each treated individually in Section 2 Critical Changes in 2016 Code. The changes and purpose of the changes are identified. These are followed by an explanation of the potential economic impact.

On March 10, 2015, CEC proposed a 2016 Version 9 45 Day Language that addresses indoor lighting system alterations and modifications (06-Mazi-Subchapt_6_141 0_Nonres Lighting Alterations-v9). Section 3 provides industry comments on CEC proposed indoor alterations Version 9.

Version 9 only specifies indoor lighting and does not mention exterior lighting. Section 4 consists of industry comments on proposed exterior lighting exemptions.

This report includes the Latest Staff Intended Changes to Address Concerns with 45-Day Language Dated February 24, 2015.

SECTION 2
CRITICAL CHANGES IN 2016 CODE
INDIVIDUAL REVISIONS SUMMARIZED AND COMMENTED

Revision 75

SUBCHAPTER 3 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES—MANDATORY REQUIREMENTS

SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

~~Space conditioning systems~~ Nonresidential, high-rise residential, and hotel/motel buildings shall ~~be installed with controls that~~ comply with the applicable requirements of ~~Subsections (a) through (i)~~ Sections 120.2(a) through 120.2(i).

(f) ***Dampers for Air Supply and Exhaust Equipment.*** Outdoor air supply and exhaust equipment shall be installed with dampers that:

1. ~~Automatically close upon fan shutdown; and,~~
2. ~~Automatically close during unoccupied periods; and,~~

EXCEPTION 1 to Section 120.2(f)2: During pre-occupancy as as specified by Section 120.1(c)2.

EXCEPTION 2 to Section 120.2(f)2: When enabled by an Occupant Sensor as specified by 120.1(c)5.

EXCEPTION 3 to Section 120.2(f)2: When enabled by an Override signal as specified by 120.2(e)1 and dampers open to provide outdoor air ventilation.

3. ~~Remain closed during setback heating and cooling as specified by 120.2(e)2~~

EXCEPTION 1 to Section 120.2(f)3: When equipped with an economizer as specified by 140.4(e) and the outdoor air conditions are below the high limit shutoff in TABLE 140.4-B.

EXCEPTION 1 to Section 120.2(f): Where it can be demonstrated to the satisfaction of the enforcing agency that the equipment serves an area that must operate continuously.

EXCEPTION 2 to Section 120.2(f): Gravity and other nonelectrical equipment that has readily accessible manual damper controls.

EXCEPTION 3 to Section 120.2(f): At combustion air intakes and shaft vents.

EXCEPTION 4 to Section 120.2(f): Where prohibited by other provisions of law.

Purpose

The proposed regulations add requirements for dampers serving air supply and exhaust equipment. Dampers must now automatically close during unoccupied periods as well as during setback heating and cooling periods. Several exceptions were added to these requirements that allow for the dampers to remain open during certain periods when outdoor air is necessary. The damper can remain open during pre-occupancy purge cycles or if the zone is enabled by an override signal from an occupancy sensor, automatic time switch control or a manually operated 4-hour time. This proposal will save energy by not unnecessarily conditioning outside air during unoccupied periods.

CBPA Comments

The CEC staff proposed regulations to add requirements for dampers serving air supply and exhaust equipment. Dampers must now automatically close during unoccupied periods as well as during setback heating and cooling periods. The damper can remain open during pre-occupancy purge cycles or if the zone is enabled by an override signal from an occupancy sensor, automatic time switch control or a manually operated 4-hour time.

This may trigger the requirement of expensive building automation systems where none were required. It may also require one when one is not in existence. This requirement may conflict with public health code for adequate ventilation and may lead to sick building syndrome. This damper requirement may be very expensive especially for smaller buildings. This is may not be cost effective.

The comments below are taken from the CASE August meeting on Economizers (page 20):

The Statewide CASE Team briefly discussed this issue with one concerned stakeholder who suggested that under the 2013 Standards, outdoor air dampers can be tied to fan operation at all times. If the outdoor dampers are tied to fan operation, then when the building is unoccupied and the thermostats are in setback mode and the air handling unit turns on to ensure that the indoor temperatures meet the setbacks, the outdoor air dampers may be opening and unnecessarily ventilating the building and consuming energy to condition the ventilation air.

The Statewide CASE Team revised language to clarify the intent of the code – that outdoor air dampers remain closed when the building does not require ventilation. Ventilation is only required during occupied periods, pre-occupancy purging, or when economizing conditions are favorable.

http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/dru_title24_parts_01_06/2016%20T24%20CASE%20Report%20-%20NonresEconomizer%20Modifications%20-%20Aug2014-V2.pdf

Revision 77

SUBCHAPTER 3 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES—MANDATORY REQUIREMENTS

SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

~~Space conditioning systems~~Nonresidential, high-rise residential, and hotel/motel buildings shall ~~be installed with controls that~~ comply with the applicable requirements of ~~Subsections (a) through (i)~~Sections 120.2(a) through 120.2(i).

- (j) Direct Digital Controls (DDC).** Direct Digital Controls shall be provided as specified by Table 120.2-A. The provided DDC system shall meet the control logic requirements of Sections 120.1(c) and 120.2(h), and be capable of the following
1. Monitoring zone and system demand for fan pressure, pump pressure, heating and cooling;
 2. Transferring zone and system demand information from zones to air distribution system controllers and from air distribution systems to heating and cooling plant controllers;
 3. Automatically detecting the zones and systems that may be excessively driving the reset logic and generate an alarm or other indication to the system operator;
 4. Readily allow operator removal of zones(s) from the reset algorithm;
 5. For new buildings, trending and graphically displaying input and output points; and
 6. Resetting heating and cooling setpoints in all non-critical zones upon receipt of a signal from a centralized contact or software point as described in Section 120.2(h)

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 fan systems bhp of 10 hp (7.45 kW) 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) served by the same chilled or hot water plant have DDC
Additions or Alterations	New air handling system and all new zones served by the system	Individual systems with fan system bhp of 10 hp (7.45 kW) and larger and supplying more than three zones and more than 75% percent of zones are new
Additions or Alterations	New or upgraded chilled water plant	Where all chillers are new and plant desing cooling capacity is 300 kBtu/h (87.9 kW) and larger
Additions or Alterations	New or upgraded hot water plant	Where all boilers are new and plant design heating capacity is 300 kBtu/h (87.9 kW) and larger

Purpose

The proposed regulations add requirements for Direct Digital Controls (DDC) for select applications. These applications are outlined in Table 120.2A, which include HVAC system capabilities and capacity. The DDC system must be capable of monitoring zone and system demand for fan pressure pump. By adding these requirements, large HVAC systems will now be required to be controlled more efficiently and will in turn save energy.

CBPA Comments

The added requirements for DDC are outlined in Table 120.2A must be capable of monitoring zone and system demand for fan pressure pump. If properly installed and commissioned large HVAC systems may reduce energy and controlled more efficiently; however, large HVAC systems are already required to operate efficiently and effectively. Thus, the proposed regulations may, in reality, not be cost effective for the amount of energy savings in this building category.

Using the criteria of 10 brake horsepower as a metric may lead to misapplication of this requirement. Does a 10 brake horse power system impact buildings as small as 10,000 square feet? We believe brake horse power is an incorrect metric for determining energy efficiency for DDC controls. We believe the cost of the controls for this could be in the neighborhood of \$30,000 to \$50,000 per building or alteration.

The proposed implementation may trigger other sections of Title 24. The mandatory requirements will require demand control ventilation and automatic demand shed when the building is equipped with DDC to zone level. Since DDC system for smaller alteration may not be existing the proposed revisions may have significant impact on smaller buildings.

Proposed Code

Proposed 25,000 square feet in lieu of 10 bhp fan system to maintain consistency language and reduce cost.

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 25,000 square feet or with fan systems bhp of 10 hp (7.45 kW) 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) served by the same chilled or hot water plant have DDC
Additions or Alterations	New air handling system and all new zones served by the system	Individual systems with 25,000 square feet or fan system bhp of 10 hp (7.45 kW) and larger and supplying more than three zones and more than 75 percent of zones are new
Additions or Alterations	New or upgraded chilled water plant	Where all chillers are new and plant design cooling capacity is 300 kBtu/h (87.9 kW) and larger
Additions or Alterations	New or upgraded hot water plant	Where all boilers are new and plant design heating capacity is 300 kBtu/h (87.9 kW) and larger

Revision 91

SUBCHAPTER 3 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES—MANDATORY REQUIREMENTS

SECTION 120.6 – MANDATORY REQUIREMENTS FOR COVERED PROCESSES

Nonresidential, high-rise residential, and hotel/motel buildings shall comply with the applicable requirements of Sections 120.6(a) through 120.6(g).

(f) Mandatory Requirements for Elevators

1. The light power density for the luminaires inside the elevator cab shall be no less than 0.6 watts per square foot.
2. Elevator cab ventilation fans for cabs without space conditioning shall not exceed 0.33 watts per CFM as measured at maximum speed.
3. When the elevator cab is stopped and unoccupied with doors closed for over 15 minutes, the cab interior lighting and ventilation fans shall be switched off until elevator cab operation resumes.
4. Lighting and ventilation shall remain operational in the event that the elevator cabin gets stuck when passengers are in the cabin.
5. Elevator Lighting and Ventilation Control Acceptance. Before an occupancy permit is granted for elevators subject to 120.6(f), the following equipment and systems shall be certified as meeting the Acceptance Requirement for Code Compliance, as specified by the Reference Nonresidential Appendix NA7. A Certificate of Acceptance shall be submitted to the enforcement agency that certifies that the equipment and systems meet the acceptance requirements specified in NA7.14.

EXCEPTION 1 to Section 120.6(f)1: Interior signal lighting and interior display lighting are not included in the calculation of lighting power density.

Purpose

The proposed regulation added new requirements for elevators in regards to the cab lighting and ventilation fan. These systems must now comply with lighting and fan efficacy requirements as well as automatic shut off controls to maximize energy savings while the elevator is not in use.

CBPA Comments

February 24, 2015-CEC Staff Intended Changes to Address Concerns with 45-Day Language CEC Staff Intended changes are highlighted above. “Less” should be changed to “greater”.

The proposed regulation added new requirements for elevators in regards to the cab lighting and ventilation fan. These systems must now comply with lighting and fan efficacy requirements as well as automatic shut off controls.

Elevator manufacturing standards for lighting and fans will need to be changed to meet the new requirements. New costly controls will be needed to turn the interior lighting and fans off when the elevators are not occupied. This could result in excessive cycling and premature wear of these equipment and components. In addition to the initial added cost this could lead to costly maintenance and servicing.

The comments below are reworded from the CASE September 2014 meeting on ASHRAE 90.1-2013 (page 20):

The light power density of 0.6 W/SF raise concerns that it may be difficult for smaller elevators to reach requirement than larger elevators.

The proposed measure involves integrating electronic controls to the fans and lighting that would otherwise not be installed and results in costly occupant sensing controls. The current design of the elevators do not have these integrated electronic controls which will make the installing and retail price of elevators to increase. The savings that correspond with the proposed requirements may not just able, especially in dense buildings where elevators are being constantly used.

http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/dru_title24_parts_01_06/2016%20T24%20CASE%20Report%20-%20Proposals%20Based%20on%20ASHRAE%2090.1%202013-Sep2014.pdf

Revision 123

SUBCHAPTER 4 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—MANDATORY REQUIREMENTS FOR LIGHTING SYSTEMS AND EQUIPMENT, AND ELECTRICAL POWER DISTRIBUTION SYSTEMS

SECTION 130.1 – INDOOR LIGHTING CONTROLS THAT SHALL BE INSTALLED

Nonresidential, high-rise residential and hotel/motel buildings shall comply with the applicable requirements of Sections 130.1(a) through 130.1(e).

(c) Shut-OFF Controls

5. **Areas where Occupant Sensing Controls are required to shut OFF All Lighting.** In offices 250 square feet or smaller, multipurpose rooms of less than 1,000 square feet, classrooms of any size, and conference rooms of any size, lighting shall be controlled with occupant sensing controls to automatically shut OFF all of the lighting when the room is unoccupied. The occupant sensing controls shall function either as a:

- A. Partial-ON Occupant Sensor capable of automatically activating between 50-70 percent of controlled lighting power, or
- B. Vacancy Sensor, where all lighting responds to a manual ON input only.

In addition, controls shall be provided that allow the lights to be manually shut-OFF in accordance with Section 130.1(a) regardless of the sensor status.

EXCEPTION to Section 130.1(c)5: Areas that are not required by Section 130.1(b) to have multi-level lighting controls may instead use occupant sensing controls that function as an Occupant Sensor or Vacancy Sensor.

Purpose

The proposed regulations add partial-ON occupant sensor and vacancy sensor technologies as mandatory requirements for areas where occupant sensing controls are required. This modification aligns Title 24 requirement to the ASHRAE 90.1-2013 requirement of the partial-On occupant sensor. The benefit is that the controls will switch off lighting when the space is unoccupied and will reduce building energy use.

Comments

CEC add mandatory requirements for partial-ON occupant sensor and vacancy sensor technologies. The lack of suitable sensor controls at competitive pricing especially for the partial-ON occupant sensor may make this revision not cost effective.

Additionally we believe the revision lacks clarity. If a vacancy sensor is selected, which we believe may be the de-facto selection, the standard is met. However, the EXEMPTION is to allow a vacancy sensor which is what the code is requiring.

Industry Comments may be reworded:

Requirements for installing shut off all lighting controls in small offices, and classroom can actually increase the cost of lighting retrofits. In many of these occurrences, people are doing very well in manually turning off lights. With the new lighting shut off control, there will be a time delay for the

sensors to turn off the lights which will have the opposite effect of savings. Since sensor control are being required, there are no or very few incentives or rebates for them which will make installing these sensors costly. The proposed regulation should be changed to a performance measure not a mandatory measure to let building owners decide how well their people are using manual controls.

In addition, turn OFF occupant sensing controls now require to turn OFF after 20 minutes which conflicts with Title 20, which requires shut off within 30 minutes.

4. 130.1 (c). Shut off Controls

This section states that all lighting is to be controlled for shut off. The California Building Code states that as long as the building is occupied, the entire exit path is to be illuminated. Occupancy sensors alone will not meet the intent as only part of the exit path could be illuminated. If timing is used and lights are off, how do you get to the reset? If someone is in a private office, on the third floor and occupancy sensors have the corridor lights turned off, this is a clear violation of the CBC.

NFPA Life Safety Code defines occupancy as when the public can enter a building. Most buildings have key access or card key access, leaving them accessible. While the intent is to reduce energy, there are minimum requirements for lighting.

In addition, Oregon has a requirement for UL 924 relays and Occupancy sensors to control exit path lighting. From calls, it appears that engineers are ignoring this or calling the local AHJ and identifying them as requiring shut off to limit liability. In checking with manufacturers, those responding do not have a Life Safety Occupancy sensor and are also concerned about liability.

Revision 137

SUBCHAPTER 4 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—MANDATORY REQUIREMENTS FOR LIGHTING SYSTEMS AND EQUIPMENT, AND ELECTRICAL POWER DISTRIBUTION SYSTEMS

SECTION 130.5 –ELECTRICAL POWER DISTRIBUTION SYSTEMS

Nonresidential, high-rise residential and hotel/motel buildings shall comply with the applicable requirements of Sections 130.5(a) through 130.5(f).

~~(a) **Service Electrical Metering.** Each electrical service or feeder shall have a permanently installed user-accessible metering system which measures of total electrical energy use per in accordance with TABLE 130.5- A.~~

1. The electrical usage shall be recorded a minimum of every 15 minutes and reported at least hourly, daily, monthly, and annually. The metering system shall be capable of maintaining all data collected for a minimum of 36 months.
- 1-2. For buildings with tenants, the distribution systems shall be separately monitored for the total building and for each individual tenant space. The data for each tenant space shall be made available to that tenant.

~~**EXCEPTION to Section 130.5(a):** Buildings Service or feeder for which the utility company provides a metering system capable of electrical energy measurement in accordance with TABLE 130.5-A requirements for occupant or user use that indicates instantaneous kW demand and kWh for a user-resettable period.~~

EXCEPTION to Section 130.5(a)1: The following buildings and areas are not required to comply with this section:

1. Building less than 25,000 square feet;
2. Individual tenant areas less than 10,000 square feet;
3. Dwelling units;
4. Functional areas where compliance with the residential lighting standards is required in accordance with Section 130.0(b).
5. Residential buildings with less than 10,000 square feet or common area;
6. Critical and Equipment branches as defined by California Electrical Code.

TABLE 130.5-A MINIMUM REQUIREMENTS FOR METERING OF ELECTRICAL LOAD

<u>Metering Type</u> <u>Functionality</u>	<u>Electrical Services</u> <u>rated 50 kVA or less</u>	<u>Electrical Services</u> <u>rated more than</u> <u>50kVA and less than</u> <u>or equal to 250 kVA</u>	<u>Electrical Services rated</u> <u>more than 250 kVA and</u> <u>less than or equal to</u> <u>1000kVA</u>	<u>Electrical Services</u> <u>rated more than</u> <u>1000kVA</u>
Instantaneous (at the time) kW demand	Required	Required	Required	Required
Historical peak demand (kW)	Not required	Not required	Required	Required
Resettable kWh	Required	Required	Required	Required
kWh per rate period	Not required	Not required	Not required	Required

Purpose

It also adds the electrical usage recording requirements and how long the recorded data shall be retained. This modification aligns the Standards to the recording requirements of ASHRAE 90.1-2013 and ensures the electrical energy usage data is recorded and retained for future use by building owners or others for purposes such as energy management and building efficiency improvement.

CBPA Comments

Mandatory requirements for electrical usage recording equipment and how long the recorded data should be retained are new added requirements. This measure adds cost to metering if utility “smart meter” is not installed. Service electrical metering is costly without directly impacting energy savings since there are no direct savings from monitoring data especially when there are no qualified individuals to interpret the data.

Disaggregation of loads is rare in existing building and adding monitoring equipment is very difficult and very expensive. With the advent of SMART meters and the continue increase in installation we believe this should be a function of the public utilities and not the commercial building industry.

Industry Comments may be reworded:

The proposed regulation involves disaggregating the metering of electrical circuits at the switchboard, control board, or panel board level. The regulation may result in installation of more or larger board s or panel boxes so it can be capable to separately meter the proposed requirements. See pg 18:

<http://www.energy.ca.gov/2015publications/CEC-400-2015-012/CEC-400-2015-012.pdf>

Proposed Code

Revise individual tenant of 25,000 square feet should be required to maintain consistency with the proposed language and minimize cost impact to the commercial building industry.

2. Individual tenant areas less than 25,000 40,000 square feet;

Revision 157

SUBCHAPTER 5 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY

SECTION 140.4 – PRESCRIPTIVE REQUIREMENTS FOR SPACE CONDITIONING SYSTEMS

A building complies with this section by being designed with and having constructed and installed a space-conditioning system that meets the applicable requirements of Subsections (a) through (m).

(n) Mechanical System Shut-off. Any directly conditioned space with operable wall or roof openings to the outdoors shall be provided with interlock controls that disable or reset the temperature setpoint to 55°F for mechanical heating and disable or reset the temperature setpoint to 90°F for mechanical cooling to that space when any such opening is open for more than 5 minutes.

EXCEPTION 1 to Section 140.4(n): Interlocks are not required on doors with automatic closing devices.

EXCEPTION 2 to Section 140.4(n): Any space without a thermostatic control (thermostat or a space temperature sensor used to control heating or cooling to the space).

EXCEPTION 3 to Section 140.4(n): Alterations to existing buildings

Purpose

The proposed regulation adds new shut off control requirements for space conditioning equipment serving zones with operable windows or doors. The purpose of the new regulation is to save energy by shutting off the space cooling or space heating equipment to the zone when the operable window or door is open. The change is necessary to save, and has the effect of saving, energy during periods when outside air is desired by the occupant.

CBPA Comments

This requires new shut off control for space conditioning equipment serving zones with operable windows or doors. This new requirement may have significant impact to smaller buildings with operable windows and doors. In large open office areas will one person that opens a window dictate for all other in the area? Especially those that are not in the proximity of the windows?

How will this be implemented and applied?

- How will this be enforced?
- Will proximity sensor, switches, etc. be required?
- Will a building controls system be required to collect the potentially numerous inputs monitoring the windows and doors and outputs to control all impacted HVAC equipment?
- Will a dead band be required to prevent unnecessary cycling especially when dealing with the application to doors being opened?

We are familiar with the comments at the CASE September 2014 meetings but do not believe that existing buildings have window switches as found by the Berkeley survey.

Revision 198

SUBCHAPTER 6 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—ADDITIONS, ALTERATIONS, AND REPAIRS

SECTION 141.0 – ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL BUILDINGS, THAT WILL BE NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES AND TO EXISTING OUTDOOR LIGHTING, AND FOR THESE OCCUPANCIES AND TO INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS

Additions, alterations, and repairs to existing nonresidential, high-rise residential and hotel/motel buildings, as well as existing outdoor lighting for these occupancies and internally and externally illuminated signs, shall meet the requirements of specified in Sections 100.0 through 110.10 and 120.0 through 130.5 that are applicable to the building project (mandatory measures), and either the performance compliance approach (energy budgets) in Section 141.0(a)1. (for additions) or 141.0(b)1. (for alterations), or the prescriptive compliance approach in Section 141.0(a)2. (for additions) or 141.0(b)2. (for alterations), for the Climate Zone in which the building is located. Climate zones are shown in FIGURE 100.1-A.

Covered process requirements for additions, alterations and repairs to existing nonresidential, high-rise residential and hotel/motel buildings are ~~covered~~ specified in Section 141.1.

NOTE: For alterations that change the occupancy classification of the building, the requirements specified in Section 141.0(b) apply to the occupancy after the alterations.

(b) Alterations. Alterations to existing nonresidential, high-rise residential, or hotel/motel buildings, relocatable public school buildings or alterations in conjunction with a change in building occupancy to a nonresidential, high-rise residential, or hotel/motel occupancy are not subject to Subsection (a) and shall meet item 1, and either Item 2 or 3 below:

2. **Prescriptive approach.** The altered components of the envelope, or space conditioning, lighting, electrical power distribution and water heating systems, and any newly installed equipment serving the alteration, shall meet the applicable requirements of Sections 110.0 through 110.9, Sections 120.0 through 120.6, and Sections 120.89 through 130.5; and

EXCEPTION to Section 141.0(b)2: The requirements of Section 120.2(i) shall not apply to alterations of space-conditioning systems or components

Q. Demand Responsive Controls and Equipment. Alterations where the altered space is larger than 10,000 square feet shall meet the demand responsive control requirements of Section 130.1(e) and 130.5(e).

Purpose

The purpose of this change is to add requirements for Demand Responsive Controls and Equipment that reflect the addition of these systems to Section 130.1 and 130.5 and ensure that these requirements are applied as appropriate to building alterations. This change is necessary for consistency with the proposed language in Sections 130.1 and 130.5 and the proposed preamble to Section 141.0, per the clarity and consistency criteria of California Government Code Sections 11349, subdivisions (c) and (d); 11349.1, subdivisions (a) and (b); 11346.2, subdivision (a)(1); and California Code of Regulations, Title 1, Section 16.

CBPA Comments

This revision requires Demand Response controls if alterations larger than 10,000 sq. ft.

This may add significant cost to alterations over 10,000 sq. ft.

Industry Comments may be reworded:

Since demand responsive are not common practice the proposed measure will have the most significant impact on buildings less than 25,000 square feet.

A building of 25,000 square feet is required to maintain consistency with the proposed language. The propose measure will not significantly impact small, medium, or large buildings if modification presented are accepted since building greater than 25,000 square feet have zones that require more sophisticated lighting controls.

Proposed Code

Q. Demand Responsive Controls and Equipment. Alterations where the altered space is larger than 25,000 ~~10,000~~ square feet shall meet the demand responsive control requirements of Section 130.1(e) and 130.5(e).

TABLE 141.0-E Control Requirements for Lighting System Alterations

<u>Mandatory control requirements that shall be met when 10% or more of existing luminaires are altered</u>	<u>Resulting lighting power, compared to the lighting power allowance specified in Section 140.6(c)2</u>	
	<u>Lighting power is ≤ 85% of allowance</u>	<u>Lighting power is > 85% to 100% of allowance</u>
<u>Section 130.1(a) Area Controls</u>	<u>Yes</u>	<u>Yes</u>
<u>Section 130.1(b) Multi-Level Lighting Controls – 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</u>	<u>For each luminaire, minimum one step between 30-70 percent regardless of luminaire type, or meet Section 130.1(b)</u>	<u>Yes</u>
<u>Section 130.1(c) Shut-Off Controls</u>	<u>Yes</u>	<u>Yes</u>
<u>Section 130.1(d) Automatic Daylight Controls</u>	<u>Not Required</u>	<u>Yes</u>
<u>Section 130.1(e) Demand Responsive Controls – only for alterations > 25,000 ft² in a single building, where the alteration changes the area or type of the space or increases the lighting power</u>	<u>Not Required</u>	<u>Yes</u>

SECTION 3
INDUSTRY COMMENTS ON CEC PROPOSED INDOOR
ALTERATIONS VERSION 9

CBPA agrees with the proposed following industry comments:

- I. **Entire Luminaire Alterations.** For each enclosed space, where the following lighting system alterations specified in Subsections i through iii include a sum total of ~~40-20~~ percent or more of the existing luminaires, the alterations shall ~~not cause~~meet the lighting power allowance in Section 140.6 ~~to be exceeded~~ and the altered luminaires shall meet the applicable requirements in TABLE 141.0-E:

- i. Adding luminaires to the enclosed space; or
- ii. Replacing entire luminaires in ~~the enclosed space a manner other than the one for one replacements described in Section 141.0(b)2I or Exception 2;~~ or
- iii. In an enclosed space, reinstalling a luminaire removed from the same space or elsewhere.

EXCEPTION 1 to Section 141.0(b)2I. Alteration of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded in accordance to Section 140.6(a)3.

EXCEPTION 2 to Section 141.0(b)2I. ~~One for one~~For work consisting of only luminaire replacements per ii above, where replacement ~~of~~ luminaires ~~where the new luminaires have~~ at least 20 percent lower ~~or the same~~ power consumption compared to the original luminaires.

EXCEPTION 3 to Section 141.0(b)2I. In an enclosed space where only one luminaire is altered per Subsections ii and iii above.

EXCEPTION 4 to Section 141.0(b)2I. Alterations that would directly cause the disturbance of asbestos, unless the alterations are made in conjunction with asbestos abatement.

Comments

Whole fixture replacements do not trigger Code so long as the replacement luminaires have at least 20 percent lower power consumption compared to the original luminaires.

This change (see Exception 2 to Section 141.0(b)2 I) allows both one-to-one and many-to-few whole fixture replacements to avoid triggering Code as long as the total wattage is at least 20% below that of the original fixtures. Typical high bay jobs along with many other retrofit types will greatly benefit from this Exception.

In the few cases where 20% savings cannot be achieved then Code is triggered and Table 141.0-E applies, although the impacts even then would not be as severe if dual switching is already present, since checkerboarding and related strategies are now allowed as a way to achieve two levels of lighting. Few-to-many jobs also trigger Code and fall into this category. Again, this represents only a very small portion of potential retrofit jobs.

J. **Luminaire Component Modifications.** Where 40 or more existing luminaires are modified as specified in i through ~~iiiiv~~ below on any single floor of a building, the modifications shall ~~not cause~~meet the lighting power allowance in Section 140.6 ~~to be exceeded~~, shall comply with Subsections 130.1(a) 1, 2, and 3, and shall not prevent or disable the operation of any multi-level, shut-off, or daylighting controls installed to control the luminaires:

- i. Replacing the ballasts or drivers and the associated lamps in the luminaire; or
- ii. Permanently changing the light source of the luminaire; or
- iii. Changing the optical system of the luminaire.

Lamp replacements alone and ballast replacements alone shall not be considered a modification of the luminaire provided that the replacement lamps or ballasts can be installed and powered without modifying the luminaire.

EXCEPTION 1 to Section 141.0(b)2J. Modification of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded in accordance to Section 140.6(a)3.

EXCEPTION 2 to Section 141.0(b)2J. ~~One for one r~~Rplacement of luminaire components where the modified luminaires have at least 20 percent lower ~~or the same~~ power consumption compared to the original luminaires.

EXCEPTION 3 to Section 141.0(b)2J. Modifications that would directly cause the disturbance of asbestos, unless the modifications are made in conjunction with asbestos abatement.

Comments

Code is not triggered for replacement of luminaire components where the modified luminaires have a t least 20 percent lower power consumption compared to the original luminaires. This language (see Exception 2 to Section 141.0(b)2 J) applies regardless of the number of fixtures that are modified. It allows delamping, kits that convert fixtures from fluorescent or HID to LED or other, and virtually all the other fixture retrofits that we typically perform to be installed without triggering Code so long as the new wattage is at least 20% below the original wattage. This should be easily accomplished in the vast majority of cases.

If 40 or more existing luminaires are modified on any single floor of a building and 20% pre-post wattage savings cannot be achieved per Exception 2 to Section 141.0(b)2 J above, then Code is triggered and permitting is required. The modifications in the space will have to meet the Section 140.6 lighting power allowances, so square footage and LPD calcs will be needed. However, new controls and new dimming capability are not required. This situation should rarely happen since 20% savings is possible in almost every circumstance.

Lamp replacements alone and ballast replacements alone shall not be considered a modification of the luminaire provided that the replacement lamps or ballasts can be installed and powered without modifying the luminaire. This simply means that Code is not triggered for lamp-only replacements (e.g., screw-in or pin-based incandescent or other to LED or other technology) as well as ballast-only replacements. This covers a large percentage of the retrofits we do and gives relief to lighting maintenance companies as well.

K. **Lighting Wiring Alterations.** For each enclosed space, the following wiring alterations serving permanently installed lighting shall not cause the lighting power allowance in Section 140.6 to be exceeded and the altered circuits and luminaires served by them shall meet the applicable requirements in Sections 130.1(a), (c), 130.1(d) for each enclosed space where 75 or more luminaires are located within the primary sidelit daylit zone and the skylit daylit zone, and for each enclosed space, minimum one step between 30-70 percent of lighting power:

- i. Adding a circuit feeding luminaires; or
- ii. Replacing, modifying, or relocating wiring between a switch or panelboard and luminaires; or
- iii. Replacing lighting control panels, panelboards, or branch circuit wiring.

EXCEPTION to Section 141.0(b)1K. Modifications strictly limited to addition of lighting controls

EXCEPTION to Section 141.0(b)2K. Alterations that would directly cause the disturbance of asbestos, unless the alterations are made in conjunction with asbestos abatement.

Comments

Wiring alterations only trigger daylighting controls for very large projects. Wiring alterations also trigger requirements for two lighting levels, but these may now be accomplished via checkerboarding or inboard/outboard switching. Retrofitters typically do very few actual wiring alterations (see Section 141.0(b)1K) so we believe these changes should have minimal impact. There's also an Exception for modifications strictly limited to the addition of lighting controls.

TABLE 141.0-E Control Requirements for Lighting System Alterations

<u>Mandatory eControl requirements that shall be met when 1020% or more of existing luminaires are altered</u>	<u>Resulting lighting power, compared to the lighting power allowance specified in Section 140.6(c)2</u>	
	<u>Lighting power is < 85% of allowance</u>	<u>Lighting power is > 85% to 100% of allowance</u>
<u>Section 130.1(a)1, 2, and 3 Area Controls</u>	<u>Yes</u>	<u>Yes</u>
<u>Section 130.1(b) Multi-Level Lighting Controls – 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</u>	<u>For each luminaireenclosed space, minimum one step between 30-70 percent of lighting power regardless of luminaire type, or meet Section 130.1(b)</u>	<u>Yes</u>
<u>Section 130.1(c) Shut-Off Controls</u>	<u>Yes</u>	<u>Yes</u>
<u>Section 130.1(d) Automatic Daylight Controls</u>	<u>Not Required</u>	<u>Yes</u>
<u>Section 130.1(e) Demand Responsive Controls – only for alterations > 10,000 ft² in a single building, and where the alteration changes the area of the space, or occupancy type of the space, or increases the lighting power</u>	<u>Not Required</u>	<u>Yes</u>

Comments

This Table only applies in cases where the new replacement luminaires do not achieve a 20% or greater savings compared to the original luminaires, or when new luminaires are added to the space (i.e., few-to-many). See Section 141.0(b)2Ii.

SECTION 4
INDUSTRY COMMENTS ON PROPOSED
EXTERIOR LIGHTING EXEPTIONS

CBPA agrees with the proposed following industry comments:

Ecology Action’s proposal is to add an Exception for exterior fixture replacements such that Code is not triggered so long as replacement luminaires have at least 40 percent lower power consumption compared to the original luminaires. Based on our analysis we believe this is reasonable to achieve in the large majority of cases and will greatly simplify the process and ease the burden for exterior lighting projects. **We believe this proposed Exception is critically important for exterior projects.**

Ecology Action is also proposing an Exception so that existing controls are allowed when 5 or fewer luminaires are replaced, and so that Time Clocks will not be required when 12 or fewer luminaires are replaced. Photocells and Occupancy-Off or Partial-Off controls would still be required. We believe this would help lessen the burden on small exterior jobs.

SECTION 5

TABLE SUMMARY OF CRITICAL CHANGES IN 2016 CODE

Table 1. Summary of Critical Changes in 2016 Code

Rev.	Code Section	Purpose of Change
		110 ALL OCCUPANCIES—MANDATORY REQUIREMENTS FOR THE MANUFACTURE, CONSTRUCTION AND INSTALLATION OF SYSTEMS, EQUIPMENT AND BUILDING COMPONENTS
		120 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES—MANDATORY REQUIREMENTS
75	120.2(f)	<p>Summary: Add automatic Dampers</p> <p>The proposed regulations add requirements for dampers serving air supply and exhaust equipment. Dampers must now automatically close during unoccupied periods as well as during setback heating and cooling periods. Several exceptions were added to these requirements that allow for the dampers to remain open during certain periods when outdoor air is necessary. The damper can remain open during pre-occupancy purge cycles or if the zone is enabled by an override signal from an occupancy sensor, automatic time switch control or a manually operated 4-hour time. This proposal will save energy by not unnecessarily conditioning outside air during unoccupied periods.</p>
77	120.2(j)	<p>Summary: Add requirements for Direct Digital Controls (DDC) for select applications.</p> <p>The proposed regulations add requirements for Direct Digital Controls (DDC) for select applications. These applications are outlined in Table 120.2A, which include HVAC system capabilities and capacity. The DDC system must be capable of monitoring zone and system demand for fan pressure pump. By adding these requirements, large HVAC systems will now be required to be controlled more efficiently and will in turn save energy.</p>
91	120.6(f)	<p>Summary: Add requirements for elevators lighting and ventilation fan.</p> <p>The proposed regulation added new requirements for elevators in regards to the cab lighting and ventilation fan. These systems must now comply with lighting and fan efficacy requirements as well as automatic shut off controls to maximize energy savings while the elevator is not in use.</p>
		130 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—MANDATORY REQUIREMENTS FOR LIGHTING SYSTEMS AND EQUIPMENT, AND ELECTRICAL POWER DISTRIBUTION SYSTEMS
123	130.1(c) 5	<p>Summary: Adds partial-ON occupant sensor and vacancy sensor technologies as mandatory requirements for areas where occupant sensing controls are required.</p> <p>The proposed regulations add partial-ON occupant sensor and vacancy sensor technologies as mandatory requirements for areas where occupant sensing controls are required. This modification aligns Title 24 requirement to the ASHRAE 90.1-2013 requirement of the partial-On occupant sensor. The benefit is that the controls will switch off lighting when the space is unoccupied and will reduce building energy use.</p>
137	130.5(a)	<p>Summary: Adds electrical usage recording requirements and how long the recorded data should be retained.</p> <p>It also adds the electrical usage recording requirements and how long the recorded data shall be retained. This modification aligns the Standards to the recording requirements of ASHRAE 90.1-2013 and ensures the electrical energy usage data is recorded and retained for future use by building owners or others for purposes such as energy management and building efficiency improvement.</p>
		140 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY
157	140.4(n)	<p>Summary: Adds new shut off control requirements for space conditioning equipment serving zones with operable windows or doors.</p> <p>The proposed regulation adds new shut off control requirements for space conditioning equipment serving zones with operable windows or doors. The purpose of the new regulation is to save energy by shutting off the space cooling or space heating equipment to the zone when the operable window or door is open. The change is necessary to save, and has the effect of saving, energy during periods when outside air is desired by the occupant.</p>
198	141.0(b) 2Q	<p>Summary: Add requirements for Demand Responsive Controls and Equipment to building alterations.</p> <p>The purpose of this change is to add requirements for Demand Responsive Controls and Equipment that reflect the addition of these systems to Section 130.1 and 130.5 and ensure that these requirements are applied as appropriate to building alterations. This change is necessary for consistency with the proposed language in Sections 130.1 and 130.5 and the proposed preamble to Section 141.0, per the clarity and consistency criteria of California Government Code Sections 11349, subdivisions (c) and (d); 11349.1, subdivisions (a) and (b); 11346.2, subdivision (a)(1); and California Code of Regulations, Title 1, Section 16.</p>