CA Title 24 2008 Lighting Control Requirements for Commercial Buildings

Michael Jouaneh
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LUTRON

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This document summarizes the mandatory lighting control requirements and optional control credits for commercial buildings according to California's 2008 Building Energy Efficiency Standards. It is for information purposes only. It is not meant to replace the California Energy Commission's (CEC) Title 24 Standards/Regulations. Please refer to those standards for precise interpretation. The complete standards and compliance manuals are available on the CEC website at: http://www.energy.ca.gov/title24/.

What is Title 24?

- Title 24 is California's energy efficiency code
- Recently revised to decrease energy consumption
- Effective **January 1, 2010**
- Effects all newly constructed or altered commercial buildings

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What are the mandatory requirements for lighting controls in commercial buildings?

1) Area Control

Each area enclosed by ceiling-height partitions must have an independent switching or control device (occupancy sensor or manual switch) that:

- is readily accessible; and
- is located so that a person using the device can see the lights or area controlled by the switch, or so that the area being lit is annunciated; and
- manually operated or automatically controlled by an occupant sensor

Other devices installed in the space, must permit the in area control to manually turn the lights off.

Exceptions:

- Up to 0.3 watts/sq. ft. of lighting for security or egress
- Areas where only authorized personnel are allowed to use the switches

Lutron® Solution:

- All Lutron lighting controls

2) Multi-level Lighting Controls

The general lighting of any enclosed space 100 square feet or larger, and has a connected lighting load that exceeds 0.8 watts per square foot, shall have multi-level lighting controls. Multi-level controls shall have at least one control step that is between 30 percent and 70 percent of design lighting power and allow the power of all lights to be manually turned off. A reasonably uniform level of illuminance shall be achieved by any of the following:

- Continuous or stepped dimming of all lamps or luminaires; or
- Switching

Exceptions:

- Corridor lighting
- Spaces with only one luminaire and no more than two lamps

Lutron Solution:

- Dimmers
- EcoSystem®
- GRAFIK Eye®/GRAFIK® Systems
- LCP128™
- Quantum®

What are the mandatory requirements for lighting controls in commercial buildings?

3) Daylighting

Primary sidelit and skylit daylight areas shall have at least one lighting control that:

- Controls at least 50 percent of the general lighting power in the primary sidelit and skylit daylight areas separately from other lighting in the enclosed space.
- Controls luminaires in primary sidelit areas separately from skylit areas.

Exceptions:

Primary sidelit and skylit daylight areas that have a combined area totaling less than or equal to 250 square feet within any enclosed space.

Lutron® Solution:

- Daylight sensor used with EcoSystem®, GRAFIK Eye®/GRAFIK® Systems, LCP128™, Quantum®, and SoftSwitch128®

4) Automatic Shut-off

For every floor, all indoor lighting systems shall be equipped with a separate automatic control to shut off the lighting. This automatic control may be an occupant sensor, automatic time switch, or other device capable of automatically shutting of the lighting. Note that if an automatic time switch is used it must have holiday feature which turns off the lights for at least 24 hours during the holiday and then resumes normally scheduled operation.

Exceptions:

- Areas continuously lit, 24 hours per day/365 days per year.
- Lighting in corridors, guest-rooms, and dwelling units of high-rise residential buildings and hotels/motels, and parking garages.
- Up to 0.3 watts/sq. ft. of lighting for any area that must be lit for security for emergency egress.

Offices 250 square feet or smaller; multipurpose rooms of less than 1000 square feet, and classrooms and conference rooms of any size, shall be equipped with occupant sensor(s) to shut off the lighting. In addition, controls shall be provided that allow the lights to be manually shut off regardless of the sensor status.

Lutron® Solution:

- All Lutron occupancy sensors and timeclock capable devices such as Radio Powr Savr®, GRAFIK Eye QS®, LCP128, Quantum, and SoftSwitch128.

What are the mandatory requirements for lighting controls in commercial buildings?

5) Display Lighting

Display lighting must be separately switched on circuits that are 20 amps or less.

Lutron® Solution:

- Dimmers
- LCP128™
- SoftSwitch128®

6) Demand Response

Demand responsive automatic lighting controls that uniformly reduce lighting power consumption by a minimum of 15 percent shall be installed in *retail* buildings with sales floor areas greater than 50,000 square feet.

Exceptions:

Buildings where more than 50 percent of the lighting power is controlled by daylighting controls.

Lutron Solution:

- Quantum®

What are the mandatory requirements for lighting controls in commercial buildings?

7) Exterior Lighting

All permanently installed lighting shall be controlled by a photocontrol or astronomical time switch that automatically turns off the outdoor lighting when daylight is available. Exceptions for tunnels, and large covered areas that require illumination during daylight hours.

For building facades, parking lots, canopies, all outdoor sales areas, and student pick-up/drop-off zones where 2 or more luminaires are used, an automatic time switch shall:

- Turn off the lights when not needed; and
- Reduce the lighting power by at least 50% but not exceeding 80% or provide continuous dimming through a range that includes 50% through 80% reduction.

Exceptions:

- Emergency lighting
- Lighting for steps or stairs
- Lighting controlled by a motion sensor and photocontrol
- Lighting for facilities that have equal lighting requirements at all hours and are designed to operate continuously
- Temporary outdoor lighting
- Signs

Lutron® Solution:

- GRAFIK Eye®/GRAFIK® Systems
- LCP128™
- Quantum®
- SoftSwitch128®

8) Sign Lighting Controls

All signs with permanently connected lighting shall be controlled with an *automatic* time switch control. And all outdoor signs shall be controlled with a photocontrol or outdoor *astronomical* time switch control.

Exceptions:

- Outdoor signs in tunnels and large covered areas that require illumination during daylight hours.

All outdoor signs shall be controlled with a dimmer that provides the ability to automatically reduce sign power by a minimum of 65 percent during nighttime hours.

Exceptions:

- Signs that are illuminated for less than 1 hour per day during daylight hours.
- Outdoor signs in tunnels and large covered areas that require illumination during daylight hours.
- Metal halide, high pressure sodium, cold cathode, and neon lamps used to illuminated signs.
- Demand Responsive Electronic Message Center Control. An Electronic Message Center (EMC) having a new connected lighting power load greater than 15 kW shall have a control installed that is capable of reducing the lighting power by a minimum of 30 percent when receiving a demand response signal that is sent out by the local utility.
- EMCs required by a health or life safety statue, ordinance, or regulation, including but not limited to exit signs and traffic signs.

Lutron Solution:

- GRAFIK Eye/GRAFIK Systems
- LCP128
- Quantum
- SoftSwitch128

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What are the lighting control credits?

The following table contains the lighting power adjustment factors (lighting control credits) which allow for more watts per square foot to be used anywhere in the building when using the appropriate lighting controls. For instance, a factor of 0.20 allows 20% more watts per square foot of lighting power to be used anywhere in the building.

*LIGHTING POWER ADJUSTMENT FACTORS**

TYPE OF CONTROL		TYPE OF SPACE	FACTOR	Lutron Solution:
Multi-level occupant sensor (see Note 2) combined with multi-level circuitry and switching in accordance with Section 146(a)2D		Any space ≤ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room.	0.20	Occupancy sensor with EcoSystem®
Multi-level occupant sensor (see Note 2) that reduces lighting power at least 50% when no persons are present. May be a switching or dimming (see Note 3) system.		Hallways of hotels/motels ,multi-family, dormitory, and senior housing	0.25	
		Commercial and Industrial Storage stack areas (max. 2 aisles per sensor)	0.15	
		Library Stacks (maximum 2 aisles per sensor)	0.15	
Dimming system	Manual	Hotels/motels, restaurants, auditoriums, theaters	0.10	Dimmers
	Multiscene programmable	Hotels/motels, restaurants, auditoriums, theaters	0.20	GRAFIK Eye®
Demand responsive lighting control that reduces lighting power consumption in response to a demand response signal. (See Note 1)		All building types	0.05	Quantum®
Manual dimming of dimmable electronic ballasts. (see Note 3)		All building types	0.10	Any Lutron® ballasts
Demand responsive lighting control that reduces lighting power consumption in response to a demand response signal when used in combination with manual dimming of dimmable electronic ballasts (see Note 1 and 3).		All building types	0.15	Quantum
Combined controls	Multi-level occupant sensor (see Note 2) combined with multi-level circuitry and switching in accordance with Section 146(a)2D combined with automatic multi-level daylighting controls	Any space ≤ 250 square feet within a daylit area and enclosed by floor-to-ceiling partitions, any size classroom, corridor, conference or waiting room. The PAF may be added to the daylighting control credit	0.10	EcoSystem/ Quantum with occupancy and daylight sensors
	Manual dimming of dimmable electronic ballasts (see Note 3) when used in combination with a multi-level occupant sensor (see Note 2) combined with multi-level circuitry and switching in accordance with Section 146(a)2D.	Any space ≤ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room	0.25	EcoSystem/ Quantum with occupancy sensors

Automatic multi-level daylighting controls (See Note 1)			Effective Aperture			
	Total primary sidelit daylight areas less than 2,500 ft² in an enclosed space and all secondary sidelit areas. (see Note 4)	General Lighting Power Density (W/ft²)	>10% and ≤20%	>20% and ≤35%	>35% and ≤65%	> 65%
		All	0.12	0.20	0.25	0.30
	Total skylit daylight areas in an enclosed space less than 2,500 square feet, and where glazing material or diffuser has ASTM D1003 haze measurement greater than 90%		Effective Aperture			
		General Lighting Power Density (W/ft²)	0.6% ≤ EA < 1%	1% ≤ EA < 1.4%	1.4% ≤ EA < 1.8%	1.8% ≤ EA
		LPD < 0.7	0.24	0.30	0.32	0.34
		0.7 ≤ LPD< 1.0	0.18	0.26	0.30	0.32
		1.0 ≤ LPD < 1.4	0.12	0.22	0.26	0.28
		1.4 ≤ LPD	0.08	0.20	0.24	0.28

EcoSystem/ Quantum with daylight sensors

NOTES FOR TABLE 146-C:

1. PAFs shall not be available for lighting controls required by Title 24, Part 6.
2. To qualify for the PAF the multi-level occupant sensor shall comply with the applicable requirements of Section 119.
3. To qualify for the PAF all dimming ballasts for T5 and T8 linear fluorescent lamps shall be electronic and shall be certified to the Commission with a minimum RSE in accordance with Table 146-D.
4. If the primary sidelit daylight area and the secondary sidelit daylight area are controlled together, the PAF is determined based on the secondary sidelit effective aperture for both the primary sidelit daylight area and the secondary sidelit daylight area.

* Source: Table 146-C on page 117 of the CA Title 24 2008 Building Energy Efficiency Standards.

Which Lutron® products can be used to satisfy Title 24 commercial lighting control requirements?

The following table contains the Lutron commercial solutions for the primary Title 24 code requirements:

	Title 24 2008 Requirements							
Lutron Solutions	**Area Control**	**Multi-Level Lighting Controls**	**Daylighting**	**Automatic Shut-off**	**Display Lighting**	**Demand Response**	**Exterior Light Control**	**Sign Lighting Controls**
Dimmers	✔	✔			✔ [2]			
EcoSystem®	✔	✔	✔	✔ [1]				
GRAFIK 5000™/6000®/7000™	✔	✔	✔	✔ [1]			✔	✔
GRAFIK Eye® 3000/4000 Series	✔	✔	✔	✔ [1]			✔	✔
GRAFIK Eye QS®	✔	✔	✔	✔			✔	✔
LCP128™	✔	✔	✔	✔	✔ [2]		✔	✔
Occupancy Sensors	✔			✔				
Quantum®	✔	✔	✔	✔		✔	✔	✔
Radio Powr Savr®	✔			✔				
SoftSwitch128®	✔		✔	✔	✔ [2]		✔	✔

✔ means that the solutions help spaces comply with the code requirement when used appropriately

1 Use with Lutron occupancy sensor

2 Use with Lutron daylight sensor

Key Definitions

Primary Sidelit Area =
Primary Sidelit Width X Primary Sidelit Depth

The Primary Sidelit Width is the width of the window plus, on each side, the smallest of:

- Two feet; or
- The distance to any five feet or higher permanent vertical obstruction.

The Primary Sidelit Depth is the horizontal distance perpendicular to the glazing, which is the smaller of:

- One window head height; or
- The distance to any five feet or higher permanent vertical obstruction.

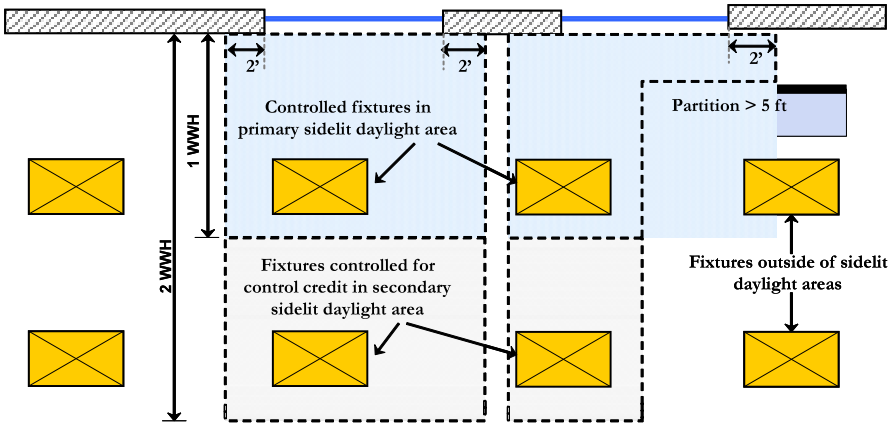
Secondary Sidelit Area =
Secondary Sidelit Width X Secondary Sidelit Depth

The Secondary Sidelit Width is the width of the window plus, on each side, the smallest of:

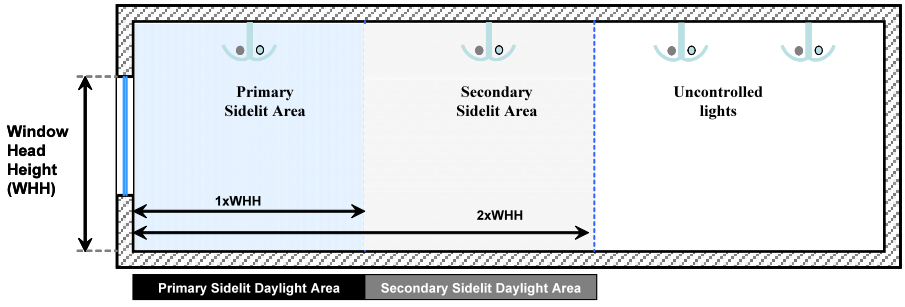
- Two feet; or
- The distance to any five feet or higher permanent vertical obstruction; or
- The distance to any skylit daylight area

The Secondary Sidelit Depth is the horizontal distance perpendicular to the glazing, which begins from one window head height, and ends at the smaller of:

- Two window head heights;
- The distance to any five feet or higher permanent vertical obstruction; or
- The distance to any skylit daylight area.



Primary Sidelit Area Plan view



Side view of Primary and Secondary Sidelit Area

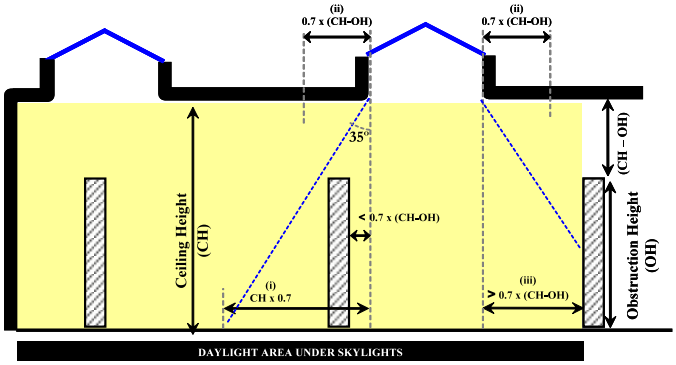
Key Definitions

Daylight area under skylight
The daylight area under each skylight is bounded by the rough opening of the skylight, plus horizontally in each direction the smallest of:

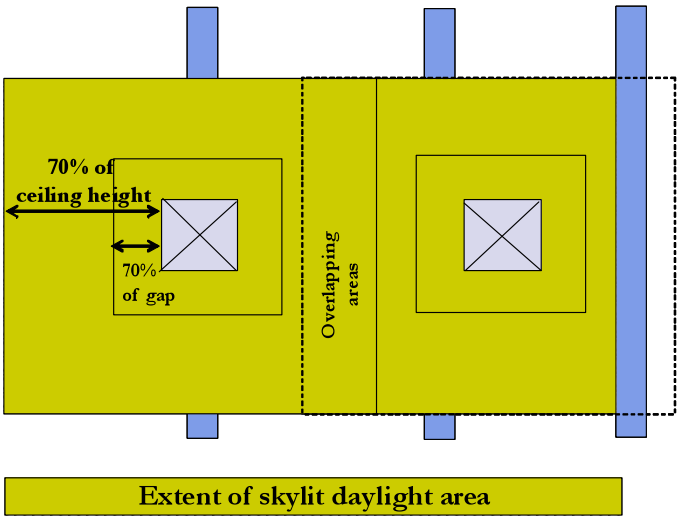
- 70% of the floor-to-ceiling height; or
- The distance to any primary sidelit area, or the daylight area under rooftop monitors; or
- The distance to any permanent partition or permanent rack which is farther away than 70% of the distance between the top of the permanent partition or permanent rack and the ceiling.

Multi-Level Occupant Sensor. Multi-level occupant sensors shall have an automatic OFF function that turns off all the lights, and either an automatic or a manually controlled ON function capable of meeting all the multi-level and uniformity requirements of Section 131(b) for the controlled lighting. The first stage shall be capable of activating between 30-70 percent of the lighting power in a room either through an automatic or manual action, and may be a switching or dimming system. After that event occurs the device shall be capable of all of the following actions when manually called to do so by the occupant:

- Activating the alternate set of lights.
- Activating 100 percent of the lighting power.
- Deactivating all lights.



Elevation View of Daylit Area under Skylight (with interior patitions)



Plan View of Daylit Area under Skylight (with interior partitions)

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For additional information

Code requirements:
Call the California Energy Commission (CEC):

- Inside California 1.800.772.3300
- Outside California 916.654.5106
- http://www.energy.ca.gov/title24

Questions/Comments:

- Michael Jouaneh, LEED AP
  610.282.5350
  mjouaneh@lutron.com

Telephone: 610.282.3800
International: +1 610.282.3800

World Headquarters
Lutron Electronics Co., Inc.
7200 Suter Road
Coopersburg, PA 18036-1299
USA

LUTRON®

www.lutron.com