

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

This document summarizes the mandatory lighting control requirements and optional control credits for commercial buildings according to California's 2013 Building Energy Efficiency Standards. It is for information purposes only. It is not meant to replace the California Energy Commission's (CEC) Title 24 Part 6 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/>.

For application examples that highlight Lutron Title 24 solutions, please visit <http://www.lutron.com/appguides>

What is Title 24?

- Title 24 Part 6 is California's energy efficiency code
- Recently revised to decrease energy consumption
- Effective **July 1, 2014**
- Effects all newly constructed or altered commercial buildings

What's new?

- Robust building commissioning and functional testing requirements
- Continuous dimming (or multiple light levels) required for most spaces
- Partial-OFF and Partial-ON occupant sensing controls in stairwells and corridors
- Increased daylight control requirements
- Demand responsive lighting control in new construction buildings greater than 10,000sq. ft.
- Energy metering of loads 50VA or greater
- Controlled receptacles in open office, private office and conference rooms
- More stringent control requirements for existing building lighting alterations

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

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

1) Area Controls

[section 130.1(a)]

Each area enclosed by ceiling-height partitions must have an independent, manual switching or control device that:

- is readily accessible to occupants
- is located in the space (with some exceptions)
- must provide ON and OFF functionality

Exceptions:

- Up to 0.2 W/sq. ft. of lighting for security or egress
- Display lighting must be separately switched on circuits that are 20 amps or less

Lutron Solution:

- All Lutron solutions that include manual lighting controls (e.g. switches, dimmers, keypads, or multi-scene controls)

2) Multi-level Lighting Controls

[section 130.1(b)]

The general lighting of an enclosed space 100 square feet or larger, with a connected lighting load that exceeds 0.5 W/sq. ft., shall have multi-level lighting controls.

- Lighting shall have the required number of control steps or be continuously dimmable (see Table 130.1-A on page 8)
- Each luminaire shall be controlled by one of the following methods:
 1. Manual dimming
 2. Lumen maintenance
 3. Tuning
 4. Automatic daylight controls
 5. Demand responsive lighting controls

Exceptions:

- Classrooms with a lighting load of 0.7 W/sq. ft. or less need only one control step between 30%–70% of full lighting power (except in daylight zones)
- Spaces with only one luminaire and no more than two lamps

Lutron Solution:

- All Lutron dimming solutions that include fluorescent dimming ballasts and dimmable LED drivers

3) Shut-off Controls [section 130.1(c)]

All indoor lighting needs to have the following:

- Automatic lighting shut-off controls (timeclock or occupancy sensor) for all lighting on every floor
- Override of automatic shut-off allowed for not more than 2 hours
- At least one control is required for every 5,000 square feet
- Separate controls for general, display, ornamental, and display case lighting

Exceptions:

- Lighting for 24-hour operation
- Office buildings may have up to 0.05 W/sq. ft. of lighting continuously illuminated for any area that must be lit for security or emergency egress
- Electrical equipment rooms

Note: 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 occupancy 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.

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

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

Partial-OFF occupancy sensors

Lighting in these spaces must be automatically reduced by at least 50% when they are unoccupied:

- Stairwells
- Corridors
- Warehouse aisles and open areas
- Library book stack aisles

Note: A timeclock is required to turn off the lights during unoccupied hours. The following buildings are exempt from this requirement:

- Buildings with more than 10 occupants during unoccupied hours
- Buildings open to the public
- Buildings opened for general occupancy

Partial-OFF control in parking garages, parking areas, and loading areas

Requirements in these areas include:

- Occupant sensing controls that have at least one control step between 20%–50% of lighting power
- No more than 500W of rated lighting power can be controlled together in a single zone
- Controls shall be capable of automatically turning lighting full ON and be activated from all paths of egress

Hotel guestrooms

All lighting in hotel/motel guest rooms must be automatically turned OFF within 30 minutes of occupants leaving

Exception:

- One high efficacy luminaire separately controlled within 6 feet of room entry

Lutron Solution:

All Lutron solutions that include occupancy sensors and timeclock capable devices, such as:

- Radio Powr Savr®
- GRAFIK Eye® QS
- Energi Savr Node™
- XPS
- LCP128
- Quantum®

4) Automatic Daylight Controls

[section 130.1 (d)]

Automatic daylight controls are required in primary and secondary sidelit daylight areas, and skylit daylight areas. (To learn what qualifies as primary and secondary zones, see pages 11 and 12.)

The lighting must be continuously dimmable or meet the required number of control steps from Table 130.1-A (see page 8).

Exceptions:

- Spaces using less than 0.3W/sq. ft.
- Rooms where the total lighting power in the daylight zones is less than 120W
- Rooms with a total glazing area less than 24 square feet

Lutron Solution:

All Lutron solutions that include fluorescent dimming ballasts and dimmable LED drivers controlled by daylight sensors

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

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

5) Demand Responsive Controls

[section 130.1 (e)]

Demand responsive automatic lighting controls that uniformly reduce lighting power consumption by a minimum of 15% below total installed lighting power upon receipt of a demand response signal shall be installed.

Exceptions:

- Buildings less than 10,000 square feet
- Spaces using less than 0.5W/sq. ft. of lighting power
- Building retrofits that do not increase the lighting power density above allowable levels

Lutron Solution:

- Energi Savr Node™
- Quantum®

6) Controls for Outdoor Lighting

[section 130.2 (c)]

Outdoor lighting controls need to meet the following requirements:

- Outdoor incandescent lighting rated over 100W shall be controlled with a motion sensor
- Outdoor lighting must be controlled with either a photocontrol or astronomical timeclock that automatically turns lights OFF when daylight is available

Additional exterior lighting control requirements

- Luminaires that are 24 ft or less from the ground must have controls that automatically reduce lighting power by 40%–80% when the area is vacant
- The controls must provide auto-ON when area is occupied

• Outdoor sales frontage, lots, or canopies shall use:

- part-night lighting controls; or
- motion sensor that reduces lighting power by 40%–80% when the area is vacant and provides auto-ON functionality

Building facades, ornamental hardscape, and outdoor dining shall use:

- part-night lighting controls; or
- motion sensor that reduces lighting power by 40%–80% when the area is vacant and provides auto-ON functionality; or
- timeclock control that reduces lighting power by at least 50%

Exceptions:

- Lighting required per health or life safety statute, ordinance, or regulation
- Lighting in tunnels required to be illuminated 24/7

Lutron Solution:

- GRAFIK Eye®
- Energi Savr Node™
- XPS
- LCP128™
- Quantum®

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

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

7) Sign Lighting Controls [section 130.3]

These controls need to meet the following requirements:

- All indoor signs shall be controlled with an automatic or astronomical time switch control
- All outdoor signs shall be controlled with a photocontrol and automatic time switch, or an astronomical time switch
- Outdoor signs on both day and night shall be controlled with a dimmer that provides the ability to automatically reduce sign power by a minimum of 65% during nighttime hours

Lutron Solution:

- GRAFIK Eye®
- Energi Savr Node™
- XPS
- LCP128™
- Quantum®

8) Lighting Control Acceptance Testing [section 130.4]

The following lighting controls must be functionally tested by a Certified Lighting Control Acceptance Test Technician (CLCATT):

- Automatic daylight controls
- Lighting shut-off controls (occupancy sensors and timeclocks)
- Demand responsive lighting controls
- Outdoor lighting controls

Lutron Solution:

Lutron field service has CLCATTs on staff that can perform the acceptance testing

9) Energy Metering [section 130.5(b)]

Whole-building electrical energy metering is required for all buildings.

- For buildings that are rated for 50kVA or more, lighting loads must be disaggregated to allow for future metering of lighting separately if desired
- Buildings that are rated for 250kVA or more must separate lighting by floor, area, or type

Lutron Solution:

Quantum energy metering provides real-time, actual energy measurement of lighting, HVAC, and plug loads

10) Automatic Receptacle Control [Section 130.5(d)]

Controlled receptacles that automatically shut-off are required in private offices, open offices, lobbies, copy rooms, kitchenettes, and conference rooms.

- At least one controlled receptacle must be within 6 feet of an uncontrolled receptacle; this can be accomplished by switching one of the two outlets in each receptacle
- Controlled receptacles need to be marked to differentiate them from uncontrolled receptacles

Note: Plug-in strips and other plug-in devices that incorporate an occupancy sensor can't be used to comply with this requirement.

Lutron Solution:

- 20 A PowPak® relay module
- 20 A Energi Savr Node with SoftSwitch®
- XP switching module

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

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 in the building when using the appropriate lighting controls. For instance, a factor of 0.20 allows an additional 20% of the controlled wattage to be used in the building.

TABLE 140.6-A LIGHTING POWER DENSITY ADJUSTMENT FACTORS (PAF)

- a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2.
- b. Only one PAF may be used for each qualifying luminaire unless combined below.
- c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF.

Type of control		Type of area	Factor
1. Partial-ON Occupancy Sensing Control		Any area \leq 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, conference room, or waiting room	0.20
2. Occupancy Sensing Controls in Large Open Plan Offices		In open plan offices > 250 square feet: One sensor controlling an area that is:	No larger than 125 square feet 0.40
			From 126 to 250 square feet 0.30
			From 251 to 500 square feet 0.20
3. Dimming System	Manual Dimming	Hotels, motels, restaurants, auditoriums, theaters	0.10
	Multi-scene Programmable		0.20
4. Demand Responsive Control		All building types less than 10,000 square feet. Luminaires that qualify for other PAFs in this table may also qualify for this demand response control PAF	0.05
5. Combined Manual Dimming plus Partial-ON Occupancy Sensing Control		Any area \leq 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, conference, or waiting room	0.25

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

What is the minimum number of lighting control steps required to meet the multi-level lighting controls requirement?

TABLE 130.1-A MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS

Luminaire Type	Minimum Required Control Steps (percent of full rated power ¹)				Uniform Level of Illuminance Shall Be Achieved By:
Line-voltage socket except GU-24	Continuous dimming 10%–100%				
Low-voltage incandescent systems					
LED luminaires and LED source systems					
GU-24 rated for LED					
GU-24 sockets rated for fluorescent > 20W	Continuous dimming 20%–100%				
Pin-based compact fluorescent > 20W ²					
GU-24 sockets rated for fluorescent ≤ 20W	Maximum one step between 30%–70%				Stepped dimming, continuous dimming, or switching alternate lamps in a luminaire
Pin-based compact fluorescent ≤ 20W					
Linear fluorescent and U-bent fluorescent ≤ 13W					
Linear fluorescent and U-bent fluorescent > 13W	Minimum one step in each range:				Stepped dimming, continuous dimming, or switching alternate lamps in a luminaire, having a minimum of 4 lamps per luminaire, illuminating the same area in the same manner
	20%–40%	50%–70%	80%–85%	100%	
Track lighting	Minimum one step between 30%–70%				Stepped dimming, continuous dimming, or separately switching circuits in a multi-circuit track with a minimum of two circuits
HID > 20W	Minimum one step between 50%–70%				Stepped dimming, continuous dimming, or switching alternate lamps in each luminaire, having a minimum of 2 lamps per luminaire, illuminating the same area in the same manner
Induction is > 25W					
Other light sources					

¹ Full rated input power of ballast and lamp, corresponding to maximum ballast factor

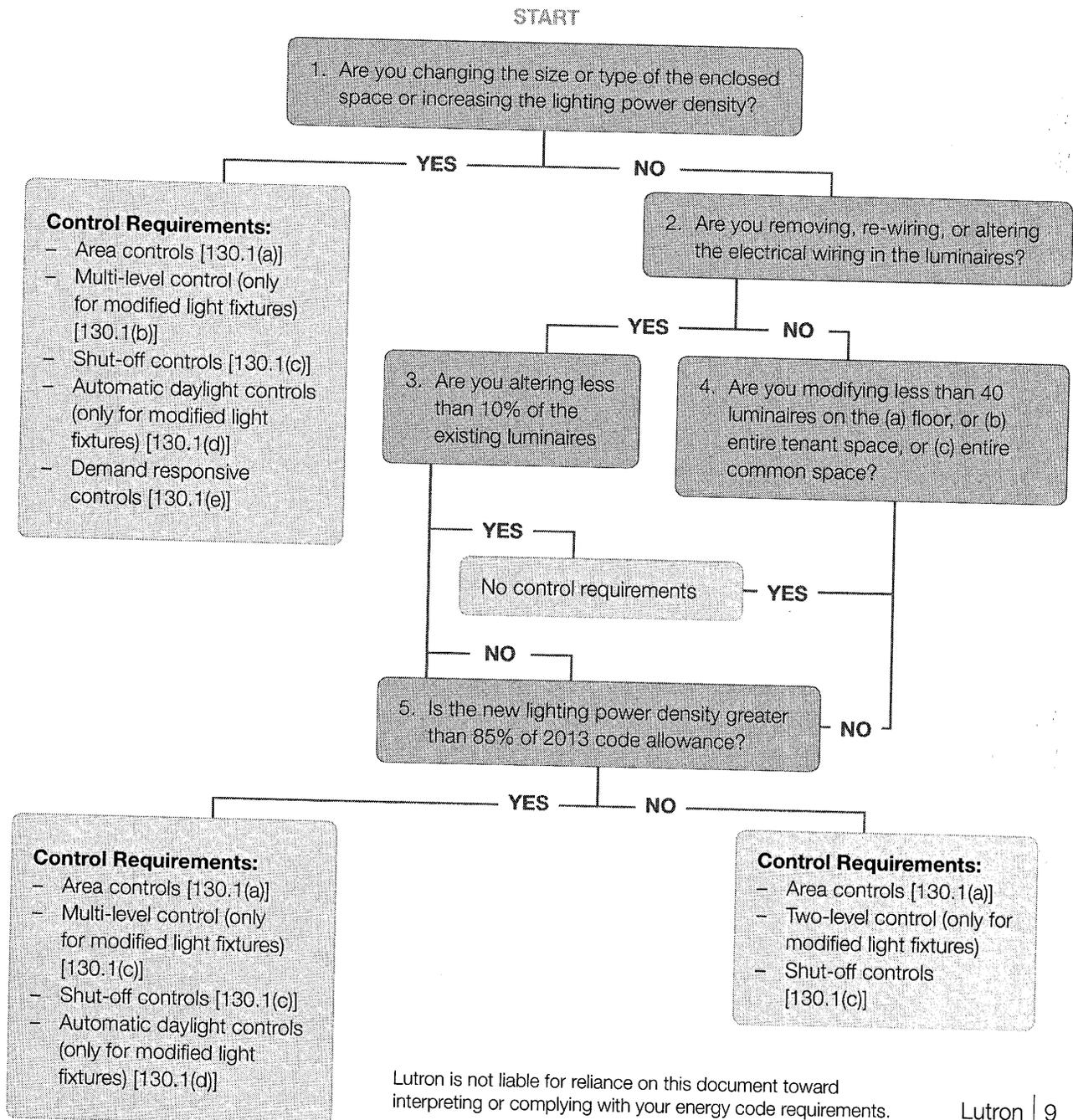
² Includes only pin-based lamps: twin tube, multiple twin tube, and spiral lamps

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

What are the lighting control requirements for existing building lighting renovation?

Answering the questions in the following flowchart will help determine the control requirements for lighting renovations.

TITLE 24 2013 LIGHTING CONTROL REQUIREMENTS FOR INTERIOR LIGHTING RETROFITS [Section 141.0(b)2I]



Lutron is not liable for reliance on this document toward interpreting or complying with your energy code requirements.

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

Commonly used terms

Automatic daylight control uses one or more photosensors to detect changes in daylight illumination and then automatically adjusts the luminous flux of the electric lighting system in response.

Demand response is short-term changes in electricity usage by end-use customers, from their normal consumption patterns. Demand response may be in response to:

- a. changes in the price of electricity
- b. participation in programs or services designed to modify electricity use:
 - i. in response to wholesale market prices or
 - ii. when system reliability is jeopardized.

Demand response period is a period of time during which electricity loads are modified in response to a demand response signal.

Demand response signal is a signal sent by the local utility, Independent System Operator (ISO), or designated curtailment service provider or aggregator, to a customer, indicating a price or a request to modify electricity consumption, for a limited time period.

Demand responsive control is a kind of lighting control that is capable of receiving and automatically responding to a demand response signal.

Lumen maintenance is a strategy used to provide a precise, constant level of lighting from a lighting system regardless of the age of the lamps or the maintenance of the luminaires.

Part-night outdoor lighting control is a time- or occupancy-based lighting control device or system that is programmed to reduce or turn off the lighting power to an outdoor luminaire for a portion of the night.

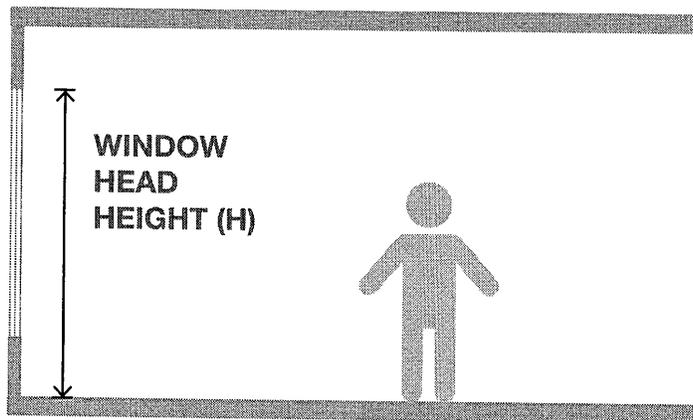
Partial-OFF occupancy/motion sensor automatically turns OFF part of the lighting load after occupants have left an area and is capable of automatically turning ON the lighting load when an area is occupied.

Partial-ON occupancy/motion sensor automatically turns lights OFF after occupants have left an area and is capable of automatically or manually turning ON part of the lighting load when an area is occupied.

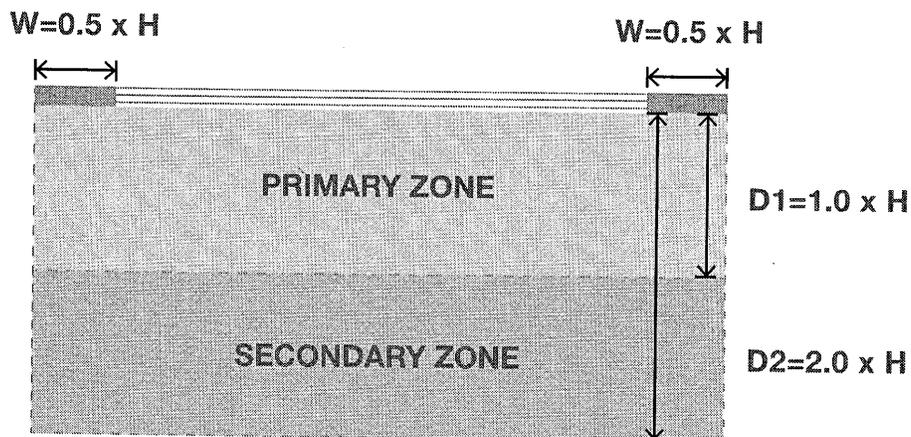
CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

Window daylight zone requirements

Window Daylight Zones



Section View
NOT TO SCALE



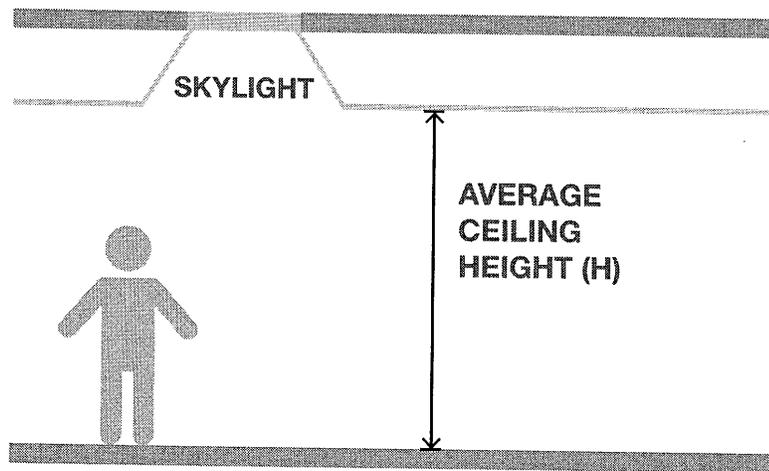
Plan View
NOT TO SCALE

NOTE: Fixtures in both zones must be controlled by a daylight sensor. Fixtures in the primary zone must be controlled separately from fixtures in the secondary zone.

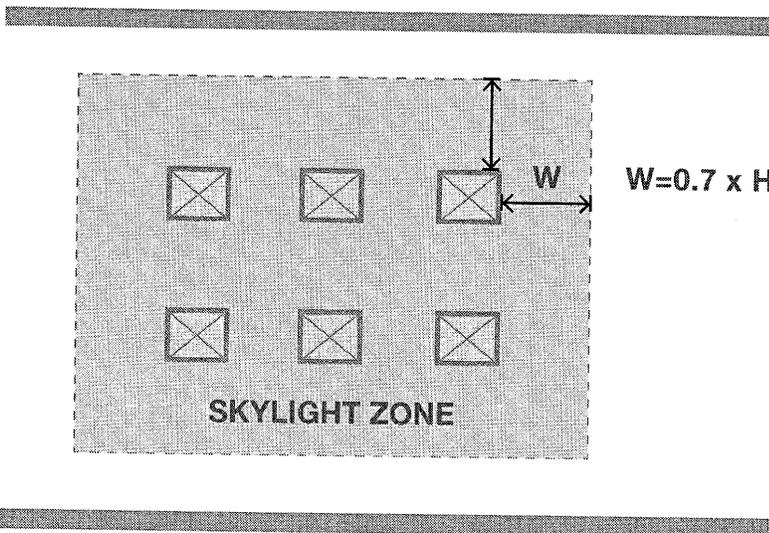
CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

Skylight daylight zone requirements

Skylight Daylight Zone



Section View
NOT TO SCALE



Plan View
NOT TO SCALE

CA Title 24 2013 Lighting and Receptacle Control Requirements for Commercial Buildings

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, CEM, 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



www.lutron.com

©2014 Lutron Electronics Co. Inc. P/N 368-3647 REV A