

Guides for
California Title 24
& ASHRAE

Code Compliance

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Lightcloud Makes Compliance Easy

This compliance solution guide recommends Lightcloud Devices to get your site in compliance with California Title 24 Part 6 and ASHRAE. Once the devices are installed, RAB will handle commissioning and compliance.

For additional compliance solutions, give us a call at **1 (844) - LIGHTCLOUD**

What are California Title 24 and ASHRAE?



California Title 24 Part 6-2016 is the state energy code for all buildings. New buildings as well as renovations/alterations must adhere to the requirements in Title 24-2016.



ANSI/ASHRAE/IES 90.1-2016 is a standard. The 90.1 standard is the reference that serves as the basis for state energy codes.

Links to Energy Codes

California Title 24 Part 6-2016¹

energy.ca.gov/title24/2016standards/index.html

energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf

ASHRAE 90.1-2016²

energycodes.gov/resource-center/training-courses/ansiashraeies-standard-901-2016

1. California Title 24 Part 6-2016 is California state law (the state energy "code"). Therefore, the code text as well as all other associated guides and forms are available to download on-line, free of charge.

2. ANSI/ASHRAE/IES 90.1-2016 is a "standard". States are supposed to adopt energy codes at least as stringent as ASHRAE 90.1-2013 or equivalent. Currently, different states have energy codes based on different versions of 90.1, or on some version of IECC (International Energy Conservation Code), while some states have no energy code at all. This is a link to a comprehensive presentation on the 2016 version.

Interior Lighting Controls

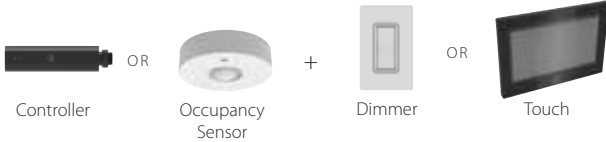


Area Controls: Manual On/Off

Interior spaces must have local switches to allow occupants to turn lights ON and OFF, overriding other controls if necessary.



RECOMMENDED PRODUCTS



Requirements

California Title 24 Part 6-2016

130.1 (a) 1

All luminaires shall be functionally controlled with manual ON and OFF lighting controls. Each area enclosed by ceiling-height partitions shall be independently controlled.

Exemption Note

Up to 0.2 watts per square foot of lighting in any area within a building may be continuously illuminated to allow for means of egress illumination.

ASHRAE 90.1-2016

9.4.1.1 (a)

At least one control that controls all the lighting in the space; in spaces $\leq 10,000$ ft², each control serves 2,500 ft² maximum and in spaces $> 10,000$ ft², serves 10,000 ft² maximum.

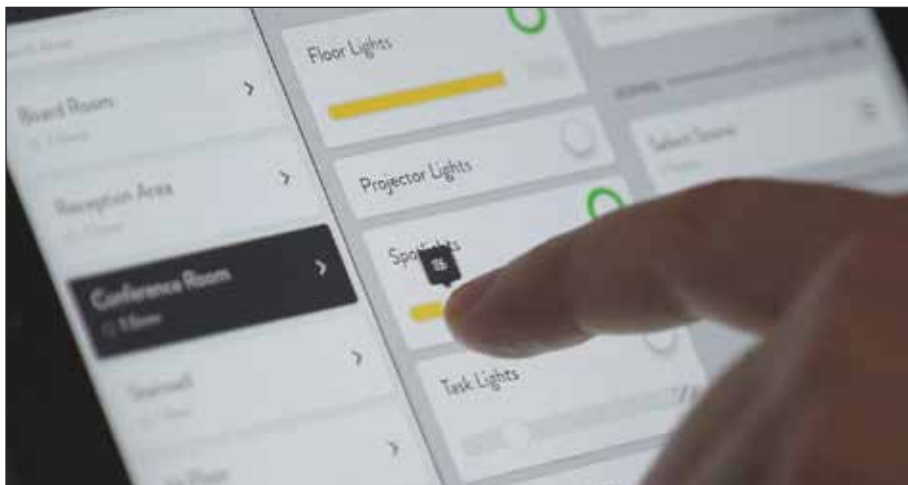
Exemption Note

Refer to code text for spaces that allow remote location of manual control(s).

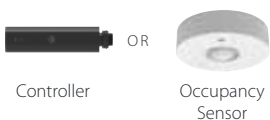


Multi-Level Controls: Dimming

Almost all light sources must be either dimmable in a full range (i.e. 10-100%) or in steps. For example, in California Title 24, any LED lamp or fixture must be dimmable from 10-100%.



RECOMMENDED PRODUCTS



Requirements

California Title 24 Part 6-2016

130.1 (b) 1

The general lighting of any enclosed area 100 ft² or larger, with a connected lighting load that exceeds 0.5 watts per ft², shall provide multi-level lighting control. All LED fixtures and lamps must be dimmable in a range of 10-100%. Linear fluorescent lamps must be able to reduce output to intermediate ranges as defined in Table 130.1A.

Exemption Note

Must meet requirements for control steps and uniformity as shown on Table 130.1A. Various exemptions apply. (The downloadable code document contains this table as well as other graphics describing specific code requirements.)

ASHRAE 90.1-2016

9.4.1.1 (d)

General lighting to provide at least one intermediate step in lighting power between 30-70% or continuous dimming in addition to full ON and full OFF.

Interior Lighting Controls



Automatic Daylighting Controls: Photo Sensor

In interior spaces, all light fixtures near windows and under skylights must be automatically controlled by photosensors.



RECOMMENDED PRODUCTS



Requirements

California Title 24 Part 6-2016

130.1 (d) 1

Luminaires providing general lighting that are in or partially in the Skylit Daylit Zones or the Primary Sidelit Daylit Zones (as well as Secondary Sidelit Daylit Zones) shall be controlled independently by fully functional automatic daylighting controls.

Exemption Note

Must comply with multi-level requirements as shown on Table 130.1A. Other specific requirements and exemptions apply.

ASHRAE 90.1-2016

9.4.1.1 (e) or 9.4.1.1 (f)

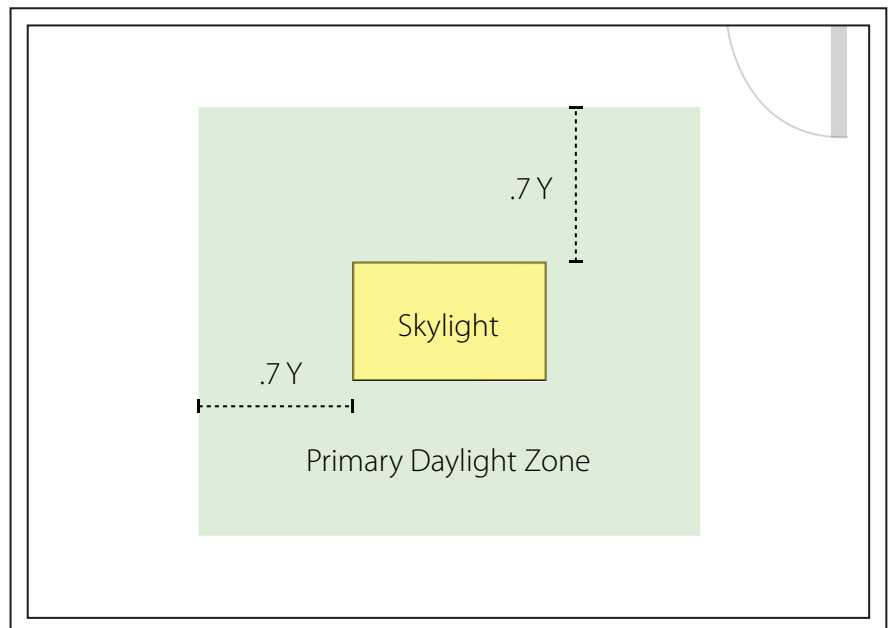
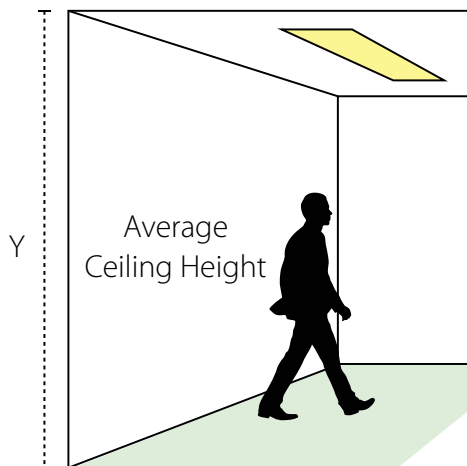
If primary sidelighted areas is $\geq 150W$; or primary and secondary sidelighted areas is $\geq 300W$; control system must have: separate control of general lighting in primary and secondary sidelighted as well as toplighted areas, photocontrol to reduce electric lighting in response to available daylight using: continuous dimming, or at least one control point between 50% and 70% of design light power...and ...second control point either 1.) between 20% and 40% of design light power or 2.) lowest dimming level technology allows...and... third control point that turns off all controlled lighting.

Exemption Note

Calibration does not require anyone to touch the actual photosensors (must be capable of being calibrated remotely). Other specific requirements and exemptions apply.

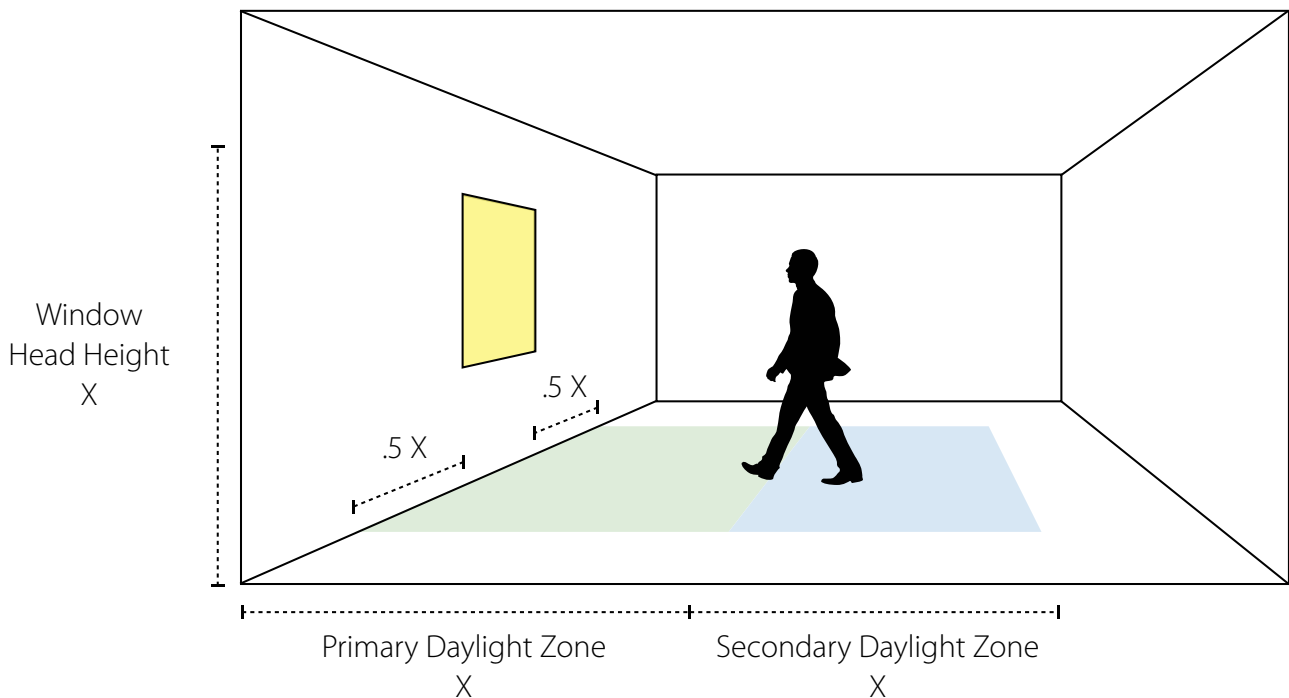
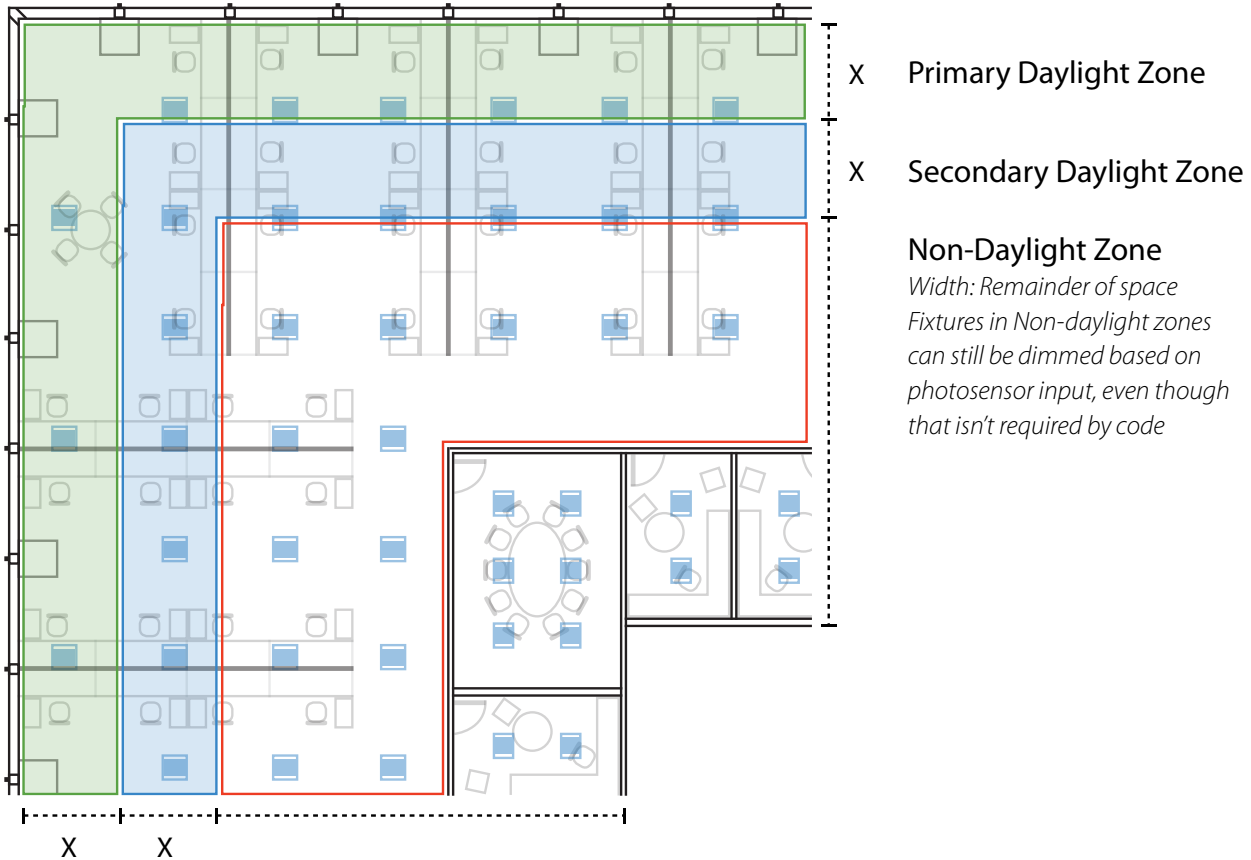
Toplighting: Width of Primary Daylight Zones

The Primary Daylight Zone creates a perimeter around the skylight that extends 70% of the average ceiling height in the space. For example, a room with 10' ceilings would have a Primary Daylight Zone extending 7' from the perimeter of the skylight.



Sidelighting: Width of Primary and Secondary Daylight Zones

The Primary Daylight Zone has the same width as the window head height (distance from top of the window to the floor), and should extend half the window head height to either side of the window. For example, a room with an 8' window head height would have a Primary Daylight Zone of 8' and a Secondary Daylight Zone of 8'. Both the Primary and Secondary Daylight Zones would extend 4' to the left and right of the window.



Interior Lighting Controls



Automatic Shut-off Controls: Schedules & Sensors

Interior spaces require some method of automatically shutting off most/all light fixtures. This is typically achieved by occupancy sensors, scheduling, or both.



RECOMMENDED PRODUCTS



OR



Controller

Occupancy Sensor



Demand Response: Automatic Dimming

In spaces larger than 10,000 ft², controls must be able to automatically dim lights by at least 15% when a signal is received from an Automated Demand Response (ADR) server.



RECOMMENDED PRODUCTS



OR



Controller

Occupancy Sensor

Requirements

California Title 24 Part 6-2016

130.1 (c) 1

- a. Shall be controlled with an occupant sensing control, automatic time-switch control, or other control capable of automatically shutting OFF all of the lighting when the space is typically unoccupied; and
- b. Separate controls for the lighting on each floor, other than lighting in stairwells; and
- c. Separate controls for a space enclosed by ceiling height partitions not exceeding 5,000 ft²; and
- d. Separate controls for general, display, ornamental, and display case lighting.

Exemption Note

In the following function areas the area controlled may not exceed 20,000 ft²: malls, auditoriums, single tenant retail, industrial, convention centers, and arenas.

ASHRAE 90.1-2016

9.4.1.1 (h) or 9.4.1.1 (i)

- h. All lighting automatically shut off within 20 minutes of all occupants leaving the space and control device to control <5,000 ft².
- i. Control lights on a scheduled basis (automatic time switch) based on input from a time-of-day controller or signal from another control or alarm

Exemption Note

Either (h) or (i) meets the requirement for automatic shutoff. Certain spaces may use a Partial ON or Partial OFF strategy to meet code requirements.

Requirements

California Title 24 Part 6-2016

130.1 (e) 1

Buildings larger than 10,000 ft² shall be capable of automatically reducing lighting power in response to a Demand Response Signal; so that the total lighting power of non-excluded spaces can be lowered by a minimum of 15% below the total installed lighting power. Lighting shall be reduced in a manner consistent with uniform level of illumination requirements in Table 130.1-A.

Exception Note

Spaces with a lighting power density of 0.5 watts per ft² or less.

Exterior Lighting Controls



Parking Garage Shutoff Controls: Occupancy Sensor

Garages and certain other applications require the use of occupancy sensors to dim light fixtures. Fixtures must be dimmed by at least 30% (ASHRAE 90.1) or by 50-80% (Title 24). Certain exemptions apply, e.g. transition zones, such as the entry into a garage from the outside.



RECOMMENDED PRODUCTS



Occupancy Sensor



Parking Garage Automatic Daylighting Controls: Photo Sensor

In garages with glazing or wall openings, all light fixtures near windows must be automatically dimmed by photosensors.



RECOMMENDED PRODUCTS



Occupancy Sensor

OR



Controller

+



Daylight Harvester

Requirements

California Title 24 Part 6-2016

130.1 (c) 7.B.

In parking garages, parking areas and loading and unloading areas, general lighting shall be controlled by occupant sensing controls having at least one control step between 20 percent and 50 percent of design lighting power. Occupancy sensors automatically switch lights in appropriate zones to full ON from all designated paths of egress.

Exemption Note

Zones \leq 500 watts; uniformity based on Table 130.1-A see page 6.

ASHRAE 90.1-2016

9.4.1.2

Automatic lighting shutoff per 9.4.1.1(i) <scheduled shutoff>; must reduce lighting power by minimum of 30% when no activity is detected for 20 minutes within a lighting zone \leq 3,600 ft²

Exemption Note

Lighting for 24/7 operation; areas where auto shutoff causes safety or security concerns; lighting load \leq 0.02 W/ft²

Requirements

California Title 24 Part 6-2016

130.1 (d) 3

In a parking garage area with a combined total of 36 ft² or more of glazing or opening, luminaires providing general lighting that are in the combined primary and secondary sidelit daylight zones shall be controlled independently from other lighting in the parking garage by automatic daylighting controls.

Exception 1

Luminaires in the daylight transition zone, and luminaires strictly for use with dedicated ramps;

Exception 2

The total combined general lighting power in the primary sidelit daylight zones is less than 60 watts.

ASHRAE 90.1-2016

9.4.1.2

Automatically reduce power at least 50% in response to daylight for luminaires within 20 ft. of any perimeter wall that has a net opening to wall ratio of \geq 40% and no exterior obstructions within 20 ft.

Exception 1

Luminaires in the daylight transition zone, and luminaires strictly for use with dedicated ramps;

Exception 2

Daylight transition zones and ramps without parking are exempt from 30% reduction and daylight control.

Exterior Lighting Controls

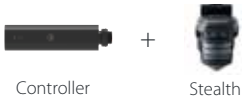


Outdoor Lighting Controls: Schedules & Sensors

All fixtures must turn OFF based on scheduling, for example by a time clock or lighting control system, or by input from a photosensor. All fixtures (including pole and wall-mounted) ≤ 24 ft. high must dim based on input from motion sensors (occupancy sensors) by $> 50\%$ (ASHRAE 90.1) or by 40-90% (Title 24). Various exemptions apply to controls requirements for many exterior lighting applications, especially where there are concerns about life safety, security, 24/7 operation, etc.



RECOMMENDED PRODUCTS



Controller

Stealth

Requirements

California Title 24 Part 6-2016

130.2 (c)

Automatic shutoff based on an astronomical timeclock or photosensor. Fixtures mounted ≤ 24 ft. above the ground shall be controlled by motion sensors that reduce the output by 40-90%. For certain exempted exterior lighting, "part-night" controls are required (i.e. controls that turn off fixtures at a specified time). All incandescent luminaires ≥ 100 watts shall be controlled by motion sensor.

Exemption Note

Outdoor lighting not permitted by a health or life safety statute, ordinance, or regulation to be turned OFF; tunnel lighting; outdoor sales frontage; building facades; ornamental hardscape; outdoor dining; pole-mounted fixtures ≤ 75 watts; non-pole-mounted fixtures ≤ 30 watts

ASHRAE 90.1-2016

9.4.1.4

Lighting must be OFF when there is sufficient daylight. Building façade and landscape lighting must be OFF between midnight or business closing (whichever is later) until 6am or business opening (whichever comes first) ... OR ... times established by the authority having jurisdiction. Power for other lighting and signage lighting shall be automatically reduced by $\geq 50\%$ from midnight or within 1 hour of end of business operations (whichever is later) until 6am or business opening (whichever is earlier) ... OR ... during any period when no activity has been detected for a time ≤ 15 minutes. Luminaires for outdoor parking areas $> 78W$ (Watts) and with a mounting height of ≤ 24 ft above ground must automatically reduce power by $> 50\%$ when no activity is detected in the area for 15 minutes.

Exemption Note

Calibration does not require anyone to touch the actual photosensors (must be capable of being calibrated remotely). Other specific requirements and exemptions apply.

Other Requirements

Lighting Power Density (LPD) Limits

For interior as well as exterior spaces, both Title 24 and ASHRAE 90.1 limit the amount of installed lighting power. Interior lighting power allowances may be determined based on the Building Method, Space-by-Space Method, or Tailored Method (depending on applicable code). Exterior lighting power allowances are determined based on the type of lighting “zone” in which the building is located. Some codes (i.e. Title 24) have more complex calculations to determine power allowance for exterior lighting. Both codes have provisions to modify the power allowances based on unusual room geometries (*i.e. atriums, high ceilings, etc.*). In general, LPD limits are lower than in previous code versions based on the availability of higher-efficacy and more effective LED lamps and fixtures.

Exterior Lighting

Title 24 Part 6 and ASHRAE 90.1 both have specific requirements for mandatory controls for exterior lighting as summarized on Page 8. These requirements apply to building-mounted exterior lighting, other area and roadway lighting as well as parking garages.

Plug-Load Control

Both Title 24 Part 6 and ASHRAE 90.1 require that at least half of all 120-volt receptacles can be automatically turned OFF either during periods of vacancy or after hours (requiring the use of either occupancy sensors or time-of-day devices *i.e. a time-clock or advanced lighting control system with scheduling*). Specific requirements, limitations and exemptions apply.

Documentation & Commissioning

Title 24 as well as ASHRAE 90.1 have specific requirements for documenting the proposed lighting and controls equipment and operation, as well as for the commissioning process for installed lighting control devices and systems.

Title 24 Acceptance Testing

In addition to specific requirements to verify installation of mandatory or other lighting controls, Title 24 also has extensive requirements for “acceptance testing” by someone trained as a CLCATT (California Licensed Controls Acceptance Test Technician).









Alterations

Many of the mandatory controls requirements as well as LPD limits are also applicable to “alterations” in existing buildings. These are triggered when > 20% (in ASHRAE 90.1) or \geq 10% (in Title 24) of the total connected lighting load is affected by the alteration. Certain types of 1-for-1 retrofits or routine maintenance of existing fixtures either have minimal compliance requirements or don’t actually trigger the need to comply with any code measures.

Energy Reporting, Disaggregation of Load Types, Sub-Metering

These are some of the additional code requirements in Title 24 and/or ASHRAE 90.1. Refer to code text for more information about all applicable requirements and limitations.

Energy Savings

Savings Method		Potential Savings*
	Occupancy / Vacancy Sensing Adjust lights based on the presence or absence of individuals in a space	43%
	Scheduling Zones and scenes adjust based on time of day or astronomical sunrise/sunset	24%
	Daylighting Dim Zones or scenes to account for sunlight or other light sources in a space	60%
	Task Tuning Set a maximum light level and dim lights for specific tasks	36%
	Demand Response Set energy saving scenes when notified by energy utility	50% at peak
	Plug Load Control Eliminate power draw after hours or when a room is unoccupied	43% of load
	Lightcloud Lightcloud can combine some or all of these methods for greater energy savings.	68%
	Lightcloud-Enabled RAB LED Fixtures Combine the power of Lightcloud with RAB's high-efficiency LED fixtures	88%

* Energy savings are a conservative upper-limit estimate but may be exceeded for some applications. Savings refer to energy used for lighting with the exception of the plug load control.

Application Solutions

	Space	Occupancy /Vacancy Sensing	Scheduling	Daylighting	Task Tuning	Demand Response	Plug Load Control
Indoor	Auditorium	●	●		●	●	
	Break Room	●		●	●	●	●
	Conference Room	●	●	●	●	●	●
	Gymnasium	●	●		●	●	
	Hallway	●		●	●	●	
	Industrial	●	●		●	●	●
	Lobby		●	●	●	●	●
	Medical	●	●	●	●	●	●
	Office	●	●	●	●	●	●
	Restroom	●				●	●
	Stairwell	●		●	●		
	Storage	●				●	●
	Restaurant		●	●	●	●	
	Retail		●	●	●	●	
Outdoor	Landscaping and Walkway		●	●	●	●	●
	Parking Lot	●	●	●		●	

These solutions are recommended, but each application is unique. If you need help determining the ideal solution for your site, give us a call at 1(844)LIGHTCLOUD.

Interested?

lightcloud.com

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