

Discover lighting control solutions

ENERGY CODE
COMPLIANCE



Watt Stopper's Energy Code Initiative

■ PUTTING A STOP TO ENERGY WASTE®

 **WattStopper**

 **legrand®**

CodeSmart

As more and more jurisdictions adopt reference standards such as ANSI/ASHRAE/IESNA* 90.1 (ASHRAE) and International Energy Conservation Code (IECC), design professionals, building owners and operators, and facility managers need up to date tools to ensure code compliance.

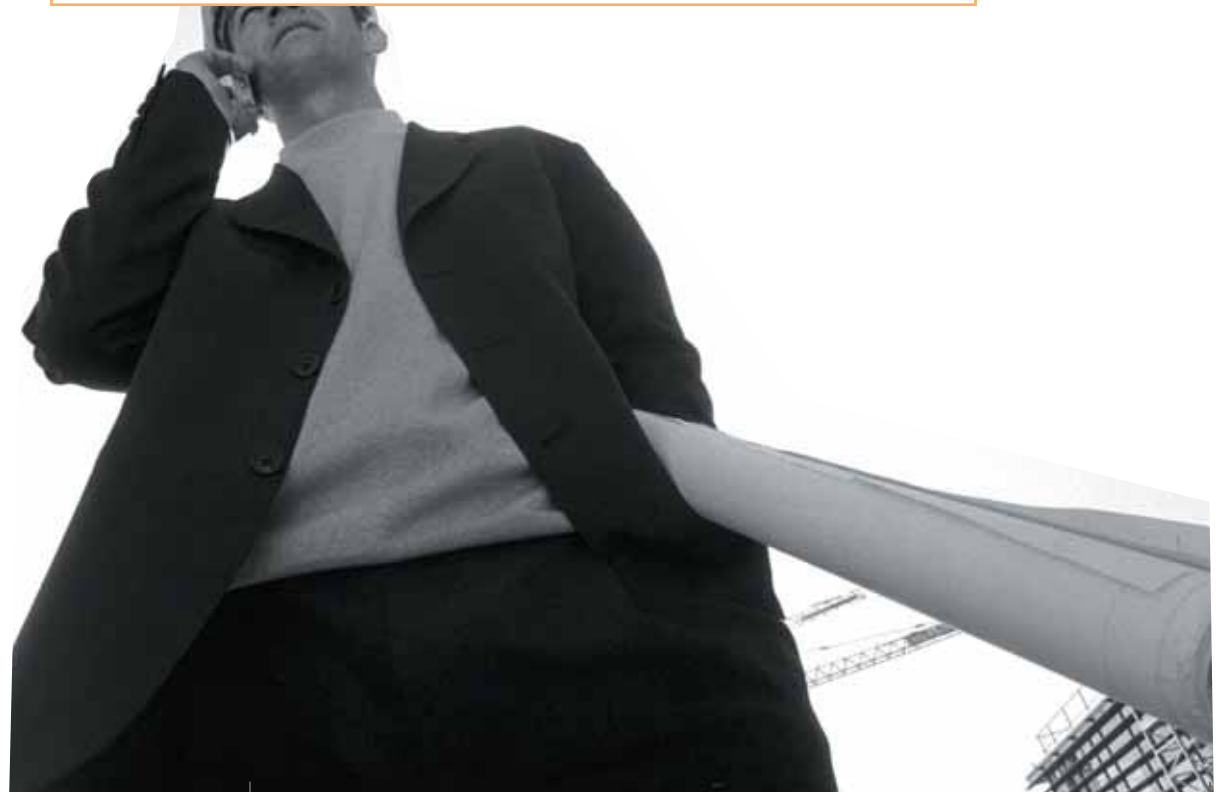
Turn to Watt Stopper/Legrand's CodeSmart energy code initiative for information you can trust:

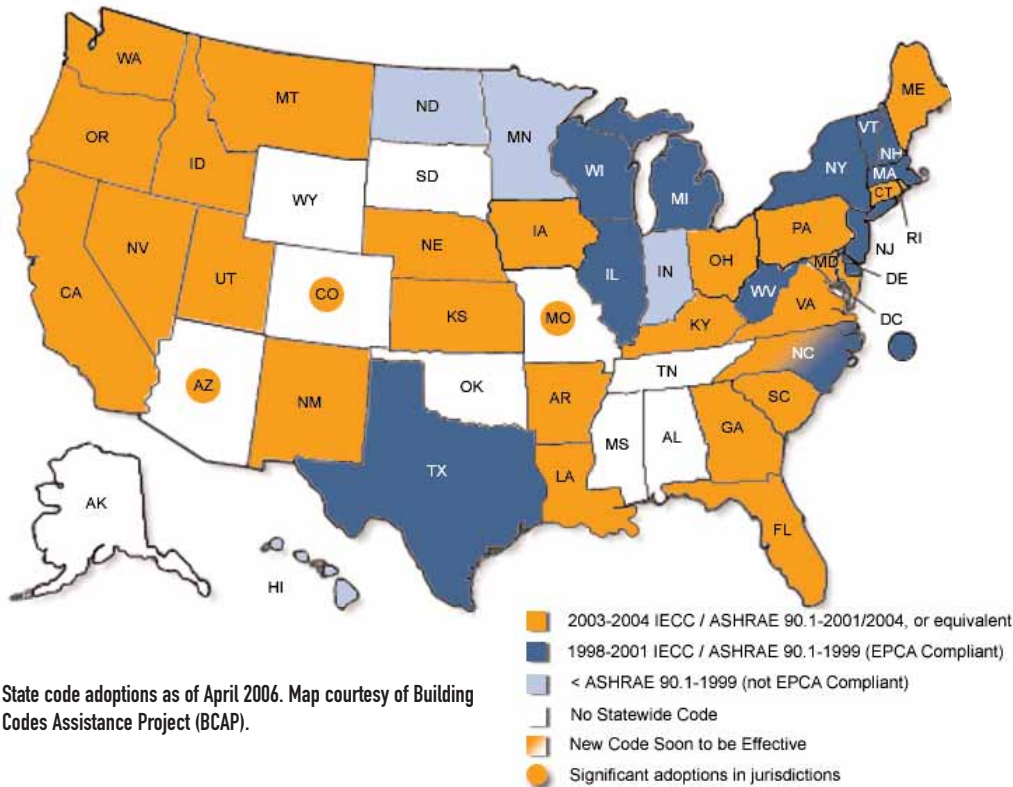
- up to date code requirements for all major codes
- design guidance in developing code-compliant projects
- technical expertise in implementing code-compliant projects

* American National Standards Institute (ANSI)
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
Illuminating Engineering Society of North America (IESNA)

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State code adoptions as of April 2006. Map courtesy of Building Codes Assistance Project (BCAP).

More and more jurisdictions have adopted mandatory energy codes requiring automatic lighting controls

With mandatory energy code requirements on the state, regional, and local levels, virtually every facility faces lighting control requirements.

With new federal tax incentives available under EPAct 2005, understanding, meeting, and exceeding code requirements represents a business opportunity as well (see pg. 15 for more information on the new Commercial Building Tax Deduction).

Lighting control code provisions at a glance

ASHRAE 90.1 (2001/2004)

- Automated shutoff
- Space control
- Exterior lighting control

IECC 2003

- ASHRAE compliance OR:
 - Automated shutoff
 - Space control
 - Exterior lighting control
 - Light level reduction control

California Title 24-2005

- Automated shutoff
- Space control
- Exterior lighting control
- Light level reduction control
- Daylighting

Refer to pages 12-13 for more details on major code requirements.

Automatic shutoff of general lighting

While different standards vary in exceptions and implementation, the core requirement is automated lighting shutoff. Acceptable methods for complying with automated shutoff requirements are:

Time scheduled shutoff

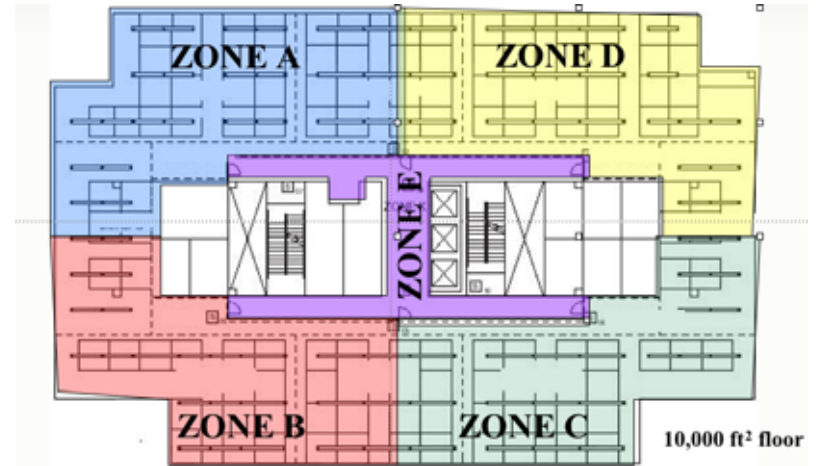
Scheduling lighting to turn on and off based on normal business hours provides a convenient way of automating general facility lighting. Using a time clock in a lighting control panel enables code compliance. Local override or space control switches enable local lighting operation regardless of scheduled status.

Products:

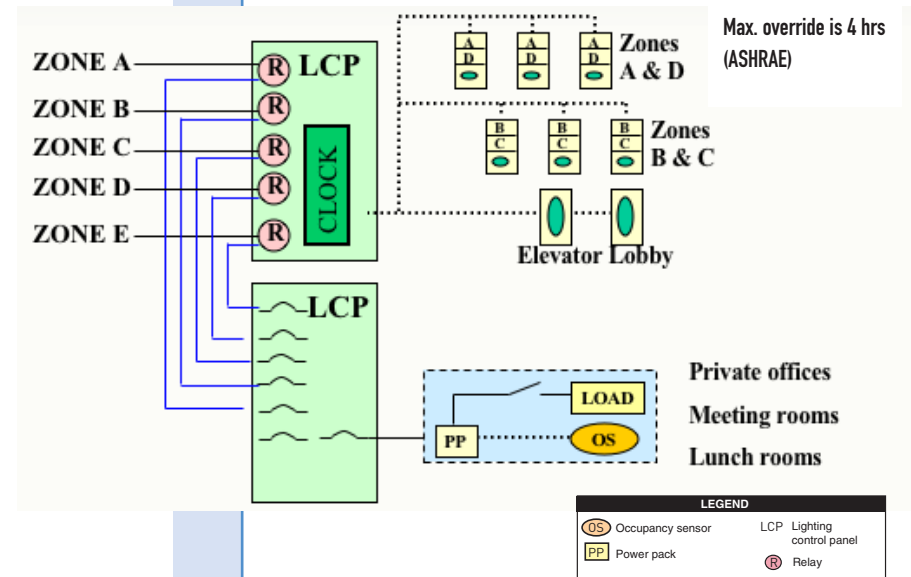
Lighting Integrator lighting control panel with time clock

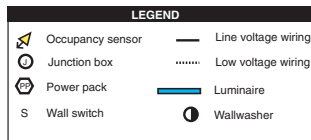
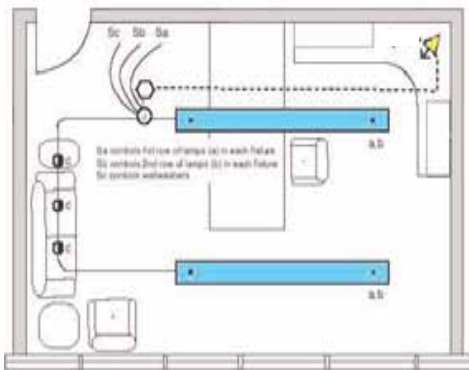
Best applications: High usage areas with regular schedules

- open offices
- retail sales floor
- hallways
- common areas



The schematics above and below illustrate a code-compliant solution for an office building with panel-based, scheduled shutoff that complies with ASHRAE-mandated zone sizes and override provisions.





Occupancy sensors comply with automated shutoff requirements in all energy codes and are ideal for intermittent use spaces such as private offices. (Here, wall switches also provide manual overrides and bi-level switching.)

Occupancy based shutoff

For spaces that follow less predictable schedules or are intermittently occupied, occupancy sensors provide reliable automated shutoff. When an area becomes unoccupied, the sensors signal lighting to turn off.

Products:

Occupancy sensor

Best applications: High usage areas with irregular schedules

- private offices
- classrooms
- conference rooms
- restrooms
- lunch rooms
- copy rooms

Timed shutoff

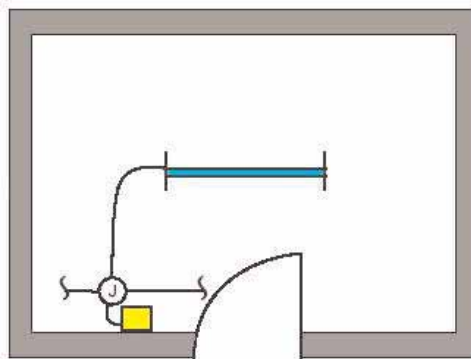
Small, infrequently used areas such as storage spaces are ideal for timed shutoff. By replacing a standard wall switch with a digital time switch, lights automatically turn off after a preset time. Users simply press the switch button and lights turn on for a preset period.

Products:

Digital time switch

Best applications: Limited usage areas

- supply/storage closets



In small, limited usage areas such as utility closets, digital time switches provide automatic shutoff.

Lighting controls in enclosed spaces

ASHRAE, IECC and Title 24 require individual control devices in spaces enclosed with floor to ceiling height partitions. These include individual rooms or partitioned open offices. Space control provisions usually include a requirement that an override device, such as a switch, be readily accessible to occupants.

Using a lighting control panel paired with automatic control switches, or occupancy sensors with manual switches, enables occupants to override automated lighting when necessary and satisfy statutory override limits.

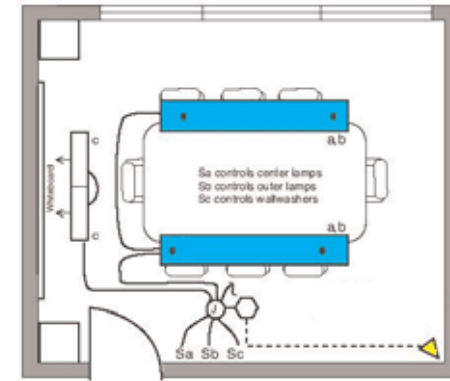
Products:

- Occupancy sensors
- Lighting control panels in conjunction with timed override switches
- Automatic wall switches

Best applications:

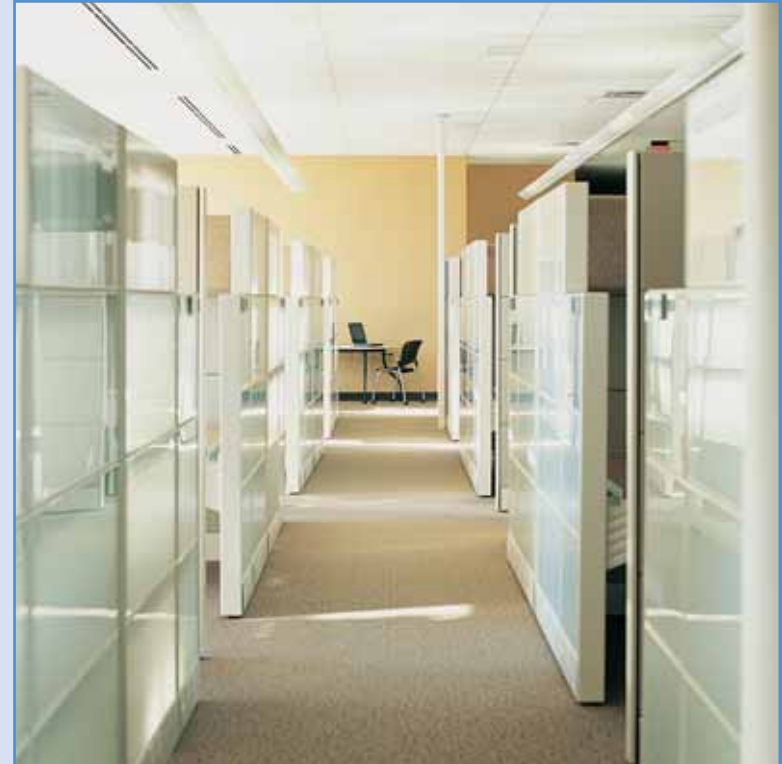
Occupancy sensors: High usage areas with irregular schedules (i.e., private offices, conference rooms, restrooms)

Lighting control panels: High usage areas with regular schedules (i.e., open offices, hallways, common areas)



LEGEND	
▲	Occupancy sensor
○	Junction box
⬡	Power pack
S	Wall switch
—	Line voltage wiring
⋯	Low voltage wiring
▬	Luminaire

Mandatory space control is a cumulative requirement in addition to automatic shutoff. Here, the occupancy sensor satisfies both requirements under ASHRAE, and manual controls (wall switches) are provided for occupant convenience.



Exterior lighting control

Codes mandate exterior lighting be automated using a photocell, an astronomical time clock, or a combination of both.

Photocell control

Operating by measuring available daylight, photocells turn lighting off when daylight becomes sufficient at dawn, and turn lighting on when daylight levels diminish at dusk.

Products:

Lighting control panels with exterior photocells

Best applications: Parking lots, walkways, building facades, security lighting

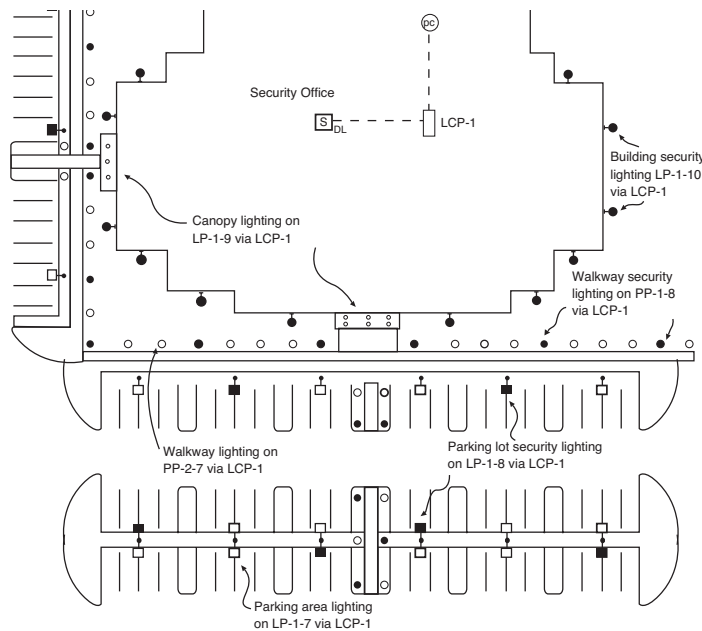
Astronomical control

With astronomical control, a time clock uses location data, such as longitude and latitude, together with the date, to implement an ON/OFF schedule for exterior lighting that accommodates the changing seasons.

Products:

Lighting control panel with astronomical time clock

Best applications: Parking lots, walkways, building facades



Exterior lighting must be controlled either by photocell or astronomic clock, or a combination of both.

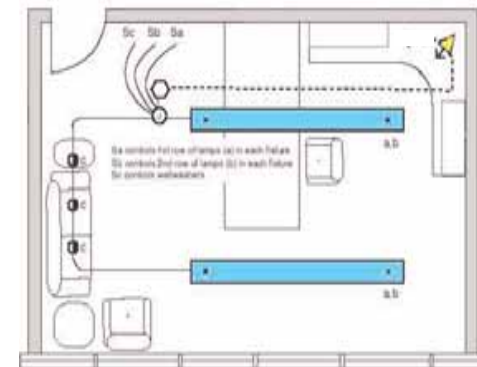
Light level reduction control

Mandatory in IECC Chapter 8, Title 24

Some energy codes, such as California's Title 24 and IECC Chapter 8, include provisions for reducing light levels by up to 50% using simple switching strategies (IECC includes an important exception for spaces controlled by occupancy sensors). Light levels can be reduced by:

- controlling all lamps or luminaires
- dual switching of alternate rows, luminaires, or lamps
- switching independent lamps within a luminaire
- switching each luminaire or lamp

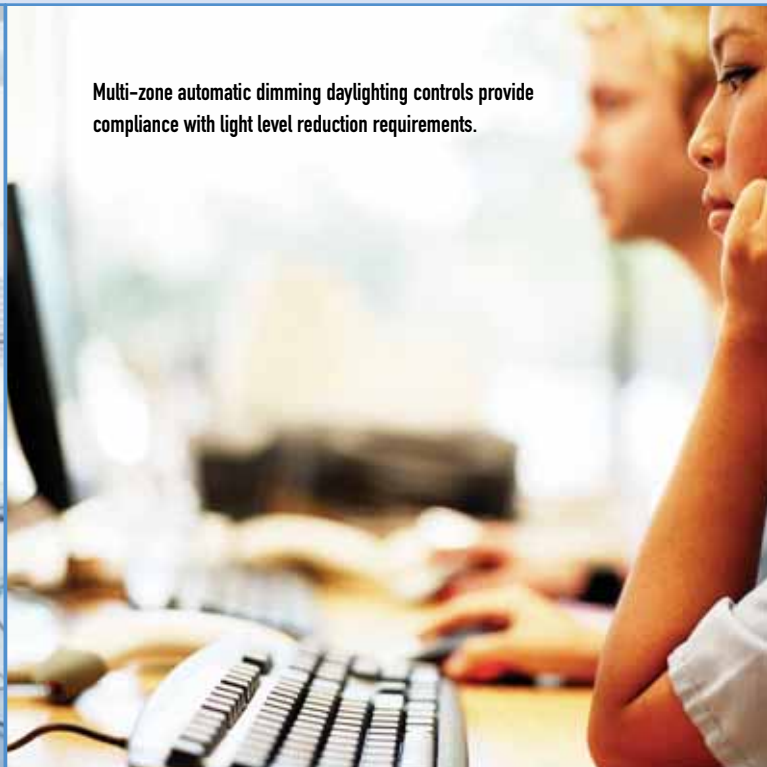
Designers can meet this requirement in a number of ways. One of the easiest is by using dual wall switches in conjunction with occupancy sensors. The sensors provide the automated shutoff and the switches provide the ability to reduce light levels when necessary. Other ways include the use of dimming controls, such as daylight dimming systems or DALI dimming controls.



LEGEND			
	Occupancy sensor		Line voltage wiring
	Junction box		Low voltage wiring
	Power pack		Luminaire
	Wall switch		Wallwasher

Bi-level switching in this conference room is achieved by combining wall switches with occupancy sensor control. This also provides compliance with the automatic shutoff and space control requirements.

Multi-zone automatic dimming daylighting controls provide compliance with light level reduction requirements.



Products:

- Automatic wall switches
- Manual wall switches
- Daylighting controls

Best applications:

Wall switches: Dual relay automatic wall switch sensors are ideal for small private offices and small restrooms

Manual wall switches: Two toggle wall switches, used in conjunction with a power pack and occupancy sensors, provide bi-level switching for medium to large private offices, conference rooms, and open office spaces.

Daylighting controls: Multi-level, multi-zone automatic dimming controls meet light level reduction requirements in any space with a significant daylight contribution, such as classrooms.

Lighting control for specific lighting types

Display lighting

Mandatory in ASHRAE 90.1, Title 24

ASHRAE 90.1 mandates separate control of display lighting. California Title 24 also requires separate control of display lighting on circuits not exceeding 20 amps.

Using a lighting control panel provides a flexible method of controlling different types of lighting independently. For instance, display lighting operates in conjunction with a store's shopping hours while general lighting accommodates the whole range of store operating hours.

Products:

Lighting control panels
Programmable switches

Best applications:

Display and accent lighting in retail sales floors



Separately automating shutoff of display lighting enables retail operators to illuminate merchandise only during store hours.



Daylighting Control

Mandatory in Title 24

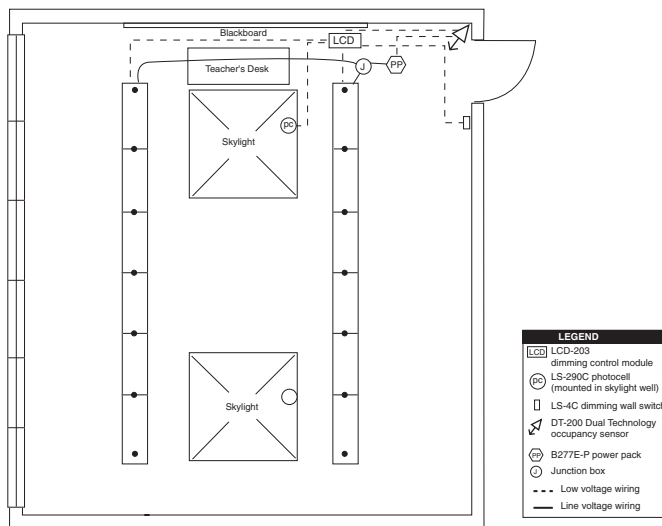
California Title 24 requires that daylit areas greater than 250 ft² have at least one independent lighting control that controls at least half the luminaires in the daylighting area. In addition, daylit areas greater than 2,500 ft² in enclosed spaces under skylights must be controlled by automatic, multi-level daylighting controls. These requirements are in addition to the automatic shutoff and space control requirements.

To comply with these provisions, a daylighting controller such as a dimming control module can be used to dim lighting continuously, based on the level of daylight contribution detected by a photocell.

Products:

Daylighting controls (dimming system)

Daylighting controls (dimming photosensor)



Title 24 compliance in this skylit classroom requires the use of a multi-level (dimming) daylighting controller as well as the automatic shutoff control (occupancy sensor) and override switch.

Compliance at a Glance

Control Provision: Automatic Shutoff	90.1-2001/2004	IECC 2003 (Ch. 8)	Title 24-2005
Scheduling - indep. schedules < 25,000 ft. ² - not more than 1 floor	X X	X X	X
Occupancy sensors	X (max. 30-minute time delay)	X	X
By another automatic method	X	X	X
Exclusions: - lighting required for 24 hour operations - where automatic shutoff would endanger safety or security	X X (2004)	X	X X
Control Provision: Space Controls			
Independent control of lighting in enclosed spaces - manual - automatic (including an occupancy sensor)	X X	X	X X
Maximum control zone sizes	2,500 ft ² up to 10,000 ft ² > 10,000 ft ² , 10,000 ft ²	5,000 ft ² *	5,000 ft ²
Maximum override time	4 hr.	2 hr. ¹	2 hr.
Specific spaces must have a control device to automatically turn lighting off within 30 minutes after last occupant leaves • employee lunch/break rooms • higher education classrooms • conference/meeting rooms	X (2004)		
Control Provision: Exterior Lighting Control			
Controlled by photosensor or astronomical time switch Memory backup in event of power loss	X X (2004: 10-hour)	X X (4-hour)	X X

*In single tenant retail spaces and malls, controlled area may not exceed 20,000 ft²

¹In single tenant retail spaces and malls, override time may exceed 2 hours.

Control Provision: Light Level Reduction	ASHRAE 90.1-2001/2004	IECC 2003 (Ch. 8)	Title 24-2005
<p>Enclosed spaces must have uniform light level reduction as follows:</p> <ul style="list-style-type: none"> - area limits - LPD limits - excluded spaces - other exclusions 		<p>X ≥ none 0.6w/ft² or greater corridors, restrooms, lobbies spaces using occ. sensors</p>	<p>X > 100 ft² 0.8w/ft² or greater corridors</p>
Control Provision: Daylighting			
<ul style="list-style-type: none"> • Daylit areas in enclosed spaces > 250 ft² must control 50% of luminaires in daylit area separately from other lighting • Control luminaires in skylit areas separately from luminaires in sidelit areas • Provide even illumination level • Daylit areas in enclosed spaces under skylights > 2,500 ft² require: <ul style="list-style-type: none"> - Automatic multi-level daylighting controller with 2-level reduction or - Multi-level time switch and override switches 			<p>X X X X X X</p>

Control Provision: Display lighting	ASHRAE 90.1-2001/2004	IECC 2003 (Ch. 8)	Title 24-2005
Independent control	<p>X (separately controlled by dedicated device)</p>		<p>X (separately switched on circuits 20 amps or less)</p>
Control Provision: Task Lighting			
Integral control device or readily accessible wall-mounted device	<p>X</p>		

Code compliance resources

www.wattstopper.com/codesmart.html

Turn to CodeSmart online for the latest information on state code adoptions, technical bulletins about specific code provisions, code compliant application highlights, and more!

Education Series

Obtain detailed, in-depth understanding of code requirements as well as the control strategies that will provide compliance. Courses are available at locations across North America or online via video.

Best Practice Design Library

Study code compliant applications for insight on product selection and implementation, layout examples, wiring and installation tips, and equipment schedules.

Additional Resources

www.energycodes.gov – this Department of Energy website provides current information on code adoptions, compliance, training, and implementation tools.

www.bcap-energy.org – this not-for-profit organization's website, designed to assist states in developing energy codes, offers extensive information on code development and adoptions, including legislative alerts, as well as training seminars and conferences.



Opportunities beyond code compliance

Under the Energy Policy Act of 2005 (EPAcT), your mandatory code compliance provides a foundation for an even greater opportunity. EPAcT 2005 enables commercial building owners to invest in energy efficiency, with a brand-new Commercial Building Tax Deduction (CBTD) for capital investments in energy efficiency equipment, including lighting controls.

Lighting Tax Deduction Provisions

Lighting system projects may qualify for a partial deduction of up to \$0.60/ft². To do so, projects must satisfy the following requirements set forth in the interim rules:

1. reduce lighting power density (LPD) by 25-40% beyond the minimum requirements outlined in ASHRAE 90.1-2001 (warehouse spaces must reduce LPD by 50%)

A pro-rated deduction is allowed for projects that reduce LPD between 25 and 40% as illustrated in the table.

2. Comply with all mandatory and prescriptive requirements of ASHRAE 90.1-2001 related to lighting controls
3. Provide bi-level switching for all types of building spaces (referred to as "occupancies").
Exceptions: hotel/motel guest rooms, store rooms, restrooms, public lobbies
4. Meet minimum requirements for calculated lighting levels according to IESNA Lighting Handbook, 9th Ed

To qualify for this new Commercial Building Tax Deduction (CBTD), building owners must act quickly. The deduction will be available only for buildings placed in service between January 1, 2006 and December 31, 2007.

Visit www.wattstopper.com/epact for more information.

% of LPD reduction	25%	26%	27%	28%	29%	30%	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%	more than 40%
Amount of tax deduction	\$0.30	\$0.32	\$0.34	\$0.36	\$0.38	\$0.40	\$0.42	\$0.44	\$0.46	\$0.48	\$0.50	\$0.52	\$0.54	\$0.56	\$0.58	\$0.60	\$0.60

Table reprinted from "Energy Policy Act of 2005 Encourages Energy-Efficient Lighting with Tax Deduction," Craig DiLouie, Lighting Controls Association, www.aboutlightingcontrols.org/education/papers/tax_deduction_2005.shtml.

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