

California Building Energy Efficiency Standards

Title 24 guidelines for controlled lighting

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Title 24 Guidelines for Controlled Lighting



On July 1, 2014, California Title 24 (T24) Building Energy Efficiency Standards went into effect. The lighting and lighting controls sections were expanded clarifying the mandatory requirements for residential and nonresidential buildings that include outdoor spaces. In keeping with the California legislation, the standards must be cost effective and include approaches that account for equipment improvements in efficient technology. As one will see, the newer technologies delivering higher energy savings are favored in the code. The new efficiency standards focus on lighting controls and LED luminaires, both of which offer the greatest energy savings with control capabilities.

California Energy Commission estimated reduction benefits from code compliance:



Annual energy savings

- 613 gigawatt-hours
- 195 megawatts peak demand



Resulting air quality and emission reductions per year

- 215 metric tons carbon dioxide equivalent
- 2.4 tons sulfur oxides
- 41 tons carbon monoxide
- 59 tons nitric oxide

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While this training material was developed based upon the published Building Energy Efficiency Standards for Residential and Nonresidential Buildings (CEC-400-201-004-CMF-REV2), Residential Compliance Manual for the 2013 Building Energy Efficiency Standards (CEC-400-2013-001-CMF), and Nonresidential Compliance Manual for Building Energy Efficiency Standards (CEC-400-2013-002-CMF) (collectively, "the code"); it is not intended to replace the code and experts that interpret the code. This training material is based on the code as it exists at the time of publication, and the code may be updated without notice. Eaton accepts no liability for the content of this presentation, or the consequences of any action taken on the basis of the information provided.

HOWTO USE THIS GUIDE

This guide is constructed to simplify the aggressive and complex California Energy Code of Title 24 into three basic steps covering the requirements for the most common spaces found in both Residential and Nonresidential compliance. Icons are used to describe the luminaire and control requirements that are conveniently aligned with Eaton's broad range of luminaires and controls delivering a compliant Title 24 space.

Sample page from this guidebook shown below:

Identify Your Space

Simplification begins by separating a building into spaces such as "office" and outlining the conditions of the space to walk through Title 24 requirements. Space assumptions and energy budget requirements are located in the header area while the rest of the page details specific luminaire and control combinations to make the space Title 24 compliant.

Follow the 3 steps below to ensure your space meets Title 24:

1. Analyze

Four simple mandatory lighting control elements cover the changing components of Title 24. The space defined above is analyzed against the code, notes are provided, and exceptions to the spaces are shown. The far right shows the code references to facilitate further understanding.

2. Align

Icons are presented to visually align the specific requirements that satisfy Title 24 requirements. The code may offer options or combined functions to satisfy the requirements.

3. Select Products

The final step is selecting products that align with the requirements. The California Title 20 Appliance Database provides a list of certified products for select product categories such as self-contained dimmers, Metal Halide luminaires, emergency EXIT signs, residential LED luminaires, etc. Not all products must be certified.

Title 24 Requirements

NONRESIDENTIAL INDOOR: Medium or Large Office

SPACE ASSUMPTIONS

- Space** – Greater than 250 square feet
- Electrical Load** – Greater than 0.5 watts per square feet planned
- Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylighting controls for both primary and secondary sidelit zones
- Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144




LED Lighting Power Density 0.75 watts per square feet required for Area Category Method
For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting

Exception when space level control not required:

- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Manually Switched ON/OFF

Reference:
See 130.1(a) page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of four control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



(OPTIONAL)


Reference:
See 130.1(a) & b) page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- 120V receptacles only having one controlled receptacle within 6 ft of uncontrolled receptacle
- Separate shut-off control for each 5,000 sq ft
- Automatic Time Switch control must have and override to remain on no more than 2 hours

Exceptions to shutoff control include:

- Lighting serving a continuous use area
- Emergency egress up to 0.05 watts per sq ft



(CHOOSE ONE OR MORE)


Reference:
See 130.1(c) page 141, 130.3(d) pages 151-152

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d) page 143



Select appropriate product solutions from the Product Reference Guides located after the Nonresidential and Residential sections.

References provide specific page numbers to the code specifications found in the California Energy Commission Building Energy Efficiency Standards. This 245 page document can be found at www.energy.ca.gov/title24



































Eaton offers a broad range of controlled lighting solutions to satisfy the latest in Title 24 code compliance that are both certified to the California Title 20 Appliance database when required and when certification is not required.

Note: Title 20 certified products can be found at <https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx>

TITLE 24 ICONOGRAPHY

Iconography System

The icons symbolize specific language found in the code requirements. They represent product and space characteristics. Icons not only represent the requirements but attributes Eaton products provide. This simplifies educating one on the code, how to apply the code for a given space, and select the products that will deliver a Title 24 compliant space.

LUMINAIRES / CONTROLS				
 Luminaire Dimming	 Fluorescent Luminaire w/ Ballast	 LED Luminaire	 Metal Halide Luminaire	 Exit Luminaire
 Residential Recessed Luminaires w/ Ballast	 Emergency Back-up (For Egress)	 High Efficacy		
FUNCTIONAL REQUIREMENTS				
 Daylighting Control	 Vacancy Sensor Manual On/Auto Off	 Occupancy Sensor	 Demand Response	 Manually Switched ON/OFF
 Manual Dimmer	 Lumen Maintenance Control	 Tuning Control	 Automatic Time Switch (Indoor)	 Astronomical Time Switch (Outdoor)
 Photocontrol	 Remote Signal Control	 Captive Key-Card Control	 Combined HVAC & Lighting Control	 Part-night Outdoor Lighting Control
 Receptacle Control	 Reporting	 Monitoring	 Automatic Countdown Timer Switch	
CONSTRAINTS				
 Square Footage Range	 Maximum Wattage Controlled Together	 Daylight Opening	 BUG / Zonal Lumen Requirements	 Lighting Power Density
 Height of Luminaire for Outdoor	 24/7 Operation			



High Efficacy

For the purpose of Title 24 compliance in residential projects a luminaire can be certified as High Efficacy by meeting performance requirements. High efficacy luminaires differ by technology. Some examples are: LED luminaires must meet Joint Appendix 8 (JA8) and certified to California Title 20 Appliance Database, CFL residential recessed luminaires must contain CFL ballast that are certified to California Title 20 Appliance Database meeting select efficacy requirement, and residential fluorescent luminaires containing fluorescent ballasts that are certified to California Title 20 Appliance Database.

References: Tables 150.0-A, 150.0-B; Sections 100.0(h), 110.9(e), 110.10(b), 130.1(c), 150.0(k), 150.2(b), 110.9(f)



LED Luminaire

In order for residential LED luminaires to be classified as High Efficacy they must meet Joint Appendix 8 (JA8) and be certified to the California Title 20 Appliance Database. Residential compliance includes single family homes, hotel/motel guest rooms, high-rise apartment living spaces, dormitory rooms, senior living facility quarters, etc.; all of which are considered generically “dwelling” spaces.

References: Tables 150.0-A and 150.0-B; Section 150.0(k), 150.2(b), 110.9(e), 100.0(h)



Fluorescent Luminaire w/ Ballast

In Title 24 Residential and Nonresidential compliance, fluorescent luminaires must include ballasts that are certified to the California Title 20 Appliance Database. While 4-pin electronic fluorescent is generally viewed as a compliant device, the ballast installed must be certified to the California Title 20 Appliance Database. In order to be certified, the ballast must meet all Title 20 requirements.

References: Tables 130.1-A, 150.0-A; Sections 100.0(h), 110.1



Residential Recessed Luminaires w/ Ballast

Fluorescent ballasts certified to the California Title 20 Appliance Database for use within a residential recessed luminaire would be classified as High Efficacy. Requirements to use high-efficacy devices are found in single family homes, hotel/motel guest rooms, high-rise apartment living spaces, dormitory rooms, senior living facility quarters, etc.; all of which are considered “dwellings”.

References: Table 150.0-A, 150.0-B; Sections 100.0(h), 110.1, 110.9(f)



Luminaire Dimming

Title 24 Nonresidential indoor compliances utilize dimming luminaires for requirements such as demand response, multi-level dimming and daylighting. Power adjustment factors that lower claimed LPD levels can be earned when select controls strategies are applied. Nonresidential outdoor compliance strategies utilize dimming luminaires during periods where the area is vacant. Part-night lighting control and centralized time-based zone control may also include dimming as part of an energy use reduction plan.

References: Tables 130.1-A and 140.6-A; Sections 130.1(b), 130.1(c), 130.1(d), 130.1(e), 130.2(c), 140.6(a)(2)



Exit Luminaire

Only Emergency Exits luminaires certified to the California Title 20 Appliance Database can be used for Title 24 compliance. This does not include egress luminaires but those that provide egress signage such as “EXIT”, illuminated 24 hours a day and 365 days a year.

References: Sections 140.6(a), 140.8(b)



Emergency Back-up (For Egress)

Emergency back-up circuits are commonly used in the design of life safety systems such as lighting to meet the code requirements for safety and noted in Title 24 as low power consumption circuits shown on the design plans.

References: Sections 130.1(a), 130.1(c), 140.6(a), 140.6(c), 150.0(k)



Reporting

For use in commissioning, reports can be provided from the energy management system to demonstrate performance for lighting loads, electrical distribution system results, branch circuit measurements, control impact, demand response, daylighting performance, and show where adjustments were made. The ability to report results from commissioning are required for building owner for buildings over 10,000 square feet.

Reference: Sections 120.8(a), 120.8(i), 130.1(d), 130.1(e)



Monitoring

An Energy Management Systems (EMS) is a computerized control system designed to regulate the energy consumption of a building by controlling the operation of energy consuming systems, such as the heating, ventilation and air conditioning (HVAC), lighting, and water heating systems, and is capable of monitoring environmental and system loads, and adjusting HVAC operations in order to optimize energy usage and respond to demand response signals.

Reference: Sections 120.8(a), 120.8(i)



Vacancy Sensor Manual On/Auto Off

A manual ON with automatic off control, commonly called “vacancy sensors”, can be used in lieu of occupancy sensors especially when short periods of occupancy occur and the lighting is not needed for the short period. Title 24 limits the amount of time a space is lit when a space is not occupied and requires in spaces like offices and conference rooms mandatory controls to turn off a the space when unoccupied.

References: Sections 110.9(a), 110.9(b), 110.10(b), 141.0(b), 150.0(k)



Daylighting Control

Title 24 in Nonresidential Indoor compliance mandates daylighting controls where there are skylit and sidelit zones. In the case of sidelit zones, where there are 24 square feet of glazing inside buildings and 36 square feet of openings or glazing for parking garages. Sidelit zones are separated in primary and secondary zones. Self-contained sensors must be certified to California Title 20 Appliance Database while daylighting systems must be certified by approved technicians.

References: Tables 141.0-E, 141.0-F; Sections 110.9(a), 110.9(b), 130.1(b), 130.1(d), 140.3(c), 140.6(d)



Demand Response

Title 24 requires that buildings larger than 10,000 square feet have demand responsive lighting controls capable of delivering a minimum of 15% reduction in lighting load in a uniform method. In the case of altered or remodeled spaces, the 10,000 square feet applies to the area modified.

References: Tables 130.1-A, 140.6-A, 141.0-E, 141.0-F; Sections 110.9(a), 110.10(b), 130.1(b), 130.1(e), 130.3(a), 140.6(a), 141.0(b),



Occupancy Sensor

The automatic on and off feature of the occupancy sensor adjusts the lighting load based upon the space’s activity. Title 24 code deploys this functionality as mandatory reducing or turning off power in residential, nonresidential indoor and outdoor compliance requirements. It is also included to as a power adjustment factor to reduce installed lighting loads to meet the lighting power budgets.

References: Tables 140.6-A, 141.0-E, 141.0-F; Sections 110.9(a), 110.9(b), 130.1(c), 130.2(c), 130.5(d), 140.6(a), 141.0(b), 150.0(k)



Manual Dimmer

In nonresidential compliance, continuous dimming is required for certain luminaires such as LED, see TABLE 130.1-A; a manual dimmer is one method to satisfy requirements of 130.1(b). Manual dimmers are also a part of the power adjustment factor(PAF) offering that can reduce prescriptive lighting power densities(LPD). Residential compliance utilizes dimmers in some spaces when “low efficacy” luminaires are allowed.

References: Tables 130.1-A, 140.6-A, 141.0-E, 141.0-F; Sections 110.9(b), 130.1(a), 130.1(b), 130.3(a), 140.6(a), 141.0(b), 150.0(k)



Manually Switched ON/OFF

Title 24 requires that a manual switch control with ON/OFF be provided for each area enclosed by ceiling-height partitions. There are some exceptions including large areas including malls, sales floors, industrial facilities, and larger public restrooms. The manual switch must be accessible within the same room and lighting types such as general lighting and display lighting must be separately circuited. When other lighting controls are included such as a manual dimmer, the ON/OFF functionality cannot be bypassed.

References: Tables 141.0-E, 141.0-F; Sections 110.9(a), 110.9(b), 130.1(a), 130.1(b), 130.1(c), 141.0(b), 150.0(k)

ICONOGRAPHY GUIDE: Functional Requirements (continued)



Lumen Maintenance Control

Lumen maintenance provides an initial lower power level by the luminaire corresponding to typical lumen depreciation factor. The power will increase over time up to the maximum rated wattage to accommodate the reduction in the light over time in the space. Lumen maintenance controls is one of the five function alternatives to meet Multi-level Lighting Controls requirements.

References: Section 130.1(b)



Tuning Control

Tuning control provides an initial lower power level (controlled by authorized personnel only). The power can be increased over time up to the maximum rated wattage. Tuning controls is one of the five function alternatives to meet Multi-level Lighting Controls requirements.

References: Sections 130.1(b)



Receptacle Control

Under Title 24, electrical distribution systems deployed with 120V receptacles used in offices, lobbies, conference rooms, office space kitchenettes, copy rooms, hotel/motel guest rooms are required by Title 24 to automatically shut-OFF when space is considered unoccupied. They are required to be located six feet from an uncontrolled receptacle. Split wired duplex receptacles with one controlled are acceptable.

References: Sections 110.10(b), 130.5(d), 141.0(b)



Automatic Time Switch (Indoor)



Astronomical Time Switch (Outdoor)

Title 24 allows for an Automatic Time Switch that controls lighting based on the time of day and astronomical events such as sunset and sunrise, accounting for geographic location and calendar date to as one of the shutoff control functions to meet the requirements. Outdoor applications require the Automatic Time Switch to include Astronomical functionality.

References: Sections 110.9(a), 110.9(b), 130.1(c), 130.2(c), 130.3(a)



Captive Key-Card Control



Combined HVAC & Lighting Control

Title 24 allows the use of captive key-cards as one of the optional controls to automatically turn off the lighting and controlled receptacles and/or modify the HVAC setpoints reducing energy consumption upon vacancy. These are commonly used in hotel/motels control in which the key that activates the override cannot be released when the lights are in the on position.

References: Sections 120.2(e), 130.1(c), and 130.5(d)



Automatic Countdown Timer Switch

In Title 24 the use of a countdown timer switch control is limited to single-stall restrooms and closets less than 70 square feet with a maximum setting of 10 minutes or in server aisles in server rooms with a maximum setting of 30 minutes.

References: Sections 130.1(c)



Photocontrol

Common control device that senses sunlight and turn on the luminaires at dusk and turns off the luminaires upon sunrise.

References: Section 130.2(c), 130.3(a), 150.0(k)



Part-night Outdoor Lighting Control

These controls turn off or reduce the lighting power for a portion of the night in outdoor lighting applications such as auto dealerships and building facades.

References: Sections 110.9(a), 110.9(b), 130.2(c)



Remote Signal Control

Title 24 allows for a signal from another building system such as an Energy Management System (EMS) or Building Automation System (BAS) as one of the shutoff control functions.

References: Sections 130.1(c)

LPD

Lighting Power Density

In nonresidential compliance, once mandatory requirements are satisfied, lighting power density (LPD) allowances must be satisfied. The evaluation can be done through one of three ways; Prescriptive, Performance or Tailored. Prescriptive is the simplest and can be done at the building or space level. Be aware that the luminaires power can be reduced by a power adjustment factor (PAF) when coupled with certain controls that are not part of the Mandatory Requirements. The Tailored Method uses target illuminance values and calculated based upon the cavity ratio to determine LPD for general lighting and allows for additional allowances for ornamental, wall display, etc. The Performance Method combines measures based upon Time Dependent Valuation (TDV).

References: Tables 140.6-A, 140.6-B, 140.6-C, 140.6-G; Sections 130.1(d), 130.1(e), 140.3(c), 140.6(a), 140.6(b), 140.6(c),



Daylight Opening

Title 24 uses the total opening area in square feet within a building and parking structure determine the need for daylighting controls. The opening in a parking structure can be glazing or an opening and the starting point is 36 square feet. For the inside of a building, the glazing starting point is 24 square feet.

References: Section 130.1(d)



Maximum Wattage Controlled Together

Title 24 requirement establishes the maximum wattage that can be controlled together to apply the mandatory requirements.

References: Sections 130.1(c), 130.2(c)



24/7 Operation

Under Title 24, there are many conditions/constraints imposed where 24 hours a day and 365 days a year provide exemptions to the mandatory use of controls such as emergency egress and tunnel lighting.

Reference: Sections 130.1(c), 130.2(c), 130.3(a)



Square Footage Range

Title 24 utilizes the area of a space to determine when to apply the mandatory requirements. Some examples include office size, controlled space, cumulative permitted work area for Demand Response, etc.



BUG / Zonal Lumen Requirements

Title 24 outdoor requirements for luminaires rated greater than 150 watts are required to meet the zonal lumen requirements.

References: Tables 130.2-A, 130.2-B; Sections 130.2(b)



Height of Luminaire for Outdoor

In nonresidential outdoor compliance the luminaire height will determine what Mandatory Measures have to be implemented to meet Title 24 requirements. When luminaires mounted 24 feet or below, automatic lighting control is required to minimize power consumption when unoccupied.

References: Sections 130.2(c)

TITLE 24: General Education and Information

When is Title 24 Compliance Required?

CONSTRUCTION TYPE	REQUIRED	
New Construction	YES	Meeting Title 24 is required for all residential and nonresidential new construction projects.
Additions	YES	Meeting Title 24 is required for all residential and nonresidential additions.
Alterations (classified as "Retrofit")	Conditional	Based upon the resulting lighting power density and percentage of luminaires altered. Refer to Table 141.0-E
Modification-in-Place (classified as "Retrofit")	Conditional	Based upon the resulting lighting power density and number of luminaires modified. Refer to Table 141.0-F
Repairs	No	Generally, no compliance required.

Note: As a general rule, when a permit is needed Title 24 Compliance is required.

Overview for Nonresidential Compliance



Step 1

ANALYZE THE FOLLOWING MANDATORY MEASURES FOR EACH SPACE

1. Space level (area control) required to operate the lighting.
2. Multi-level lighting requirements for appropriate dimming based on square footage and number of luminaires and/or lamps.
3. Controls providing shutoff reduce the lighting energy load based upon occupancy or schedule.
4. Daylighting controls capable of shedding load to eliminate energy waste when enough daylight is available.

Step 2

STAY WITHIN ALLOWABLE ENERGY BUDGET USING EITHER OF THESE OPTIONS:

1. **PRESCRIPTIVE APPROACH:**
Based on Lighting Power Density (LPD) limits. Use of controls independent of Mandatory Measures can reduce claimed lighting load by a Power Adjustment Factor (PAF) that is as high as 40%.
2. **PERFORMANCE APPROACH:**
Combined measures based upon Time Dependent Valuation (TDV).
3. **TAILORED METHOD:**
Uses target illuminance values and calculated based upon the cavity ratio to determine LPD for general lighting and allows for additional allowances for ornamental, wall display, etc.

Overview for Residential Compliance



Selection Process

EFFICACY REQUIREMENTS

Title 24 provides requirements for where High Efficacy and low efficacy luminaires can be installed on a room-by-room basis. High efficacy has different meanings for different luminaire types. In order to be classified as High Efficacy, LED luminaires are to meet JAB requirements and certified to California Title 20 Appliance database. Compact fluorescent recessed luminaires require the ballast to be certified to California Title 20 Appliance database under "Ballast For Residential Recessed Luminaires". Fluorescent luminaires require the ballast to be certified to the California Title 20 Appliance database under "Ballast".



CONTROL REQUIREMENTS

Title 24 requires the use of controls to reduce power usage based upon room/area type and the luminaire used.



STRUCTURES CLASSIFIED AS RESIDENTIAL



Single Family Home



Multi-Family Home



High-Rise Home



Dormitory Living Quarters



Senior Living Quarters



Hotel/Motel/ Guest Rooms

Title 24 and Title 20: The Basics

T24 Can be used to comply with California Title 24 High Efficacy requirements

APPLIED AT THE BUILDING/SPACE LEVEL

- Similar: ASHRAE and LEED
- Product or combination of products commissioned properly meet the Title 24 requirements
- Example: Office space using Portfolio PD6 LED luminaire with occupancy and daylight sensors

T20 Certified to California Title 20 Appliance Database

APPLIED AT THE PRODUCT LEVEL

- Similar: DLC qualified and ENERGY STAR® certified products
- Certified to the California Energy Commission Title 20 Appliance Database
- Equipment tested and certified to meet Appliance Efficiency Regulations (and listed on the T20 database)
- Example: Wall Box Dimmer, Ceiling Daylight Sensor, Occupancy Sensor, Automatic Time Switch, Emergency Exit, etc

Egress Requirements for Meeting Title 24 (Nonresidential only)

SPACE TYPE	REQUIRED	
Exit	Yes	Exit signs must be certified to California Title 20 Appliance Database.
Building Level	No	No Title 24 compliances required.
Space Level	Conditional	Egress lighting more than 0.2 watts per square foot within an area enclosed by a ceiling height space must have a manual ON/OFF control switch but not accessible to unauthorized personnel.
Multi-Level Dimming	Yes	Code requires luminaires to be dimming capable even though the functionality is not enabled.
Shut-OFF	Conditional	Up to 0.05 watts per square foot may be continuously illuminated in enforcement agency designated egress area. Stairwells, corridors in hotel/motel and high-rise require a minimum of 50%.
Daylighting	Conditional	No Title 24 compliances required. Up to 0.05 watts per square foot may be continuously illuminated in designated egress areas.

Title 24 makes special accommodations for egress lighting and must be identified on the building design documents. Egress must be shut off after typically unoccupied times, except in offices (0.05 W/ft2 allowed 24/7).

Demand Response (Nonresidential building level mandatory requirement)

Demand Response required when 10,000 square feet or more are built or altered. Nonresidential interior code requirements call for each building, including parking garages, to be capable of responding to demand response signals when the building is greater than 10,000 square feet. The installation must be capable of shedding a minimum of 15% of the lighting loads with uniform dimming which utilizes the luminaire requirements of Table 130.1-A for multi-level dimming. This is a required building level evaluation when determining the requirements for Title 24 compliances.





Reference: See 130.1(e) page 144

Daylighting Details (Nonresidential only)

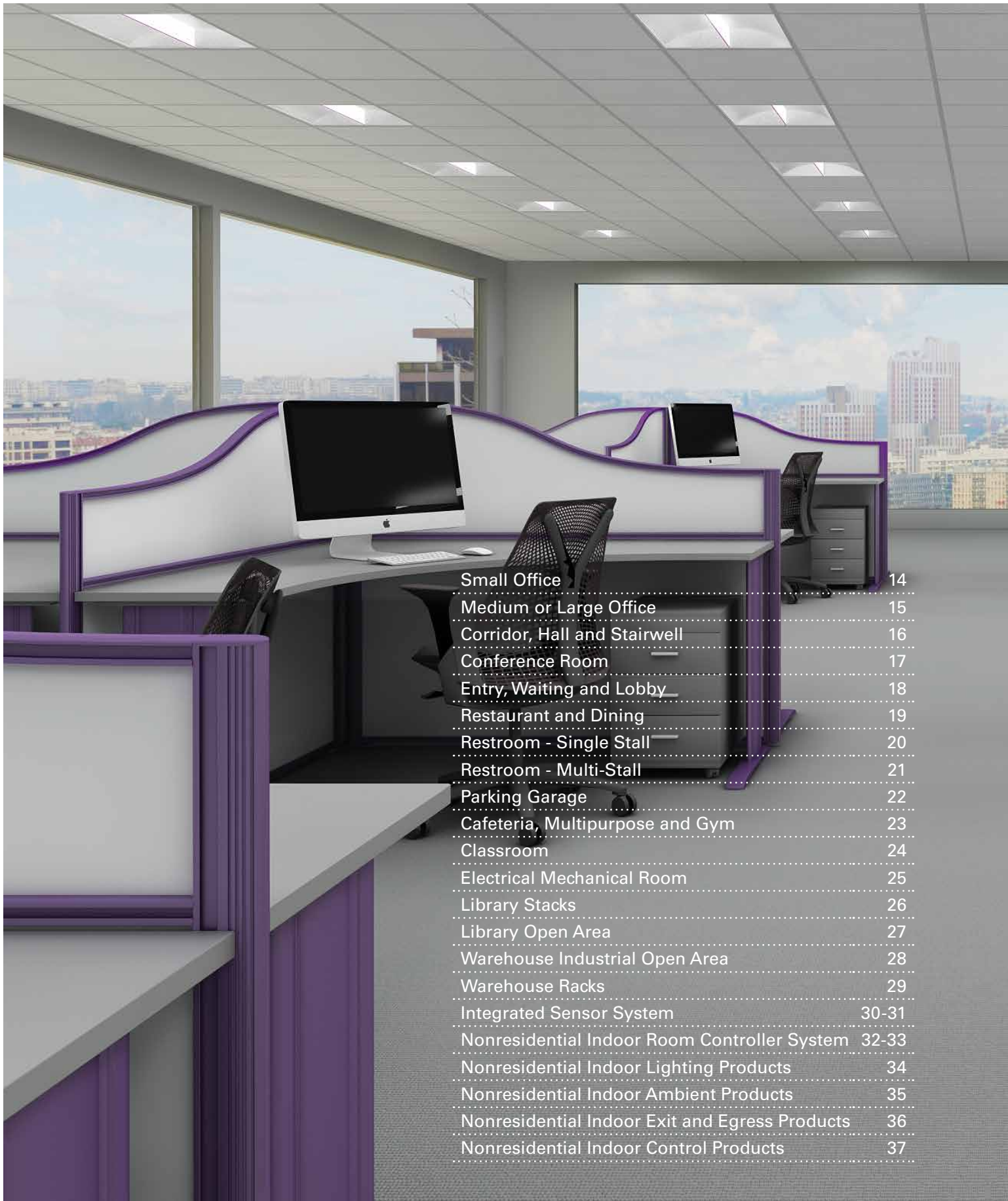
Daylighting in Title 24 Nonresidential Indoor compliance include skylit and sidelit daylighting types. Daylighting control is a mandatory requirement in spaces where daylighting is present. The location of the daylighting zones considers the obstructions and the types when determining how the controls are specified.

Zones where luminaires are in or at least 50% within the daylighting zones must be controlled. Each luminaire within the zone require uniform dimming. The daylighting zone must be controlled such that the darkest area of the zone target light levels do not exceed 150% of designed light levels and the lighting would be reduced to a minimum.

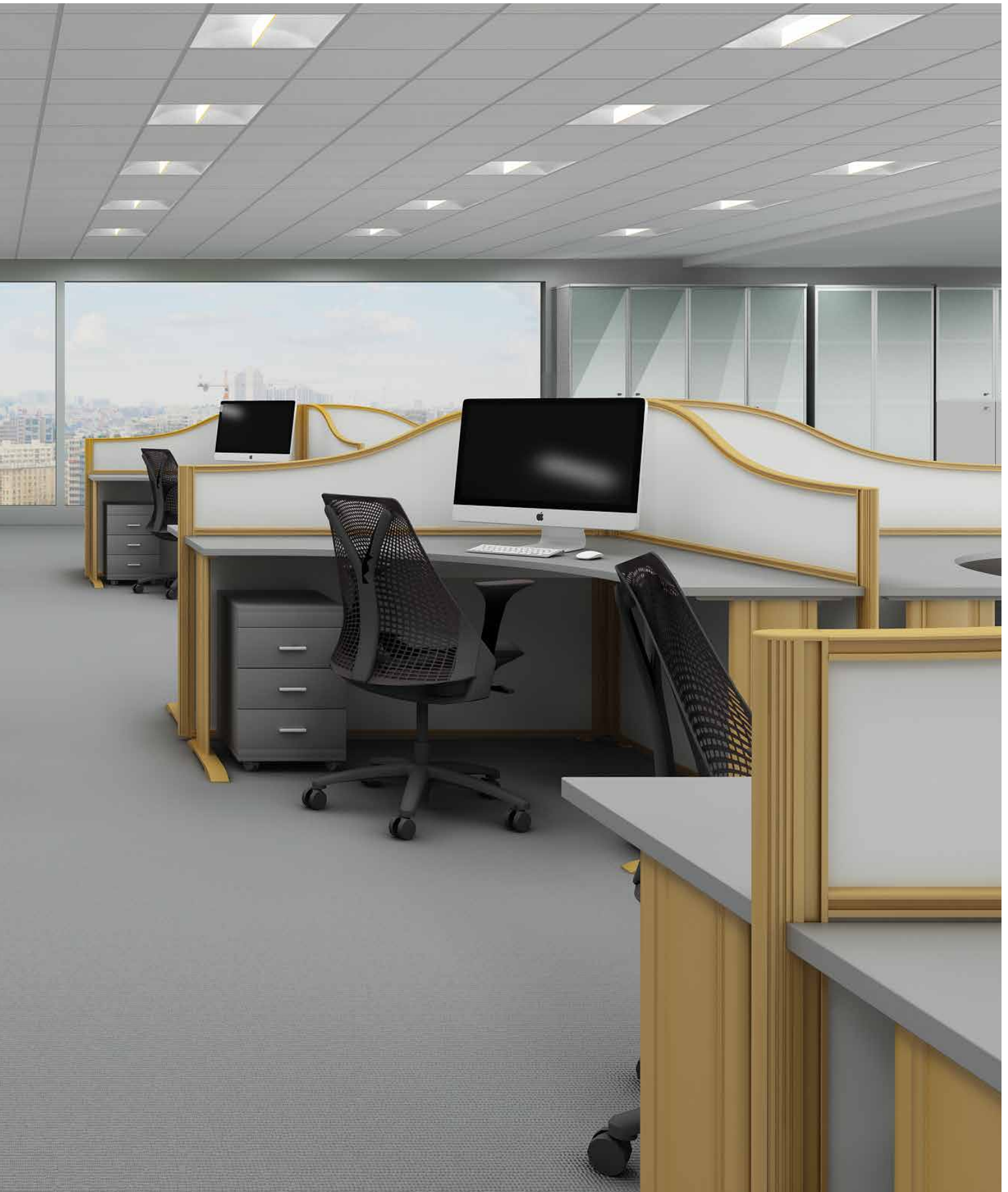
Reference: Nonresidential Compliance Manual section 5.4.4, 130.1(d), 140.6(d)

Nonresidential Interior	Parking Garage	Required Controls
<ul style="list-style-type: none"> • Up to 0.05 watts per square foot may be continuously illuminated in enforcement agency designated egress area. This is the only exception. • Sidelit or Skylight Openings >24 sqft. • Lighting power is 120W or greater in the daylight zone • Reduce at least 65% power when daylight provides more than 150% design illuminance 	<ul style="list-style-type: none"> • Sidelit Openings >36 sqft. • Lighting power is 60W or greater in the daylight zone • Turn off power when daylight provides more than 150% design illuminance 	 Luminaire Dimming Control  Daylighting Control

Nonresidential Indoor Applications

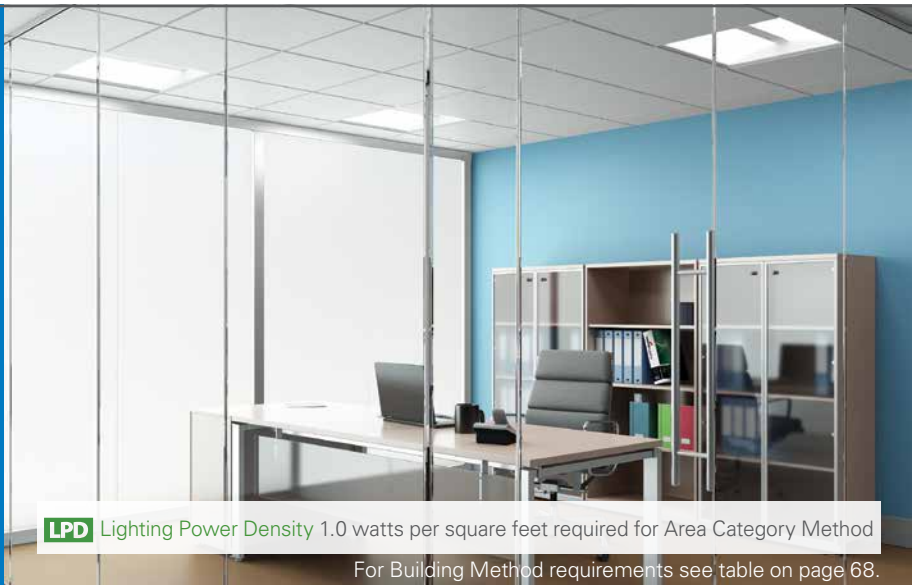


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SPACE ASSUMPTIONS

- **Space** – 250 square feet or less
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring daylighting for both primary and secondary sidelit zones
- **Building** – When lighting project permitted area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting



Manually Switched ON/OFF

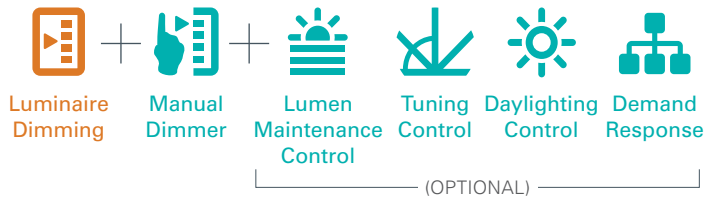
Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimmed luminaire is present. All other controls are optional.

Exceptions when multi-level control not required:

- <100 square feet
- 1 luminaire with a maximum of 2 lamps
- LPD up to 0.2W/sf



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- 120V receptacles only having one controlled receptacle within 6 feet of uncontrolled receptacle



Reference:
See 130.1(c)
page 141,
130.5(d) pages
151-152

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

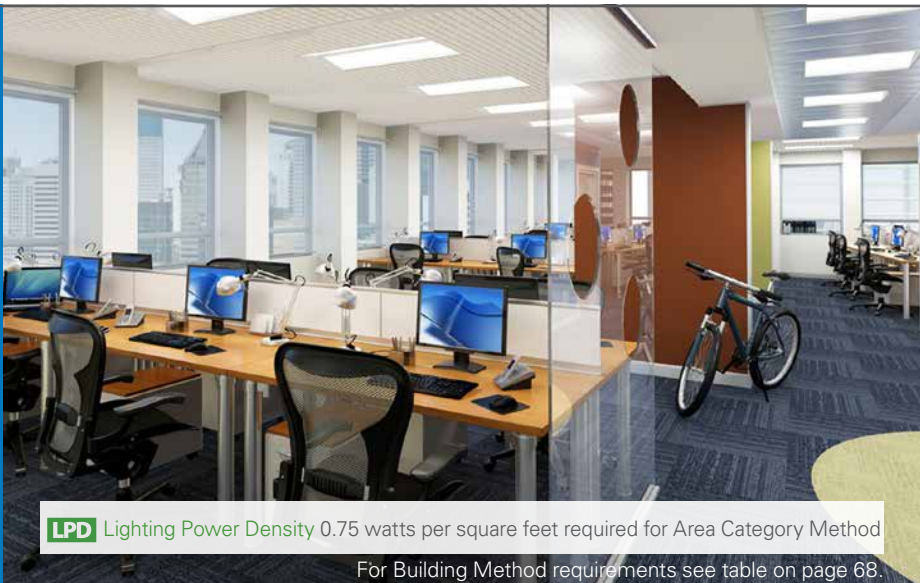
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – Greater than 250 square feet
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylighting controls for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 0.75 watts per square feet required for Area Category Method
For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

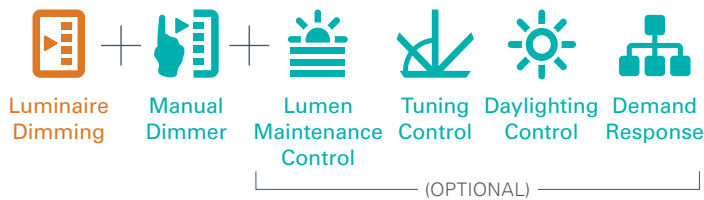
- Must be accessible to occupants to operate the lighting
- Exception when space level control not required:
- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of four control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- 120V receptacles only having one controlled receptacle within 6 ft of uncontrolled receptacle
- Separate shut-off control for each 5,000 sq ft
- Automatic Time Switch control must have and override to remain on no more than 2 hours



Reference:
See 130.1(c)
page 141,
130.5(d) pages
151-152

Exceptions to shutoff control include:

- Lighting serving a continuous use area
- Emergency egress up to 0.05 watts per sq ft

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

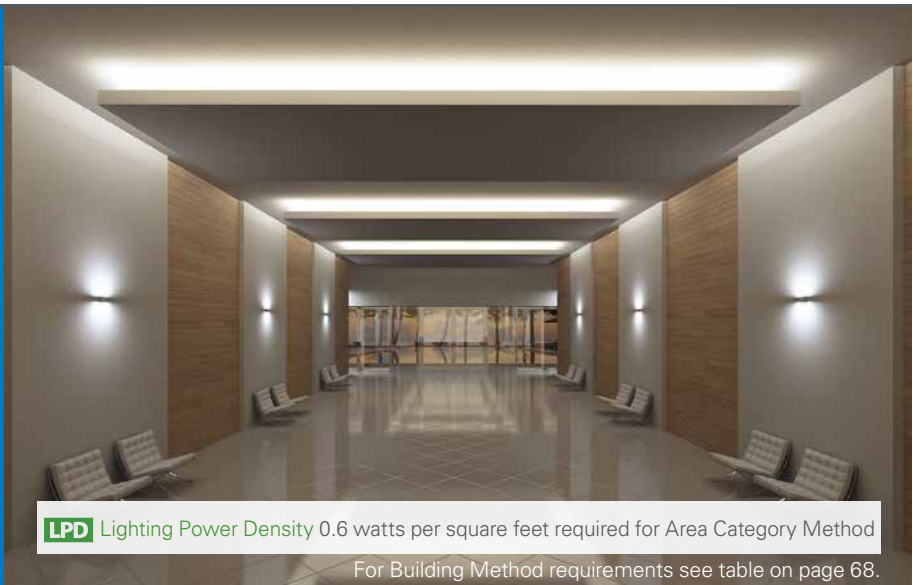
- Exceptions when daylighting control not required:
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – Accessible areas
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring daylighting for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



SPACE LEVEL (AREA CONTROL)

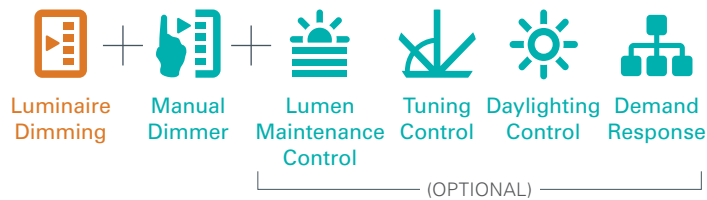
- Must be accessible to occupants to operate the lighting
- Exception when space level control not required:
- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

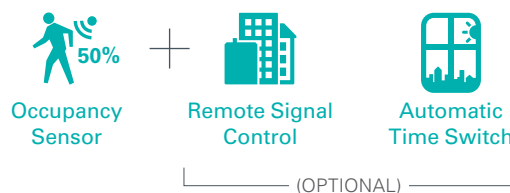
- Luminaire must provide uniform dimming
 - Manual dimmer is required when a dimming luminaire is present. All other controls are optional.
- Exceptions when multi-level control not required:
- <100 square feet
 - 1 luminaire with a maximum of 2 lamps



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires drop to at least 50% power when space is vacant, "high level" with occupant sensed in all accessible areas
- When space is not in a hotel/motel or high-rise residential, during non-business hours and the building is unoccupied, the lights are turned off



Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

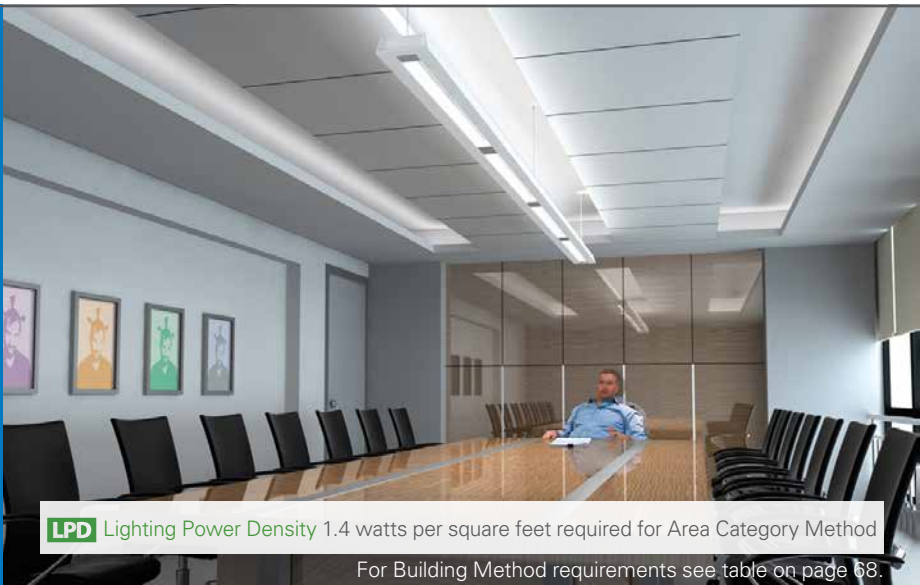
- Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring daylighting for both primary and secondary sidelit zones
- **Others** – The general lighting is not intended to for continuous use, 24 hours and 365 day use. Egress lighting is not part of the general lighting use.
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 1.4 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting

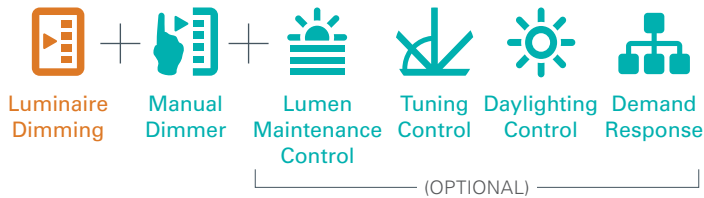


Manually Switched ON/OFF

Reference:
See 130.1(a) page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of four control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Reference:
See 130.1(a & b) page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- 120V receptacles only having one controlled receptacle within 6 feet of uncontrolled receptacle



Occupancy Sensor



Receptacle Control

Reference:
See 130.1(c) page 141, 130.5(d) pages 151-152

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Luminaire Dimming

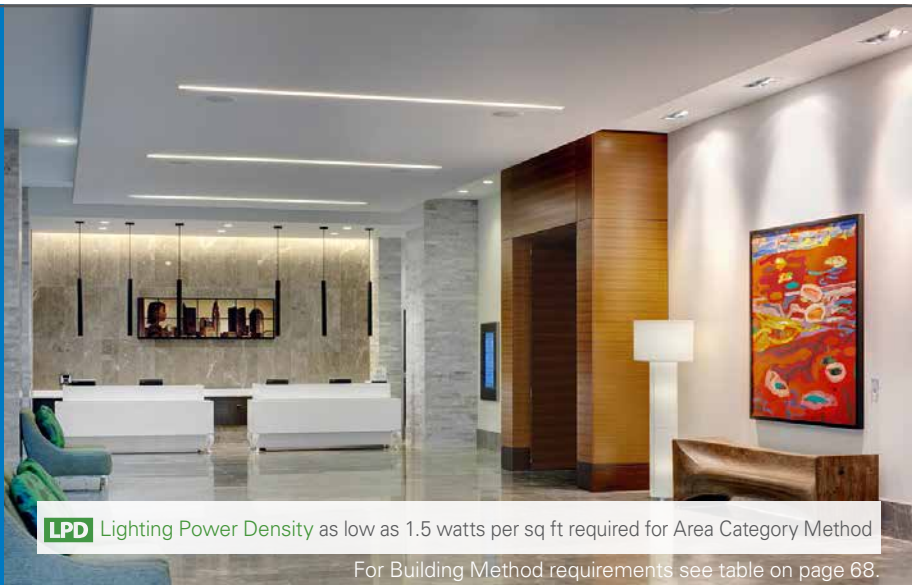


Daylighting Control

Reference:
See 130.1(d) page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring daylighting for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density as low as 1.5 watts per sq ft required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting

Exception when space level control not required:

- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Manually Switched ON/OFF

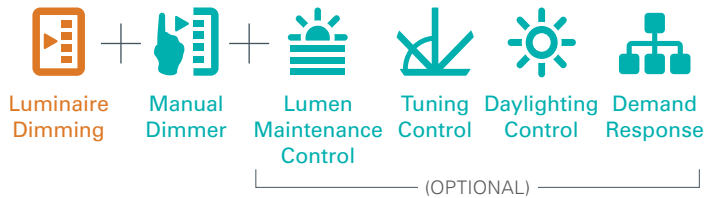
Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.

Exceptions when multi-level control not required:

- <100 square feet
- 1 luminaire with a maximum of 2 lamps



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- 120V receptacles only having one controlled receptacle within 6 ft of uncontrolled receptacle
- Separate shut-off control for each 5,000 sq ft
- Automatic Time Switch control must have and override to remain on no more than 2 hours

Exceptions to shutoff control include:

- Lighting serving a continuous use area
- Emergency egress up to 0.05 watts per sq ft



Reference:
See 130.1(c)
page 141,
130.5(d) pages
151-152

AUTOMATIC DAYLIGHTING CONTROL

- General illumination required to be controlled
- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

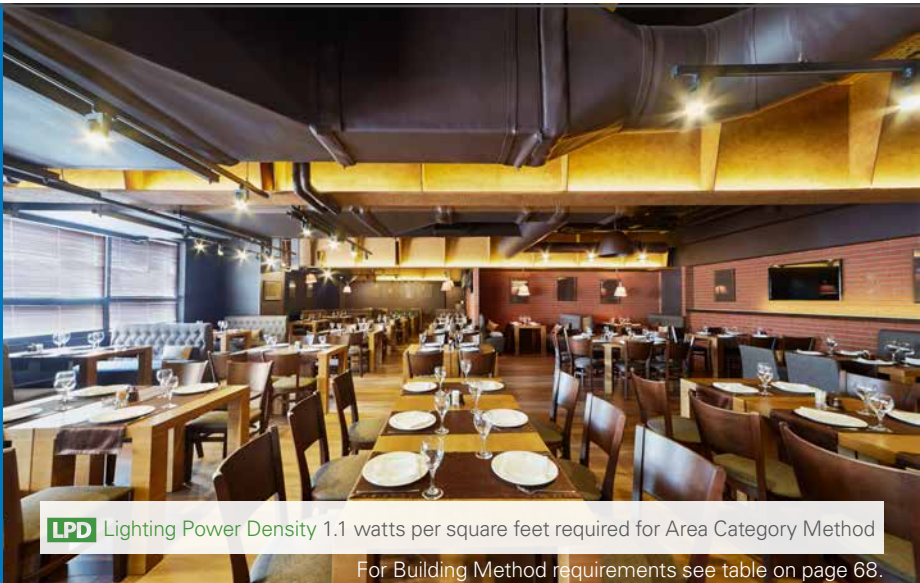
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger. Excludes food prep and kitchen areas.
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring daylighting for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 1.1 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting
- Exception when space level control not required:
- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel

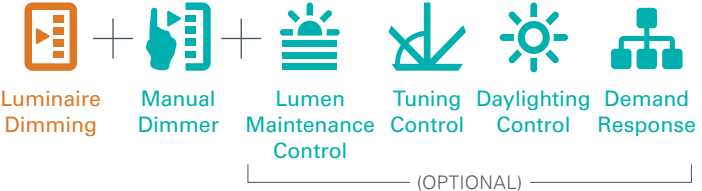


Manually Switched ON/OFF

Reference:
See 130.1(a) page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of four control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Reference:
See 130.1(a & b) page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
 - Separate shut-off control for each 5,000 sq ft
 - Automatic Time Switch control must have an override to remain on no more than 2 hours
- Exceptions to shutoff control include:
- Lighting serving a continuous use area
 - Emergency egress up to 0.05 watts per sq ft



Reference:
See 130.1(c) page 141

AUTOMATIC DAYLIGHTING CONTROL

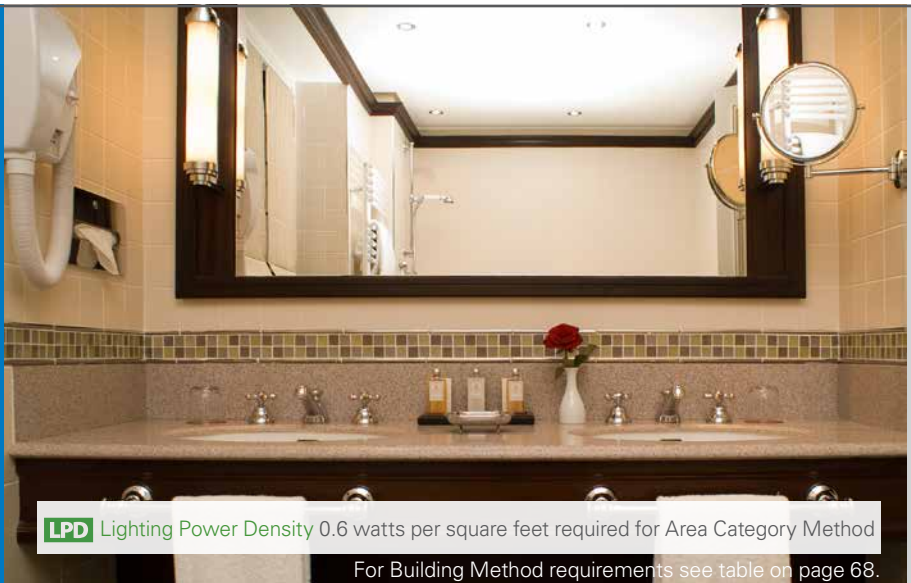
- General illumination required to be controlled
 - Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d) page 143

SPACE ASSUMPTIONS

- **Space** – Greater than 100 square feet and less than 5000 square feet
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Does not contain glazing larger than 24 square feet total daylighting for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 0.6 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting



Manually Switched ON/OFF

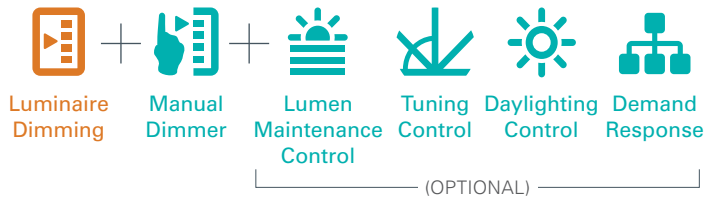
Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.

Exceptions when multi-level control not required:

- <100 square feet
- 1 luminaire with a maximum of 2 lamps



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- Automatic Time Switch control must have and override to remain on no more than 2 hours

Exception when shutoff control not required:

- Countdown timer can be used only in bathrooms and closets less than 70 square feet but no more than 10 minutes.



Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

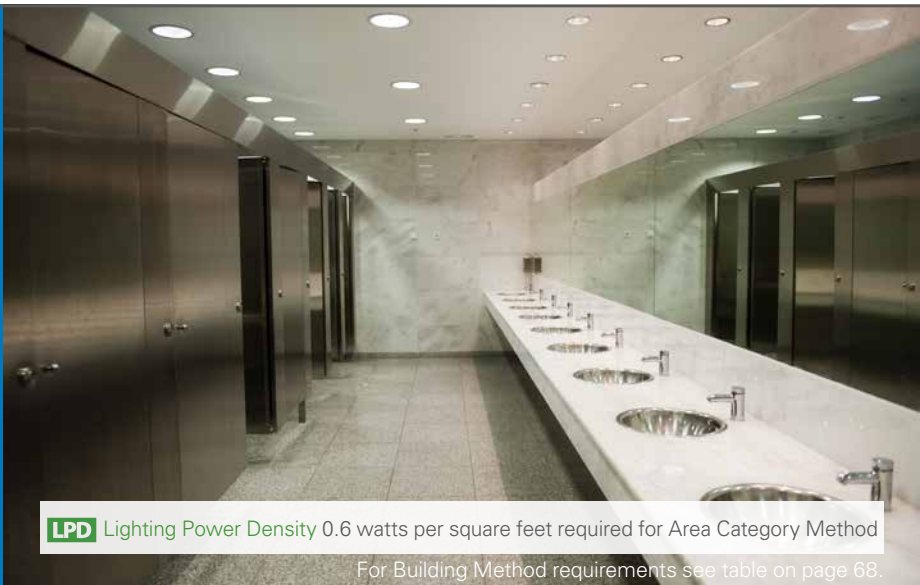
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W

AUTOMATIC DAYLIGHTING CONTROL NOT REQUIRED
BECAUSE EXCEPTIONS MOST LIKELY APPLY

Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – Greater than 100 square feet and less than 5000 square feet
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Does not contain glazing larger than 24 square feet total daylighting for both primary and secondary sidelit zones
- **Others** – The general lighting is not intended to for continuous use, 24 hours and 365 day use. Egress lighting is not part of the general lighting use.
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 0.6 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- May use a manual switch not accessible to unauthorized personnel



Manually Switched ON/OFF

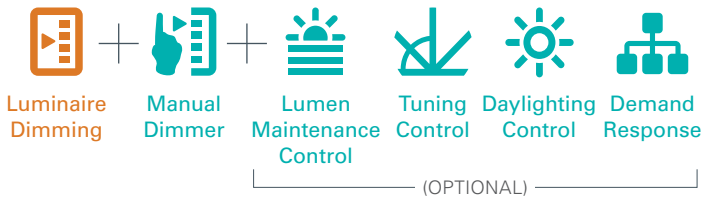
Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.

Exceptions when multi-level control not required:

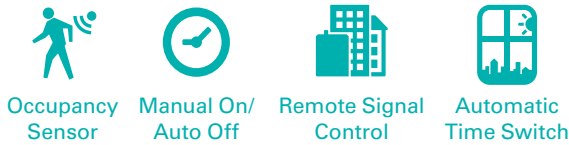
- <100 square feet
- 1 luminaire with a maximum of 2 lamps



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- Automatic Time Switch control must have and override to remain on no more than 2 hours



Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W

AUTOMATIC DAYLIGHTING CONTROL NOT REQUIRED
BECAUSE EXCEPTIONS MOST LIKELY APPLY

Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger. Includes the interior areas of parking garages* and residential carports with 8 or more vehicles; can apply to low-rise multifamily residential buildings with less than 8 vehicles.
- **Electrical Load** – No more than 0.14 watts per square feet planned for the general area
- **Daylighting** – Does not include Daylight transition zones or Daylight Adaptive zones
- **Building** – If considered a habitable space and when cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144

* Note this excludes the top deck of parking garages which are considered hardscapes. Hardscapes must comply with outdoor lighting requirements.



LPD Lighting Power Density 0.14 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting
- Check with local building department for common exemptions.

Exception when space level control not required:

- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Manually Switched ON/OFF

Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Not required except when daylighting control is required

MULTI-LEVEL LIGHTING IS NOT REQUIRED FOR THE LIGHTING POWER DENSITY SPECIFIED IN PARKING GARAGES

Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- At least one control step between 20% and 50% power when vacant, "high level" with occupant sensed for control zone
- No more than 500W controlled together in a single zone



Occupancy Sensor

Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

- Areas with no skylights or glazing/openings <36 square feet; Daylit zone is less than 60W



Luminaire Dimming



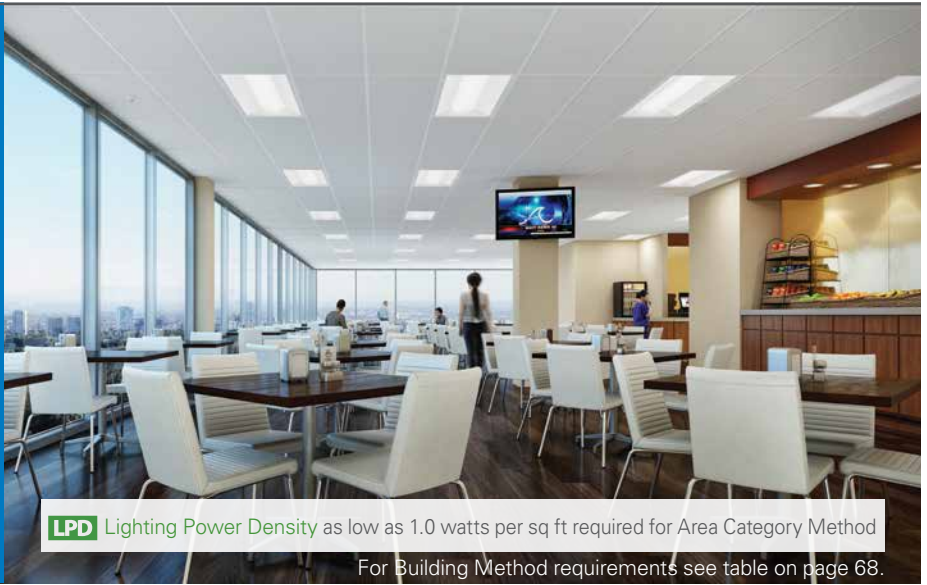
Daylighting Control

Luminaire Control can be ON/OFF

Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring daylighting for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



SPACE LEVEL (AREA CONTROL)

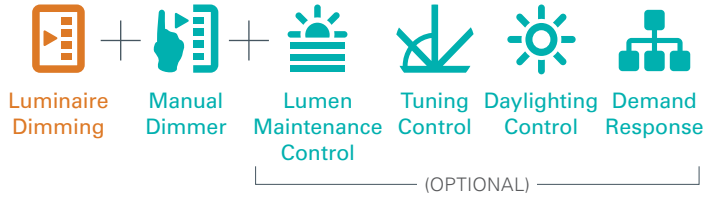
- Must be accessible to occupants to operate the lighting
- Exception when space level control not required:
- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

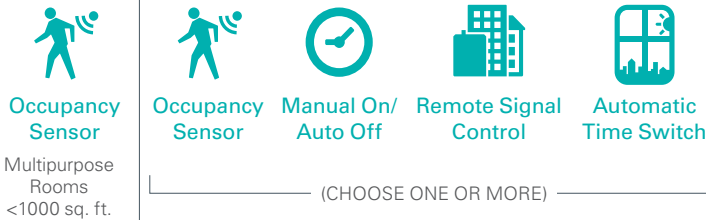
- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- Separate shut-off control for each 5,000 sq ft
- Automatic Time Switch control must have and override to remain on no more than 2 hours



Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

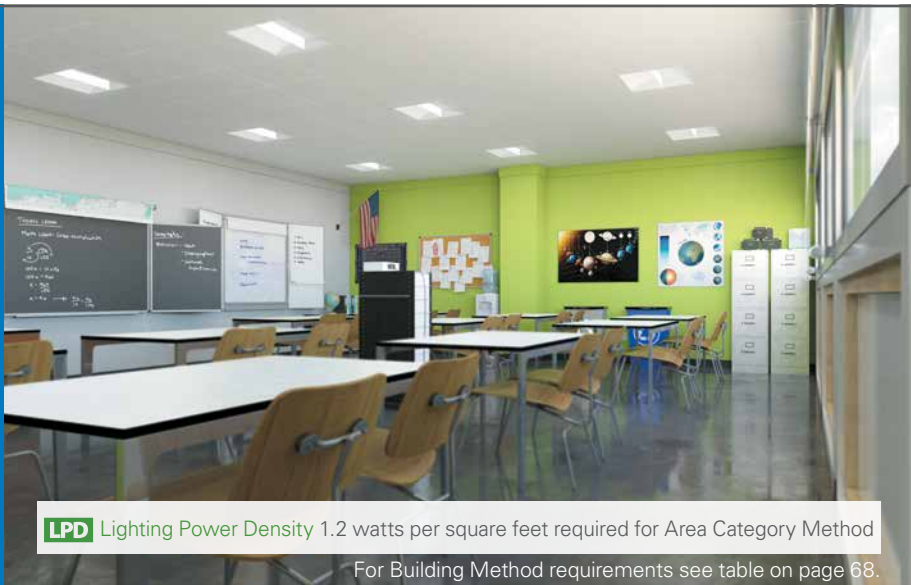
- Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – Classroom of any size
- **Electrical Load** – Greater than 0.7 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylight controls for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 1.2 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting



Manually Switched ON/OFF

Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present.

Exception when multi-level control not required:
• Minimum of one control step between 30% and 70% is required



Luminaire Dimming



Manual Dimmer

Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant



Occupancy Sensor



Manual On/ Auto Off

(CHOOSE ONE)

Reference:
See 130.1(c)
page 141,
130.5(d) pages
151-152

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:
• Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Luminaire Dimming



Daylighting Control

Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – Non-habital space
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 0.7 watts per square feet required for Area Category Method
 For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting



Manually Switched ON/OFF

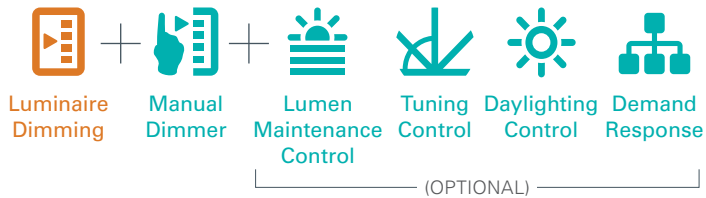
Reference:
 See 130.1(a) page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.

Exceptions when multi-level control not required:

- <100 square feet
- 1 luminaire with a maximum of 2 lamps



Reference:
 See 130.1(a & b) page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant

Electrical rooms - Must comply with Article 110.26(D) of the California Electrical Code. Generally, Auto Shutoff should not be used.



Reference:
 See 130.1(d) page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

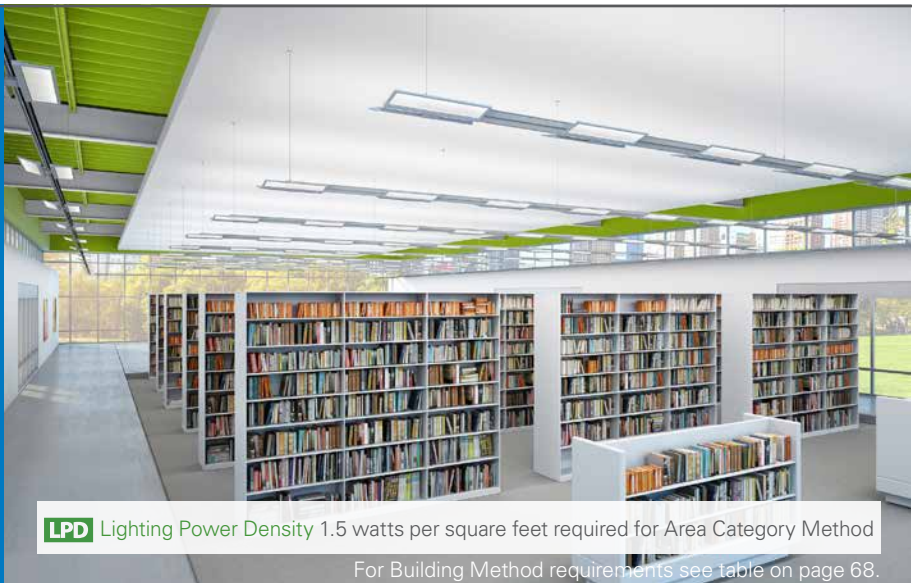
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
 See 130.1(d) page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylight controls for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 1.5 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Must be accessible to occupants to operate the lighting

Exception when space level control not required:

- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel

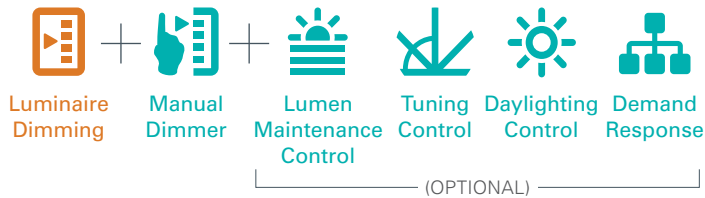


Manually Switched ON/OFF

Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of five control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires drop to at least 50% power when space is vacant, "high level" with occupant sensed in
- During non-business hours and the building is unoccupied, the lights are turned off.
- Library Stack Aisle 10 feet or longer accessible from one end and Aisles 20 feet and longer accessible from both ends. Each aisle independently controlled.



Occupancy Sensor

Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Luminaire Dimming

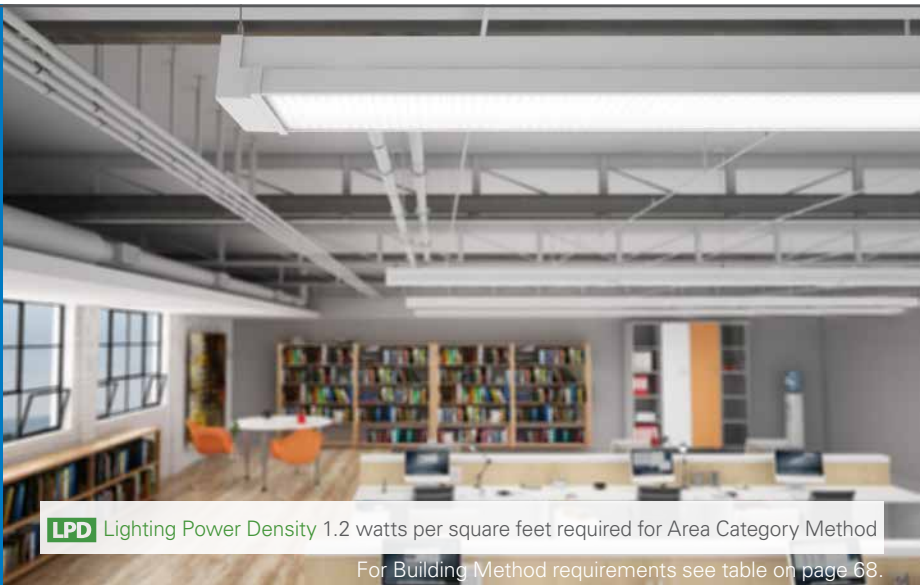


Daylighting Control

Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylight controls for both primary and secondary sidelit zones
- **Others** – The general lighting is not intended to for continuous use, 24 hours and 365 day use. Egress lighting is not part of the general lighting use.
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



SPACE LEVEL (AREA CONTROL)

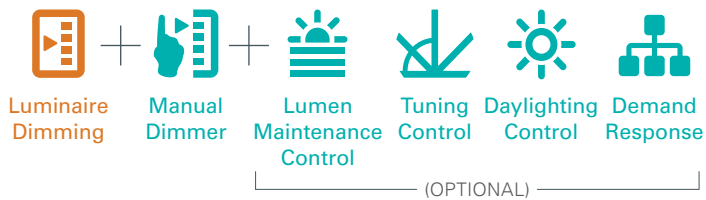
- Must be accessible to occupants to operate the lighting
- Exception when space level control not required:
- Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
 - Manual dimmer is required when a dimming luminaire is present. All other controls are optional.
- Exceptions when multi-level control not required:
- <100 square feet
 - 1 luminaire with a maximum of 2 lamps



Reference:
See 130.1(a & b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- Each 5,000 square feet to have shutoff controls
- Automatic Time Switch control must have and override to remain on no more than 2 hours



Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

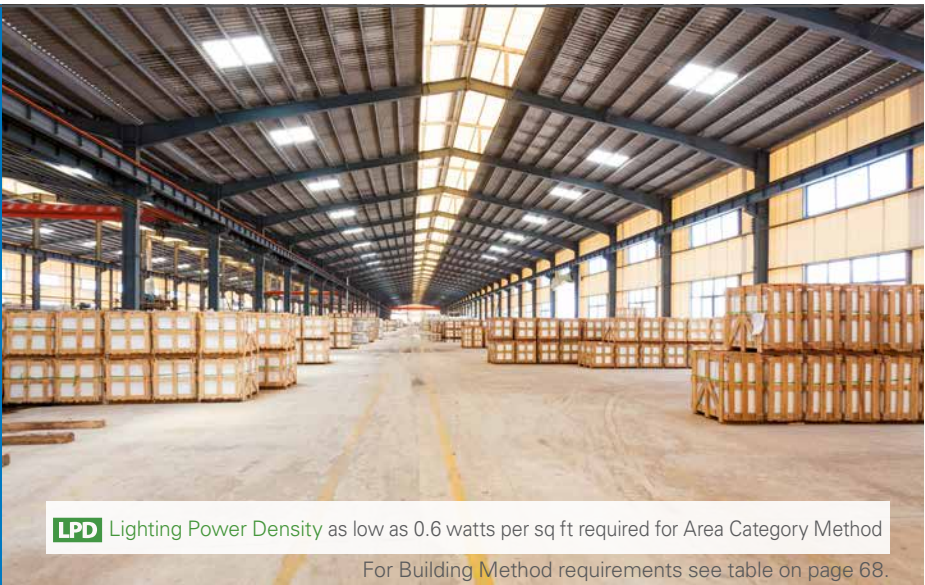
- Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Reference:
See 130.1(d)
page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylight controls for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density as low as 0.6 watts per sq ft required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Located so that a person using the control can see the lights or area being lit is annunciated
- Exception when space level control not required:
 - Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel



Manually Switched ON/OFF

INDUSTRIAL OPEN AREAS

SPACE LEVEL CONTROL NOT REQUIRED FOR WAREHOUSE APPLICATIONS

Reference:
See 130.1(a) page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of five control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Luminaire Dimming



Manual Dimmer



Lumen Maintenance Control



Tuning Control



Daylighting Control



Demand Response

(OPTIONAL)

Reference:
See 130.1(a & b) page 140

SHUTOFF CONTROL

- Luminaires in warehouses are to drop to at least 50% power when space is vacant, "high level" with occupant sensed in
- During non-business hours and the building is unoccupied, the lights are turned off
- Separate shut-off control for each 5,000 sq ft
- Automatic Time Switch control must have and override to remain on no more than 2 hours.
- Captive key override can be used to the override control for automatic time switch which can exceed the 2 hour override limit



Occupancy Sensor



Manual On/ Auto Off



Remote Signal Control



Automatic Time Switch



Automatic Countdown Timer Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.1(c) page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
 - Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Luminaire Dimming

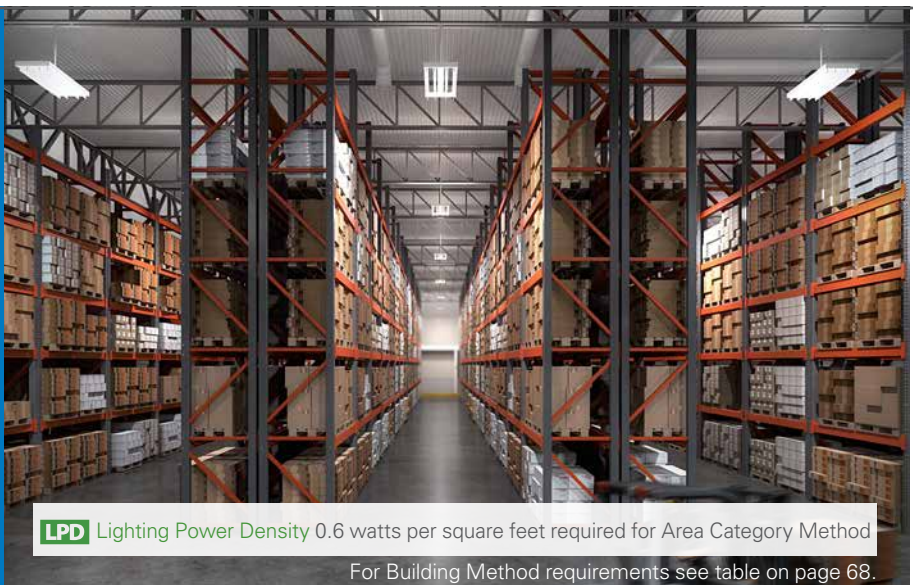


Daylighting Control

Reference:
See 130.1(d) page 143

SPACE ASSUMPTIONS

- **Space** – 100 square feet or larger
- **Electrical Load** – Greater than 0.5 watts per square feet planned
- **Daylighting** – Contains skylights or glazing larger than 24 square feet total requiring automatic daylight controls for both primary and secondary sidelit zones
- **Building** – When cumulative permitted work area is larger than 10,000 square feet Demand Response is required (capable of lowering lighting power by 15%). Reference: See 130.1(e) page 144



LPD Lighting Power Density 0.6 watts per square feet required for Area Category Method

For Building Method requirements see table on page 68.

SPACE LEVEL (AREA CONTROL)

- Located so that a person using the control can see the lights or area being lit is annunciated
- Exception when space level control not required:
 - Up to 0.2 W/sf of egress area may be continuously illuminated and the control is not accessible to unauthorized personnel

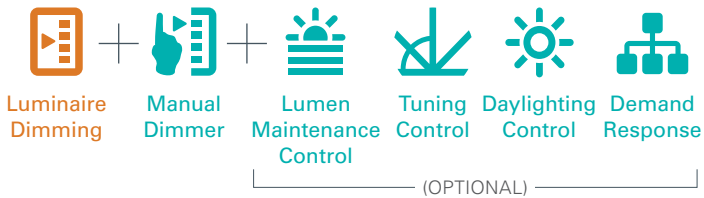


Manually Switched ON/OFF

Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Capable of reducing power by at least one of five control functions
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.



Reference:
See 130.1(a &b)
page 140

SHUTOFF CONTROL

- At least 50% power when aisles are vacant, "high level" with occupant sensed at all accessible areas
- Warehouse racking are also controlled independently



Occupancy Sensor

Reference:
See 130.1(c)
page 141

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present
- Exceptions when daylighting control not required:
 - Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W



Luminaire Dimming

Daylighting Control

Reference:
See 130.1(d)
page 143

INTEGRATED SENSOR SYSTEM

The luminaire integrated sensor system from Eaton reduces the design time and complexity of Title 24 compliance for both lighting and controls.



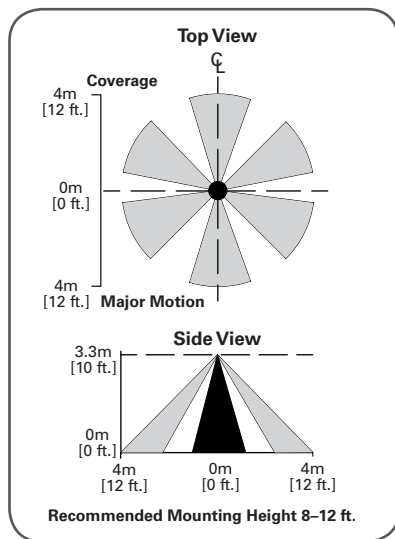
The sensor system is designed to guarantee occupancy and daylight harvesting coverage from within the footprint of an ambient luminaire, so the lighting design is the controls design.

The integrated sensor system is the **out of the box solution** to meeting the latest California Title 24 lighting non-residential indoor requirements found in Section 130.1.

The sensor system is factory-wired to the each luminaire, switching on and off based on occupancy, and dimming the light when enough daylight is available.

Eaton luminaires with integrated sensors are the most cost-effective solution for enclosed spaces with six or fewer fixtures.

- Private Offices
- Patient/Exam Rooms
- Fitness Centers
- Small Conference Rooms
- Small Classrooms
- New Construction or Renovation
- Storage Areas



Worry-free Controls Planning

Ensure seamless coverage and performance with a sensor system built into every luminaire. The multi-technology sensor's occupancy and light sensing coverage overlaps the area each fixture illuminates.

Integrated Design

The sensor system adds to the contemporary aesthetic of Eaton LED luminaires. The system is factory wired and ready to meet Title 24 code out of the box.

Sensor Remote Control

The optional remote can be used to change settings and to provide local control for one or more fixtures in the same area, allowing users to adjust light levels, even temporarily override automatic controls. Choose one per project for programming, and at least one Personal Remote per zone.

NONRESIDENTIAL INDOOR: Integrated Sensor System



These luminaires equipped with the integrated sensor system exceed California Title 24 requirements:

SPACE LEVEL (AREA CONTROL)

The sensor system keeps its settings even when power is cycled allowing the system to be combined with area controls, including manual switches. Luminaires with the sensor system can be switched on/off using a standard switch, while gaining the benefit of the occupancy sensing and daylight dimming controls commissioned.



Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

Luminaires equipped with the integrated sensor system satisfy the requirement of continuous dimming 10-100% and uniform level of illuminance found in Table 130.1-A.

The integrated sensor system meets many of the optional requirements found under multi-level lighting control, including manual dimming using the optional personal control remote, tuning, and automatic daylighting.



ISHH-02



Reference:
See 130.1(b)
page 140-141,
and table
130.1-A page
145

SHUTOFF CONTROL

The integrated sensor offers shut-off control with the occupancy sensor turning the lighting off when the space is unoccupied. The sensor complies with California's Title 20 Appliance regulations, assuring that the commissioning inspection passes with a 20-minute time-out.

The flexibility of the integrated sensor system allows for programming with the optional programming remote to the partial ON/OFF occupant sensing controls found in spaces such as corridors and hotel common areas, reducing the power by at least 50%.



ISHH-01



Reference:
See 130.1(c)
page 141-142

AUTOMATIC DAYLIGHTING CONTROL

All sky-lit zones, primary and secondary day-lit zone, requirements can be easily commissioned to service these defined zones more discretely by taking this requirement to the luminaire level without having to differentiate between these zones.

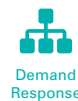
The integrated photo sensors are programmed with a separate programming remote by authorized personnel, enabling the capabilities of the multi-level lighting from the LED luminaires the sensor is integrated into.



Reference:
See 130.1(d)
page 143-144

DEMAND RESPONSIVE CONTROL

The integrated sensor allows for the 0-10Vdc input of the luminaire to be accessed by the demand responsive node to reduce the lighting by at least 15% when a DR event is called. Contact factory for wiring requirements.



Reference:
See 130.1(e)
page 144

LIGHTING POWER DENSITY ADJUSTMENT FACTOR (PAF)

Lighting Power Density Adjustment Factors can be easily utilized to secure lower LPD calculations for the spaces.

The integrated sensor capabilities exceed code requirements and offer more PAF options which results in more ways to control light using less power.



Reference:
See table
140.6-A page
189

NONRESIDENTIAL INDOOR: Room Controller System

ROOM CONTROLLER SYSTEM

The Room Controller System provides energy compliant lighting, plug and emergency control capabilities with out-of-the-box functionality in virtually any space. The system can be ordered based on specific budget or performance requirements.

- Simplified compliance with a product designed to meet the latest energy codes
- Reduce cost of installation with single enclosure and simplified wiring
- Save time with out-of-the-box controls functionality, no programming needed



OUT OF THE BOX CONTROL SOLUTION

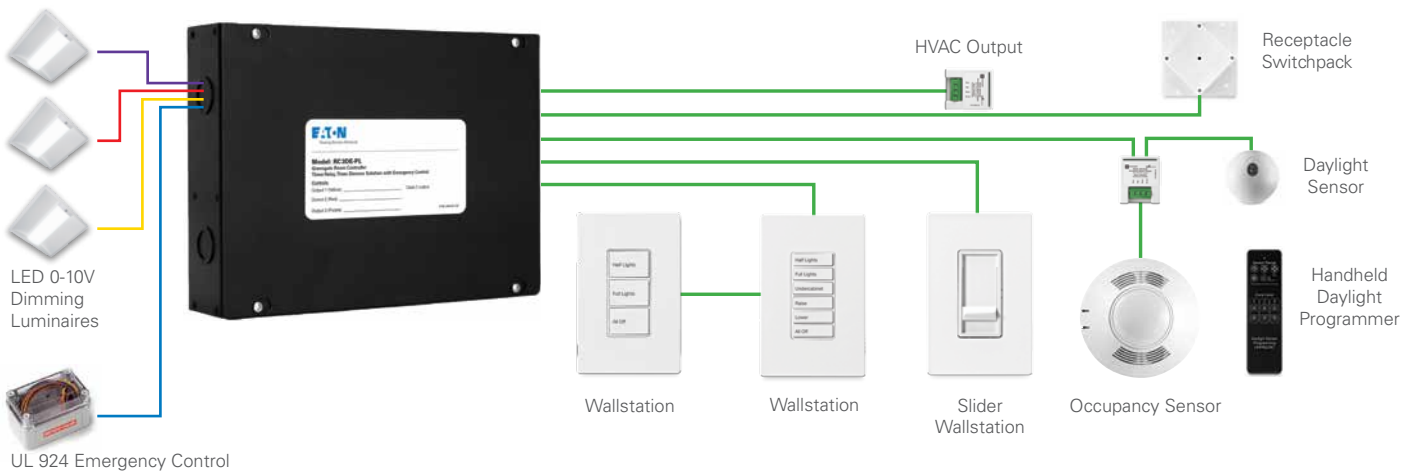
Room-by-room compliance is made easy with our Starter Kits and Quickkits. These kits are easy to order, designed and packaged for immediate in room installation and provide a complete all-in-one package solution.

Ideal Basic Electrical Distributor stocking products, everything the electrical contractor will need for installation above the ceiling. The Room Controller system is customized for each space and can be specified and ordered based on project needs. The Room Controller system is available in both a stand-alone and networked architecture.



HOW THE ROOM CONTROLLER SYSTEM WORKS

The system provides everything necessary for meeting mandatory Title 24 requirements including a wide variety of wallstations and sensors to solve all daylighting, dimming, vacancy and occupancy requirements. All appropriate control devices are listed on the Title 20 database.



ROOM CONTROLLER SYSTEM FEATURES AND CONTROL STRATEGIES



Area Control

The intuitive user interface provides for manual override and has pre-engraved buttons describing their respective functionality.



Occupancy Sensor

Any Greengate low voltage occupancy sensors can be used with the Room Controller, so select one to meet your applications needs.



Daylight Sensor

Dimmable daylighting requirements have increased with the latest version of Title 24. The daylight sensor allows up to three dimming zones to be controlled from a single sensor.



Receptacle Control

Saving additional energy by shutting off plug loads is now part of Title 24, and is easily achieved with the Receptacle Switchpack and the Room Controller.



Demand Response

Title 24 requires that buildings larger than 10,000 square feet have demand responsive lighting controls capable of delivering a minimum of 15% reduction in lighting load in a uniform method.



Integration

Combining wallstations and sensors that are designed to work with the room controller and proven to meet code requirements is a simple and effective control solution.



ROOM CONTROLLER SYSTEM MEETS TITLE 24 REQUIREMENTS

SPACE LEVEL (AREA CONTROL)

- May use a manual switch not accessible to unauthorized personnel



Manually Switched
ON/OFF

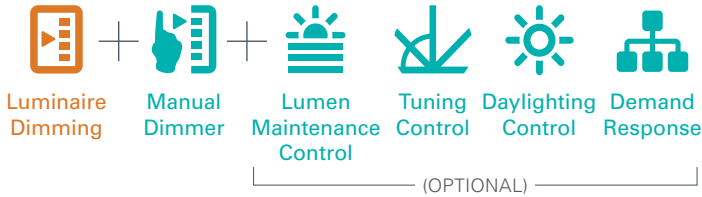
Reference:
See 130.1(a)
page 140

MULTI-LEVEL LIGHTING

- Luminaire must provide uniform dimming
- Manual dimmer is required when a dimming luminaire is present. All other controls are optional.

Exceptions when multi-level control not required:

- <100 square feet
- 1 luminaire with a maximum of 2 lamps



Reference:
See 130.1(a &b)
page 140

SHUTOFF CONTROL

- Luminaires turned off when vacant
- Each 5,000 square feet to have shutoff controls
- Automatic Time Switch control must have and override to remain on no more than 2 hours



Reference:
See 130.1(c)
page 141,
130.5(d) pages
151-152

AUTOMATIC DAYLIGHTING CONTROL

- Eliminate energy waste when natural light present

Exceptions when daylighting control not required:

- Areas with no skylights or glazing <24 square feet; Daylit zone is less than 120W in most areas







Reference:
See 130.1(d)
page 143

NONRESIDENTIAL INDOOR: Product Reference Guide

FEATURED NONRESIDENTIAL INDOOR LIGHTING PRODUCTS





These products are recommendations based on Title 24 requirements. There are many configuration combinations available in the products listed below. Due to ever-changing nature of evolving technologies other solutions may be available in addition to the ones below.

Fixture Type	Model	Product Line	Description				
				Luminaire Dimming	Optional Daylighting Control	Optional Occupancy Sensor	Emergency Backup (for Egress)
Recessed Lighting	EL406_	HALO	EL 4" LED	✓			
	ELG406_	HALO	ELG Round 4" Adjustable LED	✓			
	ELGS406_	HALO	ELG Square 4" Adjustable LED	✓			
	H750_	HALO	H7 LED housing	✓			✓
	H995_	HALO	H4 LED housing	✓			
	LD4A_	PORTFOLIO	L 4" Round Commercial LED	✓			✓
	LD6A_	PORTFOLIO	L 6" Round Commercial LED	✓			✓
	LD8A_	PORTFOLIO	L 8" Round Commercial LED	✓			✓
	LDSQ4A_	PORTFOLIO	L 4" Square Commercial LED	✓			✓
	LDSQ6A_	PORTFOLIO	L 6" Square Commercial LED	✓			✓
	ML5606_	HALO	ML 5" & 6" LED	✓			
	P3LED_	IRIS	P 3" Adjustable Commercial LED	✓			✓
	PD6_ED010_	HALO COMMERCIAL	PD 6" Commercial LED	✓			✓
	RA406_	HALO	RA LED Series 4" Adjustable	✓			
	RA5606_	HALO	RA LED Series 5 & 6" Adjustable	✓			
	RL460_	HALO	RL 4" LED	✓			
	RL560_	HALO	RL 5" & 6" LED	✓			
	SLD405_	HALO	SLD LED Series 4" Recessed and Surface	✓			
SLD606_	HALO	SLD LED Series 5" & 6" Recessed and Surface	✓				
Pendant and Surface	LSR6A_	PORTFOLIO	L 6" Round Cylinder LED Series	✓			✓
	LSSQ6A_	PORTFOLIO	L 6" Square Cylinder LED Series	✓			✓
	LSR8A_	PORTFOLIO	L 8" Round Cylinder LED Series	✓			✓
	LSM_45_	PORTFOLIO	L WaveStream LED Surface/Pendant	✓			✓
Parking Garage	QDCAST1A_	LUMARK	Quadcast	coming soon	coming soon	✓	
	TT_	MCGRAW-EDISON	TopTier LED	✓	✓	✓	✓
	VPL_	MCGRAW-EDISON	VPL LED	✓	✓	✓	✓
Industrial Highbay	HBLED	METALUX	HB LED Series	✓	✓	✓	✓
Industrial Strip	SNLED	METALUX	SN LED Series	✓	✓	✓	✓

NONRESIDENTIAL INDOOR: Product Reference Guide

FEATURED NONRESIDENTIAL AMBIENT PRODUCTS

These products are recommendations based on Title 24 requirements. There are many configuration combinations available in the products listed below. Due to ever-changing nature of evolving technologies other solutions may be available in addition to the ones below.

Fixture Type	Model	Product Line	Description				
				Luminaire Dimming	Optional Daylighting Control	Optional Occupancy Sensor	Emergency Backup (for Egress)
Ambient Troffer	_AC-LD_	METALUX	Accord 1x4, 2x2, and 2x4	✓			✓
	ALN-LD	METALUX	ArcLine 1x4, 2x2, and 2x4	✓			✓
	CZ-LD	METALUX	Cruze 2x2 and 2x4	✓	✓	✓	✓
	_EN-LD	METALUX	Wavestream Encounter 1x2, 1x4, 2x2, and 2x4	✓	✓	✓	✓
	_SR-LD	METALUX	Wavestream SkyRidge 1x2, 1x4, 2x2, and 2x4	✓	✓	✓	✓
	DRI	CORELITE	Wavestream Divide 1x4, 2x2, and 2x4	✓	✓	✓	✓
	HE LED	NEO-RAY	Luminous HE LED	✓	✓	✓	✓
	R2X	CORELITE	R2X LED	✓	✓	✓	✓
	R3	CORELITE	R3 LED	✓	✓		✓
Ambient Recessed Linear	R6	CORELITE	R6 LED	✓	✓		✓
	S12	NEO-RAY	Define LED	✓	✓	✓	✓
	22DR	NEO-RAY	Series 22 LED	✓			✓
	23DR	NEO-RAY	Series 23 LED	✓			✓
Ambient Suspended	901	NEO-RAY	Index LED	✓	✓	✓	✓
	DSI	CORELITE	WaveStream Divide Suspended	✓	✓	✓	✓
	J2	CORELITE	J2 LED	✓	✓	✓	✓
	L2	CORELITE	L2 LED	✓	✓	✓	✓
	RZL	CORELITE	RZL LED	✓	✓	✓	✓
Ambient Wall Bracket	DWI	CORELITE	WaveStream Divide Wall LED	✓	✓	✓	✓
	L1W	CORELITE	L1 Wall LED	✓	✓	✓	✓
Ambient Indirect Cove	0-08	IO	Raye LED	✓			

NONRESIDENTIAL INDOOR: Product Reference Guide

FEATURED NONRESIDENTIAL EXIT AND EGRESS PRODUCTS

These products are recommendations based on Title 24 requirements. There are many configuration combinations available in the products listed below. Due to ever-changing nature of evolving technologies other solutions may be available in addition to the ones below.

Fixture Type	Model	Product Line	Description	T20 Certified	Luminaire Dimming 	Emergency Backup (for Egress) 
Emergency Lighting	APEL	Sure-Lites	Two heads LED			✓
	AP2SQ_	Sure-Lites	Two heads LED			✓
	APR_	Sure-Lites	Remote heads LED			✓
	AEL2_	Sure-Lites	Diecast surface mount architectural			✓
	CEL_	Sure-Lites	Recessed concealed twin head			✓
	RLM_	Sure-Lites	Recessed twin head			✓
	STL2_	Sure-Lites	Linear surface mount			✓
	AA1_	Sure-Lites	Commercial two heads			✓
	CC2_	Sure-Lites	Contractor choice twin head			✓
	CU2	Sure-Lites	Contemporary twin head			✓
	LEM_	Sure-Lites	Miniature LED twin remote head			✓
Emergency Exit	APX7_	Sure-Lites	Battery backup	✓		✓
	CX7_	Sure-Lites	Diecast battery backup	✓		✓
	LPX7_	Sure-Lites	Battery backup	✓		✓
	SLX7_	Sure-Lites	Battery backup	✓		✓
Exit	APX6x	Sure-Lites	AC powered	✓		✓
	CX6_	Sure-Lites	Diecast AC powered	✓		✓
	LPX6_	Sure-Lites	AC powered	✓		✓
	SLX6_	Sure-Lites	AC powered	✓		✓

NONRESIDENTIAL INDOOR: Controls Reference Guide

FEATURED NONRESIDENTIAL CONTROL PRODUCTS

The controls listed below are designed to meet the code requirements of Title 24. These products are easy to utilize in the design planning and commissioning phases of the project to meet the space requirements of multi-level lighting control, shut-off control, and daylighting. For assistance to select the right product, consult with your Eaton lighting solutions representative.

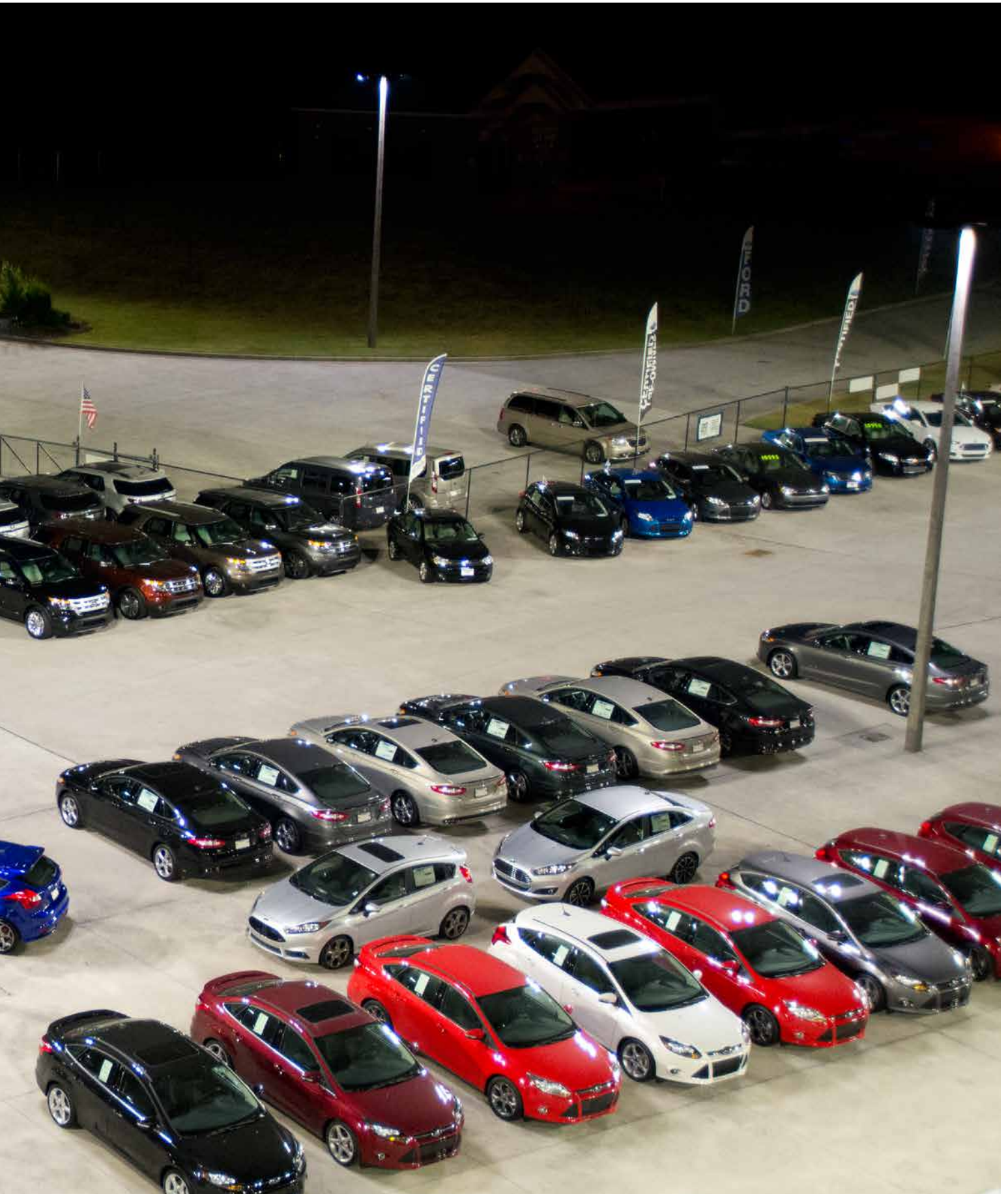
Header	Control Type	Model	Description
Addressable	DALI Mobile Software	FLT-iBuilding-iPhone	iPhone app for DALI control
	DALI Multi-Sensor	FLT-MTS_	Digital Programmable Sensor for occupancy, temperature, and daylighting
	DALI Touch Screen	FLT-TS_	Digital Programmable Touch Screen for graphical control
	DALI Wallstation	FDW_	Digital Programmable Wallstation for ON/OFF, dimming and scene presets
	DALI Wallstation	FLT-LVD_	Low Voltage programmable wallstation for ON/OFF, dimming and scene presets
	VOIP Lighting Software	FLT-VOIP	VOIP software DALI control telephone
Occupancy and Vacancy Sensors	High-Bay Occupancy Sensor	OEF-P-2MH0-MV-S	Line Voltage PIR luminaire-mount sensor ON/OFF function
	Occupancy and Daylight Sensor	OXC-P_	Extreme temperature Low Voltage PIR sensor with photocell
	Occupancy Ceiling Sensor	OAC-P_	Low Voltage PIR ceiling sensor with daylight sensing
		OAC-U_	Low Voltage Ultrasonic ceiling sensor with daylight sensing
		OAC-DT_	Low Voltage dual tech PIR and Ultrasonic ceiling sensor with daylight sensing
		OAC-DT_MV	Line Voltage dual tech PIR and Ultrasonic ceiling sensor with daylight sensing
	Vacancy Ceiling Sensor	VAC-P_	Low Voltage PIR ceiling sensor with daylight sensing
		VAC-U_	Low Voltage Ultrasonic ceiling sensor with daylight sensing
		VAC-DT_	Low Voltage dual tech PIR and Ultrasonic ceiling sensor with daylight sensing
	Wall/Corner Occupancy Sensor	OAWC-DT_	Low Voltage dual tech PIR and Ultrasonic wall or corner mount occupancy sensor
Switchpack	Relay Switchpack	SPD20-MV-NO	Line Voltage dual relay control for use with Low Voltage sensors
	Relay Switchpack	SP_MV	Heavy duty Line Voltage relay control for use with Low Voltage sensors
Room Based	Room Controller Main	RC3D/RC3DE	Main controller for dimming, occupancy/vacancy and manual switching*
	Room Controller Dimming Slider	RC-SS1_	0-10V dimming slider
	Room Controller Open Loop Sensor	DSRC-FMOIR	Daylight Sensor / IR receiver
	Room Controller Receptacle Control	SPRC-R-20-120	20A ON/OFF receptacle rated switchpack
	Room Controller Scene Wallstation	RC_T_B-P_	Low voltage ON/OFF and dimming loads
	Room Controller Wallstation	RC_T_B_	Low voltage ON/OFF and dimming loads
Stand Alone Daylighting	Daylight Controller	DLC-PDC	ON/OFF switching
	Outdoor Photosensor	PPS-5	ON/OFF switching
	Photocontrol	PC_	Analog Photosensor
		DLC-PD_	Analog Photosensor
Photodiode	DLC-PD-DIM	Continuous dimming with occupancy with ON/OFF	
Wallbox	Switch Wallstation	DF10P-C_	0-10V decorator style dimmer with ON/OFF switching
		SF10P_	0-10V slide style dimmer with ON/OFF switching
		G5_ / G20_	ON/OFF switching
	Wall Occupancy Sensor Switch	ONW-D-1001-(D)MV_	Single or dual level switch dual tech PIR and Ultrasonic occupancy sensor
		ONW-D_MV_	Low voltage switch dual tech PIR and Ultrasonic occupancy sensor
	Wall Vacancy Sensor Switch	ONW-D_SP_	Single or dual level switch dual tech PIR and Ultrasonic occupancy sensor
	Wall Timer Switch	TSW-MV_	Digital wall count-down timer switch

*RC3_ controller can be paired with all Eaton lighting products.

Nonresidential Outdoor Applications

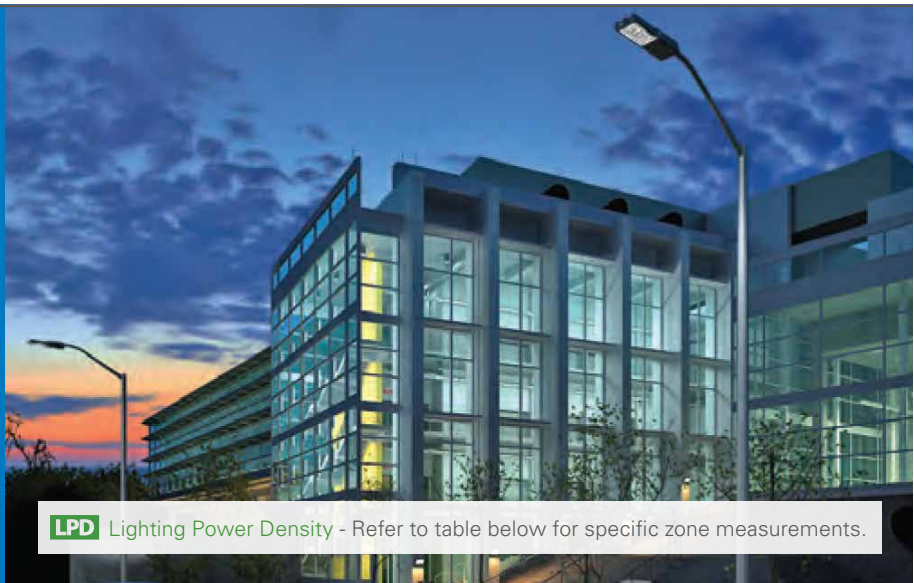


Pole Mounted Luminaires	40
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SPACE ASSUMPTIONS

- Pole Mounted 24 feet or less
- Luminaires not part of health safety statue, ordinances, regulations, on public right of way on public maintained roadways, sidewalks and bikeways
- Temporary lighting excluded
- Greater than 75 watts



LPD Lighting Power Density - Refer to table below for specific zone measurements.

CUTOFF (UPLIGHT AND GLARE)

- Refer to replacements of existing pole mounted luminaires for further exceptions
- Exception: Cutoff not required if 150W or less



Zonal Lumen Requirements

Reference:
See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148

AREA CONTROL

- 1500 watts is the maximum allowed when controlled together
- Exception: If mounted >24 feet there is no limit on wattage controlled together



Maximum Wattage Controlled Together

Reference:
See 130.2(c) pages 146-147

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL

- Luminaire must provide dimming sufficiently to meet the shutoff requirements
- One dimming step or continuous dimming between 40% and 80% power when vacant. Full ON when occupied.

Exception: Controls not required if mounted >24 feet or luminaire is rated for 75 watts maximum



Luminaire Dimming



Occupancy Sensor

Reference:
See 130.2(c) pages 146-147

AUTOMATIC DAYLIGHTING CONTROL

Exception: Tunnels required to be illuminated 24 hours and 365 days per year. On/Off control at sunrise and sunset.



Photocontrol



Automatic (Astronomical) Time Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

LIGHTING ENERGY BUDGET

LPD Lighting Power Density

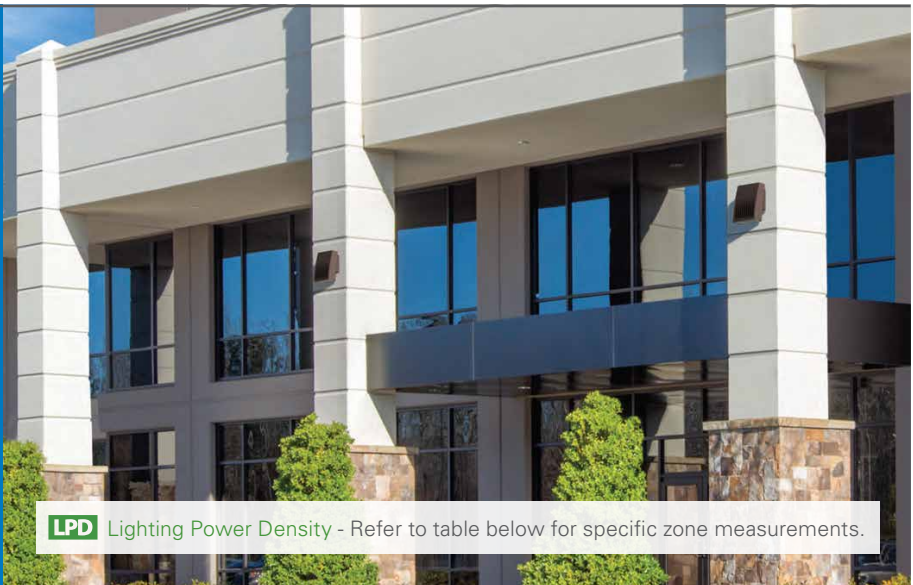
Lighting Zones:	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

*Additions can be added to the total budget where they apply.

Reference:
Table 140.7-A&B pages 195-197 for additional power allowances by specific applications.*

SPACE ASSUMPTIONS

- Non-Pole Mounted including Wall Mounted and Bollards as examples
- Mounted 24 feet or less
- Luminaires not part of health safety statute, ordinances, regulations, on public right of way on public maintained roadways, sidewalks and bikeways
- Temporary lighting excluded
- Greater than 30 watts



CUTOFF (UPLIGHT AND GLARE)

Exception: Cutoff not required if 150W or less



Zonal Lumen Requirements

Reference:
See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148

AREA CONTROL

- 1500 watts is the maximum allowed when controlled together

Exception: If mounted >24 feet there is no limit on wattage controlled together



Maximum Wattage Controlled Together

Reference:
See 130.2(c) pages 146-147

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL

- Luminaire must provide dimming sufficiently to meet the shutoff requirements.
- One dimming step or continuous dimming between 40% and 80% power when vacant. Full ON when occupied.

Exception: Controls not required if mounted >24 feet or luminaire is rated for 30 watts maximum.



Luminaire Dimming



Occupancy Sensor

Reference:
See 130.2(c) pages 146-147

AUTOMATIC DAYLIGHTING CONTROL

Exception: Tunnels required to be illuminated 24 hours and 365 days per year. On/Off control at sunrise and sunset.



Photocontrol



Automatic (Astronomical) Time Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

LIGHTING ENERGY BUDGET

LPD Lighting Power Density

Lighting Zones:	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

Reference:
Table 140.7-A&B pages 195-197 for additional power allowances by specific applications.*

*Additions can be added to the total budget where they apply.

SPACE ASSUMPTIONS

- Outdoor Sales Luminaires such as Sales Frontage, Sales Lots, and Sales Canopies
- Luminaires not part of health safety statute, ordinances, regulations, on public right of way on public maintained roadways, sidewalks or bikeways
- Temporary lighting excluded
- Greater than 150 watts



LPD Lighting Power Density - Refer to table below for specific zone measurements.

CUTOFF (UPLIGHT AND GLARE)

- Refer to replacements of existing pole mounted luminaires for further exceptions
- Exception: Cutoff not required if 150W or less



Zonal Lumen Requirements

Reference:
See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148

AREA CONTROL

- None required

AREA CONTROL NOT REQUIRED FOR SALES LUMINAIRE APPLICATIONS

Reference:
See 130.2(c) pages 146-147

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL

- Luminaire must provide dimming sufficiently to meet the shutoff requirements
- One dimming step or continuous dimming between 40% and 80% power when vacant. Full ON when occupied.
- Part-night Outdoor Lighting Control reduces power or turns off luminaire for a portion of the night



Luminaire Dimming



Occupancy Sensor



Part-night Outdoor Lighting Control

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

AUTOMATIC DAYLIGHTING CONTROL

Exception: Tunnels required to be illuminated 24 hours and 365 days per year. On/Off control at sunrise and sunset.



Photocontrol



Automatic (Astronomical) Time Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

LIGHTING ENERGY BUDGET

LPD Lighting Power Density

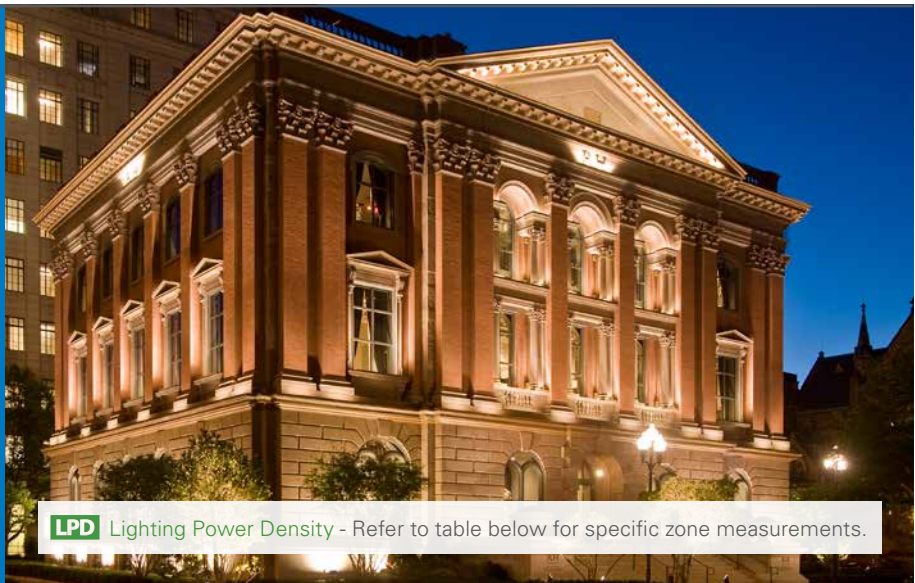
Lighting Zones:	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

*Additions can be added to the total budget where they apply.

Reference:
Table 140.7-A&B pages 195-197 for additional power allowances by specific applications.*

SPACE ASSUMPTIONS

- Building Façade and Outdoor Dining
- Luminaires not part of health safety statute, ordinances, regulations, on public right of way on public maintained roadways, sidewalks and bikeways
- Temporary lighting excluded
- Greater than 150 watts



CUTOFF (UPLIGHT AND GLARE)

- Refer to replacements of existing pole mounted luminaires for further exceptions.
- Outdoor wall mounted luminaires must have a bilaterally symmetric distribution.

Exception: Cutoff not required if 150W or less



Zonal Lumen Requirements

Reference:
See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148

AREA CONTROL

- None required

AREA CONTROL NOT REQUIRED FOR BUILDING FAÇADE AND OUTDOOR DINING APPLICATIONS

Reference:
See 130.2(c) pages 146-147

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL

- Luminaire must provide dimming sufficiently to meet the shutoff requirements
- One dimming step or continuous dimming between 40% and 80% power when vacant. Full ON when occupied.
- Part-night Outdoor Lighting Control reduces power or turns off luminaire for a portion of the night



Luminaire Dimming



Occupancy Sensor



Part-night Outdoor Lighting Control

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

AUTOMATIC DAYLIGHTING CONTROL

- On/Off control at sunrise and sunset.



Photocontrol



Automatic (Astronomical) Time Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

LIGHTING ENERGY BUDGET

LPD Lighting Power Density

Lighting Zones:	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

*Additions can be added to the total budget where they apply.

Reference:
Table 140.7-A&B pages 195-197 for additional power allowances by specific applications.*

SPACE ASSUMPTIONS

- Non-pole mounted no more than 24 feet
- Luminaires not part of health safety statute, ordinances, regulations, on public right of way on public maintained roadways, sidewalks and bikeways
- Temporary lighting excluded
- Greater than 30 watts
- Refer to OSHA guidelines since special considerations could alter the requirements



CUTOFF (UPLIGHT AND GLARE)

- Refer to replacements of existing pole mounted luminaires for further exceptions
- Exception: Cutoff not required if 150W or less



Zonal Lumen Requirements

Reference:
See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148

AREA CONTROL

- 1500 watts is the maximum allowed when controlled together
- Exception: If mounted >24 feet there is no limit on wattage controlled together



Maximum Wattage Controlled Together

Reference:
See 130.2(c) pages 146-147

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL

- Luminaire must provide dimming sufficiently to meet the shutoff requirements
- One dimming step or continuous dimming between 40% and 80% power when vacant. Full ON when occupied.

Exception: Controls not required if mounted >24 feet or luminaire is rated for 30 watts maximum



Luminaire Dimming



Occupancy Sensor

Reference:
See 130.2(c) pages 146-147

AUTOMATIC DAYLIGHTING CONTROL

Exception: On/Off control at sunrise and sunset



Photocontrol



Automatic (Astronomical) Time Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

LIGHTING ENERGY BUDGET

LPD Lighting Power Density

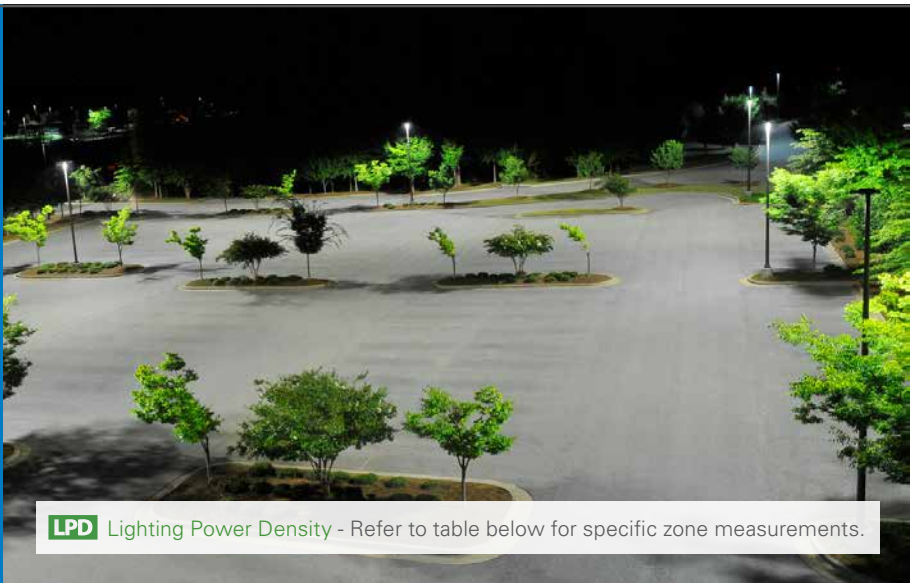
Lighting Zones:	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

*Additions can be added to the total budget where they apply.

Reference:
Table 140.7-A&B pages 195-197 for additional power allowances by specific applications.*

SPACE ASSUMPTIONS

- Hardscapes and general parking lots which includes the top deck of parking garages
- Mounting height greater than 24 feet
- Luminaires not part of health safety statute, ordinances, regulations, on public right of way on public maintained roadways, sidewalks and bikeways
- Temporary lighting excluded
- Greater than 150 watts



LPD Lighting Power Density - Refer to table below for specific zone measurements.

CUTOFF (UPLIGHT AND GLARE)

- Refer to replacements of existing pole mounted luminaires for further exceptions.
- Outdoor wall mounted luminaires must have a bilaterally symmetric distribution.

Exception: Cutoff not required if 150W or less



Zonal Lumen Requirements

Reference:
See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148

AREA CONTROL

- None required

Exception: Area control required when luminaires are mounted 24 feet or less; luminaires at this height must have no more than 1,500 watts controlled together

AREA CONTROL NOT REQUIRED FOR GENERAL PARKING LOTS AND HARDSCAPES IF MOUNTING HEIGHT OVER 24 FEET

Reference:
See 130.2(c) pages 146-147

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL

- No multi-level or shutoff control is required

Exception:

- Part-night Outdoor Lighting control are used in outdoor sales frontage, sales lots, sales canopies, building facade, ornamental hardscape, and outdoor dining
- If mounted 24 feet or less, and greater than 75 watts if pole mounted or 30 watts if non-pole mounted, an occupancy sensor is required

MULTI-LEVEL LIGHTING AND SHUTOFF CONTROL NOT REQUIRED FOR GENERAL PARKING LOTS AND HARDSCAPES

Reference:
See 130.2(c) pages 146-147

AUTOMATIC DAYLIGHTING CONTROL

- On/Off control at sunrise and sunset.



Photocontrol



Automatic (Astronomical) Time Switch

(CHOOSE ONE OR MORE)

Reference:
See 130.2(c) pages 146-147

LIGHTING ENERGY BUDGET

LPD Lighting Power Density

Lighting Zones:	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

*Additions can be added to the total budget where they apply.

Reference:
Table 140.7-A&B pages 195-197 for additional power allowances by specific applications.*

LUMAWATT LIGHTING MANAGEMENT AND CONTROL SYSTEM

The heart and soul of Title 24 is lighting management and control – to minimize power consumption and energy costs by providing the right light levels where and when they're needed. The **LumaWatt Outdoor Wireless Control System** makes implementation easy offering standard features that satisfies California Title 24 requirements. The LumaWatt system integrates sensors, reducing installation costs and commissioning time. Multi-functional sensors are factory-installed and tested in each luminaire so reliability, area coverage and location are never concerns.



The LumaWatt system is a peer-to-peer wireless network of luminaire-integrated sensors, which operate in accordance with stored programmable profiles. Each sensor is capable of motion and photo sensing, metering power consumption and wireless communication.

BUILT-IN CODE COMPLIANCE

The LumaWatt system commissioning enables code compliance for Indoor and Outdoor requirements. The products shown below are popular luminaires compatible with LumaWatt.

Indoor Integrated Luminaires



TopTier LED



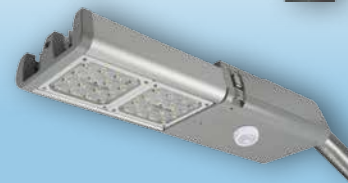
Valet LED

Reference: Section 130.1, "Indoor Lighting Controls That Shall Be Installed", applies to spaces including Parking Garages requiring area-control, multi-level lighting, shutoff control and daylighting.

Outdoor Integrated Luminaires



Galleon LED



Navion LED

Reference: Section 130.2, "Outdoor Lighting Controls and Equipment", applies to spaces including hardscapes like a parking lot where requirements like photocontrol, motion sensing, dimming, and part-night are required.

LUMINAIRES USING THE LUMAWATT SYSTEM EXCEED CALIFORNIA TITLE 24 REQUIREMENTS:

An additional 30%-50% reduction of energy use is common as a result of integrating basic lighting control strategies to efficient LED luminaires.

NONRESIDENTIAL OUTDOOR CONTROLS: LumaWatt System




THE LUMAWATT SYSTEM EXCEEDS CALIFORNIA TITLE 24 REQUIREMENTS IN THE FOLLOWING AREAS:

	Indoor	Outdoor
CUTOFF (UPLIGHT AND GLARE)	Cutoff not applicable to indoor applications	Eaton offers a broad range of LumaWatt integrated outdoor luminaires such as the McGraw-Edison Navion that reliably meet the cutoff code requirements identified in the various Lighting Zones found in TABLES 130.2-A and 130.2-B. Reference: 130.2(b) page 146
AREA CONTROL	Manual switch can communicate a wireless signal to the luminaire-integrated LumaWatt sensors to turn off the luminaires. Reference: 130.1(a) page 140	LumaWatt integrated outdoor luminaires mounted 24 feet or less are easily commissioned to be controlled wirelessly together to satisfy the maximum wattage within a control group of 1500W. This capability assures that all outdoor lighting is controlled independently from other electrical loads. Reference: 130.2(c) pages 146-147
MULTI-LEVEL LIGHTING	Eaton parking garage luminaires like the McGraw-Edison TopTier feature multi-level lighting continuous dimming capabilities. The sensors respond to signals to continuously dim to the commissioned level. Reference: 130.1(b) page 140-141	Luminaires like the McGraw-Edison Galleon site luminaire come with continuous multi-level leveling lighting continuous dimming capabilities. The LumaWatt sensors will respond to signals to continuously dim to the commissioned level. Reference: 130.2(c) pages 146-147
SHUTOFF CONTROL	The LumaWatt luminaire-integrated sensor includes an occupancy sensor at each luminaire. In addition, time-switching and remote signals can be received to satisfy multiple requirements for the intended use to meet code requirements. Reference: 130.1(c) page 141-143	Whether occupancy sensing, part-night control or both are needed for the application, the LumaWatt integrated control system meets the code requirements simply during the commissioning process. Reference: 130.2(c) pages 146-147
AUTOMATIC DAYLIGHTING CONTROL	Daylighting capabilities comes standard with the LumaWatt luminaire-integrated sensor. LumaWatt commissioning is simple to address the needs of Skylit and Sidelit Daylit Zones for the space at each luminaire simplifying light level requirements for each discrete luminaire complying with the code requirements. Reference: 130.1(d) page 143-144	Photocontrols or astronomical time-switch are essential to meet the code requirements of which the LumaWatt exceeds the requirements by offering both via wirelessly. The precise integrated LumaWatt sensor coupled with the Energy Management Server assures the luminaires turn on and off during the nighttime hours incorporating additional time schedules as needed. Reference: 130.2(c) pages 146-147
ADDITIONAL FEATURES	The LumaWatt Energy Management Server can receive commands for a DR event. These command are then programmed to reduce the wattage by 15% or more consistent with uniform level of illumination requirements found in TABLE 130.1-A. This capability allows for power factor adjustment to the lighting power density. Reference: 130.1(e) page 144	The LumaWatt system incorporates the photocontrol, time-switch control, motion sensing, power reduction, part-night control, and auto-ON functionality. This comprehensive set of features using the luminaire-integrated sensor along with the Energy Management Server operates luminaires installed at any height to satisfying code requirements in one comprehensive solution. Reference: 130.2(c) pages 146-147

NONRESIDENTIAL OUTDOOR: Product Reference Guide

FEATURED NONRESIDENTIAL OUTDOOR LIGHTING PRODUCTS

These products are recommendations based on Title 24 requirements. There are many configuration combinations available in the products listed below. Due to ever-changing nature of evolving technologies other solutions may be available in addition to the ones below.

Fixture Type	Model	Product Line	Description	 Luminaire Dimming	 Integral Occupancy Sensor	 Integral Photocontrol Sensor
Canopy	CNC_	MCGRAW-EDISON	Concise - Surface Mount LED	✓	✓	✓
	LRC_	MCGRAW-EDISON	LRC - Recessed LED	✓		✓
Decorative	ACN_	STREETWORKS	Generation Series - Traditional LED	✓		✓
	ARC_	STREETWORKS	Generation Series - Traditional LED	✓		✓
	CEL_	STREETWORKS	Classical Epic - LED	✓	✓	✓
	CEM_	STREETWORKS	Classical Epic - LED	✓	✓	✓
	CLB_	STREETWORKS	Generation Series - Traditional LED	✓		✓
	ECL_	INVUE	Epic Large - LED	✓	✓	✓
	ECM_	INVUE	Epic Medium - LED	✓	✓	✓
	EML_	INVUE	Epic Large - LED	✓	✓	✓
	EMM_	INVUE	Epic Medium - LED	✓	✓	✓
	GAR_	MCGRAW-EDISON	Generation Series - Traditional LED	✓		✓
	GAT_	MCGRAW-EDISON	Generation Series - Traditional LED	✓		✓
	GLC_	MCGRAW-EDISON	Generation Series - Traditional LED	✓		✓
	MEL_	STREETWORKS	Modern Epic Large - LED	✓	✓	✓
	MEM_	STREETWORKS	Modern Epic Medium - LED	✓	✓	✓
	MPW_	STREETWORKS	Woodbridge - LED	✓		✓
	MSA_	INVUE	Mesa - LED	✓	✓	✓
	PMM_	STREETWORKS	Mesa - LED	✓		✓
	UTLD_	STREETWORKS	UTLD Traditionaire - LED	✓		✓
	UTR_	STREETWORKS	UTR Traditionaire - LED	✓		✓
	Flood	MAQ_	MCGRAW-EDISON	Marquis - LED	✓	
NFFLD_		LUMARK	Night Falcon - LED	✓	✓	✓
UFLD_		STREETWORKS	Utility Flood - LED	✓	✓	✓
VFS_		INVUE	Vision Flood Small - LED	✓		✓

Pole Mounted and Wall Mounted products on following page

NONRESIDENTIAL OUTDOOR: Product Reference Guide

FEATURED NONRESIDENTIAL OUTDOOR LIGHTING PRODUCTS

These products are recommendations based on Title 24 requirements. There are many configuration combinations available in the products listed below. Due to ever-changing nature of evolving technologies other solutions may be available in addition to the ones below.



Fixture Type	Model	Product Line	Description	Luminaire Dimming	Integral Occupancy Sensor	Integral Photocontrol Sensor	
Pole Mounted	AVM_	STREETWORKS	Vision Site Medium - Area LED	✓		✓	
	AVS_	STREETWORKS	Vision Site Small - Area LED	✓		✓	
	CRTK-A_	STREETWORKS	Caretaker - Area LED	Not required if <75W		✓	
	CTKR1A_	LUMARK	Caretaker - Area/Site LED	Not required if <75W		✓	
	GAN_	STREETWORKS	Galleon - Area LED	✓	✓	✓	
	GLEON_	MCGRAW-EDISON	Galleon - Area Roadway LED	✓	✓	✓	
	ICM_	INVUE	Icon Site - Area Roadway LED	✓	✓	✓	
	LDRC_	LUMARK	Small Cobrahead - Area/Site LED			✓	
	LDRL_	LUMARK	Large Cobrahead - Area/Site LED			✓	
	LDRV_	LUMARK	Ridgeview - Area/Site LED	✓	✓	✓	
	NAV_	LUMARK	Navion - Area/Site LED	✓	✓	✓	
	NVN_	STREETWORKS	Navion - Roadway LED	✓	✓	✓	
	OVF_	STREETWORKS	Large Cobrahead - Roadway LED	✓		✓	
	OVH_	STREETWORKS	OVH - Roadway LED	✓		✓	
	RDG_	STREETWORKS	Ridgeview - Area LED	✓	✓	✓	
	SDM_	INVUE	Slide Site - Area Roadway LED	✓	✓	✓	
	TLM_	MCGRAW-EDISON	Talon Medium - Area Roadway LED	✓		✓	
	TMU_	STREETWORKS	Talon - Area LED	✓		✓	
	VERD_	STREETWORKS	Verdeon - Roadway LED	✓	✓	✓	
	VST_	STREETWORKS	Ventus - Area LED	✓	✓	✓	
	VTS_	MCGRAW-EDISON	Ventus - Area Roadway LED	✓	✓	✓	
	VXM_	INVUE	Vision Site Medium - Area Roadway LED	✓	✓	✓	
	VXS_	INVUE	Vision Site Medium - Area Roadway LED	✓	✓	✓	
	XNV_	STREETWORKS	XNV - Roadway LED	✓	✓	✓	
	Wall Mounted	ENC_	INVUE	Entri Round Clean - LED	✓	✓	✓
		ENT_	INVUE	Entri Triangle Reveals - LED	✓	✓	✓
ENV_		INVUE	Entri Round Reveals - LED	✓	✓	✓	
ISC_		MCGRAW-EDISON	Impact Elite Cylinder - LED	✓	✓	✓	
ISS_		MCGRAW-EDISON	Impact Elite Quarter Sphere - LED	✓	✓	✓	
IST_		MCGRAW-EDISON	Impact Elite Trapezoid - LED	✓	✓	✓	
ISW_		MCGRAW-EDISON	Impact Elite Wedge - LED	✓	✓	✓	
LDWP_		LUMARK	Wal-Pak - LED	✓		✓	
WKP_		STREETWORKS	Wal-Pak - LED	✓		✓	
XTOR		LUMARK	Crosstour - LED	✓	✓	✓	

Residential Applications



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Controlled, efficient lighting offers both comfort and lower electric bills. Homeowners no longer have to sacrifice the quality of their home lighting to save energy.

The code utilizes two categories of luminaires: "High Efficacy" and "Low Efficacy".

"High Efficacy" and "Low Efficacy" luminaires must be circuited separately. "High Efficacy" luminaires are favored and generally do not require controls beyond a manual ON/OFF switch, whereas "Low Efficacy" luminaires typically require additional controls such as dimming and vacancy sensors.



KITCHEN

Lighting circuits within the kitchen area are included

High Efficacy Luminaires	Low Efficacy Luminaires
≥50% wattage <u>must be</u> "High Efficacy"	≤ 50% wattage <u>can be</u> "Low Efficacy"

- Internal cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

Reference:
See 150.0(k)(3)
page 218

BATHROOMS

Sinks, toilets, shower and tub

High Efficacy Luminaires	Low Efficacy Luminaires
At least one luminaire <u>must be</u> "High Efficacy"	Remaining luminaires <u>can be</u> "Low Efficacy" controlled by a vacancy sensor

Reference:
See 150.0(k)(5)
page 218

LAUNDRY ROOMS AND UTILITY ROOMS

Attached laundry rooms and utility rooms

High Efficacy Luminaires	Low Efficacy Luminaires
All <u>must be</u> "High Efficacy" and controlled by a vacancy sensor	None

- Consider use of dual technology, IR and ultrasound, in large rooms such as garages where the potential of low motion can turn off the lighting

Reference:
See 150.0(k)(6)
page 218

OTHER ROOMS

Hallways, dining rooms, family rooms, home offices, bedrooms, attic spaces, and closets

Exceptions: Closets <70 sf and detached buildings <1000sf

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> "High Efficacy"	<u>Can be</u> "Low Efficacy" controlled by dimmers or vacancy sensors

- Portable lighting must be T20 certified

Reference:
See 150.0(k)(7)
page 218

OUTDOOR

Includes all outdoor lighting circuits

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> "High Efficacy"	<u>Can be</u> "Low Efficacy" controlled by ON/OFF switch, motion sensor and one of the following: photocontrol, astronomical time clock or EMCS

- Optional types in area includes "High Efficacy" OR "Low Efficacy" using T20 photocell or T20 astronomical time clock or energy management control system (EMCS)
- Does not apply to 8 parking spots or more in a garage or parking lot. Refer to nonresidential in this case.

Reference:
See 150.0(k)(9)
page 219

Multi-family homes, 3 stories or less, are administered much like single family. The dwelling spaces are covered under residential compliance.

The percentage of the common floor space separates when the common areas are treated under the nonresidential compliance requirements.

“High Efficacy” and “Low Efficacy” are to be separately switched with readily accessible manual ON/OFF control.



KITCHEN

Lighting circuits within the kitchen area are included

High Efficacy Luminaires	Low Efficacy Luminaires
≥50% wattage <u>must be</u> “High Efficacy”	≤ 50% wattage <u>can be</u> “Low Efficacy”

- Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

Reference:
See 150.0(k)(3) page 218

BATHROOMS

Sinks, toilets, shower and tub

High Efficacy Luminaires	Low Efficacy Luminaires
At least one luminaire <u>must be</u> “High Efficacy”	Remaining luminaires <u>can be</u> “Low Efficacy” controlled by a vacancy sensor

Reference:
See 150.0(k)(5) page 218

LAUNDRY ROOMS AND UTILITY ROOMS

Attached laundry rooms and utility rooms

High Efficacy Luminaires	Low Efficacy Luminaires
All <u>must be</u> “High Efficacy” and controlled by a vacancy sensor	None

- Consider use of dual technology, IR and ultrasound, in large rooms such as garages where the potential of low motion can turn off the lighting

Reference:
See 150.0(k)(6) page 218

OTHER ROOMS

Hallways, dining rooms, family rooms, home offices, bedrooms, attic spaces, and closets

Exceptions: Closets <70 sf and detached buildings <1000sf

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	<u>Can be</u> “Low Efficacy” controlled by dimmers or vacancy sensors

- Portable lighting must be T20 certified

Reference:
See 150.0(k)(7) page 218

OUTDOOR

Nonresidential compliance method can be used. For units with less than eight vehicles per site, residential compliance method is acceptable for multifamily private patios, entrances, balconies, and porches.

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	<u>Can be</u> “Low Efficacy” controlled by ON/OFF switch, motion sensor and one of the following photocontrol, astronomical time clock or EMCS

- Offer two methods: 1. Can use “High Efficacy” or “low efficacy” with controlled by ON/OFF switch, motion sensor, and photocontrol/astronomical time clock/EMCS; 2. Can use nonresidential compliance methods.
- Parking lots with 8 or more vehicles must comply with nonresidential compliance. When less than 8 vehicles, the two methods mention above are allowed.

Reference:
See 150.0(k)(9) page 219

INTERIOR COMMON AREAS

Interior common areas with ≤20% of the floor of the floor area

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	Can be “Low Efficacy” controlled by an occupancy sensor.

- Total common areas with 20% or less floor area require “High Efficacy” or controlled by an occupancy sensor
- Areas 20% or greater require nonresidential compliance with paths of ingress and egress using occupancy sensors reducing power at least 50% when vacant

Reference:
See 150.0(k)(12) page 219

High-rise buildings, greater than 3 stories, are considered nonresidential except in each individual dwelling unit.

The interior spaces of these dwelling units and outdoor lighting switched from the inside of the unit are required to meet residential compliance requirements.

“High Efficacy” and “Low Efficacy” are to be separately switched with readily accessible manual ON/OFF control.



KITCHEN

Lighting circuits within the kitchen area are included

High Efficacy Luminaires	Low Efficacy Luminaires
≥50% wattage <u>must be</u> “High Efficacy”	≤ 50% wattage <u>can be</u> “Low Efficacy”

- Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

Reference:
See 150.0(k)(3)
page 218

BATHROOMS

Sinks, toilets, shower and tub

High Efficacy Luminaires	Low Efficacy Luminaires
At least one luminaire <u>must be</u> “High Efficacy”	Remaining luminaires <u>can be</u> “Low Efficacy” controlled by a vacancy sensor

Reference:
See 150.0(k)(5)
page 218

LAUNDRY ROOMS AND UTILITY ROOMS

Attached laundry rooms and utility rooms

High Efficacy Luminaires	Low Efficacy Luminaires
All <u>must be</u> “High Efficacy” and controlled by a vacancy sensor	None

- Consider use of dual technology, IR and ultrasound, in large rooms such as garages where the potential of low motion can turn off the lighting

Reference:
See 150.0(k)(6)
page 218

OTHER ROOMS

Hallways, dining rooms, family rooms, home offices, bedrooms, attic spaces, and closets

Exceptions: Closets <70 square feet

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	<u>Can be</u> “Low Efficacy” controlled by dimmers or vacancy sensors

- Portable lighting must be T20 certified

Reference:
See 150.0(k)(7)
page 218

OUTDOOR

Private patios, entrances, balconies, and porches switched from inside the dwelling unit

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	<u>Can be</u> “Low Efficacy” controlled by ON/OFF switch, motion sensor and one of the following photocontrol, astronomical time clock or EMCS

- Optional types in area includes “High Efficacy” OR “Low Efficacy” using T20 photocell or T20 astronomical time clock or energy management control system (EMCS)
- For parking garage refer to nonresidential compliance

Reference:
See 150.0(k)(9)
page 219

Dormitory facilities are generally considered nonresidential.

The dorm room is considered a dwelling and therefore the spaces found within the unit must comply with residential compliance requirements such as ICAT and "High Efficacy" luminaires.

"High Efficacy" and "Low Efficacy" are to be separately switched with readily accessible manual ON/OFF control.



KITCHEN

Lighting circuits within the kitchen area are included

High Efficacy Luminaires	Low Efficacy Luminaires
≥50% wattage <u>must be</u> "High Efficacy"	≤ 50% wattage <u>can be</u> "Low Efficacy"

- Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

Reference:
See 150.0(k)(3) page 218

BATHROOMS

Sinks, toilets, shower and tub

High Efficacy Luminaires	Low Efficacy Luminaires
At least one luminaire <u>must be</u> "High Efficacy"	Remaining luminaires <u>can be</u> "Low Efficacy" controlled by a vacancy sensor

Reference:
See 150.0(k)(5) page 218

LAUNDRY ROOMS AND UTILITY ROOMS

Attached laundry rooms and utility rooms to the dormitory room

High Efficacy Luminaires	Low Efficacy Luminaires
All <u>must be</u> "High Efficacy" and controlled by a vacancy sensor	None

- Consider use of dual technology, IR and ultrasound, in large rooms such as garages where the potential of low motion can turn off the lighting

Reference:
See 150.0(k)(6) page 218

OTHER ROOMS

Hallways, dining rooms, family rooms, home offices, bedrooms, attic spaces, and closets

Exceptions: Closets <70 square feet

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> "High Efficacy"	<u>Can be</u> "Low Efficacy" controlled by dimmers or vacancy sensors

- Portable lighting must be T20 certified

Reference:
See 150.0(k)(7) page 218

Much like dormitory facilities, Senior Living facilities are generally considered nonresidential. The living quarters for are considered dwelling spaces and also must comply with residential compliance requirement. Close review of these facilities should be made. If the spaces are utilized for hospital care, the space would no longer need to comply with residential requirements. "High Efficacy" and "Low Efficacy" are to be separately switched with readily accessible manual ON/OFF control.



KITCHEN

Lighting circuits within the kitchen area are included

High Efficacy Luminaires	Low Efficacy Luminaires
≥50% wattage <u>must be</u> "High Efficacy"	≤ 50% wattage <u>can be</u> "Low Efficacy"

- Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

Reference:
See 150.0(k)(3) page 218

BATHROOMS

Sinks, toilets, shower and tub

High Efficacy Luminaires	Low Efficacy Luminaires
At least one luminaire <u>must be</u> "High Efficacy"	Remaining luminaires <u>can be</u> "Low Efficacy" controlled by a vacancy sensor

Reference:
See 150.0(k)(5) page 218

LAUNDRY ROOMS AND UTILITY ROOMS

Attached laundry rooms and utility rooms

High Efficacy Luminaires	Low Efficacy Luminaires
All <u>must be</u> "High Efficacy" and controlled by a vacancy sensor	None

- Consider use of dual technology, IR and ultrasound, in large rooms such as garages where the potential of low motion can turn off the lighting

Reference:
See 150.0(k)(9) page 218

OTHER ROOMS

Hallways, dining rooms, family rooms, home offices, bedrooms, attic spaces, and closets

Exceptions: Closets <70 sf and detached buildings <1000sf

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> "High Efficacy"	<u>Can be</u> "Low Efficacy" controlled by dimmers or vacancy sensors

- Portable lighting must be T20 certified

Reference:
See 150.0(k)(7) page 218

OUTDOOR

Private patios, entrances, balconies, and porches switched from inside the dwelling unit

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> "High Efficacy"	<u>Can be</u> "Low Efficacy" controlled by ON/OFF switch, motion sensor and one of the following photocontrol, astronomical time clock or EMCS

- Offer two methods: 1. Can use "High Efficacy" or "low efficacy" with controlled by ON/OFF switch, motion sensor, and photocontrol/astronomical time clock/EMCS; 2. Can use nonresidential compliance methods.
- For parking areas refer to nonresidential compliance

Reference:
See 150.0(k)(9) page 219

The guest rooms of Hotels and Motels are considered dwellings and fall under residential compliance requirements.

One High Efficacy luminaire switched separately within 6 feet of entry required.

Remaining lighting and controlled receptacles require captive card key, vacancy or occupancy sensing, or automatic control that allows them to remain on no longer than 30 min once the room is vacated. Ref: Section 130.1(c)

The remaining part of the building construction is classified as nonresidential.

“High Efficacy” and “Low Efficacy” are to be separately switched with readily accessible manual ON/OFF control.



KITCHEN

Lighting circuits within the kitchen area are included

High Efficacy Luminaires	Low Efficacy Luminaires
≥50% wattage <u>must be</u> “High Efficacy”	≤ 50% wattage <u>can be</u> “Low Efficacy”

- Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

Reference:
See 150.0(k)(3) page 218

BATHROOMS

Sinks, toilets, shower and tub

High Efficacy Luminaires	Low Efficacy Luminaires
At least one luminaire <u>must be</u> “High Efficacy”	Remaining luminaires <u>can be</u> “Low Efficacy” controlled by a vacancy sensor

Reference:
See 150.0(k)(5) page 218

LAUNDRY ROOMS AND UTILITY ROOMS

Attached laundry rooms and utility rooms

High Efficacy Luminaires	Low Efficacy Luminaires
All <u>must be</u> “High Efficacy” and controlled by a vacancy sensor	None

- Consider use of dual technology, IR and ultrasound, in large rooms such as garages where the potential of low motion can turn off the lighting

Reference:
See 150.0(k)(6) page 218

OTHER ROOMS

Hallways (inside the dwelling unit), dining and living rooms, home offices, bedrooms, storage spaces, and closets

Exceptions: Closets <70 square feet

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	<u>Can be</u> “Low Efficacy” controlled by dimmers or vacancy sensors

- Portable lighting must be T20 certified

Reference:
See 150.0(k)(7) page 218

OUTDOOR

Private patios, entrances, balconies, and porches switched from inside the dwelling unit

High Efficacy Luminaires	Low Efficacy Luminaires
<u>Can be</u> “High Efficacy”	<u>Can be</u> “Low Efficacy” controlled by ON/OFF switch, motion sensor and one of the following photocontrol, astronomical time clock or EMCS

- Optional types in area includes “High Efficacy” OR “Low Efficacy” using T20 photocell or T20 astronomical time clock or energy management control system (EMCS)
- For parking areas refer to nonresidential compliance

Reference:
See 150.0(k)(9) page 219

Title 24 Overview of Residential Lighting Standards

HALO LED Recessed Lighting meets Title 24 requirements in all areas of the house when used with Halo LED recessed housings (non-screw base); for a complete high-efficacy luminaire.

HALO offers the largest selection of recessed LED certified to California Energy Commission Title 20 Appliance Efficiency Database. Luminaires listed on the Title 20 database are considered “high efficacy” products. Title 24 provides requirements for where high efficacy and low efficacy luminaires can be installed on a room-by-room basis. For specific LED listings refer to the CEC Title 20 Appliance Efficiency Database located at www.energy.ca.gov



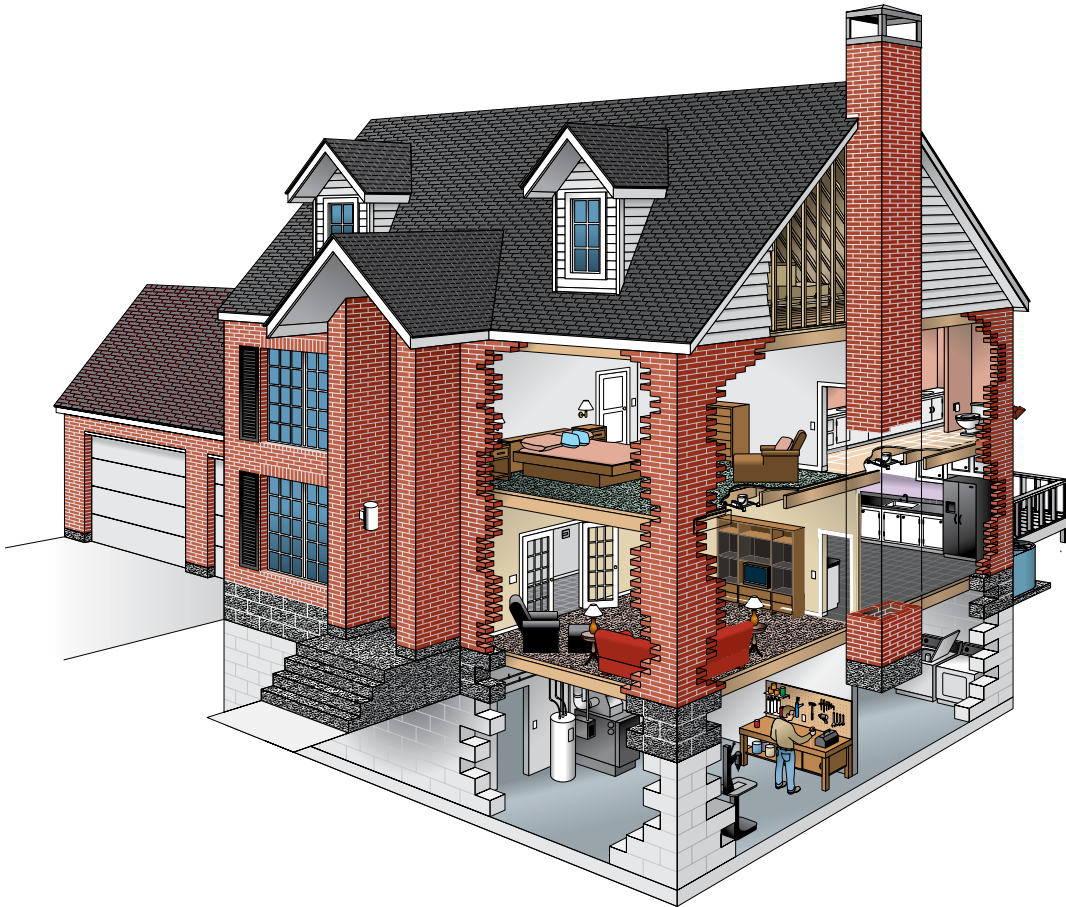
Featured Halo High Efficacy Solutions listed on the Title 20 Database



Title 24 Residential High Efficacy Lighting

- High efficacy luminaires may not have a medium screwbase socket.
- High efficacy luminaires must meet minimum lumen per watt and light source criteria per T24 & JA-8 California Code Standards
- LED residential luminaires must be certified to the CA Energy Commission (Title 20)
- Indoor LED nominal correlated color temperature (CCT) range of 2700K to 4000K (outdoor 2700K to 5000K)
- LED luminaire must be capable of providing a minimum 90 Color Rendering Index (CRI)
- Pin-base CFL luminaires ≥13W
- Luminaires with GU-24 sockets rated for LED, CFL, or HID lamps are automatically qualified as high efficacy for residential use

High Efficacy Luminaire - LPW	
Luminaire Power Rating	Minimum Efficacy (Lumens per Watt)
5 watts or less	30
over 5 watts to 15 watts	45
over 15 watts to 40 watts	60
over 40 watts	90



Can be used for
T24
 California Title 24
 High Efficacy
 Compliance

Kitchens*
 Lighting in kitchen areas must have at least 50% of the total rated wattage as high efficacy. There is no limit on the total kitchen wattage or total illumination levels.

Kitchen Low Efficacy Trade-off Option
 - When additional low efficacy lighting is needed (residential kitchen only)
 - All kitchen lighting (low and high efficacy) must be controlled by vacancy sensors, dimmers, or lighting control system with vacancy and/or dimming function
 - Refer to trade-off option wattage table

Kitchen Lighting Controls
 Separate controls are required:
 - High efficacy lighting
 - Low efficacy lighting
 Independent controls are recommended:
 - Recessed lighting
 - Undercabinet lighting
 - Linear fluorescent lighting
 - Uplights and task lighting

Kitchen Undercabinet
 Lighting mounted to a cabinet (not for inside cabinet lighting) shall be calculated as kitchen lighting where at least 50% of permanent lighting must be high efficacy. Lighting internal to cabinets shall use no more than 20W per linear foot of illumination cabinet.

Bedrooms
 Permanently installed lighting in bedrooms must be high efficacy or be controlled by a vacancy sensor or a dimmer

Bathrooms
 Lighting in bathrooms must have (1) minimum high efficacy fixture. All other lighting shall be high efficacy or be controlled by a vacancy sensor

Laundry and Utility Rooms
 Lighting fixtures in laundry and utility rooms must be high efficacy and be controlled by a vacancy sensor

Outdoor Lighting
 Outdoor lighting attached to the building must be high efficacy or controlled by motion sensor and either a photocell or an astronomical time clock

Garages
 Lighting in garages must be high efficacy and be controlled by a vacancy sensor.

Other Rooms**
 Permanently installed lighting in "other rooms" must be high efficacy or be controlled by vacancy sensor or a dimmer

Residential Recessed Luminaires:
 - UL Listed for IC, insulation contact
 - Certified airtight label per ASTM E283 test standards
 - Sealed gasket or caulk between luminaire and ceiling
 - High efficacy luminaires must meet minimum lumens per watt and T-24 and JA-8 (per high efficacy definitions and LPW table)

Note: Title 24 requirements do not apply to portable floor lamps or table lamps.

Kitchen Low Efficacy Trade-off Option - Wattage	
Dwelling Size	Additional Low Efficacy Lighting
≤ 2,500 ft ²	up to 50W additional
> 2,500 ft ²	up to 100W additional

*Kitchens include dining areas when dining is on the same lighting circuit.
 **Other rooms: hallways, closets, attics, home offices, dining, and family rooms.

Vacancy sensor: Manual on/automatic off occupancy sensor. Must be certified by the manufacturer to the CA Energy Commission Title 20 Appliance Efficiency Regulations.

RECESSED DOWNLIGHT - HIGH EFFICACY TITLE 20 CERTIFIED (require dedicated LED ICAT housing)



Halo
RA LED Series
4" Adjustable
RA4069_w/ICAT



Halo
RA LED Series
5" and 6" Adjustable
RA56069_w/ICAT



Halo
RL LED Series
4" Downlight
RL460_9_w/ICAT



Halo
RL LED 600 Series
5" & 6" Downlight
RL560_69_w/ICAT



Halo
RL LED 900 Series
5" & 6" Downlight
RL56_99_w/ICAT



Halo
ML LED 600 Series
5" & 6" Downlight
ML56069_w/ICAT



Halo
ML LED 900 Series
5" & 6" Downlight
ML56069_w/ICAT



Halo
EL LED Series
4" Downlight
EL4069_w/ICAT



Halo
ELG Round LED Series
4" Adjustable
ELG4069_w/ICAT



Halo
ELSG Square LED Series
4" Adjustable
ELGS4069_w/ICAT

RECESSED HOUSINGS - ICAT - HIGH EFFICACY / NON-SCREW BASE



Halo
H4 LED Gen2 Housing
4" LED Housing
H457ICAT1E



Halo
H4 LED Gen2 Housing
4" LED Remodel Housing
H457RICAT1E



Halo
H750ICAT
6" LED Housing



Halo
H750RICAT
6" LED Remodel Housing



Halo
H724ICATL
6" GU24 Housing
(lamp included)



Halo
H724RICATL
6" GU24 Remodel Housing
(lamp included)



Iris
P3LED Series (90 CRI models)
3" Adjustable Housing
900 or 1200 Lumen options

SURFACE AND RECESSED DOWNLIGHT - HIGH EFFICACY TITLE 20 CERTIFIED



Halo
SLD4 LED Series 4"
SLD4069_



Halo
SLD6 LED Series 5" & 6"
SLD6069_

OUTDOOR



All Pro
Revolve Series
LED Outdoor Security

UNDERCABINET LIGHTING - HIGH EFFICACY TITLE 20 CERTIFIED



Halo
HU10 LED Series
18", 24", 34" and 48" Undercabinet
HU10_

CONTROLS - TITLE 20 CERTIFIED



NeoSwitch
ONW
Recommended for bathrooms,
garages, laundry, utility and more



NeoSwitch
VNW
Recommended for bathrooms,
garages, laundry, utility and more



NeoSwitch
VAC
Recommended for "other
rooms" such as home offices



iLumen
Ineo CLS
Recommended for
kitchens, but not required

SURFACE & RECESSED DOWNLIGHT - LOW EFFICACY

FLUSHMOUNTS - LOW EFFICACY



Halo
SLD4 LED Series 4"
SLD4068_



Halo
SLD6 LED Series 5" & 6"
SLD6068_



Metalux LED
FM Series Flushmounts, Ceiling or Wall
12", 16" and 20" White Rounds
FMLED_

RECESSED DOWNLIGHT - LOW EFFICACY



Halo
RL LED Series
4" Downlight
RL460_8_w/ICAT



Halo
RL LED 600 Series
5" & 6" Downlight
RL560_68_w/ICAT



Halo
RL LED 900 Series
5" & 6" Downlight
RL56_98_w/ICAT



Halo
ML LED 600 Series
5" & 6" Downlight
ML56068_w/ICAT



Halo
ML LED 900 Series
5" & 6" Downlight
ML56068_w/ICAT

RECESSED HOUSINGS - LOW EFFICACY / SCREW BASE



Halo
4" Incandescent Housing
H99ICAT



Halo
4" Incandescent
Remodel Housing
H99RTAT



Halo
6" Incandescent Housing
H7ICAT



Halo
6" Incandescent
Remodel Housing
H7RICAT

SPECIALTY - LOW EFFICACY



Halo Art Glass
Pendants



Halo
Soft Cone Pendant
SCN



HALO
High Output LED Track Fixture
806 / 807



Halo
LED Undercabinet
HU20

OUTDOOR - LOW EFFICACY



Lumark
Crosstour LED
Wall Pack
XTOR_



Lumark
Crosstour Maxx LED
Wall Pack
XTOR_



Lumiere
Eon Wall Series
LED Wall Mount
303W_



Lumiere
Eon Ceiling Series
LED Ceiling Light
303S1_



All-Pro
FSL2030L Series
LED Large Single Head
Floodlight



All-Pro
MST18920L Series
180° Motion Activated
Twin Head LED Floodlight



All-Pro
MST27920LES
270° Motion Activated
Twin Head LED Floodlight



All-Pro
FE0650LPC Series
LED Entry and Patio light



Consumer Products
VT100G
100 Watt Vapor Tight
Floodlight



Consumer Products
MS188 Series
180° 300 Watt Halogen
Security Floodlight












Lumiere
Westwood 714 Series
Wall Mount



Lumiere
Westwood 903 Series
Wall Mount

APPENDIX: Interior Lighting Control Application Quick Reference Guide

INTERIOR SPACES

	Minimum Required Control Type					Page Reference
	A	B	C	D	E	
	 Manually Switched ON/OFF	 Luminaire Dimming	     Vacancy Sensor, Occupancy Sensor, Automatic Time Switch, Countdown Timer or Remote Signal	 Daylighting Control	 Receptacle Control	
Office - Small	1	4, 6	<=250sf; 14	21, 24, 25, 27	26	14
Office - Medium or Large	1	4	>250sf; 7, 9, 12	21, 24, 25, 27	26	15
Corridor, Hall and Stairwell	1	4	9,15	21, 24, 25, 27		16
Conference Room	1	4	14	21, 24, 25, 27	26	17
Entry, Waiting and Lobby	1	4, 6	7, 9, 12	21, 24, 25, 27	26	18
Restaurant and Dining	1	4	7, 9, 12, 16	21, 24, 25, 27		19
Restroom - Single Stall	1	4, 6	4 or <70sf; 10	21, 24, 25, 27		20
Restroom - Multi-Stall	1, 2	4	4	21, 24, 25, 27		21
Parking Garage	1	4	17, 18	22, 23, 24, 25		22
Cafeteria, Multipurpose and Gym	1	4	Multipurpose Rooms <1,000sf; 14 Cafeteria and Gym <1,000sf; 7, 9, 12, 16	21, 24, 25, 27		23
Classroom	1	5	14	21, 24, 25, 27		24
Electrical or Mechanical Room	1	4	(<70sf; 10) or 4 or (Elect. Regulated by 110.23(D))	21, 24, 25, 27		25
Library Stacks	1	4	15	21, 24, 25, 27		26
Library Open Area	1	4	7, 9, 12	21, 24, 25, 27		27
Warehouse Racks	3	4	8, 13, 15, 16	21, 24, 25, 27		29
Loading Docks	3	4	8, 9, 13, 17, 18	21, 24, 25, 27		35
Server Aisle	1	4	7, 9, 11	21, 24, 25, 27		

ALTERATIONS AND MODIFICATIONS-IN-PLACE (see Section 141.0, and Tables 141.0-E and 141.0-F)

Luminaire Alterations (per space)					Reference: 141.0 (b)lii
<10% of Existing Luminaires	existing provisions permitted				
≥10% of Existing Luminaries					
≤85% Lighting Power per 140.6 Area Method	A	B	C		
>85% Lighting Power per 140.6 Area Method	A	B	C	Daylighting is required for luminaires "altered" >10,000sf	
Luminaires Modified-in-Place					Reference: 141.0 (b)liii
<40 Luminaires /Year	existing provisions permitted				
≥40 Luminaires /Year					
Power ≤85%	A	B (one step between 30-70% and modified)	C		
Power >85%	A	B (multi-level for those modified)	C	D (for luminaires modified)	

A,B,C,D: Controls required per column as shown in above INTERIOR Area Type Guide matrix. Refer to Controls Summary Table 130.1-A

INTERIOR REFERENCE KEY

1. MANDATORY: Luminaires must be manual switched ON/OFF for each area enclosed by ceiling-height partitions and independently controlled, readily accessible, and operated in the same room with the luminaires controlled. Ref: Section 130.1(a)
2. OPTION. May use manual switch not accessible to unauthorized personnel. Ref: Section 130.1(a)
3. MANDATORY. Switch shall be located so that the person using the lighting control can see the lights or area operated by the switch, or the area being lit is annunciated. Ref: Section 130.1(a)
4. MANDATORY. Enclosed spaces 100sf or greater with connected load greater than 0.5W/sf. Each luminaire must be controlled by one of five control methods; manual dimmer, lumen maintenance, tuning, daylighting, or demand response. Ref: Section 130.1(b), Table 130.1-A.
5. MANDATORY. General lighting load of 0.7W/sf or less requires one control step between 30-70%. Ref: Section 130.1(b)
6. EXCEPTION. Enclosed area with one luminaire having 2 or less lamps. LED luminaires are not part of the exception. Ref: Section 130.1(b)
7. MANDATORY. Each 5,000 sf or less enclosed area requires vacancy, occupancy, automatic time-switch, or signal controls capable of turning off the lighting when unoccupied. Ref: Section 130.1(c)
8. MANDATORY. Each 20,000 sf or less enclosed area requires vacancy, occupancy, automatic time-switch, or signal controls capable of turning off the lighting when unoccupied for these larger spaces. Ref: Section 130.1(c)
9. EXCEPTION. Lighting used for 24/7 operation. Ref: Section 130.1(c)
10. OPTION: Countdown timer allowed when less than 70sf with a 10 minute setting. Ref: Section 130.1(c)
11. OPTION: Countdown timer allowed with a 30 minute setting. Ref: Section 130.1(c)
12. MANDATORY: Automatic time-switch with a 2 hour setting. Automatic time-switch required to have a "holiday shut-OFF" feature to turn off all loads for at least 24hr, and then resume to normal schedule. Ref: Section 130.1(c)
13. OPTION: Countdown timer greater than a 2 hour setting allowed when automatic time-switch control used where captive-key override is utilized. Ref: Section 130.1(c)
14. MANDATORY. Vacancy or occupancy sensing control required to shut OFF ALL lighting when the room is unoccupied. This includes any classroom, any conference room, multipurpose rooms less than 1,000sf, and offices 250sf or less. Ref: Section 130.1(c)
15. MANDATORY. Partial ON/OFF vacancy or occupancy sensing control is required to reduce lighting power when unoccupied. Warehouse aisle ways and open warehouses shall reduce lighting power by at least 50%; Library book stacks 10 ft or longer accessible from one end and 20 ft or longer accessible from both ends shall reduce lighting power by 50% and done so in each library book stack aisle; General corridors and general stairwells shall reduce lighting power by at least 50% when each space is unoccupied and FULL ON at each designed path of egress; Common area corridors and common area stairwells providing access to dwelling units in buildings including high-rise, hotel/motel, and multi-family apartments shall reduce lighting power by at least 50% when each space is unoccupied and FULL ON at each designed path of egress. Ref: Section 130.1(c)
16. EXCEPTION: Installed lighting power is 80% or less of the allowed value for the areas and then at least 40% of the lighting power shall be reduced or when HID technology is deployed at least 40% of the lighting power shall be reduced. Ref: Section 130.1(c)
17. MANDATORY. Vacancy or occupancy sensing control shall have at least one control step between 20-50% of lighting power, no more than 500W controlled together as a single zone, and turn the lights FULLY ON in each controlled space activated from designed paths of egress. Areas include parking garages, parking areas, and loading/unloading docks. Ref: Section 130.1(c)
18. EXCEPTION. Metal halide luminaires with system efficacy of 75lpw shall have at least one control step between 20-60% of lighting power. Ref: Section 130.1(c)
19. MANDATORY. Hotel/motel guest rooms require captive card key, vacancy or occupancy sensing, or automatic control that allows the lighting power and controlled receptacles to remain on no longer than 30 min once the room is vacated. Ref: Section 130.1(c)
20. EXCEPTION. One "High Efficacy" luminaire located within 6 feet of entry door. Ref: Section 130.1(c)
21. MANDATORY. The indoor, non-parking garage daylighting zones shall be controlled separately. These zones are Skylit, Primary Sidelit, and Secondary Sidelit. Sidelit zones apply when a space has at least 24 sf of glazing. Luminaires that fall in both Skylit and Primary Sidelit are to be controlled as part of the Skylit zone. Luminaires that are at least 50% within the zone are considered part of the designated zone. The luminaires in the daylighting zones must meet the multilevel lighting and uniformity requirements. Illuminance of daylight controlled lighting shall not be less than the space not controlled. When illuminance exceeds 150% of the designed illuminance, the general lighting in the daylighting zones shall be reduce by a minimum of 65%. Ref: Section 130.1(d) and Table 130.1-A
22. MANDATORY. The parking garage daylighting zones shall be controlled separately. These zones are Primary Sidelit, and Secondary Sidelit. Sidelit zones apply when a space has at least 36 sf of glazing and when the Primary Skylit zone has lighting loads greater than 60W. Luminaires that are at least 50% within the zone are considered part of the designated zone. The luminaires in the daylighting zones must meet the multilevel lighting and uniformity requirements OR ON/OFF. Illuminance of daylight controlled lighting shall not be less than the space not controlled. When illuminance exceeds 150% of the designed illuminance, the general lighting in the daylighting zones shall be reduce to zero. Ref: Section 130.1(d) and Table 130.1-A
23. EXCEPTION. Luminaires located in the daylight transition zone and for only dedicated ramps do not require daylight control. Ref: Section 130.1(d)
24. MANDATORY. Photosensors and their calibration adjustment shall be only accessible to authorized personnel. Ref: Section 130.1(d)
25. EXCEPTION. Daylit controlled lighting having a lighting power density of less than 0.3W/sf do not require multilevel lighting control. ON/OFF control is sufficient. Ref: Section 130.1(d)
26. MANDATORY. 120V receptacle control required for each within each 6 ft of uncontrolled receptacles and the controlled receptacle shall be marked. Hotel/motel guest rooms require that 1/2 of the receptacles to be controlled. Ref: Section 130.5(d)
27. EXCEPTION. When the combined total wattage of Skylit and Primary Sidelit zones is less than 120W, daylighting is not required.

APPENDIX: Multi-Level Requirements Quick Reference Guide

MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS (Summary of Table 130.1-A)







Luminaire Type	Minimum Required Control Steps (percent of full rated power ¹)	Uniform level of illuminance shall be achieved by:
Line-voltage sockets except GU-24	Continuous dimming 10-100 percent	
Low-voltage incandescent systems		
LED luminaires and LED source systems		
GU-24 rated for LED		
GU-24 sockets rated for fluorescent > 20 watts	Continuous dimming 20-100 percent	
Pin-based compact fluorescent > 20 watts ²		
GU-24 sockets rated for fluorescent ≤ 20 watts	Minimum one step between 30-70 percent	Stepped dimming; or Continuous dimming; or Switching alternate lamps in a luminaire
Pin-based compact fluorescent ≤ 20 watts ²		
Linear fluorescent and U-bent fluorescent ≤ 13 watts		
Linear fluorescent and U-bent fluorescent > 13 watts	Minimum one step in each range:	Stepped dimming; or Continuous dimming; or switching alternate lamps in each luminaire, having a minimum of 4 lamps per luminaire, illuminating the same area and in the same manner
	20-40 % 50-70 % 80-85 % 100 %	
Track Lighting	Minimum one step between 30 – 70 percent	Step dimming; or Continuous dimming; or Separately switching circuits in multi- circuit track with a minimum of two circuits.
HID > 20 watts	Minimum one step between 50 - 70 percent	Stepped dimming; or Continuous dimming; or Switching alternate lamps in each luminaire, having a minimum of 2 lamps per luminaire, illuminating the same area and in the same manner.

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

APPENDIX: Exterior Lighting Control Application Quick Reference Guide

EXTERIOR SPACES

	 BUG / Zonal Lumen Control	 1500W Controlled Together	 Photocontrol or Astronomical Time-Switch	 Occupancy Sensor	 Multi-Level Dimming	 Part-Night Control
Incandescent Luminaires	B	F	D	A		
Public Right of Way (roadways, sidewalks, bikeways)	C		E			
Roadway Tunnels	C		E			
Building Facades	C, N		D	L, N or	G	K, M or
Ornamental Hardscapes	B, N		D	L, N or	G	K, M or
Outdoor Dining	B, N		D	L, N or	G	K, M or
Outdoor Sales (Frontage, Lots, and Canopies)	B		D	L, N or	G	K or M
General Parking Lots (Hardscapes pole mounted >24ft)	B		D			
General Parking Lots (Hardscapes pole mounted <= 24ft)	B	F	D	F, H	G, H, J	
General Wall Mounted (non-pole mounted >24ft)	B		D			
General Wall Mounted (non-pole mounted <=24ft)	B	F	D	F, I	G, I, J	

EXTERIOR ALTERATIONS

Increases in Lighting Load, All Luminaires must meet the requirements; More than 50% of Luminaires Replaced, All Luminaires must meet the requirements; 10% or More of the Luminaires Replaced, the Altered Luminaires must meet the requirements.

Incandescent Luminaires	B	F	D	A		
Public Right of Way (roadways, sidewalks, bikeways)	C		E			
Roadway Tunnels	C		E			
Building Facades	C, N		D	L, N	G	K, M
Ornamental Hardscapes	B, O, N		D	L, N	G	K, M
Outdoor Dining	B		D	L, N	G	K, M
Outdoor Sales (Frontage, Lots, and Canopies)	B, O		D	L	G	K
General Parking Lots (Hardscapes pole mounted >24ft)	B, O		D			
General Parking Lots (Hardscapes pole mounted <= 24ft)	B, O	F	D	F, H, J	G, H, J	
General Wall Mounted (non-pole mounted >24ft)	B		D			
General Wall Mounted (non-pole mounted <=24ft)	B	F	D	F, I, J	G, I, J	

EXTERIOR REFERENCE KEY

- A. MANDATORY. Incandescent luminaire rated over 100W must be controlled by a motion sensor to turn-on when occupied. Ref: Section 130.2(a)
- B. MANDATORY. Luminaire must meet the cutoff requirements when the lamp wattage is greater than 150W complying with BUG requirements in accordance with the appropriate lighting zone. Ref: Section 130.2(b), Table 130.2-A, Table 130.2-B
- C. EXCEPTION. Lighting is not required to meet the cutoff requirements for building facades, public monuments, vertical surfaces of bridges, health or life-safety regulations, public right of way for publicly maintained areas (roadways, sidewalks, bikeways) and temporary lighting. Also replacement of existing pole mounted luminaires in hardscape areas with all the following conditions: existing luminaires do not meet BUG rating, spacing between existing poles is greater than 6 times mounting height of the existing luminaires, new wiring is not being installed, and connected load is not increased. Ref: Section 130.2(b)
- D. MANDATORY. Outdoor controls shall be controlled by a photosensor OR outdoor astronomical time-switch that turns OFF the outdoor lighting when daylight is available. The outdoor lighting must be circuited and independently controlled from other electrical loads. Ref: Section 130.2(c)
- E. EXCEPTION. Controls are not required to turn OFF outdoor lighting for health or life-safety regulations applications and in tunnels illuminated 24/7. Ref: Section 130.2(c)
- F. MANDATORY. Luminaires installed 24 feet or less above the ground shall be controlled. No more than 1500W can be controlled together. Motion or other controls shall automatically reduce the power of each luminaire when vacant and turn to full-ON when area becomes occupied. Ref: Section 130.2(c)
- G. MANDATORY. When controlled, the luminaires must reduce power between 40-80% which allows for both stepped and continuous dimming. Ref: Section 130.2(c)
- H. EXCEPTION. Pole mounted luminaires 75W or less do not require controls that automatically reduce power when vacant. Ref: Section 130.2(c)
- I. EXCEPTION. Non-pole mounted luminaires 30W or less do not require controls that automatically reduce power when vacant. Ref: Section 130.2(c)
- J. EXCEPTION. Linear lighting 4W per linear foot or less do not require controls that automatically reduce power when vacant. Ref: Section 130.2(c)
- K. MANDATORY. Part-night outdoor lighting control. Ref: Section 130.2(c)
- L. MANDATORY. Motion sensors of automatically reducing lighting power with auto-ON functionality. Ref: Section 130.2(c)
- M. MANDATORY. Centralized time-based zone lighting automatically reducing lighting by a minimum of 50%. Ref: Section 130.2(c)
- N. MANDATORY. Wall mounted luminaires ("wallpacks") must provide a bilaterally symmetric distribution. Ref: Section 130.2(c) 5 D
- O. Replacement of existing pole mounted luminaires do not need to meet the requirements whereby spacing is greater than 6x mounting height of existing luminaires, no poles added, no new wiring and connected power is not increasing.

BUILDING METHOD REQUIREMENTS: LIGHTING ENERGY BUDGET

TYPE OF BUILDING	LPD
	ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)
Auditorium Building	1.5
Classroom Building	1.1
Commercial and Industrial Storage Building	0.6
Convention Center Building	1.2
Financial Institution Building	1.1
General Commercial Building/Industrial Work Building	1.0
Grocery Store Building	1.5
Library Building	1.3
Medical Building/Clinic Building	1.1
Office Building	0.8
Parking Garage Building	0.2
Religious Facility Building	1.6
Restaurant Building	1.2
School Building	1.0
Theater Building	1.3
All others buildings	0.6

Refer to specific application page for Area Method

Reference:

Table 140.6-B for additional details page 190

OUTDOOR LUMINAIRES: LIGHTING ENERGY BUDGET

Lighting Zones:	LPD Lighting Power Density			
	Zone 1	Zone 2	Zone 3	Zone 4
Area Wattage Allowance (AWA) [watts per square foot]	0.035	0.045	0.090	0.115
Linear Wattage Allowance (LWA) [watts per linear foot]	0.25	0.45	0.60	0.85
Initial Wattage Allowance (IWA) [wattage]	340	510	770	1,030

*Additions can be added to the total budget where they apply.

Reference:

Table 140.7-A pages 195-197 for additional power allowances by specific applications.*

**Our Lighting
Product Lines**

Halo
Halo Commercial
Portfolio
Iris
RSA
Metalux
Corelite
Neo-Ray
Fail-Safe
MWS
Ametrix
Shaper
io
Lumark
McGraw-Edison
Invue
Lumière
Streetworks
AtLite
Sure-Lites

**Our Controls
Product Lines**

Greengate
iLumin
Zero 88
Fifth Light Technology
iLight (International Only)

Eaton
1121 Highway 74 South
Peachtree City, GA 30269
P: 770-486-4800
www.eaton.com/lighting

Canada Sales
5925 McLaughlin Road
Mississauga, Ontario L5R 1B8
P: 905-501-3000
F: 905-501-3172

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