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

**TABLE OF CONTENTS**

- How to use this guide ................................................. 4
- Iconography .......................................................... 5
- General Education on Title 24 ................................. 10
- NONRESIDENTIAL INDOOR APPLICATIONS ............... 12
  - Small Office .................................................. 14
  - Medium or Large Office ...................................... 15
  - Corridor, Hall and Stairwell ................................. 16
  - Conference Room ........................................... 17
  - Entry, Waiting and Lobby .................................... 18
  - Restaurant and Dining ....................................... 19
  - Restroom - Single Stall ..................................... 20
  - Restroom - Multi-Stall ...................................... 21
  - Parking Garage ................................................ 22
  - Cafeteria, Multipurpose and Gym ......................... 23
  - Classroom ...................................................... 24
  - Electrical Mechanical Room ................................. 25
  - Library Stacks ................................................ 26
  - Library Open Area ........................................... 27
  - Warehouse Industrial Open Area ......................... 28
  - Warehouse Racks .............................................. 29
  - Integrated Sensor System .................................... 30
  - Nonresidential Indoor Room Controller System ........ 32
  - Nonresidential Indoor Lighting Products ................ 34
  - Nonresidential Indoor Ambient Products ................ 35
  - Nonresidential Indoor Exit and Egress Products ....... 36
  - Nonresidential Indoor Control Products ................. 37

- NONRESIDENTIAL OUTDOOR APPLICATIONS ............... 38
  - Pole Mounted Luminaires .................................... 40
  - Non-Pole Mounted Luminaires .............................. 41
  - Sales Luminaires ............................................ 42
  - Building Façade and Outdoor Dining ...................... 43
  - Loading Docks ................................................ 44
  - General Parking Lots and Hardscapes ..................... 45
  - Nonresidential Outdoor Controls (LumaWatt) .......... 46
  - Nonresidential Outdoor Lighting Products ............... 48

- RESIDENTIAL APPLICATIONS ................................ 50
  - Single Family Home .......................................... 52
  - Multi-Family Home ........................................... 53
  - High-Rise Home ............................................... 54
  - Dormitory ...................................................... 55
  - Senior Living Quarters ....................................... 56
  - Hotel/Motel Guest Rooms ................................... 57
  - Halo and Title 24 Residential Standards ................ 58
  - Residential Products - High Efficacy ................. 59
  - Residential Products - Low Efficacy .................... 62

- APPENDIX
  - Interior Quick Reference Guide .......................... 64
  - Interior Quick Reference Guide Key ..................... 65
  - Multi-Level Requirements Guide ......................... 66
  - Exterior Quick Reference Guide and Key ............... 67
  - Lighting Power Density Tables ............................ 68

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.
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.

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

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
**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.

<table>
<thead>
<tr>
<th>LUMINAIRES / CONTROLS</th>
<th>FUNCTIONAL REQUIREMENTS</th>
<th>CONSTRAINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminaire Dimming</td>
<td>Daylighting Control</td>
<td>Square Footage Range</td>
</tr>
<tr>
<td>Fluorescent Luminaire w/ Ballast</td>
<td>Vacancy Sensor Manual On/Auto Off</td>
<td>Maximum Wattage Controlled Together</td>
</tr>
<tr>
<td>LED Luminaire</td>
<td>Occupancy Sensor</td>
<td>Daylight Opening</td>
</tr>
<tr>
<td>Metal Halide Luminaire</td>
<td>Demand Response</td>
<td>BUG / Zonal Lumen Requirements</td>
</tr>
<tr>
<td>Exit Luminaire</td>
<td>Manually Switched ON/OFF</td>
<td>Lighting Power Density</td>
</tr>
<tr>
<td>Residential Recessed Luminaire</td>
<td>Manual Dimmer</td>
<td>Height of Luminaire for Outdoor</td>
</tr>
<tr>
<td>w/ Ballast</td>
<td>Lumen Maintenance Control</td>
<td>24/7 Operation</td>
</tr>
<tr>
<td>Emergency Back-up (For Egress)</td>
<td>Tuning Control</td>
<td></td>
</tr>
<tr>
<td>High Efficacy</td>
<td>Automatic Time Switch (Indoor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Astronomical Time Switch (Outdoor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Photocontrol</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remote Signal Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Captive Key-Card Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined HVAC &amp; Lighting Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part-night Outdoor Lighting Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automatic Countdown Timer Switch</td>
<td></td>
</tr>
</tbody>
</table>
**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 luminaries must meet Joint Appendix 8 (JA8) and certified to California Title 20 Appliance Database, CFL residential recessed luminaries must contain CFL ballast that are certified to California Title 20 Appliance Database, 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)
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)

A manual ON with automatic off control, commonly called “vacancy sensors”, can be used to 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)

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), 110.9(b), 130.1(b), 130.1(e), 130.3(a), 140.6(a), 141.0(b), 150.0(k)

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)

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)

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)

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)
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

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

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)
Title 24 Guidelines (2013 Standards)

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 luminaries 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)

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

References: Sections 130.1(d)

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)

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)

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)
When is Title 24 Compliance Required?

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

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 JA8 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

**T20** Certified to California Title 20 Appliance Database

**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

**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

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**Egress Requirements for Meeting Title 24 (Nonresidential only)**

<table>
<thead>
<tr>
<th>SPACE TYPE</th>
<th>REQUIRED</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit</td>
<td>Yes</td>
<td>Exit signs must be certified to California Title 20 Appliance Database.</td>
</tr>
<tr>
<td>Building Level</td>
<td>No</td>
<td>No Title 24 compliances required.</td>
</tr>
<tr>
<td>Space Level</td>
<td>Conditional</td>
<td>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.</td>
</tr>
<tr>
<td>Multi-Level Dimming</td>
<td>Yes</td>
<td>Code requires luminaires to be dimming capable even though the functionality is not enabled.</td>
</tr>
<tr>
<td>Shut-OFF</td>
<td>Conditional</td>
<td>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%.</td>
</tr>
<tr>
<td>Daylighting</td>
<td>Conditional</td>
<td>No Title 24 compliances required. Up to 0.05 watts per square foot may be continuously illuminated in designated egress areas.</td>
</tr>
</tbody>
</table>

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).

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**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

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**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)

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**Daylighting Control**

<table>
<thead>
<tr>
<th>Nonresidential Interior</th>
<th>Parking Garage</th>
<th>Required Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 0.05 watts per square foot may be continuously illuminated in enforcement agency designated egress area. This is the only exception.</td>
<td>Sidelite Openings &gt;36 sqft.</td>
<td>Luminaire Dimming Control</td>
</tr>
<tr>
<td>Sidelit or Skylight Openings &gt;24 sqft.</td>
<td>Lighting power is 60W or greater in the daylit zone</td>
<td>Daylighting Control</td>
</tr>
<tr>
<td>Lighting power is 120W or greater in the daylit zone</td>
<td>Reduce at least 65% power when daylight provides more than 150% design illuminance</td>
<td></td>
</tr>
<tr>
<td>Reduce at least 65% power when daylight provides more than 150% design illuminance</td>
<td>Turn off power when daylight provides more than 150% design illuminance</td>
<td></td>
</tr>
</tbody>
</table>
Nonresidential Indoor Applications

Small Office
Medium or Large Office
Corridor, Hall and Stairwell
Conference Room
Entry, Waiting and Lobby
Restaurant and Dining
Restroom - Single Stall
Restroom - Multi-Stall
Parking Garage
Cafeteria, Multipurpose and Gym
Classroom
Electrical Mechanical Room
Library Stacks
Library Open Area
Warehouse Industrial Open Area
Warehouse Racks
Integrated Sensor System
Nonresidential Indoor Room Controller System
Nonresidential Indoor Lighting Products
Nonresidential Indoor Ambient Products
Nonresidential Indoor Exit and Egress Products
Nonresidential Indoor Control Products
**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

**MULTI-LEVEL LIGHTING**

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

**SHUTOFF CONTROL**

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

**AUTOMATIC DAYLIGHTING CONTROL**

- Eliminate energy waste when natural light present

**LPD Lighting Power Density 1.0 watts per square feet required for Area Category Method**

For Building Method requirements see table on page 68.
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

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

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.

SHUTOFF CONTROL
- Luminaire dimming
- Manual dimmer
- Lumen Maintenance Control
- Tuning Control
- Daylighting Control
- Demand Response

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
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

LIGHTING POWER DENSITY

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

For Building Method requirements see table on page 68.

NONRESIDENTIAL INDOOR: Corridor, Hall and Stairwell

**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

**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

**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

**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

16 EATON Title 24 Guidelines (2013 Standards)
**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

**SPACE LEVEL (AREA CONTROL)**

- Must be accessible to occupants to operate the lighting

**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.

**SHUTOFF CONTROL**

- Luminaire dimming
- Occupancy sensor
- Receptacle control
- Daylight control

**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

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**SPACe Level (Area Control)**

- Must be accessible to occupants to operate the lighting

**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**

- Luminaire dimming
- Occupancy sensor
- Receptacle control
- Daylight 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

**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

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

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

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
**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.

**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.

**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.

**SHUTOFF CONTROL**

- Luminaire must be shut-off control 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.
- **Exceptions** to shut-off control include:
  - Lighting serving a continuous use area.
  - Emergency egress up to 0.05 watts per sq ft.

**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.

**MANUAL Dimmer**

- Luminaire Dimming
- Manual Dimmer
- Lumen Maintenance Control
- Tuning Control
- Daylighting Control
- Demand Response

**AUTOMATIC Dimmer**

- Occupancy Sensor
- Manual On/ Auto Off
- Remote Signal Control
- Automatic Time Switch

**LPD** Lighting Power Density 1.1 watts per square feet required for Area Category Method.
SPACE ASSUMPTIONS

- **Space** – Greater than 100 square feet and less than 5000 square feet
- **Electrical Load** – Greater than 0.5 watts per square foot 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

Reference:
- See 130.1(a) page 140
- See 130.1(a & b) page 140
- See 130.1(c) page 141
- See 130.1(d) page 143

**SPACE LEVEL (AREA CONTROL)**

- Must be accessible to occupants to operate the lighting

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

Exceptions 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

Reference:
- See 130.1(d) page 143

**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 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

**SPACE LEVEL (AREA CONTROL)**

- May use a manual switch not accessible to unauthorized personnel

**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

**SHUTOFF CONTROL**

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

**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(a) page 140
- See 130.1(a & b) page 140
- See 130.1(c) page 141
- 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(a) page 144

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

**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

**MULTI-LEVEL LIGHTING**

- Not required except when daylighting control is required

**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

**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

For Building Method requirements see table on page 68.
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

**MULTI-LEVEL LIGHTING**

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

**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

**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(a) page 140
- See 130.1(c) page 141
- See 130.1(d) page 143

**Lighting Power Density** as low as 1.0 watts per sq ft required for Area Category Method. For building Method requirements see table on page 68.
# Title 24 Requirements

## NONRESIDENTIAL INDOOR: Classroom

### 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 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

### SPACE LEVEL (AREA CONTROL)
- Must be accessible to occupants to operate the lighting

<table>
<thead>
<tr>
<th>Luminaire Dimming</th>
<th>Manual Dimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manually Switched</strong>&lt;br&gt;ON/OFF</td>
<td></td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Luminaire Dimming</th>
<th>Manual Dimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Luminaire Dimming</strong>&lt;br&gt;Manual Dimmer</td>
<td></td>
</tr>
</tbody>
</table>

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

### SHUTOFF CONTROL
- Luminaires turned off when vacant

<table>
<thead>
<tr>
<th>Occupancy Sensor</th>
<th>Manual On/Auto Off</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(CHOOSE ONE)</strong></td>
<td></td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Luminaire Dimming</th>
<th>Daylighting Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Luminaire Dimming</strong>&lt;br&gt;Daylighting Control</td>
<td></td>
</tr>
</tbody>
</table>

**Reference:**
See 130.1(d) page 143
**SPACE ASSUMPTIONS**

- **Space** – Non-habitation 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

**SPACE LEVEL (AREA CONTROL)**

- Must be accessible to occupants to operate the lighting

Reference: See 130.1a 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 130.1a & b page 140

**SHUTOFF CONTROL**

- Luminaire 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 130.1c 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 130.1d 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

**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

**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.

**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.

**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

---

**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 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

**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

**SHUTOFF CONTROL**

- Luminaire 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

**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
**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

**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

**MULTI-LEVEL LIGHTING**

- Luminaires 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.

**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

**AUTOMATIC DAYLIGHTING CONTROL**

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

**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 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

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 Wsf 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 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
  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
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 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.

**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.

**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%.

**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.

**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.

**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 130.1(a) page 140

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

Reference:
See 130.1(c) page 141-142

Reference:
See 130.1(d) page 143-144

Reference:
See 130.1(e) page 144

Reference:
See table 140.6-A page 189
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 Quickits. 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

Reference: See 130.1(a) page 140

Manually Switched ON/OFF

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
## 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.

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Model</th>
<th>Product Line</th>
<th>Description</th>
<th>Luminaire Dimming</th>
<th>Optional Daylighting Control</th>
<th>Optional Occupancy Sensor</th>
<th>Emergency Backup (for Egress)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recessed Lighting</td>
<td>EL406_</td>
<td>HALO</td>
<td>EL 4&quot; LED</td>
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<td>ELG406_</td>
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<td>H750_</td>
<td>HALO</td>
<td>H7 LED housing</td>
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<td>H995_</td>
<td>HALO</td>
<td>H4 LED housing</td>
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<td>LD4A_</td>
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<td></td>
<td>LD6A_</td>
<td>PORTFOLIO</td>
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<td>LDSQ6A_</td>
<td>PORTFOLIO</td>
<td>L 6&quot; Square Commercial LED</td>
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<td>P3LED_</td>
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<td>PD6_ED010_</td>
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<td>✓</td>
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<td>RA406_</td>
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<tr>
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<td>RA5606_</td>
<td>HALO</td>
<td>RA LED Series 5 &amp; 6&quot; Adjustable</td>
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<td>LSSQ6A_</td>
<td>PORTFOLIO</td>
<td>L 6&quot; Square Cylinder LED Series</td>
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<td>✓</td>
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</tr>
<tr>
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<td>LSR8A_</td>
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<td>LSM_45_</td>
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<td>L WaveStream LED Surface/Pendant</td>
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<td>LUMARK</td>
<td>Quadcast</td>
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<td>coming soon</td>
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<td>SN LED Series</td>
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### 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.

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Model</th>
<th>Product Line</th>
<th>Description</th>
<th>Luminaire Dimming</th>
<th>Optional Daylighting Control</th>
<th>Optional Occupancy Sensor</th>
<th>Emergency Backup (for Egress)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Troffer</td>
<td>AC-LD</td>
<td>METALUX</td>
<td>Accord 1x4, 2x2, and 2x4</td>
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<td>ALN-LD</td>
<td>METALUX</td>
<td>ArcLine 1x4, 2x2, and 2x4</td>
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<td></td>
<td>✓</td>
<td>✓</td>
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<td>METALUX</td>
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<td>EN-LD</td>
<td>METALUX</td>
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<td>✓</td>
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<tr>
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<td>SR-LD</td>
<td>METALUX</td>
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<tr>
<td></td>
<td>DRI</td>
<td>CORELITE</td>
<td>Wavestream Divide 1x4, 2x2, and 2x4</td>
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<td>HE LED</td>
<td>NEO-RAY</td>
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<td>R2X</td>
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<td>S12</td>
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<td>Ambient Suspended</td>
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<td>NEO-RAY</td>
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<td>DSI</td>
<td>CORELITE</td>
<td>WaveStream Divide Suspended</td>
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<tr>
<td></td>
<td>J2</td>
<td>CORELITE</td>
<td>J2 LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
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<td>L2</td>
<td>CORELITE</td>
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<td>RZL</td>
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<td>Ambient Wall Bracket</td>
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<td>Raye LED</td>
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## 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.

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Model</th>
<th>Product Line</th>
<th>Description</th>
<th>T20 Certified</th>
<th>Luminaire Dimming</th>
<th>Emergency Backup (for Egress)</th>
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</thead>
<tbody>
<tr>
<td>Emergency Lighting</td>
<td>APEL</td>
<td>Sure-Lites</td>
<td>Two heads LED</td>
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<tr>
<td></td>
<td>AP2SQ_</td>
<td>Sure-Lites</td>
<td>Two heads LED</td>
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</tr>
<tr>
<td></td>
<td>APR_</td>
<td>Sure-Lites</td>
<td>Remote heads LED</td>
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</tr>
<tr>
<td></td>
<td>AEL2_</td>
<td>Sure-Lites</td>
<td>Diecast surface mount architectural</td>
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</tr>
<tr>
<td></td>
<td>CEL_</td>
<td>Sure-Lites</td>
<td>Recessed concealed twin head</td>
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</tr>
<tr>
<td></td>
<td>RLM_</td>
<td>Sure-Lites</td>
<td>Recessed twin head</td>
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<td></td>
<td>STL2_</td>
<td>Sure-Lites</td>
<td>Linear surface mount</td>
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<td>AA1_</td>
<td>Sure-Lites</td>
<td>Commercial two heads</td>
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<td></td>
<td>CC2_</td>
<td>Sure-Lites</td>
<td>Contractor choice twin head</td>
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<td>CU2</td>
<td>Sure-Lites</td>
<td>Contemporary twin head</td>
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<td>Sure-Lites</td>
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<td>Emergency Exit</td>
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<td>CX7_</td>
<td>Sure-Lites</td>
<td>Diecast battery backup</td>
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<td>LPX7_</td>
<td>Sure-Lites</td>
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<td>LPX6_</td>
<td>Sure-Lites</td>
<td>AC powered</td>
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<td></td>
<td>SLX6_</td>
<td>Sure-Lites</td>
<td>AC powered</td>
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</table>
## 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.

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

*RC3_ controller can be paired with all Eaton lighting products.
## Nonresidential Outdoor Applications

<table>
<thead>
<tr>
<th>Application</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Mounted Luminaires</td>
<td>40</td>
</tr>
<tr>
<td>Non-Pole Mounted Luminaires</td>
<td>41</td>
</tr>
<tr>
<td>Sales Luminaires</td>
<td>42</td>
</tr>
<tr>
<td>Building Façade and Outdoor Dining</td>
<td>43</td>
</tr>
<tr>
<td>Loading Docks</td>
<td>44</td>
</tr>
<tr>
<td>General Parking Lots and Hardscapes</td>
<td>45</td>
</tr>
<tr>
<td>Nonresidential Outdoor Controls (LumaWatt)</td>
<td>46-47</td>
</tr>
<tr>
<td>Nonresidential Outdoor Lighting Products</td>
<td>48-49</td>
</tr>
</tbody>
</table>
**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

**CUTOFF (UPLIGHT AND GLARE)**

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

**AREA CONTROL**

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

**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

**AUTOMATIC DAYLIGHTING CONTROL**

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

**LIGHTING ENERGY BUDGET**

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

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

**LPD** Lighting Power Density - Refer to table below for specific zone measurements.
CUTOFF (UPLIGHT AND GLARE)

Exception: Cutoff not required if 150W or less

AREA CONTROL

1500 watts is the maximum allowed when controlled together

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

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.

AUTOMATIC DAYLIGHTING CONTROL

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

LIGHTING ENERGY BUDGET

<table>
<thead>
<tr>
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<td>0.115</td>
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<td>510</td>
<td>770</td>
<td>1,030</td>
</tr>
</tbody>
</table>

*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

CUTOFF (UPLIGHT AND GLARE)
• Refer to replacements of existing pole mounted luminaires for further exceptions
  Exception: Cutoff not required if 150W or less

AREA CONTROL
• None required

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

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

LIGHTING ENERGY BUDGET

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<thead>
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</table>

*Additions can be added to the total budget where they apply.
**SPACE ASSUMPTIONS**
- Building Façade and Outdoor Dining
- 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 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

**AREA CONTROL**
- None required

**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

**AUTOMATIC DAYLIGHTING CONTROL**
- On/Off control at sunrise and sunset.

**LIGHTING ENERGY BUDGET**

<table>
<thead>
<tr>
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</tr>
</tbody>
</table>

*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*

**AREA CONTROL**

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

**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*

**AUTOMATIC DAYLIGHTING CONTROL**

- On/Off control at sunrise and sunset

**LIGHTING ENERGY BUDGET**

<table>
<thead>
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</tr>
</tbody>
</table>

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

**Reference:**

- See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148
- See 130.2(c) pages 146-147
- See 130.2(c) pages 146-147
- See 130.2(c) pages 146-147
- 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 statue, ordinances, regulations, on public right of way on public maintained roadways, sidewalks and bikeways
- Temporary lighting excluded
- Greater than 150 watts

## LIGHTING ENERGY BUDGET

<table>
<thead>
<tr>
<th>Lighting Zones:</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
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<td>1,030</td>
</tr>
</tbody>
</table>

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

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

## CUT-OFF (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

## 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

## 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

## AUTOMATIC DAYLIGHTING CONTROL

- On/Off control at sunrise and sunset.

## Zonal Lumen Requirements

**Reference:**
- See 1D-114-A page 37 and Tables 130.2-A and B pages 147-148
- See 130.2(c) pages 146-147
- See 130.2(c) pages 146-147
- See 130.2(c) pages 146-147
- See 130.2(c) pages 146-147

## PHOTOCONTROL

- (CHOOSE ONE OR MORE)

## Automatic (Astronomical) Time Switch

**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.

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.

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

### CUTOFF

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
</tr>
</thead>
</table>
| **(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

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
</tr>
</thead>
</table>
| **Manual switch can communicate a wireless signal to the luminaire-integrated LumaWatt sensors to turn off the luminaires.** | 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

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
</tr>
</thead>
</table>
| 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. | 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

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
</tr>
</thead>
</table>
| 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. | 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

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
</tr>
</thead>
</table>
| 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

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
</tr>
</thead>
</table>
| 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 |
## 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.

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

Pole Mounted and Wall Mounted products on following page
### 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.

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Model</th>
<th>Product Line</th>
<th>Description</th>
<th>Luminaire Dimming</th>
<th>Integral Occupancy Sensor</th>
<th>Integral Photocontrol Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Mounted</td>
<td>AVM_</td>
<td>STREETWORKS</td>
<td>Vision Site Medium - Area LED</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>AVS_</td>
<td>STREETWORKS</td>
<td>Vision Site Small - Area LED</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>CRTK-A_</td>
<td>STREETWORKS</td>
<td>Caretaker - Area LED</td>
<td>Not required if &lt;75W</td>
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<td>✓</td>
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<tr>
<td></td>
<td>CTKRV1A_</td>
<td>LUMARK</td>
<td>Caretaker - Area/Site LED</td>
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<td>✓</td>
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<tr>
<td></td>
<td>GAN_</td>
<td>STREETWORKS</td>
<td>Galleon - Area LED</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>GLEON_</td>
<td>MCGRAW-EDISON</td>
<td>Galleon - Area Roadway LED</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>ICM_</td>
<td>INVUE</td>
<td>Icon Site - Area Roadway LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>LDRC_</td>
<td>LUMARK</td>
<td>Small Cobrahead - Area/Site LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>LDRL_</td>
<td>LUMARK</td>
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<td>✓</td>
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<tr>
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<td>LDRV_</td>
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<td>Ridgeview - Area/Site LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>NAV_</td>
<td>LUMARK</td>
<td>Navion - Area/Site LED</td>
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<td>✓</td>
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<td>Navion - Roadway LED</td>
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<td>TMU_</td>
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<td>VST_</td>
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<td>✓</td>
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<tr>
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<td>VTS_</td>
<td>MCGRAW-EDISON</td>
<td>Ventus - Area Roadway LED</td>
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<td>✓</td>
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<tr>
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<td>VXM_</td>
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<tr>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Wall Mounted</td>
<td>ENC_</td>
<td>INVUE</td>
<td>Entri Round Clean - LED</td>
<td>✓</td>
<td>✓</td>
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<tr>
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<td>ENT_</td>
<td>INVUE</td>
<td>Entri Triangle Reveals - LED</td>
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<td>✓</td>
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<tr>
<td></td>
<td>ENV_</td>
<td>INVUE</td>
<td>Entri Round Reveals - LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>ISC_</td>
<td>MCGRAW-EDISON</td>
<td>Impact Elite Cylinder - LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>ISS_</td>
<td>MCGRAW-EDISON</td>
<td>Impact Elite Quarter Sphere - LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
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<td>IST_</td>
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<td>Impact Elite Trapezoid - LED</td>
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<td>✓</td>
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<td>Impact Elite Wedge - LED</td>
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<td>✓</td>
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<tr>
<td></td>
<td>LDWP_</td>
<td>LUMARK</td>
<td>Wal-Pak - LED</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
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<td>WKP_</td>
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<td>Wal-Pak - LED</td>
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<td>✓</td>
<td>✓</td>
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<tr>
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<td>XTOR</td>
<td>LUMARK</td>
<td>Crosstour - LED</td>
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</table>
## Residential Applications

<table>
<thead>
<tr>
<th>Application</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family Home</td>
<td>52</td>
</tr>
<tr>
<td>Multi-Family Home</td>
<td>53</td>
</tr>
<tr>
<td>High-Rise Home</td>
<td>54</td>
</tr>
<tr>
<td>Dormitory</td>
<td>55</td>
</tr>
<tr>
<td>Senior Living Quarters</td>
<td>56</td>
</tr>
<tr>
<td>Hotel/Motel Guest Rooms</td>
<td>57</td>
</tr>
<tr>
<td>Halo and Title 24 Residential Standards</td>
<td>58-59</td>
</tr>
<tr>
<td>Residential Products - High Efficacy</td>
<td>60-61</td>
</tr>
<tr>
<td>Residential Products - Low Efficacy</td>
<td>62-63</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥50% wattage must be “High Efficacy”</td>
<td>≤ 50% wattage can be “Low Efficacy”</td>
</tr>
</tbody>
</table>

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

**BATHROOMS**

Sinks, toilets, shower and tub

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one luminaire must be “High Efficacy”</td>
<td>Remaining luminaires can be “Low Efficacy” controlled by a vacancy sensor</td>
</tr>
</tbody>
</table>

**LAUNDRY ROOMS AND UTILITY ROOMS**

Attached laundry rooms and utility rooms

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>All must be “High Efficacy” and controlled by a vacancy sensor</td>
<td>None</td>
</tr>
</tbody>
</table>

• 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

**OTHER ROOMS**

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

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

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by dimmers or vacancy sensors</td>
</tr>
</tbody>
</table>

• Portable lighting must be T20 certified

**OUTDOOR**

Includes all outdoor lighting circuits

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by ON/OFF switch, motion sensor and one of the following: photocontrol, astronomical time clock or EMCS</td>
</tr>
</tbody>
</table>

• 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.
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

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<tr>
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</tr>
</thead>
<tbody>
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</tbody>
</table>

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

### BATHROOMS

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<thead>
<tr>
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<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

### LAUNDRY ROOMS AND UTILITY ROOMS

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>All must be “High Efficacy” and controlled by a vacancy sensor</td>
<td>None</td>
</tr>
</tbody>
</table>

- 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

### OTHER ROOMS

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by dimmers or vacancy sensors</td>
</tr>
</tbody>
</table>

- Portable lighting must be T20 certified

### OUTDOOR

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by ON/OFF switch, motion sensor and one of the following: photocontrol, astronomical time clock or EMCS</td>
</tr>
</tbody>
</table>

- 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.

### INTERIOR COMMON AREAS

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by an occupancy sensor</td>
</tr>
</tbody>
</table>

- 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)(3) page 218
- See 150.0(k)(5) page 218
- See 150.0(k)(6) page 218
- See 150.0(k)(7) page 218
- See 150.0(k)(9) page 219
- 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.

### Title 24 Requirements

**RESIDENTIAL: High-Rise Home**

#### KITCHEN
Lighting circuits within the kitchen area are included

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
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</thead>
<tbody>
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<td>≤ 50% wattage can be “Low Efficacy”</td>
</tr>
</tbody>
</table>

- 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

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<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Remaining luminaires can be “Low Efficacy” controlled by a vacancy sensor</td>
</tr>
</tbody>
</table>

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

#### LAUNDRY ROOMS AND UTILITY ROOMS
Attached laundry rooms and utility rooms

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>All must be “High Efficacy” and controlled by a vacancy sensor</td>
<td>None</td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by dimmers or vacancy sensors</td>
</tr>
</tbody>
</table>

- 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

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

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

### Title 24 Requirements

#### RESIDENTIAL: Dormitory

<table>
<thead>
<tr>
<th>KITCHEN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting circuits within the kitchen area are included.</td>
<td>Reference: See 150.0(k)(3) page 218</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥50% wattage must be “High Efficacy”</td>
<td>≤ 50% wattage can be “Low Efficacy”</td>
</tr>
</tbody>
</table>

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

#### BATHROOMS

<table>
<thead>
<tr>
<th>Sinks, toilets, shower and tub</th>
<th>Reference: See 150.0(k)(5) page 218</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one luminaire must be “High Efficacy”</td>
<td>Remaining luminaires can be “Low Efficacy” controlled by a vacancy sensor</td>
</tr>
</tbody>
</table>

#### LAUNDRY ROOMS AND UTILITY ROOMS

<table>
<thead>
<tr>
<th>Attached laundry rooms and utility rooms to the dormitory room</th>
<th>Reference: See 150.0(k)(6) page 218</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>All must be “High Efficacy” and controlled by a vacancy sensor</td>
<td>None</td>
</tr>
</tbody>
</table>

- 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.

#### OTHER ROOMS

<table>
<thead>
<tr>
<th>Hallways, dining rooms, family rooms, home offices, bedrooms, attic spaces, and closets</th>
<th>Reference: See 150.0(k)(7) page 218</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by dimmers or vacancy sensors</td>
</tr>
</tbody>
</table>

- Portable lighting must be T20 certified.
**RESIDENTIAL: Senior Living Quarters**

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.

### Title 24 Requirements

#### RESIDENTIAL: Senior Living Quarters

- 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.
- Portable lighting must be T20 certified.

#### LIGHTING CIRCUITS

<table>
<thead>
<tr>
<th></th>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen</td>
<td>≥50% wattage must be “High Efficacy”</td>
<td>≤ 50% wattage can be “Low Efficacy”</td>
</tr>
<tr>
<td>Reference</td>
<td>See 150.0(k)(3) page 218</td>
<td></td>
</tr>
<tr>
<td>Bathrooms</td>
<td>At least one luminaire must be “High Efficacy”</td>
<td>Remaining luminaires can be “Low Efficacy” controlled by a vacancy sensor</td>
</tr>
<tr>
<td>Reference</td>
<td>See 150.0(k)(5) page 218</td>
<td></td>
</tr>
<tr>
<td>Laundry Rooms</td>
<td>All must be “High Efficacy” and controlled by a vacancy sensor</td>
<td>None</td>
</tr>
<tr>
<td>Reference</td>
<td>See 150.0(k)(6) page 218</td>
<td></td>
</tr>
<tr>
<td>Hallways</td>
<td>Can be “High Efficacy”</td>
<td>Can be “Low Efficacy” controlled by dimmers or vacancy sensors</td>
</tr>
<tr>
<td>Reference</td>
<td>See 150.0(k)(7) page 218</td>
<td></td>
</tr>
<tr>
<td>Private Patios</td>
<td>Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods</td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>See 150.0(k)(9) page 219</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

- KITCHEN
- BATHROOMS
- LAUNDRY ROOMS AND UTILITY ROOMS
- OTHER ROOMS
- OUTDOOR

**OUTDOOR**

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

**Title 24 Requirements**

- Can be “High Efficacy”
- Can be “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.
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

<table>
<thead>
<tr>
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<tbody>
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- Cabinet illumination must not exceed ≤ 20W / linear foot. Refer to code for calculation methods.

**BATHROOMS**
Sinks, toilets, shower and tub

<table>
<thead>
<tr>
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</tbody>
</table>

**LAUNDRY ROOMS AND UTILITY ROOMS**
Attached laundry rooms and utility rooms

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>All must be “High Efficacy” and controlled by a vacancy sensor</td>
<td>None</td>
</tr>
</tbody>
</table>

- 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

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

<table>
<thead>
<tr>
<th>High Efficacy Luminaires</th>
<th>Low Efficacy Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

- Portable lighting must be T20 certified

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

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<thead>
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</tr>
</tbody>
</table>

- 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
**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**

![Featured Halo High Efficacy Solutions listed on the Title 20 Database](image)

**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**

<table>
<thead>
<tr>
<th>Luminaire Power Rating</th>
<th>Minimum Efficacy (Lumens per Watt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 watts or less</td>
<td>30</td>
</tr>
<tr>
<td>over 5 watts to 15 watts</td>
<td>45</td>
</tr>
<tr>
<td>over 15 watts to 40 watts</td>
<td>60</td>
</tr>
<tr>
<td>over 40 watts</td>
<td>90</td>
</tr>
</tbody>
</table>
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.

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)

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.

Laundry and Utility Rooms
Lighting fixtures in laundry and utility rooms 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**

<table>
<thead>
<tr>
<th>Dwelling Size</th>
<th>Additional Low Efficacy Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2,500 ft²</td>
<td>up to 50W additional</td>
</tr>
<tr>
<td>&gt; 2,500 ft²</td>
<td>up to 100W additional</td>
</tr>
</tbody>
</table>

*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 RL LED 900 Series**
  - 5” & 6” Downlight RL56069_w/ICAT

- **Halo EL LED Series**
  - 4” Downlight EL4069_w/ICAT

- **Halo EL LED Series**
  - 4” Remodel Housing EL4069_w/ICAT

- **Halo ELG Round LED Series**
  - 4” Adjustable ELG4069_w/ICAT

- **Halo ELSG Square LED Series**
  - 4” Adjustable ELSG4069_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 H750CAT**
  - 6” LED Housing H750RICAT

- **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
RESIDENTIAL: Product Reference Guide - High Efficacy Luminaires

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
### RESIDENTIAL: Product Reference Guide - Low Efficacy Luminaires

#### SURFACE & RECESSED DOWNLIGHT - 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_

#### 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

SPECIALTY - LOW EFFICACY

RESIDENTIAL: Product Reference Guide - Low Efficacy Luminaires
## INTERIOR SPACES

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Page Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum Required Control Type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office - Small</td>
<td>1</td>
<td>4, 6</td>
<td>&lt;=250sf; 14</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Office - Medium or Large</td>
<td>1</td>
<td>4</td>
<td>&gt;250sf; 7, 9, 12</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Corridor, Hall and Stairwell</td>
<td>1</td>
<td>4</td>
<td>9, 15</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Conference Room</td>
<td>1</td>
<td>4</td>
<td>14</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Entry, Waiting and Lobby</td>
<td>1</td>
<td>4, 6</td>
<td>7, 9, 12</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Restaurant and Dining</td>
<td>1</td>
<td>4</td>
<td>7, 9, 12, 16</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Restroom - Single Stall</td>
<td>1</td>
<td>4, 6</td>
<td>4 or &lt;70sf; 10</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Restroom - Multi-Stall</td>
<td>1, 2</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Parking Garage</td>
<td>1</td>
<td>4</td>
<td>12, 18</td>
<td></td>
<td></td>
<td>22, 23, 24, 25</td>
</tr>
<tr>
<td>Cafeteria, Multipurpose and Gym</td>
<td>1</td>
<td>4</td>
<td>Multipurpose Rooms &lt;1,000sf; 14 Cafeteria and Gym &lt;1,000sf; 7, 9, 12, 16</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Classroom</td>
<td>1</td>
<td>5</td>
<td>14</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Electrical or Mechanical Room</td>
<td>1</td>
<td>4</td>
<td>(&lt;70sf; 10) or 4 or (Elect. Regulated by 110.23(D))</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Library Stacks</td>
<td>1</td>
<td>4</td>
<td>15</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Library Open Area</td>
<td>1</td>
<td>4</td>
<td>7, 9, 12</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Warehouse Racks</td>
<td>3</td>
<td>4</td>
<td>8, 13, 15, 16</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Loading Docks</td>
<td>3</td>
<td>4</td>
<td>8, 9, 13, 17, 18</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
<tr>
<td>Server Aisle</td>
<td>1</td>
<td>4</td>
<td>7, 9, 11</td>
<td></td>
<td></td>
<td>21, 24, 25, 27</td>
</tr>
</tbody>
</table>

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

#### Luminaire Alterations (per space)

<table>
<thead>
<tr>
<th>Luminaire Alterations (per space)</th>
<th>Reference: 141.0 (b)lii</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10% of Existing Luminaires</td>
<td>existing provisions permitted</td>
</tr>
<tr>
<td>≥10% of Existing Luminaries</td>
<td></td>
</tr>
<tr>
<td>≤85% Lighting Power per 140.6 Area Method</td>
<td>A</td>
</tr>
<tr>
<td>&gt;85% Lighting Power per 140.6 Area Method</td>
<td>A</td>
</tr>
</tbody>
</table>

#### Luminaires Modified-in-Place

<table>
<thead>
<tr>
<th>Luminaires Modified-in-Place</th>
<th>Reference: 141.0 (b)liii</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40 Luminaires / Year</td>
<td>existing provisions permitted</td>
</tr>
<tr>
<td>≥40 Luminaires / Year</td>
<td></td>
</tr>
<tr>
<td>Power ≤85%</td>
<td>A</td>
</tr>
<tr>
<td>Power &gt;85%</td>
<td>A</td>
</tr>
</tbody>
</table>

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
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 78ipw 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 daylit 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 reduced 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 daylit 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 reduced 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 ½ 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.
### MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS (Summary of Table 130.1-A)

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

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
### EXTERIOR SPACES

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

### 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.

<table>
<thead>
<tr>
<th></th>
<th>BUG / Zonal Lumen Control</th>
<th>1500W Controlled Together</th>
<th>Photocore Control or Astronomical Time-Switch</th>
<th>Occupancy Sensor</th>
<th>Multi-Level Dimming</th>
<th>Part-Night Control</th>
</tr>
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<tbody>
<tr>
<td>Incandescent Luminaries</td>
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<td></td>
</tr>
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<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadway Tunnels</td>
<td>C</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Facades</td>
<td>C, N</td>
<td>D</td>
<td>L, N or G</td>
<td>K, M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ornamental Hardscapes</td>
<td>B, O, N</td>
<td>D</td>
<td>L, N or G</td>
<td>K, M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor Dining</td>
<td>B</td>
<td>D</td>
<td>L, N or G</td>
<td>K, M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor Sales (Frontage, Lots, and Canopies)</td>
<td>B, O</td>
<td>D</td>
<td>L</td>
<td>G</td>
<td>K</td>
<td></td>
</tr>
<tr>
<td>General Parking Lots (Hardscapes pole mounted &gt;24ft)</td>
<td>B, O</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Parking Lots (Hardscapes pole mounted &lt;=24ft)</td>
<td>B, O</td>
<td>F</td>
<td>D</td>
<td>F, H</td>
<td>G, H, J</td>
<td></td>
</tr>
<tr>
<td>General Wall Mounted (non-pole mounted &gt;24ft)</td>
<td>B</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Wall Mounted (non-pole mounted &lt;=24ft)</td>
<td>B</td>
<td>F</td>
<td>D</td>
<td>F, I</td>
<td>G, I, J</td>
<td></td>
</tr>
</tbody>
</table>

### 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 circuitted 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.** Luminaries 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 luminaries must reduce power between 40-80% which allows for both stepped and continuous dimming. Ref: Section 130.2(c)

H. **EXCEPTION.** Pole mounted luminaries 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

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

Reference: Table 140.6-B for additional details page 190

### OUTDOOR LUMINAIRES: LIGHTING ENERGY BUDGET

<table>
<thead>
<tr>
<th>Lighting Zones:</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Wattage Allowance (AWA) watts per square foot</td>
<td>0.035</td>
<td>0.045</td>
<td>0.090</td>
<td>0.115</td>
</tr>
<tr>
<td>Linear Wattage Allowance (LWA) watts per linear foot</td>
<td>0.25</td>
<td>0.45</td>
<td>0.60</td>
<td>0.85</td>
</tr>
<tr>
<td>Initial Wattage Allowance (IWA) wattage</td>
<td>340</td>
<td>510</td>
<td>770</td>
<td>1,030</td>
</tr>
</tbody>
</table>

Reference: Table 140.7-A pages 196-197 for additional power allowances by specific applications.*

*Additions can be added to the total budget where they apply.
Our Lighting Product Lines

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

Our Controls Product Lines

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