

# Title 24 2019 for Lighting & Controls: Update & Applications

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Course # AIA PLS-201

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# Course Description

The purpose of this course is to help participants learn updated California Title 24 Standards with focus on lighting and controls. Course material includes a high-level comparison between current and new code, non-residential updates, residential updates, and alteration updates. There will be light discussions on practical application and examples throughout the session.

# Objectives

1. Highlight of Major Changes
2. Examine Nonresidential Changes
3. Examine Residential Changes
4. Discuss Nonresidential TI and Alterations

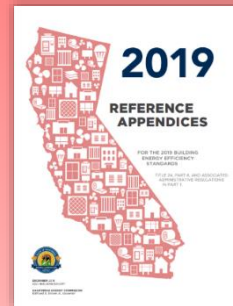
# 1. Major Changes

# Code Effective Date

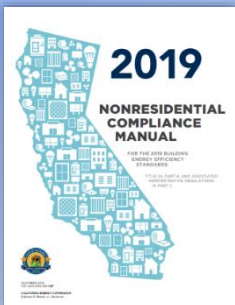
- Effective since **01/01/2020!**
- Permit applications submitted on or after 01/01/2020



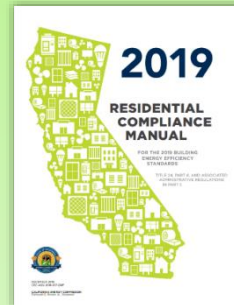
- Building Energy Efficiency Standards or the “**BEES**”
- Non-Resi and Resi
- 325 pages



- Verification & Testing Procedures for CLCATT
- JA8: Qualification requirements for high efficacy fixtures



- Supplements the BEES
- **NOT CODE**
- 746 pages



- Supplements the BEES
- **NOT CODE**
- 514 pages

# Quick Points about the BEES

- **30% more efficient** than previous 2016 Standards
- Applies to occupancy groups:
  - A, B, E, F, H, I, M, R, S and U
  - **I-1 and I-2 (hospitals) added**
  - Does not apply to I-3, I-4, L; (Prisons & Labs)



- ✓ Alcohol and drug centers
- ✓ Assisted Living facilities
- ✓ Congregate care facilities
- ✓ Convalescent facilities
- ✓ Group homes
- ✓ Halfway houses
- ✓ Residential board and custodial care facilities



- ✓ Foster care facilities
- ✓ Detoxification facilities
- ✓ Hospitals
- ✓ Nursing homes
- ✓ Psychiatric hospitals



# Indoor Ltg Power Allowance

## 140.6(b)

- Lighting power density (LPD in W/ft<sup>2</sup>) values based on **LED** as a baseline
- **28% avg reduction** in general lighting power allowances
- New function area types and definitions added
  - More granular area types
  - Healthcare and hospital areas
  - Sport arena areas



# Reduced Lighting Allowances

## Complete Building Method 140.6(b)

**Table 140.6-B Complete Building Method Lighting Power Density Values**

Type of Building	Allowed Lighting Power Density (Watts/sqft)	
	2016	2019
Auditorium Assembly Building	1.40	0.70
Classroom Building	1.10	n/a
→ Commercial and Industrial Storage Building	0.60	0.45
Convention Center Building	1.00	n/a
Financial Institution Building	1.00	0.65
→ Industrial/Manufacturing Facility Building [2016: General Commerical Building/Industrial Work Building]	1.00	0.60
Grocery Store Building	1.50	0.95
Gymnasium Building	n/a	0.65
Library Building	1.20	0.70
Healthcare Facility	n/a	0.90
Medical Building/Clinic Building	1.00	n/a
→ Office Building	0.80	0.65
→ Parking Garage Building	0.20	0.13
Religious Facility Building	1.50	0.70
→ Restaurant building	1.10	0.70
Retail Store building	n/a	0.90
School Building	0.95	0.65
Sports Arena Building	n/a	0.75
Motion Picture Theater Building	1.30	0.70
Performing Arts Theater Building	n/a	0.80
All other buildings	0.50	0.40

# Reduced Lighting Allowances

## Area Category Method 140.6(b)

**Table 140.6-C Area Category Method - Lighting Power Density Values (Watts/sqft)**

Primary Function Area	Allowed Lighting Power Density (W/sqft)		Additional Lighting Power		
	2016	2019	Qualified Lighting Systems	Allowed Lighting Power Density (W/sqft)	
				2016	2019
Auditorium Area	1.4	0.7	Ornamental	0.5	0.3
			Accent, display and feature	N/A	0.2
Auto Repair / Maintenance Area	0.9	0.55	Detailed Task Work	0.5	0.2
Audience Seating Area [2016: n/a]	N/A	0.6	Ornamental	N/A	0.3
Beauty Salon Area	1.7	0.8	Detailed Task Work	-	0.2
			Ornamental	-	0.3
Civic Meeting Place Area	1.3	1	Ornamental	0.5	0.3
Classroom, Lecture, Training, Vocational Areas	1.2	0.7	White or Chalk Board	5.5 W/ft	4.5 W/ft
Commerical /Industrial Storage Warehouse Shipping & Handling	N/A	0.45	-	N/A	-
	N/A	0.6	-	N/A	-
<del>[2016: Commerical and Industrial Storage Areas (conditioned and unconditioned)]</del>	<del>0.6</del>	<del>N/A</del>	<del>N/A</del>	<del>-</del>	<del>N/A</del>
<del>[2016: Commerical and Industrial Storage Areas (refrigerated)]</del>	<del>0.7</del>	<del>N/A</del>	<del>N/A</del>	<del>-</del>	<del>N/A</del>
Convention, Conference, Multipurpose and Meeting Center	1.2	0.85	Ornamental	0.5	0.3
Copy Room [2016: n/a]	N/A	0.5	-	N/A	-

# Reduced Lighting Allowances

## Area Category Method cont. 140.6(b)

Table 140.6-C Area Category Method - Lighting Power Density Values (Watts/sqft)

Primary Function Area	Allowed Lighting Power Density (W/sqft)		Additional Lighting Power		
			Qualified Lighting Systems	Allowed Lighting Power Density (W/sqft)	
				2016	2019
Corridor Area [2016: Corridor, Restroom, Stair, and Support Areas]		0.6		-	-
→ Dining Area	Bar/Lounge and Fine Dining	1	Ornamental	0.5	0.3
	Cafeteria/Fast Food				
	Family and Leisure				
Electrical, Mechanical, Telephone Rooms		0.55	Detailed Task Work	0.5	0.2
→ Exercise/Fitness Center and Gymnasium Areas		1	-	-	-
→ Hotel Function Area		1.43	Ornamental	-	0.3
Museum Area	Exhibition/Display	1.8	-	-	-
	Restoration Room [2016: N/A]	N/A	Detailed Task Work	N/A	0.2
Financial Transaction Area		1	Ornamental	0.5	0.3
→ General/Commercial & Industrial Work Area	Low Bay	0.9	Detailed Task Work	0.5	0.2
	High Bay	1	Detailed Task Work	0.5	0.2
	Precision	1.2	Precision Work	1	0.7
Library Area	Reading Area	1.1	Ornamental	0.5	0.3
	Stacks Area	1.5	Ornamental	0.5	-

# Reduced Lighting Allowances

## Area Category Method cont. 140.6(b)

**Table 140.6-C Area Category Method - Lighting Power Density Values (Watts/sqft)**

Primary Function Area	Allowed Lighting Power Density (W/sqft)		Additional Lighting Power		
			Qualified Lighting Systems	Allowed Lighting Power Density (W/sqft)	
	2016	2019		2016	2019
Main Entry Lobby [2016: Lobby Area: Hotel Lobby   Main Entry Lobby]	0.95	0.85	Ornamental	0.5	0.3
Locker Room [2016: Locker/Dressing Room]	0.7	0.45	-	-	-
Lounge, Breakroom, or Waiting Areas [2016: Lounge Area]	0.9	0.65	Ornamental	0.5	0.3
Concourse and Atria Area [2016: Malls and Atria]	0.95	0.9	Ornamental	0.5	0.3
Office Area <div> <div>&gt; 250 square feet</div> <div>&lt; 250 square feet</div> <div>Open plan office</div> </div>	0.75	0.65	Portable lighting for office areas	-	0.2
	1	0.7			
	N/A	0.6			
<div> <div>Parking Garage Area</div> <div>Parking Zone</div> <div>Dedicated Ramps</div> <div>Daylight Adaptation Zones</div> </div>	0.14	0.1	First ATM	N/A	100 W
			Additional ATM	N/A	50 W each
	0.3	0.25	-	-	-
	0.6	0.5	-	-	-
Pharmacy Area [2016: N/A]	N/A	1.1	Specialized Task Work	N/A	0.35

# Reduced Lighting Allowances

## Area Category Method cont. 140.6(b)

Table 140.6-C Area Category Method - Lighting Power Density Values (Watts/sqft)

Primary Function Area		Allowed Lighting Power Density (W/sqft)		Additional Lighting Power		
				Qualified Lighting Systems	Allowed Lighting Power Density (W/sqft)	
		2016	2019			2016
Laundry Area		0.7	0.45	-	-	-
Religious Worship Area		1.5	0.95	Ornamental	0.5	0.3
Restrooms		0.6	0.65	-	-	-
Transportation Function Area	Baggage Area	0.5	0.4	-	-	-
	Ticketing Area	1	0.45	Accent, display and feature	-	0.2
Sports Arena - Playing Area	Class I Facility	N/A	2.25	-	N/A	-
	Class II Facility		1.45	-		-
	Class III Facility		1.1	-		-
	Class IV Facility		0.75	-		-
Stairwell		0.6	0.5	Accent, display and feature	-	0.2
				Decorative	-	0.15
Videoconferencing Studio		1.2	0.9	Videoconferencing	1.5	1
All Other		0.5	0.4	-	-	-

# Healthcare/Hospital Areas

## Area Category Method cont. 140.6(b)

Kitchen/Food Preparation Area		0.95	-	-
Scientific Laboratory Area		1.00	Specialized Task Work <sup>s</sup>	0.35
Healthcare Facility and Hospitals	Exam/Treatment Room	1.15	-	-
	Imaging Room	1.00	-	-
	Medical Supply Room	0.55	-	-
	Nursery	0.95	Tunable white or dim-to-warm <sup>10</sup>	0.10
	Nurse's Station	0.75	Tunable white or dim-to-warm <sup>10</sup>	0.10
	Operating Room	1.90	-	-
	Patient Room	0.55	Decorative	0.15
			Tunable white or dim-to-warm <sup>10</sup>	0.10
	Physical Therapy Room	0.85	Tunable white or dim-to-warm <sup>10</sup>	0.10
	Recovery Room	0.90	Tunable white or dim-to-warm <sup>10</sup>	0.10
Laundry Area		0.45	-	-
Religious Worship Area		0.95	Ornamental	0.30

# Acceptance Testing & Certification

For lighting controls (130.4 & Reference Nonresi Appendix)

1. Applies to ALL permitting nonresi projects except for healthcare facilities, high-rise resi buildings, and hotel/motel buildings
2. Performed by a *Certified Lighting Controls Acceptance Test Technician* (CLCATT)
3. Before occupancy permit is granted, the CLCATT must:
  - Test and verify (daylighting, shut-off, demand response, tuning, outdoor lighting, and PAF)
  - After passing all tests, a *Certificate of Acceptance* is submitted to the enforcement agency
4. Acceptance Testing is NOT the same as Project Commissioning or System Start-Up.



## 2. Nonresidential Changes

# Luminaire Classification & Power

## Wattage Determination 130.0(c)2, 5

- Recessed Screw Base Lamp Holders
  - Rated wattage of socket, no less than 50W minimum per socket; OR
  - Rated wattage of installed “**JA8**” compliant lamp (*certified and recognized as a **HIGH EFFICACY** light source*)
- LED Linear Tape Lighting
  - MAX rated wattage = installed length X mfr rated watts per linear ft; OR
  - MAX rated input wattage of power supply or driver

# Track & Modular Ltg Systems

## Wattage Classification Section 130.0(c)6

A. Baseline approach, take GREATER of:

- **30W/linear ft**; OR
- Maximum rated wattage of combined luminaires

B. Current Limiter:

- Track integrated: Volt-Ampere (VA) rating of current limiter
- Panel based: Total VA rating of combined breakers

C. Powered by driver, power supply, or transformer

- Maximum rated input wattage of power source

# Area Controls: ON/OFF Switch

Mandatory 130.1(a)

Required for **ALL** enclosed areas:



1. Readily accessible



Exceptions:

*Public restrooms, parking areas, stairwells, and corridors ... **may use switch inaccessible to public***

2. Located in the **same enclosed area** with the lighting it controls

Exceptions:

*Malls, atria, auditorium, retail merchandise sales areas, wholesale showroom areas, commercial/industrial storage areas, convention centers, arenas, health facilities, health safety hazardous location ... **switch may be relocated***

# Area Controls

## Reference for 130.1(a)

### SECTION 130.1 – MANDATORY INDOOR LIGHTING CONTROLS

Nonresidential, high-rise residential, and hotel/motel buildings shall comply with the applicable requirements of Sections 130.1(a) through 130.1(f), in addition to the applicable requirements of Sections 110.9 and 130.0.

- (a) **Manual Area Controls.** Each area enclosed by ceiling-height partitions shall provide lighting controls that allow the lighting in that area to be manually turned on and off. The manual control shall:

1. Be readily accessible; and

**EXCEPTION to Section 130.1(a)1:** Public restrooms having two or more stalls, parking areas, stairwells, and corridors may use a manual control not accessible to unauthorized personnel.

2. Be located in the same enclosed area with the lighting it controls; and

**EXCEPTION 1 to Section 130.1(a)2:** For malls and atria, auditorium areas, retail merchandise sales areas, wholesale showroom areas, commercial and industrial storage areas, general commercial and industrial work areas, convention centers, arenas, psychiatric and secure areas in healthcare facilities, and other areas where placement of a manual area control poses a health and safety hazard, the manual area control may instead be located so that a person using the control can see the lights or area controlled by that control, or visually signal or display the current state of the controlled lighting.

**EXCEPTION 2 to Section 130.1(a)2:** In healthcare facilities, for restrooms and bathing rooms intended for a single occupant, the lighting control may be located outside the enclosed area but directly adjacent to the door.

3. Provide separate control of general, floor display, wall display, window display, case display, ornamental, and special effects lighting, such that each type of lighting can be turned on or off without turning on or off

# Multi-Level Ltg Controls

## Mandatory 130.1(b)

- Trigger for this requirement:
  1. Enclosed area  $\geq 100\text{ft}^2$ ; **AND**
  2. *GENERAL* lighting with connect load  $> 0.5\text{W/ft}^2$
- If triggered, how do I comply?
  1. Make it **DIMMABLE**
  2. Reference Table 130.1-A (Multi-Level Uniformity Table)
- Exceptions:
  - Restrooms and Healthcare Facilities
  - Single luminaire in room

# Multi-Level Ltg Controls

Reference for 130.1(b) cont.

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

Luminaire Type	Minimum Required Control Steps (percent of full rated power <sup>1</sup> )	Uniform level of illuminance shall be achieved by:
Line-voltage sockets except GU-24	Continuous dimming 10-100 percent	
Low-voltage incandescent systems		
LED luminaires and LED source systems		
GU-24 rated for LED		
GU-24 sockets rated for fluorescent > 20 watts	Continuous dimming 20-100 percent	
Pin-based compact fluorescent > 20 watts <sup>2</sup>		
GU-24 sockets rated for fluorescent ≤ 20 watts	Minimum one step between 30-70 percent	Stepped dimming; or Continuous dimming; or
Pin-based compact fluorescent ≤ 20 watts <sup>2</sup>		

At least have a  
**MIDDLE** control step!

Example:  
100%, **50%**, OFF

**EXCEPTION 1 to Table 130.1-A Minimum Required Control Steps:** Classrooms with a connected general lighting load of 0.7 watts per square foot or less shall have a minimum of one control step between **30-70 percent** of full rated power, regardless of luminaire type.

**EXCEPTION 2 to Table 130.1-A Minimum Required Control Steps:** Library stack aisles, aisle ways and open areas in warehouses, parking garages, parking areas, loading and unloading areas, stairwells, and corridors shall have a minimum of one control step between **20-60 percent** of full rated power, regardless of luminaire type.

HID > 20 watts	Minimum one step between 50 - 70 percent	Stepped dimming; or
Induction > 25 watts		Continuous dimming; or
Other light sources		Switching alternate lamps in each luminaire, having a minimum of 2 lamps per luminaire, illuminating the same area and in the same manner.
1. Full rated input power of ballast and lamp, corresponding to maximum ballast factor 2. Includes only pin based lamps: twin tube, multiple twin tube, and spiral lamps		



# Multi-Level Ltg Controls

## Reference for 130.1(b)

(b) **Multi-Level Lighting Controls.** The general lighting of any enclosed area 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot shall provide multi-level lighting controls that allow the level of lighting to be adjusted up and down. The multi-level controls shall provide the number of control steps and meet the uniformity requirements specified in TABLE 130.1-A.

**EXCEPTION 1 to Section 130.1(b):** An area enclosed by ceiling height partitions that has only one luminaire with no more than two lamps.

**EXCEPTION 2 to Section 130.1(b):** Restrooms.

**EXCEPTION 3 to Section 130.1(b):** Healthcare facilities.



# Automatic Shut-OFF Controls

## Mandatory 130.1(c)

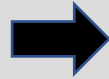
- Applies to ALL installed indoor lighting
- Exceptions:
  - Healthcare facilities
    - Area where lighting is in continuous use 24/7/365
    - Electrical equipment rooms
    - Up to 0.1W/ft<sup>2</sup> for areas designated for means of egress

# Occupant Sensing Controls

**Mandatory 130.1(c)5, 6, 7, 8**



- Office  $\leq 250\text{ft}^2$ , Classrooms, Conference Rooms, Multipurpose  $< 1,000\text{ft}^2$



Partial-ON / Auto OFF  
OR  
Manual ON / Auto OFF  
(vacancy mode)

- **Restroom**



**Auto OFF**

- Corridors, Stairwells, Library Book Stack Aisles, Warehouse Open Areas and Aisles,



At least 50% Partial-OFF + Auto OFF  
(**HIGH / LOW / OFF**) or (**HIGH / OFF**)

- Common Corridors, Common Stairwells, Parking Garage Areas



At least 50% Partial-OFF  
(**HIGH / LOW**)

# Occupant Sensors for Mechanical

120.2(e)3 & Table 120.1-A

1. Incorporate occupant sensing controls for temperature setback and different modes
2. Affected spaces:
  - Offices, corridors, multipurpose rooms, hotel/motel dwelling, break rooms, conference rooms, lobbies lecture hall, etc.
3. Why not use the same OS from lighting?

# Controlled Receptacles

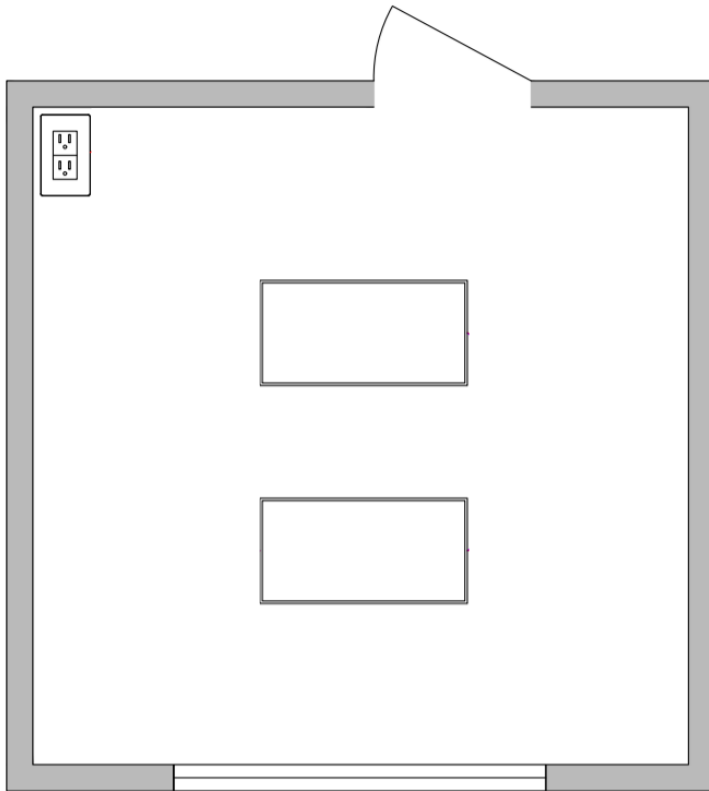
## 130.5(d)

- No change from T24 2016
- Still required for New Construction:
  - Offices, lobbies, conference rooms, kitchen areas in office spaces, and copy rooms
  - Hotel/Motel guest rooms
- T.I. not affected unless changing complete electrical power distribution system; 141.0(b)(2)(P)(iv)



# Controls Exercise #1

Office  $\leq 250\text{ft}^2$  (new construction)

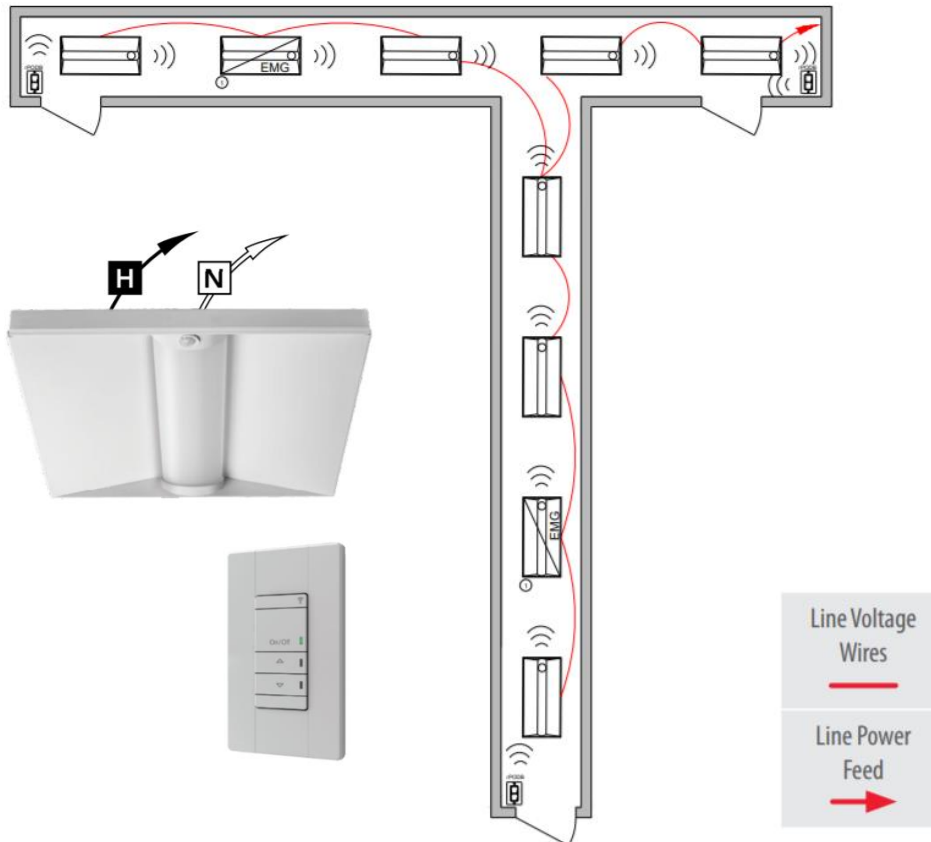


1. What are the mandatory requirements?
2. Is the OS effectively located to detect occupancy without false triggers?
3. Are we using the right OS technology? PIR, Dual Tech?
4. 4ft minimum away from supply air diffuser?
5. What's the Sequence of Operation for the space? Is it specified?

# Controls Exercise #2

## Corridor (T.I.)

### Wireless

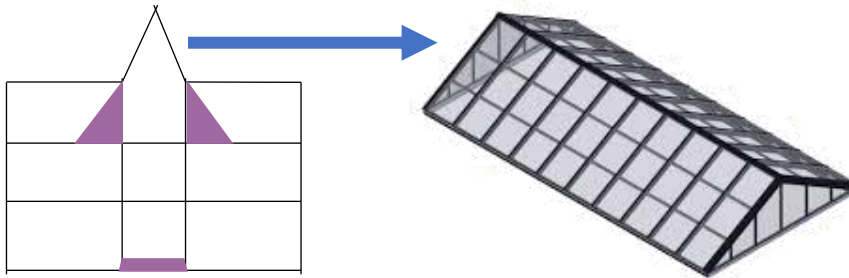


1. What are the mandatory requirements?
2. Are the OS effectively located to detect occupancy without false triggers? Are we using the right OS technology? PIR, Dual Tech?
3. 4ft minimum away from supply air diffuser?
4. What's the Sequence of Operation for the space? Is it specified?
5. How does EM and controls work here in a WIRELESS application vs standalone integrated sensor method?

# Daylighting Controls

## Mandatory 130.1(d)

- Show all daylit zones on plans: Skylit, Primary, and Secondary 140.6(d)
- Show daylit zone for parking garage : Combined Skylit + Primary
- Atrium skylit zone shall include floor directly below it

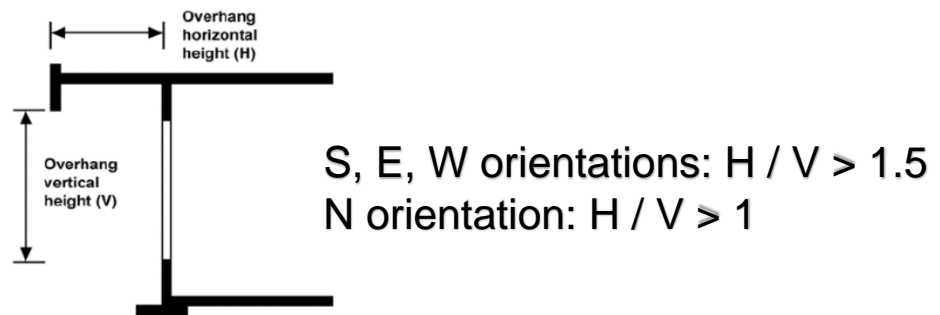


- Separate control for luminaires in each type of daylit zone
- Photosensor(s) to be located where not readily accessible to unauthorized personnel

# Daylighting Controls

## Exceptions 130.1(d)

- Total *GENERAL* lighting in Skylit & Primary Zone < 120W
- Total *GENERAL* lighting in Secondary < 120W; **OR**  
Primary + Secondary < 240W
- Skylit zones with documented obstruction blocking for more than 1,500 daytime hours per year (8am-4pm)
- Glazing with exterior overhang



- Luminaires in sidelit daylit zones in retail merchandise sales and wholesales showroom areas



# Control Interactions

## New 130.1(f)

- (f) **Control Interactions.** Each lighting control installed to comply with Section 130.1 shall permit or incorporate the functions of the other lighting controls required by this Section.
1. For general lighting, the manual area control shall permit the level or amount of light provided while the lighting is on to be set or adjusted by the controls specified in Section 130.1(b), (c), (d), and (e).
  2. The manual area control shall permit the shutoff control to turn the lighting down or off.
  3. The multi-level lighting control shall permit the automatic daylighting control to adjust the electric lighting level in response to changes in the amount of daylight in the daylit zone.
  4. The multi-level lighting control shall permit the demand responsive control to adjust the lighting during a demand response event and to return it to the level set by the multilevel control after the event.
  5. The shutoff control shall permit the manual area control to turn the lighting on. If the on request occurs while an automatic time switch control would turn the lighting off, then the on request shall be treated as an override request consistent with Section 130.1(c)3.
  6. The automatic daylighting control shall permit the multi-level lighting control to adjust the level of lighting.
  7. For lighting controlled by multi-level lighting controls and by occupant sensing controls that provide an automatic-on function, the controls shall provide a partial-on function that is capable of automatically activating between 50-70 percent of controlled lighting power.

# Demand Responsive Controls

110.12; removed from 130.1(e)

- Demand Response Control: *is an automatic control that is capable of receiving and automatically responding to a demand response signal per Section 100.1*
- Section 110.12 is new and consolidates all Demand Response items; no longer under Section 130.1(e)
- Must be certified **OpenADR 2.0a** or **2.0b Virtual End Node (VEN)**; find at <https://products.openadr.org/>

# Demand Responsive Controls

110.12 cont.

- How do I know if my lighting controls is OpenADR certified?
  - Certified list at <https://products.openadr.org/>; OR
  - Certified by the manufacturer

# Demand Responsive Controls

## Lighting Controls 110.12(c)

- Trigger for this requirement:
  1. Project scope or building > 10,000ft<sup>2</sup>
  2. Spaces  $\leq 0.5\text{W/ft}^2$  do not count toward the 10, 000ft<sup>2</sup>
- If triggered, what shall the lighting control system do?
  1. Demonstrate lighting power reduction by minimum 15% of total installed lighting power; AND
  2. Reduced in a consistent uniform manner per Table 130.1-A; AND
  3. Field tested and verified by a Certified Lighting Controls Acceptance Test Technician (**CLCATT**); Section 130.4

# Controls Exercise #3

## Demand Responsive Controls

- Scope: 100,000ft<sup>2</sup> New Parking Structure/Garage
  - Treat as non-resi indoor space and follows mandatory requirements 130.1
- Do we need to consider demand responsive controls?
  - No, because lighting power allowances are all under 0.5W/ft<sup>2</sup>

Parking Garage Area	Parking Zone	0.10
	Dedicated Ramps	0.25
	Daylight Adaptation Zones <sup>2</sup>	0.50

# Controls Exercise #4

## Demand Responsive Controls

- Scope: 50,000ft<sup>2</sup> Warehouse Building
  - 5,000ft<sup>2</sup> Office Areas > 0.5W/ft<sup>2</sup>)
  - 45,000ft<sup>2</sup> Warehouse Open Areas ≤ 0.5W/ft<sup>2</sup>
- Did we trigger demand responsive controls?
  - No, because we did not exceed 10,000ft<sup>2</sup>
  - Areas ≤ 0.5W/ft<sup>2</sup> do not count toward 10,000ft<sup>2</sup>

# Controls Exercise #5

## Parking Garage

- What are the requirements?

1. Area Controls (switch)
2. Fixtures controlled by HIGH / LOW occupant sensors (500W max per zone)
3. Upper deck follows Exterior Hardscape Requirements

- Best practice:

1. Sensor integrated fixture
2. Make sure EM functions properly; UL924 Shunt Relay? Other options?
3. Wireless controls is best suited for zoning flexibility and labor savings



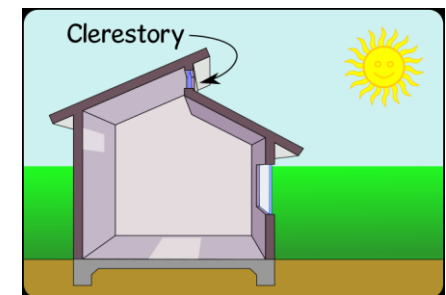
Luminaire with integrated EM UL924 occupant sensor that does HIGH / LOW operation.

Example EM Operation:  
Power interrupt > 30ms forces lights to go HIGH and ignore wireless commands.

# Power Adjustment Factors (PAF)

Table 140.6-A from 140.6

TABLE 140.6-A LIGHTING POWER ADJUSTMENT FACTORS (PAF)		
TYPE OF CONTROL	TYPE OF AREA	FACTOR
<p>a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2</p> <p>b. Only one PAF may be used for each qualifying luminaire unless combined below.</p> <p>c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF</p>		
1. Daylight Dimming plus OFF Control	Luminaires in skylit daylight zone or primary sidelit daylight zone	0.10
2. Occupant Sensing Controls in Large Open Plan Offices	In open plan offices > 250 square feet: One sensor controlling an area that is:	No larger than 125 square feet
		From 126 to 250 square feet
		From 251 to 500 square feet
3 Institutional Tuning	Luminaires in non-daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.	0.10
	Luminaires in daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.	0.05
4. Demand Responsive Control	All building types of 10,000 square feet or smaller. Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF	0.05
5. Clerestory Fenestration	Luminaires in daylit areas adjacent to the clerestory. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.05
6. Horizontal Slats	Luminaires in daylit areas adjacent to vertical fenestration with interior or exterior horizontal slats. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.05
7. Light Shelves	Luminaires in daylit areas adjacent to clerestory fenestration with interior or exterior light shelves. This PAF may be combined with the PAF for clerestory fenestration. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF	0.10





# Outdoor Lighting Controls

## 130.2(c)

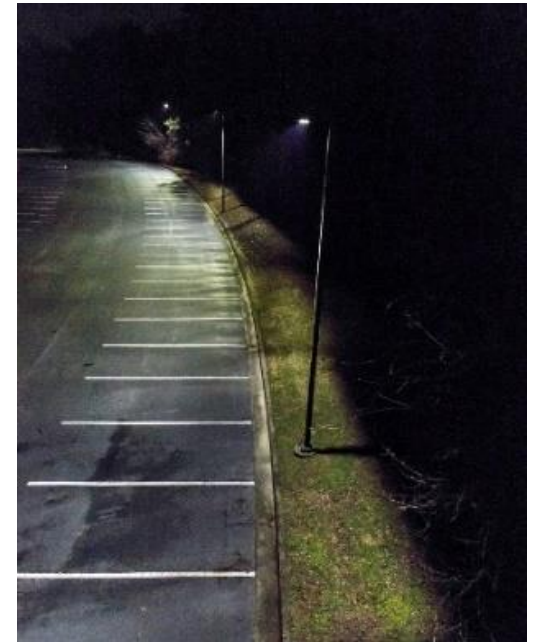
1. Outdoor photocell (not req'd if time clock does astronomical)
2. Time clock for scheduling
  - Capable of reducing power by 50%-90%, and separately turning OFF
  - Demonstrate minimum 2 nighttime periods with independent lighting levels; to be tested by CLCATT per 130.4
3. Motion sensing controls for lights  $\leq 24\text{ft}$ 
  - Capable of reducing power by 50%-90%, and separately turning OFF
  - 15 minutes max of vacancy, must go to dimmed or OFF state (**HIGH / LOW**)
  - Exceptions: **Luminaires  $\leq 40\text{W}$** ; building façade, ornamental, outdoor dining, outdoor sales frontage lighting



# Outdoor Luminaire Cutoff

## Light Pollution Reduction 130.2(b)

- **Outdoor luminaire  $\geq 6,200$  Lumens** shall comply with Backlight, Uplight, and Glare (**B-U-G**) requirements per Title 24, Part 11 (Cal-Green), Section 5.106.8
- Exceptions:
  - Signs, bldg facades, public monuments, statues and vertical surfaces of bridges
  - Not permitted by a health or life statute, ordinance or regulation to be a cutoff luminaire
  - Luminaires that illuminate public right of way on publicly maintained roadways, sidewalks and bikeways



# Outdoor Luminaire Cutoff

## Complying with B-U-G 130.2(b)

- Step 1: Identify the Lighting Zone (**LZ**) of project
- Step 2: Identify the property line with respect to the luminaire
- Step 3: Identify your luminaires B-U-G number based on specification sheet and/or photometric report
- Step 4: Take all 3 data points from above and verify compliance to B-U-G Rating Table 5.106.8

# Outdoor Luminaire Cutoff

## Step 1: Identify the Lighting Zone (LZ)

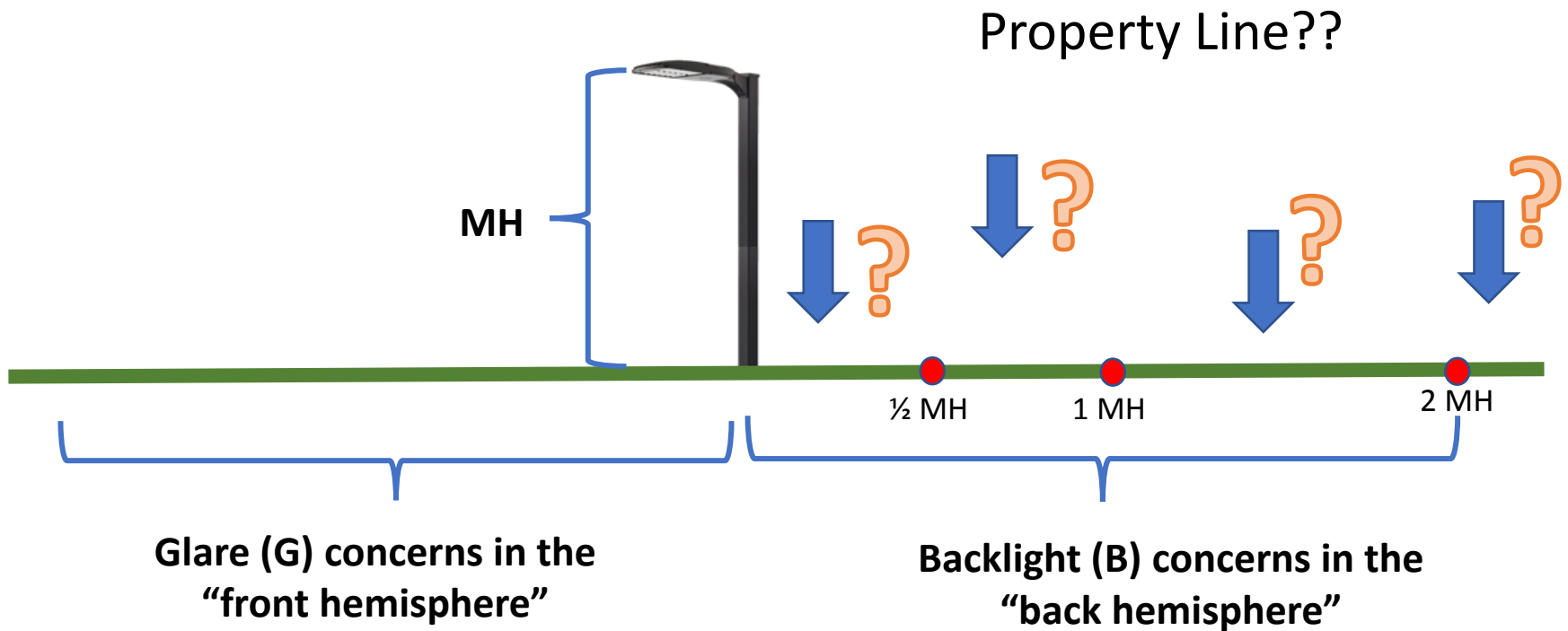
*TABLE 10-114-A LIGHTING ZONE CHARACTERISTICS AND RULES FOR AMENDMENTS BY LOCAL JURISDICTIONS*

Zone	Ambient Illumination	State wide Default Location	Moving Up to Higher Zones	Moving Down to Lower Zones
LZ0	Very Low	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves.	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves can be designated as LZ1 or LZ2 if they are contained within such a zone.	Not applicable
LZ1	Low	Developed portion of government designated parks, recreation areas, and wildlife preserves. Those that are wholly contained within a higher lighting zone may be considered by the local government as part of that lighting zone.	Developed portion of a government designated park, recreation area, or wildlife preserve, can be designated as LZ2 or LZ3 if they are contained within such a zone.	Not applicable.
LZ2	Moderate	Rural areas, as defined by the 2010 U.S. Census.	Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction. Examples include special commercial districts or areas with special security considerations located within a rural area.	Special districts and government designated parks within a default LZ2 zone maybe designated as LZ1 by the local jurisdiction for lower illumination standards, without any size limits.
LZ3	Moderately High	Urban areas, as defined by the 2010 U.S. Census.	Special districts within a default LZ3 may be designated as a LZ4 by local jurisdiction for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.	Special districts and government designated parks within a default LZ3 zone may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.
LZ4	High	None.	Not applicable.	Not applicable.

**NOTE:** Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 25943, Public Resources Code.

# Outdoor Luminaire Cutoff

## Step 2: Property Line



# Outdoor Luminaire Cutoff

## Step 3: Identify Luminaire B-U-G Numbers

### Performance Data

#### Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed. Performance data on any configurations not shown here.

#### Forward Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
30	530	P1	54W	T1S	6,457	2	0	2	120	6,956	2	0	2	129
				T2S	6,450	2	0	2	119	6,949	2	0	2	129
				T2M	6,483	1	0	1	120	6,984	2	0	2	129
				T3S	6,279	2	0	2	116	6,764	2	0	2	125
				T3M	6,468	1	0	2	120	6,967	1	0	2	129
				T4M	6,327	1	0	2	117	6,816	1	0	2	126
				TFTM	6,464	1	0	2	120	6,963	1	0	2	129
				T5VS	6,722	2	0	0	124	7,242	3	0	0	134
				T5S	6,728	2	0	1	125	7,248	2	0	1	134
				T5M	6,711	3	0	1	124	7,229	3	0	1	134
				T5W	6,667	3	0	2	123	7,182	3	0	2	133
				BLC	5,299	1	0	1	98	5,709	1	0	2	106
				LCCO	3,943	1	0	2	73	4,248	1	0	2	79
				RCCO	3,943	1	0	2	73	4,248	1	0	2	79
				T1S	8,249	2	0	2	118	8,886	2	0	2	127
				T2S	8,240	2	0	2	118	8,877	2	0	2	127
				T2M	8,283	2	0	2	118	8,923	2	0	2	127
				T3S	8,021	2	0	2	115	8,641	2	0	2	123
				T3M	8,263	2	0	2	118	8,901	2	0	2	127
				T4M	8,083	2	0	2	115	8,708	2	0	2	124

# Outdoor Luminaire Cutoff

## Step 4: Check Table

TABLE 5.106.8 [N]  
MAXIMUM ALLOWABLE BACKLIGHT, UPLIGHT AND GLARE (BUG) RATINGS<sup>1,2</sup>

ALLOWABLE RATING	LIGHTING ZONE LZ0	LIGHTING ZONE LZ1	LIGHTING ZONE LZ2	LIGHTING ZONE LZ3	LIGHTING ZONE LZ4
<b>Maximum Allowable Backlight Rating<sup>3</sup> (B)</b>					
Luminaire greater than 2 mounting heights (MH) from property line	N/A	No Limit	No Limit	No Limit	No Limit
Luminaire back hemisphere is 1 – 2 MH from property line	N/A	B2	B3	B4	B4
Luminaire back hemisphere is 0.5 – 1 MH from property line	N/A	B1	B2	B3	B3
Luminaire back hemisphere is less than 0.5 MH from property line	N/A	B0	B0	B1	B2
<b>Maximum Allowable Uplight Rating (U)</b>					
For area lighting <sup>4</sup>	N/A	U0	U0	U0	U0
For all other outdoor lighting, including decorative luminaires	N/A	U1	U2	U3	U4
<b>Maximum Allowable Glare Rating<sup>5</sup> (G)</b>					
Luminaire greater than 2 MH from property line	N/A	G1	G2	G3	G4
Luminaire front hemisphere is 1 – 2 MH from property line	N/A	G0	G1	G1	G2
Luminaire front hemisphere is 0.5 – 1 MH from property line	N/A	G0	G0	G1	G1
Luminaire front hemisphere is less than 0.5 MH from property line	N/A	G0	G0	G0	G1

1. IESNA Lighting Zones 0 are not applicable; refer to Lighting Zones as defined in the *California Energy Code* and Chapter 10 of the *California Administrative Code*.
2. For property lines that abut public walkways, bikeways, plazas and parking lots, the property line may be considered to be 5 feet beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
3. If the nearest property line is less than or equal to two mounting heights from the back hemisphere of the luminaire distribution, the applicable reduced Backlight rating shall be met.
4. General lighting luminaires in areas such as outdoor parking, sales or storage lots shall meet these reduced ratings. Decorative luminaires located in these areas shall meet *U*-value limits for "all other outdoor lighting."
5. If the nearest property line is less than or equal to two mounting heights from the front hemisphere of the luminaire distribution, the applicable reduced Glare rating shall be met.

# General Hardscape Ltg Allowance

140.7

- LPDs reduced by **15% to 38%**
- Specific lighting application power reduced on average by **50%**



# Outdoor LPA

## Reference for Table 140.7-A

**TABLE 140.7-A GENERAL HARDSCAPE LIGHTING POWER ALLOWANCE**

Type of Power Allowance	Lighting Zone 0 <sup>3</sup>	Lighting Zone 1 <sup>3</sup>	Lighting Zone 2 <sup>3</sup>		Lighting Zone 3 <sup>3</sup>		Lighting Zone 4 <sup>3</sup>
	Asphalt/Concrete	Asphalt/Concrete	Asphalt	Concrete <sup>2</sup>	Asphalt	Concrete <sup>2</sup>	Asphalt/Concrete
Area Wattage Allowance (AWA)	No allowance <sup>1</sup>	0.018 W/ft <sup>2</sup>	0.023 W/ft <sup>2</sup>	0.025 W/ft <sup>2</sup>	0.025 W/ft <sup>2</sup>	0.03 W/ft <sup>2</sup>	0.03 W/ft <sup>2</sup>
Linear Wattage Allowance (LWA)		0.15 W/lf	0.17 W/lf	0.4 W/lf	0.25 W/lf	0.4 W/lf	0.35 W/lf
Initial Wattage Allowance (IWA)		180 W	250 W	250 W	350 W	350 W	400 W

<sup>1</sup>Continuous lighting is explicitly prohibited in Lighting Zone 0. A single luminaire of 15 Watts or less may be installed at an entrance to a parking area, trail head, fee payment kiosk, outhouse, or toilet facility, as required to provide safe navigation of the site infrastructure. Luminaires installed shall meet the maximum zonal lumen limits as specified in Section 130.2(b).

<sup>2</sup>Where greater than 50% of the paved surface of a parking lot is finished with concrete. This does not extend beyond the parking lot, and does not include any other General Hardscape areas.

<sup>3</sup>Narrow band spectrum light sources with a dominant peak wavelength greater than 580 nm – as mandated by local, state, or federal agencies to minimize the impact on local, active professional astronomy or nocturnal habitat of specific local fauna – shall be allowed a 2.0 lighting power allowance multiplier.

# Outdoor LPA

## Reference for Table 140.7-B

**TABLE 140.7-B ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS**

*All area and distance measurements in plan view unless otherwise noted.*

Lighting Application	Lighting Zone 0	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
	WATTAGE ALLOWANCE PER APPLICATION. Use all that apply as appropriate.				
Building Entrances or Exits. Allowance per door. Luminaires qualifying for this allowance shall be within 20 feet of the door.	Not applicable	9 watts	15 watts	19 watts	21 watts
Primary Entrances to Senior Care Facilities, Police Stations, Healthcare Facilities, Fire Stations, and Emergency Vehicle Facilities. Allowance per primary entrance(s) only. Primary entrances shall provide access for the general public and shall not be used exclusively for staff or service personnel. This allowance shall be in addition to the building entrance or exit allowance above. Luminaires qualifying for this allowance shall be within 100 feet of the primary entrance.	Not applicable	20 watts	40 watts	57 watts	60 watts
Drive Up Windows. Allowance per customer service location. Luminaires qualifying for this allowance shall be within 2 mounting heights of the sill of the window.	Not applicable	16 watts	30 watts	50 watts	75 watts
Vehicle Service Station Uncovered Fuel Dispenser. Allowance per fueling dispenser. Luminaires qualifying for this allowance shall be within 2 mounting heights of the dispenser.	Not applicable	55 watts	77 watts	81 watts	135 watts
ATM Machine Lighting. Allowance per ATM machine. Luminaires qualifying for this allowance shall be within 50 feet of the dispenser.	Not applicable	100 watts for first ATM machine, 35 watts for each additional ATM machine.			
	WATTAGE ALLOWANCE PER UNIT LENGTH (w/linear ft). May be used for one or two frontage side(s) per site.				
Outdoor Sales Frontage. Allowance for frontage immediately adjacent to the principal viewing location(s) and unobstructed for its viewing length. A corner sales lot may include two adjacent sides provided that a different principal viewing location exists for each side. Luminaires qualifying for this allowance shall be located between the principal viewing location and the frontage outdoor sales area.	Not applicable	No Allowance	11 W/linear ft	19 W/linear ft	25 W/linear ft

# Outdoor LPA

## Reference for Table 140.7-B cont.

WATTAGE ALLOWANCE PER HARDSCAPE AREA (W/ft <sup>2</sup> ). May be used for any illuminated hardscape area on the site.					
<b>Hardscape Ornamental Lighting.</b> Allowance for the total site illuminated hardscape area. Luminaires qualifying for this allowance shall be rated for 100 watts or less as determined in accordance with Section 130.0(d), and shall be post-top luminaires, lanterns, pendant luminaires, or chandeliers.	Not applicable	No Allowance	0.007 W/ft <sup>2</sup>	0.013 W/ft <sup>2</sup>	0.019 W/ft <sup>2</sup>
WATTAGE ALLOWANCE PER SPECIFIC AREA (W/ft <sup>2</sup> ). Use as appropriate provided that none of the following specific applications shall be used for the same area.					
<b>Building Facades.</b> Only areas of building façade that are illuminated shall qualify for this allowance. Luminaires qualifying for this allowance shall be aimed at the façade and shall be capable of illuminating it without obstruction or interference by permanent building features or other objects.	Not applicable	No Allowance	0.100 W/ft <sup>2</sup>	0.170 W/ft <sup>2</sup>	0.225 W/ft <sup>2</sup>
<b>Outdoor Sales Lots.</b> Allowance for uncovered sales lots used exclusively for the display of vehicles or other merchandise for sale. Driveways, parking lots or other non sales areas shall be considered hardscape areas even if these areas are completely surrounded by sales lot on all sides. Luminaires qualifying for this allowance shall be within 5 mounting heights of the sales lot area.	Not applicable	0.060 W/ft <sup>2</sup>	0.210 W/ft <sup>2</sup>	0.280 W/ft <sup>2</sup>	0.485 W/ft <sup>2</sup>
<b>Vehicle Service Station Hardscape.</b> Allowance for the total illuminated hardscape area less area of buildings, under canopies, off property, or obstructed by signs or structures. Luminaires qualifying for this allowance shall be illuminating the hardscape area and shall not be within a building, below a canopy, beyond property lines, or obstructed by a sign or other structure.	Not applicable	0.006 W/ft <sup>2</sup>	0.068 W/ft <sup>2</sup>	0.138 W/ft <sup>2</sup>	0.200 W/ft <sup>2</sup>
<b>Vehicle Service Station Canopies.</b> Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy.	Not applicable	0.220 W/ft <sup>2</sup>	0.430 W/ft <sup>2</sup>	0.580 W/ft <sup>2</sup>	1.010 W/ft <sup>2</sup>
<b>Sales Canopies.</b> Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy.	Not applicable	No Allowance	0.470 W/ft <sup>2</sup>	0.622 W/ft <sup>2</sup>	0.740 W/ft <sup>2</sup>
<b>Non-sales Canopies and Tunnels.</b> Allowance for the total area within the drip line of the canopy or inside the tunnel. Luminaires qualifying for this allowance shall be located under the canopy or tunnel.	Not applicable	0.057 W/ft <sup>2</sup>	0.137 W/ft <sup>2</sup>	0.270 W/ft <sup>2</sup>	0.370 W/ft <sup>2</sup>

# Outdoor LPA

Reference for Table 140.7-B cont.

<b>Guard Stations.</b> Allowance up to 1,000 square feet per vehicle lane. Guard stations provide access to secure areas controlled by security personnel who stop and may inspect vehicles and vehicle occupants, including identification, documentation, vehicle license plates, and vehicle contents. Qualifying luminaires shall be within 2 mounting heights of a vehicle lane or the guardhouse.	Not applicable	0.081 W/ft <sup>2</sup>	0.176 W/ft <sup>2</sup>	0.325 W/ft <sup>2</sup>	0.425 W/ft <sup>2</sup>
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# Outdoor LPA

## Reference for Table 140.7-B cont.

*CONTINUED: TABLE 140.7-B ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS*

*All area and distance measurements in plan view unless otherwise noted.*

Lighting Application		Lighting Zone 0	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
	<b>Student Pick-up/Drop-off zone.</b> Allowance for the area of the student pick-up/drop-off zone, with or without canopy, for preschool through 12th grade school campuses. A student pick-up/drop off zone is a curbside, controlled traffic area on a school campus where students are picked-up and dropped off from vehicles. The allowed area shall be the smaller of the actual width or 25 feet, times the smaller of the actual length or 250 feet. Qualifying luminaires shall be within 2 mounting heights of the student pick-up/drop-off zone.	Not applicable	No Allowance	0.056 W/ft <sup>2</sup>	0.200 W/ft <sup>2</sup>	No Allowance
	<b>Outdoor Dining.</b> Allowance for the total illuminated hardscape of outdoor dining. Outdoor dining areas are hardscape areas used to serve and consume food and beverages. Qualifying luminaires shall be within 2 mounting heights of the hardscape area of outdoor dining.	Not applicable	0.004 W/ft <sup>2</sup>	0.030 W/ft <sup>2</sup>	0.050 W/ft <sup>2</sup>	0.075 W/ft <sup>2</sup>
	<b>Special Security Lighting for Retail Parking and Pedestrian Hardscape.</b> This additional allowance is for illuminated retail parking and pedestrian hardscape identified as having special security needs. This allowance shall be in addition to the building entrance or exit allowance.	Not applicable	0.004 W/ft <sup>2</sup>	0.005 W/ft <sup>2</sup>	0.010 W/ft <sup>2</sup>	No Allowance

## 3. Residential Changes



# High Efficacy Requirement

150.0(k)

- ALL Resi Luminaires MUST be high efficacy

TABLE 150.0-A CLASSIFICATION OF HIGH EFFICACY LIGHT SOURCES

High Efficacy Light Sources	
Light sources shall comply with one of the columns below:	
<p>Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are <b>not</b> required to comply with Reference Joint Appendix JA8</p> <ol style="list-style-type: none"><li>1. Pin-based linear fluorescent or compact fluorescent light sources using electronic ballasts.</li><li>2. Pulse-start metal halide light sources.</li><li>3. High pressure sodium light sources.</li><li>4. Luminaires with hardwired high frequency generator and induction lamp.</li><li>5. LED light sources installed outdoors.</li><li>6. Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting.</li></ol>	<p>Light sources in this column are only considered to be high efficacy if they are certified to the Commission as High Efficacy Light Sources in accordance with Reference Joint Appendix JA8 and marked as required by JA8.</p> <ol style="list-style-type: none"><li>8. All light sources installed in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw bases regardless of lamp type as described in Section 150.0(k)1C.</li><li>9. Any light source not otherwise listed in this table.</li></ol>

**CLASSIFIED HIGH EFFICACY**

**NEEDS TO BE JA8 COMPLIANT TO BE HIGH EFFICACY**

# Is it JA8 Compliant?

150.0(k)

- Two things inspectors check for:

1. Certified to CEC; check database:

<https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx>

2. Luminaire/Lamp shall be clearly labeled/marked “JA8-2019”  
(JA8-2016 label accepted)



# Resi Reminder: Indoor

## 150.0(k)2

- Manual ON/OFF switch
  - Readily accessible and wall-mounted
- Vacancy sensor [at least 1 luminaire] required for:
  - Bathroom, Garage, Laundry Rm, Utility Rm
- All other spaces:
  - Dimmer switch (for JA8 luminaires; complies with NEMA SSL 7A)
  - Exceptions: Closets less than 70sqft, Hallways
- Recessed downlights shall NOT contain screw base sockets
- Exhaust fans controlled separately from lighting



# Resi Reminder: Outdoor

150.0(k)3 ... In addition to high efficacy requirement

- Single-family
  - Controlled by manual ON/OFF switch **AND** one of the choices below:
    1. Photocell and motion sensor
    2. Photocell and automatic time switch
    3. Astronomical time clock
- Low-rise (dwelling units  $\geq 4$ )
  - Parking  $< 8$ 
    1. Do same as as above (Single-family resi requirement) **OR**
    2. Follow non-resi requirements (Section 130.2)
  - Parking  $\geq 8$ 
    1. Follow non-resi requirements (Section 130.2)

# Resi Reminder: Parking Garage, Vehicles $\geq 8$

150.0(k)5

- Follow non-resi parking garage requirements
- Manual ON/OFF switch
- HIGH/LOW Motion Sensors

# Resi Reminder: Common Areas

## Low-rise Multi-Family Building 150.0(k)6

- If total interior COMMON AREA  $\leq$  20% of floor area
  1. Comply with High Efficacy requirement (JA8)
  2. Controlled by occupant sensor
- If total interior COMMON AREA  $>$  20% of floor area
  1. Comply with non-resi requirements

# Resi Code Still Applies Here ...

130.0 & 150.0

1. High rise dwelling units
2. Hotel/Motel guest rooms
3. Fire station dwelling areas
4. Dormitory and senior housing dwelling areas
5. Outdoor lighting attached to high-rise resi bldg or hotel/motel bldg and separately controlled from inside of dwelling unit

## 4. Alteration Changes

# Interior Lighting Alterations

## Nonresi Interior 141.0

- Triggered if 10% or more of luminaires within an enclosed space altered
- Controls depend on path to compliance: i, ii or iii

i. Path i meets LPD allowance

ii. Path ii beats LPD allowance by 20%

iii. Path iii beats existing lighting wattage by 40% (for bldg or tenant spaces  $\leq 5,000$ sqft)

Table 141.0-F – Control Requirements for Indoor Lighting System Alterations

Control Specifications		Projects complying with Section 141.0(b)2Ii	Projects complying with Sections 141.0(b)2Iii and 141.0(b)2Iiii
Manual Area Controls	130.1(a)1	Required	Required
	130.1(a)2	Required	Required
	130.1(a)3	Only required for new or completely replaced circuits	Only required for new or completely replaced circuits
Multi-Level Controls	130.1(b)	Required	Not Required
Automatic Shut Off Controls	130.1(c)1	Required; 130.1(c)1D only required for new or completely replaced circuits	Required; 130.1(c)1D only required for new or completely replaced circuits
	130.1(c)2	Required	Required
	130.1(c)3	Required	Required
	130.1(c)4	Required	Required
	130.1(c)5	Required	Required
	130.1(c)6	Required	Required
	130.1(c)7	Required	Required
	130.1(c)8	Required	Required
Daylighting Controls	130.1(d)	Required	Not Required
Demand Responsive Controls	130.1(e)	Required	Not Required

# Interior Lighting Alt. Exceptions

## Nonresi Interior Section 141.0(b)2I

the control separation requirements of Section 130.1(a)4 and 130.1(c)1D.

**EXCEPTION 1 to Section 141.0(b)2I.** Alteration of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded as specified in Section 140.6(a)3.

**EXCEPTION 2 to Section 141.0(b)2I.** Any enclosed space with only one luminaire.

**EXCEPTION 3 to Section 141.0(b)2I.** Any alteration that would directly cause the disturbance of asbestos, unless the alteration is made in conjunction with asbestos abatement.

**EXCEPTION 4 to Section 141.0(b)2I.** Acceptance testing requirements of Section 130.4 are not required for alterations where lighting controls are added to control 20 or fewer luminaires.

**EXCEPTION 5 to Section 141.0(b)2I.** Any alteration limited to adding lighting controls or replacing lamps, ballasts, or drivers.

**EXCEPTION 6 to Section 141.0(b)2I.** One-for-one luminaire alteration of up to 50 luminaires either per complete floor of the building or per complete tenant space, per annum.

J. Reserved.



# Outdoor Ltg Alteration Triggers

## Nonresi Outdoor 141.0

Alterations to existing outdoor lighting must comply with 130.0, 130.2(a), 130.2(b), 130.4; **AND**

1. Alterations that increase connected lighting load must meet 130.2(c) and 140.7; **AND**
2. Alterations that do not increase connected lighting load, where the greater of 5 luminaires or 10% of existing luminaires that are altered:
  - a. Parking Lots & Outdoor Sales Lots Luminaires  $\leq$  24ft must meet 130.2(c)1 and 130.2(c)3
  - b. Other Luminaires  $>$  24ft must meet 130.2(c)1 and one of the following:
    - A. 130.2(c)2
    - B. 130.2(c)3; **AND**
3. Alterations that do not increase connected lighting load, where the greater of 5 luminaires or 50% of existing luminaires that are altered must meet 140.7 and:
  - a. Same as #2 above

\*Exception to 3a: Alterations  $\geq$  40% reduced power consumption can disregard 140.7

# Outdoor Ltg Alteration Triggers

## Nonresi Outdoor 141.0 cont.

- Exception to 141.0(b)2L: Acceptance testing per 130.4 not required for alterations  $\leq 20$  luminaires
- Quick Code Section Reference:
  - 130.0: Lighting Systems & Equipment
  - 130.2(a): Reserved or N/A
  - 130.2(b): Luminaire Cutoff Requirement (Backlight, Uplight, Glare)
  - 130.2(c)1: Outdoor Lighting Controls (daylight photo control)
  - 130.2(c)2: Outdoor Lighting Controls (auto scheduling via time clock)
  - 130.2(c)3: Outdoor Lighting Controls (motion sensing controls)
  - 130.4: Lighting Control Acceptance & Installation Certificate Requirements
  - 140.7: Prescriptive Requirements for Outdoor Lighting (Allowances)

# Q&A