

SECTION 146 – PRESCRIPTIVE REQUIREMENTS FOR INDOOR LIGHTING¹

A building complies with this section if the actual lighting power density calculated under Subsection (a) is no greater than the allowed indoor lighting power calculated under Subsection (b).

(a) **Calculation of Actual Indoor Lighting Power Density.** The actual indoor lighting power of the proposed building area is the total watts of all planned permanent and portable lighting systems; ~~including but not limited to, track and flexible lighting systems, lighting that is integral with modular furniture, workstation task lights, portable freestanding lights, lights attached to workstation panels, movable displays and cabinets, and internally illuminated case work for task or display purposes;~~; subject to the following specific requirements and adjustments under Subsections 1 through 6. For office areas where there is less than 0.6 watts per square foot of permanently installed lighting power, all permanent and portable lighting systems and the designed illumination levels shall be documented.²

~~1. In office areas, if the actual watts of portable lighting are not known at the time of permitting, the actual lighting power for portable and integral lighting shall be determined using either A or B following. However, upon installation of the portable lighting systems the building official may require resubmittal of compliance documentation using installed lighting and equipment data.~~

~~A. In office areas greater than 250 square feet with permanently installed lighting systems, a portable lighting power of 0.2 watts per square foot shall be included in calculation of actual lighting power density.~~

~~B. In office areas of 250 square feet or less, no additional task lighting power will be required in the calculation of actual lighting power.~~

~~2. In office areas greater than 250 square feet with permanently installed lighting systems, if sufficient supporting evidence is submitted and accepted by the building official, the actual lighting power for portable lighting shall be included in the calculation of actual lighting power. The individual signing the lighting plans, pursuant to Division 3 of the California Business and Professions Code, shall clearly indicate on the plans the actual lighting power for the portable lighting systems in the area.~~

~~3. **Multiple interlocked lighting systems serving a space.** When multiple interlocked lighting systems serve a space, the watts of all systems except the system with the highest wattage may be excluded if:~~³

~~A. The lighting systems are interlocked to prevent simultaneous operation; or~~

~~B. The lighting systems are controlled by a preset dimming system or other device that prevents simultaneous operation of more than one lighting system, except under the direct control of authorized personnel.~~

~~4.1. **Reduction of wattage through controls.**~~⁴ The controlled watts of any luminaire may be reduced by the number of controlled watts times the applicable factor from ~~TABLE 146-A~~ TABLE 146-C if:

~~A. The control complies with Section 119; and~~

~~B. At least 50 percent of the light output of the luminaire is within the applicable space listed in ~~TABLE 146-A~~ TABLE 146-C; and~~

~~C. Except as noted in ~~TABLE 146-A~~ TABLE 146-C, only one power adjustment factor is used for the luminaire; and~~

~~D. For~~ Occupant sensors used to qualify for the Power Adjustment Factor in ~~small offices~~ any space less than or⁵ equal to 250 square feet enclosed by floor-to-ceiling partitions or any size classroom, corridor, conference or waiting room, the occupant sensor shall be controlled by a multi-level occupant sensors meeting Section 119(e), have an automatic OFF function that turns off all the lights, either an automatic or a manually controlled ON function, and have wiring capabilities so that each switch function activates a portion of the lights. The occupant sensor The multi-level occupancy sensor shall be installed to meet all the multi-level and uniformity requirements of Section 131-(b) for the controlled lighting. The first stage shall activate between ~~50~~ 30-70%⁶ of the lights in a room either through an automatic or manual action. After that event occurs any of the following actions shall be assigned to occur when manually called to do so by the occupant:

i. Activating the alternate set of lights.

ii. Activating 100% of the lights.

iii. Deactivating all lights.

E. For daylighting control ~~credits~~ Power Adjustment Factors (PAFs)⁷, the luminaire(s) ~~is~~shall be controlled by the daylighting control(s) as described in Section 131(c) and as described below in Section 146(a)(1)(E)(i through iii), and at least 50 percent of the luminaire is~~shall be~~ located within the daylight area. Daylight controls shall not control lamps that are outside of the daylight area (skylit, primary sidelit, and/or secondary sidelit daylight areas). PAFs shall not be available for daylighting controls required by §131(c). The power adjustment factor is a function of the lighting power density of the general lighting in the space and the effective aperture of the skylights determined using Equation 146-A.

i. **Power Adjustment Factor for controlling Primary Sidelit Daylight Areas:**

The PAF for the primary sidelit daylight areas shall be used only if the daylighting control is separately controlling lighting within the primary sidelit daylight area. If lighting in the primary sidelit area is controlled together with lighting in the secondary sidelit area, the PAF for the secondary sidelit area in accordance with Section 146(a)(1)(E)(ii) shall be used. The PAF is a function of the effective aperture of the primary sidelit daylight area in accordance with Equation 146-A.

EQUATION 146-A – EFFECTIVE APERTURE OF THE PRIMARY SIDELIT AREA

$$\text{Primary Sidelit Effective Aperture} = \frac{\sum \text{Window Area} \times VT}{\text{Primary Sidelit Daylight Area}}$$

where,

Window Area = rough opening of windows adjacent to the sidelit area, ft²

Window VT = visible light transmittance of window, no units

Primary Sidelit Daylight Area = see §101-

ii. **Power Adjustment Factor for controlling secondary sidelit areas:**

To qualify for the secondary sidelit daylight area PAF, the lighting in the secondary sidelit daylight area, or the lighting in the combined primary and secondary sidelit areas shall be controlled separately from lighting outside of these sidelit areas. The PAF is a function of the effective aperture of the secondary sidelit area in accordance with Equation 146-B.

EQUATION 146-B – EFFECTIVE APERTURE OF THE SECONDARY SIDELIT AREA

$$\text{Secondary Sidelit Effective Aperture} = \frac{\sum \text{Window Area} \times VT}{\text{Secondary Sidelit Daylight Area} + \text{Primary Sidelit Daylight Area}}$$

where,

Window Area = rough opening of windows adjacent to the sidelit area, ft²

Window VT = visible light transmittance of window, no units

Primary Sidelit Daylight Area = -see §101

Secondary Sidelit Daylight Area = see §101.

iii. **Power Adjustment Factor for controlling skylit areas.**

The PAF is a function of the lighting power density of the general lighting in the space and the effective aperture of the skylights shall be determined in accordance with Equation 146-C.

EQUATION 146-C – EFFECTIVE APERTURE OF SKYLIGHTS

$$\text{Skylit Effective Aperture} = \frac{0.85 \times \sum \text{Skylight Area} \times \text{VT} \times \text{Well Efficiency}}{\text{Skylit Daylight Area}}$$

~~E. Equation 146 CA – Effective Aperture OF Skylights~~

where,

Skylight Area = the area of each individual skylight

VT = Total skylight area is the sum of skylight areas above the space. The skylight area is defined as the rough opening of the skylight.

Glazing visible light transmittance is the ratio of visible light that is transmitted through a glazing material to the light that is incident on the material. ~~This~~ The VT shall include all skylighting system accessories including diffusers, louvers and other attachments that impact the diffusion of skylight into the space. The visible light transmittance of movable accessories shall be rated in the full open position. When the visible light transmittance of glazing and accessories are rated separately, the overall glazing transmittance is the product of the visible light transmittances of the glazings and accessories.

~~Daylight area under skylights is as defined in Section 131(e).~~

Well Efficiency ~~is~~ the ratio of the amount of visible light leaving a skylight well to the amount of visible light entering the skylight well. Well Efficiency ~~and~~ shall be determined from ~~the nomograph in FIGURE 146-A Equation 146 F or Table 146-B for specular and tubular light wells and from Table 146-A for all other light wells,~~ based on the weighted average reflectance of the walls of the well and the ~~well cavity ratio (WCR) geometry of the light well,~~ or other test method approved by the Commission.

The well efficiency for non-specular or non-tubular light wells is based on the average weighted reflectance of the walls of the light well and the well cavity ratio. The well cavity ratio (WCR) is determined by the geometry of the skylight well and shall be determined using either Equation 146-~~B-D~~ or Equation 146-~~CE~~.

EQUATION 146-B-D WELL CAVITY RATIO FOR RECTANGULAR WELLS

$$\text{WCR} = \left(\frac{5 \times \text{well height} (\text{well length} + \text{well width})}{\text{well length} \times \text{well width}} \right); \text{ or}$$

EQUATION 146-CE WELL CAVITY RATIO FOR NON-RECTANGULAR-SHAPED WELLS:

$$\text{WCR} = \left(\frac{2.5 \times \text{well height} \times \text{well perimeter}}{\text{well area}} \right)$$

Where the ~~length, width, well~~ perimeter and well, ~~and~~ area are measured at the bottom of the well.

EQUATION 146-F WELL EFFICIENCY FOR SPECULAR TUBULAR LIGHT WELLS:

$$WE_{Tube} = \rho \left(2.2 * \frac{L}{D} \right)$$

where,

ρ = specular reflectance of interior light well wall

L/D = ratio of light well length to light well interior diameter

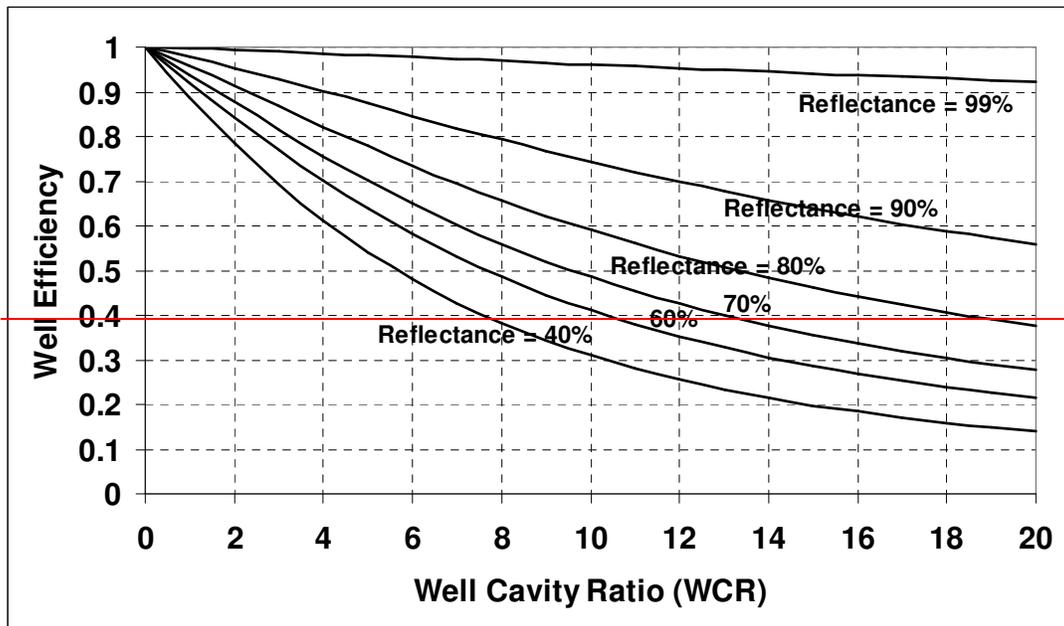


FIGURE 146-A WELL EFFICIENCY NOMOGRAPH

52. **Lighting wattage excluded.** The watts of the following lighting applications may be excluded from ~~the actual lighting power of the building~~ Section 146(b):⁸

- A. In theme parks: lighting for themes and special effects;
- B. Studio Lighting for film, ~~video~~ or photography ~~studios~~ provided that these lighting systems are separately switched from a general lighting system;
- C. Lighting for dance floors, ~~and~~ lighting for theatrical and other live performances, ~~and theatrical lighting used for religious worship~~⁹, provided that these lighting systems are additions to a general lighting system and are controlled by a multiscene or theatrical cross-fade control station accessible only to authorized operators;
- D. In civic facilities, transportation facilities, convention centers, and hotel function areas: lighting for temporary exhibits, if the lighting is an addition to a general lighting system and is separately controlled from a panel accessible only to authorized operators;
- E. Lighting installed by the manufacturer in refrigerated cases, walk-in freezers, vending machines, food preparation equipment, and scientific and industrial equipment.;

- F. In medical and clinical buildings: examination and surgical lights, low-level night-lights, and lighting integral to medical equipment, provided that these lighting systems are additions to and separately switched from a general lighting system;¹⁰
- G. Lighting for plant growth or maintenance, if it ~~is equipped with an automatic 24 hour time switch that has program backup capabilities that prevent the loss of the switch's program and time setting for at least 10 hours if power is interrupted~~ controlled by a multi-level astronomical time-switch control that complies with Section 119(h);
- H. Lighting equipment that is for sale if it is controlled by a multi-level astronomical time-switch control that complies with Section 119(h);
- I. Lighting demonstration equipment in lighting education facilities;
- J. Lighting that is required for exit signs subject to the CBC ~~if it has a maximum lamp input power rating of five watts per illuminated face~~ Exit signs shall meet the requirements of the Appliance Efficiency Regulations.
- K. Exitway or egress illumination that is normally off and that is subject to the CBC;
- L. In hotel/motel buildings: lighting in guestrooms (lighting in hotel/motel guestrooms shall comply with Section 150(k));
- M. In high-rise residential buildings: lighting in ~~living quarters~~ dwelling units (lighting in high-rise residential dwelling units shall comply with Section 150(k));
- N. Temporary lighting systems;
- O. Lighting in occupancy group U buildings less than 1000 square feet;
- P. Lighting in unconditioned agricultural buildings less than 2500 square feet;
- Q. Lighting systems in qualified historic buildings, as defined in the State Historic Building Code (Title 24, Part 8), are exempt from the lighting power allowances, if they consist solely of historic lighting components or replicas of historic lighting components. If lighting systems in qualified buildings contain some historic lighting components or replicas of historic components, combined with other lighting components, only those historic or historic replica components are exempt. All other lighting systems in qualified historic buildings shall comply with the lighting power allowances;
- R. Lighting in Pparking garages for seven or less vehicles;¹¹
- S. Lighting for Internally illuminated, externally illuminated, and unfiltered signs.(Signs shall comply with Section 148).¹²
- T. Lighting in a videoconferencing studio: Up to 2.5 watts per square foot of lighting in a videoconferencing studio provided the lighting is in addition to and separately switched from a general lighting system, and the video conferencing studio has permanently installed videoconferencing cameras, audio equipment, and playback equipment.
- U. Lighting for automatic teller machines that are located inside parking garages.¹³

63. **Lighting fixtures****Luminaire Power.**¹⁴ The watts of track and other lighting fixtures that allow the substitution of low efficacy sources for high efficacy sources without altering the wiring of the fixture shall be determined in accordance with Section 130 (ee) or by a method approved by the commission.

(b) **Calculation of Allowed Indoor Lighting Power Density.** The allowed indoor lighting power density for each application for a building permit shall be calculated using one and only one of the methods in Subsection 1, 2, or 3, as applicable, except as noted in Section 146 (b) 3. The allowed indoor lighting power density for conditioned and unconditioned spaces shall be separate allotments, which shall be met separately without tradeoffs between the separate allotments.

1. **Complete Building Method.** The Complete Building Method shall be used only on projects involving entire buildings with one type of use occupancy or mixed occupancy buildings where one type of use occupancy makes up 90 percent of the entire building. This approach shall only be used when the applicant is applying for a lighting permit for, and submits plans and specifications for, the entire building. Under this approach, the allowed lighting

power density is the lighting power density value in TABLE 146-E times the floor area of the entire building. Retail and wholesale stores, Hotel/hotel/motel, and high-rise residential buildings shall not use this method. ~~The retail and wholesale store type of use lighting power allowance shall be used only for single tenant retail and wholesale buildings, or for buildings with multiple tenants if it is known at the time of permit application that the buildings will be entirely made up of retail and wholesale stores. Retail and wholesale store buildings shall use this method only if the merchandise sales function area is 70% or greater of the building area.~~¹⁵

2. **Area Category Method.** Under the Area Category Method, the total allowed lighting power for the building is the sum of all allowed lighting powers for all areas in the building. For purposes of the Area Category Method, an "area" shall be defined as all contiguous spaces which accommodate or are associated with a single one of the primary functions listed in TABLE 146-F. Where areas are bounded or separated by interior partitions, the floor space occupied by those interior partitions shall be included in any area. If at the time of permitting a tenant is not identified for a multi-tenant space, the tenant leased space allowance from TABLE 146-F shall be used. When the Area Category Method is used to calculate the allowed total lighting power for an entire building, main entry lobbies, corridors, restrooms, and support functions shall be treated as separate areas.
3. **Tailored Method.** The Tailored Method shall only be used for spaces whose combined area does not exceed 30 percent of the building that is otherwise using the Area Category Method. The Tailored Method and the Area Category method shall not be used for the same floor area. The floor area for calculations based on the Tailored Method shall be subtracted from the floor area for the remainder of the building lighting calculations. Trade-offs of lighting power between the Tailored Method and Area Category Methods are not allowed.

EXCEPTION 1 TO 146 (b) 3. The Tailored Method may be used for up to 100% of the entire building area of Retail Merchandise Sales and Museums.¹⁶

EXCEPTION 2 TO 146 (b) 3. If a single function area within the building exceeds 30 percent of the floor area of the entire building, the Tailored Method may be used for that entire function area alone, with the remaining spaces using the Area Category Method.

Under the Tailored Method, the allowed indoor lighting power shall be calculated according to primary function type as permitted in column 1 of TABLE 146-G.

- A. For all spaces, determine the general lighting allowance according to Sections 146 (b) 3 A i through vi.
 - i. If a specific IESNA Illuminance Category is listed in Column 2 of TABLE 146-G, then such illuminance Category shall be used. Otherwise, determine the category for each lighting task according to categories specified in the IESNA Lighting Handbook (IESNA HB), using the "Design Guide" for illuminance. It is permissible to have more than one task type in a space. For spaces employing tasks E, F, or G, submit plans under Section 10-103 of Title 24, Part 1 clearly identifying all task spaces for such categories and the lighting equipment designed to illuminate them. Tasks that are performed less than two hours a day, or poor quality tasks that can be improved shall not be employed to justify use of E, F, or G.
 - ii. Determine the area of each task. Areas without tasks shall be identified as non-task. The total of all task areas and non-task areas shall be equal to the area of the space.
 - iii. Determine the room cavity ratio (RCR) and area of each space. The RCR shall be calculated using either Equation 146-D or Equation 146-E.

EQUATION 146-D ROOM CAVITY RATIO FOR RECTANGULAR ROOMS,

$$RCR = \frac{5 \times H \times (L + W)}{L \times W}$$

EQUATION 146-E ROOM CAVITY RATIO FOR IRREGULAR-SHAPED ROOMS

$$RCR = \frac{2.5 \times H \times P}{A}$$

WHERE:

- L = Length of room.
 W = Width of room.
 H = Vertical distance from the work plane to the centerline of the lighting fixture.
 P = Perimeter of room.
 A = Area of room.

- iv. Multiply the area of each task by the allowed lighting power density for the task according to TABLE 146-F. The product, or the actual installed lighting power for the task, whichever is less, is the allowed lighting power for the task.
 - v. For non-task areas, the allowed lighting power density shall be 50% of the adjacent task area or that permitted for Category D, whichever is lower. Multiply the non-task area by the allowed lighting power density.
 - vi. Add the allowed lighting power of all tasks and non-task areas. This is the Allowed General Lighting Power for the Space.
- B. Determine additional allowed power for display and decorative lighting according to Sections 146 (b) 3 B i through v.
- i. Separate wall display lighting power is permitted if allowed by column 3 of TABLE 146-G . The allowed wall display lighting power is the smaller of:
 - a. The product of the room wall lengths and the listed allowed power density watts per linear foot (w/ft) in column 3 of TABLE 146-G , if applicable, or
 - b. The actual power of wall lighting systems.

The length of display walls shall include the length of the perimeter walls, including closable openings and permanent full height interior partitions. For mounting height of display ~~13'-11' 6"~~ above the finished floor or higher, this amount may be increased by multiplying the product by the appropriate factor from TABLE 146-H-E. Qualifying wall lighting systems shall be mounted within ~~72"~~ten feet of the wall and shall be of a lighting system type appropriate for wall lighting including a lighting track, wallwasher, valance, cove, or ~~adjustable~~-accent light including adjustable or fixed luminaires with PAR, R, MR, AR, or other projector lamp types.
 - ii. Separate floor display lighting power is allowed if allowed by column 4 of TABLE 146-G . The allowed floor display lighting power is the smaller of:
 - a. The product of the area of the space and the allowed floor display lighting power density listed in column 4 of TABLE 146-G , if applicable, or
 - b. The actual power of floor display lighting systems.

For mounting height display lighting ~~132'~~ above finished floor or higher, this amount may be increased by multiplying the product by the appropriate factor from TABLE 146-H . Qualifying floor display lighting systems shall be mounted no closer than ~~72"~~two feet to a wall and shall be a lighting system type such as track lighting, adjustable or fixed luminaires with PAR, R, MR, AR, or other projector lamp types or employing optics providing directional display light from non-directional lamps. Except for lighting ~~that is external to~~for ~~very valuable merchandised display cases~~ as defined below, lighting mounted inside of display cases shall also be considered floor display lighting.
 - iii. Separate ornamental/special effects lighting power is permitted if allowed by column 5 of TABLE 146-G . If so, the allowed ornamental/special effects lighting power is the smaller of:
 - a. The product of the area of the space and the allowed ornamental/special effects lighting power density specified in column 5 of TABLE 146-G , if applicable, or
 - b. The actual power of allowed ornamental/special effects lighting luminaires.

Qualifying ornamental luminaires include chandeliers, sconces, lanterns, neon and cold cathode, light emitting diodes, theatrical projectors, moving lights, and light color panels when used in a decorative manner that does not serve as display lighting. Ornamental/special effects lighting shall not be the only light source in the space.

- iv. ~~In retail, museum, and religious worship, the smallest of the following~~ ~~Separate~~ ~~separate~~ lighting power for ~~very valuable displays~~ ~~cases presenting very valuable merchandise~~ is permitted ~~if allowed by column 6 of TABLE 146~~. ~~The allowed lighting power for very valuable displays is the smallest of:~~
- ~~The product of the area of the space and~~ ~~the allowed very valuable lighting power density specified in column 6 of TABLE 146~~, ~~if applicable~~, ~~1.0 watts per square foot~~; or
 - ~~The product of the area of the display case and~~ ~~20-16~~ watts per square foot, or
 - ~~The actual power of lighting for very valuable displays.~~

Qualifying lighting includes internal display case lighting or external lighting employing highly directional luminaires specifically designed to illuminate the case ~~or inspection area~~ without spill light. To qualify for this allowance, cases shall contain jewelry, coins, fine china or crystal, precious stones, silver, small art objects and artifacts, and/or valuable collections the selling of which involves customer inspection of very fine detail from outside of a locked case.

- v. Only the general portion of the lighting power determined in 146 (b) 3A above shall be used for tradeoffs among the various occupancy or task types of the permitted space. The allowed wall display lighting power, the allowed floor display lighting power, the allowed ornamental/special effect lighting power, and the allowed lighting power for very valuable displays are “use it or lose it” power allowances that shall not be traded off.

~~**EXCEPTION 1 to 146 (b) 3:** The Tailored Method may be used for up to 100% of the entire building area of Retail Merchandise Sales and Museums.~~

~~**EXCEPTION 2 to 146 (b) 3:** If a single function area within the building exceeds 30 percent of the floor area of the entire building, the Tailored Method may be used for that entire function area alone, with the remaining spaces using the Area Category Method.¹⁷~~

TABLE 146-A WELL EFFICIENCY FOR NON-SPECULAR OR NON-TUBULAR LIGHT WELLS ¹⁸

WCR	light well wall reflectance					
	$\rho = 99\%$	$\rho = 90\%$	$\rho = 80\%$	$\rho = 70\%$	$\rho = 60\%$	$\rho = 40\%$
0	1.00	1.00	1.00	1.00	1.00	1.00
1	1.00	0.98	0.96	0.94	0.92	0.89
2	0.99	0.95	0.91	0.88	0.84	0.78
4	0.99	0.90	0.82	0.76	0.70	0.61
6	0.98	0.85	0.74	0.65	0.58	0.48
8	0.97	0.79	0.66	0.56	0.49	0.38
10	0.96	0.74	0.59	0.49	0.41	0.31
12	0.95	0.70	0.53	0.43	0.35	0.26
14	0.95	0.66	0.48	0.38	0.31	0.22
16	0.94	0.62	0.44	0.34	0.27	0.18
18	0.93	0.59	0.41	0.31	0.24	0.16
20	0.92	0.56	0.38	0.28	0.21	0.14

TABLE 146-B WELL EFFICIENCY FOR SPECULAR TUBULAR LIGHT WELLS

L/D	Light Well Reflectance (ρ)						
	$\rho = 99\%$	$\rho = 97\%$	$\rho = 95\%$	$\rho = 92\%$	$\rho = 90\%$	$\rho = 85\%$	$\rho = 80\%$
0.5	0.99	0.97	0.95	0.91	0.89	0.84	0.78
1.0	0.98	0.94	0.89	0.83	0.79	0.70	0.61
1.5	0.97	0.90	0.84	0.76	0.71	0.58	0.48
2.0	0.96	0.87	0.80	0.69	0.63	0.49	0.37
2.5	0.95	0.85	0.75	0.63	0.56	0.41	0.29
3.0	0.94	0.82	0.71	0.58	0.50	0.34	0.23
3.5	0.93	0.79	0.67	0.53	0.44	0.29	0.18
4.0	0.92	0.76	0.64	0.48	0.39	0.24	0.14
4.5	0.91	0.74	0.60	0.44	0.35	0.20	0.11
5.0	0.90	0.71	0.57	0.40	0.31	0.17	0.09
5.5	0.88	0.68	0.52	0.35	0.26	0.13	0.06
6.0	0.87	0.65	0.48	0.30	0.22	0.10	0.04

TABLE 146-A LIGHTING POWER ADJUSTMENT FACTORS

TYPE OF CONTROL	TYPE OF SPACE	FACTOR	
Occupant sensor with “manual ON” or bi-level automatic ON combined with multi-level circuitry and switching	Any space ≤ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room	0.20	
Occupant sensor-controlled multi-level switching or dimming system that reduces lighting power at least 50% when no persons are present	Hallways of hotels/motels	.25	
	Commercial and Industrial Storage stack areas (max. 2 aisles per sensor)	.15	
	Library Stacks (maximum 2 aisles per sensor)	.15	
Dimming system			
—Manual	Hotels/motels, restaurants, auditoriums, theaters	0.10	
—Multiscene-programmable	Hotels/motels, restaurants, auditoriums, theaters	0.20	
Manual dimming with automatic load control of dimmable electronic ballasts.	All building types	.25	
Combined controls			
Occupant sensor With “manual ON” or bi-level automatic ON combined with multi-level circuitry and switching in conjunction with daylighting controls	Any space ≤ 250 square feet within a daylit area and enclosed by floor-to-ceiling partitions, any size classroom, corridor, conference or waiting room.	0.10 (may be added to daylighting control credit)	
Manual Dimming with Dimmable Electronic Ballasts and Occupant sensor with “manual ON” or automatic ON to less than 50% power and switching	Any space ≤ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room	0.25	
Automatic Daylighting Controls with Windows (Stepped Switching or Stepped Dimming/Continuous Dimmed)			
	Window Wall Ratio		
Glazing Type — Windows	< 20%	20% to 40%	> 40%
VLT ≥ 60%	0.20/0.30	0.30/0.40	0.40/0.40
VLT ≥ 35 and < 60%	0/0	0.20/0.30	0.30/0.40
VLT < 35%	0/0	0/0	0.20/0.40
Automatic Multi-Level Daylighting Controls with Skylights			
Glazing Type — Skylights	Factor		
Glazing material or diffuser with ASTM D1003 haze measurement greater than 90%	$10 \times \text{Effective Aperture} - \frac{\text{Lighting Power Density}}{10} + 0.2$		
	WHERE Effective Aperture is as calculated in the Equation 146-A. Lighting Power Density is the lighting power density of general lighting		

TABLE 146-C LIGHTING POWER ADJUSTMENT FACTORS

<u>TYPE OF CONTROL</u>		<u>TYPE OF SPACE</u>	<u>FACTOR</u>				
Multi-level occupant sensor ¹ with “manual ON” or bi-level automatic ON, combined with multi-level circuitry and switching in accordance with Section 146(a)(1)(D)		Any space ≤ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room.	<u>0.20</u>				
Multi-level occupant sensor ¹ controlling multi-level switching that reduces lighting power at least 50% when no persons are present, or dimming system ² that reduces lighting power at least 50% when no persons are present.		Hallways of hotels/motels, multi-family, dormitory, and senior housing	<u>0.15</u>				
		Commercial and Industrial Storage stack areas (max. 2 aisles per sensor)	<u>0.15</u>				
		Library Stacks (maximum 2 aisles per sensor)	<u>0.25</u>				
Dimming system	Multiscene programmable	Hotels/motels, restaurants, auditoriums, theaters	<u>0.10</u>				
	Manual	Hotels/motels, restaurants, auditoriums, theaters	<u>0.20</u>				
Demand responsive lighting control that reduces lighting power consumption in response to a demand response signal, and manual dimming of dimmable electronic ballasts ²		All building types	<u>0.15</u>				
Manual dimming of dimmable electronic ballasts ²		All building types	<u>0.10</u>				
Combined controls	Multi-level occupant sensor ¹ with “manual ON” or bi-level automatic ON combined with multi-level circuitry and switching in conjunction with daylighting controls	Any space ≤ 250 square feet within a daylit area and enclosed by floor-to-ceiling partitions, any size classroom, corridor, conference or waiting room. The PAF may be added to the daylighting control credit	<u>0.10</u>				
	Manual Dimming with Dimmable Electronic Ballasts ² and Multi-level occupant sensor ¹ with “manual ON” or automatic ON to less than 50% power and switching	Any space ≤ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room	<u>0.25</u>				
Automatic multi-level daylighting controls	Primary sidelit daylight areas less than 2,500 ft ² and all secondary sidelit areas. ¹⁹ (see Note 3)	General Lighting Power Density (W/ft ²) All	<u>Effective Aperture</u>				
			>10% and ≤20%	>20% and ≤35%	>35% and ≤65%	> 65%	
			<u>0.12</u>	<u>0.20</u>	<u>0.25</u>	<u>0.30</u>	
	Skylit daylight areas less than 2,500 square feet, and where glazing material or diffuser has ASTM D1003 haze measurement greater than 90%	General Lighting Power Density (W/ft ²) LPD < 0.7 0.7 < LPD < 1.0 1.0 < LPD < 1.4 1.4 < LPD	<u>Effective Aperture</u>				
0.6% ≤ EA < 1%			1% ≤ EA < 1.4%	1.4% ≤ EA < 1.8%	1.8% ≤ EA		
<u>0.24</u>			<u>0.30</u>	<u>0.32</u>	<u>0.34</u>		
<u>0.18</u>			<u>0.26</u>	<u>0.30</u>	<u>0.32</u>		
<u>0.12</u>			<u>0.22</u>	<u>0.26</u>	<u>0.28</u>		
			<u>0.08</u>	<u>0.20</u>	<u>0.24</u>	<u>0.28</u>	

NOTES FOR TABLE 146-C:

¹ To qualify for the PAF the multi-level occupant sensor shall comply with the applicable requirements of Section 119.

² To qualify for the PAF all dimming ballasts for linear fluorescent lamps shall be certified to the Energy Commission with a minimum RSE in accordance with Table 146-D.

³ If the primary sidelit daylight area and the secondary sidelit daylight area are controlled together, the PAF is determined based on the secondary sidelit effective aperture for both the primary sidelit daylight area and the secondary sidelit daylight area.

TABLE 146-D RELATIVE SYSTEM EFFICIENCY (RSE) FOR DIMMABLE ELECTRONIC BALLASTS

NOTE: This table is incomplete for the February 26, 2007 Staff Workshop. It is in the process of being expanded to cover other lengths of T5 and T-8 lamps.

Minimum Relative System Efficiency	Number of T-8 Lamps per Ballast	Equivalent Ballast Efficacy Factor
0.89	<u>1</u>	<u>2.78</u>
0.93	<u>2</u>	<u>1.45</u>
	<u>3</u>	<u>0.97</u>
	<u>4</u>	<u>0.73</u>
Minimum Relative System Efficiency	Number of T-5 Lamps per Ballast	Equivalent Ballast Efficacy Factor
0.85	<u>1</u>	<u>1.57</u>
	<u>2</u>	<u>0.79</u>
	<u>3</u>	<u>0.52</u>
	<u>4</u>	<u>0.39</u>
NOTE: RSE = Ballast Factor / (Ballast Input Power / Total Rated Lamp Power) where Total Rated Lamp Power = number of Lamps per Ballast x Rated Lamp Power		

TABLE 146-~~E B~~ COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES (WATTS/FT²)

TYPE OF USE	ALLOWED LIGHTING POWER
Auditoriums	1.5
Convention centers	1.3 <u>1.2</u>
Financial institutions	1.1
General commercial and industrial work buildings	
High bay	1.1 <u>1.0</u>
Low bay	1.0
Grocery stores	1.5
Hotel	1.4
Industrial and commercial storage buildings	0.7 <u>0.6</u>
Medical buildings and clinics	1.1
Office buildings	1.1 <u>0.8</u>
Parking Garages	0.4 <u>0.3</u>
Religious facilities	1.6
Restaurants	1.2
Retail and wholesale stores*	1.5 <u>1.3</u>
Schools	1.2
Theaters	1.3
All others	0.6

* For retail and wholesale stores, the complete building method may only be used when the sales area is 70% or greater of the building space.

TABLE 146-F ~~C~~ AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

PRIMARY FUNCTION	ALLOWED LIGHTING POWER (W/ft ²)	PRIMARY FUNCTION	ALLOWED LIGHTING POWER (W/ft ²)
Auditorium	1.5 ¹ *	Library	
Auto Repair	1.1 0.9 ² **	Reading areas	1.2
Beauty Salon	1.7	Stacks	1.5
Civic Meeting Place	1.3 ¹ *		
Classrooms, lecture, training, vocational room	1.2	Lobbies	
Commercial and industrial storage (conditioned and unconditioned)	0.6	Hotel lobby	1.1 ¹ *
Commercial and industrial storage (refrigerated)	0.7	Main entry lobby	1.5 ¹ *
Convention, conference, multipurpose and meeting centers	1.4 ¹ *	Locker/dressing room	0.8
Corridors, restrooms, stairs, and support areas	0.6	Lounge/recreation	1.1
Dining	1.1 ¹ *	Malls and atria	1.2 ¹ *
Electrical, mechanical rooms	0.7 ² **	Medical and clinical care	1.2
Exercise center, gymnasium	1.0	Offices	
Exhibit, museum	2.0	Office Greater than 250 square feet	1.2 0.9
Financial transactions	1.2 ¹ *	250 square feet or smaller	1.1
General commercial and industrial work		Parking garage	0.4
High bay	1.1 1.0 ² **	Parking Area	0.2
Low bay	1.0 0.9 ² **	Ramps and Entries	0.6
Precision	1.3 1.2 ³ ***	Religious worship	1.5 ¹ *
Grocery sales	1.6		
Hotel function area	1.5 ¹ *	Retail merchandise sales, wholesale showrooms	1.7 1.6
Housing, Public and Commons Areas		Tenant lease space	1.0
Multi-family, Dormitory	1.0	Theaters	
Dormitory , Senior Housing	1.5	Motion picture	0.9 ¹ *
Kitchen, food preparation	1.6	Performance	1.4 ¹ *
Laundry	0.9	Transportation Function	1.2
		Waiting area	1.1 ¹ *
		All other	0.6
TABLE 146- C F NOTES			

TABLE 146-F NOTES

***¹** The smallest of the following values may be added to the allowed lighting power for ornamental chandeliers and sconces that are **in addition to and** switched or dimmed on circuits different from the circuits for general lighting:

- a. One watt per square foot times the area of the task space that the chandelier or sconce is in; or
- b. The actual design wattage of the chandelier or sconce.

****²** The smallest of the following values may be added to the allowed lighting power for specialized task work:

- a. 0.5 watt per square foot times the area of the task space required for an art, craft assembly or manufacturing operation; or
- b. The actual design wattage of the luminaire(s) providing illuminance to the specialized task area

For spaces employing this allowance, the plans shall clearly identify all task spaces using these tasks and the lighting equipment designed to illuminate these tasks. Tasks that are performed less than two hours per day or poor quality tasks that can be improved are not eligible for this specialized task work allowance.

*****³** The smallest of the following values may be added to the allowed power for precision commercial and industrial work:

- a. One watt per square foot times the area of the task space required for the precision work; or
- b. The actual design wattage of the luminaire(s) providing the illuminance to the precision task area.

For spaces employing this allowance, the plans shall clearly identify all task spaces using these tasks and the lighting equipment designed to illuminate these tasks. Tasks that are performed less than two hours per day or poor quality tasks that can be improved are not eligible for this precision task work allowance.

TABLE 146-~~G D~~-TAILORED METHOD SPECIAL LIGHTING POWER ALLOWANCES

1	2	3	4	5	6
Primary Function	Illumination Category	Wall Display Power (W/ft)	Allowed Floor Display Power (W/ft ²)	Allowed Ornamental/Special Effect Lighting	Allowed Very Valuable Display Power (W/ft ²)
Auditorium	D	2.5 <u>2.25</u>	0.3	0.5	0
Civic Meeting Place	D	3.5 <u>3.15</u>	0.2	0.5	-
Classrooms, lecture, training, vocational room	D	7	0	0	0
Commercial and industrial storage	IESNA HB	0	0	0	0
Inactive	B				
Active: bulky items; large labels	C				
Active: small items; small labels	D				
Convention, conference, multipurpose and meeting centers	D	2.5	0.4	0.5	0
Corridors, restrooms, stairs and support areas	IESNA HB	0	0	0	0
Correction Facility cells and day rooms	D	0	0	0	
Dining	B	1.5	.6	0.6	0
Dressing room	D	0	0	0	
<u>Education facilities</u>					
Classrooms, lecture, training, vocational room	D	5.5	0	0	
Science Labs	E	5.5	0	0	
Exercise center, gymnasium	IESNA HB	0	0	0	0
Exhibit, museum	C	20.0	1.4	0.7	1.3
Financial Transactions	D	3.5 <u>3.15</u>	0.2	0.6	0
<u>Food Service Facilities</u>					
Butcher Shop, Food Display, Galley, Kitchen, Scullery	E	0	0	0	
All other	C	0	0	0	
Grocery store	D	11 <u>9.9</u>	1.2 <u>1.1</u>	0	0
Housing, Public and Commons Areas					
Multi-family	D	0	0	1.0 <u>0.9</u>	0
Dormitory, Senior Housing	D	0	0	1.0 <u>0.9</u>	0
Hotel function area	D	2.5 <u>2.25</u>	0.2	0.5	0
Jail	IESNA HB	0	0	0	0
Kitchen, food preparation	IESNA HB	0	0	0	0
Laundry	IESNA HB	0	0	0	0
	D				
Library (Reading areas, Stacks) ¹	D	0	0	0.7 <u>0.6</u>	0
	D	0	0	0.7	0
Lobbies:					
Hotel lobby	C	3.5 <u>3.15</u>	.2	0.7 <u>0.6</u>	0
Main entry lobby	C	3.5 <u>3.15</u>	.2	0	0
Locker/ dressing room ¹	IESNA HB	0	0	0	0
	C				
Lounge/recreation	C	7	0	0.7	0
Malls and atria	D	3.5	0.5	0.7 <u>0.6</u>	0
Medical and clinical care	IESNA HB	0	0	0	0

1	2	3	4	5	6
Primary Function	Illumination Category	Wall Display Power (W/ft)	Allowed Floor Display Power (W/ft ²)	Allowed Ornamental/Special Effect Lighting	Allowed Very Valuable Display Power (W/ft ²)
Office	IESNA HB	0	0	0	0
<u>Open office: Intensive VDT use</u>	D				
<u>Open office: Intermittent VDT use</u>	E				
<u>Private Office</u>	E				
Police or fire stations	IESNA HB	0	0	0	0
Religious worship	D	1.5	0.5	0.5	0.3
Retail merchandise sales, wholesale showrooms	D	<u>2.0 17.0</u>	<u>1.5 1.2</u>	0.7	<u>1.3</u>
<u>Public rest areas along state and federal roadways</u>	IESNA HB	0	0	0	
<u>Stairways and corridors; toilets and washrooms</u>	B				
Tenant lease space	C	0	0	0	0
Transportation Function	D	<u>3.5 3.15</u>	0.3	<u>0.7 0.6</u>	0
Theaters:					
Motion picture	C	3	0	0.6	0
Performance	D	6	0	0.6	0
Waiting area	C	<u>3.5 3.15</u>	.2	<u>0.7 0.6</u>	0
All other <u>not included above</u>	IESNA HB	0	0	0	0

¹. Library stacks and locker rooms may use a room cavity ratio (RCR) of > 7 in Table 146-I

TABLE 146-~~H E~~ ADJUSTMENTS FOR MOUNTING HEIGHT ABOVE FLOOR

Height in feet above finished floor and bottom of luminaire(s)	Floor Display - Multiply by	Wall Display — Multiply by
<u>12-11' 6"</u> or less	1.0	<u>1.0</u>
<u>13</u>	<u>1.05</u>	
<u>14</u>	<u>1.10</u>	
<u>15</u>	<u>1.15</u>	
<u>>12 >11' 6"</u>	<u>1.2+ 1.2</u>	<u>1.15</u>
<u>17</u>	<u>1.47</u>	
<u>18</u>	<u>1.65</u>	
<u>>16'</u>	<u>1.84 1.4</u>	<u>1.35</u>
<u>20 or more > 20'</u>	<u>2.04 2.0</u>	<u>1.75</u>

TABLE 146-~~I F~~ ILLUMINANCE CATEGORIES A THROUGH G LIGHTING POWER DENSITY VALUES (WATTS/FT²)

IESNA Illuminance Category	RCR<3.5	3.5<RCR<7.0	RCR>7.0
A	0.2	0.3	0.4
B	0.4	0.5	0.7
C	0.6	0.8	1.1
D	0.9	1.2	1.4
E	1.3	1.8	2.5
F	2.7	3.5	4.7
G	8.1	10.5	13.7

SECTION 147 – REQUIREMENTS FOR OUTDOOR LIGHTING ²⁰

This section applies to all outdoor lighting, whether attached to buildings, poles, structures or self supporting, including but not limited to, hardscape areas including parking lots, lighting for building entrances, sales and non-sales canopies; lighting for all outdoor sales areas; and lighting for building facades.

EXCEPTIONS to Section 147:

1. Temporary outdoor lighting.
 2. Lighting required and regulated by the Federal Aviation Administration, and the Coast Guard.
 3. Lighting for public streets, roadways, highways, and traffic signage lighting, including lighting for driveway entrances occurring in the public right-of-way.
 4. Lighting for sports and athletic fields, and children’s playground.
 5. Lighting for industrial sites, including but not limited to, rail yards, maritime shipyards and docks, piers and marinas, chemical and petroleum processing plants, and aviation facilities.
 6. Automated Teller Machine lighting.
 7. Lighting of public monuments.
 8. ~~Internally illuminated, externally illuminated, and unfiltered signs~~ (Signs shall meet the requirements of Section 148).
 9. Lighting used in or around swimming pools, water features, or other locations subject to Article 680 of the California Electrical Code.
 10. Lighting of tunnels, bridges, stairs, and ramps other than parking garage ramps.
 11. Landscape lighting.
 12. In theme parks: outdoor lighting for themes and special effects
 13. Lighting for outdoor theatrical and other outdoor live performances, provided that these lighting systems are additions to area lighting systems and are controlled by a multiscene or theatrical cross-fade control station accessible only to authorized operators
 14. Outdoor lighting systems in qualified historic properties, as defined in the State Historic Building Code (Title 24, Part 8), if they consist solely of historic lighting components or replicas of historic lighting components. If lighting systems in qualified historic properties contain some historic lighting components or replicas of historic components, combined with other lighting components, only those historic or historic replica components are exempt. All other lighting systems in qualified historic buildings shall comply with Section 147.
- (a) **Outdoor Lighting Power Trade-offs.** Allowed lighting power determined according to Section 147(e)1 for illuminated hardscape areas may be traded between the illuminated hardscape areas, and may be traded to specific applications in Section 147(e)2. Allowed lighting power determined according to Section 147(e)2 for specific applications shall not be traded between specific applications, or to Section 147(e)1. Trading off lighting power allowances with any indoor areas shall not be permitted.
- (~~ab~~) **Outdoor Lighting Power.** An outdoor lighting installation complies with this section if the actual outdoor lighting power ~~installed-calculated under Subsection (b)~~ is no greater than the allowed outdoor lighting power calculated under Subsection (~~ee~~)3. The allowed outdoor lighting shall be calculated by Lighting Zone as defined in Section 10-114. Local governments may amend lighting zones in compliance with Section 10-114. ~~Trading off lighting power allowances with any indoor areas shall not be permitted.~~
- (~~bc~~) **Calculation of Actual Lighting Power.** The actual outdoor lighting power ~~of outdoor lighting shall be determined in accordance with Section 130 (d) is the total watts of all lighting systems (including ballast or transformer loss).~~

(d) Determining Illuminated Use Area. In plan view of the site, determine the illuminated use areas for hardscape, outdoor sales lots, and vehicle service station hardscape. The illuminated use area is defined as the area within a square pattern around each luminaire or pole that is ten times the luminaire mounting height with the luminaire in the middle of the pattern, less any area that is beyond the lighting application as determined according to Section 147(e)1 or 2, and less any area that is within a building, below a canopy, beyond property lines, or obstructed by a sign or other structure. Only portions of the lighting application that are inside the illuminated area shall be used to determine allowed lighting power. The illuminated use area shall include portions of planters and landscaped areas that are within the lighting application and are less than or equal to ten feet wide in the short dimensions and are enclosed by hardscape or other improvement on at least three sides. The illuminated use area for all other specific lighting not listed above shall be determined according to Section 147(e)2.

(ee) Calculation of Allowed Lighting Power. The allowed lighting power shall be calculated as follows:

1. Determine the allowed lighting power for ~~general hardscape illuminated use areas illumination of the site~~ as follows:

~~A. In plan view of the site, determine the illuminated area. The illuminated area is defined as any area within a square pattern around each luminaire or pole that is six times the luminaire mounting height, with the luminaire in the middle of the pattern, less any area that is within a building, under a canopy, beyond property lines, or obstructed by a sign or structure.~~

~~B. Determine a lighting application from Table 147-A for each portion of the illuminated area. Determine the allowed area for each application. Note that the allowed area only applies to illuminated areas. Only portions of the site that are inside the illuminated area determined in step A qualify for allowed lighting power for general illumination. Multiply the allowed area of each lighting application by the allowed lighting power density from Table 147-A. Only applications listed in Table 147-A shall be included. Each portion of the illuminated area shall only be assigned one lighting application, and the assigned lighting applications shall be consistent with the actual use of the area. The allowed area of a site roadway, driveway, sidewalk, walkway or bikeway shall be determined by either of the following methods:~~

~~A. Determine the hardscape illuminated use area in accordance with Section 147(d). Multiply the hardscape illuminated use area by the Area Wattage Allowance (AWA) from Table 147-A. The allowed hardscape illuminated use area of a site shall include parking lot, roadway, driveway, sidewalk, walkway or bikeway, plaza, or other improved space.~~

~~i. The actual paved area plus 5 feet on either side of the centerline path of travel; or~~

~~ii. A 25 foot wide area running along the axis of the path of travel and including as much of the paved area of the site roadway, driveway, sidewalk, walkway or bikeway as possible. Any overlapping area of another lighting application shall be subtracted from the area of the other lighting application. In this case the allowed lighting power is the length of the centerline of the path times the allowed power per unit length.~~

EXCEPTION 1 to Section 147 (ee)-1-BA: For hardscape including parking lots, site roadways, driveways, sidewalks, walkways or bikeways, when specific light levels are required by law through a local ordinance, the allowed lighting power densities specified in TABLE 147-~~CD~~ may be used to calculate the allowed lighting power.

EXCEPTION 2 to Section 147 (ee)-1-BA: For retail parking lots in lighting zones 1, 2, and 3, hardscape areas within 100 feet of the entrance of senior housing facilities, and parking lots and walkways within 60 feet of ~~building entrances for law enforcement, fire, ambulance and emergency vehicle facilities, police stations, fire stations, hospitals and emergency vehicle facilities, and pedestrian hardscape or vehicle parking areas in Lighting Zone 3 documented to have special security requirements in accordance with IESNA G-1-03,~~ the allowed lighting power densities specified in Table 147-A may be adjusted by applying the multipliers for special security requirements in TABLE 147-D to establish allowed lighting power for these special applications. ~~Retail parking lots shall not include outdoor sales lots or outdoor sales frontage.~~ Luminaires qualifying for these adjusted allowances shall not be used to determine allowed power for general illumination. The adjusted lighting power allowances shall be separate allotments, which shall be complied with separately without trade-offs.

- B. Determine the perimeter length of the hardscape area. The total perimeter shall not include portions of planters and landscaped areas that are less than or equal to ten feet wide in the short dimensions and are enclosed by hardscape on at least three sides. Multiply the hardscape perimeter by the Linear Wattage Allowance (LWA) for hardscape from Table 147-A.
- ~~C. Determine the sum of the allowed power for all general illuminated areas of the site as determined in Section 147(e)1.B.~~
- C. Determine the Initial Wattage Allowance (IWA) for hardscape from Table 147-A. The hardscape area shall be permitted one IWA per site.
- D. The total allowed lighting power for hardscape shall be calculated according to the following formula:
- Allowed hardscape lighting power = (AWA times hardscape illuminated use area) + (LWA times perimeter length) + IWA
- WHERE:
- AWA = Area Wattage Allowance in accordance with Section 147(e)1(A) and Table 147-A
- LWA = Linear Wattage Allowance in accordance with Section 147(e)1(B) and Table 147-A
- IWA = Initial Wattage Allowance in accordance with Section 147(e)1(C) and Table 147-A
2. The allowed lighting power for specific applications shall be the smaller of the lighting power allowance from Section 147(e)2 plus any trade-offs from Section 147(e)1, or the actual installed lighting power for each specific application. Determine the allowed lighting power for specific applications as follows:
- A. Determine the allowed lighting power for building entrances. The allowed lighting power for building entrances shall be the smaller of the product of the number of entrance doors and the AWA from Table 147-B, or the actual power per building entrance used to illuminate the entrances. Only entrances that are specifically illuminated shall be counted.
- B. Determine the allowed lighting power for building façade. The allowed lighting power for lighting the façade shall be the smaller of the product of the area of the façade and the ~~allowed lighting power density~~ AWA for it from Table 147-B, or the actual power used to illuminate the façade. Only areas of the façade that are illuminated without obstruction or interference, by one or more luminaires, shall be used. ~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~
- C. Determine the allowed lighting power for outdoor sales lots. Only uncovered sales lots used exclusively for the display of vehicles or other merchandise for sale shall use the allowed lighting power for sales lots. Determine the allowed lighting power for outdoor sales lots as follows:
- i. The allowed lighting power for outdoor sales lots shall be the smaller of the product of the area of the sales lots and the AWA for it from Table 147-B plus the IWA for it from Table 147-C, or the actual power used to illuminate the sales lot. The illuminated use area of the outdoor sales lot shall be determined according to Section 147(d). All access drives, walkway areas, customer parking areas, vehicle service or storage areas shall not be considered outdoor sales lot.
- ii. The allowed lighting power for outdoor sales frontage shall be the smaller of the product of the frontage (in feet) and the AWA per foot from Table 147-B, or the actual power used to illuminate the frontage. Sales frontage shall be immediately adjacent to the principal viewing location and unobstructed for its viewing length. A corner sales lot may include both sides provided that a different principal viewing location exists for each side. No more than 50 percent of the total sales lot perimeter may be assigned to outdoor sales frontage. Luminaires qualifying for this allowance shall be located in plan view between the principal viewing location and the frontage outdoor sales area
- ~~B. Determine the allowed lighting power for outdoor sales frontage. The allowed lighting power for outdoor sales frontage shall be the smaller of the product of the frontage (in feet) and the allowed lighting power density per foot from Table 147-B, or the actual power used to illuminate the frontage. Sales frontage shall be immediately adjacent to the principal viewing location and unobstructed for its viewing length. A corner sales lot may include both sides provided that a different principal viewing location exists for each side. Measured in plan view, only sections of the outdoor sales area that are along the frontage and are within a 3 mounting heights of frontage~~

~~luminaires shall be eligible for this power allowance. Luminaires qualifying for this allowance shall be located in plan view between the principal viewing location and the frontage outdoor sales area, and shall not be used to determine allowed lighting power for general illumination.~~

- C. Determine the allowed lighting power for hardscape ornamental lighting. The allowed lighting power for hardscape ornamental lighting shall be the smaller of the product of the total hardscape illuminated use area of the site determined according to Section 147(d)-external to buildings, and the allowed lighting power densityAWA for hardscape ornamental lighting from Table 147-B, or the actual power used for hardscape ornamental lighting. Luminaires qualifying for this allowance shall employ lamps rated for 100 watts or less as determined in accordance with Section 130 (d), ~~and shall not be used to determine allowed lighting power for general illumination.~~
- D. Determine the allowed lighting power for lighting under canopies. The allowed lighting power for lighting under a canopy shall be the smaller of the product of the area in plan view of the horizontal projection of the canopy and the allowed lighting power density appropriate AWA for either a vehicle service station with or without canopies, for all other sales canopies, or for non-sales canopies from Table 147-B plus the appropriate IWA from Table 147-C, or the actual power used for lighting mounted beneath the canopy. ~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~
- E. Determine the allowed lighting power for lighting of vehicle service stations without canopies. The allowed lighting power for an uncovered a service station without canopy shall be the smaller of the product of the allowed lighting power densityAWA for a vehicle service station with or without canopies and 500 square feet per double-sided fuel dispenser plus the IWA from Table 147-C, or the actual power used to illuminate this area ~~(in cases where the site only allows fuel to be dispensed on one side of the dispenser, the allowed lighting power shall be the smaller of the product of the allowed lighting power density and 250 square feet per dispenser or the actual power).~~ ~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~
- F. Determine the allowed lighting power for lighting of vehicle service station hardscape areas. The allowed lighting power for vehicle service station hardscape areas shall be the smaller of the product of the illuminated use area of the vehicle service station hardscape determined according to Section 147(d) and the allowed lighting power densityAWA foot from Table 147-B plus the IWA from Table 147-C, or the actual power used to illuminate this area. Vehicle service station hardscape areas include all vehicle service station outdoor hardscape areas beyond the horizontal projection of the canopy in plan view. ~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~
- G. Determine the allowed lighting power for drive-up windows. The allowed lighting power for drive-up windows shall be the smaller of the product of the area of the drive-up window and the allowed lighting power densityAWA foot from Table 147-B plus the IWA from Table 147-C, or the actual power used to illuminate this area. Drive-up window area is the product of the width of the window plus six feet and the distance 30 feet outward from the window. ~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~
- H. Determine the allowed lighting power for guarded facilities. The allowed lighting power for guarded facilities shall be the smaller of the product of the area for the guarded facility and the allowed lighting power densities AWA specified in Tables 147-B. The guarded facility area includes the guardhouse interior area plus the product of the entrance width of 25 feet and length of 80 feet. Guarded facilities include the entrance driveway, gatehouse, and guardhouse interior areas that 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. ~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~
- I. Determine the allowed lighting power for outdoor dining. The allowed lighting power for outdoor dining shall be the smaller of the product of the outdoor dining area and the allowed lighting power densityAWA from Table 147-B plus the IWA from Table 147-C, or the actual power used to illuminate this area. Outdoor dining areas are hardscape areas used to serve and consume food and beverages.

~~Luminaires qualifying for this allowance shall not be used to determine allowed lighting power for general illumination.~~

3. The Allowed Lighting Power shall be the total of the allowed power for general hardscape illumination of the site as determined in Section 147-(~~ee~~)-1-~~C~~ and the sum of all the allowed power for specific applications determined under Section 147 (~~ee~~)-2. ~~The allowed outdoor power and the allowed indoor power determined in Section 146 (b) shall be separate allotments, which shall be met separately without tradeoffs between the separate allotments.~~

TABLE 147-A LIGHTING POWER ALLOWANCES FOR GENERAL SITE ILLUMINATION (W/FT² UNLESS OTHERWISE NOTED)

Lighting Application	Allowed Area	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for automotive vehicular use, including parking lots, driveways and site roads	Method (i.) Actual paved area plus 5' perimeter of adjacent unpaved land. Includes planters and landscaped areas less than 10' wide that are enclosed by hardscape on at least three sides.	0.05	0.08	0.15	0.19
Hardscape for pedestrian use, including, plazas, sidewalks, walkways and bikeways	Method (i.) Actual paved area plus 5 feet of unpaved land on either side of path of travel. Shall include all continuous paved area before including adjacent grounds.	0.06	0.09	0.17	0.21
Hardscape for driveways, site roads, sidewalks, walkways and bikeways	Method (ii.) 25' wide path incorporating as much of the paved area of the site roadway, driveway, sidewalk, walkway or bikeway as possible.	1.0 w/lf	1.5 w/lf	4.0 w/lf	5.0 w/lf
Building Entrances (without canopy)	Width of doors plus 3 ft on either side times a distance of 18 feet outward.	0.35	0.50	.70	1.00
Outdoor Sales Lot	Actual portion of uncovered outdoor sales lot used exclusively for display of vehicles or other merchandise for sale. All adjacent access drives, walkway areas, customer parking areas, vehicle service or storage areas that are not surrounded on at least three sides by sales area shall be considered hardscape.	0.35	0.70	1.25	2.00

TABLE 147-A LIGHTING WATTAGE ALLOWED FOR HARDSCAPE

Type of Power Allowance	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Area Wattage Allowance (AWA)	0.036 W/ft ²	0.045 W/ft ²	0.092 W/ft ²	0.115 W/ft ²
Linear Wattage Allowance (LWA)	0.36 W/lf	0.45 W/lf	0.92 W/lf	1.15 W/lf
Initial Wattage Allowance (IWA)	340 W	510 W	770 W	1030 W

TABLE 147-B LIGHTING POWER ~~ALLOWANCES~~ AREA WATTAGE ALLOWANCE (AWA) FOR SPECIFIC APPLICATIONS (W/FT² UNLESS OTHERWISE NOTED)

Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
<u>Building Entrances</u>	<u>50 watts</u>	<u>75 watts</u>	<u>100 watts</u>	<u>150 watts</u>
Building Facades	Not allowed	0.18	0.35	0.50
<u>Outdoor Sales Lots</u>	<u>0.35</u>	<u>0.70</u>	<u>1.25</u>	<u>2.00</u>
Outdoor Sales Frontage (Frontage in linear feet)	Not allowed	22.5 w/lf	38.5 w/lf	55 w/lf
Vehicle Service Station with or without Canopies	<u>0.70</u> <u>0.55</u>	<u>1.15</u> <u>1.05</u>	1.45	2.40
Vehicle Service Station Hardscape	0.05	0.20	0.40	0.60

All Other Sales Canopies	Not allowed	0.70	1.00	1.25
Non-sales canopies	0.12	0.25	0.50	0.70
Hardscape Ornamental Lighting	Not allowed	0.01	0.02	0.04
Drive Up Windows	0.12	0.25	0.50	0.70
Guarded Facilities	0.19	0.40	0.80	1.10
Outdoor Dining	0.05	0.18	0.35	0.55

TABLE 147-C INITIAL WATTAGE ALLOWANCE FOR SPECIFIC APPLICATIONS (WATTS)

Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
<u>Outdoor Sales Lots</u>	<u>190</u>	<u>190</u>	<u>290</u>	<u>370</u>
<u>Vehicle Service Station with or without Canopies</u>	<u>130</u>	<u>190</u>	<u>290</u>	<u>370</u>
<u>Vehicle Service Station Hardscape</u>	<u>190</u>	<u>190</u>	<u>290</u>	<u>370</u>
<u>All Other Sales Canopies</u>	<u>Not allowed</u>	<u>130</u>	<u>190</u>	<u>290</u>
<u>Non-sales canopies</u>	<u>20</u>	<u>40</u>	<u>70</u>	<u>90</u>
<u>Drive Up Windows</u>	<u>70</u>	<u>90</u>	<u>130</u>	<u>190</u>
<u>Outdoor Dining</u>	<u>90</u>	<u>130</u>	<u>190</u>	<u>290</u>

TABLE 147-D ~~C~~ ALTERNATIVE POWER ALLOWANCE FOR ORDINANCE REQUIREMENTS

Required light levels by law through a local ordinance (horizontal foot-candles, average)	When MINIMUM Light Levels Are Required	When AVERAGE Light Levels Are Required
	Allowed Lighting Power Density (W/ft ²)	Allowed Lighting Power Density (W/ft ²)
0.5	<u>0.04</u>	<u>0.05 0.02</u>
1.0	<u>0.08</u>	<u>0.07 0.04</u>
1.5	<u>0.16</u>	<u>0.10 0.06</u>
2.0	<u>0.20</u>	<u>0.12 0.08</u>
3.0	<u>0.20</u>	<u>0.19 0.12</u>
4.0 or greater	<u>0.20</u>	<u>0.25 0.16</u>

TABLE 147-E ~~D~~ MULTIPLIERS FOR SPECIAL SECURITY REQUIREMENTS

Function	Multiplier
Retail parking lots in lighting zones 1 , 2 and 3	1.25
Hardscape areas within 100 feet of the entrance of senior housing facilities in lighting zones 1, 2, and 3	1.25
Parking lots and walkways within 60 feet of entrances to the building for law enforcement, fire, ambulance and emergency vehicle facilities	2.00

SECTION 148 – REQUIREMENTS FOR SIGNS ²¹

This section applies to all internally illuminated and externally illuminated signs, message boards, and unfiltered neon, both indoor and outdoor. Each sign shall comply with either subsection (a), ~~or (b) or (c)~~, as applicable, ~~or with one of the alternatives that immediately follow subsection (b)~~.

- (a) For internally illuminated signs, the maximum allowed lighting power shall not exceed the product of the illuminated sign area and 12 watts per square foot. For double-faced signs, only the area of a single face shall be used to determine the allowed lighting power.
- (b) For externally illuminated signs, the maximum allowed lighting power shall not exceed the product of the illuminated sign area and 2.3 watts per square foot. Only areas of an externally lighted sign that are illuminated without obstruction or interference, by one or more luminaires, shall be used.

(c)

~~ALTERNATIVE to 148(a) and (b):~~ The sign ~~complies with this Section if it is e-~~

~~Equipped-quipped~~ only with one or more of the following light sources:

1. High pressure sodium lamps, or
2. pulse start and or ceramic Metal halide lamps that are:
 - A. Pulse start or ceramic served by a ballast that has a minimum efficiency of 88% or greater; or
 - B. Pulse start that are 320 watts or smaller, are not 250 watt or 175 watt lamps, and are served by a ballast that has a minimum efficiency of 80%;

Where ballast efficiency is the measured output wattage to the lamp divided by the measured operating input wattage when tested according to ANSI C82.6-2005; or
3. Neon with transformer or power supply efficiency, the ratio of the output wattage to the input wattage at 100% tubing load, greater than or equal to following minimum efficiencies: or
 - A. A minimum efficiency of 77% when the transformer or power supply rated output current is less than 50 mA, or
 - B. A minimum efficiency of 68% when the transformer or power supply rated output current is 50 mA or greater
4. ~~Ce~~old cathode lamps, or
5. Fluorescent lamps with barrier coat rare earth phosphors and equipped only with electronic ballasts having a fundamental output frequency not less than 20 kHz, or
6. Light emitting diodes with a power supply having an efficiency of 80% or greater, or
~~barrier coat rare earth phosphor fluorescent lamps, or~~

7. Ceompact fluorescent lamps that do not contain a medium base socket (E24/E26), or

~~b.8. Equipped only with E~~lectronic ballasts with a fundamental output frequency not less than 20 kHz,

EXCEPTION 1 to Section 148: Unfiltered signs and traffic signs.

EXCEPTION 2 to Section 148: Exit signs shall meet the requirements of the Appliance Efficiency Regulations.

End Notes

The following notes are an explanation of the changes that have been made. These notes are not part of the Standard.

¹ All edits in Section 146 have been proposed by the PG&E indoor lighting and daylighting CASE studies unless otherwise noted.

² Edited as proposed by CABEC and other stakeholders for simplification of the Standards and compliance forms. This removes the requirement for the portable lighting worksheet. It is reported that everyone is using the 0.2 watts per square foot default number for portable office lighting. Therefore, we propose removing the portable office lighting reporting requirement and reduce the LPDs for office general lighting by 0.2 W/ft².

³ This deletion recommended by staff because lighting controls have become so sophisticated that they can be simply reprogrammed after the final building inspection has been conducted. Therefore, this there is no way to prevent simultaneous operation of multiple lighting systems.

⁴ This deletion recommended by staff because lighting controls have become so sophisticated that they can be simply reprogrammed after the final building inspection has been conducted. Therefore, this there is no way to prevent simultaneous operation of multiple lighting systems.

⁵ Edited for clarity

⁶ Proposed by WattStopper, to allow more flexibility.

⁷ Edited for clarity

⁸ Edited for clarity

⁹ Edited for clarity

¹⁰ Edited for clarity to demonstrate that general lighting shall not be considered examination and surgical lights, low-level night-lights, or lighting integral to medical equipment.

¹¹ Edited for clarity

¹² Edited for clarity

¹³ Edited for clarity

¹⁴ Edited for clarity and consistency. In other sections of the Standards the term “luminaire power” is used.

¹⁵ Edited as proposed by CABEC and other stakeholders. Retail and wholesale stores shall be required to use the Area Category or Tailored methods.

¹⁶ Edited for clarity

¹⁷ This is a redundant entry of language. The identical language directly below the first paragraph in Section 146(b)(3) continues to cover these exceptions.

¹⁸ Table 146-A and 146-B have been added to replace Figure 146-A, Well Efficiency Nomograph because tables are more appropriate for Standards than using a nomograph. Table 146-B was specifically added to address tubular skylights.

¹⁹ A lighting power allowance credit is permitted only for primary sidelit daylight areas less than 2,500 ft² because automatic controls are already required in §131 for spaces larger than 2,500 ft². Note that if the primary sidelit daylight area and the secondary sidelit daylight area are controlled together, the PAF is determined based on the secondary sidelit effective aperture for both the primary sidelit daylight area and the secondary sidelit daylight area.

²⁰ All edits in Section 147 have been proposed by the PG&E outdoor lighting CASE study unless otherwise noted.

²¹ All edits in Section 148 have been proposed by the PG&E sign lighting CASE study unless otherwise noted.