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6. Outdoor Lighting

This chapter covers the requirements for outdoor lighting design and installation, including controls. 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. It is addressed primarily to lighting designers or electrical engineers and to enforcement agency personnel responsible for lighting and electrical plan checking and inspection. Chapter 5 addresses indoor lighting applications and Chapter 7 addresses sign lighting applications.

6.1 Summary of Changes in 2013 Standards

6.1.1 Mandatory Changes

All luminaires rated for use with lamps greater than 150 watts shall comply with the uplight and glare maximum zonal lumen limits.

All outdoor lighting shall be controlled both by a photocontrol device <u>and</u> by an automatic scheduling control. This is a change from 2008, when only a photocontrol was required. Ann astronomical time-switch control that automatically turns the lights off during daylight hours is allowed as an alternative to a photocontrol device. All outdoor lighting is required to be circuited and independently controlled from other electric loads.

Outdoor luminaires mounted less than 24 feet above the ground are required to have controls (motion sensors or other systems) that are capable of reducing the lighting power of each luminaire by at least 40 percent but not exceeding 80 percent. The luminaire must switch to its “on” state automatically when the space becomes occupied.

In addition to the photocontrol and automatic scheduling controls described above, outdoor sales frontage, outdoor sales lots, and outdoor sales canopy lighting, controls are required that offer part-night control or have motion sensing capability to automatically reduce the lighting power by at least 40 percent but not more than 80 percent, and ability to automatically turn the lighting to ‘occupied’ light level when the space becomes occupied.

For building façade, ornamental hardscape, and outdoor dining, the same additional controls are required as for outdoor sales areas (above), but a centralized time-based zone lighting control that reduces lighting power by at least 50 percent is allowed as an alternative.

6.1.2 Prescriptive Changes

The general hardscape power allowances have been updated for Lighting Zone 1, 3 and 4. The additional lighting power allowances for specific applications have been updated for Building Entrances and Exits, Vehicle Service Station Canopies, and Outdoor Dining.

6.1.3 Additions and Alterations Changes

For alterations that do not increase connected lighting load, and in which 10 percent or more and less than 50 percent of the luminaires in a lighting application listed in Table 140.7-A or 140.7-B, only the altered luminaires are required to meet the applicable controls requirements of Sections 130.0, 130.2, and 130.4. The entire system is not required to meet Section 140.7, and LPD calculations are not required for the affected luminaires.

For alterations that replace more than 50 percent of the luminaires in a lighting application listed in Table 140.7-A or 140.7-B, all of the lighting in that application shall meet the applicable controls requirements of Sections 130.0, 130.2, 130.4, and 140.7.

Alterations that increase the connected lighting load in a lighting application listed in Table 140.7-A or 140.7-B require that the entire system in the application zone meet all the applicable requirements of Sections 130.0, 130.2, 130.4, and 140.7.

Table 6-1- Addition and Alteration Compliance

Addition/Alteration	***Compliance***
If an addition or alteration of any number of luminaires increases the connected load…	The entire system in the lighting application is required to meet requirements listed in Section 130.0, 130.2, 130.4, and 140.7
If an addition or alteration replaces between 10 and 50 percent of the luminaires in an application and the connected load does not increase….	Only the altered luminaires are required to meet the requirements listed in Section 130.0, 130.2, and 130.4.
If an addition or alteration replaces more than 50 percent of the luminaires in an application…	All of the lighting in that application is required to meet the requirements listed in Section 130.0, 130.2, 130.4, and 140.7.

6.2 Overview

The Outdoor Lighting Standards conserve energy, reduce winter peak electric demand, and are technically feasible and cost effective. They set minimum control

requirements, maximum allowable power levels, minimum efficacy requirements, and cutoff (uplight and glare) zonal lumen limits for large luminaires.

The lighting power allowances are based on current Illuminating Engineering Society of North America (IES) recommendations for the quantity and design parameters of illumination, current industry practices, and efficient sources and equipment that are readily available. Data indicates that the IES recommendations provide more than adequate illumination, since a 2002 baseline survey of outdoor lighting practice in California showed that the majority of establishments are illuminated at substantially lower levels than IES recommendations.[1]

Outdoor lighting is addressed in this chapter. Lighting in unconditioned buildings (including parking garages) is addressed in Chapter 5.

The Standards do not allow trade-offs between outdoor lighting power allowances and indoor lighting, sign lighting, HVAC, building envelope, or water heating [§140.7(a)].

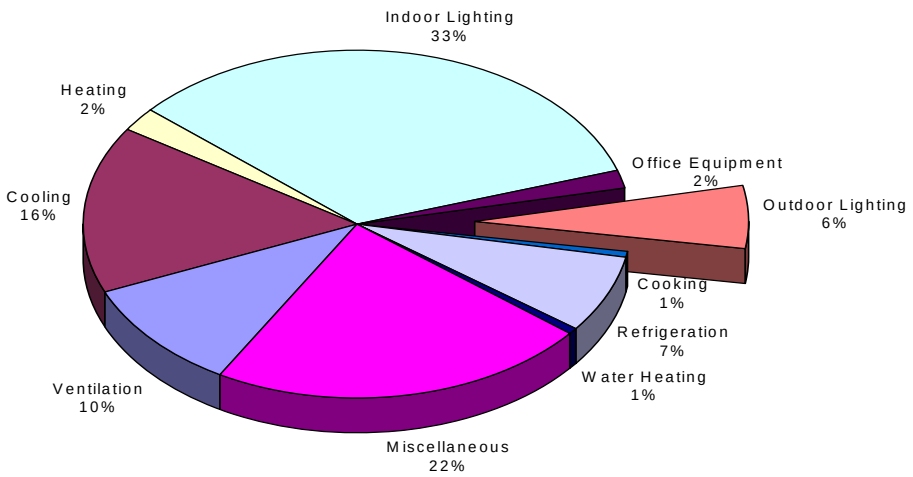


Figure 6-1 – Energy Consumption by End-Use

Source: California Commercial End-Use Survey, March 2006

6.2.1 History and Background

In response to the 2000 electricity crisis, the legislature charged the Energy Commission to develop Outdoor Lighting Standards that are technologically feasible and cost-effective. The intent of the legislature was that the Standards would provide ongoing reliability to the electricity system and reduce energy consumption.

Regulations for lighting have been on the books in California since 1977, but have only addressed indoor lighting through control requirements and maximum allowable

[1]Integrated Energy Systems Productivity and Building Science, Outdoor Lighting Baseline Assessment, New Buildings Institute, August 12, 2002

lighting power. In 2005 Standards the scope was expanded to include outdoor lighting applications as well as indoor applications in unconditioned buildings.

The 2013 Outdoor Lighting Standards evolved over a three-year period through an, open, public process. The Energy Commission encouraged all interested persons to participate in a series of public hearings and workshops through which the Energy Commission gathered information and viewed presentations on energy efficiency possibilities from a variety of perspectives. The Energy Commission hired a consulting team that included a number of nationally recognized outdoor lighting experts to assist in the development of the Standards. The Energy Commission also solicited ideas, proposals, and comments from a number of interested parties.

The allowed lighting power densities for outdoor lighting are structured according to a "layered" approach. With the layered approach, the first layer of allowed lighting power is general hardscape for the entire site. After that layer of allowed lighting power has been determined, additional layers of lighting power are allowed for specific applications. For example, the total allowed power for a sales lot with frontage is determined by layering the hardscape, sales lot and sales frontage allowances, with certain restrictions associated with the location of the power used for frontage and sales lot lighting.

6.2.2 Scope and Application

The outdoor lighting applications that are addressed by the Standards are shown in the first two columns of Table 6-2. The first column is general site illumination applications, which allow trade-offs within the outdoor portion only. The second column is specific outdoor lighting applications, which do not allow trade-offs, and are considered "use it or lose it". The lighting applications in the third column are not regulated. The Standards include control requirements as well as limits on installed lighting power.

A. Trade-offs

The Standards do not allow trade-offs between outdoor lighting power allowances and indoor lighting, sign lighting, HVAC, building envelope, or water heating [(§140.7(a)].

Allowed lighting power determined according to §140.7(d) 1 for general hardscape lighting may be traded to specific applications in §140.7(d) 2, provided the luminaires used to determine the illuminated area are installed as designed. This means that if luminaires used to determine the total illuminated area are removed from the design, resulting in a smaller illuminated area, then the general hardscape lighting power allowance must also be reduced accordingly.

Allowed lighting power for specific applications shall not be traded between specific applications, or to hardscape lighting in §140.7(d) 1. This means that for each and every specific application, the allowed lighting power is the smaller of the allowed power determined for that specific application according to §140.7(d)2, or the actual installed lighting power that is used in that specific application. These additional power allowances are "use it or lose it" allowances.

Table 6-2 – Scope of the Outdoor Lighting Requirements

Lighting Applications Covered		Lighting Applications Not Regulated
General Hardscape (trade-offs permitted)	**Specific Applications (trade-offs not permitted)**	**(only as detailed in §140.7)**
The general hardscape area of a site shall include parking lot(s), roadway(s), driveway(s), sidewalk(s), walkway(s), bikeway(s), plaza(s), and other improved area(s) that are illuminated	Canopies: Sales and Non-sales Drive-Up Windows Emergency Vehicle Facilities Entrances or Exits Facades Guard Stations Ornamental Lighting Outdoor Dining Primary Entrances for Senior Care Facilities, Police Stations, Hospitals, Fire Stations, and Emergency Vehicle Facilities Sales Frontage and Lots Special Security Lighting for Retail Parking and Pedestrian Hardscape Student Pick-up/Drop-off zone Vehicle Service Station: Canopies, Hardscape, and Uncovered Fuel Dispenser	Temporary Required & regulated by FAA Required & regulated by the Coast Guard. For public streets, roadways, highways, and traffic signage lighting, and occurring in the public right-of-way For sports and athletic fields, and children's playground For industrial sites For ATM required by law For public monuments Signs For tunnels, bridges, stairs, wheelchair elevator lifts For ramps that are other than parking garage ramps Landscape lighting For themes and special effects For theatrical and other outdoor live performances For qualified historic buildings
Other outdoor lighting applications that are not included in Standards Tables 140.7-A, 140.7-B or 140.7-C are assumed to be not regulated by these Standards. This includes decorative gas lighting and emergency lighting powered by an emergency source as defined by the California Electrical Code. The text in the above list of lighting applications that are not regulated has been shortened for brevity. Please see Section 6.1.2 B below for details about lighting applications not regulated.		

B. Outdoor Lighting Applications Not Regulated

When a luminaire is installed only to illuminate one or more of the following applications, the lighting power for that luminaire shall be exempt from §140.7(a). The Standards clarify that at least 50 percent of the light from the luminaire must fall within an application to qualify as being installed for that application.

- Temporary outdoor lighting.

  Temporary Lighting is defined in §100.1 as a lighting installation with plug-in connections that does not persist beyond 60 consecutive days or more than 120 days per year.

- Lighting required and regulated by the Federal Aviation Administration and the Coast Guard.
- Lighting for public streets, roadways, highways, and traffic signage lighting, including lighting for driveway entrances occurring in the public right-of-way.
- Lighting for sports and athletic fields, and children's playground.
- 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.
- Lighting specifically for Automated Teller Machines as required by California Financial Code Section 13040, or required by law through a local ordinance.

- Lighting of public monuments.
- Lighting of signs. Signs shall meet the requirements of §130.3 and 140.8.
- Lighting of tunnels, bridges, stairs, wheelchair elevator lifts for American with Disabilities Act (ADA) compliance, and ramps that are other than parking garage ramps.
- Landscape lighting.

  Landscape lighting is defined in §100.1 as lighting that is recessed into or mounted on the ground, paving, or raised deck, which is mounted less than 42 inches above grade or mounted onto trees or trellises, and that is intended to be aimed only at landscape features. Lighting installed for a purpose other than landscape, such as walkway lighting, shall not be considered exempt landscape lighting if only incidental lighting from the walkway luminaires happens to spill onto the landscape.
- In theme parks: outdoor lighting only for themes and special effects. However, all non-theme lighting, such as area lighting for a parking lot, shall not be considered theme lighting, even if the area luminaires are mounted on the same poles as the theme lighting.
- 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 multi-scene or theatrical cross-fade control station accessible only to authorized operators.
- Outdoor lighting systems for qualified historic buildings, as defined in the California Historic Building Code (Title 24, Part 8), if they consist solely of historic lighting components or replicas of historic lighting components. If lighting systems for qualified historic 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 outdoor lighting systems for qualified historic buildings shall comply with §140.7.

6.3 Mandatory Measures

The mandatory features and devices must be included in all outdoor lighting projects when they are applicable. These features have been proven to be cost-effective over a wide range of outdoor lighting applications.

Mandatory measures for outdoor lighting and signs are specified in §110.9, §130.0, and §130.2. These are similar to the mandatory measures for indoor lighting. Even if the design has errors and has specified incorrect features and devices, the installer is responsible to meet all of the applicable requirements that he or she installs. The installer is also required to sign the appropriate Installation Certificate to verify correct installation.

6.3.1 Minimum Luminaire Control

§130.2(a)

All outdoor luminaires with incandescent lamps rated over 100 W must be controlled by a motion sensor.

Example 6-1 Motion Sensors for Incandescent Lamps

Question

I am installing outdoor luminaires with screw-based sockets and I intend to use 60W incandescent lamps. Am I required to put these luminaires on motion sensors?

Answer

For incandescent luminaires with screw-based sockets it depends on the maximum relamping rated wattage of the luminaires, not on the wattage of the lamps that are used. If the maximum relamping rated wattage of a screw-based luminaire as listed on a permanent factory-installed label is less than or equal to 100 W, then motion sensors are not required. However, if the maximum relamping rated wattage of the luminaire, as listed on permanent factory-installed labels is more than 100 W, or if the luminaire is not labeled, then motion sensors are required.

6.3.2 Luminaire Cutoff Zonal Lumen Limits

§130.2 (b)

Outdoor luminaires that use lamps or light sources rated greater than 150 W in the following areas are required to comply with uplight and glare zonal lumen limits:

- Hardscape areas, including parking lots and service stations hardscape
- Building entrances
- All sales and non-sales canopies
- Outdoor dining
- All outdoor sales areas

Uplight and glare zonal lumen limits are not considered for outdoor luminaires when they are used to illuminate the following:

- Signs.
- Lighting for building facades, public monuments, statues, and vertical surfaces of bridges.
- Lighting required by a health or life safety statute, ordinance, or regulation that may fail to meet the uplight and glare limits due to application limitations.
- Temporary outdoor lighting as defined by §100.1.
- Replacement of existing pole mounted luminaires in hardscape areas meeting all of the following conditions:
    - Where the existing luminaire does not meet the luminaire uplight and glare zonal lumen limits in §130.2(b); and
    - Spacing between existing poles is greater than 6 times the mounting height of the existing luminaires; and
    - Where no additional poles are being added to the site; and
    - Where new wiring to the luminaires is not being installed; and
    - Provided that the connected lighting power wattage is not increased.

The illuminated Engineering Society of North America (IES) published (TM-15-11) the technical memorandum *'Luminaire Classification for Outdoor Luminaires'* in 2011. This document defines three-dimensional regions of analysis for exterior luminaires and further establishes zonal lumen limits for these regions as part of a larger method of categorizing outdoor lighting equipment into Backlight, Uplight, and Glare components. Collectively, the three components are referred to as the BUG system.

The zonal lumen limits per secondary solid angles for uplight and glare are based upon the methodology found in TM-15. The Lighting Zone that the project is located in determines the maximum zonal lumens for both uplight and glare. There are no separate zonal lumen limits for the Backlight component regardless of the lighting zone, because this component is intended for specific property boundary conditions, and is outside the prevue of Title 24.

To comply with this mandatory measure, the luminaire must not exceed the maximum zonal lumen limits for each secondary solid angle region within both the Uplight and Glare component per lighting zone. The zonal lumen values in a photometric test report mustinclude any tilt or other non-level mounting condition of the installed luminaire.

Within the Uplight component, there are two secondary solid angles that have maximum zonal lumen limits. The two angles are designated as Uplight High (UH) and Uplight Low (UL). Both of the zonal lumen limits must be met in order for a luminaire to be in compliance.

Table 6-3 – Uplight Secondary Solid Angles

	Secondary Solid Angle
Uplight High (UH)	100-180 degrees

Uplight Low (UL)	>90 to 100 degrees

Within the Glare component, there are four secondary solid angles that have maximum zonal lumen limits. The four angles are designated as Forward Very High (FVH), Backlight Very High (BVH), Forward High (FH), and Backlight High (BH). **All four of the zonal lumen limits must be met in order for a luminaire to be in compliance.** Note that the BVH and BH angles are regulated within the glare component.

Table 6-4 – Glare Secondary Solid Angles

	Secondary Solid Angle
Forward Very High (FVH)	80 to 90 degrees
Backlight Very High (BVH)	80 to 90 degrees
Forward High (FH)	60 to <80 degrees
Backlight High (BH)	60 to <80 degrees

The maximum zonal lumen limits for glare are different for asymmetrical luminaires (such as Type I, Type II, Type III, and Type IV) then for quadrilateral symmetrical luminaires such as Type V and Type V Square. Refer to Figure 6-2 for a zonal lumen distribution illustration. The maximum zonal lumen limits for uplight are the same for both asymmetrical and quadrilateral symmetrical luminaires.

The uplight and glare values are specific for each luminaire/light source combination and orientation and therefore are not transferrable between different lamp wattage, light sources or geometric applications. .

In order to determine if a luminaire meets the zonal lumen limits for both uplight and glare, a photometric file will need to be procured from the manufacturer for the specific wattage and mounting configuration. Using lighting calculation software, the photometric file will designate the absolute lumens in each of the secondary solid angles for uplight and glare. Alternatively, many manufacturers may provide a photometric report that provides the relevant zonal lumen values for their fixtures. Using the designations in the software or on a luminaire photometric report, a comparison is made to the maximum zonal lumen limits listed in Table 130.2-A and 130.2-B for the lighting zone in which the luminaire is being installed. This comparison will need to be made for each luminaire type being proposed, at each wattage, and at every tilt angle of installation.

Table 6-5 – (Table 130.2 – A) Uplight Ratings (Maximum Zonal Lumens

Secondary Solid Angle	*Maximum Zonal Lumens per Outdoor Lighting Zone*			
	OLZ1	OLZ2	OLZ3	OLZ4
Uplight High (UH) 100 to 180 degrees	10	50	500	1,000
Uplight Low (UL) 90 to<100 degrees	10	50	500	1,000

Table 6-6 – (Table 130.2 – B) Glare Ratings (Maximum Zonal Lumens

Glare Rating for Asymmetrical Luminaire Types (Type I, II, III, IV)				
Secondary Solid Angle	Maximum Zonal Lumens per Outdoor Lighting Zone			
	OLZ1	OLZ2	OLZ3	OLZ4
Forward Very High (FVH) 80 to 90 degrees	100	225	500	750
Backlight Very High (BVH) 80 to 90 degrees	100	225	500	750
Forward High (FH) 60 to <80 degrees	1,800	5,000	7,500	12,000
Backlight High (BH) 60 to <80 degrees	500	1,000	2,500	5,000

Glare Rating for Quadrilateral Luminaire Types (Type V, and V Square)				
Secondary Solid Angle	Maximum Zonal Lumens per Outdoor Lighting Zone			
	OLZ1	OLZ2	OLZ3	OLZ4
Forward Very High (FVH) 80 to 90 degrees	100	225	500	750
Backlight Very High (BVH) 80 to 90 degrees	100	225	500	750
Forward High (FH) 60 to <80 degrees	1,800	5,000	7,500	12,000
Backlight High (BH) 60 to <80 degrees	1,800	5,000	7,500	12,000

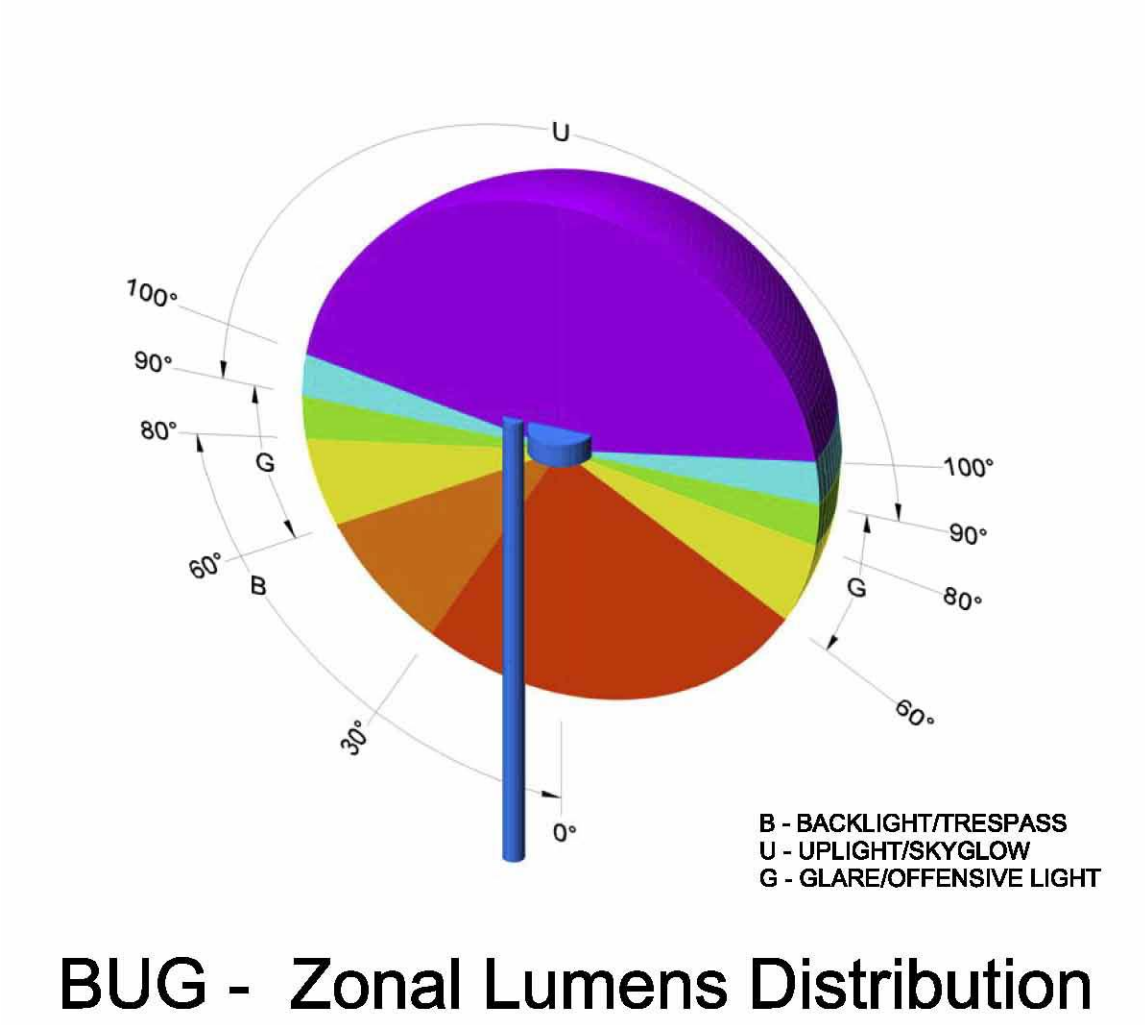


Figure 6-2 – Outdoor Luminaire BUG Zone Regions

Example 6-2 Backlight Zonal Lumen Limits

Question

I am installing four 200W luminaires. What are the maximum zonal lumen limits for Backlight that I have to meet?

Answer

You will need to comply with the zonal lumen limits for each solid angle zone found within the Uplight and Glare components only. Note that within the Glare component, there are two solid angle zones that include some backwards propagating light portions. Zonal lumen limits for these angles (Backlight Very High and Backlight High) are limited because they are a part of the Glare component.

Example 6-3 Obtaining Zonal Lumen Limits

Question

How are luminaire zonal lumen limits obtained?

Answer

The zonal lumen values for a particular luminaire, lamping and orientation are obtained from the manufacturer or may be calculated from photometric data. Table 130.2-A and 130.2-B list the maximum zonal lumens allowed in each solid angle zone within the Uplight and Glare categories. If the zonal lumens in any solid angle zone is exceeded in each category, the uplight or glare rating moves into a higher outdoor lighting zone.

For instance, an example photometric report indicates the following for a Type III luminaire:

Uplight Zonal Lumens		
	UH	UL
Zonal Lumens	135.4	74.9

Uplight Zonal Lumens				
	FVH	BVH	FH	BH
Zonal Lumens	104.3	65.2	1935.7	440.8

Comparing the Uplight zonal lumen values to Table 130.2-A, the luminaire is only acceptable for use in OLZ3 because both the UH and UL zonal lumen values are below 500 lumens.

Comparing the Glare zonal lumen values to Table 130.2-B for Type III luminaires, this luminaire is only acceptable for use in OLZ2. Even though there are some angles that are less than the maximum zonal lumen limits, the FVH value moves this luminaire up to OLZ2.

Combining both Uplight and Glare, this luminaire can only be used in OLZ3.

Example 6-4 Zonal Lumen Limits by Lighting Zone

Question

Do Uplight and Glare zonal lumen limits vary in the regulations?

Answer

Yes, they vary depending on lighting zone. Outdoor Lighting Zone 1 has more stringent zonal lumen requirements than Outdoor Lighting Zone 2. Refer to Table 130.2-A and 130.2-B for the zonal lumen maximums.

Example 6-5 Zonal Lumen Limits for Luminaires in a Rail Yard

Question

Am I required to meet the uplight and glare zonal lumen limits for luminaires in a rail yard?

Answer

No, only luminaires in areas such as hardscape areas, building entrances, canopies, or outdoor sales areas are required to meet the uplight and glare zonal lumen limits. However, in this example, the parking lot outside the rail yard must meet the uplight and glare zonal lumen limits.

Example 6-6 Full Cut-Off Luminaires and Zonal Lumen Limits

Question

Can full cut-off luminaires be used to meet the zonal lumen limits of the Standards?

Answer

Luminaires using light sources of150W or greater, including full cut-off luminaires, must meet the Uplight zonal lumen limits in Table 130.2-A to meet the requirements of this section. Fully shielded luminaires have superior optics that can very effectively reduce or eliminate disability and discomfort glare, and other negative impacts of high intensity unshielded lighting. However, a traditional “full cut-off” style luminaire is not assured to meet the Uplight and Glare zonal lumen limits of Table 130.2-B, so verification will be required.

Example 6-7 Wallpacks and Zonal Lumen Limits

Question

A parking lot adjacent to a building is being illuminated by 250W wall packs mounted on the side of the building. Do these wall packs have to meet the zonal lumen limits? The wall packs are also illuminating the façade of the building, but their main purpose is for parking lot illumination.

Answer

Yes, these 250W wall packs will have to meet the zonal lumen limits because their main purpose is for parking lot illumination. Luminaire mounting methods or locations do not necessarily determine the purpose of the illumination.

Each luminaire must be appropriately assigned to the function area that it is illuminating, whether it is mounted to a pole, building, or other structure. Only wall packs that are 150W or less are not required to meet the Uplight and Glare limits in the Standard.

Example 6-8 Wallpacks and Zonal Lumen Limits

Question

Can we use 250W, non-cut-off wall packs for building façade lighting?

Answer

Even though façade lighting is exempt from the zonal lumen limits, you cannot consider a traditional – wall pack installation as façade lighting since most of the light from these luminaires will not illuminate the façade to which they are attached. Most ‘wall pack’ style luminaires do not direct the majority of the light exiting the luminaire onto the façade. Only wall packs that are 150W or less are not required to meet the Uplight and Glare limits in the Standard.

Example 6-9 Cut-Off Luminaires and Zonal Lumen Limits

Question

If a cut-off or full cut-off luminaire is mounted at a tilt does it still meet the zonal lumen limits?

Answer

It depends. Luminaires that meet the zonal lumen limits when mounted at 90° to nadir may or may not comply with the zonal lumen limits when they are mounted at a tilt. In order for a tilted luminaire to meet this requirement a photometric test report must be provided showing that the luminaire meets the zonal lumen limits at the proposed tilt, or other non-level mounting condition.

6.3.3 Controls for Outdoor Lighting

Outdoor lighting controls shall be installed that meet the following requirements as applicable.

Controls are not required for outdoor lighting not permitted by a health or life safety statute, ordinance, or regulation to be turned OFF, and for lighting in tunnels required to be illuminated 24 hours per day and 365 days per year.

A. Automatic Shutoff Controls

§130.2(c) 1

All installed outdoor lighting must be controlled by a photocontrol or astronomical time switch that automatically turns off the outdoor lighting when daylight is available. Additionally, outdoor lighting must be controlled by an automatic scheduling control.

B. Circuiting

§130.2(c) 2

All installed outdoor lighting shall be circuited and independently controlled from other electrical loads.

Example 6-10 Circuiting of Irrigation Controllers

Question

Can irrigation controllers be on the same circuit as lighting?

Answer

No, this is not allowed. Outdoor lighting must be separately circuited from all other loads.

C. Mounting Specific Controls

§130.2(c) 3

All outdoor lighting, where the bottom of the luminaire is mounted 24 feet or less above the ground shall be controlled with automatic lighting controls that meet the following requirements:

- Shall be motion sensors or other lighting control systems that automatically controls lighting in response to the area being vacated of occupants.
- Shall be capable of automatically reducing the lighting power of each luminaire by at least 40 percent but not exceeding 80 percent, or provide continuous dimming through a range that includes 40 percent through 80 percent.

- Shall employ auto-ON functionality when the area becomes occupied.
- No more than 1,500 watts of lighting power shall be controlled together.

The following applications are not required to use controls for luminaires mounted less than 24 feet above the ground:

- Lighting for Outdoor Sales Frontage, Outdoor Sales Lots, and Outdoor Sales Canopies
- Lighting for Building Facades, Ornamental Hardscape and Outdoor Dining
- Outdoor lighting, where luminaire rated wattage is determined in accordance with Section 130.0(c), and which meets one of the following conditions: pole mounted luminaires with a maximum rated wattage of 75 watts, non-pole mounted luminaires with a maximum rated wattage of 30 watts each, or linear lighting with a maximum wattage of 4 watts per linear foot of luminaire.
- Applications listed as Exceptions to Section 140.7(a) shall not be required to meet the requirements of Section 130.2(c) 3.

D. Application Specific Controls

§130.2(c) 4 & §130.2(c) 5

For Outdoor Sales Frontage, Outdoor Sales Lots, and Outdoor Sales Canopies lighting, an automatic lighting control shall be installed that meets the following requirements:

- A part-night outdoor lighting control as defined in Section 100.1, or
- Motion sensors capable of automatically reducing lighting power by at least 40 percent but not exceeding 80 percent, and which have auto-ON functionality.

For Building Façade, Ornamental Hardscape and Outdoor Dining lighting, an automatic lighting control shall be installed that meets one or more of the following requirements.

- A part-night outdoor lighting control as defined in section 100.1, or
- Motion sensors capable of automatically reducing lighting power by at least 40 percent but not exceeding 80 percent, and which have auto-ON functionality, or
- A centralized time-based zone lighting control capable of automatically reducing lighting power by at least 50 percent.
- Note that outdoor wall mounted luminaires ‘wall packs’ where the bottom of the luminaire is mounted 24 feet or less above the ground must also be controlled by a motion sensor capable of shutting off between 40% and 80% of the load, as required by Section 130.2(c) 3.

There are a number of options available to meet the requirements of this section. Automatic controls to reduce outdoor lighting by at least 40 percent but not exceeding 80 percent are required with all of these strategies. Following are a few examples:

- Dimmable lighting systems can be used to meet the outdoor multi-level switching requirements. For HID luminaires, the high-low output approach (normally applied by switching capacitors in the ballast) capable of reducing the connected lighting power by 40 percent to 80 percent may be used. For

HID and LED luminaires, stepped dimming is acceptable provided that steps are available within the 40 percent to 80 percent range. LED continuous dimming strategies are acceptable as long as their dimming capacity encompasses the 40 percent to 80 percent range.

- Equip the lighting systems with motion sensors and photoelectric switches. This option works well with fluorescent and LED sources. HID sources may employ the high-low strategy with motion sensors.
- Employ a part-night control system to set back the light level at a predetermined time after business hours.

Example 6-11 Mandatory Outdoor Requirements

Question

What are the mandatory outdoor lighting requirements?

Answer

The mandatory outdoor lighting requirements include:

• Motion sensing for incandescent luminaires rated over 100 watts

• BUG zonal lumen limits for luminaires ratings greater than 150 watts unless excluded by the code.

• Automatic controls to turn lighting OFF when daylight is available

• Separate circuiting and independently controlled from other electrical loads by an automatic scheduling control

• Motion sensing devices for luminaires mounted below 24 feet above ground that automatically reduce the lighting power of each luminaire by at least 40 percent, but not greater than 80 percent, auto-ON functionality when the area becomes occupied and no more than 1,500 watts of lighting power shall be controlled together with a single sensor.

• Outdoor Sales Frontage, Outdoor Sales Lot, and Outdoor Sales Canopies shall have a part-night control or motion sensors capable of automatically reducing lighting power by at least 40 percent but not exceeding 80 percent, along with auto-ON functionality.

• Building Façade, Ornamental Hardscape, and Outdoor Dining shall have a part-night control or motion sensors capable of automatically reducing lighting power by at least 40 percent but not exceeding 80 percent, along with auto-ON functionality, or a centralized time-based zone lighting control capable of automatically reducing lighting power by 50 percent.

All lighting controls must meet the requirements of §110.9.

6.3.4 Requirements for Lighting Control Functionality

§110.9(b)

Lighting control devices are required to have various types of functionality, depending on what type of control they are, and whether they are “devices” (consisting of a single component), or “systems” consisting of two or more components. Devices are regulated by the Appliance Standards (California Code of Regulations, Title 20), whereas systems are regulated by Title 24 Part 6, Section 110.9.

A. Self-contained lighting control devices are defined by the Standards as unitary lighting control modules that require no additional components to be fully functional lighting controls. Most self-contained lighting controls are required to be certified by the manufacturer according to the Title 20 Appliance Efficiency Regulations; please see the Appliance Standards Manual for details of those requirements. The following lighting controls are required to be certified to Title 20:

1. Time-Switch Lighting Controls
   - Automatic Time-Switch Controls
   - Astronomical Time-Switch Controls
   - Multi-Level Astronomical Time-Switch Controls
   - Outdoor Astronomical Time-Switch Controls
2. Daylighting Controls
   - Automatic Daylight Controls
   - Photo Controls
3. Dimmers
4. Occupant Sensing Controls
   - Occupant Sensors
   - Motion Sensors
   - Vacancy Sensors

A part-night control device is <u>not</u> required to be certified to Title 20, but must meet the following requirements. A Part-Night Outdoor Lighting Control is defined by the Standards as a time or occupancy-based lighting control device or system that is programmed to reduce or turn off the lighting power to an outdoor luminaire for a portion of the night.

a. Be able to accurately predict sunrise and sunset within +/- 15 minutes and timekeeping accuracy within five minutes per year; and

b. Be able to setback or turn off lighting at night as required in §130.2(c), by means of a programmable timeclock or motion sensing device; and

c. When the setback or turning off is controlled with a timeclock, shall be capable of being programmed to allow the setback or turning off of the lighting to occur from any time at night until any time in the morning, as determined by the user.

B. Lighting Control Systems are defined by the Standards as requiring two or more components to be installed in the building to provide all of the functionality required to make up a fully functional and compliant lighting control. Lighting control systems are <u>not</u> required to be certified to Title 20, and may be installed for compliance with lighting control requirements in the Standards providing they meet all of the following requirements:

1. Alighting control system shall comply with all requirements listed below; and all components of the system considered together as installed shall meet all

applicable requirements for the lighting control application for which they are installed as required in Sections 130.0 through 130.5, Sections 140.6 through 140.8, §141.0, and §150(k).

2. For all lighting control systems, including Energy Management Control Systems (EMCS), an installation certificate shall be signed by the licensee of record in accordance with §130.4(b) and Nonresidential Appendix NA7
3. If there are indicator lights that are integral to a lighting control system, they shall consume no more than one watt of power per indicator light.
4. A lighting control system shall meet all of the requirements in the Title 20 Appliance Efficiency Regulations for the identical self-contained lighting control device it is installed to function as. For example, if a lighting control system is installed to comply with the requirements for an occupancy sensor, then the system shall comply with all of the requirements for an occupancy sensor in Title 20.
5. If the system is installed to function as a partial-on or partial-off occupant sensor, the installation may be made up of a combination of single or multi-level Occupant, Motion, or Vacancy Sensor Controls, provided that the components installed to comply with manual-on requirements shall not be capable of conversion by the user from manual-on to automatic-on functionality.

Example 6-12 Manufacturer Responsibility for Certified Controls

Question

What is the responsibility of the manufacturer with regard to using lighting controls that are certified by the Energy Commission and listed in the Energy Commission directories?

Answer

It is the responsibility of the manufacturer to certify its specific controls and to present the data to the Energy Commission so that it can be listed in the Energy Commission directories.

Example 6-13 Designer Responsibility for Certified Controls

Question

What is the responsibility of the designer with regard to using lighting controls that are certified by the Energy Commission and listed in the Energy Commission directories?

Answer

It is the responsibility of the designer to specify only lighting controls that have been listed certified and listed in the Energy Commission directories.

Example 6-14 Installer Responsibility for Certified Controls

Question

What is the responsibility of the installer with regard to using lighting controls that are certified by the Energy Commission and listed in the Energy Commission directories?

Answer

It is the responsibility of the installer to install only controls that are certified by the Energy Commission and listed in the Energy Commission directories. It is also the responsibility of the installer to sign the Installation Certificate.

6.4 Prescriptive Measures

6.4.1 Lighting Zones

§10-114

The basic premise of the Standards is to base the outdoor lighting power that is allowed on how bright the surrounding conditions are. The Standards contain lighting power allowances for newly installed equipment and specific alterations that are dependent on which Lighting Zone the project is located.

A. Outdoor Lighting Zones

The technical basis for the differences in outdoor lighting zones described by the Illuminating Engineering Society of North America (IES) is that the eyes adapt to darker surrounding conditions and less light is required to properly see; when the surrounding conditions get brighter, more light is needed to see. The least power is allowed in Lighting Zone 1 and increasingly more power is allowed in Lighting Zones 2, 3, and 4. Providing greater power than is needed potentially leads to debilitating glare and an increasing spiral of brightness as over-bright projects become the surrounding conditions for future projects causing future projects to unnecessarily require greater power resulting in wasted energy.

The Energy Commission defines the boundaries of Outdoor Lighting Zones based on U.S. Census Bureau boundaries for urban and rural areas as well as the legal boundaries of wilderness and park areas (see Standards Table 10-114-A). By default, government designated parks, recreation areas and wildlife preserves are Lighting Zone 1; rural areas are Lighting Zone 2; and urban areas are Lighting Zone 3. Lighting Zone 4 is a special use district that may be created by a local government through application to the CEC.

Table 6-7 – Standards 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
LZ1	Dark	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.	A government designated park, recreation area, wildlife preserve, or portions thereof, can be designated as LZ2 or LZ3 if they are contained within such a zone.	Not applicable.
LZ2	Low	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	Medium	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.

The options allowed under §10-114 are as follows

Parks, Recreation Areas and Wildlife Preserves

The default for government designated parks, recreation areas, and wildlife preserves is Lighting Zone 1. The local jurisdiction having authority over the property will know if the property is a government designated park, recreation area, or wildlife preserve. However, when a park, recreation area, wildlife preserve, or portions thereof, are surrounded by urban areas (as defined by the U.S. Census Bureau), such areas may be designated as Lighting Zone 3 by adoption of the local jurisdiction. Similarly, a Lighting Zone 2 designation can be adopted if the area is surrounded by rural areas (as defined by the U.S. Census Bureau). All adjustments in LZ designation must be reviewed by the CEC for approval.

Rural Areas

The default for rural areas as defined by the U.S. Census Bureau is Lighting Zone 2. However, local jurisdictions having building permit authority may designate certain areas as either Lighting Zone 3 or Lighting Zone 4 if the local jurisdiction determines that ambient lighting levels are higher than typical for a rural area. Examples of areas that might be designated Lighting Zone 3 are special commercial districts or areas with special security considerations. All adjustments in LZ designation must be reviewed by the CEC for approval.

Local jurisdictions also may designate default Lighting Zone 2 areas as Lighting Zone 1, which would establish lower lighting power for outdoor areas with lower surrounding brightness. An example of an area that might be changed to Lighting

Zone 1 would include an underdeveloped, environmentally sensitive or predominately residential area within a default Lighting Zone 2 area.

Urban Areas

The default for urban areas, as defined by the U.S. Census Bureau, is Lighting Zone 3. Local jurisdictions may designate areas to Lighting Zone 4 for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels. All adjustments in LZ designation must be reviewed by the CEC for approval.

Local jurisdictions also may designate areas as Lighting Zone 2 or even Lighting Zone 1 if they deem that this is appropriate.

6.4.2 How to Determine the Lighting Zone for an Outdoor Lighting Project

Permit applicants may determine the Lighting Zone for a particular property using the following steps:

- Local jurisdiction – Check with the local jurisdiction having authority over permitting of the property. The local jurisdiction will know if the property is a government designated park, recreation area, or wildlife preserve, and therefore in default Lighting Zone 1. The local jurisdiction also may know if the property is contained within the physical boundaries of a Lighting Zone for which a locally-adopted change has been made. However, verify through the California Energy Commission website whether or not a locally-adopted change has been submitted to the Energy Commission.
- U.S. Census – Look at the U.S. Census website to determine if the property is within a rural (statewide default Lighting Zone 2) or urban (statewide default Lighting Zone 3) census block.
    - Go to the US Census page, street address search (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml).
    - A 'Geography Results' window will display a number of geographies within which the address is located. If you are in an urban area, one of the geographies will designate this; otherwise you are in a rural geography.
- Energy Commission website – Check the Energy Commission's website to determine if the property is contained within the physical boundaries of a Lighting Zone that has been changed through a local jurisdiction adoption process.

6.4.3 Examples for Defining Physical Boundaries

Using Metes and bounds is a good method to use for defining the physical boundaries of an adopted Lighting Zone.

Metes and bounds is a system that uses physical features of the local geography, along with directions and distances, to define and describe the boundaries of a parcel of land. The boundaries are described in a running prose style, working around the parcel of the land in sequence, from a point of beginning, returning back to the same point. The term “metes” refers to a boundary defined by the measurement of each straight run, specified by a distance between the terminal points, and an orientation or direction. The term “bounds” refers to a more general boundary descriptions, such as along a certain watercourse or public road way.

Following are examples of using metes and bounds to define the physical boundaries of an adopted Lighting Zone:

- Properties with frontage on Mazi Memorial Expressway, between Nancy Avenue and Jessica Street to a depth of 50 ft from each frontage property line.
- The area 500 ft east of Interstate 5, from 500 ft north of Gary Ave to 250 ft south of West William Way.
- The area of the Owen Bike Trail starting at Michael Avenue and going east to Flamm Park, the width of a path which is from the edge of the South Fork of the Joshua River on one side, to 100 ft beyond the paved bike trail, or to private property lines, whichever is shorter, on the other side.
- The area that is bounded by the Nelson River on the West, Hudler Lane on the south, Jon Road on the east, and the boundary of Beverly County on the north.

Note: The physical boundaries of a changed Lighting Zone are not required to coincide with the physical boundaries of a census tract.

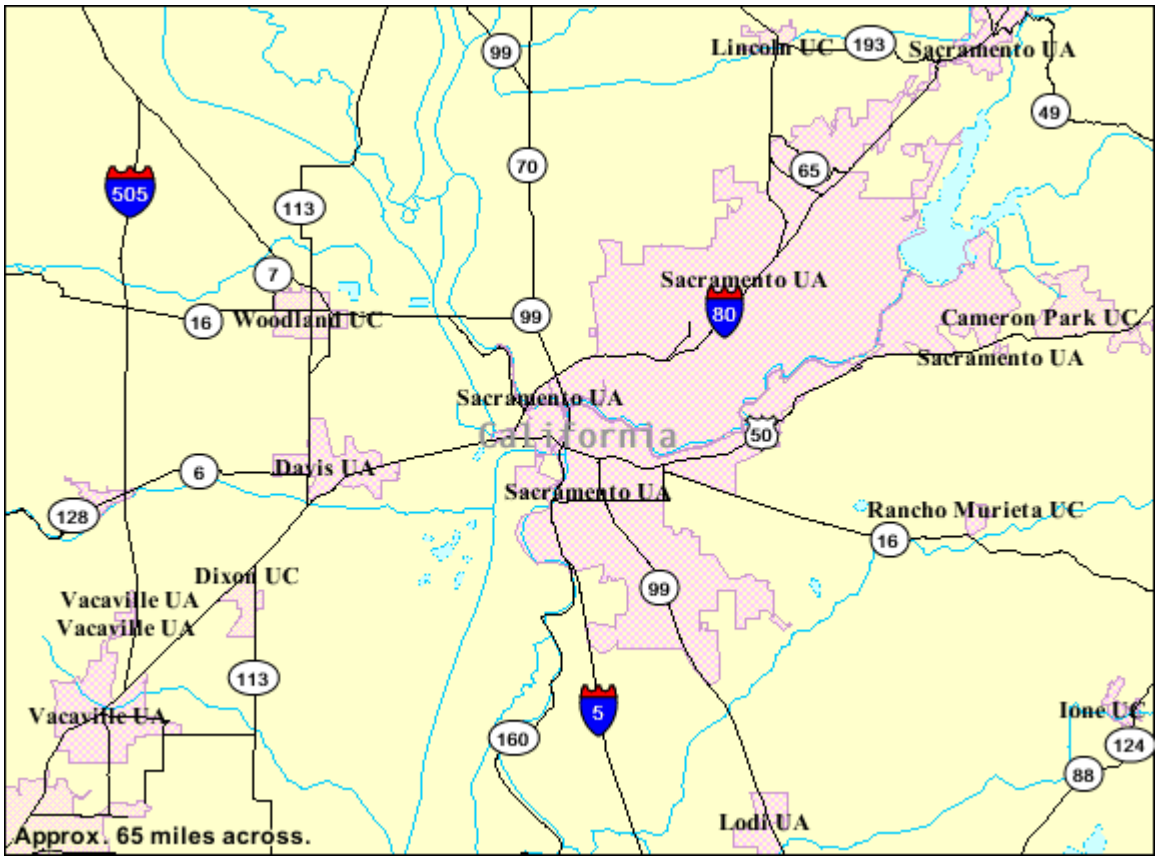


Figure 6-3 – Example of US Census Bureau Information

Example 6-15 Changing the Default Lighting Zone

Question

I want to have the default outdoor Lighting Zone for a particular piece of property changed. How do I accomplish that?

Answer

Check with the local jurisdiction having authority over the property and ask them what you need to do to petition them to have the default outdoor Lighting Zone officially adjusted.

6.4.4 Lighting Zone Adjustments by Local Jurisdictions

§10-114

Standards Table 10-114-A

The Energy Commission sets statewide default Lighting Zones. However, jurisdictions (usually a city or county), may change the zones to accommodate local conditions. Local governments may designate a portion of Lighting Zones 2 or 3 as Lighting Zone 4. The local jurisdiction also may designate a portion of Lighting Zone 3 to Lighting Zone 2 or even Lighting Zone 1. When a local jurisdiction adopts changes to the Lighting Zone boundaries, it must follow a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction also must provide the Energy Commission with detailed information about the new Lighting Zone boundaries, and submit a justification that the new Lighting Zones are consistent with the specifications in §10-114.

The Energy Commission has the authority to disallow Lighting Zone changes if it finds the changes to be inconsistent with the specification of Standards Table 10-114-A or §10-114.

6.4.5 Outdoor Lighting Power Compliance

An outdoor lighting installation complies with Standards if the actual outdoor lighting power is no greater than the allowed outdoor lighting power. This section describes the procedures and methods for complying with §140.7(a through d).

In some situations, more than one lighting designer designs the outdoor lighting. An example might be that one designer is designing the pole mounted lighting for the parking lot and another designs the lighting that is attached to the building. Final compliance documentation must be developed that accounts for all outdoor lighting power and calculates the allowable lighting power once.

Two separate sets of outdoor lighting compliance documentation may double count the allowances for outdoor lighting. Thus a final single outdoor lighting compliance calculation must be provided to the local authority having jurisdiction.

The allowed lighting power is determined by measuring the area or length of the lighting application and multiplying this area or length times the Lighting Power Allowance, which is expressed either in W/ft^2 or W/ft, respectively. The allowed

lighting power must be calculated for either the general hardscape lighting of the site and for specific applications.

The area of the lighting application must be defined exclusive of any areas on the site that are not illuminated.

The actual power of outdoor lighting is the total watts of all of the non-exempt lighting systems (including ballast, driver or transformer loss). See §140.7(c).

The allowed outdoor lighting power is calculated by Lighting Zone as defined in §10-114. Local governments may amend Lighting Zones in compliance with §10-114. See Section 0 for more information about amending outdoor ordinances by local jurisdictions.

A. Maximum Outdoor Lighting Power

The Standards establish maximum outdoor lighting power that can be installed. The allowed outdoor lighting power must be determined according to the Outdoor Lighting Zone in which the site is located. See Section 6.3.3C for more information about Outdoor Lighting Zones.

The wattage of outdoor luminaires must be determined in accordance with §130.0(d) or Reference Nonresidential Appendix NA8. See Section 5.5.3 for more information about determining luminaire wattage.

The total allowed lighting power is the combined total of all of the allowed lighting power layers. There are lighting power allowances for general hardscape lighting and lighting power allowances for specific applications. An outdoor lighting installation complies with the lighting power requirements if the actual outdoor lighting power installed is no greater than the allowed outdoor lighting power calculated under §140.7(d) and complies with certain stipulations associated with specific special application allowances. The allowed lighting power shall be the combined total of the sum of the general hardscape lighting allowance determined in accordance with §140.7(d)1, and the sum of the additional lighting power allowance for specific applications determined in accordance with §140.7(d)2.

B. Illuminated Area

With indoor lighting applications, the entire floor area is considered to be illuminated for the purpose of determining the allowed lighting power. However, for outdoor lighting applications, the number of luminaires, their mounting heights and their layout affect the presumed illuminated area and therefore the allowed lighting power.

The area of the lighting application may not include any areas on the site that are not illuminated. The area beyond the last luminaire is considered illuminated only if it is located within 5 mounting heights of the nearest luminaire.

In plan view of the site, the illuminated area is defined as any hardscape area within a square pattern around each luminaire or pole that is 10 times the luminaire mounting height, with the luminaire in the middle of the pattern. Another way to envision this is to consider an illuminated area from a single luminaire as the area that is 5 times the mounting height in four directions.

Illuminated areas shall not include any area that is obstructed by any other structure, including a sign or within a building, or areas beyond property lines.

The primary purpose for validating the illuminated area is to not include any areas that are not illuminated. Areas that are illuminated by more than one luminaire shall not be double counted. Either an area is illuminated, or it is not illuminated.

When luminaires are located further apart (more than 10 times their mounting height apart), then the illuminated area stops at 5 times the mounting height of each luminaire.

Planters and small landscape areas are included within the general hardscape area as long as the minor dimension of the inclusion is less than 10 ft, and the inclusion is bordered on at least three sides.

Landscape areas that are greater than 10 ft wide in the minor dimension are excluded from the general hardscape area calculation, but the perimeter of these exclusions may be included in the linear wattage allowance (LWA) calculation. See Section 6.4.6C for information about the LWA.

6.4.6 General Hardscape Lighting Power Allowance

§140.7(d) 1, Standards Table 140.7-A

Hardscape is defined in §100.1 as an improvement to a site that is paved and has other structural features, including but not limited to, curbs, plazas, entries, parking lots, site roadways, driveways, walkways, sidewalks, bikeways, water features and pools, storage or service yards, loading docks, amphitheaters, outdoor sales lots, and private monuments and statuary.

The allowed lighting power for general hardscape lighting is calculated as the sum of three distinct items as follows:

- The first is the Area Wattage Allowance (AWA), which is the area of the illuminated hardscape, and is expressed in W/ ft^2.
- The second is Linear Wattage Allowance (LWA), which is the length of the perimeter of the illuminated hardscape, and is expressed in watts per linear foot.
- The third is the Initial Wattage Allowance (IWA), which is a flat allowance for each property, and is expressed in watts.

To determine the total allowed power for general hardscape lighting, add the AWA + LWA + IWA. The AWA, LWA, and IWA are described below.

A. General Hardscape Power Trade-Offs

Allowed lighting power determined according to §140.7(d) 1 for general hardscape lighting may be traded to specific applications in §140.7(d) 2, provided the hardscape area from which the lighting power is traded continues to be illuminated in accordance with §140.7(d) 1A. This means that if luminaires used originally to determine the total hardscape illuminated area are not installed, then the general hardscape lighting power allowance must also be reduced accordingly, and will not be available to trade-off. However, if the illuminated area remains the same, but luminaire wattage is reduced, then unused allowed lighting power may be traded-off.

B. Area Wattage Allowances (AWA)

The Area Wattage Allowance (AWA) is the total illuminated hardscape area that is included in the project times the AWA listed in Table 6-8. Multiply the illuminated hardscape area by the AWA from Table 6-8 for the appropriate Lighting Zone.

The area for the AWA includes all illuminated hardscape, regardless of whether the area will have an additional lighting power allowances for Specific Applications from Table 6-9.

C. Linear Wattage Allowances (LWA)

The Linear Wattage Allowance (LWA) is the total hardscape perimeter length that is included in the project times the LWA listed in Table 6-8. Multiply the total hardscape perimeter length by the LWA from Table 6-8 for the appropriate Lighting Zone.

The total hardscape perimeter is the length of the actual perimeter of the illuminated hardscape on the property, with specific perimeter additions for building and other area exclusions that have been removed from the AWA calculation above. Generally, if there is an enclosed exclusion in the area AWA calculation, the perimeter may be included in the LWA calculation.

The total hardscape perimeter shall not include portions of hardscape that is not illuminated according to §140.7(d) 1A. The perimeter length for hardscape around landscaped areas and permanent planters shall be determined as follows:

- Landscaped areas completely enclosed within the hardscape area, and which have width or length less than 10 ft wide, shall not be added to the hardscape perimeter length.
- Landscaped areas completely enclosed within the hardscape area, and which width or length are a minimum of 10 ft wide, the perimeter of the landscaped areas or permanent planter shall be added to the hardscape perimeter length.
- Landscaped edges that are not abutting the hardscape shall not be added to the hardscape perimeter length.

D. Initial Wattage Allowances (IWA)

The Initial Wattage Allowance (IWA) is allowed to be used one time per site. The purpose of the IWA is to provide additional watts for small sites, or for odd hardscape geometries. Add the IWA from Table 6-8 for the appropriate Lighting Zone.

Table 6-8 (Table 140.7-A in the Standards) – General Hardscape Lighting Power Allowance

Type of Power Allowance	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Area Wattage Allowance (AWA)	0.035 W/ft²	0.045 W/ft²	0.090 W/ft²	0.115 W/ft²
Linear Wattage Allowance (LWA)	0.25 W/lf	0.45 W/lf	0.60 W/lf	0.85 W/lf
Initial Wattage Allowance (IWA)	340 W	510 W	770 W	1030 W

Example 6-16 Power Allowance for Parking Lots

Question

In a parking lot in front of a retail store, we are not using the maximum lighting power allowance for the parking lot. Can we use the remaining allowance to illuminate the building entrance and the walkways near the store to a higher level?

Answer

Yes, since hardscape power densities are tradable, you may use the unused portion of the power allowance in the parking lot to increase the illumination levels for other lighting applications, including building entrance and walkway areas.

Example 6-17 Illumination for Stairs

Question

Lighting for stairs is exempt from the requirements of §140.7, so is a pole-mounted luminaire that is located at the stairs considered exempt, even though some of the light serves hardscape areas that are not exempt?

Answer

In this example, the luminaire is not regulated by the Standards if the primary purpose for that luminaire is to illuminate the stairs (or other unregulated areas), and a majority of the light coming from a luminaire falls on stairs. However, the luminaire is regulated by the Standards if the majority of the light coming from the luminaire falls on regulated areas, such as hardscape areas. For example, if the luminaire is equipped with optics that directs more than 50 percent of the light towards the stairs, then the luminaire may be considered stair lighting and therefore exempt. Conversely, the luminaire must be considered hardscape lighting if the lack of proper optical controls results in more than 50 percent of the light falling on the adjacent hardscape areas.

Example 6-18 Calculating the Illuminated Area of a Parking Lot

Question

A parking lot is only illuminated from a series of 5 cut-off wall packs mounted on an adjacent building. The parking lot extends 100 ft from the building. The luminaires are mounted at a height of 15 ft above the ground and spaced 50 ft apart. How large is the illuminated area?

Answer

The illuminated area extends a distance equal to 5 times the mounting height in three directions (the fourth direction is not counted because it is covered by the building). The illuminated area therefore extends from the building a distance of 75 ft. The total illuminated area is 75 ft x 350 ft or 26,250 ft^2.

Example 6-19 Calculating the Illuminated Area

Question

If a pole has a height of 15 ft, what are the dimensions of the square pattern used for power calculations?

Answer

The illuminated area is defined as any area within a square pattern around each luminaire or pole that is 10 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. Therefore, for a 15 ft pole, the area will be described by a square that is 150 ft (15 ft x 10) on each side, or 22,500 ft^2 (150 ft x 150 ft), minus areas that are beyond the property line or other obstructions.

Example 6-20 Calculating the Illuminated Area

Question

If two poles in the center of an illuminated area are a greater distance than 10 times the mounting height, will all of the square footage between them be included in the area?

Answer

In most applications, for example parking lots, these square patterns will typically overlap, so the entire area of the parking lot between poles will typically be included when determining the lighting power budget. However, if the poles are so far apart that they exceed 10 times the mounting height of the poles, the coverage squares do not overlap and the non-illuminated areas between poles cannot be included in determining illuminated hardscape area.

Example 6-21 Calculating the Power Allowance for a Roadway

Question

A 300 ft long, 15 ft wide roadway leads through a wooded area to a hotel entrance in Lighting Zone 2, and the owner wants to light the roadway with luminaires mounted at a height of 20 ft. What is the allowed lighting power for this roadway?

Answer

The hardscape area for the roadway must first be calculated. If the entire roadway will be lighted, then the 20 ft poles will not be spaced more than 200 ft apart and not more than 100 ft from the ends of the roadway. (Lighted area is 10 times the pole height.) The hardscape area then is 15 ft x 300 ft or 4500 ft^2. The linear perimeter of this hardscape is the sum of the sides (not including the side that connects to the larger site) 300 ft + 15 ft + 300 ft or 615 ft.

Three allowances make up the total power allowance: Area, Linear, and Initial. However, the initial wattage allowance applies one time to the entire site. It is not considered for this roadway piece which would only be one small part of the site. All allowances are based on lighting zone 2 and found in Table 6-8 (Table 140.7-A in the Standards). The area wattage allowance is equal to 202.5 W (0.045 W/ft^2 x 4500 ft^2).

The linear wattage allowance (LWA) is equal to 276.75 W (0.45 W/lf x 615 lf).

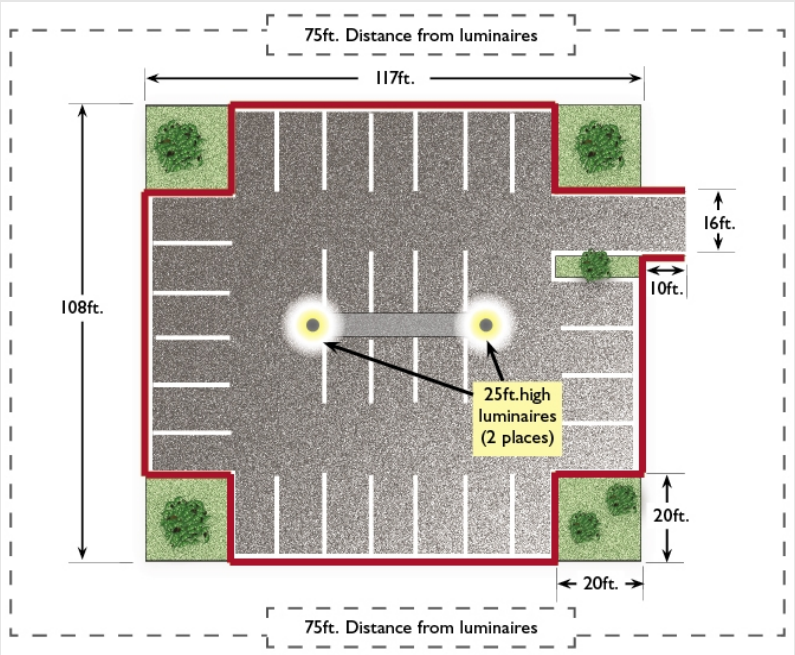
Finally, the sum of these allowances gives a total wattage allowance for the roadway of 479 W (202.5 W + 276.75 W).

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Initial	510W	-	0 W
Area	0.045 W/ft^2	4500 ft^2	202.5 W
Perimeter	0.45 W/LF	615 ft	276.75 W
TOTAL POWER ALLOWANCE			**479 W**

Example 6-22 Calculating the Power Allowance for a Parking Lot

Question

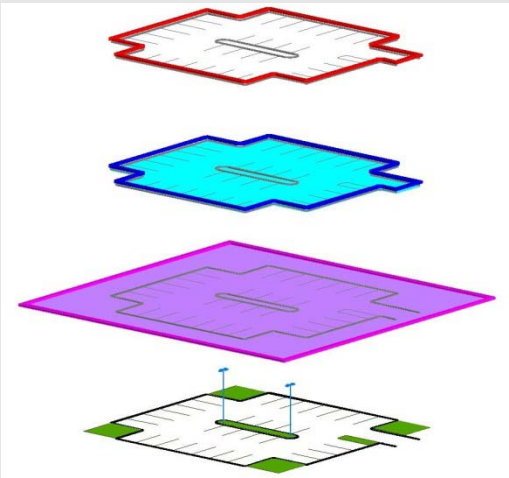
The parking lot illustrated below has two luminaires that are mounted at a height of 25 ft. What is the illuminated hardscape area and what is the allowed lighting? The lot is located in Lighting Zone 3.



Poles are 40 feet apart

Answer

The poles are 40 ft apart, and using the 10 times mounting height rule, the illuminated area can be as large as 250 ft by 290 ft. The boundary of this maximum illuminated area extends beyond the edges of the parking lot as well as the entrance driveway, so the entire paved area is considered illuminated. The landscaped island in middle and peninsula below the entrance driveway are less than 10 ft wide, so they are included as part of the illuminated area, but not part of the hardscape perimeter. The landscaped cutouts (20 x 20 ft) in the corners of the parking lot are bound by pavement on only two sides so they are not included. The total paved area is 11,196 ft². [(12,636 ft² + 160 ft² (driveway) – 1,600 ft² (cutouts)]. The perimeter of the hardscape is 470 ft [(2 x 77 ft) + (2 x 68 ft) + (8 x 20 ft) + (2 X10 ft)].



Perimeter

Area

Illuminated Area

Site Plan

Three allowances make up the total power allowance: Area, Linear, and Initial. All allowances are based on lighting zone 3 and found in Table 6-8 (Table 140.7-A in the Standards). The area wattage allowance is equal to 1,007.6 W (0.090 W/ft² x 11,196 ft²).

The linear wattage allowance (LWA) is equal to 282 W (0.60W/lf x470 lf). The initial wattage allowance (IWA) is 770 W for the entire site.

Finally, the sum of these three allowances gives a total wattage allowance for the site of 2,059.6 W (1,007.6 W + 282W + 770 W).

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Initial	770W	-	770 W
Area	0.090 W/ft^2	11,196 ft^2	1,007.6 W
Perimeter	0.60 W/LF	470 ft	282 W
TOTAL POWER ALLOWANCE			**2,059.6 W**

Example 6-23 Calculating the Illuminated Area of a Parking Lot

Question

In the parking lot layout shown above, what would the illuminated area be and what would the maximum allowed lighting power be if much smaller pedestrian style poles were used at 8 ft high and placed 30 ft apart?

Answer

If the mounting height is reduced to 8 ft, and the spacing to 30 ft and using the 10 times mounting height rule, the illuminated area can be a rectangle as large as 80 ft by 110 ft. The hardscape area that intersects the maximum allowed illuminated area is now 8,524 ft² [(80 ft x (80 ft + 30 ft) - 2 x (6 ft x 6 ft cutouts) -2 x (6 ft x 17 ft cutouts)]. The new hardscape perimeter is 380 ft [(2 x 88 ft) + (2 x 68 ft) + (4 x 6 ft) + (2 x 6 ft) + (2 x 16 ft)].

Using the same allowances as in the previous example, the total wattage allowance for the site is 1,765 W (767 area W + 228 perimeter W + 770 initial W).

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Initial	770W	-	770 W
Area	0.090 W/ft^2	8524 ft^2	767 W
Perimeter	0.60 W/LF	380 ft	228 W
TOTAL POWER ALLOWANCE			**1,765 W**

6.4.7 Additional Light Power Allowance by Applications

§140.7(d)2, Standards Table 140.7-B

The lighting power for Specific Applications provides additional lighting power that can be layered in addition to the General Hardscape lighting power allowances as applicable.

Most of a site will be classified as 'General Hardscape' and will be calculated using Table 6-8 (Table 140.7-A in the Standards) as the only source of allowance.

Some portions of the site may fit use categories that permit the addition of another lighting allowance for that portion of the site. These Specific Applications are detailed in Table 6-9 (Table 140.7-B in the Standards). Not all of these allowances are based on area.

The single exception to this is the allowance for Hardscape Ornamental Lighting, which is calculated independent of the rest of the Specific Applications, and no regard to the overlap of this Application is made. See Section D for more information about the ornamental lighting allowance.

Assigned lighting applications must be consistent with the actual use of the area. Outdoor lighting definitions in §100.1 must be used to determine appropriate lighting applications.

Special Applications that are based on specific instances on the site are the cumulative total of those instances on the site, with the allowance being accumulated per instance.

Special Applications that are based on the length of an instance on the site are calculated as the product of the total length of the instance and the allowance per linear foot for the Application.

A. Specific Allowances Power Trade-Offs Not Allowed

Allowed lighting power for specific applications shall not be traded between specific applications, or to hardscape lighting in §140.7(d)1. This means that for each and every specific application, the allowed lighting power is the smaller of the allowed power determined for that specific application according to §140.7(d)2, or the actual installed lighting power that is used in that specific application.

B. Wattage Allowance per Application (watts)

The applications in this category are provided with additional lighting power, in watts per instance, as defined in Table 6-9 (Table 140.7-B in the Standards). Use all that apply as appropriate. Wattage allowances per application are available for the following areas:

- Building Entrances or Exits.
- Primary Entrances of Senior Care Facilities, Police Stations, Hospitals, Fire Stations, and Emergency Vehicle Facilities.
- Drive-Up Windows. See Section 6.4.8G for additional information about drive-up windows
- Vehicle Service Station Uncovered Fuel Dispenser. See Section 6.4.8D for additional information about vehicle service stations.

C. Wattage Allowance per Unit Length (w/linear ft)

The wattage allowance per linear foot is available only for outdoor sales 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. The outdoor sales frontage allowance is calculated as the product of the total length of qualifying sales frontage times the outdoor sales frontage lighting allowance in Table 6-9 (Table 140.7-B in the Standards). See Section 0 for additional information about sales frontage.

D. Wattage Allowance per Hardscape Area (W/ft²)

The ornamental lighting allowance on the site is calculated as the product of the total illuminated hardscape for the site times the hardscape ornamental lighting allowance in Table 6-9 (Table 140.7-B in the Standards). Luminaires qualifying for this allowance shall be rated for 100 W or less as determined in accordance with §130.0(d), and shall be post-top luminaires, lanterns, pendant luminaires, or chandeliers in accordance with Table 6-9. This additional wattage allowance may be used for any illuminated hardscape area on the site. See Section 6.4.8F for additional information about ornamental lighting.

E. Wattage Allowance per Specific Area (W/ft²)

Applications in this category are provided with additional lighting power, in watts per instance, as defined in Table 6-9. Wattage allowances per specific area are available for the following areas:

Building Facades.

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. See Section 6.4.8A for additional information about building facades.

Outdoor Sales Lots.

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, not outdoor sales lots, 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.

Vehicle Service Station Hardscape.

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. See Section 6.4.8D for additional information about vehicle service stations.

Vehicle Service Station Canopies.

Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy. See Section 6.4.8D for additional information about vehicle service stations.

Sales Canopies.

Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy. See Section 6.4.8E for additional information about lighting under canopies.

Non-sales Canopies.

Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy. See Section 6.4.8E for additional information about lighting under canopies.

Guard Stations.

Allowance up to 1,000 ft² 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. See Section 6.4.8H for additional information about guarded facilities.

Student Pick-up/Drop-off zone.

Allowance for the area of the student pickup/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 ft, times the smaller of the actual length or 250 ft. Qualifying luminaires shall be within 2 mounting heights of the student pick-up/drop-off zone.

Outdoor Dining.

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.

Special Security Lighting for Retail Parking and Pedestrian Hardscape.

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.

6.4.8 Further Discussion about Additional Lighting Power Allowance for Specific Applications

A. Building Facades

§140.7(d)2

Building façade is defined in §100.1 as the exterior surfaces of a building, not including horizontal roofing, signs, and surfaces not visible from any reasonable viewing location. 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.

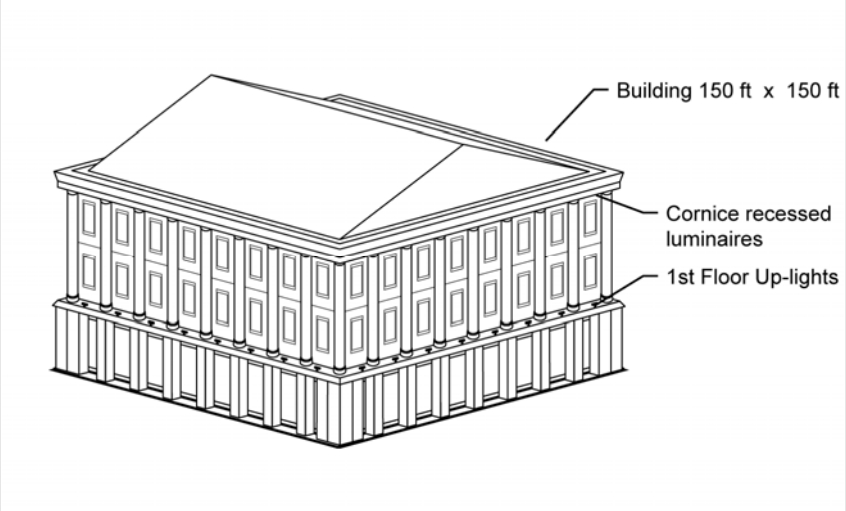
Building façades and architectural features may be illuminated by flood lights, sconces or other lighting attached to the building. Building façade lighting is not permitted in Lighting Zone 1. Façade orientations that are not illuminated and façade areas that are not illuminated because the lighting is obstructed shall not be included. General site illumination, sign lighting, and/or lighting for other specific applications can be attached to the side of a building and not be considered façade lighting. Wall packs mounted on sides of the buildings are not considered façade lighting when most of the light exiting these luminaires lands on areas other than the building façade.

Courtesy of Horton Lees Brogden Lighting Design, Inc of San Francisco
Photographer: Jay Graham

Figure 6-4 – Façade Lighting

Example 6-24 Calculating the Allowance for a Projected Area

Question



(Lighting Zone 3) A city wants to illuminate its city hall on two sides. The structure is a three-story building with a colonnade on the second and third floors and a cornice above. The columns are considered important architectural features and the principal goal of the lighting project is to highlight these features. The columns are 30 ft tall x 3 ft in diameter and are spaced at 8 ft. For the purposes of determining the lighting power allowance for the building, what is the surface area to be illuminated? What is the lighting power allowance? The columns will be illuminated by downlights at the cornice and uplights above the first floor.

Answer

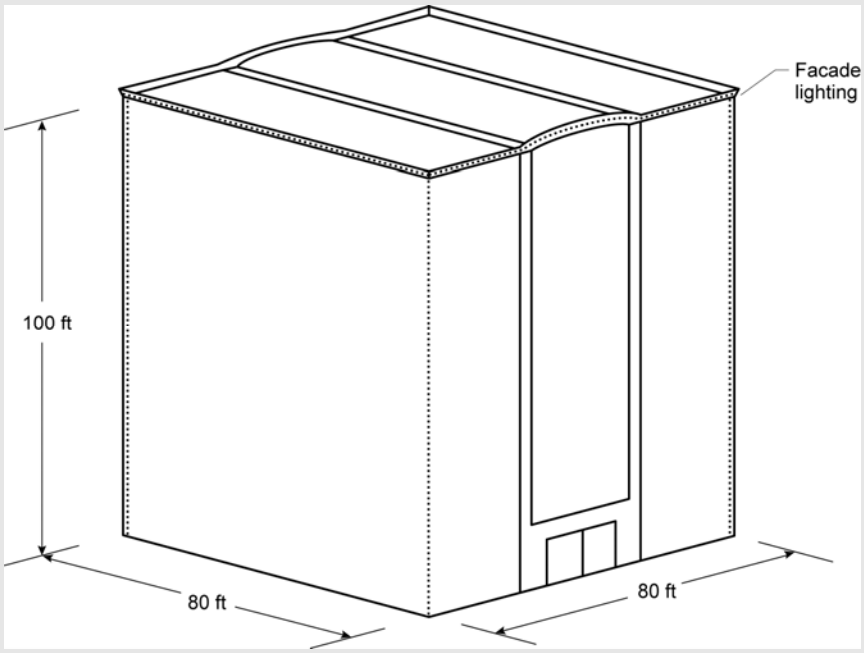
The area of the façade for the purposes of calculating the lighting allowance is the projected area of the illuminated façade. Architectural features such as columns, recesses, facets, etc. are ignored. The illuminated area for each façade is therefore 30 ft x 150 ft or 4,500 ft². The façade allowance for Lighting Zone 3 is 0.35 W/ft², so the total power allowed is 1,575 W per façade, or 3,150 W total.

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Facade	0.35 W/^{ft2}	B. 4,500 ft^2	1,575 W
	TOTAL POWER ALLOWANCE		**1,575 W**

Example 6-25 Permanent vs. Temporary Façade Lighting

Question

I am designing a high-rise building and permanently mounted marquee lights will be installed along the corners of the building. The lights will be turned on at night, but only for the holiday season, roughly between mid-November and mid-January. The lights consist of a series of 9 W compact fluorescent luminaires spaced at 12 inches on-center (OC) along all the corners of the building and along the top of the building. Essentially, the lights provide an outline of the building. For the purposes of the Outdoor Lighting Standards, are these considered façade lighting? Since they will only be used for about two months of the year, are they considered temporary lighting and exempt?



Answer

The lighting is permanent lighting and must comply with the Standards. Temporary lighting is defined in §101 as is a lighting installation with plug-in connections that does not persist beyond 60 consecutive days or more than 120 days per year. Anything that is permanently mounted to the building is considered permanent lighting, and the hours of intended use do not affect its status as permanent lighting.

Since this lighting is primarily used to accent the architectural outline of the building, it may be considered façade lighting. And since all corners of the building are illuminated, all four facades may be considered to be illuminated. The area on each façade is 80 ft x 100 ft or 8,000 ft². The total illuminated area is four times 8,000 ft² or 32,000 ft². The Lighting Zone 3 allowance for façade lighting is 0.35 W/ft² and the total power allowance for façade lighting is 11,200 W.

There are 100 ft x 4 plus 80 ft x 4 lamps (a total of 720 lamps) on the building. Each lamp is 13 W (including the ballast). This data is taken from Reference Nonresidential Appendix NA8. The installed power is 720 lamps times 13 W/lamp or 9,360 W. The installed power is less than the allowance so the façade lighting complies. If this building were in Lighting Zone 2, the allowance would be 0.18 W/ft² or a total of 5,760 W. The lighting design would not comply in Lighting Zone 2.

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Facade	0.35 W/^{ft2}	32,000 ft^2	11,200 W
	TOTAL POWER ALLOWANCE		**11,200 W**

Example 6-26 Power Allowance for Facades

Question

Portions of the front façade of a proposed wholesale store in Lighting Zone 3 are going to be illuminated. The front wall dimensions are 120 ft by 20 ft. There is 250 ft² of fenestration in the front wall that is illuminated by the façade lighting. Signs cover another 500 ft² of the front wall, and another 400 ft² is not illuminated at all. What is the allowed front façade lighting power?

Answer

The gross wall area is 2,400 ft² (120 x 20). However we must subtract all those areas that are not illuminated. Note that since the 250 ft² of fenestration is intended to be illuminated by the façade lighting, this area may be included in the total area eligible for power calculations.

The areas not eligible for power calculations include:

500 ft² of signs + 400 ft² of unlighted façade = 900 ft²

Net wall area used for façade lighting: 2,400 ft² – 900 ft² = 1,500 ft²

From Table 6-9 (Table 1407-B in the Standards), the allowed façade lighting power density in Lighting Zone 3 is 0.35 W/ft²

The calculated allowed power based on net wall area is 1,500 ft² x 0.35 W/ft² = 525 W.

The allowed power is therefore the smaller of actual wattage used for façade lighting or 525 W.

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Facade	0.35 W/^{ft2}	1,500 ft^2	525 W
	TOTAL POWER ALLOWANCE		**525 W**

Example 6-27 Sign Lighting

Question

Is sign lighting part of my façade lighting?

Answer

The sign area must be subtracted from the façade area so that the area is not double counted. The sign lighting must meet the requirements of the Standards for sign lighting. See Chapter 7 for more information about sign lighting.

Example 6-28 Oranamental vs. Façade Lighting

Question

Is the lighting of my parapet wall with small wattage decorative lighting considered ornamental or façade lighting?

Answer

Lamps attached to a building façade are considered façade lighting. This cannot be considered ornamental lighting because ornamental lighting is defined in Table 140.7-B of the Standards as post-top luminaires, lanterns, pendant luminaires, chandeliers.

Example 6-29 Hardscape vs. Façade Lighting

Question

If I mount a luminaire on the side of my building to illuminate an area is it considered façade lighting or hardscape lighting?

Answer

It depends on the primary intent of the luminaire. For example, if the luminaire is primarily illuminating the walls (such as a sconce), then it should be considered part of the building façade lighting. If on the other hand, the luminaire is primarily illuminating the parking lot beyond (most wall packs), then it should be part of the hardscape lighting. It should be noted that lighting power tradeoffs are not allowed between building façade and hardscape areas.

C. Sales Frontage

§140.7(d)2

This additional allowance is intended to accommodate the retailers need to highlight merchandise to motorists who drive by their lot. Outdoor sales frontage includes car lots, but can also include any sales activity.

Outdoor sales frontage must be 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. The outdoor sales frontage allowance is calculated as the product of the total length of qualifying sales frontage times the outdoor sales frontage lighting allowance in Table 6-9 (Table 147-B in the Standards).

When a sales lot qualifies for the sales frontage allowance, the total sales lot wattage allowance is determined by adding the following three layers:

- General hardscape lighting power allowance
- Outdoor sales frontage
- Outdoor sales lot

D. Vehicle Service Stations

§140.7(d)2

According to the definition in §101, vehicle service station is a gasoline, natural gas, diesel, or other fuel dispensing station. In addition to allowances for building entrances and exits, hardscape ornamental lighting, building façade, and outdoor dining allowances, as appropriate; the total wattage allowance specifically applying to vehicle service station hardscape is determined by adding the following layers, as appropriate:

- General hardscape lighting power allowance

- Vehicle service station uncovered fuel dispenser (allowance per fuelling dispenser, with 2 mounting heights of dispenser)
- Vehicle service station hardscape (less area of buildings, under canopies, off property, or obstructed by signs or other structures)
- Vehicle service station canopies (within the drip line of the canopy)

The lighting power allowances are listed in Table 6-9 (Table 140.7-B in the Standards).

Source: AEC Photographer: Tom Bergstrom

Source: AEC Photographer: Tom Bergstrom

Figure 6-5 – Service Station Hardscape Areas

Example 6-30 Calculating Canopy Lighting Area and Hardscape Area

Question

Where does canopy lighting area end and hardscape area start?

Answer

The horizontal projected area of the canopy on the ground establishes the area for under canopy lighting power calculations. This area also referred to as the “drip line” of the canopy.

E. Under Canopies

§140.7(d)2

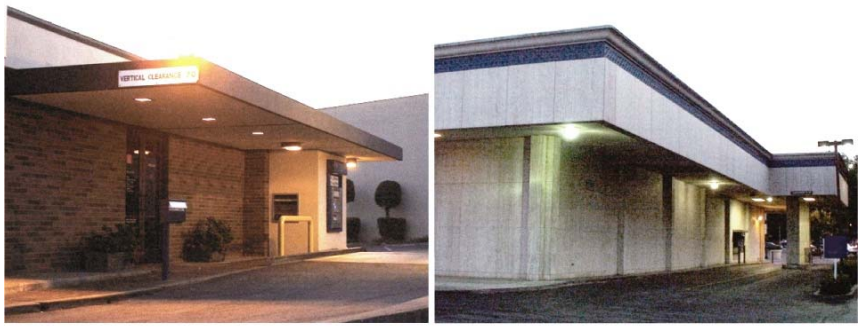
According to the definition in §100.1, a **canopy** is a permanent structure, other than a parking garage, consisting of a roof and supporting building elements, with the area beneath at least partially open to the elements. A canopy may be freestanding or attached to surrounding structures. A canopy roof may serve as the floor of a structure above.

The definition of a canopy states that a canopy is not a parking garage. A parking garage is classified as an unconditioned interior space, whereas a canopy is classified as an outdoor space.

The lighting power allowance for a canopy depends on its purpose. Service station canopies are treated separately (see the previous section). The two types of canopies addressed in this section are those that are used for sales and those that are not. Non-sales canopies include covered entrances to hotels, office buildings, convention centers and other buildings. Sales canopies specifically cover and protect an outdoor sales area, including garden centers, covered automobile sales lots, and outdoor markets with permanent roofs. The lighting power allowances are listed in Table 6-9 (Table 140.7-B in the Standards).

The area of a canopy is defined as the horizontal projected area, in plan view, directly underneath the canopy. This area is also referred to as the “drip line” of the canopy. Canopy lighting, either sales or non-sales shall comply separately, e.g. trade-offs are not permitted between other specific lighting applications or with general site illumination.

General site lighting or other specific applications lighting, and/or sign lighting that are attached to the sides or top of a canopy, cannot be considered canopy lighting. For example, internally illuminated translucent panels on the perimeter of a canopy are considered sign lighting, while the lighting underneath the canopy and directed towards the ground is canopy lighting.



Source: AEC Photographer: Tom Bergstrom

Figure 6-6 – Canopy Lighting

Example 6-31 Power Allowance Under Canopies

Question

The first floor of an office tower in Lighting Zone 3 is setback 20 ft on the street side. The width of the recessed façade is 150 ft. The primary purpose of the setback (and canopy) is to provide a suitable entrance to the office tower; however, space under the canopy is leased as news-stand, a flower cart and a shoe shine stand. These commercial activities occupy about half of the space beneath the canopy. What is the allowed lighting power?

Answer

The total canopy area is 20 ft x 150 ft or 3,000 ft². The General hardscape allowance for the site will need to be separately determined. The canopy allowance is an additional layer allowed only for the canopy area. The 1,500 ft² used for the flower cart, news-stand and shoe shine stand is considered a sales canopy and the allowance is 0.908 W/ft² or a total of 1,362 W. The other 1,500 ft² is a non-sales canopy and the allowance is 0.408 W/ft² or a total of 612 W. Trade-offs are not permitted between the sales portion and the non-sales portions.

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Non-Sales Canopy	0. 408W/^{ft2}	1,500 ft^2	612 W
Sales Canopy	0.908 w/ft^2	1,500 ft^2	1,362 W
TOTAL POWER ALLOWANCE			**1,575 W**

F. Ornamental Lighting

§140.7(d)2

Ornamental lighting is defined in §101 as post-top luminaires, lanterns, pendant luminaires, chandeliers, and marquee lighting. However, marquee lighting does not qualify for the ornamental lighting allowance. The allowances for ornamental lighting are listed in Table 6-9 (Table 140.7-B in the Standards).

The ornamental lighting allowance on the site is calculated as the product of the total illuminated hardscape for the site times the hardscape ornamental lighting allowance in Table 6-9. This allowance is calculated separately, and is not accumulated into the other allowances. This additional wattage allowance may be used for any illuminated hardscape area on the site.

Luminaires used for ornamental lighting shall have a rated wattage, as listed on a permanent, pre-printed, factory-installed label, of 100 W or less.

Source: Ted Walson Photographer

Figure 6-7– Ornamental Lighting (The cobra head luminaires shown in the above figure are not ornamental lighting. However, if the post-top acorn luminaires are rated 100 watts or less, they qualify as ornamental lighting)

Example 6-32 Bollard Luminaires

Question

Are bollard luminaires considered ornamental lighting?

Answer

No, Ornamental lighting is defined in Table 140.7-B of the Standards as post-top luminaires, lanterns, pendant luminaires, chandeliers.

G. Drive-up Windows

§140.7(d)2

Drive-up windows are common for fast food restaurants, banks, and parking lot entrances. In order to qualify, a drive-up window must have someone working behind the “window”. Automatic ticket dispensers at parking lots do not count.

The lighting power allowances are listed in Table 6-9 (Table 140.7-B in the Standards) as a wattage allowance per application.

The wattage allowance in Lighting Zone 3 is 125 W for each drive-up window.

Luminaires qualifying for this allowance must be within 2 mounting heights of the sill of the window.

Source: AEC Photographer: Tom Bergstrom

Figure 6-8 – Drive-up Windows

Example 6-33 Power Allowance for Drive-up Window

Question

A drive-up window in Lighting Zone 2 has width of 7 ft. What is the allowed lighting power for this drive-up window?

Answer

The width of a drive-up window in not used for determining the allowed wattage. In Lighting Zone 2, 75 W is allowed for each drive-up window.

H. Guarded Facilities

Guarded facilities, including gated communities, 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.

There is an allowance of up to 1,000 ft² per vehicle lane. Qualifying luminaires shall be within 2 mounting heights of a vehicle lane or the guardhouse.

The power allowances for guarded facilities are listed in Table 6-9 (Table 140.7-B in the Standards).

Example 6-34 Power Allowance for Guard Stations

Question

A guard station to the research campus of a defense contractor consists of a guard station building of 300 ft². Vehicles enter to the right of the station and exit to the left. What is the outdoor lighting power allowance? The guard station is located in Lighting Zone 2.

Answer

Assuming there are two lanes, the allowance for Lighting Zone 2 is 2,000 times 0.355 W/ft² is 700 W, in addition to the general hardscape lighting power allowance.

Example 6-35 Residential Guarded Facilities

Question

Is the guarded facility at the entrance to a residential gated community covered by the Standards?

Answer

Yes, residential guarded facilities are covered by the Standards.

Table 6-9 (Table 140.7-B in the Standards) – Additional Lighting Power Allowance For Specific Applications

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

Lighting Application	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 ft of the door.	30W	60 W	90 W	90 W
Primary Entrances, Senior Care Facilities, Police Stations, Hospitals, 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 ft of the primary entrance.	45 W	80 W	120 W	130 W
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.	40 W	75 W	125 W	200 W
Vehicle Service Station Uncovered Fuel Dispenser. Allowance per fueling dispenser. Luminaires qualifying for this allowance shall be within 2 mounting heights of the dispenser.	120 W	175 W	185 W	330 W
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.	No Allowance	22.5 W per linear ft	36 W per linear ft	45 W per linear ft
WATTAGE ALLOWANCE PER HARDSCAPE AREA (W/ft²). May be used for any illuminated hardscape area on the site.				
Hardscape Ornamental Lighting. Allowance for the total site illuminated hardscape area. Luminaires qualifying for this allowance shall be rated for 100 W or less as determined in accordance with § 130(d), and shall be post-top luminaires, lanterns, pendant luminaires, or chandeliers.	No Allowance	0.02 W/ft²	0.04 W/ft²	0.06 W/ft²
WATTAGE ALLOWANCE PER SPECIFIC AREA (W/ft²). Use as appropriate provided that none of the following specific applications shall be used for the same area.				
Building Facades. 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.	No Allowance	0.18 W/ft²	0.35 W/ft²	0.50 W/ft²
Outdoor Sales Lots. 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.	0.164 W/ft²	0.555 W/ft²	0.758 W/ft²	1.285 W/ft²
Vehicle Service Station Hardscape. 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.	0.014 W/ft²	0.155 W/ft²	0.308 W/ft²	0.485 W/ft²
Vehicle Service Station Canopies Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy.	0.514 W/ft²	1.005 W/ft²	1.300 W/ft²	2.2 W/ft²

Sales Canopies Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy.	No Allowance	0.655 W/ft²	0.908 W/ft²	1.135 W/ft²
Non-sales Canopies. Allowance for the total area within the drip line of the canopy. Luminaires qualifying for this allowance shall be located under the canopy.	0.084 W/ft²	0.205 W/ft²	0.408 W/ft²	0.585 W/ft²
Guard Stations. Allowance up to 1,000 ft2 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.	0.154 W/ft²	0.355 W/ft²	0.708 W/ft²	0.985 W/ft²
Student Pick up/Drop off zone. 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 ft, times the smaller of the actual length or 250 ft. Qualifying luminaires shall be within 2 mounting heights of the student pick-up/drop-off zone.	No Allowance	0.12 W/ft²	0.45 W/ft²	No Allowance
Outdoor Dining. 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.	0.014 W/ft²	0.135 W/ft²	0.240 W/ft²	0.400 W/ft²
Special Security Lighting for Retail Parking and Pedestrian Hardscape. 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.	0.007 W/ft²	0.009 W/ft²	0.019 W/ft²	No Allowance

Example 6-36 Outdoor Lighting for Hospitals

Question

Is the parking lot outside of a hospital ("I" occupancy) regulated by the Standards?

Answer

No. Hospitals are "I" type occupancies and are not covered by the Building Energy Efficiency Standards. This includes all outdoor areas. The same is true for all other "I" type occupancies such as detention facilities.

Example 6-37 Parking Garage Standards

Question

We have a 5 story parking garage. The top level is uncovered. What are the lighting Standards requirements for this garage?

Answer

Since the lower 4 floors have a roof, they are considered indoor unconditioned buildings and must comply with the requirement of Standards Table 140.6-C. For these levels, indoor compliance forms will be required. The uncovered top floor is considered a parking lot and therefore must comply with the hardscape requirements of Table 6-8 (Table 140.7-A in the Standards). Outdoor lighting compliance forms will be required for the top level.

Example 6-38 Hardscape Materials for Parking Lots

Question

Our overflow parking lot is covered with gravel. Is this parking lot considered “hardscape” and must it comply with Table 6-8 requirements?

Answer

Yes, parking lots covered with gravel, or any other material used to enhance the surface to accommodate parking or travel, such as pavers, asphalt, cement, or other pervious or non-pervious materials are considered hardscape and must comply with the requirements for hardscape areas.

6.5 Alterations and Additions for Outdoor Lighting

§141.0(J)

The Standards apply to alterations and additions to outdoor lighting systems. In general, additions are the same as new construction such as the mandatory measures and compliance with lighting power density requirements. The application of the Standards to alterations depends on the scope of the proposed improvements. In general, alterations to existing outdoor lighting systems that for any lighting application that is regulated by the Standards, increase the connected lighting load or replace more than 50 percent of the luminaires shall meet the requirements.

Some or all mandatory measures may apply to altered components. The mandatory requirements include certification of any new lamps, ballasts and drivers that are installed if they are the type regulated by the Appliance Efficiency Regulations. Any new lighting controls must meet minimum performance requirements.

For alterations that do not increase connected lighting load, but do replace 10 percent or more and less than 50 percent of the luminaires in a lighting application listed in Table 140.7-A or 140.7-B, only the altered luminaires are required to meet the applicable controls requirements of Sections 130.0, 130.2, and 130.4. The entire system is not required to meet Section 140.7, and LPD calculations are not required for the affected luminaires.

For alterations that replace more than 50 percent of the luminaires in a lighting application listed in Table 140.7-A or 140.7-B, all of the lighting in that application shall meet the applicable controls requirements of Sections 130.0, 130.2, 130.4, and 140.7.

Alterations that increase the connected lighting load in a lighting application listed in Table 140.7-A or 140.7-B require that the entire system in the application zone meet all the applicable requirements of Sections 130.0, 130.2, 130.4, and 140.7.

Lighting alterations generally refers to replacing the entire luminaire. Simply replacing the lamps and ballasts in an existing fixture is not considered a lighting alteration. Retrofitting luminaires with another technology does not count as an alteration as long as the connected lighting load does not increase and the luminaire housing remains intact. Replacing or installing new wiring represents a lighting alteration and a great opportunity to meet the applicable mandatory requirements.

6.5.1 Outdoor Lighting Additions and Alterations – Mandatory and Lighting Power Density Requirements

§141.0(a)1. §130.0, §130.2

A. Mandatory Requirements

Additions to existing outdoor lighting must meet all of the Standards mandatory measures for the added lighting fixtures. The mandatory requirements include certification of any new lamps, light sources, ballasts and drivers that are installed if they are the type regulated by the Appliance Efficiency Regulations. Any new lighting controls must meet minimum performance requirements. In addition, control and circuiting requirements apply as follows:

- Motion sensing for incandescent luminaires rated over 100 watts
- BUG zonal lumen limits for luminaires rated greater than 150 watts
- Automatic controls to turn lighting OFF when daylight is available
- Separate circuiting and independently controlled from other electrical loads by an automatic scheduling control
- Motion sensing devices for luminaires mounted below 24 feet above ground that automatically reducing the lighting power of each luminaire by at least 40 percent, but not greater than 80 percent, auto-ON functionality when the area becomes occupied and no more than 1,500 watts of lighting power shall be controlled together.
- Outdoor Sales Frontage, Outdoor Sales Lot, and Outdoor Sales Canopies shall have a part-night control or motion sensors capable of automatically reducing lighting power by at least 40 percent but not exceeding 80 percent, along with auto-ON functionality.
- Building Façade, Ornamental Hardscape, and Outdoor Dining shall have a part-night control or motion sensors capable of automatically reducing lighting power by at least 40 percent but not exceeding 80 percent, along with auto-ON functionality, or a centralized time-based zone lighting control capable of automatically reducing lighting power by 50 percent.
- All lighting controls must meet the requirements of §110.9.

B. Lighting Power Density Requirements

The outdoor lighting additions must also comply with lighting power allowances of §140.7, Standards Tables 140.7-A and 140.7-B. These requirements are the same as new construction discussed earlier in this Chapter.

Example 6-39 Requirements for Parking Lot Additions

Question

I am adding a new 20,000 ft² section to our parking lot. What are the outdoor lighting requirements for the new addition?

Answer

§141.0(a) 1 specifies that all additions to existing outdoor lighting systems must comply with prescriptive requirements of §110.0 through 130.5 and §140.2 through §140.9

Example 6-40 BUG Requirements for Parking Lot Lighting Replacement

Question

We are replacing 20 percent of the existing 250 W luminaires in a parking lot. Does the BUG requirement apply to the new and existing luminaires?

Answer

New luminaires may be required to meet the Uplight and Glare lumen limits, but luminaires that are not being replaced are not required to be upgraded to meet the Uplight and Glare lumen limits. §141.0 (b) specifies that all altered components must meet applicable mandatory requirements, including Uplight and Glare lumen limits for replacements luminaires. Therefore, replacement luminaires that are greater than 150 W must meet the Uplight and Glare limits of the Standards, even if less than 50 percent of the luminaires on site are replaced.

However, there is an exception to §130.2(b) where replacement of existing pole mounted luminaires in hardscape areas meeting all of the following conditions are not required to comply with the Uplight and Glare lumen limits:

- Where the existing luminaire does not meet the luminaire Uplight and Glare lumen limits in §130.2(b); and
- Spacing between existing poles is greater than 6 times the mounting height of the existing luminaires; and
- Where no additional poles are being added to the site; and
- Where new wiring to the luminaires is not being installed; and
- Provided that the connected lighting power wattage is not increased.

Example 6-41 Requirements for Retrofitting Existing Luminaires

Question

In a service station we are retrofitting all existing luminaires under the canopy with new lamps, ballasts, reflectors, and lenses, while leaving the luminaire housing intact. Does this trigger the alterations requirements for outdoor lighting?

Answer

No, §141.0(b)2J specify that alterations requirements are triggered when the luminaires are replaced in a given function area, which includes replacing the entire luminaire including the internal components and the housing. In this example, since the luminaires are being retrofitted with new components, the alterations requirements of the Standards are not triggered.

Example 6-42 Requirements for Replacing Existing Luminaires

Question

In a service station we are replacing more than 50 percent of under canopy luminaires. Does this trigger the alteration requirements for outdoor lighting? Do we need to bring non-canopy lighting such as hardscape lighting up to code as well?

Answer

§141.0(b)2J specifies that when more than 50 percent of luminaires are replaced in a given Lighting Application included in Standards Tables 140.7-A and 140.7-B, the alteration requirements apply. So, in this example, all of the under canopy luminaires must meet the requirements of §140.7. Hardscape and other outdoor Lighting Applications other than the canopy need not meet these requirements even if they are included in the permit along with the canopy lighting.

Example 6-43 Requirements for Adding New Luminaires in a Parking Lot

Question

We are adding new luminaires to the existing lighting systems in a parking lot. Which Standards requirements are triggered by this alteration?

Answer

Since additional load is being added to the parking lot, which is part of the general hardscape lighting, the entire general hardscape area must comply with the lighting power density requirements for the given Lighting Zone. However, only the newly installed lighting system must comply with the applicable mandatory requirements, including control requirements and Uplight and Glare lumen limits.

Example 6-44 Requirements for Replacing Ballasts

Question

I am going to change the ballasts in my façade lighting system. Will I be required to meet the new Outdoor Lighting Standards for façade lighting?

Answer

No, the replacement of only lamps or ballasts in outdoor lighting systems is not considered an alteration and does not trigger compliance with Outdoor Lighting Standards. Replacing entire luminaires will trigger mandatory requirements for the altered (replaced) luminaires only. Replacing more than 10 percent of the luminaires or adding to the connected lighting load for any outdoor lighting application will trigger the lighting power density requirements of the Standards.

Example 6-45 Requirements for LED Retrofits

Question

I am going to retrofit all of my HID parking lot lights with an LED retrofit kit. What requirements do I need to follow for the LED retrofits?

Answer

As long as the LED retrofits do not increase the connected lighting load and the luminaire housing remains intact, there are no requirements for the LED retrofits.

6.5.2 Outdoor Lighting Alterations – Adding Outdoor Lighting to Existing Sites

In many cases, the general lighting for a site will be designed for a shopping center or a strip mall and stores or restaurants may be added later with additional lighting needs. In general, if one has a new outdoor lighting application (more doors, outdoor dining, retail sales) one can add the amount of lighting associated with the additional lighting allowances for specific applications contained in Standards Table 140.7-B. If this amount of lighting allowance is not enough, one can either re-design the

proposed lighting system or re-calculate the hardscape lighting allowances for the entire site to identify if savings somewhere else on site can be used to add light for this application.

Outdoor lighting power allowances are based upon a "layering" of specific application allowances on top of general hardscape allowances. The general hardscape allowance has three components: the initial wattage allowance (IWA) which is available once per site, the linear wattage allowance (LWA) which is available for the perimeter of the hardscape and the area wattage allowance (AWA) which is available for the field of the illuminated hardscape area. When the outdoor lighting is designed all at the same time, the outdoor lighting allowance is calculated as described in Section 6.4.5 of this chapter.

Example 6-46 Power Allowance for Additional Outdoor Dining (Inside Illuminated Area)

Question

A strip mall in Lighting Zone 3 with a common parking lot has its lighting system already designed and installed. A restaurant moves into one of the buildings and designates 400 ft² as outdoor dining. The outdoor dining area is within the illuminated area (5 mounting heights) of the pre-existing lighting. How is the allowable lighting calculated?

Answer

The allowable lighting power can be calculated in two ways:

Method 1

Calculate only the additional allowance layer for the outdoor dining area for specific applications (Outdoor Dining) as contained in Table 140.7-B of the Standards. In this case the allowance is 0.240 W/ft². Multiplying this allowance by 400 ft² yields 96 W.

Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Outdoor Dining	0.240 W/ft^2	400 ft^2	96 W
	TOTAL POWER ALLOWANCE		**96 W**

Method 2

One could have the permit cover all of the site lighting including the outdoor dining area. (This second compliance path would provide a greater power allowance, but would require more work in the application process.) This only yields a higher allowance if the current lighting system serving hardscape areas for the rest of the site has less wattage than the calculated total site hardscape wattage allowance. Additional allowances would be possible if one upgraded to the current hardscape system for other parts of the site and reduced its wattage.

Example 6-47 Power Allowance for Additional Outdoor Dining (Outside Illuminated Area)

Question

A strip mall in Lighting Zone 3 with a common parking lot has the parking lot lighting system designed and installed. A restaurant moves into one of the buildings and designates 400 ft² as outdoor dining. The outdoor dining area is outside of the illuminated area of the pre-existing parking lot lighting. How is the allowable lighting calculated?

Answer

In addition to adding outdoor dining area, which is a specific application that is allowed more light, the illuminated general hardscape lighting area is also increasing in size by 400 ft². Adding illuminated hardscape area results in increased general hardscape area wattage allowances (AWA) and increased linear wattage allowances (LWA) but it does NOT add an additional initial wattage allowance (IWA) because only one initial wattage allowance is allowed per site. The allowable lighting power can be calculated in two ways:

Method 1

Calculate the general hardscape area wattage allowances (AWA) and the increase to the general hardscape linear wattage allowances (LWA) and the additional allowance layer for the outdoor dining area for specific applications (Outdoor Dining) as contained in Table 140.7-B of the Standards. As discussed above, it is not permissible to also claim the general hardscape initial wattage allowance (IWA) as this is calculated only once per site. The linear wattage allowance applies only to the new perimeter length, which is not adjacent to previously illuminated area that is part of the site.

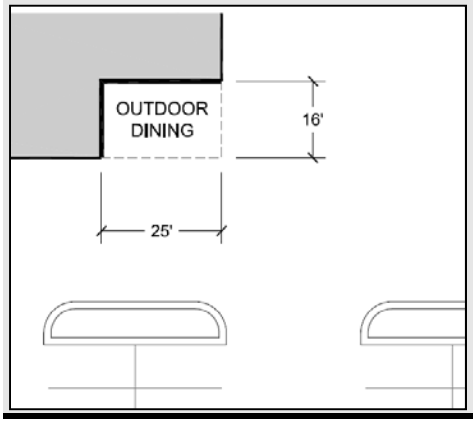
As shown in the figure below, the perimeter length is 41 ft (25 ft + 16 ft). In LZ 3 the AWA is 0.090 W/ft² and the LWA is 0.60 W/ft. The additional allowance for the outdoor dining area for specific applications (Outdoor Dining) as contained in Table 140.7-B is 0.240 W/ft². Thus for a perimeter length of 41 ft and an area of 400 ft², the total lighting wattage allowance is:

Hardscape LWA of 0.60 W/ft x 41 ft = 25 W

Hardscape AWA of 0.090 W/ft² x 400 ft² = 36 W

Specific Allowance Outdoor Dining 0.240 W/ft². x 400 ft² = 96 W

Total allowance = 157 W



Type of Allowance	*Allowance*	*Area/Perimeter Value*	*Power Allowance*
Outdoor Dining	A. 0.240 W/ft^2	B. 400 ft^2	96 W
Area	0.090 W/ft^2	400 ft^2	36 W
Perimeter	0.60 W/LF	41 ft	25 W
	TOTAL POWER ALLOWANCE		**157 W**

Method 2

One could have the permit cover all of the site lighting including the outdoor dining area. (This second compliance path would provide a greater power allowance, but would require more work in the application process.) This only yields a higher allowance if the current lighting system serving hardscape areas for the rest of the site has less wattage than the calculated total site hardscape wattage allowance.

Example 6-48 Power Allowance for Outdoor Dining

Question

A restaurant moves in next door to a strip mall and the strip mall has its own parking lot lighting. Although the restaurant is adjacent to the outdoor parking lot lighting of the mall, this restaurant has its own parking lot and is not on the same site as the mall. The restaurant is adding 400 ft² of outdoor dining. How is the outdoor lighting allowance calculated?

Answer

This restaurant is on its own site and is able to take the all of the general hardscape lighting power allowances (IWA, LWA, and AWA). This lighting system is also allowed to take the additional specific application wattage allowance for the 400 ft² of outdoor dining.

6.6 Compliance and Enforcement

This section contains information about required outdoor lighting documentation, including outdoor lighting plan check documents in Section 6.6.1, Installation Certificate in Section 6.6.2, and Certificate of Acceptance in Section 6.6.3.

6.6.1 Outdoor Lighting Plan Check Documents

At the time a building permit application is submitted to the enforcement agency, the applicant also submits plans and energy compliance documentation. This section describes the recommended forms and procedures for documenting compliance with the outdoor lighting requirements of the Standards.

The Administrative Regulations §10-103(a) 2 require that the Certificate(s) of Compliance and any applicable supporting documentation be submitted with permit applications enabling the plans examiner to verify that the building or system design specifications shown on construction documentation is consistent with the energy features specified on the Certificate of Compliance in order to determine whether the design complies with the Energy Efficiency Standards. The Certificate of Compliance forms submitted to the enforcement agency to demonstrate compliance must be readily legible and of substantially similar format and informational order as those specified in this compliance manual. See Chapter 2 for additional information about Compliance and Enforcement.

The use of each form is briefly described below, and complete instructions for each form are presented in the following subsections. These forms may be included in the lighting equipment schedules on the plans, provided the information is in a similar format as the suggested form.

6.6.2 OLTG-1C: Certificate of Compliance

The OLTG-1-C Certificate of Compliance form is in four pages. Each page, if required (see below), must appear on the plans (usually near the front of the electrical drawings). A copy of these forms should also be submitted to the enforcement agency along with the rest of the compliance submittal at the time of building permit application. With enforcement agency approval, the applicant may use alternative formats of these forms (rather than the official Energy Commission forms), provided the information is the same and in a similar format.

OLTG-1C Page 1 of 4 Certificate of Compliance

Project Description

- PROJECT NAME is the title of the project, as shown on the plans and known to the enforcement agency.
- DATE is the date of preparation of the compliance submittal package. It should be on or after the date of the plans, and on or before the date of the building permit application.
- PROJECT ADDRESS is the address of the project as shown on the plans and as known to the enforcement agency.
- TOTAL HARDSCAPE ILLUMINATED AREA is the total of the hardscape illuminated area determined in accordance with §147(d) 1(a). This number shall be taken from OLTG (Page 1 of 3), section A. Lighting Power Allowance for General Hardscape, the sum of Column A

General Information

- PHASE OF CONSTRUCTION indicates the status of the outdoor lighting project described in the compliance documents. Refer to Section 1.6 for detailed discussion of the various choices.
- NEW CONSTRUCTION should be checked for all new outdoor lighting systems.
- ADDITION should be checked for an addition to a site with an existing outdoor lighting system.
- ALTERATION should be checked for alterations to an existing outdoor lighting system.

Declaration Statement of Documentation Author

- DOCUMENTATION AUTHOR is the person who prepared the energy compliance documentation and who signs the Declaration Statement. The person's telephone number is given to facilitate response to any questions that arise. A Documentation Author may have additional certifications such as an Energy Analyst or a Certified Energy Plans Examiner certification number. Enter number in the EA# or CEPE# box if applicable.

Declaration Statement of Principal Lighting Designer

The Declaration Statement is signed by the person responsible for preparation of the plans for the building and the documentation author. This principal designer is also responsible for the energy compliance documentation, even if the actual work is delegated to someone else (the Documentation Author as described above). It is necessary that the compliance documentation be consistent with the plans. The Business and Professions Code governs who is qualified to prepare plans and therefore to sign this statement. See Section 2.2.2 Permit Application for applicable text from the Business and Professions Code.

The person's telephone number is given to facilitate response to any questions that arise.

Outdoor Lighting Mandatory Measures

This portion requests the location of notes clarifying the inclusion of the mandatory requirements. Notes should be included on the plans to demonstrate compliance with mandatory requirements of the Standards.

Following are prototype examples of the notes that should be rewritten to actual conditions. A note for each of the items listed should be included, even if the note states "not applicable".

Determining installed lighting power

Installed lighting power has been determined in accordance with §130.0(c and d).

Controls for inefficient lighting systems

All outdoor incandescent luminaires with lamps rated over 100 W must be controlled by a motion sensor [§130.2(a)].

Outdoor luminaire Uplight and Glare zonal lumen limits

Outdoor luminaires that use lamps rated greater than 150 W (§130.2(b)) in the hardscape areas, parking lots, building entrances, canopies and all outdoor sales areas will be required to be meet Uplight and Glare zonal lumen limits as designated in Table 130.2-A.

Controls to turn off the lights during the day

All permanently installed outdoor lighting must be controlled by a photoelectric switch or astronomical time switch that automatically turns off the outdoor lighting when daylight is available (§132(c)1).

Controls to provide the option to turn off a portion of the lights

For lighting of building facades, parking lots, garages, sales and non-sales canopies, and all outdoor sales areas, automatic controls are required to provide the owner with

the ability to turn off the lighting or to reduce the lighting power by at least 50 percent but not exceeding 80 percent when the lighting is not needed [§132(c)2].

The above notes are only examples of wording. Each mandatory measure that requires a separate note should be listed on the plans.

To verify certification, use one of the following options:

- The Energy Hotline (see above) can verify certification of appliances not found in the above directories.
- The Energy Commission's Web Site includes listings of energy efficient appliances for several appliance types. The web site address is http://www.energy.ca.gov/appliances/database/

Documenting the mandatory measures on the plans is accomplished through a confirmation statement, notes and actual equipment location as identified on the plans. The plans should clearly indicate the location and type of all mandatory control devices; such as motion sensors, photocontrols, astronomical time switches, and automatic time switches.

Outdoor Lighting Compliance Forms & Worksheets

Check all of the appropriate boxes at the bottom of page 1 to indicate which worksheet(s) are being included with the certificate of compliance.

OLTG-1C Page 2 of 4 Compliance Fixture/Control Schedule and Field Inspection Checklist

Part 2 of OLTG-1-C documents that mandatory controls, luminaire schedules, and automatic controls are in compliance with Standards.

The form serves two purposes, one is to document compliance to the satisfaction of the enforcement agency and the other is for use as a field inspection checklist. After installation of the outdoor lighting system, the field inspector shall also verify that the OLTG-1INST and the appropriate Certificate of Acceptance has been completed and signed.

Luminaire Schedule

- NAME OR TAG is the name or symbol used on the plans to identify the luminaire.
- LUMINAIRE DESCRIPTION is a complete narrative description of the luminaire, including the type of luminaire, number and type of lamps or light sources in the luminaire, and number and type of ballast(s), drivers or generators in the luminaire. For example:
- LUMINAIRE TYPE is the type of luminaire, such as shoe box, cobra head, post top, etc.
- LAMP OR LIGHT SOURCE TYPE is the type of lamps or light source such as high pressure sodium, ceramic metal halide, induction, LED, etc.
- BALLAST OR DRIVER TYPE is the type of ballast or driver, such as electronic, dimmable, etc.

- WATTS PER LUMINIARE is the total input wattage of the complete lighting unit in accordance with §130(c or d). This is the total rated wattage of the luminaire, including lamp, light source, ballast, driver and/or generator not the nominal wattage of the lamp or light source (bulb) used in the luminaire.
- SPECIAL FEATURES is if there exist any special features for the field inspector to verify.
- HOW WAS WATTAGE DETERMINED? If CEC DEFAULT is checked, this indicates the wattage is a standard value taken from the data in Reference Nonresidential Appendix NA8. If this column is not checked, this indicates the nonstandard values must be substantiated with manufacturer's data sheets and determined according to §130(d or e).
- NUMBER OF LUMINAIRES is the number of luminaires of the identical type used for this particular function area.
- INSTALLED WATTS is determined by the product of the watts per Luminaire (column D) and the number of luminaires (column G).
- After the page has been completed, all of the installed watts in Column H shall be added up and entered into OLTG-1C, Page 4, Row Hl.
- FIELD INSPECTOR, this column is reserved for the field inspector whom determines if the system installed matches the forms. The inspector is to indicate in this column whether the system passes or fails.

Exempt Luminaires

When more than 50 percent of the light from a luminaire falls on one or more of the 12 Exceptions to §140.7, the lighting power for that luminaire shall be exempt from §140.7(b). This section of page 2 is where those exempt luminaires are documented.

- NAME OR SYMBOL shall correspond to the name or symbol on the plans
- DESCRIPTION – all luminaires included in this column must be in accordance with §140.7.

Mandatory Outdoor Lighting Controls

This area of page 2 serves two purposes, one is to document compliance with the outdoor lighting control requirements in §130.2 and the other is for use as a field inspection checklist.

- NUMBER corresponds to the number of controls of the same type.
- DESCRIPTION shall be a narrative describing the device.
- LOCATION indicates the location or area the control serves.

Special Features Inspection Checklist

This section is for special features upon which require written justification, documentation and inspection.

OLTG-1C Page 3 of 4

Outdoor Lighting Zone

The outdoor lighting zones are described in Table 10-114-A of the Standards. Default lighting zones shall be used unless the local jurisdiction having authority has conducted a public process to officially amend the outdoor lighting zone of a specific area, and has filed the change with the Energy Commission.

One box shall be checked to declare the outdoor lighting zone, and another box shall be checked to declare if the default lighting zone or the amended outdoor lighting zone is used.

Acceptance Form

The person with overall responsibility of the project must list the applicable Acceptance Testing, OLTG-2A that is to be completed by the end of the project. The space provided should list each system and accompanying test.

- EQUIPMENT – indicate the equipment type that requires testing.
- DESCRIPTION – give a brief description of the luminaires controlled by the equipment described in the previous column.
- NUMBER OF CONTROLS – indicate the number of controls that will be included in the test.
- LOCATION – indicate the location or area being controlled and tested.

Indicate the Acceptance Test pertinent to the equipment described in that row. Insert:

- OMS for Outdoor Motion Sensor
- OLSC for Outdoor Lighting Shutoff Controls
- OP for Outdoor Photocontrol
- ATS for Astronomical Time Switch
- STS for Standard (non-astronomical) Time Switch

OLTG -1C Page 4 of 4 Allowed and Installed Outdoor Lighting Power

Page 4 is a summary page of the allowed outdoor lighting power compared to the installed outdoor lighting power. The values inputted on this form are calculated on the OLTG-1C (Page 2 of 4) and OLTG-2C as described in each row.

The “Yes” box on the bottom row declares that the outdoor lighting complies with the Standards. The outdoor lighting complies only if Row H is less than or equal to Row G.

6.6.3 OLTG-2C

Form OLTG-2C (Outdoor Lighting Worksheet) shall be completed and submitted for General Hardscape and Specific Applications: per unit length, for ornamental lighting, and per application or per area. These forms are not required to be on the plans (they

may be submitted separately in the energy compliance package), or they may be included on the plans.

Lighting Compliance Summary for General Hardscape

OLTG-2C Part 1 of 3 is for lighting power allowances for general hardscape illumination (Standards Table 140.7-A).

- ILLUMINATED HARSCAPE AREA is the area of the general hardscape determined in accordance with §147(d) 1A.
- AREA WATTAGE ALLOWANCE (AWA) PER SQUARE FOOT is amount of wattage allowed per square foot of hardscape area found listed in Standards Table 147-A.
- CALCULATING AWA is achieved by multiplying the ILLUMINATED HARDSCAPE AREA (column A) and the AWA (column B). The resultant is the allowed wattage in watts for that given area.
- PERIMETER LENGTH is the measured length of the general hardscape area determined in accordance with §140.7(d) 1B.
- LINEAR WATTAGE ALLOWANCE (LWA) is the allowed wattage per linear feet listed in Standards Table 140.7-A.
- CALCULATING LWA is achieved by multiplying the PERIMETER LENGTH (column D) and the LWA (column E). The resultant is the allowed wattage in watts.
- INITIAL WATTAGE ALLOWANCE (IWA) is the default amount of watts allowed, dependent of the outdoor lighting zone, and listed in Standards Table 147-A.
- TOTAL GENERAL HARDSCAPE is the total allowed watts for the general hardscape illumination and is calculated by the sum of the AWA (column C), LWA (column F) and the IWA (column G).

Add up all of the rows for Column H, and insert the total site General Hardscape Lighting Allowance into OLTG-1C (Page 4 of 4) Row A.

The “Yes” box shall be checked to declare that the AWA, LWA, and IWA from Table 140.7-A was used as appropriate for the Outdoor Lighting Zone for this particular site.

Lighting Compliance Summary for Special Applications Per Unit Length

Part B of the OLTG-2C, Page 1 of 3 is for specific application lighting wattage allowance per unit length, which is available only for projects with a sales frontage.

- SPECIFIC LIGHTING APPLICATION shall only list “Outdoor Sales Frontage” in accordance with Standards Table 140.7-B. No other lighting applications qualify to use this allowance.
- LINEAR FEET OF FRONTAGE is the measured value of the sales frontage measured in feet.
- SALES FRONTAGE ALLOWANCE is the amount listed, dependent of outdoor lighting zone, and found in Standards Table 140.7-B.

- WATTAGE ALLOWED is the product of the LINEAR FEET (column B) and the SALES FRONTAGE ALLOWANCE of column C.
- NAME OF SYMBOL is the description corresponding to the plans.
- LUMINAIRE TYPE is the description of the type of luminaire.
- LUMINAIRE Uplight and Glare Lumen Limits for luminaires greater than 150 watts as installed (including tilt).
- LUMINAIRE QUANTITY is the number of identical luminaires.
- WATTS PER LUMINAIRE is the rated watts the luminaire as determined in accordance with §130.0(c or d). It is not the wattage of the lamp (bulb) or light source installed in the luminaire.
- DESIGN WATTS is the product of the number of luminaires of the same type (column G) and the watts per luminaire (column H).
- ALLOWED WATTS is the smaller of the wattage allowed in column D or the DESIGN WATTS of column I.

Add up all of the rows for Column J and insert the Specific application lighting wattage allowance per unit length into OLTG-1C (Page 4 of 4) Row B.

Lighting Compliance Summary for Ornamental Lighting

Part C of the OLTG-2C, Page 1 of 3 is for specific application lighting wattage allowance for ornamental lighting, which is available only for projects with hardscape ornamental lighting.

- SPECIFIC LIGHTING APPLICATION shall only be listed as “Hardscape Ornamental Lighting” in accordance with Table 140.7-B.
- SQUARE FEET OF HARDSCAPE is the total hardscape area for the site, as defined in §100.1.
- ORNAMENTAL LIGHTING ALLOWANCE is the amount listed, depending on the outdoor lighting zone, in accordance with Standards Table 140.7-B.
- WATTAGE ALLOWED is the product of the SQUARE FEET (column B) and the ORNAMENTAL LIGHTING ALLOWANCE of column C.
- NAME OF SYMBOL is the description corresponding to the plans.
- LUMINAIRE TYPE is the description of the lighting type.
- LUMINAIRE Uplight and Glare lumen limits for luminaires greater than 150 watts as installed (including tilt).
- LUMINAIRE QUANTITY is the number of identical luminaires.
- WATTS PER LUMINAIRE is the rated watts of the luminaire in accordance with §130.0(c and d). It is not the wattage of the lamp (bulb) or light source installed in the luminaire.
- DESIGN WATTS is the product of the number of identical luminaires (column G) and the watts per luminaire (column H).

- ALLOWED WATTS is the smaller of the wattage allowed in column D or the DESIGN WATTS of column I.

Add up all of the rows for Column J, and insert the Specific application wattage allowance for ornamental lighting into OLTG-1C (Page 4 of 4) Row C.

Lighting Compliance Summary per Application

Part D of the OLTG-2C, Page 2 of 3 is for specific application lighting wattage allowance per application in accordance with Table 147-B.

- SPECIFIC LIGHTING APPLICATION is listed in accordance with Standards Table 140.7-B.
- NUMBER OF LUMINAIRES is the number of identical luminaires used in the single specific application identified in Column A for this row.
- SPECIFIC APPLICATION ALLOWANCE is the allowed watts for the specific application listed in this row, dependent on outdoor lighting zone, and found in Standards Table 140.7-B. Note: for this section this shall be listed as watts.
- WATTAGE ALLOWED is the product of the NUMBER OF LUMINAIRES (column B) and the SPECIFIC APPLICATION ALLOWANCE of column C.
- LUMINARE SYMBOL is the description corresponding to the plans.
- LUMINAIRE TYPE is the description of the type of luminaire used in this specific application.
- LUMINAIRE QUANTITY is the number of identical luminaire types for this single specific application.
- WATTS PER LUMINAIRE is the number of watts the luminaire is rated at as determined according to §130.0(c and d). It is not the wattage of the lamp (bulb) or light source installed in the luminaire.
- DESIGN WATTS is the product of the number of luminaires of the same type (column G) and the watts per luminaire (column H).
- ALLOWED WATTS is the smaller of the wattage allowed in column D or the DESIGN WATTS of column I.

Add up all of the rows for Column J, and insert the Specific application wattage allowance per application into OLTG-1C (Page 4 of 4) Row D.

Lighting Compliance Summary per Specific Application Area

Part E of the OLTG-2C, Page 2 of 3 is for specific application lighting wattage allowance area.

- SPECIFIC LIGHTING APPLICATION is listed in Standards Table 140.7-B.
- ILLUMINATED AREA is the calculated area specific to the single application listed on this row.
- SPECIFIC APPLICATION ALLOWANCE is the watts per square foot listed, dependent on outdoor lighting zone, and found in Standards Table 140.7-B.

- WATTAGE ALLOWED is the product of the SQUARE FEET (column B) and the SPECIFIC APPLICATION ALLOWANCE of column C.
- CODE FOR LUMINAIRE TYPE is the description corresponding to the plans.
- LUMINAIRE TYPE is the description of the lighting type.
- LUMINAIRE Uplight and Glare lumen limits for luminaires over 150 watts, unless exempted such as building façade and sign lighting.
- LUMINAIRE QUANTITY is the number identical luminaires for this single specific application.
- WATTS PER LUMINAIRE is the number of watts the luminaire is rated as determined in accordance with §130.0(c and d). It is not the wattage of the lamp (bulb) or light source installed in the luminaire.
- DESIGN WATTS is the product of the number of identical luminaires (column G) and the watts per luminaire (column H).
- ALLOWED WATTS is the smaller of the wattage allowed in column D or the DESIGN WATTS of column I.

Add up all of the rows for Column J, and insert the Specific application lighting wattage allowance per area into OLTG-1C (Page 4 of 4) Row E.

6.6.4 Installation Certificate OTLG-INST

During the construction process, the general contractor or specialty subcontractors are required to complete various construction certificates. These certificates verify that the contractor is aware of the requirements of the Building Energy Efficiency Standards, and that the actual construction/installation meets the requirements.

Installation Certificates are required to be completed and submitted to certify compliance of regulated energy features such as luminaires and outdoor lighting controls. The licensed person responsible for the construction, or for the installation of a regulated energy feature must ensure their construction or installation work is done in accordance with the approved plans and specifications for the outdoor lighting system, and must complete and sign an Installation Certificate to certify that the installed features, materials, components or manufactured devices for which they are responsible, conform to the plans and specifications and the Certificate of Compliance documents approved by the enforcement agency for the building. A copy of the completed signed and dated Installation Certificate must be posted at the building site for review by the enforcement agency in conjunction with requests for final inspection for the building. See Section 2.2.3 for more information about the Installation Certificate.

6.6.5 Certificate of Acceptance

Before an occupancy permit is granted for a new building or space, or a new lighting system serving a building, space, or site is operated for normal use, all outdoor lighting controls serving the site shall be certified as meeting the Acceptance Requirements for Code Compliance. A Certificate of Acceptance shall be submitted to the enforcement agency under Administrative Regulations §10-103(a).

The acceptance requirements that apply to outdoor lighting controls include the following:

- Certifies plans, specifications, installation certificates, and operating and maintenance information meet the requirements of the Standards.
- Certified that outdoor lighting controls meet the applicable requirements of §110.9 and §130.2.

Acceptance testing must be conducted, and a Certificate of Acceptance must be completed and submitted before the enforcement agency can issue the certificate of occupancy. The procedures for performing the acceptance tests are documented in Reference Nonresidential Joint Appendix NA7.7. See the following chapters for more information about outdoor lighting control acceptance requirements.

- Chapter 2.2.4 Certificate of Acceptance
- Chapter 10.1 Acceptance Requirements
- Chapter 10.7 Testing Procedures for Lighting Equipment
- Chapter 10.9 Outdoor Lighting forms For Acceptance Requirements
- Reference Nonresidential Joint Appendix NA7.7, Outdoor Acceptance Test