



Requirements for Outdoor Lighting

City of San Diego
Development Services Department

TECHNICAL BULLETIN

ENER-5-1

November 2020

The purpose of this technical bulletin is to describe the major requirements for outdoor lighting. Outdoor lighting is regulated by the California Energy Code (CEnC), California Green Building Standards Code (CGBSC) and San Diego [Municipal Code Section 142.0740](#). The intent of outdoor lighting requirements is to ensure that newly constructed projects reduce the amount of backlight, uplight, light and glare from exterior light sources in an effort to minimize light pollution in order to maintain dark skies. Light pollution is disruptive to the environment, wildlife and humans.

I. INTRODUCTION

A. Definitions

1. **Uplight** is defined as excess lighting directed up into the night sky, above 90 degrees. This causes light pollution or artificial sky glow.
2. **Glare** is caused by light emitted between 60 and 90 degrees around a luminaire. Light emitted at these angles can be uncomfortable and even hazardous.
3. **Backlight** includes all illumination behind a luminaire. Backlight causes light trespass, which occurs when light spills into unwanted areas.

B. Description

The backlight, uplight and glare (BUG) rating system helps designers select luminaires that meet state and local requirements for different outdoor Lighting Zones (LZ0 – LZ4). A BUG rating consists of three parts, indicating how well the luminaire controls backlight, uplight and glare. Lower ratings indicate minimal amounts of stray light, light pollution or glare. The lowest possible rating in each category is 0 (B0, U0 or G0). Higher ratings, the highest being 5 (B5, U5 or G5), indicate less control. For example, a luminaire rated B2-U0 -G1 delivers mediocre control of backlight, excellent control of uplight and controls glare well.

C. Lighting Zones

The majority of the City of San Diego is located in Lighting Zone 3 but there are portions that are located in Lighting Zone 2. See Map C-948 for specifics.

II. REQUIREMENTS FOR LIGHT POLLUTION REDUCTION

A. General.

Per CEnC Section 130.2 (b), all outdoor luminaires rated over 6,200 initial luminaire lumens or greater must comply with BUG rating in accordance with IES TM-15-11, Addendum A, except for the following:

1. Signs
2. Lighting for building facades, public monuments, statues and vertical surfaces of bridges
3. As required by a health or life safety statute, ordinance or regulation to be a cutoff luminaire
4. Temporary outdoor lighting
5. Replacement of pole mounted luminaires in hardscape areas where all of the following is true:
 - a. Where the existing luminaire does not meet BUG requirements
 - b. Spacing between existing poles is greater than 6 times the mounting height of the existing luminaires
 - c. No additional poles are added to the site

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- d. No new wiring to the luminaires is installed
 - e. The connecting lighting power wattage is not increased.
 6. Luminaires that illuminate the public right of way on publicly maintained roadways, sidewalks and bikeways.
 7. Lighting attached to a high-rise residential or hotel/motel building and separately controlled from the inside of a dwelling unit or guest room.
- B. Maximum BUG Output.** Outdoor lighting systems must be designed to comply with the requirements in CGSBC Table 5.106.8(N) based upon the specific lighting zone except for when more than 50% of the light from a luminaire covers one of the following installations that qualify as exceptions in CEnC, Section 140.7:
1. Temporary lighting
 2. As required for the Federal Aviation Administration and the Coast Guard
 3. Public streets, roadways, highways and traffic signage lighting
 4. Sports and athletic fields and children's playgrounds
 5. Industrial sites (rail yards, shipyards, docks, piers, marinas, etc)
 6. Public monuments
 7. Signs in accordance with CEnC Section 130.3 and 140.8
 8. Tunnels, bridges, stairs, wheelchair elevator lifts for Americans with Disability Act (ADA) and ramps other than parking garage ramps
 9. Landscape lighting
 10. For theme parks, outdoor lighting only for themes and special effects
 11. Outdoor theatrical and other outdoor live performances, provided that they are controlled by a multiscene or theatrical cross-face control station accessible only to authorized operators
 12. Outdoor lighting for qualified historic buildings if they consist solely of historic lighting components or replicas of historic lighting components.

TABLE 5.106.8 [N]
MAXIMUM ALLOWABLE BACKLIGHT, UPLIGHT AND GLARE (BUG) RATINGS^{1,2}

ALLOWABLE RATING	LIGHTING ZONE LZ0	LIGHTING ZONE LZ1	LIGHTING ZONE LZ2	LIGHTING ZONE LZ3	LIGHTING ZONE LZ4
Maximum Allowable Backlight Rating³ (B)					
Luminaire greater than 2 mounting heights (MH) from property line	N/A	No Limit	No Limit	No Limit	No Limit
Luminaire back hemisphere is 1 – 2 MH from property line	N/A	B2	B3	B4	B4
Luminaire back hemisphere is 0.5 – 1 MH from property line	N/A	B1	B2	B3	B3
Luminaire back hemisphere is less than 0.5 MH from property line	N/A	B0	B0	B1	B2
Maximum Allowable Uplight Rating (U)					
For area lighting ⁴	N/A	U0	U0	U0	U0
For all other outdoor lighting, including decorative luminaires	N/A	U1	U2	U3	U4
Maximum Allowable Glare Rating⁵ (G)					
Luminaire greater than 2 MH from property line	N/A	G1	G2	G3	G4
Luminaire front hemisphere is 1 – 2 MH from property line	N/A	G0	G1	G1	G2
Luminaire front hemisphere is 0.5 – 1 MH from property line	N/A	G0	G0	G1	G1
Luminaire front hemisphere is less than 0.5 MH from property line	N/A	G0	G0	G0	G1

1. IESNA Lighting Zones 0 are not applicable; refer to Lighting Zones as defined in the *California Energy Code* and Chapter 10 of the *California Administrative Code*.

2. For property lines that abut public walkways, bikeways, plazas and parking lots, the property line may be considered to be 5 feet beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.

3. If the nearest property line is less than or equal to two mounting heights from the back hemisphere of the luminaire distribution, the applicable reduced Backlight rating shall be met.

4. General lighting luminaires in areas such as outdoor parking, sales or storage lots shall meet these reduced ratings. Decorative luminaires located in these areas shall meet U-value limits for "all other outdoor lighting."

5. If the nearest property line is less than or equal to two mounting heights from the front hemisphere of the luminaire distribution, the applicable reduced Glare rating shall be met.

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III. CONTROLS FOR OUTDOOR LIGHTING

- A. **General.** Outdoor lighting must be independently controlled from all other electrical loads and meet the requirements in Section III, B except for the following:
1. Lighting required by a health or life safety code that is not permitted to be turned off or reduced.
 2. Lighting in tunnels required to be illuminated 24/7.
- B. **Control Requirements.** Outdoor lighting required to be controlled must meet the following functional requirements:
1. Outdoor lighting must be controlled by a photo control, astronomical time-switch control or other control capable of automatically shutting Off the outdoor lighting when daylight is available.
 2. Automatic Scheduling Controls
 - a. Automatic scheduling controls shall be capable of reducing the outdoor lighting power by at least 50 percent and no more than 90 percent, and separately capable of turning the lighting OFF, during scheduled unoccupied periods.
 - b. Automatic scheduling controls shall allow scheduling of a minimum of two nighttime periods with independent lighting levels, and may include an override function that turns lighting ON during its scheduled dim or OFF state for no more than two hours when an override is initiated.
 - c. Acceptance tests of outdoor lighting controls shall verify the scheduled occupied and unoccupied periods, as specified in Section 130.4(a)6.
 - d. Automatic scheduling controls shall be installed for all outdoor lighting, and may be installed in combination with motion sensing controls or other outdoor lighting controls.
 3. Motion sensing controls are required for outdoor lighting except for luminaires with a maximum rated wattage of 40 watts, applications that qualify as exceptions in CEnC, Section 140.7, and lighting subject to a health or life safety code per CEnC, Section 130.2(c)3, Exception 3. Where required, motion sensing controls shall comply with the following:
 - a. Motion sensing controls shall be capable of reducing the outdoor lighting power of each controlled luminaire by at least 50 percent and no more than 90 percent, and separately capable of turning the luminaire OFF, during unoccupied periods.
 - b. Motion sensing controls shall be capable of reducing the lighting to its dim or OFF state no longer than 15 minutes after the area has been vacated, and of returning the lighting to its ON state when the area becomes occupied.
 - c. No more than 1,500 watts of lighting power shall be controlled by a single sensor.
 - d. Motion sensing controls shall be installed for the following luminaires and may be installed for other outdoor lighting and in combination with other outdoor lighting controls:
 - i. Outdoor luminaires other than building façade, ornamental hardscape, outdoor dining or outdoor sales frontage lighting, where the bottom of luminaire is mounted 24 feet or less above grade; and,
 - ii. Outdoor wall mounted luminaires installed for building façade, ornamental hardscape or outdoor dining lighting that have a bilaterally symmetric distribution as described in the IES Handbook (typically referred to as “wall packs”) mounted 24 feet above grade or lower.

III. SUBMITTAL REQUIREMENTS

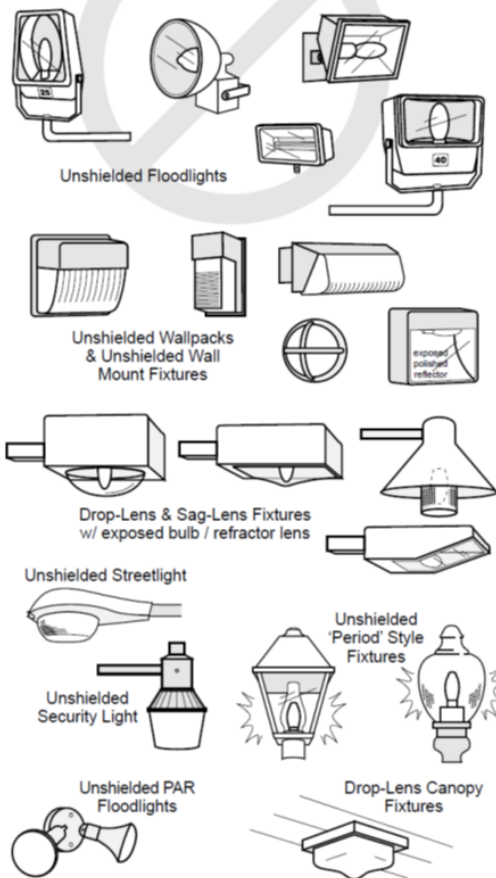
All projects proposing new outdoor lighting fixtures, including the replacement of outdoor lighting fixtures, must provide the following information.

- Lighting zone the subject project is located
- Electrical plans and specifications showing compliance with exterior lighting requirements, including photometric data for perimeter site lighting fixtures
- Exterior light sources
- Specifications for all controls proposed on the project.
- Proposed lighting fixtures complying with applicable City of San Diego Municipal Code requirements such as Color Correlated Temperature (CCT), glare, and maximum lumens.

Examples of Acceptable / Unacceptable Lighting Fixtures

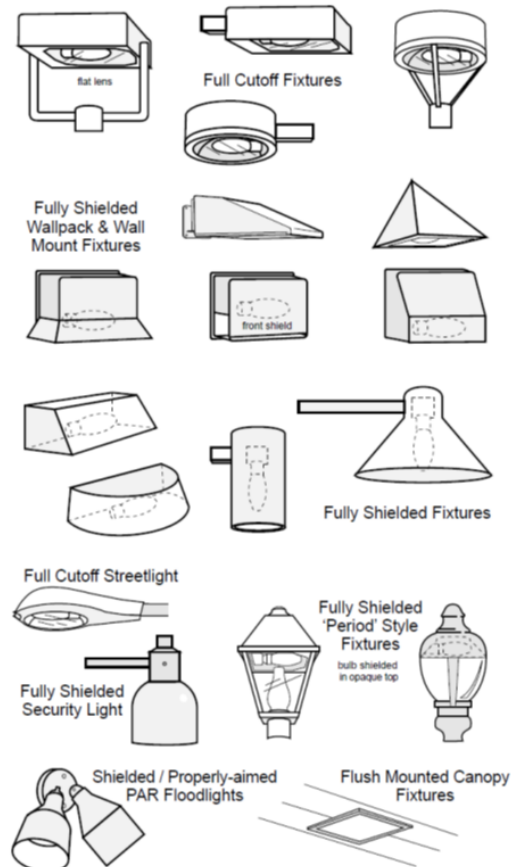
Unacceptable / Discouraged

Fixtures that produce glare and light trespass



Acceptable

Fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night



Documents Referenced in this Technical Bulletin

- San Diego Municipal Code, ([SDMC](#))
- [California Electrical Code](#) (CEC)
- [California Energy Code](#) (CEnC)
- [California Green Building Standards Code](#) (CGBSC)

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