The California State University
OFFICE OF THE CHANCELLOR

Outdoor Lighting Design Guide

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SECTION 1:

Introduction

The purpose of this Guide is to provide CSU campuses with guidelines for outdoor lighting design to provide a safe and comfortable nighttime environment for students and visitors, maximize energy efficiency, and improve campus aesthetics. Issues related to public safety must also be considered, on a case-by-case basis, when applying the design techniques presented in this guideline.

This Guide covers:

- Lighting Design Goals
- Lighting Design Strategies to meet Design Goals
- Control Strategies and Methods
- Lamp Types Preferred for Energy and Maintenance Savings
- State of California Regulations and Requirements

SECTION 2:

Lighting Design Goals

Compliance with Applicable Codes

Outdoor lighting designs must comply with the following State of California Codes:

Refer to California Energy Code, (California Code of Regulations Title 24, Part 6) Section 140.7 for maximum requirements for outdoor lighting power allowances and mandatory control requirements. Refer to Section 130.2 for luminaire cutoff requirements and lighting control requirements.

Refer to California Electrical Code (California Code of Regulations Title 24, Part 3) for electrical requirements for outdoor lighting, including circuiting, overcurrent protection, and grounding.

Refer to California Green Building Standards (California Code of Regulations Title 24, Part 11) for additional requirements for outdoor lighting. Outdoor lighting shall comply with Cal-Green Tier 1, which exceeds Title 24 Part 6 by 15%, or Cal-Green Tier II, which is preferred, exceeds Title 24 Part 6 by 30%.

All electrical devices must be listed and labeled for their intended use. Outdoor electrical components such as LED luminaires and drivers shall be listed for wet locations and environments by an agency such as Underwriters Laboratories (UL).

Good Nighttime Visibility

The primary purpose of the nighttime lighting system is to provide good nighttime visibility and a sense of security for the campus community and visitors. Good visibility does not necessarily mean high levels of illumination. Many visual issues must be addressed to meet this goal including light source color, reduction of glare, appropriate uniformity of illuminance, and vertical surface brightness. Addressing all of these issues creates a comfortable visual environment.

Outdoor Lighting Zones

The basic premise of the California Energy Standards is to base the outdoor lighting power allowed on the perceived brightness of the surrounding conditions. The California Energy Standards contain lighting power allowances for newly installed equipment and specific alterations that are dependent on which Lighting Zone the project is located. See Appendix 7.9.

The technical basis for the differences in outdoor lighting zones described by the Illuminating Engineering Society of North America (IESNA) is that the eyes adapt to darker surrounding conditions and less light is required for proper vision; when the surrounding conditions get brighter, more light is needed. The least power is allowed in Lighting Zone 1 and increasingly more power is allowed in Lighting Zones 2, 3, and 4. Lighting Zone 0 is intended for undeveloped spaces in parks and wildlife preserves and is very low ambient illumination. Providing greater power for illumination 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.

For outdoor lighting design recommended practice documents, the IES has directed the various committees to incorporate the Lighting Zone concept into the design criteria. However, in 2014, the IESNA published a new Recommended Practice for Parking Facilities (RP-20-14). In this document, the Lighting Zone concept has been

effectively disregarded by establishing a single design criteria for Lighting Zones 1-4. As a result, the new Lighting Zone allowances for General Hardscape do not increment upward in the same manner as previous versions of the Code.

The California Energy Commission defines the boundaries of Outdoor Lighting Zones based on the 2010 U.S. Census Bureau boundaries for urban and rural areas as well as the legal boundaries for wilderness and park areas (see CA Energy Standards Table 10-114-A). By default, government designated parks, recreation area, and wildlife preserves are Lighting Zone 0 and Lighting Zone 1. Lighting Zone 0 areas are undeveloped areas of government designated parks, recreation areas, and wildlife preserves; Lighting Zone 1 are developed portions of government designated parks, recreation areas, and wildlife preserves. 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 Energy Commission.

Modification of Exterior Lighting Zone Designations

Exterior lighting allowances in California vary by Lighting Zones (LZ). Table 10-114-A (see Appendix 7.9) specifies the relative ambient illumination level and the statewide default location for each lighting zone.

A local jurisdiction may officially adopt changes to the lighting zone designation of an area by following a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction may determine areas where LZ4 is applicable and may increase or decrease the lighting zones for areas that are in LZ1, LZ2, and LZ3, as specified in Table 10-114-A (see Appendix 7.9).

The California Energy Commission shall have the authority to not allow lighting zone changes which the Commission finds to be inconsistent with specifications of 2016 Building Energy Efficiency Standards.

Low Maintenance

Luminaires and lamps should be selected based on energy efficiency, long life, and durability to reduce operating costs and maintenance over the life of the equipment. The future cost of maintenance, such as re-lamping and replacement parts, can quickly overwhelm the initial cost of the lighting equipment. Luminaires should be designed to provide access to the array and driver without the use of special tools to reduce the amount of time required to replace the lamp or driver. The luminaires and lighting controllers should also be selected and specified from nation- wide, established manufacturers that have a minimum of 10 years in the lighting industry. The luminaire manufacturers should have a distributor geographically close to the campus to reduce shipping and lead time for replacement parts.

Energy Efficiency

One of the primary goals for any campus is to reduce energy consumption, peak electrical demand, and greenhouse gas emissions (GHG). The exterior lighting design can contribute to this goal in several ways – careful use of light to brighten surfaces and enhance visibility, the use of energy efficient, white light sources, and the incorporation of lighting controls. With many California electrical utilities shifting time of use rates from the afternoon into the evening, outdoor lighting will contribute to peak electrical demand

Lighting vertical surfaces not only enhances the campus architecture but improves the overall nighttime visibility. It is an effective use of light rather than trying to cover an entire ground area (horizontal surface) to provide a high illumination level.

The peripheral vision for our eyes performs better under white light sources, such as LED, rather than orange light sources, such as high-pressure sodium. The result is that less energy can be used to achieve better visibility with white

light sources. By using energy efficient sources such as LED, the most amount of light can be produced with the least amount of electricity necessary. Lamps with a high efficacy *should* be selected. Efficacy is defined as the amount of light produced by a lamp, usually measured in lumens, divided by the amount of power utilized to produce the light, usually measured in watts. The California Energy Code mandates a lamp efficacy of at least 60 lumens per watt for lamps rated over 100 watts.

Once the light is used effectively and produced efficiently, it can be controlled so that the brightness and energy are appropriate based on conditions. Controls may be a simple photocell or astronomical time switch that turns the luminaire on at dusk and then off at dawn. They can also be more complex and controlled as groups or monitored with a campus-wide energy management system. Motion sensors can be used to dim the lights when an area is unoccupied. LED fixtures with multiple or dimming drivers can be step dimmed from 100% by at least 40%, but not exceed 90%. Refer to Section 4 of this guide for lighting control details.

Reduced Light Pollution

Light pollution or sky glow is caused by light aimed directly up into the sky and by light reflected off the ground or objects. Sky glow disrupts the ecosystem and prevents the public and astronomers from seeing the stars. It is also an inefficient use of nighttime illumination and energy.

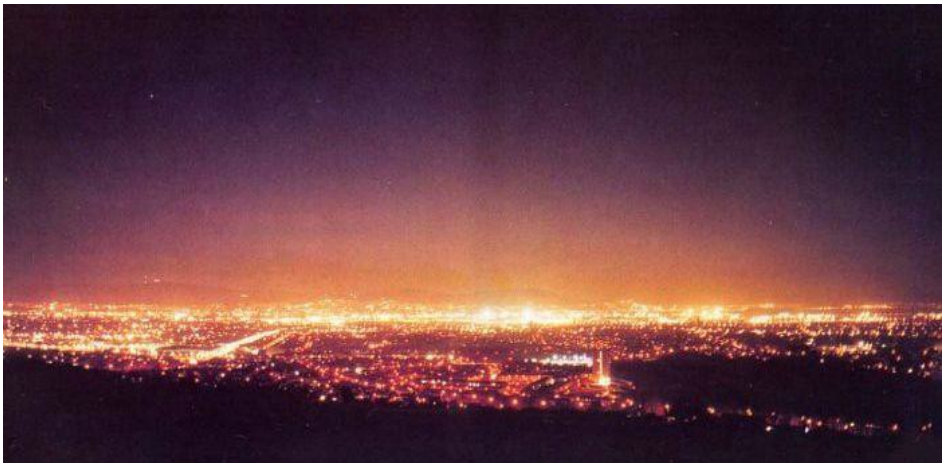


Photo of sky glow over Belfast. Photo by Peter Paice

Satellite image of light reflected into space. Photo by NASA

To minimize light pollution, use fully shielded luminaires for area and roadway lighting with a minimal Uplight rating (zero or one). Title 24 Part 11 defines three metrics to quantify light distribution, denoted "BUG" ratings BUG rating refers to "Back-light, Up-light, and Glare". The California Energy Code requires all luminaires over 150 watts to meet cutoff requirements. However, to minimize light pollution, Campus design guidelines and specifications should stipulate all luminaires as U0 or U1 rated, regardless of wattage.

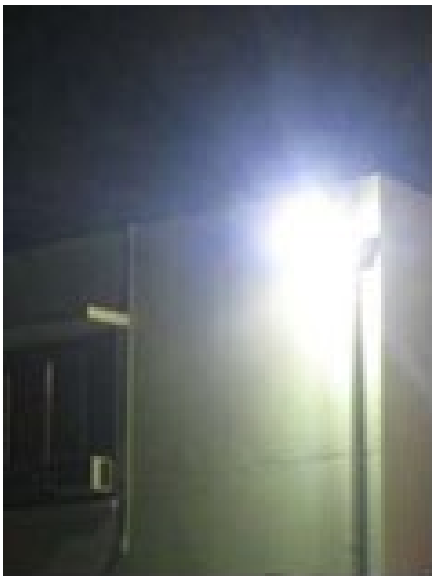
Image provided courtesy of Abacus Lighting

Floodlights, wall packs and other un-shielded luminaires are the major contributors to sky glow. Excess illumination, even with shielded luminaires, reflects unnecessary light back into the atmosphere and adds to sky glow.

Applications such as pedestrian and entry lighting, typically require greater vertical illuminance for identification of features and landmarks. Where possible, the control of lighting with motion sensors energizes lighting only when needed, thus reducing light pollution.

Consult local codes and ordinances regarding luminaire selection and BUG requirements to avoid light pollution. Municipalities near an observatory or military facility may have stricter requirements regarding the light source and light pollution allowances. Local codes should be identified in campus design guidelines and should specify a certain type of lamp or lamp color temperature that is allowed and required for outdoor lighting.

Minimal Light Trespass



Light trespass is also referred to as nuisance glare that is visible from adjacent properties. Uncontrolled light sources such as floodlights and unshielded wall pack luminaires mounted at a low elevation create glare and are often the cause of light trespass. Since glare inhibits our ability to "see" objects, features, and decreases contrast, all designs must minimize glare for good visibility.

To minimize light trespass, use only fully shielded luminaires for area lighting. Do not over-light areas as reflected light can also result in complaints and poor nighttime visibility from increased glare. Outdoor lighting that is reflected into natural areas can also affect wildlife in the natural area.

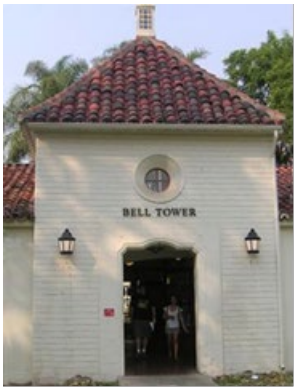
Locate luminaires to avoid any direct light into adjacent building windows, especially dorm rooms. Luminaires attached to exterior building façades should be located between windows, not directly above windows. Also, consider dimming or turning off lighting when not needed and activate with motion sensors or timers when activity occurs to minimize light trespass into building interiors.

Integrate with Campus Aesthetics

Not only must the lighting system perform well at night, but also the selected aesthetic must complement the campus architecture and surroundings during the day. The lighting aesthetic should be consistent between similar areas across the campus.

Campus lighting standards should be developed for all applicable outdoor lighting applications, including building

façades, pedestrian pathways, campus roads, parking lots, athletic fields, signs, and stairways. Selection of luminaires and lamps as a campus standard will help maintain a consistent aesthetic across the campus.



Existing Illumination Level Survey

All new projects should include a light level survey to document existing conditions and area illumination levels, especially those areas adjacent to the project. Existing light sources such as pedestrian pathway lighting, street lighting, and building exterior lighting that will remain in service after project completion should be included in the project outdoor illumination plans and calculations.

SECTION 3:

Lighting Design Strategy

Create Vertical Surface Brightness

The use of lighting for building vertical surfaces, building entrances, and monuments as markers or reference points is important for visual orientation. Buildings and monuments, when properly illuminated, may act as visual anchors or serve as points of arrival for the campus. Surface brightness is critical for good nighttime visibility. Brightness of vertical surfaces especially improves visibility and a sense of security for pedestrians. With lighted backgrounds or walls, people can see the movement of others in silhouette. It also defines walls of an exterior space making the surroundings feel more comfortable visually as well as secure. The following renderings and photographs illustrate the concept of surface brightness as it could be applied to the campus:

Note that the actual light sources are concealed and provide uniform illumination to minimize glare while the illuminated surfaces create a soft and comfortable visual environment. Building entrances are illuminated with downlighting for wayfinding.

Enhance Wayfinding

Nighttime lighting can aid pedestrians in finding their way around campus. This may be straight-forward such as illuminating directional or informational signs. It can also be subtle such as brightening building entries or pathway intersections. Illuminated iconic facades can also orient people at night and provide additional wayfinding. By using

consistent light levels and lighting equipment across the campus, a clear relationship is established between area types and lighting application for each area type.

Minimize Glare

Direct glare is caused by excessive light entering the eye from a bright light source. The potential for direct glare exists any time one can "see" a light source. With direct glare, the eye has a harder time seeing contrast and details. It also can make other surroundings seem darker. A lighting system designed solely on horizontal footcandle lighting levels, tends to aim more light outwards and increases the potential for glare. Glare can also be minimized by appropriate shielding of luminaires. A fully shielded luminaire can use a lamp of a higher lumen output than an unshielded luminaire, while maintaining a visually comfortable level of glare.

To further minimize glare, all brightness levels in the nighttime environment should be in approximately the same range. For comparison, a full moon has a Luminance (brightness) level of about 2,500 candela per square meter (cd/m2), while an unshielded floodlight has a level of 22,000 cd/m2. By illuminating building surfaces and shielding light sources, most of the luminance levels on the campus will be similar.

Maintain Lighting Uniformity

Lighting uniformity refers to the evenness of light along a surface area. Uniform lighting can mean the difference between visual comfort and exasperating distractions and confusion. Uneven illumination throws annoying patterns of light and shadows across everything it touches. These glaring contrasts often impact visibility, comfort, and perception. The eyes automatically adjust for differing light levels (adaptation). At the same time, the eye is also trying to maintain focus (accommodation). This can create undue stress that can result in fatigue. Eyes are continuously adapting to the brightest object in the field of view. As areas become less uniform, details become harder to distinguish. Uniformity is also related to glare. If the eye must adapt to a bright source, it will have a harder time seeing objects of lower brightness. This issue must be considered when designing lighting for roadways, pedestrian paths, and parking lots. With lighting that is not uniform, pedestrians may become invisible to oncoming motorists, because the driver's eyes have adapted to the bright source making it difficult to identify

the pedestrian if the pedestrian is in a dark area relative to the bright light source. Providing uniform lighting and minimizing glare will aid in pedestrian and vehicular safety.

In the photograph to the right, note how the pedestrian "disappears" in an environment without uniform lighting. There is only one lamp illuminating the roadway intersection and crosswalks. By using several luminaires to achieve more uniform lighting across the roadways, pedestrian visibility is greatly enhanced. Roadway pedestrian crossings should have the same or higher illumination levels than the surrounding area.

LED Arrays and Light Dispersion

An array of spacially distributed LED's can produce a desired illumination pattern. A cluster of LED's can produce a given desired illuminance distribution on a surface. In general, a high powered LED emits light onto a surface with some degree of directionality. As a consequence, a light fixture with an LED array can be designed to easily direct emissions into specific lighting patterns without additional optical devices, such as reflectors or refractors. An adaptive lighting pattern can be adjusted to specific requirements by individually modulating the LED's. This controllability can provide benefits for the exterior lighting such as different light patterns (IES Type 1 through Type 5) from the same style of fixture.

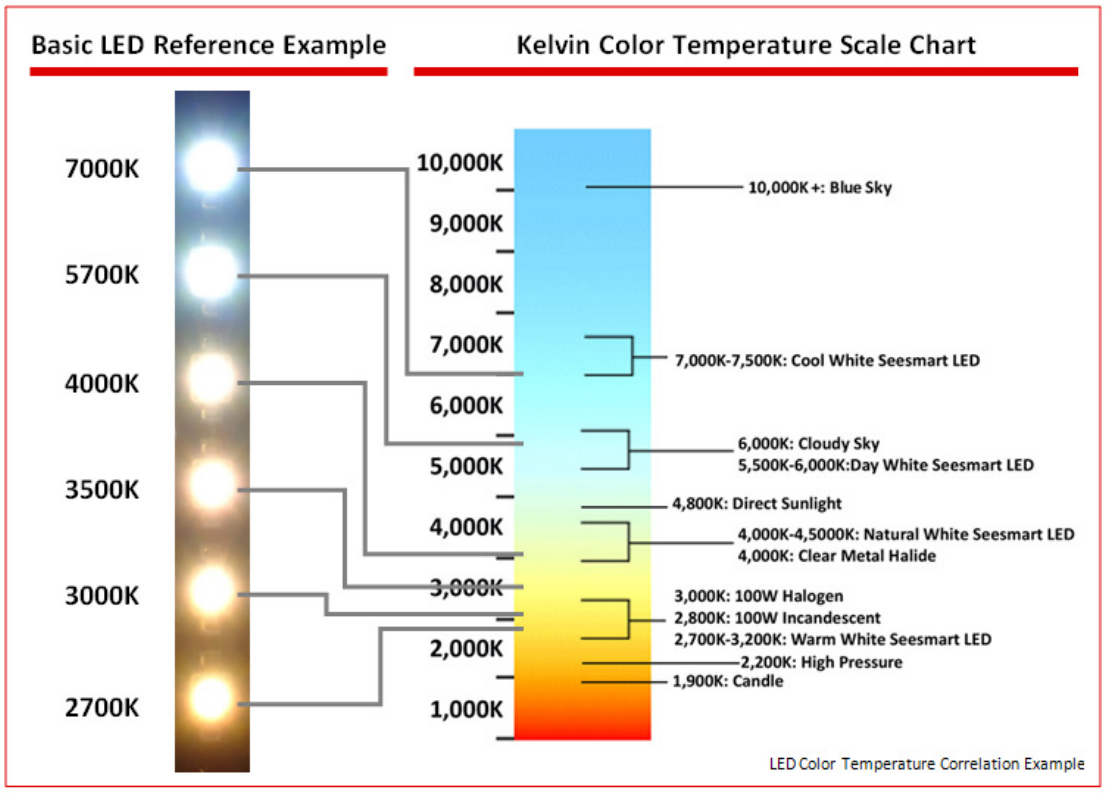
Provide Appropriate Light Levels

Light level or illuminance, measured in footcandles, is a measure of light incident on a surface. While this is not a value that we actually see, it is a basis for some lighting criteria. The term "footcandle" was developed to establish the illuminance cast on a surface by a one candela source one foot away. One footcandle is generally accepted to equal one lumen per square foot and also approximately 10 Lux (metric units of lumens per square meter). Policies at some campuses specify a minimum footcandle value for outdoor areas, regardless of the lighting application. While adequate light levels need to be provided for good visibility, this criteria is not the only or most important lighting strategy. In fact, with good surface brightness, lighting uniformity, and good color rendition using white light sources, such as LED, light levels can be lower and provide equal or better visibility. Walkways and parking lots are required to be 0.5fc minimum and 1.0fc average and be within Cal-Green Tier II compliance.

In the above photo, the left side of the room has higher horizontal footcandle values, as measured on the floor, yet the right side of the room appears brighter. The ceiling on the right has been painted white, reflecting more light. The luminaires have been configured to provide a portion of up-lighting to illuminate the ceiling. This strategy gives the appearance of a brighter environment, despite lower footcandle values. Using vertical surface illumination and selection of luminaires that minimize glare can provide an environment that appears brighter, despite lower energy and footcandle values. This strategy would apply to cover walkways, parking structures, and tunnels.

Provide Appropriate Light Temperature

Outdoor LED lighting temperature is an important criteria and the ideal lighting temperature may vary by application from under 3000K to over 5000K. Although efficient, too high of a lighting temperature and the associated blue light can impact circadian rhythm, cause glare, and contribute more to light pollution. American Medical Association recommends lighting temperature of 3000K or less in their study Human and Environmental Impacts of LED Community Lighting: “energy efficiency of 3000K lighting is only 3% less than 4000K, but the light is more pleasing to humans and has less of an impact on wildlife”.


Basic LED Reference Example
Kelvin Color Temperature Scale Chart
7000K
5700K
4000K
3500K
3000K
2700K
10,000K
9,000K
8,000K
7,000K
6,000K
5,000K
4,000K
3,000K
2,000K
1,000K
10,000K +: Blue Sky
7,000K-7,500K: Cool White Seesmart LED
6,000K: Cloudy Sky
5,500K-6,000K:Day White Seesmart LED
4,800K: Direct Sunlight
4,000K-4,5000K: Natural White Seesmart LED
4,000K: Clear Metal Halide
3,000K: 100W Halogen
2,800K: 100W Incandescent
2,700K-3,200K: Warm White Seesmart LED
2,200K: High Pressure
1,900K: Candle
LED Color Temperature Correlation Example

CCT Chart

SECTION 4:

Lighting Control Strategies

Compliance with Applicable Codes for Lighting Control

The California Energy Code mandates all permanently installed outdoor lighting to be controlled by a photosensor or astronomical time switch to automatically turn off lighting when daylight is available. In addition, lighting of building facades, parking lots, garages and canopy luminaires mounted below 24 feet must be controlled such that the power usage in watts can be reduced by 40-90 percent. This requirement can be accomplished by use of bi-level switching or continuous dimming through a range that includes 40 to 90 percent reduction in power consumption.

All installed outdoor lighting shall be independently controlled from other electrical loads by a time-based lighting control device or system that is being programmed to turn off outdoor luminaires for a portion of the night and the day.

Judicious selection and installation of controllers such as time switches, motion sensors, and photosensors can realize significant energy savings. Integration of exterior lighting circuits with an interior lighting controller or EMS system can result in greater savings.

Control Strategies

Reduction of Accent and Non-Essential Lighting Energy Use

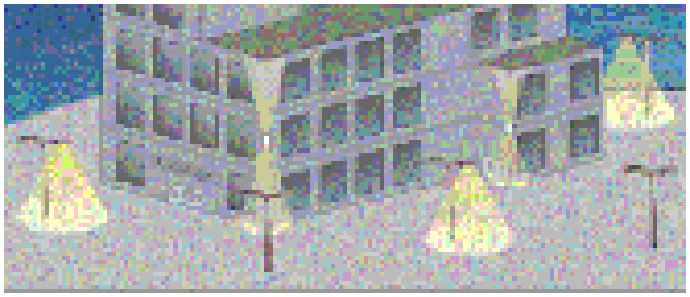
During a typical night, students, staff, and faculty are traversing the campus from dusk to midnight. After midnight, the number of people moving about the campus is minimal. Superfluous lighting, such as feature, landscape, and art lighting, should be turned off from midnight to dawn. When controlled by a programmable time switch, this lighting can be configured to remain off completely during campus holidays. It is recommended to leave pathway and building façade lighting on throughout the night for security purposes, however, a time switch in combination with a motion sensor can realize energy savings during periods when the number of persons on the campus site is minimal. The location, quantity, and efficacy of occupancy and motion sensors is critical to outdoor lighting control and design. Sensors have specific operating characteristics that must be evaluated for each location.

Coordinate Indoor and Outdoor Lighting

Building interior lighting may contribute to light pollution and light trespass if not properly controlled and located. This may occur with bright decorative luminaires or indirect, pendant mounted lighting located next to large window walls. During design or retrofit of a building, the locations and positions of interior lighting should be considered along with locations of exterior lighting. Avoid placing large interior lights next to windows to minimize light trespass.

Interior lighting, regardless of type, can cause light trespass and a significant increase in energy use if the lights remain on throughout the night. It is recommended to control both interior and exterior lighting from the same control system. The system can then be programmed to control lighting with a nighttime scheme that keeps only minimal interior lighting energized.

In the above illustration, note that the exterior lighting turns on while the interior lighting remains on. There is no control coordination between interior and exterior lighting, resulting in excessive use of lighting and energy usage.



In the above illustration, the interior lighting is turned off, while the exterior lighting is carefully controlled to provide adequate illumination. Motion sensors for both interior and exterior lighting can turn off lighting when the building is not in use but turn the lighting back on for periods of activity. Coordination of interior and exterior lighting control can provide significant energy savings per building.

Parking Structures

In a parking garage it is possible to have high quality lighting that illuminates the horizontal driving surface and provide proper vertical illumination levels. Multiple LED systems offer the option of coming on to 50% or to 100%, either individually or in groups. This allows for bi-level and full occupancy control. Install low-profile LED luminaires specifically designed for parking structures. LED parking structure fixtures are designed to control

surface glare through optical shielding. Careful placement and dimming of these fixtures can prevent or reduce light trespass outside of the structure or property line.

Stadium Lighting

Campus stadiums usually consume an excess amount of energy and usually contribute to light trespass and light pollution. Each campus should conduct an energy audit to determine how much energy could be saved by replacing HID fixtures with new LED fixtures and controls.

New LED stadium floodlights are designed to control light distribution to the playing surface more efficiently, avoiding light pollution and unwanted light spill. LED lighting is also better for viewing of big screens and scoreboards, and result in flicker free, super slow motion TV.

Monitor Performance of Controller

Controllers must be periodically inspected and monitored to ensure proper operation, and continued energy savings. A stuck contactor, miss-aligned photosensor, or improperly programmed time switch can cause exterior lighting to remain on during daylight hours and negate energy cost savings. Photosensors, timers, and contactors within controllers should be inspected regularly to ensure the lighting does not remain on during daylight hours. Lighting control schemes should be reviewed periodically to ensure that non-essential exterior lighting remains off during periods of minimal campus activity, such as holidays. Lighting circuit energy use can be measured and monitored to detect small changes such as lower current use from burnt out lamps or non-functional LED drivers. Higher currents during off hours would indicate improper dimmer control operation. Current during daylight would also be indicative of a controller malfunction.

Control Methods

Photosensors

Photosensors are available with adjustable thresholds for detecting daylight, as well as a time-delay feature to prevent the sensor from turning on exterior lighting during temporarily dark conditions, such as from passing clouds or pedestrians walking by the controller. Manufacturer's recommendations for positioning photosensors should be followed. The photosensor should have a clear view of the sky and be facing north. The photosensor should not be located next to trees, poles, or other obstructions that may block the sensor's light input and turn on exterior lighting during daylight hours.

Motion Sensors

A motion sensor or occupancy sensor is a device that detects a moving object, particularly people. For exterior applications, Passive Infrared (PIR) technology sensors should generally be used, which detect heat in motion. These sensors can be mounted on light poles or installed within a fixture. Most outdoor sensors can have settings that can be adjusted for mounting heights. For bollard and other low level lighting, microwave emitters with the luminaire can be effective for proximity detection.

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

a. Include motion sensors or other lighting control system that automatically control lighting in response to the area being vacated by occupants.

b. Be capable of automatically reducing the lighting of each luminaire by at least 40%, but not exceeding 90%, or provide continuous dimming through a range that includes 40-90%.

c. Employ auto-on functionality when the area becomes occupied.

d. Ensure that no more than 1500 watts of lighting power are controlled together. The 1500 watt limit is intended to keep the total area of the lighting zones small enough to ensure that the lighting source energy will be setback enough to make the lighting controls cost effective.

Timers

Timers for exterior lighting should be of the astronomical type to comply with California Energy Code requirements and prevent exterior lighting from remaining on during periods of daylight. Astronomical timers self-adjust according to local longitude and latitude, eliminating the need for reprogramming during different periods of darkness throughout the year. Timers should include a battery back-up source to maintain programming during a temporary power outage. There are two types of timers: electro-mechanical and solid-state relays. While the electro-mechanical and solid-state relays are fundamentally similar, electro-mechanical timers have a limited contact life cycle, can take up more space, and have slower switch speeds. Solid-state timers have no such limitations. The main advantages of solid-state relays are they have no moving parts to wear out, therefore no contact bounce issues, and faster on/off switching time.

Digital Controls

Digital lighting controllers can combine a photosensor and astronomical timer for maximum control flexibility and energy savings. For example, lighting can be configured to turn on at dusk using the photosensor control input and turn off at midnight using the timer control input. Facilities that are used during the night, such as loading docks, can be programmed to turn on at a certain time of night, and turn off at dawn. Digital controls should include a programming scheme based on day-of-week and day-of-year to reduce lighting use during weekends and holidays.

Integration with Campus EMS

Integration of exterior, as well as interior, lighting control with the campus energy management system (EMS) can provide significant energy savings while simultaneously providing detailed information on lighting use and performance. Lighting controllers should be digitally addressable and have the capability to be monitored in real-time from a central monitoring station. Controllers should provide the capability to send an alarm regarding a stuck contactor or tripped circuit to the central EMS monitoring station. This alarm will instantly notify maintenance personnel of exterior lights remaining on during daylight hours or failing to turn on during the night. Use of an addressable lighting controller with the capability to send status and alarm notifications will minimize time spent by maintenance personnel troubleshooting lighting circuits. Many campuses are now utilizing cloud-based metering systems that can be programmed to identify abnormal operation and energy usage patterns.

Wireless Technology

Wireless devices refer to the lighting control equipment that operates on a wireless network. Typical devices in a wireless control system include light fixtures, various configurations of motion sensors and photocells (fixture mounted), and a central area controller (usually called a gateway).

While wired networked systems offer better reliability, installation costs for both materials and labor are significantly higher. There is also a greater chance of disruption to day-to-day operations when deploying or upgrading a wired system. A wireless network provides significant cost savings with minimal disruptions during development. Wireless networks are easier to install and upgrade, offering the flexibility needed to respond quickly to changing business demands.

Most typical system topologies feature a linear structure that transmits messages from one device to all others in an established and sequential mesh network order. There is no singular, pre-defined communication path through the system. The wireless devices act as nodes, that send and receive messages across multiple devices to a dedicated area controller. The mechanical topology creates a stronger and more reliable wireless network structure. The mechanical network offers two distinct benefits. First, the network can detect where a specific component is having an issue and secondly it will re-route messages accordingly to protect the performance of the system. Mechanical networks are also equipped to identify and incorporate new devices into the system map and reestablish devices that have been moved.

SECTION 5:

Lamp Types

LED Light Sources

LED is the most established and proven design technology in the relatively new field of solid state lighting (SSL) systems. Based on state-of-the-art technology, LED lighting systems offer significant performance and savings benefits over older technology and conventional lighting including:

a. Long Life: LED lighting fixtures retain up to 70% of the initial output after 50,000 operating hours of service (5.7 years at 24 hours per day) and 50% output after 100,000 operating hours. Unlike HID and fluorescent, the frequency of on / off cycles, ambient temperatures, and lamp orientation will not reduce the expected life cycle. Even under ideal conditions, HPS, and MH can only offer 20,000 – 25,000 operating hours, and fluorescent lighting has a considerably shorter life cycle.

b. Instant On: LED reaches 100% light output in less than 1-second, unlike HPS and MH which can take up to 10-minutes to reach full light output.

c. Severe Service: LED light fixtures withstand vibration, impacts, and cold temperatures better than any other lighting method available.

d. No Mercury: LED lights contain no mercury. HPS, MH, fluorescent and induction all contain small amounts of mercury. LED lighting eliminates or reduces the disposal costs of lamps containing mercury and other hazardous materials.

e. Dark Skies: LED is very directional and spreads only 15° off the lamp centerline. The light output is directed where it is needed, not into the night sky or neighboring properties.

f. Lower Energy Consumption: Properly designed LED lighting can provide both sufficient light and reduced energy consumption.

g. Low Heat Output: LED lighting systems add negligible heat loads to air conditioning or refrigeration systems. Both the emitter and driver of LED lighting remain relatively cool.

h. LED Lamps Do Not Burn Out: Although they will gradually dim over years of use, LED's do not fail suddenly or unexpectedly, leaving the area in the dark.

i. Works with Motion Detectors: LED lighting comes on instantly upon detecting motion. LED lighting with motion sensors can be turned off or dimmed to save energy.

Lamps of Limited or Prohibited Use

High Pressure Sodium (HPS) lamps produce reduced wavelength orange-hued light and should not be used on campus due to the poor color rendition unless their use is mandated by local ordinances.

Ceramic arc-tube metal halide (CMH) lamps should be used only when LED options are not available, or to match exiting conditions. Arc-tube metal halide lamps should not be used.

Mercury vapor, low pressure sodium, and halogen lamps should not be used largely due to their low efficacy (lumens of light output per watt of electricity input) and short life, high heat output. If halogen lamps are used in limited cases, they should be dimmed to extend their life. For emergency and life safety applications, only light sources capable of

illuminating with no delay should be specified.

Incandescent lamps (non-halogen) are prohibited. The average life of an incandescent lamp is only 1,000 hours. They are a very inefficient use of electric energy and are an unsustainable waste of material and resources.

SECTION 6:

Outdoor Lighting System Commissioning

The IESNA defines commissioning of lighting systems as “a systematic process that insures all elements of the lighting control system perform interactively and continuously according to documented design intent and the needs of the building owner”. The commissioning process should begin as early as possible in the lighting design.

The Commissioning Agent (CxA) should develop a plan of action based upon clearly identified objectives and timelines, such as type of lighting sources, type of controls, and schedule of testing. Next, the CxA will carry out equipment testing in 2 stages: Pre-Functional Performance Testing and Functional Performance Testing. This testing includes review of the equipment and installation to be sure it meets the design criteria: aiming and adjusting of lights that need to be focused to accent areas, testing and programming of lighting control systems, user training of the lighting control system, and maintenance training. Timeclocks are tested to insure the lighting is turned off when daylight is available. Title 24 Part 6 states that all installed outdoor lighting must be controlled by a photocell or astronomically time-switch. These timeclocks should also be capable of turning lights on / off for a portion of night and day.

Outdoor fixture testing of control devices will include exterior motion sensors, time clocks, and photocells. Motion sensors are usually fixture mounted and are tested for on/off/dimming capability and that the motion sensor functions properly at its installed mounting height. Photocells are usually fixture mounted and are tested for on/off capability and that the photocell is at a proper set point for sensing dawn and dusk.

SECTION 7:

Appendices

NOTE:

- The Codes, Checklists, Guidelines, Certification Forms, and other reference materials in this Appendix is subject to change.
- Verify the information included for reference is current and applicable prior to use.
- Always use the latest applicable Code and Regulatory requirements.

Title 24 California Code of Regulations

Guide to the 2016 California Green Building Standards Code (Nonresidential)

Title 24, California Code of Regulations

The 2016 *California Building Standards Code*, Title 24, California Code of Regulations consists of the following thirteen parts. The *CALGreen* Code is Part 11 of Title 24.

Part 1 *California Administrative Code*;

Part 2 *California Building Code* Volume 1 and Volume 2 are based on the 2015 *International Building Code*;

Part 2.5 *California Residential Code* is based on the 2015 *International Residential Code*;

Part 3 *California Electrical Code* is based on the 2014 *National Electrical Code*;

Part 4 *California Mechanical Code* is based on the 2015 *Uniform Mechanical Code*;

Part 5 *California Plumbing Code* is based on the 2015 *Uniform Plumbing Code*;

Part 6 *California Energy Code*;

Part 7 Vacant;

Part 8 *California Historical Building Code* is located within Part 2, Volume 2;

Part 9 *California Fire Code* is based on the 2015 *International Fire Code*;

Part 10 *California Existing Building Code* is located within Part 2, Volume 2;

Part 11 *California Green Building Standards Code (CALGreen)*;

Part 12 *California Referenced Standards Code*.

Cal-Green Verification Guidelines Mandatory Measures Checklist

STATE OF CALIFORNIA – DEPARTMENT OF GENERAL SERVICES – BUILDING STANDARDS COMMISSION
CALGreen Verification Guidelines – Mandatory Measures Checklist
BSC CG-200 (Rev. 12/16)

CALGreen VERIFICATION GUIDELINES MANDATORY MEASURES CHECKLIST

Application: This checklist shall be used for nonresidential projects that meet one of the following: new construction, building additions of 1,000 sq. ft. or greater or building alterations with a permit valuation of $200,000 or more pursuant to *CALGreeen* Section 301.3 AND do not trigger a Tier 1 or Tier 2 requirement:

Y = Yes (section has been selected and/or included)
N/A = Not Applicable (Code section does not apply to the project, mainly used for additions and alterations)
O = Other (provide explanation)
[N] = New construction pursuant to Section 301.3
[A] = Additions and/or alterations pursuant to Section 301.3

CHAPTER 5 DIVISIONS		SECTION TITLE	CODE SECTION	Y	N/A	O	Plan sheet, Spec or Attach Reference
DIVISION 5.1 Planning and Design	Mandatory	Storm Water Pollution Prevention w/ subsections	5.106.1 through 5.106.1.2				
	Mandatory	Short Term Bicycle Parking	5.106.4.1.1				
	Mandatory	Long Term Bicycle Parking	5.106.4.1.2				
	Mandatory	Designated Parking For Clean Air Vehicles	5.106.5.2				
	Mandatory	Parking stall marking	5.106.5.2.1				
	Mandatory	Single (EV) Charging space requirements [N]	5.106.5.3.1				
	Mandatory	Multiple (EV) Charging space requirements [N]	5.106.5.3.2				
	Mandatory	EV charging space calculation [N] w/exceptions	5.106.5.3.3				
	Mandatory	[N] Identification	5.106.5.3.4				
	Mandatory	[N] Future charging spaces w/ notes 1-3	5.106.5.3.5				
	Mandatory	Light Pollution Reduction [N] w/ exceptions and note	5.106.8				
	Mandatory	Grading and Paving w/exception for Additions and Alterations not altering the drainage path	5.106.10				
DIVISION 5.2 Energy Efficiency	Mandatory	Meet the minimum Energy Efficiency Standard	5.201.1				
DIVISION 5.3 Water Efficiency and Conservation	Mandatory	Separate Meters (new buildings or additions > 50,000 SF that consume more than 100 gal/day)	5.303.1.1				
	Mandatory	Separate Meters (for tenants in new buildings or additions that consume more than 1,000 gal/day)	5.303.1.2				
	Mandatory	Water closets shall not exceed 1.28 gallons per flush	5.303.3.1				
	Mandatory	Wall-mounted urinals shall not exceed 0.125 gpf	5.303.3.2.1				
	Mandatory	Floor-mounted urinals shall not exceed 0.5 gpf	5.303.3.2.2				
	Mandatory	Single showerhead shall have maximum flow rate of 2.0 gpm (gallons per minute) at 80 psi	5.303.3.3.1				
	Mandatory	Multiple showerheads serving one shower shall have a combined flow rate of 2.0 gpm at 80 psi	5.303.3.3.2				
	Mandatory	Nonresidential lavatory faucets	5.303.3.4.1				
	Mandatory	Kitchen faucets	5.303.3.4.2				
	Mandatory	Wash basins	5.303.3.4.3				
	Mandatory	Metering faucets	5.303.3.4.4				

CHAPTER 5 DIVISIONS		SECTION TITLE	CODE SECTION	Y	N/A	O	Plan sheet, Spec or Attach Reference
	Mandatory	Metering faucets for wash fountains	5.303.3.4.5				
	Mandatory	Food waste disposers w/note	5.303.4.1				
	Mandatory	Areas of additions and alterations	5.303.5				
	Mandatory	Standards for plumbing fixtures and fittings	5.303.6				
	Mandatory	Outdoor water use in landscape areas equal to or greater than 500 square feet	5.304.2				
	Mandatory	Outdoor water use in rehabilitated landscape projects with areas equal to or greater than 2,500 square feet	5.304.3				
	Mandatory	Outdoor water use in landscape areas of 2,500 square feet or less	5.304.4				
	Mandatory	Graywater or rainwater use in landscaped areas	5.304.5				
DIVISION 5.4 Material Conservation and Resource Efficiency	Mandatory	Weather Protection	5.407.1				
	Mandatory	Moisture Control: sprinklers	5.407.2.1				
	Mandatory	Moisture Control: Exterior door protection	5.407.2.2.1				
	Mandatory	Moisture Control: Flashing	5.407.2.2.2				
	Mandatory	Construction waste management-comply with either: sections 5.408.1.1, 5.408.1.2, 5.408.1.3 or more stringent local ordinance	5.408.1.1, 5.408.1.2, 5.408.1.3				
	Mandatory	Construction waste management: Documentation w/notes	5.408.1.4				
	Mandatory	Universal Waste [A]	5.408.2				
	Mandatory	Excavated soil and land clearing debris w/ exception and notes	5.408.3				
	Mandatory	Recycling by Occupants w/ exception	5.410.1				
	Mandatory	Recycling by Occupants: Additions w/ exception	5.410.1.1				
	Mandatory	Recycling by Occupants: Sample ordinance	5.410.1.2				
	Mandatory	Commissioning new buildings (≥ 10,000 SF) [N] w/exceptions and notes	5.410.2				
	Mandatory	Owner's or Owner representative's Project Requirements (OPR) [N]	5.410.2.1				
	Mandatory	Basis of Design (BOD) [N]	5.410.2.2				
	Mandatory	Commissioning Plan [N]	5.410.2.3				
	Mandatory	Functional Performance Testing [N]	5.410.2.4				
	Mandatory	Documentation and Training [N]	5.410.2.5				
	Mandatory	Systems Manual [N]	5.410.2.5.1				
	Mandatory	Systems Operation Training) [N]	5.410.2.5.2				
	Mandatory	Commissioning Report [N]	5.410.2.6				
	Mandatory	Testing and adjusting for new buildings < 10,000 SF or new systems that serve additions or alterations.	5.410.4				
	Mandatory	System Testing Plan for HVAC, Lighting, water heating, renewable energy, landscape irrigation and water reuse.	5.410.4.2				
	Mandatory	Procedures for testing and adjusting	5.410.4.3				
	Mandatory	HVAC balancing	5.410.4.3.1				
	Mandatory	Reporting for testing and adjusting	5.410.4.4				
	Mandatory	Operation and Maintenance (O&M) Manual	5.410.4.5				
	Mandatory	Inspection and reports	5.410.4.5.1				

CHAPTER 5 DIVISIONS		SECTION TITLE	CODE SECTION	Y	N/A	O	Plan sheet, Spec or Attach Reference
DIVISION 5.5 Environ-mental Quality	Mandatory	Fireplaces	5.503.1				
	Mandatory	Woodstoves	5.503.1.1				
	Mandatory	Temporary ventilation	5.504.1				
	Mandatory	Covering of ducts openings and protection of mechanical equipment during construction	5.504.3				
	Mandatory	Adhesives, sealants and caulks	5.504.4.1				
	Mandatory	Paints and coatings	5.504.4.3				
	Mandatory	Aerosol paints and coatings	5.504.4.3.1				
	Mandatory	Aerosol paints and coatings: Verification	5.504.4.3.2				
	Mandatory	Carpet systems	5.504.4.4				
	Mandatory	Carpet cushion	5.504.4.4.1				
	Mandatory	Carpet adhesive	5.504.4.4.2				
	Mandatory	Composite wood products	5.504.4.5				
	Mandatory	Composite wood products: Documentation	5.504.4.5.3				
	Mandatory	Resilient flooring systems	5.504.4.6				
	Mandatory	Resilient flooring: Verification of compliance	5.504.4.6.1				
	Mandatory	Filters w/ exceptions	5.504.5.3				
	Mandatory	Filters: Labeling	5.504.5.3.1				
	Mandatory	Environmental tobacco smoke (ETS) control	5.504.7				
	Mandatory	Indoor moisture control	5.505.1				
	Mandatory	Outside air delivery	5.506.1				
	Mandatory	Carbon dioxide (CO2) monitoring	5.506.2				
	Mandatory	Acoustical control w/ exception	5.507.4				
	Mandatory	Exterior noise transmission, prescriptive method w/ exceptions	5.507.4.1				
	Mandatory	Noise exposure where noise contours are not readily available	5.507.4.1.1				
	Mandatory	Performance method	5.507.4.2				
	Mandatory	Site features	5.507.4.2.1				
	Mandatory	Documentation of compliance	5.507.4.2.2				
	Mandatory	Interior sound transmission w/ note	5.507.4.3				
	Mandatory	Ozone depletion and greenhouse gas reductions	5.508.1				
	Mandatory	Chlorofluorocarbons (CFCs)	5.508.1.1				
	Mandatory	Halons	5.508.1.2				
	Mandatory	Supermarket refrigerant leak reduction for retail food stores 8,000 square feet or more sections 5.508.2 through 5.508.2.6.3	5.508.2 through 5.508.2.6.3				
		END OF MANDATORY PROVISIONS					

Documentation Author's /Responsible Designer's Declaration Statement Mandatory: I attest that this mandatory provisions checklist is accurate and complete.	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip	License:

Cal-Green Verification Guidelines Tier 1 Checklist

STATE OF CALIFORNIA – DEPARTMENT OF GENERAL SERVICES – BUILDING STANDARDS COMMISSION
CALGreen Verification Guidelines – Tier 1 Checklist
BSC CG-201 (Rev. 12/16)

CALGreen VERIFICATION GUIDELINES TIER 1 CHECKLIST

Application: This checklist shall be used for nonresidential projects that meet the following: new construction, or building additions of 1,000 sq. ft. or greater, or building alterations with a permit valuation of $200,000 or more pursuant to *CALGreen* Section 5.301.3, AND are adopting Tier 1 voluntary measures.

Note: All applicable mandatory requirements in chapter 5 shall be met prior to applying Tier 1 voluntary measures.

Instructions:

Comply with all Tier 1 (prerequisite) measures from the various categories shown on the table below.

Add a "Y" to all Mandatory and Tier 1 mandatory provisions in the appropriate columns.

Select the required number of additional electives from those categories shown on the table below and add a "Y" on the selected elective and add an "N" on the rest.

Count the total number of Tier 1 (prerequisite) measures plus the additional electives and write down the total number at the end of the checklist. Determine if the required number of Tier 1 measures have been selected to achieve Tier 1 compliance.

Y = Yes (section has been selected and/or included)
N = No (section has not been selected and/or included)
O = Other (provide explanation)
[N] = New construction pursuant to Section 301.3
[A] = Additions and/or alterations pursuant to Section 301.3

CHAPTER 5 DIVISIONS		SECTION TITLE	CODE SECTION	Y	N	O	Plan sheet, Spec or Attach Reference
DIVISION 5.1 Planning and Design	Mandatory	Storm Water Pollution Prevention w/subsections	5.106.1 through 5.106.1.				
	Mandatory	Short Term Bicycle Parking	5.106.4.1.1				
	Mandatory	Long Term Bicycle Parking	5.106.4.1.2				
	Mandatory	Designated Parking for clean air vehicles	5.106.5.2				
	Tier 1 Prerequisite	*Designated Parking - 10% of Parking Capacity w/ parking stall markings and stall identification*	*A5.106.5.1 A5.106.5.1.1 A5.106.5.1.3 A5.106.5.1.4*				
	Mandatory	Parking stall marking	5.106.5.2.1				
	Mandatory	Single (EV) Charging space requirements	5.106.5.3.1				
	Mandatory	Multiple (EV) Charging space requirements	5.106.5.3.2				
	Tier 1 Prerequisite	*Electric Vehicle (EV) Charging [N] w/ associated electrical panel Identification and designated parking allowance*	*A5.106.5.3 A5.106.5.3.1 A5.106.5.3.3 A5.106.5.3.4*				
	Mandatory	EV charging space calculation [N] w/ exceptions	5.106.5.3.3				
	Mandatory	[N] Identification	5.106.5.3.4				
	Mandatory	[N] Future charging spaces w/ notes 1-3	5.106.5.3.5				
	Mandatory	Light Pollution Reduction [N] w/ exceptions and note	5.106.8				
	Mandatory	Grading and Paving, w/exception for Additions and Alterations not altering the drainage path	5.106.10				
	Tier 1 Prerequisite	*Cool Roof (Table A5.106.11.2.2): SRI 75 when < 2:12, SRI 16 when >2:12*	*A5.106.11.2*				

	SELECT ONE ELECTIVE	*Elective*	*Community Connectivity*	*A5.103.1*				
		Elective	*Brownfield or Greyfield site redevelopment or infill area development.*	*A5.103.2 A5.103.2.1*				
		Elective	*Reduce development footprint and optimize open space.*	*A5.104.1 A5.104.1.1 A5.104.1.2 A5.104.1.3*				
		Elective	*Disassemble and Reuse Existing Building Structure (70%) with exceptions*	*A5.105.1.1*				
		Elective	*Disassemble and Reuse Existing Non-Structure elements (50%) with exceptions*	*A5.105.1.2*				
		Elective	*Salvage*	*A5.105.1.3*				
		Elective	*Storm Water Design*	*A5.106.2 A5.106.2.1 A5.106.2.2*				
		Elective	*Low Impact Development (LID)*	*A5.106.3 A5.106.3.1 A5.106.3.2*				
		Elective	*Changing rooms w/ note*	*A5.106.4.3*				
		Elective	*Parking capacity w/ reduced parking capacity option*	*A5.106.6 A5.106.6.1*				
		Elective	*Exterior wall shading w/ fenestration and/or opaque wall areas option*	*A5.106.7 A5.106.7.1 A5.106.7.2*				
		Elective	*Heat island Effect*	*A5.106.11*				
DIVISION 5.2 Energy Efficiency		Mandatory	Meet the minimum Energy Efficiency Standard	*5.201.1*				
		Tier 1 Prerequisite	Energy Performance Outdoor lighting power 90% of Part 6	A5.203.1.1.1				
		Tier 1 Prerequisite	If applicable, Service for water heating in restaurants 8,000 sf or greater	A5.203.1.1.2				
		Tier 1 Prerequisite	Energy Budget 95% or 90% of Part 6 calculated value of allowance	A5.203.1.2.1				
	SELECT ONE ELECTIVE	Elective	On-site renewable energy w/ documentation	A5.211.1 A5.211.1.1				
		Elective	Green power	A5.211.3				
		Elective	Elevators w/ car lights and fan	A5.212.1.1 A5.212.1.1.1				
		Elective	Escalators w/ controls	A5.212.1.2 A5.212.1.4				
		Elective	Steel framing	A5.213.1				
DIVISION 5.3 Water Efficiency and Conservation		Mandatory	Separate Meters (new Buildings or additions > 50,000 SF that consume more than 100 gal/day)	5.303.1.1				
		Mandatory	Separate Meters (for tenants in new buildings or additions that consume more than 1,000 gal/day)	5.303.1.2				
		Tier 1 Prerequisite	Water Reduction Tier 1. 12% savings over the "water use baseline" Table A5.303.2.2 or Meet table A5.303.2.3.1	A5.303.2.3.1				
		Mandatory	Water closets shall not exceed 1.28 gallons per flush	5.303.3.1				
		Mandatory	Wall-mounted urinals shall not exceed 0.125 gpf	5.303.3.2.1				
		Mandatory	Floor-mounted urinals shall not exceed 0.5 gpf	5.303.3.2.2				
		Mandatory	Single showerhead shall have maximum flow rate of 2.0 gpm (gallons per minute) at 80 psi	5.303.3.3.1				
		Mandatory	Multiple showerheads serving one shower shall have a combined flow rate of 2.0 gpm at 80 psi	5.303.3.3.2				

	Mandatory	Nonresidential lavatory faucets	5.303.3.4.1				
	Mandatory	Kitchen faucets	5.303.3.4.2				
	Mandatory	Wash basins	5.303.3.4.3				
	Mandatory	Metering faucets	5.303.3.4.4				

	Mandatory	Metering faucets for wash fountains	5.303.3.4.5				
	Mandatory	Food waste disposers w/note	5.303.4.1				
	Mandatory	Areas of additions and alterations	5.303.5				
	Mandatory	Standards for plumbing fixtures and fittings	5.303.6				
	Mandatory	Outdoor water use in landscape areas equal to or greater than 500 square feet	5.304.2				
	Mandatory	Outdoor water use in rehabilitated landscape projects with areas equal to or greater than 2,500 square feet	5.304.3				
	Mandatory	Outdoor water use in landscape areas of 2,500 square feet or less	5.304.4				
	Mandatory	Graywater or rainwater use in landscaped areas	5.304.5				
SELECT 1	*Elective*	*Nonpotable water systems for indoor use*	*A5.303.2.3.4*				
	Elective	*Appliances and fixtures for commercial application*	*A5.303.3*				
		Nonwater supplied urinals	*A5.303.4.1*				
	Elective	*Dual plumbing*	*A5.303.5*				
	Elective	*Outdoor potable water use*	*A5.304.2*				
	Elective	*Restoration of areas disturbed by construction*	*A5.304.6*				
	Elective	*Previously developed sites w/ exception*	*A5.304.7*				
	Elective	*Graywater irrigation system*	*A5.304.8*				
	Elective	*Nonpotable water systems*	*A5.305.1*				
	Elective	*Irrigation systems*	*A5.305.2*				
DIVISION 5.4 Material Conservation and Resource Efficiency	*Tier 1 Prerequisite*	*Recycled content for10% of total material cost*	*A5.405.4 A5.405.4. 1 Through*				
	Mandatory	Weather Protection	5.407.1				
	Mandatory	Moisture Control: sprinklers	5.407.2.1				
	Mandatory	Moisture Control: Exterior door protection	5.407.2.2.1				
	Mandatory	Moisture Control: Flashing	5.407.2.2.2				
	Mandatory	Construction waste management-comply with either: sections 5.408.1.1, 5.408.1.2, 5.408.1.3 or more stringent local ordinance	5.408.1.1, 5.408.1.2, 5.408.1.3				
	Mandatory	Construction waste management: Documentation w/notes	5.408.1.4				

		Mandatory	Universal waste [A]	5.408.2				
		Mandatory	Excavated soil and land clearing debris w/ exceptions and notes	5.408.3				
		Tier 1 Prerequisite	*Enhanced construction waste reduction 65% – Tier 1 w/ verification*	*A5.408.3.1 A5.408.3.1.2*				
		Mandatory	Recycling by Occupants w/ exception	5.410.1				
		Mandatory	Recycling by Occupants: Additions w/ exception	5.410.1.1				
		Mandatory	Recycling by Occupants: Sample ordinance	5.410.1.2				
		Mandatory	Commissioning new buildings (≥ 10,000 SF) [N] w/exceptions and notes	5.410.2				
		Mandatory	Owner's or Owner representative's Project Requirements (OPR) [N]	5.410.2.1				
		Mandatory	Basis of Design (BOD) [N]	5.410.2.2				
		Mandatory	Commissioning Plan [N]	5.410.2.3				
		Mandatory	Functional Performance Testing [N]	5.410.2.4				
		Mandatory	Documentation and Training [N]	5.410.2.5				
		Mandatory	Systems Manual [N]	5.410.2.5.1				
		Mandatory	Systems Operation Training) [N]	5.410.2.5.2				
		Mandatory	Commissioning Report [N]	5.410.2.6				
		Mandatory	Testing and adjusting for new buildings < 10,000 SF or new systems that serve additions or alterations.	5.410.4				
		Mandatory	System Testing Plan for HVAC, Lighting, water heating, renewable energy, landscape irrigation and water reuse.	5.410.4.2				
		Mandatory	Procedures for testing and adjusting	5.410.4.3				
		Mandatory	HVAC balancing	5.410.4.3.1				
		Mandatory	Reporting for testing and adjusting	5.410.4.4				
		Mandatory	Operation and Maintenance (O&M) Manual	5.410.4.5				
		Mandatory	Inspection and reports	5.410.4.5.1				
	SELECT ONE ELECTIVE *(see next page for more options)*	*Elective*	*Wood framing or OVE w/ note*	*A5.404.1 A5.404.1.1 A5.404.1.2*				
		Elective	*Regional materials*	*A5.405.1*				
		Elective	*Bio-based materials*	*A5.405.2*				
		Elective	*Rapidly renewable materials*	*A5.405.2.2*				
		Elective	*Reused materials w/ note*	*A5.405.3*				
		Elective	*Cement and concrete: Cement*	*A5.405.5.1*				
		Elective	*Cement and concrete: Concrete /w SCM & Mix design equation*	*A5.405.5.2 A5.405.5.2.1 A5.405.5.2.1.1*				
		Elective	*Cement and concrete: Additional means of compliance*	*A5.405.5.3 A5.405.5.3.1 A5.405.5.3.1.1 A5.405.5.3.1.2 A5.405.5.3.2 A5.405.5.3.2.1 A5.405.5.3.2.2 A5.405.5.3.2.3 A5.405.5.3.2.4*				

	SELECT ONE ELECTIVE	*Elective*	*Choice of materials*	*A5.406.1 A5.406.1.1 A5.406.1.2 A5.406.1.3*				
		Elective	*Life cycle assessment: General*	*A5.409.1*				
		Elective	*Whole building life cycle assessment*	*A5.409.2 A5.409.2.1 A5.409.2.2*				
		Elective	*Materials and system assemblies*	*A5.409.3*				
		Elective	*Substitution for prescriptive standards*	*A5.409.4*				
		Elective	*Verification of compliance*	*A5.409.5*				
DIVISION 5.5 Environmental Quality		Mandatory	Fireplaces	5.503.1				
		Mandatory	Woodstoves	5.503.1.1				
		Mandatory	Temporary ventilation	5.504.1				
		Mandatory	Covering of ducts openings and protection of mechanical equipment during construction	5.504.3				
		Mandatory	Adhesives, sealants and caulks	5.504.4.1				
		Mandatory	Paints and coatings	5.504.4.3				
		Mandatory	Aerosol paints and coatings	5.504.4.3.1				
		Mandatory	Aerosol paints and coatings: Verification	5.504.4.3.2				
		Mandatory	Carpet systems	5.504.4.4				
		Mandatory	Carpet cushion	5.504.4.4.1				
		Mandatory	Carpet adhesives	5.504.4.4.2				
		Mandatory	Composite wood products	5.504.4.5				
		Mandatory	Composite wood products: Documentation	5.504.4.5.3				
		Mandatory	Resilient flooring systems	5.504.4.6				
		Mandatory	Resilient flooring: Verification of compliance	5.504.4.6.1				
		Tier 1 Prerequisite	*Resilient flooring systems, Tier 1w/ verification*	*A5.504.4.7 A5.504.4.7.2*				
		Tier 1 Prerequisite	*Thermal insulation, Tier 1 w/ verification of compliance*	*A5.504.4.8 A5.504.4.8.2*				
		Mandatory	Filters w/ exceptions	5.504.5.3				
		Mandatory	Filters: Labeling	5.504.5.3.1				
		Mandatory	Environmental tobacco smoke (ETS) control	5.504.7				
		Mandatory	Indoor moisture control	5.505.1				
		Mandatory	Outside air delivery	5.506.1				
		Mandatory	Carbon dioxide (CO_2) monitoring	5.506.2				
		Mandatory	Acoustical control w/ exception	5.507.4				
		Mandatory	Exterior noise transmission, prescriptive method w/ exceptions	5.507.4.1				
		Mandatory	Noise exposure where noise contours are not readily available	5.507.4.1.1				
		Mandatory	Performance method	5.507.4.2				
		Mandatory	Site features	5.507.4.2.1				
		Mandatory	Documentation of compliance	5.507.4.2.2				
		Mandatory	Interior sound transmission w/ note	5.507.4.3				
		Mandatory	Ozone depletion and greenhouse gas reductions	5.508.1				
		Mandatory	Chlorofluorocarbons (CFCs)	5.508.1.1				

		Mandatory	Halons	5.508.1.2				
		Mandatory	Supermarket refrigerant leak reduction for retail food stores 8,000 square feet or more sections 5.508.2 through 5.508.2.6.3	5.508.2 through 5.508.2.6.3				
	SELECT ONE ELECTIVE	*Elective*	*Indoor air quality (IAQ) during construction*	*A5.504.1 A5.504.1.1 A5.504.1.2*				
			IAQ postconstruction	*A5.504.2*				
		Elective	*IAQ testing*	*A5.504.2.1 A5.504.2.1.1 A5.504.2.1.2 A5.504.2.1.3*				
		Elective	*No added formaldehyde Tier 1 w/ notes*	*A5.504.4.5.1*				
		Elective	*Acoustical ceilings and wall panels w/ verification of compliance*	*A5.504.4.9 A5.504.4.9.1*				
		Elective	*Hazardous particulates and chemical pollutants*	*A5.504.5*				
		Elective	*Entryway systems*	*A5.504.5.1*				
		Elective	*Isolation of pollutant sources*	*A5.504.5.2*				
		Elective	*Filters, Tier 1*	*A5.504.5.3.1*				
		Elective	*Lighting and thermal comfort controls*	*A5.507.1 A5.507.1.1 through A5.507.1.2*				
		Elective	*Daylight w/ exception*	*A5.507.2*				
		Elective	*Views w/ exception*	*A5.507.3*				
		Elective	*Interior office spaces*	*A5.507.3.1*				
		Elective	*Multi-occupant spaces*	*A5.507.3.2*				
		Elective	*Hydrochlorofluorocarbons (HCFCs)*	*A5.508.1.3*				
		Elective	*Hydrofluorocarbons (HFCs)*	*A5.508.1.4*				
Additional Measures		*Select 1 additional measure (from any division)*		Add section #				
Total number of Measures require for Tier 1				15				
Total number of Measures selected								

Documentation Author's /Responsible Designer's Declaration Statement

Check the appropriate box(s) for the list below

- **Mandatory:** I attest that the mandatory provisions checklist is accurate and complete.
- **Tier 1compliant:** I attest that the total number of voluntary measures selected meet or exceed the total number required to achieve Tier 1compliance.
- **Partial Tier 1 compliant:** I attest that the total number of voluntary measures selected do not meet the total number required to achieve Tier 1compliance however partial Tier 1 compliance has been achieved.

Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

Cal-Green Verification Guidelines Tier 2 Checklist

STATE OF CALIFORNIA – DEPARTMENT OF GENERAL SERVICES – BUILDING STANDARDS COMMISSION
CALGreen Verification Guidelines – Tier 2 Checklist
BSC CG-201 (Rev. 12/16)

CALGreen VERIFICATION GUIDELINES TIER 2 CHECKLIST

Application: This checklist shall be used for nonresidential projects that meet the following: new construction, or building additions of 1,000 sq. ft. or greater, or building alterations with a permit valuation of $200,000 or more pursuant to *CALGreen* Section 5.301.3, AND are adopting Tier 2 voluntary measures.

Note: All applicable mandatory requirements in chapter 5 shall be met prior to applying Tier 2 voluntary measures.

Instructions:

Comply with all Tier 2 (prerequisite) measures from the various categories shown on the table below.

Add a "Y" to all Mandatory and Tier 2 mandatory provisions in the appropriate columns.

Select the required number of additional electives from those categories shown on the table below and add a "Y" on the selected elective and add an "N" on the rest.

Count the total number of Tier 2 (prerequisite) measures plus the additional electives and write down the total number at the end of the checklist. Determine if the required number of Tier 2 measures have been selected to achieve Tier 2 compliance.

Y = Yes (section has been selected and/or included)
N = No (section has not been selected and/or included)
O = Other (provide explanation)
[N] = New construction pursuant to Section 301.3
[A] = Additions and/or alterations pursuant to Section 301.3

CHAPTER 5 DIVISIONS		SECTION TITLE	CODE SECTION	Y	N	O	Plan sheet, Spec or Attach Reference
DIVISION 5.1 Planning and Design	Mandatory	Storm Water Pollution Prevention w/subsections	5.106.1 through 5.106.1.				
	Mandatory	Short Term Bicycle Parking	5.106.4.1.1				
	Mandatory	Long Term Bicycle Parking	5.106.4.1.2				
	Mandatory	Designated Parking for clean air vehicles	5.106.5.2				
	Tier 2 Prerequisite	*Designated Parking - 12% of Parking Capacity w/ parking stall markings and stall identification*	*A5.106.5.1 A5.106.5.1.2 A5.106.5.1.3 A5.106.5.1.4*				
	Mandatory	Parking stall marking	5.106.5.2.1				
	Mandatory	Single (EV) Charging space requirements	5.106.5.3.1				
	Mandatory	Multiple (EV) Charging space requirements	5.106.5.3.2				
	Tier 2 Prerequisite	*Electric Vehicle (EV) Charging [N] w/ associated electrical panel Identification and designated parking allowance*	*A5.106.5.3 A5.106.5.3.2 A5.106.5.3.3 A5.106.5.3.4*				
	Mandatory	EV charging space calculation [N] w/ exceptions	5.106.5.3.3				
	Mandatory	[N] Identification	5.106.5.3.4				
	Mandatory	[N] Future charging spaces w/ notes 1-3	5.106.5.3.5				
	Mandatory	Light Pollution Reduction [N] w/ exceptions and note	5.106.8				
	Mandatory	Grading and Paving, w/exception for Additions and Alterations not altering the drainage path	5.106.10				
	Tier 2 Prerequisite	*Cool Roof (Table A5.106.11.2.2): SRI 82 when < 2:12, SRI 27 when >2:12*	*A5.106.11.2*				

	SELECT ONE ELECTIVE	*Elective*	*Community Connectivity*	*A5.103.1*				
		Elective	*Brownfield or Greyfield site redevelopment or infill area development.*	*A5.103.2 A5.103.2.1*				
		Elective	*Reduce development footprint and optimize open space.*	*A5.104.1 A5.104.1.1 A5.104.1.2 A5.104.1.3*				
		Elective	*Disassemble and Reuse Existing Building Structure (70%) with exceptions*	*A5.105.1.1*				
		Elective	*Disassemble and Reuse Existing Non-Structure elements (50%) with exceptions*	*A5.105.1.2*				
		Elective	*Salvage*	*A5.105.1.3*				
		Elective	*Storm Water Design*	*A5.106.2 A5.106.2.1 A5.106.2.2*				
		Elective	*Low Impact Development (LID)*	*A5.106.3 A5.106.3.1 A5.106.3.2*				
		Elective	*Changing rooms w/ note*	*A5.106.4.3*				
		Elective	*Parking capacity w/ reduced parking capacity option*	*A5.106.6 A5.106.6.1*				
		Elective	*Exterior wall shading w/ fenestration and/or opaque wall areas option*	*A5.106.7 A5.106.7.1 A5.106.7.2*				
		Elective	*Heat island Effect*	*A5.106.11*				
DIVISION 5.2 Energy Efficiency		Mandatory	Meet the minimum Energy Efficiency Standard	*5.201.1*				
		Tier 2 Prerequisite	Energy Performance Outdoor lighting power 90% of Part 6	A5.203.1.1.1				
		Tier 2 Prerequisite	If applicable, Service for water heating in restaurants 8,000 sf or greater	A5.203.1.1.2				
		Tier 2 Prerequisite	Energy Budget 90% or 85% of Part 6 calculated value of allowance	A5.203.1.2.2				
	SELECT ONE ELECTIVE	Elective	On-site renewable energy w/ documentation	A5.211.1 A5.211.1.1				
		Elective	Green power	A5.211.3				
		Elective	Elevators w/ car lights and fan	A5.212.1.1 A5.212.1.1.1				
		Elective	Escalators w/ controls	A5.212.1.2 A5.212.1.4				
		Elective	Steel framing	A5.213.1				
DIVISION 5.3 Water Efficiency and Conservation		Mandatory	Separate Meters (new Buildings or additions > 50,000 SF that consume more than 100 gal/day)	5.303.1.1				
		Mandatory	Separate Meters (for tenants in new buildings or additions that consume more than 1,000 gal/day)	5.303.1.2				
		Tier 2 Prerequisite	*Water Reduction Tier 2. 20% or 25% savings over the "water use baseline" Table A5.303.2.2*	*A5.303.2.3.2 or A5.303.2.3.3*				
		Mandatory	Water closets shall not exceed 1.28 gallons per flush	5.303.3.1				
		Mandatory	Wall-mounted urinals shall not exceed 0.125 gpf	5.303.3.2.1				
		Mandatory	Floor-mounted urinals shall not exceed 0.5 gpf	5.303.3.2.2				
		Mandatory	Single showerhead shall have maximum flow rate of 2.0 gpm (gallons per minute) at 80 psi	5.303.3.3.1				
		Mandatory	Multiple showerheads serving one shower shall have a combined flow rate of 2.0 gpm at 80 psi	5.303.3.3.2				

	Mandatory	Nonresidential lavatory faucets	5.303.3.4.1				
	Mandatory	Kitchen faucets	5.303.3.4.2				
	Mandatory	Wash basins	5.303.3.4.3				
	Mandatory	Metering faucets	5.303.3.4.4				

	Mandatory	Metering faucets for wash fountains	5.303.3.4.5				
	Mandatory	Food waste disposers w/note	5.303.4.1				
	Mandatory	Areas of additions and alterations	5.303.5				
	Mandatory	Standards for plumbing fixtures and fittings	5.303.6				
	Mandatory	Outdoor water use in landscape areas equal to or greater than 500 square feet	5.304.2				
	Mandatory	Outdoor water use in rehabilitated landscape projects with areas equal to or greater than 2,500 square feet	5.304.3				
	Mandatory	Outdoor water use in landscape areas of 2,500 square feet or less	5.304.4				
	Mandatory	Graywater or rainwater use in landscaped areas	5.304.5				
SELECT 1	*Elective*	*Nonpotable water systems for indoor use*	*A5.303.2.3.4*				
	Elective	*Appliances and fixtures for commercial application*	*A5.303.3*				
		Nonwater supplied urinals	*A5.303.4.1*				
	Elective	*Dual plumbing*	*A5.303.5*				
	Elective	*Outdoor potable water use*	*A5.304.2*				
	Elective	*Restoration of areas disturbed by construction*	*A5.304.6*				
	Elective	*Previously developed sites w/ exception*	*A5.304.7*				
	Elective	*Graywater irrigation system*	*A5.304.8*				
	Elective	*Nonpotable water systems*	*A5.305.1*				
	Elective	*Irrigation systems*	*A5.305.2*				
DIVISION 5.4 Material Conservation and Resource Efficiency	*Tier 2 Prerequisite*	*Recycled content for15% of total material cost*	*A5.405.4 A5.405.4.1 Through A5.405.4.5*				
	Mandatory	Weather Protection	5.407.1				
	Mandatory	Moisture Control: sprinklers	5.407.2.1				
	Mandatory	Moisture Control: Exterior door protection	5.407.2.2.1				
	Mandatory	Moisture Control: Flashing	5.407.2.2.2				
	Mandatory	Construction waste management-comply with either: sections 5.408.1.1, 5.408.1.2, 5.408.1.3 or more stringent local ordinance	5.408.1.1, 5.408.1.2, 5.408.1.3				
	Mandatory	Construction waste management: Documentation w/notes	5.408.1.4				

		Mandatory	Universal waste [A]	5.408.2				
		Mandatory	Excavated soil and land clearing debris w/ exceptions and notes	5.408.3				
		Tier 2 Prerequisite	*Enhanced construction waste reduction 80%- Tier 1 w/ verification*	*A5.408.3.1.1 A5.408.3.1.2*				
		Mandatory	Recycling by Occupants w/ exception	5.410.1				
		Mandatory	Recycling by Occupants: Additions w/ exception	5.410.1.1				
		Mandatory	Recycling by Occupants: Sample ordinance	5.410.1.2				
		Mandatory	Commissioning new buildings (≥ 10,000 SF) [N] w/exceptions and notes	5.410.2				
		Mandatory	Owner's or Owner representative's Project Requirements (OPR) [N]	5.410.2.1				
		Mandatory	Basis of Design (BOD) [N]	5.410.2.2				
		Mandatory	Commissioning Plan [N]	5.410.2.3				
		Mandatory	Functional Performance Testing [N]	5.410.2.4				
		Mandatory	Documentation and Training [N]	5.410.2.5				
		Mandatory	Systems Manual [N]	5.410.2.5.1				
		Mandatory	Systems Operation Training) [N]	5.410.2.5.2				
		Mandatory	Commissioning Report [N]	5.410.2.6				
		Mandatory	Testing and adjusting for new buildings < 10,000 SF or new systems that serve additions or alterations.	5.410.4				
		Mandatory	System Testing Plan for HVAC, Lighting, water heating, renewable energy, landscape irrigation and water reuse.	5.410.4.2				
		Mandatory	Procedures for testing and adjusting	5.410.4.3				
		Mandatory	HVAC balancing	5.410.4.3.1				
		Mandatory	Reporting for testing and adjusting	5.410.4.4				
		Mandatory	Operation and Maintenance (O&M) Manual	5.410.4.5				
		Mandatory	Inspection and reports	5.410.4.5.1				
	SELECT ONE ELECTIVE ***(see next page for more options)***	*Elective*	*Wood framing or OVE w/ note*	*A5.404.1 A5.404.1.1 A5.404.1.2*				
		Elective	*Regional materials*	*A5.405.1*				
		Elective	*Bio-based materials*	*A5.405.2*				
		Elective	*Rapidly renewable materials*	*A5.405.2.2*				
		Elective	*Reused materials w/ note*	*A5.405.3*				
		Elective	*Cement and concrete: Cement*	*A5.405.5.1*				
		Elective	*Cement and concrete: Concrete /w SCM & Mix design equation*	*A5.405.5.2 A5.405.5.2.1 A5.405.5.2.1.1*				
		Elective	*Cement and concrete: Additional means of compliance*	*A5.405.5.3 A5.405.5.3.1 A5.405.5.3.1.1 A5.405.5.3.1.2 A5.405.5.3.2 A5.405.5.3.2.1 A5.405.5.3.2.2 A5.405.5.3.2.3 A5.405.5.3.2.4*				

	SELECT ONE ELECTIVE	*Elective*	*Choice of materials*	*A5.406.1 A5.406.1.1 A5.406.1.2 A5.406.1.3*				
		Elective	*Life cycle assessment: General*	*A5.409.1*				
		Elective	*Whole building life cycle assessment*	*A5.409.2 A5.409.2.1 A5.409.2.2*				
		Elective	*Materials and system assemblies*	*A5.409.3*				
		Elective	*Substitution for prescriptive standards*	*A5.409.4*				
		Elective	*Verification of compliance*	*A5.409.5*				
DIVISION 5.5 Environmental Quality		Mandatory	Fireplaces	5.503.1				
		Mandatory	Woodstoves	5.503.1.1				
		Mandatory	Temporary ventilation	5.504.1				
		Mandatory	Covering of ducts openings and protection of mechanical equipment during construction	5.504.3				
		Mandatory	Adhesives, sealants and caulks	5.504.4.1				
		Mandatory	Paints and coatings	5.504.4.3				
		Mandatory	Aerosol paints and coatings	5.504.4.3.1				
		Mandatory	Aerosol paints and coatings: Verification	5.504.4.3.2				
		Mandatory	Carpet systems	5.504.4.4				
		Mandatory	Carpet cushion	5.504.4.4.1				
		Mandatory	Carpet adhesives	5.504.4.4.2				
		Mandatory	Composite wood products	5.504.4.5				
		Mandatory	Composite wood products: Documentation	5.504.4.5.3				
		Mandatory	Resilient flooring systems	5.504.4.6				
		Mandatory	Resilient flooring: Verification of compliance	5.504.4.6.1				
		Tier 2 Prerequisite	*Resilient flooring systems, Tier 2 w/ verification*	*A5.504.4.7.1 A5.504.4.7.2*				
		Tier 2 Prerequisite	*Thermal insulation, Tier 2 w/ verification of compliance*	*A5.504.4.8.1 A5.504.4.8.2*				
		Mandatory	Filters w/ exceptions	5.504.5.3				
		Mandatory	Filters: Labeling	5.504.5.3.1				
		Mandatory	Environmental tobacco smoke (ETS) control	5.504.7				
		Mandatory	Indoor moisture control	5.505.1				
		Mandatory	Outside air delivery	5.506.1				
		Mandatory	Carbon dioxide (CO2) monitoring	5.506.2				
		Mandatory	Acoustical control w/ exception	5.507.4				
		Mandatory	Exterior noise transmission, prescriptive method w/ exceptions	5.507.4.1				
		Mandatory	Noise exposure where noise contours are not readily available	5.507.4.1.1				
		Mandatory	Performance method	5.507.4.2				
		Mandatory	Site features	5.507.4.2.1				
		Mandatory	Documentation of compliance	5.507.4.2.2				
		Mandatory	Interior sound transmission w/ note	5.507.4.3				
		Mandatory	Ozone depletion and greenhouse gas reductions	5.508.1				
		Mandatory	Chlorofluorocarbons (CFCs)	5.508.1.1				

		Mandatory	Halons	5.508.1.2				
		Mandatory	Supermarket refrigerant leak reduction for retail food stores 8,000 square feet or more sections 5.508.2 through 5.508.2.6.3	5.508.2 through 5.508.2.6.3				
	SELECT ONE ELECTIVE	*Elective*	*Indoor air quality (IAQ) during construction*	*A5.504.1 A5.504.1.1 A5.504.1.2*				
			IAQ postconstruction	*A5.504.2*				
		Elective	*IAQ testing*	*A5.504.2.1 A5.504.2.1.1 A5.504.2.1.2 A5.504.2.1.3*				
		Elective	*No added formaldehyde Tier 1 w/ notes*	*A5.504.4.5.1*				
		Elective	*Acoustical ceilings and wall panels w/ verification of compliance*	*A5.504.4.9 A5.504.4.9.1*				
		Elective	*Hazardous particulates and chemical pollutants*	*A5.504.5*				
		Elective	*Entryway systems*	*A5.504.5.1*				
		Elective	*Isolation of pollutant sources*	*A5.504.5.2*				
		Elective	*Filters, Tier 1*	*A5.504.5.3.1*				
		Elective	*Lighting and thermal comfort controls*	*A5.507.1 A5.507.1.1 through A5.507.1.2*				
		Elective	*Daylight w/ exception*	*A5.507.2*				
		Elective	*Views w/ exception*	*A5.507.3*				
		Elective	*Interior office spaces*	*A5.507.3.1*				
		Elective	*Multi-occupant spaces*	*A5.507.3.2*				
		Elective	*Hydrochlorofluorocarbons (HCFCs)*	*A5.508.1.3*				
		Elective	*Hydrofluorocarbons (HFCs)*	*A5.508.1.4*				
Additional Measures			*Select 1 additional measure (from any division)*	Add section #				
Total number of Measures require for Tier 1				15				
Total number of Measures selected								

Documentation Author's /Responsible Designer's Declaration Statement

Check the appropriate box(s) for the list below

- **Mandatory:** I attest that the mandatory provisions checklist is accurate and complete.
- **Tier 1compliant:** I attest that the total number of voluntary measures selected meet or exceed the total number required to achieve Tier 1compliance.
- **Partial Tier 1 compliant:** I attest that the total number of voluntary measures selected do not meet the total number required to achieve Tier 1compliance however partial Tier 1 compliance has been achieved.

Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

Outdoor Lighting Certification of Compliance NRCC-LTO-01-E

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 1 of 4)
Project Name:	Date Prepared:

A. General Information				
Project Address:				Total Illuminated Hardscape Area:
Phase of Construction:	☐ New Construction	☐ Addition	☐ Alteration	
Outdoor Lighting Zone (LZ)	☐ LZ-1	☐ LZ-2	☐ LZ-3	☐ LZ-4
I have confirmed with the AHJ which LZ applies to this site. For default lighting zone designations, see Title 24 Part 6, §10-114				

B. Lighting Compliance Documents (check box for each document included)		
For detailed instructions on the use of this and all Energy Efficiency Standards compliance documents, refer to the Nonresidential Manual published by the California Energy Commission.		
☐	NRCC-LTO-01-E	Certificate of Compliance
☐	NRCC-LTO-02-E	Outdoor Lighting Controls Certificate of Compliance
☐	NRCC-LTO-03-E	Outdoor Lighting Power Allowance Certificate of Compliance
☐	NRCC-LTO-04-E	Outdoor Lighting Existing Conditions Certificate of Compliance

C. Summary of Allowed Outdoor Lighting Power		Watts
01	**Sum Total ALLOWED** Outdoor Lighting Wattage from NRCC-LTO-03-E, page 1 Alterations with NO increase of connected lighting load may instead use the allowed wattage from NRCC-LTO-04, page 2.	
	Complies ONLY if **Installed** (Box 02) ≤ **Allowed** (Box 01)	
02	**Sum Total INSTALLED** Outdoor Lighting Wattage from NRCC-LTO-01-E, page 3.	

D. Declaration of Required Installation Certificates Declare by checking all Installation Certificates that will be submitted. (Retain copies and verify compliance documents are completed and signed.)	
☐ NRCI-LTO-01-E - Must be submitted for all buildings	☐ Field Inspector
☐ NRCI-LTO-02-E - Must be submitted for a lighting control system, or for an Energy Management Control System (EMCS), to be recognized for compliance.	☐ Field Inspector

E. Declaration of Required Certificates of Acceptance Declare by checking all of the Certificates of Acceptance that will be submitted. (Retain copies and verify compliance documents are completed and signed.)	
☐ NRCA-LTO-02-A - Must be submitted for outdoor lighting controls.	☐ Field Inspector

F. Schedule of Luminaires Exempt from the Outdoor Lighting Power Requirements in §140.7	
01	02
Name or Symbol	Description of exempt luminaire in accordance with the exemptions

CA Building Energy Efficiency Standards - 2016 Nonresidential Compliance April 2016

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 04/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 2 of 4)
Project Name:	Date Prepared:

G. Schedule of Luminaires Exempt from the Cutoff Requirements in §130.2(b)	
01	02
Name or Symbol	Description of exempt luminaire in accordance with the exemptions

H. Schedule of Luminaires Exempt from the Outdoor Lighting Control Requirements in §130.2(c)	
01	02
Name or Symbol	Description of exempt luminaire in accordance with the exemptions

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 04/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 3 of 4)
Project Name:	Date Prepared:

I. Outdoor Lighting Schedule and Field Inspection Energy Checklist

Luminaire Schedule		Installed Watts				Location	Cutoff	Field Inspector	
01	02	03	04		05	06	07	08	09	
Name or Item Tag	Complete Luminaire Description	Watts per Luminaire	How wattage was determined: CEC Default from NA8	How wattage was determined: According to §130.0(c)	Number of Luminaires	Total installed Watts in this area (03 x 05)	Primary Function area in which these luminaires are installed (Outdoor Lighting Zone)	BUG Rating	Pass	Fail
			☐	☐		0		UH: UL: FVH: BVH: FH: BH:	○	○
			☐	☐		0		UH: UL: FVH: BVH: FH: BH:	○	○
			☐	☐		0		UH: UL: FVH: BVH: FH: BH:	○	○
					INSTALLED WATTS PAGE TOTAL:	0	Enter sum total of all pages (**Sum Total INSTALLED** Outdoor lighting wattage) into NRCC-LTO-01-E; Page 1			

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 04/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 4 of 4)
Project Name:	Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA Certification Identification (if applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
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Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

Outdoor Lighting Controls Certification of Compliance NRCC-LTO-02-E

STATE OF CALIFORNIA
OUTDOOR LIGHTING CONTROLS
CEC-NRCC-LTO-02-E (Revised 08/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-02-E
Outdoor Lighting Controls	(Page 1 of 3)
Project Name:	Date Prepared:

A. Mandatory Outdoor Lighting Control Declaration Statements

Check all that apply:

- ☐ Lighting shall be controlled by self-contained lighting control devices which are certified to the Energy Commission according to the Title 20 Appliance Efficiency Regulations in accordance with §110.9(a).
- ☐ Lighting shall be controlled by a lighting control system or energy management control system in accordance with §110.9. An Installation Certificate shall be submitted in accordance with §130.4(b).
- ☐ All lighting controls and equipment shall comply with the applicable requirements in §110.9 and shall be installed in accordance with the manufacturer's instructions in accordance with §130.0(d).
- ☐ Part-Night Outdoor Lighting Controls, as defined in Section 100.1(b), shall meet the requirements in Section 110.9(b)5.
- ☐ All outdoor incandescent luminaires rated over 100 watts, determined in accordance with Section 130.0(c), shall be controlled by a motion sensor.
- ☐ All outdoor luminaires rated for use with lamps greater than 150 lamp watts, determined in accordance with Section 130.0(c), shall comply with Uplight and Glare requirements in accordance with Section 130.2(b)
- ☐ All installed outdoor lighting shall be controlled by a photocontrol or outdoor astronomical time-switch control, or other control capable of automatically switching OFF in accordance with Section 130.2(c)1.
- ☐ All installed outdoor lighting shall be circuited and independently controlled from other electrical loads by an automatic scheduling control in accordance with Section 130.2(c)2.
- ☐ All installed outdoor lighting, where the bottom of the luminaire is mounted 24 feet or less above the ground, shall be controlled with automatic lighting controls in accordance with Section 130.2(c)3.
- ☐ For Outdoor Sales Frontage, an automatic lighting control shall be installed in accordance with Section 130.2(c)4.
- ☐ For Building Facade, Ornamental Hardscape and Outdoor Dining lighting, an automatic lighting control shall be installed in accordance with Section 130.2(c)5
- ☐ Before an occupancy permit is granted for the newly constructed building or for the addition, or for any altered outdoor lighting controls, shall be certified as meeting the Acceptance Requirements for Code Compliance in accordance with §130.4.(a). Outdoor lighting controls shall comply with the applicable requirements of Section 130.2(c) and Reference Nonresidential Appendix NA7.8.

CA Building Energy Efficiency Standards - 2016 Nonresidential Compliance August 2016

STATE OF CALIFORNIA
OUTDOOR LIGHTING CONTROLS
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CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-02-E
Outdoor Lighting Controls	(Page 2 of 3)
Project Name:	Date Prepared:

B. Mandatory Outdoor Lighting Control Schedule and Field Inspection Checklist

Outdoor Lighting Control Schedule			Standards Complying With (✓ all that apply, or leave empty if Exempted)						✓ if Acceptance Test Required	Field Inspector	
01	02	03	04	05	06	07	08	09	10	11	
Location and Application of Luminaires Being Controlled	Type/ Description of Lighting Control (i.e. outdoor motion sensor, outdoor photocontrol, outdoor astronomical time-switch control, automatic scheduling control, part-night outdoor lighting control)	# of Units	§130.2(a)	§130.2(c)1	§130.2(c)2	§130.2(c)3	§130.2(c)4	§130.2(c)5		Pass	Fail
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○
									☐	○	○

STATE OF CALIFORNIA
OUTDOOR LIGHTING CONTROLS
CEC-NRCC-LTO-02-E (Revised 08/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-02-E
Outdoor Lighting Controls	(Page 3 of 3)
Project Name:	Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA Certification Identification (if applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
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Responsible Designer Name:	Responsible Designer Signature:
Company:	Date Signed:
Address:	License:
City/State/Zip:	Phone:

Outdoor Lighting Power Allowance Certificate of Compliance NRCC-LTO-03-E

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 01/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 1 of 4)
Project Name:	Date Prepared:

A. OUTDOOR LIGHTING POWER ALLOWANCE SUMMARY

1. General Hardscape Lighting Power Allowance (Site Total from Section B of NRCC-LTO-03-E)	1.	0
2. Additional Specific "use it or lose it" Lighting Power Allowances listed in each of these cells shall be identical to total allowed watts determined in Section C-1 to C-4 of NRCC-LTO-03-E.		

PER APPLICATION from Section C-1		PER UNIT LENGTH (SALES FRONTAGE) from Section C-2		PER HARDSCAPE AREA (ORNAMENTAL LIGHTING) from Section C-3		PER SPECIFIC AREA from Section C-4.			
0	+	0	+	0	+	0	=	2.	0
3. **Sum Total ALLOWED** Outdoor Lighting Wattage (add rows 1 and 2)								3.	0

B. GENERAL HARDSCAPE LIGHTING POWER ALLOWANCE FROM TABLE 140.7-A

Area Wattage Allowance (AWA)				Linear Wattage Allowance (LWA)			Initial Wattage Allowance (IWA)	Total General Hardscape Lighting Allowance
01	02	03	04	05	06	07	08	09
Name of Area	Illuminated Hardscape Area	AWA Per Square Foot	AWA (B02 x B03)	Perimeter Length of General Hardscape	LPA per Linear Foot	LWA (B05 x B06)	IWA (Watts)	B04 + B07 + B08
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0		0
			0			0	TOTAL	0

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 2 of 4)
Project Name:	Date Prepared:

C. ADDITIONAL "USE IT OR LOSE IT" OUTDOOR LIGHTING POWER ALLOWANCES FOR SPECIFIC APPLICATIONS

☐ The additional specific outdoor lighting power allowance shall be the smaller of the allowed lighting power or the actual lighting power used.

☐ Use Outdoor Lighting Zone (OLZ) that is documented on page 1 of NRCC-LTO-01-E to calculate the specific wattage allowances.

C-1. WATTAGE ALLOWANCE PER APPLICATION – Table 140.7-B

☐ Available only for qualifying locations, which include Building Entrances or Exits; Primary Entrances to Senior Care Facilities, Police Stations, Hospitals, Fire Stations, and Emergency Vehicle Facilities; Drive Up Windows; Vehicle Service Station Uncovered Fuel Dispenser, ATM Machine Lighting

☐ If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS			DESIGN WATTS					
Name of Location for Which Allowance is Claimed	Number of Qualifying Locations	Wattage Allowance per Qualifying Location	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
			0					0	
			0					0	
			0					0	
			0					0	
							Sum total allowance per application on this site:		0

C-2. WATTAGE ALLOWANCE PER UNIT LENGTH (Sales Frontage) from Table 140.7-B

☐ If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS			DESIGN WATTS					
Name of Location for Which Allowance is Claimed	Linear Feet of Sales Frontage	Wattage Allowance per Linear Foot	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
			0					0	
			0					0	
			0					0	
			0					0	
							Sum total allowance for sales frontage on the site:.		0

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 01/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 3 of 4)
Project Name:	Date Prepared:

C-3. WATTAGE ALLOWANCE PER SQUARE FOOT OF HARDSCAPE AREA (Ornamental Lighting) – Table 140.7-B

- Allowance for the total site illuminated hardscape area. Luminaires qualifying for this allowance shall be rated for 100 watts or less as determined in accordance with Section 130.0(c), and shall be post-top luminaires, lanterns, pendant luminaires, or chandeliers.
- If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS			DESIGN WATTS					
Name of area for which ornamental allowance is claimed	Square Feet of Hardscape	Wattage Allowance per Square Foot	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
			0					0	
			0					0	
			0					0	
			0					0	
								Sum total allowance for ornamental lighting on the site:.	0

C-4. WATTAGE ALLOWANCE PER SQUARE FOOT OF SPECIFIC AREA - Table 140.7-B

- Allowances for Building Facades; Outdoor Sales Lots; Vehicle Service Station Hardscape; Vehicle Service Station Canopies; Sales Canopies; Non-sales Canopies; Tunnels; Guard Stations; Student Pick-up/Drop-off zone: Outdoor Dining; Special Security Lighting for Retail Parking and Pedestrian Hardscape.
- If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS			DESIGN WATTS					
Name of Location for Which Allowance is Claimed	Illuminated Area of Application	Wattage Allowance per Square Foot	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
			0					0	
			0					0	
			0					0	
			0					0	
								Sum total allowance for specific area on the site:	0

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 4 of 4)
Project Name:	Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA Certification Identification (if applicable):
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Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

Outdoor Lighting Existing Conditions Certificate of Compliance NRCC-LTO-04-E

STATE OF CALIFORNIA
OUTDOOR LIGHTING EXISTING CONDITIONS
CEC-NRCC-LTO-04-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-04-E
Outdoor Lighting Existing Conditions	(Page 1 of 3)
Project Name:	Date Prepared:

A. General Information

Project Address:

1. Sum total of original, existing luminaires in the hardscape area =		2. Sum total of luminaires being added or altered =		3. Percentage of existing luminaires being altered ((Box 2 / Box 1) x 100%) =	

Note(s):
If the alteration increases the total connected lighting load, STOP. Projects that increase the connected lighting load must use 2016-NRCC-LTO-03 to determine the lighting power allowance, and do NOT use this form.

If the total number of added or altered luminaires is less than five (5), or less than 10% of the existing luminaires, STOP. Outdoor lighting projects modifying less than five luminaires, or less than 10% of the existing luminaires, do not require compliance documentation (NRCC-LTO compliance documents) provided that they do not increase the total connected load.

STATE OF CALIFORNIA
OUTDOOR LIGHTING EXISTING CONDITIONS
CEC-NRCC-LTO-04-E (Revised 04/16)
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-04-E
Outdoor Lighting Existing Conditions	(Page 2 of 3)
Project Name:	Date Prepared:

B. Existing Luminaire Schedule

Name of the space with the alteration:

01	02	03	04		05	06
		Wattage per Luminaire	How Wattage was Determined		Quantity of Luminaires	Total Wattage (Quantity x Wattage per Luminaire) (Cell 03 x Cell 05)
Name or Item Tag	Luminaire Description		CEC default from NA8	According to §130.0(c)		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
					Total Installed Watts:	0

Allowed Lighting Power

If the percentage of existing luminaires being altered (from Box 3, page 1) is less than 50%, then enter the Total Installed Watts in the box to the right.

If the percentage of existing luminaires being altered is 50% or more,
multiply the Total Installed Watts by a multiplier of 0.60 and enter the adjusted value in the box to the right.

Watts

Enter this value in compliance document NRCC-LTO-01-E, Table C, cell 01 (Allowed Outdoor Lighting Wattage). Alternatively, NRCC-LTO-03-E can be used to determine the Allowed Outdoor Lighting Wattage based on the square footage of each hardscape area and the specific application of the lighting.

STATE OF CALIFORNIA

OUTDOOR LIGHTING EXISTING CONDITIONS

CEC-NRCC-LTO-04-E (Revised 04/16)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-04-E
Outdoor Lighting Existing Conditions	(Page 3 of 3)
Project Name:	Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
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Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
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Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

Determining Outdoor Lighting Zone

10-114 – DETERMINATION OF OUTDOOR LIGHTING ZONES AND ADMINISTRATIVE RULES FOR USE

This section establishes rules for implementing outdoor lighting zones to show compliance with Section 140.7 of Title 24, California Code of Regulations, Part 6.

(a) **Lighting Zones.** Exterior lighting allowances in California vary by Lighting Zones (LZ).

(b) **Lighting Zone Characteristics.** TABLE 10-114-A specifies the relative ambient illumination level and the statewide default location for each lighting zone.

(c) **Amending the Lighting Zone Designation.** A local jurisdiction may officially adopt changes to the lighting zone designation of an area by following a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction may determine areas where Lighting Zone 4 is applicable and may increase or decrease the lighting zones for areas that are in State Default Lighting Zones 1, 2 and 3, as specified in TABLE 10-114-A.

(d) **Commission Notification, Amended Outdoor Lighting Zone Designation.** Local jurisdictions who adopt changes to the State Default Lighting Zones shall notify the Commission by providing the following materials to the Executive Director:

1. A detailed specification of the boundaries of the adopted Lighting Zones, consisting of the county name, the city name if any, the zip code(s) of the re designated areas, and a description of the physical boundaries within each zip code;
2. A description of the public process that was conducted in adopting the Lighting Zone changes; and
3. An explanation of how the adopted Lighting Zone changes are consistent with the specifications of Section 10-114.

(e) The Commission shall have the authority to not allow Lighting Zone changes which the Commission finds to be inconsistent with the specifications of Section 10-114.

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

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

California State University Campuses