



BOARD OF COUNTY COMMISSIONERS WORKSHOP AGENDA DOCUMENTATION

PREPARATION DATE: June 23, 2016

WORKSHOP DATE: June 27, 2016

SUBMITTING DEPARTMENT: Long-Range Planning

DEPARTMENT DIRECTOR: Tyler Sinclair

PRESENTER: Regan Kohlhardt

SUBJECT: Exterior Lighting Standards

PURPOSE

Samuel Singer, Executive Director of Wyoming Stargazing has proposed an amendment to reduce light pollution in the Jackson/Teton County community and to improve the nighttime natural environment. The purpose of this workshop is to introduce the Board of County Commissioners to Wyoming Stargazing's proposed changes to the existing exterior lighting standards (Section 5.3.1. of the LDRs) and invite any initial feedback or questions in preparation for upcoming review hearings. Key topics for consideration by Board include:

- 1) **Alignment with Comprehensive Plan**
- 2) **Current Standard compared to New Standard**

BACKGROUND

Wyoming Stargazing is a nonprofit, educational organization that facilitates public and private stargazing programs throughout the community. The organization is running a 'Save Our Night Skies' campaign to reduce light pollution in the community. Amending current Land Development Regulations (LDRs) regarding exterior lighting is part of this campaign. Wyoming Stargazing's amendment aims to improve upon existing exterior lighting standards as outlined in Section 5.3.1. of the LDRs through the use of new language that is more precise and easily interpreted by landowners and through the incorporation of new standards that comply with the International Dark Sky Association best practices that promote dark skies.

Mr. Singer, on behalf of Wyoming Stargazing, first brought the issue of light pollution to the attention of Town Council and the Board of County Commissioners at the July 2015 JIM. He was invited at that time to pursue an LDR Amendment, which he submitted in January 2016. The amendment will affect both Town and County exterior lighting standards.

The attached amendment is a *revised draft* of what Wyoming Stargazing originally submitted. The revised draft reflects changes suggested by Staff and by the Planning Review Committee and that Wyoming Stargazing has agreed to incorporate into the amendment. Importantly, Wyoming Stargazing originally proposed changes to exterior lighting standards on private property, public property, and in the public

right-of-way (specifically street lights). Staff recommended dividing the amendment into two parts – Part 1 being an amendment that addresses exterior lighting on private and public property and Part 2 being a separate amendment that addresses exterior lighting in the public right-of-way.

The separation of the amendment into two parts will allow Staff to more carefully consider, at a later date, the safety implications associated with exterior lighting standards in the public right-of-way. In the future, staff intends to incorporate exterior lighting standards for the public right-of-way into our Community Streets Plan as well as the LDRs, thereby ensuring the use of lighting that is appropriate for the varying types of right-of-way (main thoroughfare, side street, bike path, etc). However, this first amendment does not apply in the public right-of-way.

While on the topic of public safety implications, it is worth noting that this first amendment in no way requires the complete extinguishment of all lights after dark. Lighting at night is always permitted, and exceptions to the standards in this amendment are made where appropriate for public safety and for building code requirements. The overall intention of the amendment is to maintain public safety as paramount.

KEY TOPICS AND DISCUSSION

1) Alignment with Comprehensive Plan

Wyoming Stargazing’s intentions to update and improve our exterior lighting standards are in line with a specific policy and a strategy set forth in the Comprehensive Plan to maintain dark skies:

Policy 1.3.d: Maintain dark night skies

The prominence of nature over the built environment should extend beyond daytime viewsheds. Lighting of individual developments cumulatively impacts the ability to see dark and starry night skies. Although lighting is required for public safety, especially along pedestrian corridors, non-essential lighting will be limited and all lighting will be designed to meet dark skies best practices. Existing development will also be encouraged to implement best practices.

Strategy 1.3.S.2: Evaluate and amend lighting standards based on dark skies best practices.

Aligning our exterior lighting standards to dark skies best practices has been outlined as a community goal. Wyoming Stargazing has worked closely with the International Dark Sky Association (IDA) to draft an exterior lighting standard that incorporates best practices for exterior lighting. The IDA, founded in 1988, is a non-profit organization widely considered a leading authority on night sky protection. Many communities such as Flagstaff, AZ and Boulder, CO have worked with the IDA to establish local regulations to reduce light pollution in consideration of the environmental benefits, health benefits, and community character benefits associated with dark skies. Some communities, Flagstaff for example, have gone so far as to become a Certified IDA International Dark Sky Community, a designation granted by the IDA to communities that show exceptional dedication to the implementation of an exterior lighting standard that preserves dark skies. Adoption of this first amendment by the Town of Jackson and the Board of County Commissioners could be a step towards qualifying the Town of Jackson and Teton County for consideration as an International Dark Sky Community.

2) Current Standard Compared to New Standard

Current Exterior Lighting Standard:

Criticism of the current regulations includes the following:

- The definition of a fully shielded light fixture, an important preventative measure for reducing light pollution, is cryptic and needs clarification.
- The current Standard uses ‘footcandles’ as a measurement of illumination. In practice, footcandles have been difficult for both property owners and Staff to measure.
- The current regulations do not protect our dark skies, described as being “vital” to our community character in the Jackson/Teton County Comprehensive Plan, because the current regulations do not limit the total amount of illumination permitted on a property. The end result is that the exterior lighting in the Jackson/Teton Community is contributing to sky glow and nighttime light pollution. The images below show the skyglow produced by developed areas within the valley.



Photo courtesy of Mike Cavaroc, Free Roaming Photography



Photo courtesy of Mike Cavaroc, Free Roaming Photography



Photo courtesy of Mike Cavaroc, Free Roaming Photography

Comparison of Current Standard and Proposed Amendment:

The important similarities, differences, and expected impacts of changing the current regulations are outlined in the charts below.

Similarities:

Important Similarities
Both require shielding of light fixtures and limit light emitted to 90 degrees or to a horizontal plane.
Both prohibit light trespass on adjacent properties.
Both prohibit flickering/flashing lights, searchlights, & strings of lights (with an exemption for holiday lighting). It should be noted that the proposed amendment shortens the time period from November through April to November through January.
Maximum heights of 15 feet for residential and 18 feet for nonresidential.

Differences:

Submittal Requirements

The current standard does not have submittal requirements, which has made it difficult for Staff to understand what kind of lighting design is being implemented and to enforce the existing standards.

Current	Proposed	Community Impacts
None specified.	Requires lighting plans for all applications that include the installation of exterior lighting. Lighting plans must demonstrate conformance with standards.	Improved application of the regulations and easier navigation of standards by both Staff and the public.

Measurement

How light is measured makes a difference in compliance with exterior lighting standards by making it easier for property owners to understand the standard. The new standard proposes changing measurements from footcandles to lumens as shown in the chart below. A footcandle is a measurement of how well lit a surface is. A lumen, is a measurement of light output.

Current	Proposed	Community Impacts
Measures maximum permitted illumination in footcandles, which is difficult to measure.	Measures maximum permitted illumination in lumens, a measurement commonly found on lighting packaging.	Improves ability of average resident to comply with standards. Improves County's ability to enforce standards.

The use of footcandles to measure and restrict exterior lighting has proved problematic for several reasons. An accurate measurement of footcandles requires a light meter, and thus property owners have to hire a lighting professional or purchase a light meter to help them understand if they are compliant or not. On the enforcement side, the need for a light meter also presents difficulties in that it requires staff training. Light meter measurements can also be easily skewed by other ambient lighting in the vicinity.

Lumens on the other hand, are indicated on lighting packaging. The change from footcandles to lumens is therefore meant to simplify interpretation of the regulations for both property owners and Staff.

Maximum Illumination

Current regulations do not limit the maximum illumination allowed per acre or per site, and thus do not prevent situations where multiple lights – all of which could be compliant with current regulations – contribute to light pollution on a property. As the current regulations are written, property owners can have as many lights and as much illumination as they want on their property as long as the light does not trespass onto adjacent properties.

Maximum Illumination					
	Current	Proposed			
	No limit to total light allowed on property.	<i>Per light</i>	<i>Per Acre of Site Development</i>	<i>Per Site</i>	
R, S, NC, NC-2, RB, AR, BC			Not applicable	No limit	5,000 lumen for properties 1 acre or less. 10,000 lumen for properties greater than 1 acre.
Nonresidential			20,000 lumen	50,000 lumen	250,000 lumen
Community Impact: Prevents situations where multiple lights on a property will contribute inordinately to light pollution. Reduces overall max illumination permitted.					

For context, a single luminaire that produces 20,000 lumens illuminating one square meter can be compared to light on a typical overcast day at midday. To use other examples, a typical stadium light like those at the County Fairgrounds emits about 20,000 lumens. Typical parking lot lights might range from 900 lumens to 15,000 lumens.

A standard 60 watt non-halogen bulb produces approximately 800 lumens. Under the proposed standard, residential properties one acre or less could have six 60 watt exterior lights. Properties greater than one acre could have the equivalent of 12 60 watt exterior lights.

Under the new regulations, a one acre nonresidential property would be allowed 63 60 watt exterior lights.

Limits to maximum illumination are modelled after the City of Flagstaff’s Outdoor Lighting Standards.

Light Color

Correlated color temperature and color rendering index play a significant role in the ability of both humans and animals to see at night. Correlated color temperature measures the ‘warmth’ or the ‘coolness’ of a light. Color rendering index indicates the accuracy of an object’s coloring when illuminated by a light. Color temperature and color accuracy outside of the ranges specified in the proposed amendment

contribute to glare (oncoming bright headlights are the classic example of high correlated color temperature producing glare), distorted color, and disrupted circadian rhythms of people and animals alike. Both correlated color temperature and color rendering are generally indicated on light packaging. Current regulations do not address light color.

Current	Proposed	Community Impacts
No standard.	Restricts correlated color temperature to under 3000 Kelvin and Color rendering index to over 65.	Reduces nighttime glare and night blindness.

Adaptive Controls and Lighting Reduction

The existing standard has no requirements for adaptive controls or lighting reduction. In the proposed amendment, these two requirements work together to conserve energy and require reduction in nighttime lighting levels. Property owners may choose the kind of adaptive control they use for their lighting in order to meet regulations for extinguishing lighting during the day. The use of such adaptive controls will then assist them in meeting the lighting reduction requirement of 30% at night.

Current	Proposed	Community Impacts
No adaptive controls required.	Requires adaptive controls to extinguish exterior lights during the day.	Conserves energy and promotes extinguishing lights when an area is not being utilized. May be considered burdensome for landowners.
No lighting reductions required.	Establishes a lighting reduction curfew of 12:00 am at which time lights must be reduced by 30% or extinguished.	Reduces unnecessary nighttime illumination. This will especially impact businesses that operate 24 hours a day, specifically gas stations who use lighting to attract customers.

Complex Uses

The current standard generally exempts complex uses such as outdoor recreation facilities, construction sites, or industrial sites from the exterior lighting standards. The proposed amendment provides flexible standards while still limiting the overall light pollution that can be produced by these types of uses.

Current	Proposed	Community Impacts
Exempts outdoor recreation so long as luminaires are shielded and as long as they do not exceed a post height of 40 feet.	Provides more comprehensive standards for complex uses. These standards include establishing an overall limit to the total illumination at these sites, establishing a 10:00 pm or end-of-operations curfew, maximum post height of 40 feet, requiring shielding of lights, and prohibiting light trespass.	Regulates uses that were formerly considered exempt from exterior lighting standards, reduces light nuisance from complex uses, and achieves overall reduction in nighttime light levels.

Planning Review Committee

The application has been reviewed by the following individuals:

- Tyler Sinclair, Planning Director
- Alex Norton, Long-Range Planner, Town/County Planning Department
- Brian Schilling, Pathways Coordinator, Jackson Hole Community Pathways
- Steve Haines, Building Official, Town of Jackson
- Larry Pardee, Public Works
- Jeremy Parker, Public Works
- Todd Smith, Town of Jackson Police
- Steve Ashworth, Parks and Recreation
- Erin Weisman, County Deputy Attorney
- Jim Whalen, Teton County Sherriff

Extensive comments and modifications were communicated verbally by the Town and County Building Departments, Public Works, and the Police to Staff. These suggestions have been incorporated into the current amendment draft. Brief written comment was provided by Todd Smith, Chief of Police and is quoted below.

“In reading this, I wonder who and how the TOJ decides what lighting is for safety? Lighting prevents crime, which is closely tied to safety and would appear to be difficult in defining who needs to be safe vs. who does not.”

[ATTACHMENTS](#)

Proposed Amendment as modified in response to review.

[RECOMMENDATION](#)

The purpose of this Workshop is to invite any feedback or questions from the Board prior to hearings on the Exterior Lighting Standard Amendment.

[SUGGESTED MOTIONS](#)

No motion necessary, the amendment was proposed by a member of the public and will come before the Board of County Commissioners pursuant to Section 8.7.1 of the LDRs, this workshop is an opportunity to introduce the proposal to the Board.

Proposed Amendments to LDR 5.3.1. Exterior Lighting Standard

5.3.1. EXTERIOR LIGHTING STANDARD

The purpose of this standard is to allow necessary and reasonable lighting of public and private property for the safety and convenience of occupants and the general public, while eliminating or reducing the nuisance and hazards of light pollution, including, but not limited to: glare, light trespass, sky glow, energy waste, and negative impacts on the nocturnal environment.

- A. Applicability. All exterior lighting, unless exempted below, shall comply with the regulations set forth in this Section. This includes, but is not limited to: lighting attached to structures, poles, the earth, or any other location, including lighting installed by any third party.

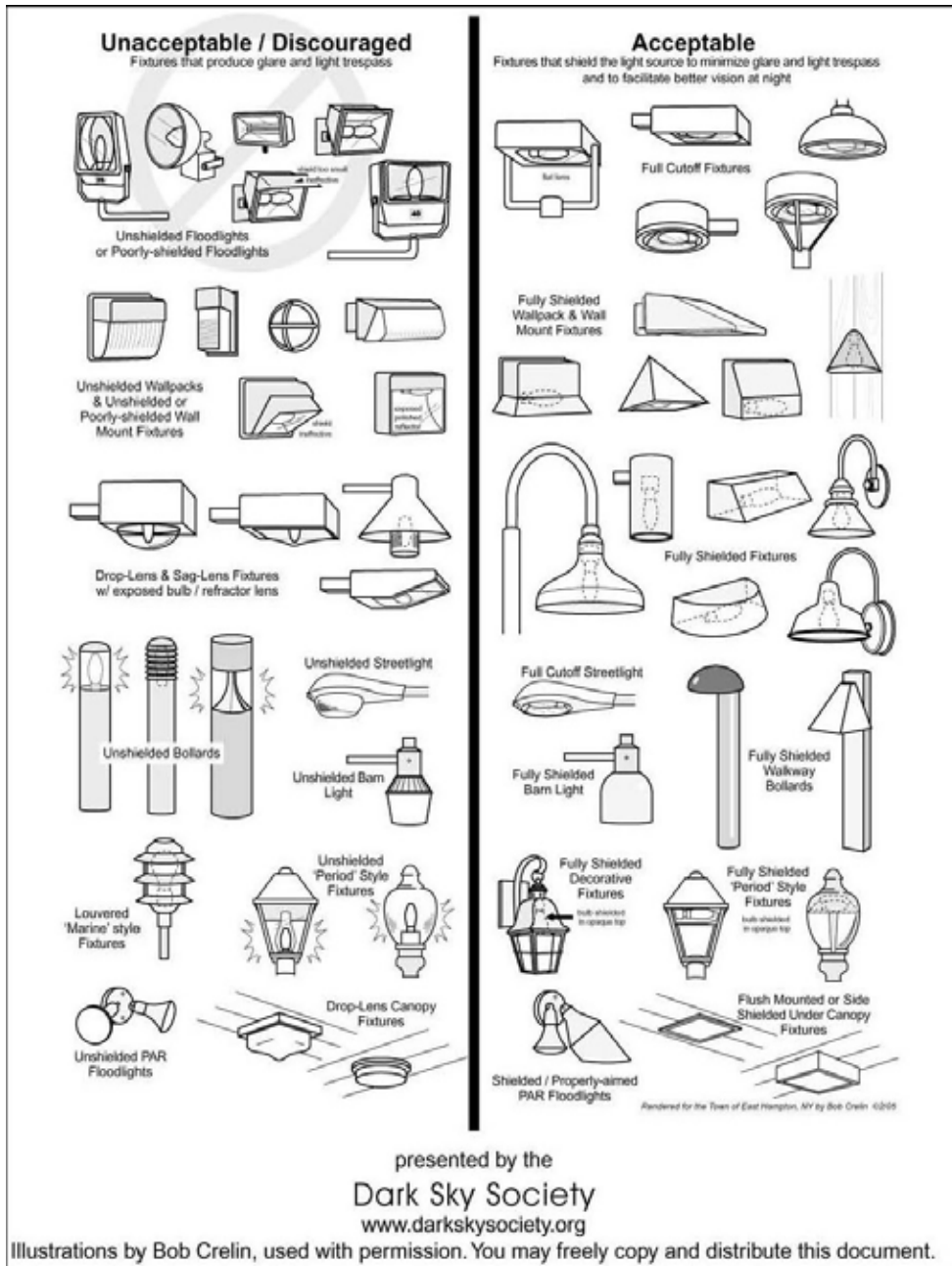
1. Exempt Lighting

- a. Lighting in the public right of way.
- b. Open flame gas lamps.
- c. Flagpole lighting that is directed downward from the top of the flagpole.
- d. Underwater lighting in swimming pools and other water features
- e. Lighting that is only used by emergency response personnel
- f. Lighting solely for signs (lighting for signs is regulated by Div. 5.6)
- g. Lighting used solely for agricultural purposes.

- B. Submittals. All applications that include the installation of exterior lighting shall include lighting plans demonstrating conformance with this Section. Lighting plans shall indicate:
1. The location and height of all light fixtures
 2. Compliance with Sec. 5.3.1.C.4. prohibiting light trespass offsite. This can be demonstrated through submittal of one of the following:
 - a. A picture taken post-installation of the light fixture(s) showing zero illumination from the fixture at the property line, or
 - b. A sketch of the expected path of the light as determined by the cutoff angle of light as it is emitted from the light fixture, or
 - c. A photometric distribution map produced by a lighting professional showing no illumination at the property line
 3. Lumens of each luminaire and the total lumens on the site
 4. A description of the luminaires and any adaptive controls to be used to comply with Sec. C.6 and C.7. The description may include catalogue illustrations from the manufacturer.
 5. Correlated Color Temperature and Color Rendering Index of lights as indicated on the light packaging

C. Standards.

1. Fully Shielded Light Fixtures. Any light source whose initial output exceeds 1,500 lumens shall be fully shielded. Any structural part of the luminaire providing full shielding shall be permanently attached. Fixtures shall be mounted such that no light is emitted above the horizontal plane of the fixture. Examples of Unshielded (Unacceptable/Discouraged) and Shielded (Acceptable) lights and luminaires limiting light to the horizontal plane are shown below.



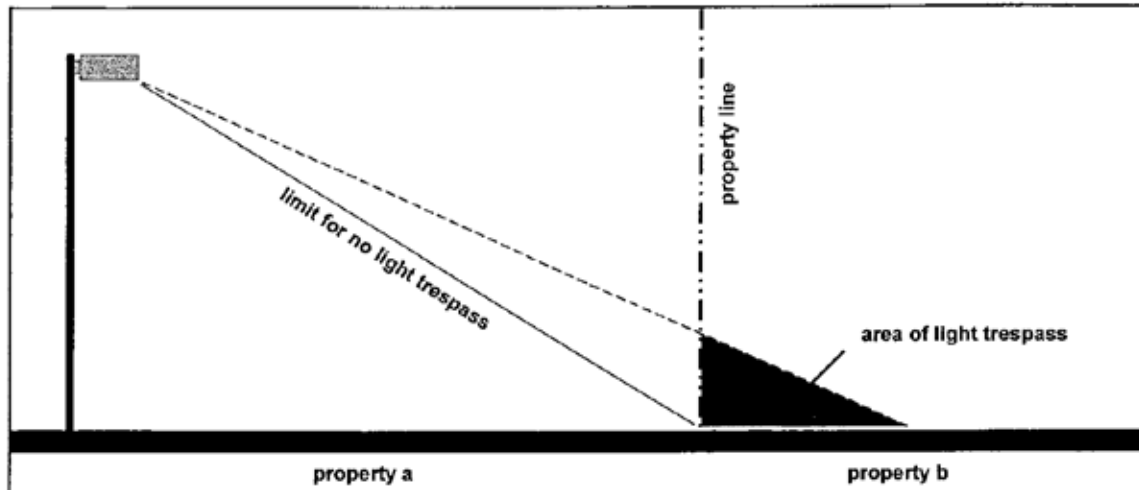
2. Total Exterior Light Output. Total exterior light output for light fixtures on a site shall not exceed the following limits shown in the table below. These lumen per acre and total site limits are upper limits and not a design goal; design goals should be the lowest levels of lighting possible.

How much light is permitted?	All Fixtures	Unshielded Fixtures (for lights emitting fewer than 1,500 lumens)
Maximum lumens per acre of site development:		
UC, TS, DC, BP, P/SP, Park, OR, CR-2, CR-1, UR, AC	50,000 per acre of site development	25,000 per acre of site development
Complex Uses (outdoor recreation, construction, etc. See Sec. E)	100,000 per acre of site development	Not applicable
Maximum lumens per site:		
UC, TS, DC, BP, P/SP, Park, OR, CR-2, CR-1, UR, AC	250,000	250,000
R, S, NC, NC-2, RB, AR, BC	5,000 lumens per site for lots equal to or less than 1 acre. 10,000 lumens per site for lots greater than 1 acre.	2,500 lumens per site for lots equal to or less than 1 acre. 5,000 lumens per site for lots greater than 1 acre.

3. Light Color. Correlated color temperature of any exterior light source shall not exceed 3000 Kelvin. Color rendering index (Color Accuracy) of any outdoor light source shall not be less than 65.

Example: Many light bulb manufacturers include correlated color temperature on packaging. Where packaging does not indicate light color in Kelvins, it is often indicated in descriptive terms. Lights with a “cool” quality typically exceed 3000 Kelvin in color temperature. Light bulbs that create a more “warm” tone are typically under 3000 K.

4. Light Trespass. All lighting fixtures shall limit horizontal light levels at property lines to zero illumination as shown in the diagram below.

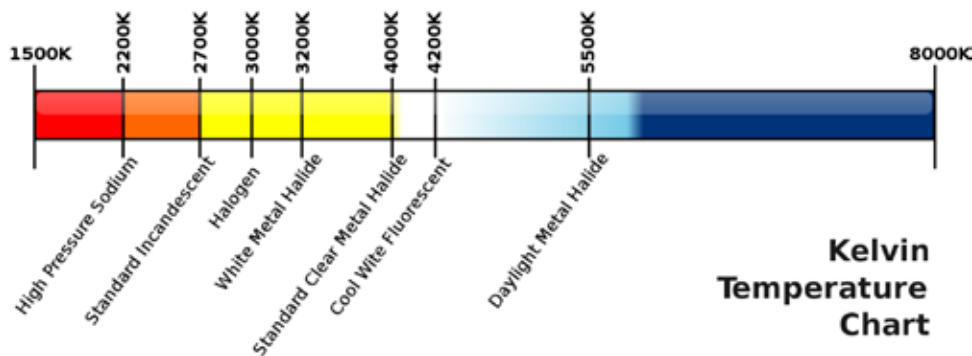


5. Maximum Height of Light Fixture. The maximum height of any luminaire on residential properties shall not exceed 15 feet. The maximum height of any luminaire on non-residential properties shall not exceed 18 feet.
 - a. Exception. Where lighting fixtures are required by Building Code to illuminate egress located above 15 and 18 feet, luminaires shall be permitted so long as they adhere to the other applicable standards in this Section.
6. Adaptive Controls. All lighting fixtures shall employ automatic lighting controls that extinguish exterior lighting when sufficient daylight is available. Such controls include, but are not limited to: timers, wireless remote monitoring with turn on/off capabilities, photo sensitive light controls, photoelectric switches, astronomic time switches or equivalent functions from a programmable lighting controller, building automation system or lighting energy management system, all with battery or similar backup power or device.
 - a. Exceptions:
 - i. Lighting required by Building Code
 - ii. Lighting necessary for public safety
 - iii. Lighting under canopies
 - iv. Lighting for tunnels, parking garages, garage entrances, and similar conditions.
7. Lighting Reduction. After 12:00 AM a site's total exterior lighting lumens shall be extinguished or reduced by at least 30%.
 - a. Exceptions:
 - i. Motion activated lighting
 - ii. Lighting affixed to residential buildings (Landscape lighting not affixed to a building remains subject to this Standard.)
 - iii. Lighting required by Building Code

- iv. Lighting necessary for public safety
 - v. Lighting governed by a conditional use permit in which times of operation are specifically identified
 - vi. When the exterior lighting consists of only one luminaire
- D. Prohibited Lighting. The following lighting systems are prohibited from being installed or used.
- 1. Flickering or flashing lights. No flickering or flashing lights shall be permitted.
 - 2. Searchlights. No searchlights, laser lights, aerial lasers, or holograms are permitted.
 - 3. Strings of Light. Strings or strands of lights used to highlight a sign, perimeter of a sign, or any portion of a building are not permitted, except for Christmas-type decorative lighting displayed between November 15 and January 10.
 - 4. Lighting in which any single luminaire exceeds 20,000 initial lumens.
- E. Complex Uses
- 1. Complex uses such as stadiums, ball diamonds, playing fields, outdoor rinks, ski areas, rodeo grounds, special events, tennis courts, construction sites, parking structures, urban parks, theme and amusement parks, ornamental and architectural lighting of bridges, public monuments, statuary and public buildings, correctional facilities, and industrial sites all have unique requirements for nighttime visibility and often have limited hours of operation. They shall be exempted from the above standards of this Section, if the below standards are met or if their lighting has been approved via issuance of a Conditional Use Permit or Special Event Permit.
 - a. Maximum height. Exterior luminaires shall not exceed a maximum post height of 40 feet.
 - b. Fully Shielded. Each luminaire shall be fully shielded in either its orientation or by landscaping to prohibit glare and light trespass to adjacent residential property and must be installed and maintained with minimum aiming angles of 25 degrees downward from the horizontal.
 - c. Lights Extinguished. Lights shall be extinguished by 10:00 PM or at the conclusion of events, whichever is later. Lighting is not allowed to remain on overnight.
 - d. Maximum lumens. Overall site lumens shall not exceed 100,000 lumens.

Definitions:

Correlated color temperature. Correlated color temperature indicates the ‘warmth’ or the ‘coolness’ of a light’s appearance (see image below). Color temperature is generally indicated on light bulb packaging. Specifically, correlated color temperature is defined as the absolute temperature of a blackbody radiator whose chromaticity most nearly resembles that of the light source.



Color rendering index (CRI). Color rendering index indicates the accuracy of an object's coloring when illuminated by a light. It is the measurement of the degree of color shift objects undergo when illuminated by the light source as compared to those same objects when illuminated by a reference source of comparable color temperature. It is also referred to as Color Accuracy. CRI is generally indicated on light bulb packaging.

Fully shielded light fixtures. Fully shielded light fixtures are luminaires that are constructed and installed in such a manner that all light emitted by the luminaire, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the luminaire, is projected below the horizontal plane through the luminaire's lowest light-emitting part as determined by photometric test or certified by the manufacturer. This applies to all lateral angles around the luminaire.

Glare. Glare means lighting entering the eye directly from luminaires or indirectly from reflective surfaces that causes visual discomfort or reduced visibility.

Luminaire. Luminaire means a complete lighting fixture, consisting of a lamp, or lamps and ballast(s) (when applicable), together with the parts designed to distribute the light from the fixture (i.e., reflector, lens, diffuser), to position and protect the fixture, and to connect the fixture to the power supply.

Light trespass. Light trespass means lighting that falls beyond the boundaries of the property from which it is emitted.

Lumen. Lumen is a measure of light emission. Lumen measurements are commonly indicated on light bulb packaging. Specifically, a lumen is the amount of light emitted per second in a unit solid angle of one steradian from a uniform source of one candela.