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## 30-6-119 Outdoor lighting and dark sky standards

### A. Preface.

1. **Authority.** On behalf of the Town of Berthoud, this outdoor lighting code is enacted on the effective date pursuant to, and in accordance with, the authority of the Town of Berthoud Town Board.
2. **Purpose.** This outdoor lighting code is intended to protect the health and welfare of all residents within the Town of Berthoud, enhance its [character and quality of life], prevent inappropriate and poorly installed outdoor lighting, reduce lighting conflicts between property owners, prevent the increase of potentially harmful sky glow, and preserve the naturally dark sky for the benefit of residents, visitors, wildlife, and the environment. The purpose of this ordinance is to provide regulations for outdoor lighting that will:
  - a. Permit the use of outdoor lighting that does not exceed the levels specified in International Engineering Society (IES) recommended practices for night-time safety, utility, security, productivity, enjoyment, and commerce.
  - b. Minimize adverse offsite impacts of lighting such as light trespass, and obtrusive light to ensure that the functional and security needs of the project are met in a way that does not adversely affect the adjacent properties or neighborhood.
  - c. Curtail light pollution, reduce sky glow and improve the nighttime environment for astronomy, intended to support the continued use, enjoyment, and success of Berthoud's Little Thompson Observatory and Bunyan Observatory at the Pioneer Museum and their operations.
  - d. Help protect the natural environment from the adverse effects of night lighting from gas and oil extraction activities or electric services.
  - e. Conserve energy and resources to the greatest extent possible.
  - f. These standards should result in exterior lighting that is functional, aesthetically pleasing, and complimentary to the architectural style of buildings or setting.
  - g. Light style. The style of lights shall be consistent with the style and character of architecture proposed on the site.
  - h. Concealed light source. Light sources shall be concealed or shielded to the maximum extent feasible to minimize the potential for glare or unnecessary diffusion on adjacent property. All lights shall be directed downward and the light source shall be equipped with "cut-off" devices so that they do not negatively impact any adjacent property and to ensure that ambient skyward light is eliminated.
3. **The Five Principles for Responsible Outdoor Lighting** will guide the Town of Berthoud's outdoor lighting decisions because:
  - a. Whereas, outdoor uses of Artificial Light at Night (ALAN) often include inappropriate and bright sources of light that cause an unsafe reduction in human visual performance; and
  - b. Whereas, excessive, unnecessary, and misdirected ALAN contributes to Light Pollution and wastes energy resources that would, if corrected, generate tangible cost savings; and

- c. Whereas, increased use of ALAN has contributed to an escalation of Light Pollution, thus increasing the brightness of the night sky by 10% annually and rendering the current night sky orders of magnitude (often hundreds of times) brighter than the natural and original sky background; and
- d. Whereas, Light Pollution from ALAN is known to cause adverse effects on the health and well-being of birds, wildlife, nocturnal ecosystems, vegetation, and under certain circumstances, human health;
- i. Now, therefore, let it be resolved that the Town of Berthoud, which has the authority to protect natural resources and maintain a healthy environment for present and future generations, chooses to enact this outdoor lighting code.

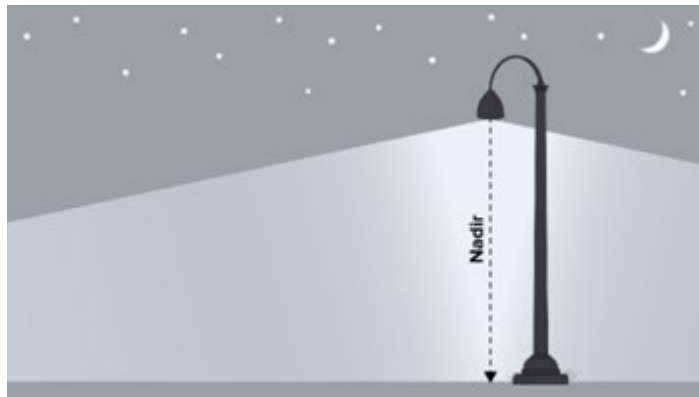
4. **Definitions.** The following definitions apply to terms used in this Code:

- a. **ANSI:** American National Standards Institute.
- b. **ANSI/IES Lighting Standards:** Applicable outdoor lighting standards and metrics include but are not limited to outdoor retail spaces, outdoor sports and recreational areas, outdoor industrial areas, roadway and parking facilities, and outdoor pedestrian areas.
- c. **ALAN (artificial light at night):** Light that is created from human technology, rather than a naturally occurring process. Also known as anthropogenic lighting.
- d. **Candela (cd):** The unit of measure for luminous intensity.
- e. **CCT (correlated color temperature):** The measured color appearance of light emitted by a light source described using a nominal value stated in kelvins (K). Lower CCTs (1800 K to 2200 K) appear very warm or amber. Medium CCTs (2700 K to 3000 K) appear “warm white,” similar to standard incandescent bulbs. High CCTs (4000 K and higher) appear “cool white” or “blue.”



- f. **DarkSky Approved Outdoor Sports Lighting:** A standalone program put forth by DarkSky International to guide and/or certify sports lighting that meets stringent glare and *Light Trespass* requirements.
- g. **Five Principles for Responsible Outdoor Lighting:** Co-authored and published by DarkSky International and the Illuminating Engineering Society: 1) Use light only if needed; 2) distribute light only where it is needed; 3) use light that is no brighter than needed; 4) control light so it is on only when needed; and 5) use warmer color light when possible.
- h. **Fully Shielded:** A *Luminaire* designed or shielded in such a manner that no light is emitted, either directly or indirectly, at or above a horizontal plane running through the lowest light-emitting part of the luminaire.

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- i. **IES (Illuminating Engineering Society):** An ANSI-recognized Standards Development Organization. ANSI/IES Recommended Practices are universally recognized as authoritative references for lighting applications.
  - j. **Illuminance:** Measured in *Lux* or footcandles, the total luminous flux incident at a point on a surface.
  - k. **Light Level:** The maintained *Luminance* or *Illuminance* value.
  - l. **Light Pollution:** *ALAN* traveling into areas where it is not needed or wanted. This can be in the form of *Light Trespass*, glare, or atmospheric sky glow.
  - m. **Light Trespass:** *ALAN* illuminating past property lines without permission. Unless specified otherwise, light trespass limits are measured at any location along a property line both horizontally at the ground plane facing upward and vertically at 1.5 meters (5ft) above grade with the meter aimed toward the light source in question.
  - n. **Lighting Zones:** An ANSI/IES/DarkSky system describing the luminous environment and related lighting conditions based on land uses and expected tasks. These range from natural and intrinsically dark zones to very bright zones.
  - o. **Lumen (lm):** A unit of measure of the *luminous flux* of a light source.
  - p. **Luminaire:** A complete lighting unit, including the light source, housing, optics, electronics, and other necessary components for the purpose of providing outdoor illumination.
  - q. **Luminance:** The intensity of light emitted from a surface per unit area in a given direction.
  - r. **Lux (lx):** The SI metric system unit of measure for *Illuminance*. Measured as 1 lumen per square meter (3 square feet)
  - s. **Nadir:** A downward vertical vector directly beneath a luminaire, opposite to zenith.



- t. **Nighttime Hours:** The time between [10] PM and sunrise, or 7 AM (whichever comes earlier). For businesses and events with operating hours later than [10] PM, nighttime hours will begin one hour after closing.
- u. **Non-essential:** Lighting that is not directly associated with the physical safety of motor vehicle and pedestrian threats, including but not limited to: landscape lighting, illuminated signage, or advertising after business hours, façade lighting, vacant sports fields, and seasonal lighting.
- v. **Residential Use:** Municipal zoning districts dedicated exclusively to places of low-rise (i.e., 3 stories or less) human residence and dwelling. Examples include single family, duplex, dual family, multi-family, apartment, townhouse, and mobile home. This does not include mixed-use or commercial districts with combined dwellings.

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- w. **Seasonal Lighting:** Outdoor or site lighting that is portable, temporary, decorative, and used in connection with holidays and traditions. This includes but is not limited to string lighting, icicle lighting, and lighted inflatables, none of which are intended for general illumination.
  - x. **Security Lighting:** Illumination used specifically to protect people, property, and infrastructure from criminal threat.
  - y. **Shielding:** A *Luminaire* design, optical intervention, or physical accessory (such as a louver) preventing light emission from traveling into a particular area, angle, or region.

## 5. Applicability

- a. The lighting standards of this Chapter shall be applicable to all exterior lighting within the Town. All exterior lighting installed after the effective date of this ordinance codified herein shall conform to the standards established by this Chapter. The effective date of Ordinance 1336 for Oil and Gas regulations shall conform to the standards established by this Chapter. This code applies to all sources of outdoor lighting installed or replaced within the Town of Berthoud after enactment date. This includes, but is not limited to, newly permitted development and construction projects involving homes, dwellings, roadways, public right-of-way, signage, billboard, buildings, facilities, properties, landscape, parking lots, hardscape, non-habitable structures, and monuments.
- b. Existing outdoor lighting lawfully installed prior to the adoption of these regulations and not meeting the requirements of this code shall be considered legal and repairable but non-conforming. All non-conforming Luminaires may continue to be used and maintained until one of the following occurs:
  - 1. A determination by the Town of Berthoud that an outdoor light source constitutes a hazard to public safety or constitutes a nuisance.
  - 2. When a property is re-zoned for a new land use, at which time all outdoor lighting on the property shall meet the requirements of this code before the new use commences.
  - 3. A 10-year amortization period exists from the date the light code become effective to the date whereupon all lighting must conform to this Code.

## 6. Exemptions

- a. Lawful: Lighting requirements mandated by a legal jurisdiction with broader authority (e.g., federal, state, or territorial) than the Town of Berthoud, including but not limited to:
  - 1. Navigational lighting systems regulated by the Federal Aviation Administration and the US Coast Guard.
  - 2. Any contradictory building code or Department of Transportation illumination requirements.
  - 3. Lighting for worker safety as mandated by the Occupational Safety and Health Administration.
- b. Safety: Luminaires installed for the benefit of public safety, including but not limited to:
  - 1. Security Lighting as determined by a municipal official with authority.
  - 2. Temporary lighting used by authorized first responders during emergency procedures.
- c. Historic: Luminaires replicating time period historical character and lighting effect that are protected by historical registration, or otherwise permitted by an authority having jurisdiction.
- d. Permitted: Temporary and semi-permanent lighting approved by municipal permit for special events, festivals, and community benefit, provided the permitted lighting still meets light trespass requirements and does not add further disruption to ecological migration or habitat.
- e. Flags: Lighting of national, state, or local municipal flags that is shielded from the sides to a narrow beam of no more than 15 degrees. Nighttime illumination of other flags is not allowed. When possible, lowering and removing flags from sunset to sunrise is encouraged so illumination is not needed. The use of top of pole, downward-directed lights is encouraged.

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- f. Seasonal: Seasonal string lighting of a temporary nature is allowed between October 15 and March 15. Seasonal string lighting shall not create dangerous glare on adjacent streets or properties, shall be maintained in an attractive condition, and shall not constitute a fire hazard. Multicolored lighting is acceptable.
1. When seasonal lighting is white, it shall not exceed a CCT of 3000K.
  2. Lightbulbs shall not exceed 3 inches in size.
  3. Lighting shall be in a singular strand along no more than two (2) of the following features:
    - i. The building roof eave line;
    - ii. The building window trim;
    - iii. Building columns; or
    - iv. Railings.
  4. Seasonal lighting is subject to the following curfew hours. During these times, all seasonal lighting shall be extinguished.
    - i. Residential: 10:00 p.m. to 7:00 a.m.
    - ii. Non-Residential: Curfew hours of 10:00 p.m. to 7:00 a.m. shall apply to all businesses unless normal operating hours end or begin within the hours of curfew. If so, the curfew applies until one (1) hour after closing or one (1) hour before opening.

## **7. Prohibitions**

- a. ALAN must not interfere with the safe movement of motor vehicles. Any lighting that distracts or disables the vision of a motor vehicle operator (e.g., excessively bright or rapid blinking, flashing, and/or motion video) or contributes to traffic control confusion (e.g., sources resembling or imitating traffic or railroad signals) is prohibited.
- b. Beacons and searchlights, except for emergency use by authorized first responders.

## **B. Outdoor Lighting Requirements**

### **1. General**

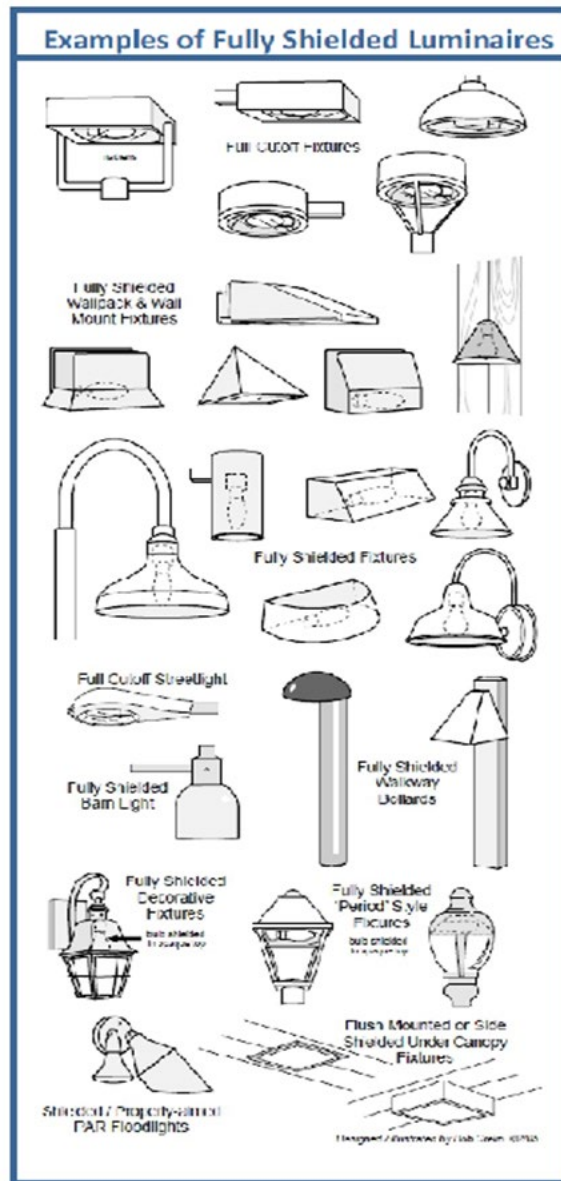
- a. Legal: All outdoor Luminaires and Luminaire installations shall comply with federal and state law; county and municipal codes; applicable energy and building codes; product safety labeling; the requirements of this [Code]; and shall be subject to the appropriate permit and inspection requirements thereof.
- b. Light Level: Unless otherwise specified in this Code, lighting installed for an outdoor use shall not exceed 25% more than the Light Level recommended by the applicable ANSI/IES Lighting Standard, or a state approved alternate, as published by effective date.
- c. Distribution: Unless otherwise specified in this Code, Luminaires emitting more than 1,000 Lumens shall be Fully Shielded and shall emit no more than 5% of their total Lumen output above 80 degrees from Nadir. Exceptions are:
  1. Festoon string lighting where no individual lamp emits more than 50 lumens, and the lumen density of the string is no greater than 25 lumens per foot.
  2. Directional Luminaires used for façade illumination which are shielded and aimed to hit their target such that the light is contained by architectural elements.
- d. Trespass: Unless otherwise specified in this Code, Light Trespass shall meet the following:
  1. Luminaire light sources shall not be visible from federal or state designated wilderness, natural area, habitat, or reserves, and Light Trespass shall measure no greater than 0.1 Lux.
  2. Light Trespass onto Waters of the United States shall measure no greater than 1 Lux.

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3. Light Trespass onto Residential Use property shall measure no greater than 1 Lux.
  - e. Curfew: Non-essential outdoor lighting, including but not limited to landscape and decorative lighting elements, shall be extinguished during Nighttime Hours.
    1. When applicable, outdoor lighting shall dim or be extinguished during Nighttime Hours as prescribed by an adopted energy code.
  - f. Controls: Luminaires activated by motion detection shall automatically turn off or return to their dimmed state no more than [5] minutes after activity is no longer detected.
  - g. Spectrum: Unless otherwise specified in this Code, the maximum allowable correlated color temperature (CCT) for outdoor Luminaires is 3000 Kelvin.
    1. Exception: CCT exemptions are allowed if a public safety need is documented.

## 2. Residential Use

The following requirements are supplementary to the General Outdoor Lighting Requirements (**Section 2.1** and its subsections) and shall further regulate outdoor lighting on Residential Use property:

- a. Lighting for Residential Use, excluding roadway, parking, and public right-of-way, shall be exempt from the requirement in **Section 2.1(B)** provided no single Luminaire exceeds 1,000 lumens and the total installed lumens per dwelling are limited to:
  1. No single Luminaire exceeds 1,000 lumens
  2. Residential uses (1 unit only): 6,500 lumens per net acre
  3. Residential uses (2 units or greater): 20,000 lumens per net acre
- b. Light Trespass leaving Residential Use property shall be no greater than 1 Lux.
- c. *Tree*, garden and landscape lighting is subject to curfew hours and shall be turned off between the hours of 10:00 p.m. and 7:00 a.m.
- d. Pole Lights. Pole mounted lighting for multi-family common areas or any parking lot adjacent to a residential use are allowed up to twelve (12) feet from finished grade. This allowance shall not exceed light trespass limits.
- e. When needed, Residential Use roadway Luminaires shall be a maximum 2400 Kelvin.
- f. All area lights, including street lights and parking area lighting, shall have a maximum BUG rating of B2-U0-G1 according to the guidelines set forth by the Illuminating Engineering Society (IES) TM15-11. Examples of these luminaires can be found in example below:



### 3. Non-Residential Use

The following requirements are supplementary to the General Outdoor Lighting Requirements (Section 2.1 and its subsections) and shall further regulate outdoor lighting on non-residential property. The total allowable site lumens for nonresidential properties are based on the square footage of the facade and other elements of the developed structure, landscape buffer, and hardscape. A site shall calculate a maximum site lumen allowance by choosing a maximum of four (4) of the following lighting types and adding their limits:

- a. Non-Residential Use lighting shall be exempt from the requirement in Section 2.1(B), provided there is no Luminaire installed on the property capable of exceeding a total output greater than 3,000 Lumens.
- b. Building Entrance: 1,000 lumens per door. Luminaires shall be located within 20 feet of the door.

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- c. Building Facades: 10 lumens per square foot of building façade that is illuminated. Luminaires shall be aimed at the façade and capable of illuminating it without obstruction.
  - d. Nighttime Service Loading: 4,000 lumens per service loading door. Luminaires shall be located within 20 feet of the door.
  - e. Outdoor At-grade Parking Lot: 500 lumens per parking space. See 180-6.16.4.A. Parking Lot Lighting Standards.
  - f. Gas Station Canopy: 5,000 lumens per fuel pump. Each side of a two-sided pump qualifies for an allowance.
  - g. *Tree*, garden and landscape lighting is subject to curfew hours and shall be turned off between the hours of 10:00 p.m. and 7:00 a.m.
  - h. Outdoor Dining: 8 lumens per square foot of illuminated hardscape for outdoor dining. Luminaires shall be within 6 feet of the hardscape area of outdoor dining.
  - i. Pole Lights: Pole mounted lighting for non-residential parking lots is allowed up to twenty (20) feet tall from finished grade, provided it is not directly adjacent to residential property. This allowance shall not exceed light trespass limits.
  - j. Light Trespass leaving non-Residential Use property onto adjacent public right-of-way shall be no greater than 3 Lux when measured 20 feet past the property line.
  - k. Adaptive Controls and Curfews: All future non-Residential outdoor lightings will use adaptive controls and or lighting curfews to control and ALAN.
  - l. *Towers*. All radio, communication, and navigation towers that require lights shall have dual lighting capabilities. For daytime, the white strobe light will be used, and for nighttime, only red lights shall be used.

#### **4. Security Lighting**

Motion sensor lights shall be permitted if they are fully shielded and downcast per the requirements of this section. All motion sensor lights, or proposed security surveillance systems shall meet the following criteria.

- a. Multi-Family residential and nonresidential common areas with increased density and activity may require increased illumination at primary points of entrances or exits. Light intensity shall not exceed 50 lux average at grade.
- b. Shielded floodlights controlled by a motion sensor shall be limited to motion within the owner's property lines and turned off no more than five (5) minutes after such motion was detected.
- c. Security lighting shall be properly installed/commissioned so it shall not be oversensitive to surroundings and be triggered repeatedly in an unreasonable or disruptive manner by naturally occurring causes (such as wind in foliage).
- d. It is located in such a manner as to prevent glare and lighting onto properties of others or into the public right of way.

#### **5. Signage**

The purpose of the sign design standards is to promote a high level of quality and creativity, in keeping with the architectural goals and the character of Berthoud. The goal of the guidelines is also to encourage sign design that is eclectic, artistic, and original.

- a. *Illumination*. The illumination of signs is intended to minimize the undesirable side effects of excessive illumination such as glare, sky glow, and light pollution. The following standards shall apply to sign illumination:



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1. *Light Source.* All exterior sign lighting shall be fully shielded and down-directed so that light is directed only onto the sign face and not aimed at the sky, adjacent streets, roads, or properties. All upward-directed sign lighting is prohibited.
  2. *Luminance levels.* Luminance levels for signs shall not exceed 100 nits (100 candelas per square meter) between sunset and sunrise, as measured under the conditions of a full white display.
  3. During the first hour after sunset and during the last hour immediately preceding sunrise, sign luminance shall not exceed 100 nits (100 candelas per square meter, cd/m<sup>2</sup>)
  4. Signs may only be illuminated while the associated activity is taking place; for businesses, sign illumination must be extinguished completely during the hours the business is closed.
  5. The luminous or illuminated surface area of an individual sign must not exceed 18.6 square meters (200 square feet).
  6. *Curfew.* Sign illumination shall be extinguished completely one (1) hour after sunset or one-half (1/2) hour after the end of normal business hours, whichever is later, and remain off until at least one (1) hour before sunrise.
  7. *Adaptive controls.* Sign lighting shall be controlled by a light sensor, timer, or equivalent system in order to properly adjust the sign luminance and minimize the duration of illumination. Should an electronic problem prevent normal function, the sign shall default to night mode or remain unlit.
  8. *Component Painting.* All light fixtures, conduit, and shielding must be concealed and shall be painted to match either the building or the supporting structure that serves as the background of the sign.
  9. *Externally Illuminated Signs.* Externally lit signs shall be illuminated only with steady, stationary, shielded light sources directed solely onto the sign without causing glare. Light bulbs or lighting tubes used for illuminating a sign shall be simple in form and should not clutter the building or structure. Light bulbs or lighting tubes should be shielded so as to not be physically visible from adjacent properties and public rights-of-way.
  10. *Internally Illuminated Signs.* Internally illuminated signs with light colored backgrounds, including, but not limited to, white, off-white, light gray, cream and yellow are discouraged.
  11. *Fixtures.* Lighting fixtures shall be simple in form and should not clutter the building. The fixtures must be directed only at the sign. Lighting for front lit signs shall be housed in fixtures and installed in a manner that will serve to substantially shield exposed bulbs and lighting tubes from public view. Gooseneck or other building mounted fixtures are encouraged.

## **6. Sports Lighting**

The following requirements are supplementary to the General Outdoor Lighting Requirements (Section 2.1 and its subsections) and shall further regulate outdoor lighting for sports and recreational areas to provide essential requirements for safe play and light trespass mitigation. Following ANSI/IES RP-6 guidelines.

- a. Lighting for sports and recreational areas shall also meet the following requirements:
  1. Eighty-five percent (85%) of the lumens generated by sports lighting luminaires shall be confined to within 10 meters (33 feet) or a distance of one pole height, whichever is greater, of the playing field or the spectator track or bleacher area, whichever is greater.
  2. Lighting installations for aerial sports are allowed a maximum of 8% of the total lumen output to be emitted above 80 degrees from Nadir.
  3. When the recommended sports field Light Level is higher than 100 lux, installed lighting shall not exceed 10% more than the Light Level recommended by the applicable ANSI/IES lighting standard, or a state approved alternate, as published by the effective date.

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4. The maximum CCT for outdoor sports lighting should be the lowest possible for the sport, class of play, and viewing audience as defined by the relevant ANSI/IES lighting standard, or any state approved alternative, but never exceeding 5700 K.
  5. The maximum luminous intensity from any luminaire lighting a sports field shall not exceed 10,000 candelas (cd) as measured along a perimeter that is 46 meters (150 feet) from the edge of the field, at 1.5 meters (5 feet) above grade
  6. A 10 pm curfew exists for all sports and recreational outdoor field lighting, or one hour after play ends.
  7. Timers shall be install for all sports and recreational outdoor lighting to prevent lights being left on overnight.

## **C. Administrative Requirements**

### **1. Permit Application**

- a. Submittal: Whenever a building, subdivision, site plan, or outdoor lighting permit is applied for, an outdoor lighting plan must be submitted along with a compliance statement that the proposed work will comply with all code requirements. All applications for building permits or land use planning review which include installation of outdoor lighting fixtures shall include lighting plans conforming to the provisions of this Section. Town staff has the authority to request additional information in order to achieve the purposes and intent of this Section.

The outdoor lighting plan must follow one of the following:

1. The submittal shall contain the following information and be submitted as part of the site plan to the Planning and Building departments for approval.
  - i. Plans indicating the location, type, intensity, and height of luminaries including both building and ground-mounted fixtures;
  - ii. A description of the luminaries, including lamps, poles or other supports and shielding devices, which may be provided as catalogue illustrations from the manufacturer;
  - iii. Photometric data, such as that furnished by the manufacturer, showing the angle of light emission and the foot-candles on the ground. Area and roadway lighting requires compliance with the BUG rating with this data; and
  - iv. Additional information as may be required by the Town in order to determine compliance with this Chapter.
- b. Review: Submitted spreadsheets, site lighting plans, and compliance affidavits shall be subject to review and approval by the administrator, or designee. The administrator shall have the authority to refer an application to the planning and zoning commission or the historic commission if deemed appropriate.
- c. Appeals: Any appeals related to decisions regarding outdoor lighting shall be made to the administrator, or designee.

### **2. Enforcement and Penalty**

- a. Enforcement: Unless otherwise noted in this code, the administrator, or designee, shall be responsible to implement, administer, and enforce this code, including investigations of alleged violation. A private right of action may also constitute enforcement of the requirements within this code.
  1. The administrator charged with enforcing this chapter shall have the authority to grant partial waiver of specific code requirements for up to one year if a property owner demonstrates that

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compliance creates unreasonable hardship, as balanced against the potential impacts of non-compliance, or results in conditions that are materially detrimental to health, safety or welfare.

- b. Penalty: Any property owner that does not meet the requirements of this code shall be in violation. A person, firm, or corporation found to have violated, disobeyed, omitted, neglected, or refused to comply with any provisions of this code shall be issued a notice and administrative citation as provided by the municipal code. Any person, firm, or corporation found to have violated any portion of this code shall correct the violations within ninety (90) days of the citation date. Each day a violation continues beyond ninety (90) days of the citation date without having been corrected shall be a separate offense.
- c. Private Action: Any person adversely affected by lighting that does not meet the requirements of this code shall have a private cause of action for nuisance against the person, firm, or corporation responsible for such lighting.