

Chapter 15.22 Outdoor Lighting Ordinance

Section 15.22.010 Short Title. This Ordinance may be cited as the “Outdoor Lighting Ordinance” of the City of Cambridge (the “City”).

Section 15.22.020 Purpose. The purpose of this Outdoor Lighting Ordinance is to regulate outdoor lighting, as defined in this Ordinance, in the City, the intent being to permit an amount of outdoor lighting that is appropriate to allow for the safe use and enjoyment of outdoor areas, while also mitigating potential nuisance in the form of light trespass and glare to abutters and the public at large, reducing light pollution, and promoting energy conservation.

Section 15.22.030 Definitions.

A. **Architectural lighting.** Lighting designed to reveal architectural beauty, shape and/or form and for which lighting for any other purpose is ~~incidental~~secondary/ancillary.

~~B. **Color rendering index** means a measure 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.~~

C. **Correlated color temperature (CCT).** ~~means the absolute temperature of a blackbody radiator whose chromaticity most nearly resembles that of the light source.~~ **A specification of the color appearance of the light emitted by a lamp, relating its color to the color of light from a reference source when heated to a particular temperature, measured in degrees Kelvin (K). [RPI Color Research Center]**

D. **Emergency lighting.** ~~conditions means~~ Lighting that is ~~only~~ activated **only** during an emergency. ~~lighting fed from a backup power source; lighting for illuminating the path of egress solely during a fire or other emergency situation; or, lighting for security purposes used solely during an alarm.~~

E. **Fully shielded light fixture.** ~~means a~~ **A** light fixture constructed, ~~and~~ installed, **and maintained** in such a manner that all light emitted by the light fixture, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the light fixture, is projected below the horizontal plane through the light fixture's lowest light-emitting part.

F. **Glare.** ~~means~~ **The sensation produced by a bright light source within the visual field that is sufficiently brighter than the level to which the eyes are adjusted, causing discomfort and/or loss in visual performance or visibility.** ~~lighting entering the eye directly from luminaires or indirectly from reflective surfaces that causes visual discomfort or reduced visibility.~~

- G. High Intensity Discharge (“HID”)** means a discharge lamp where the emitted energy (light) is produced by the passage of an electric current through a gas. HID includes mercury, metal halide, and high pressure sodium (“HPS”) lamps. **[not mentioned in text]**
- H. Lamp / Light Bulb.** An element within a light fixture that directly produces light, means a source of optical radiation, often called a “bulb” or “tube”, such as incandescent, fluorescent lamps, high intensity discharge (“HID”) lamps, and low pressure sodium (“LPS”) lamps, as well as light emitting diode (“LED”) modules and arrays.
- I. Landscape lighting.** means lighting of trees, shrubs, or other plant material as well as ponds and other landscape features. **Lighting which is positioned and aimed to illuminate foliage, yards, gardens, sculptures, driveways, walkways, patios, decks and other exterior areas.**
- J. Light bulb. See Lamp.** means the element within a light fixture that directly produces light, and, as used in this Ordinance, is synonymous with lamp or tube.
- K. Light fixture / Luminaire.** means A complete lighting unit consisting of one or more electric lamps, the lamp holder or holders, reflector, lens, diffuser, ballast, and/or other components and accessories, but excluding the support assembly. For purposes of determining total light output from a luminaire, lighting assemblies which include multiple unshielded or partially shielded lamps on a single pole or standard shall be considered as a single unit. **a complete lighting unit consisting of one or more light bulbs together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply. Sometimes this includes ballasts or drivers, and photocells. For the purpose of this Ordinance, light fixture shall be synonymous with luminaire.**
- L. Light trespass.** means lighting that falls beyond the boundaries of the property it is intended to illuminate. **Stray light falling where it is not wanted or needed. Direct or reflected light that has its source on one site, and illuminates areas beyond the property boundaries. Light trespass is typically produced by stray light from unshielded or misdirected outdoor lighting, and includes glare from direct viewing, as well as “off-site spill” light.**
- M. Lighting.** means Electric, man-made, or artificial lighting. **See lighting equipment.**
- N. Lighting equipment.** means Equipment specifically intended to provide gas or electric illumination, including but not limited to, lamp(s), luminaire(s), **reflectors**, ballast(s), poles, posts, lens(es), electrical wiring, and related structures or other necessary or auxiliary components.
- O. Lighting plan.** means A site plan depicting the property lines of all properties for which lighting is proposed, the location and **label specification** of all exterior luminaires **light fixtures to be installed** within the property, **their lumen values, mounting heights, shielding, and directionality, controls, and** the location of all adjacent streets, the uses of abutting properties and properties located directly across a street, any relevant project site conditions,

and any additional information required to demonstrate compliance with applicable standards.

P. Lighting pollution. means Adverse effects of lighting, as defined in this Ordinance, including, but, not limited to, glare, light trespass, sky glow, energy waste, compromised safety and security, and impacts on the nocturnal environment.

Q. Low Pressure Sodium (“LPS”) means a discharge lamp where the light is produced by radiation from sodium vapor at a relatively low partial pressure (about 0.001 torr). LPS is a “tube source” and is monochromatic light. [not mentioned]

R. Lumen. means the A unit of measure used to quantify the amount of light produced by a lamp or emitted from a light fixture luminaire (as distinct from “watt” or other measure of a lamp's power consumption).

S. Luminaire. See "Light fixture," above. 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.

T. Lux. means the A unit of measure used to quantify the intensity, as perceived by the human eye, of visible light hitting or passing through a surface. One lux designates the intensity of one lumen uniformly distributed across one square meter. (One lux equals approximately .1 footcandle.) illuminance on a surface one square meter in area on which there is a uniformly distributed flux of one lumen, or the illuminance produced at a surface all points of which are at a distance of one meter from a uniform point source of one candela.

U. New lighting means lighting for areas not previously illuminated, or newly installed lighting of any type, except for replacement lighting or lighting repairs.

V. Outdoor or exterior lighting. means Lighting equipment installed within the property line and outside the building envelopes of a subject property, whether attached to poles, building structures, the earth, or any other location, and any associated lighting control equipment. (A building envelope is the physical separator between the conditioned and unconditioned environment of a building and designates the portion resistant to air, water, heat, light, and noise transfer.) For the purposes of this Ordinance, lighting which is installed indoors but which illuminates an area outdoors shall be considered exterior lighting.

Note: Clarify if this includes (1) Parking lot and parking structure lighting; (2) Roadway lighting; (3) Buildings and structures; (4) Recreational areas; (5) Landscape lighting; (6) Billboards and other signs (advertising or other); (7) Product display area lighting; (8) Building overhangs and open canopies. [Many other lighting ordinances include these as separate categories.]

W. Partly shielded light fixture. means a light fixture with opaque top and translucent or perforated sides, designed to emit most light downward. A light fixture constructed and

mounted such that most light emitted by the fixture, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the fixture, is projected below the horizontal. Light emitted at or above the horizontal direction (sideways or upwards) arises only from decorative elements or strongly colored or diffusing materials such as "honey" or colored glass or plastic. Fixtures using spot or flood lamps are considered partially shielded if the lamps are aimed no higher than 45 degrees above straight down (half-way between straight down and straight to the side). [from **Pattern Outdoor Lighting Code (USA)2010** http://www.nofs.navy.mil/about_NOFS/staff/cbl/CL_POLC_standard_v2.0.pdf]

- X. **Seasonal lighting.** ~~means~~ Lighting installed with temporary wiring and operated for less than 60 days between November 10 and January 30. ~~temporary lighting not covered under an electrical permit issued by the City's Inspectional Services Department installed and operated in connection with holidays or traditions. See temporary lighting.~~ Additional restrictions may apply in zoning districts specified in Article 7, Section 7.20 of the Cambridge Zoning Ordinance.
- Y. **Shielded directional light fixture.** ~~means~~ A light fixture that includes an adjustable mounting device allowing aiming in ~~any~~ more than one direction and that also contains a shield, hood, cowl, louver, or baffle to reduce direct view of the lamp.
- Z. **Sky glow.** ~~means the~~ Brightening of the nighttime sky that results from scattering and reflection of artificial light by moisture and dust particles in the atmosphere, caused by light directed or reflected upwards or sideways, ~~and~~, which reduces ability to view the night sky.
- AA. **Temporary lighting means lighting** not covered under an electrical permit issued by the City's Inspectional Services Department and installed and operated for periods up to 60 days not to exceed 60 days, and thereafter, completely removed, not more than twice during a calendar year. ~~not operated again for a period of at least 30 days.~~ Additional restrictions may apply in zoning districts specified in Article 7, Section 7.20 of the Cambridge Zoning Ordinance.
- BB. **Unshielded light fixture.** ~~means~~ A light fixture capable of emitting light in any multiple directions, including downwards. ~~above the horizontal plane of the lamp(s).~~
- CC. **Vertical illuminance.** ~~means illuminance measured or calculated in a plane perpendicular to the property boundary or property line of a subject property.~~ The amount of light striking a vertical surface or, for example, a vertical plane at a property line. Illuminance is calculated as the density of lumens per square meter (lux) or square foot (footcandle). Illuminance is measured using a light meter.

ALSO ADD HORIZONTAL ILLUMINANCE

Section 15.22.040 Effective Date. This Ordinance shall take effect on three (3) months from the date of enactment.

Section 15.22.050 General Requirements.

A. Conformance with all Applicable Codes. Except as otherwise provided in this Ordinance, all outdoor lighting (~~including, but, not limited to luminaires, light fixtures, lamp equipment, etc.~~) shall be installed in conformance with all applicable federal, state, and local laws, rules, and regulations, including, but not limited to, applicable sections of the Massachusetts Building Code, the Cambridge Zoning Ordinance, and the Cambridge Municipal Code.

B. Applicability. ~~Except as set forth in this Ordinance,~~ All outdoor lighting installed after the effective date of this Ordinance shall comply with the requirements of this Ordinance. This includes, but is not limited to, new lighting, replacement lighting, **replacement lamps or light bulbs**, or any other lighting whether attached to structures, poles, the earth, or any other location, including lighting installed by any third party that receives an electrical permit from the City's Inspectional Services Department. Except as otherwise provided in this Ordinance, all outdoor lighting installed prior to the effective date of this Ordinance shall be altered or replaced so as to comply with these requirements within five (5) years of the effective date of this Ordinance. **In particular circumstances, timelier remedies may be sought and incentivized.**

C. Interim Modification and Replacement of Light Fixtures and Light Bulbs. When any outdoor light fixture is replaced, **after the effective date of this ordinance**, the replacement light fixture shall comply with this Ordinance. ~~Where~~ **Whenever** a light bulb is replaced within an existing non-compliant light fixture, ~~and the light fixture itself is not replaced or repaired aside from the replacement of the light bulb, the light fixture may remain provided that the replacement light bulb is~~ **must be** compliant with the applicable initial lumen **limits** ~~standards or vertical illuminance standards~~ set forth in this Ordinance, and **if possible, shielded or directed in such a way as to relieve abutters of light trespass.** ~~provided that the light fixture is not otherwise altered to be in greater non-compliance with the requirements of this Ordinance.~~ **Add something like,** In addition, within six months of the LO effective date, property owners and/or lessees must rectify simple light trespass violations that can be solved or substantially ameliorated by one or more of the following: (1) a change of bulb, (2) change of angle, (3) additional shielding, or (4) replacement, at a product cost of less than \$200. An electrical permit fee may be waived for this procedure.

D. Light Color.

1. Correlated color temperature of any outdoor light source shall not exceed ~~4000~~ **3500** Kelvins.
- ~~2. For the Performance Standard, color rendering index of any outdoor light source shall not be less than 65.~~

E. Automatic shut-offs. ~~In residential districts, automatic lighting shut-off controls (daylight sensor or time clock) are required with new or replacement light fixtures.~~ [This doesn't make sense to me - burdensome, and why not in commercial districts - that seems more appropriate.]

E.F. Prescriptive Standards. Exterior lighting that meets the standards set forth in the table below shall be permitted in the City. Any lighting that does not meet the standards set forth in the table below may be permitted in the City only if it meets the Alternative Performance Standards set forth in this Ordinance. **(Table missing here.)**

COMMENTS ABOUT THIS SECTION AND THE TABLE ARE IN "DISCUSSION FROM 9-16-15 MEETING" DOC and C.L. Alpert PowerPoint presentation. In sum,

- There needs to be a limit on total lumens, for fixtures above 315 lumens each.
- There needs to be a more explicit ban on light trespass, probably by using the same as the LEED standard (2 lux Zone 3, 1 lux Zone 2)
- Don't include commercial, parking areas in same table. Don't undermine Zoning Ordinance Articles 6.41, 6.46, 6.93.

E. Alternative Performance Standards. An outdoor lighting installation may only exceed the limitations set forth in the Prescriptive Standards in this Ordinance if the lighting complies with the Alternative Performance Standards **1a and 1b or 1c** in this Ordinance.

COMMENTS ABOUT THIS SECTION AND THE TABLE ARE IN "DISCUSSION FROM 9-16-15 MEETING" DOC and C.L. Alpert PowerPoint presentation.

1. Standards.

- All lighting shall have no light emitted above the height of the light fixture, with the exception of lighting that is used solely for façade and landscape lighting, provided that such lighting shall not exceed 630 lumens per light fixture. **All such lighting must be constrained through shielding within the boundaries of the facade or landscape.**
- The maximum allowable **horizontal and** vertical illuminance values shall be **no greater than 2 lux in LZ 3 and 1 lux in LZ2 areas (in alignment with LEED Light Pollution Credit standards) eight (8) lux** at the perimeter of the lot, which shall be measured as follows. For portions of the lot abutting another lot under separate ownership (i.e., a side or rear lot line), the vertical **and horizontal** illuminance shall be measured at 5 feet in height **or and** above in the plane of the property line. ~~For portions of the lot abutting a street, the vertical illuminance shall be measured at any point 5 feet in height or above in the plane of the centerline of the street.~~ **(Note: Difficult to measure because of street light scatter and Why allow glare on the sidewalk where people are most vulnerable to danger due to poor visibility from passing cars and other unanticipated threats?)**
- As an alternative to the requirements described in paragraphs **1a and 1b** ~~2~~ above, the project may meet the requirements of the Light Pollution Reduction credit of the U.S. Green Building Council's LEED rating system as it ~~may be amended from time to time.~~ **stands on the date of enactment of this Ordinance.**
- All properties 10,000 square feet more in lot and/or building size and all properties in LZ 3 must comply with the LEED Light Pollution Reduction Credit standards, including leased units within such properties.**

2. **Application Requirements.** In order to apply the Alternative Performance Standards **1a plus 1b or 1c**, a **lighting plan as defined in this Ordinance** (need better definition of lighting plan, see sample below*) must be prepared by a registered architect or professional engineer licensed in the Commonwealth of Massachusetts, and submitted to the Inspectional Services Department with accompanying calculations certifying that the lighting depicted in the lighting plan shall conform to the Alternative Performance Standards set forth in this Ordinance. The Alternative Performance Standards shall not be applied unless such a lighting plan has been approved by the Commissioner of Inspectional Services or her/his designee.

F. Exemptions from Applicability.

1. Lighting within public ways for the principal purpose of illuminating public ways. No exemption shall apply to any lighting within a public way when the purpose of the ~~luminaire~~ **light fixture** is to illuminate areas outside the public way, other than as provided in this Ordinance. **[What does this mean? Does this include street lights or not?]**
2. Lighting for public parks or public art that is commissioned, owned, or operated by a city, state, or federal entity, or that is required by the City, by special permit, or otherwise by law to be accessible to the general public. **THIS IS TOO BROAD AND ALLOWS ACRES OF BAD LIGHTING. Many municipal lighting ordinances have reasonable standards for parks and recreation areas. Many residents live in areas abutting parks and recreation areas.**
3. Lighting for public monuments, statuary, or the national flag. **TOO BROAD. Such lighting should be designed to minimize sky glow and glare.**
4. Architectural lighting that has received a Certificate of Appropriateness from the Cambridge Historical Commission or Neighborhood Conservation District. **(Is there a process for this?) Such lighting should be designed to minimize sky glow and glare.**
5. Architectural lighting of structures or buildings listed on the National Register of Historical Places. **(Is there a process for this?) Such lighting should be designed to minimize sky glow and glare.**
6. Lighting solely for signs as regulated under Article 7 of the Cambridge Zoning Ordinance.
7. Temporary lighting for theatrical or television production, or performance areas, if an electrical permit has been received from the City's Inspectional Services Department.
8. Temporary lighting for work areas at construction sites, if an electrical permit has been received from the City's Inspectional Services Department.
9. Underwater lighting in swimming pools and other water features.
10. Temporary lighting or seasonal lighting as defined in this Ordinance. **The MLO and most municipal lighting ordinances specify "Temporary lighting and seasonal lighting provided that individual lamps are less than 10 watts and 70 lumens." Most limit it to a period between mid-Nov. and Jan 30. This is why I have suggested defining Temporary and Seasonal lighting separately.**
11. Lighting for hospital emergency departments, including associated helipads. **CHALLENGE TO**

THIS. Why can't they provide shielding and avoid trespass and uplight?

12. Lighting that is only used under emergency conditions.
13. Lighting required by federal, state, or local laws, rules or regulations **to be in non-compliance with the terms of this Ordinance, in which case, it should conform as closely as possible.** (Otherwise, it's an excuse to do it whatever way they can.)

Section 15.22.060 Administrative Exemption. The Commissioner of Inspectional Services shall have the authority to grant a partial or complete waiver of the requirements of this Ordinance where the property owner has submitted an Application for Administrative Exemption demonstrating that: 1) bringing the source of light for which the administrative exemption is sought into compliance with this Ordinance would constitute a demonstrably unreasonable hardship on the applicant; or 2) bringing the source of light for which the administrative exemption is sought into compliance with this Ordinance would result in conditions that are detrimental to public health, safety, or welfare. The property owner seeking the administrative exemption shall file the Application for Administrative Exemption with the Inspectional Services Department demonstrating one of the two requirements for an administrative exemption listed above. **This should require a hearing with notification to abutting property owners/lessees. Decisions like this should be transparent.** Records of such exemptions and their justifications should be made publically available.

Section 15.22.070 Enforcement.

- A. Enforcement Officials.** The Commissioner of Inspectional Services or her/his designee shall be the authorized enforcement personnel charged with the enforcement of the provisions of this Ordinance.
- B. Violations.** Authorized enforcement personnel may order and specify remedial actions to be taken by a violator of this Ordinance to achieve compliance, or issue citations, pursuant to G. L. c. 40, § 21D, for violations of these provisions, assessing fines of three hundred dollars for each such violation. Each day such a violation continues shall constitute a separate offense. Additionally, any person found to be in violation of any of the provisions of this Ordinance may be prosecuted for a misdemeanor and upon conviction thereof shall be fined three hundred dollars for each such misdemeanor. **This will not be effective unless there is a commitment to staffing, training, tools, more evening hours during all seasons. ISD needs a court order to go onto a property to inspect lighting if the owner declines to allow it.**
- C. Injunction.** As an additional remedy, any outdoor lighting installed or maintained in violation of any provision of this Ordinance may be subject to abatement summarily by a restraining order or injunction issued by a court of competent jurisdiction.
- D. Suspension or Revocation of Permit.** As an additional remedy, any enforcement official hereunder may summarily suspend, and after a

hearing may revoke, any license or permit, including a building, demolition, or electrical permit.

There needs to be delineation of a means of enforcement of Prescriptive Standards.

- **Anticipatory: Through permit process, affidavit, and inspection for compliance process**
- **Complaint Driven: Through web portal submission process, availability of tools/trained personnel/evening hours, timeline.**

There needs to be a delineation of a means of enforcement of Alternative Performance Standards.

- **Affidavit at submittal of lighting plan. Definition of lighting plan needs to be more specific. See Canby plan definition below***
- **Follow up inspection**

Add provision for encouragement of rapid compliance in acute situations

- **Require within 1 year relief from simple installations that can be amended by one or more of the following: (1) a change of bulb, (2) change of angle, (3) additional shielding, or (4) replacement, at a cost of less than \$500.**
- **ISD to waive rewiring permit fee for any resident/business willing to adjust lighting to conform within first 3 years.**
- **Provide education materials concerning motivation, diagrams and instructions for easy fixes, including specific products.**
- **See how Boulder does this** (second asterisk below)**

***Example of a Lighting Plan Requirement (Canby, OR)**

(http://www.ci.canby.or.us/Chap16/16.43OUTDOOR_LIGHTING_STANDARDS.pdf)

A lighting plan shall be submitted with the development or building permit application and shall include:

- A.** A site plan showing the location of all buildings and building heights, parking, and pedestrian areas.
- B.** The location and height (above grade) of all proposed and existing luminaires on the subject property.
- C.** Luminaire details including type and lumens of each lamp, shielding and cutoff information, and a copy of the manufacturer's specification sheet for each luminaire.
- D.** Control descriptions including type of control (time, motion sensor, etc.), the luminaire to be controlled by each control type, and the control schedule when applicable.
- E.** Any additional information necessary to demonstrate compliance with the standards in this section.

(Ord.1338, 2010)

**** Boulder language on replacement bulbs.**

- **Replacement of Bulbs:** To the extent that compliance with this section can be achieved by replacement of a light bulb, the light bulb shall be replaced with one that meets the requirements of this section upon its failure or *by* September 1, 2004, whichever is earlier.
- **Aiming of Fixtures:** To the extent that compliance with this section can be achieved by re-aiming a fixture, such fixture shall be re-aimed by September 1, 2004.