



WHEREAS, light pollution of adjacent properties or of the night sky results from using too much light, directing it where it is not needed, or using it when it is not needed; and

WHEREAS, light pollution in the U.S. is estimated to waste up to 35% of the energy used for outdoor lighting, enough to power two cities the size of New York, resulting in five million tons of greenhouse gas being emitted into the air unnecessarily, costing three billion dollars in wasted energy, and squandering limited energy resources; and

WHEREAS, light pollution has significant environmental effects, including the alteration of the circadian rhythms of many animals and insects who depend on the natural light / dark cycle of day and night and the disruption of seasonal cycles used by migrating birds, sea turtles, and many other animals; and

WHEREAS, research suggests that artificial light at night can negatively affect human health, increasing risks for obesity, depression, sleep disorders, diabetes, breast cancer and more; and

WHEREAS, light pollution reduces the ability to see the constellations of the night sky, an invaluable source of wonder and curiosity, diminishing the opportunity to draw our children into fascination with Science Technology, Engineering, and Math (STEM) education; and

WHEREAS, the Livable Nashville Committee was convened in 2016 to develop a vision for protecting and enhancing Nashville's livability and environmental quality, and one of the committee's general recommendations was to structure the Metro Code and its enforcing Department around achieving sustainability goals; and

WHEREAS, among the specific recommendations of the Livable Nashville Committee was (1) the conversion of all street lights within the Urban Services District to LED to meet the International Dark-Sky Association's guidelines; and (2) the conversion of all traffic lights to LED by 2020; and

WHEREAS, the Mayor's Sustainability Advisory Committee has been convened to advise and support the City's commitment to develop a Climate Action and to provide advice on a range of sustainability issues with a goal of tackling climate change and driving urban action that reduces greenhouse gas emissions; and the energy savings from Dark Skies lighting design are consistent with these goals.

NOW THEREFORE, BE IT ENACTED BY THE COUNCIL FOR OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

Section 1. That Section 16.20.150 of the Metropolitan Code of Laws is hereby amended by adding subsections 16.20.150(T) and 16.20.150(U) as follows:

(T) Article 410.10 of the 2017 Edition of the National Electrical Code is amended by adding the following Section G:

Parking Lots - Open parking lots shall use luminaires with a "U" BUG rating (Backlight Uplighting Glare) of 0 without external shields. Luminaires shall have a Correlated Color Temperature (CCT) of 3000 Kelvin or below. Principal walkways and parking shall have a maintained minimum illuminance of 0.2 foot-candles at grade. The average light level is not to exceed the average lighting levels set forth in the table below, as related to the Transect Category for the site as designated in the Community Plans of NashvilleNext. Spill light at the property line shall not exceed 0.5 foot-candles measured at 3' above grade. Exception may be given for calculation points on the drive between the parking lot and roadway only. Luminaires shall be controlled by occupancy sensor or timers after business hours or between the hours of 12 a.m. to 6 a.m., at a minimum. Occupancy sensors or timers may turn lights off or dim by at least 30% during periods of no occupancy. Prior to installation, a photometric plan shall be

reviewed by a certifying engineer with calculation points on a 10' X 10' grid.

Transect Category	Average Lighting Level
T1 Natural, T2 Rural	0.8 foot-candles at grade
T-3 Suburban	1.25 foot-candles at grade
T4 Urban, T-5 Center, T-6 Downtown	1.5 foot-candles at grade

Section 2. That Section 17.28.100 shall be deleted in its entirety and replaced as follows:

17.28.100 - Lighting.

A. Definitions Specific to this Section.

When used in this chapter, the following words and terms shall have the meanings ascribed to them in this section. In the event of a conflict between a definition in this section and section 17.04.060, the definition in this section will control.

“Ambient lighting” means the general overall level of lighting in an area.

“Architectural lighting means outdoor lighting directed at buildings, facades, structures, monuments, and other architectural features.

“Canopy” means a roofed structure with at least one side open for pedestrian and/or vehicle access that typically provides protection from the sun or weather and is associated with providing goods or services.

“Commercial” means any lot, however zoned, in any zoning district that does not have as its primary use a single-family or two-family residential dwelling or land used for agricultural purposes.

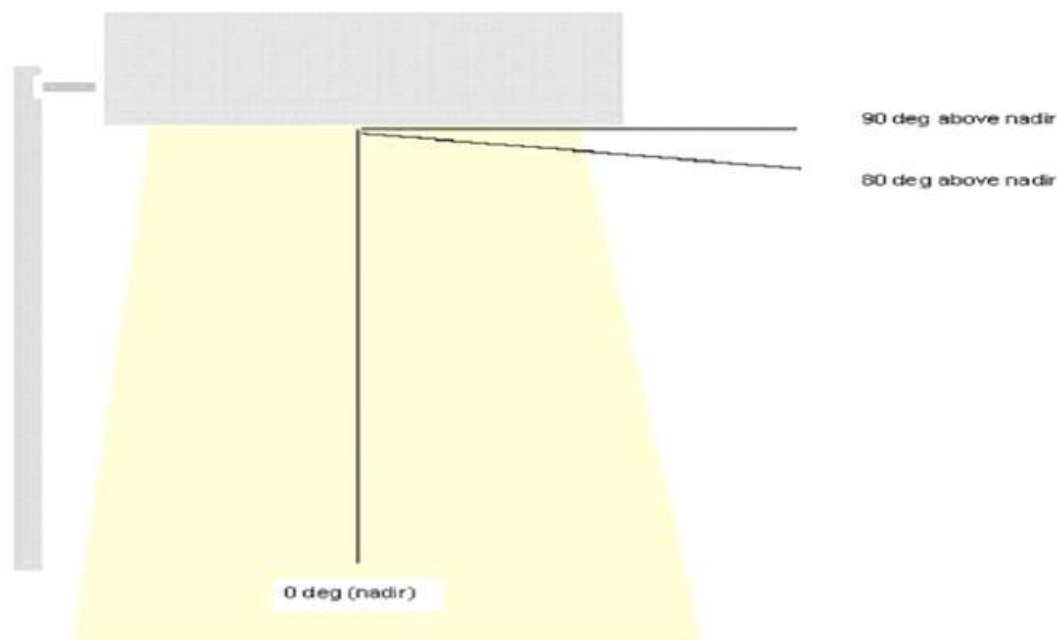
“Correlated color temperature (CCT)” means measured in degrees Kelvin (K), the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source. For the purpose of this section, "CCT" is used as a simplified way to characterize the spectral properties of a light source and estimate the overall appearance of the light to the human eye.

“Floodlight” means a light designed for lighting a scene or object to a luminance greater than its surroundings.

“Foot-candle” means a unit of measure of illuminance equal to one lumen of light spread over an area of one square foot.

“Full cutoff luminaire” means a luminaire having zero intensity at or above horizontal (90°) and limited to a value not exceeding ten percent (10%) of lamp lumens at or above eighty degrees (80°). Such luminaire is determined by a photometric test and certified by the manufacturer. See diagram below:

## CUTOFF ANGLES



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

“IES” means Illuminating Engineering Society Of North America.

“Illuminance” means the total luminous flux incident on a surface, per unit area.

“Illuminance grid plot” means a photometric report indicating the average horizontal illumination delivered to each of the squares of a gridded area illuminated by one or more luminaires.

“Initial lumen” means the measurement of a lamp’s lumen output at the time the lamp is burned for the first time. As a light ages, the amount of light produced is reduced.

“Installed height” means the height above grade of the lowest light emitting point of an installed luminaire.

“ISO foot-candle plots” means a plot that graphically represents a particular luminaire’s lighting pattern, in illuminance, as the light strikes a horizontal surface. It includes foot-candle calculations shown with the luminaire at various mounting heights. Contour lines are drawn through illuminance values.

“Kelvin” means a unit increment of temperature used as a color temperature scale of a light bulb (see definition of “correlated color temperature (CCT)” in this section).

“LED (light emitting diode)” means an electronic semiconductor device that emits light when an electrical current is passed through it.

“Lamp” means the source of light being emitted from a luminaire, such as a bulb, LED, and/or a refractive pane.

“Light” means electromagnetic radiation within a range of wavelengths sufficient for visual perception by the normal unaided human eye.

“Light level” has the same meaning as Illuminance.

“Light output” means luminous flux (see definition of "luminous flux" in this section). The amount of light which is emitted by a lamp or luminaire.

“Light pole” means a pole on which a luminaire is mounted.

“Light spill” means unwanted transmission of light onto adjacent areas that may affect sensitive receptors such as residential properties or ecological sites.

“Light trespass” means light that falls on property other than that of the owner of the light source.

“Lighting installation” means an arrangement of one or more luminaires including any mounting hardware, brackets, and supporting structures.

“Lighting plan” means an overall plan that describes the outdoor lighting.

“Lumen” means a unit of measure of luminous flux.

“Luminaire, Light luminaire” means the complete lighting assembly (including the lamp(s), housing, ballasts, photocells, globes, reflectors or refractors, lenses, sensors and shield(s) and excluding the support assembly or pole, mounting bracket and base) consisting of one or more lamps, together with the attachment parts designed to distribute light, position and connect the lamp to the power supply.

“Luminous flux” means the power emitted from a source of electromagnetic radiation, such as a light bulb, in the form of visible light. Luminous flux is measured in lumens and is typically specified by the manufacturer for a given lamp or luminaire.

“Municipal stadium” means a structure:

1. With seats for not less than thirty thousand spectators;
2. Constructed after July 7, 1977;
3. Used primarily for sporting events and other related activities; and
4. Currently financed or was financed by general obligation bonds, revenue bonds or other indebtedness issued by the metropolitan government or the sports authority.

“Nadir” means the direction pointing directly downward from the light source of the luminaire that originates from a horizontal plane at the lowest point on the luminaire. See diagram above.

“Neon light” means colored fluorescent or gas discharge tubular which can be bent into various forms for use decoratively or as signs.

“New construction,” subject to the exemption described in subsection 4 of this definition, means:

1. Site preparation for, and construction of, entirely new structures (including new poles) and subsequent replacement of such new structures or any part thereof.
2. Enlargement of any existing structure by the more restrictive of fifty percent (50%) of the area of the footprint of the building or fifty percent (50%) of the gross square footage of such existing structure (regardless of the number of other structures on the same site).
3. Adding new exterior lighting fixture(s), pole(s) or other amenity(ies) to existing structure(s) or pole(s) to which such fixture(s) were or are to be attached.
4. New construction does not mean the replacement of lamps in lighting fixtures, poles, or other amenities that existed prior to the passage of this ordinance.

“Open space and open space lot” means a parcel of land in a predominately undeveloped condition that is protected from development.

“Organized sporting event” means a prearranged sports or recreational event involving at least one group or team with a roster and schedule.

“Outdoor lighting” means light generated from an indoor or outdoor source that provides illumination to any exterior surface, building, sign, structure, device, or other outdoor feature (including land) which is visible to an observer located outdoors. For the purposes of this section, the light source inside an internally illuminated sign is not considered outdoor lighting.

“Photometric plan” means a technical plan that will indicate light distribution and the performance of lighting fixtures. It will explain the distribution of the proposed lighting and its effects on the area surrounding the site.

“Playing field” means an open outdoor field or court used for, but not limited to, playing sports such as baseball, soccer, football, tennis, volleyball, and basketball.

“Residential” means any zoning lot in a residential or agricultural zoning district that has as its primary use a single-family home or duplex.

“Street lighting” means one or more luminaires or light installations designed to illuminate a private roadway or intersection.

“Sidewalk lighting” means free-standing lighting for the illumination of sidewalks and walkways.

“Uplighting” means lighting applications which direct light above a horizontal plane.

## B. Application of Provisions

This section shall be applicable to the following lighting applications:

1. Residential and Agricultural: All exterior lighting, excluding freestanding floodlights, is subject to subsection E.4 only. Freestanding floodlights shall be subject to subsections E.1.d, E.2, and E.4.
2. Commercial: For new construction only and the subsequent maintenance of all new construction: any outdoor lighting luminaire.

### C. Exempt Outdoor Lighting

The following lighting is exempt from the provisions of these outdoor lighting regulations for new construction in any zoning district as of the effective date hereof, provided such activities are permitted by this Title:

1. Temporary lighting for theatrical, television, performance areas and construction sites, specifically excluding upward-facing searchlights used to advertise the location of an event.
2. Lighting that is otherwise required for a life-safety purpose within the Metropolitan Code.
3. Lighting that is only erected or used under emergency conditions.
4. Lighting located within the following Downtown Code Subdistricts: Core Historic, Core, Upper Broadway, 2<sup>nd</sup> and Broadway, SoBro, except that such lighting shall be subject to the provisions of subsections D3, D4, and D5 of this section.
5. Lighting located at a Municipal Stadium, except that such lighting shall be subject to the provisions of subsections D3 and D5 of this section. However, the provisions of D5 shall not be applicable during an event, game, performance or other organized function at the municipal stadium.
6. Lighting on property owned by the Metropolitan Nashville Airport Authority and lighting otherwise required by the Federal Aviation Administration.

### D. Prohibited Outdoor Lighting

The following lighting shall not be permitted for new construction in any zoning district as of the effective date hereof:

1. Strobe lights and laser lights, including laser light shows and aerial laser lights.
2. Flashing lights unless temporarily triggered by a security system and extinguished within thirty (30) minutes or at a time of security response.
3. Any lighting luminaire that is construed as or confused with a traffic signal or traffic control device.
4. Lighting that contributes to or causes disabling or distracting glare onto a public roadway.
5. The use of uplighting, except when lighting a flag or other government endorsed symbol.

### E. Illumination standards.

1. Light Intensity and Uniformity:
  - a. The maximum illuminated surface light level at any point outdoor parking lots, automobile convenience stations and drive-in/drive-through canopies is ten (10) foot-candles, measured horizontally at ground level.
  - b. The total installed initial luminaire lumens of all exterior lighting systems on the

site shall not exceed the allowed total initial site lumens. The allowed total initial site lumens shall be the sum of 7,000 base lumens for all entrances and facades plus 2.5 lumens per square foot of hardscape.

c. As an alternative to compliance with the foregoing provisions of this section, an applicant may choose to comply with The International Dark Sky Association (IDA) model legislation of June 2011 (located at <https://www.darksky.org/wp-content/uploads/bsk-pdf-> . ) except no special permit referenced in section VI.B of the model legislation shall be required. For special uses outlined in section VI.B of the model legislation that cannot comply with the technical requirements, a letter from an engineer licensed with the state of Tennessee shall be submitted to the Department of Codes Administration confirming that the project has sustained reasonable effort to mitigate the effects of light on the environment and surrounding properties, supported by a signed statement describing the mitigation measures. Lighting Zones in the model legislation shall correlate to the Transect Category for the site as designated in the Community Plans of NashvilleNext as follows:

T1 Natural	LZ-0
T2 Rural	LZ-1
T3 Suburban	LZ-2
T4 Urban	LZ-2
T5 Center D District	LZ-3
T6 Downtown	LZ-4

d. Light Direction and Control: Lighting applications shall meet the following requirements:

Lighting Application	Maximum Inclination Above Nadir
Architectural lighting	90 degrees
Floodlighting	90 degrees
Sidewalk lighting	90 degrees

2. Correlated Color Temperature (CCT): All lighting sources, except for public playing fields and lighting on public property necessary for the proper functioning of security cameras, must have a correlated color temperature (CCT) at or below three thousand degrees Kelvin (3000 K).

3. Permitted Hours of Outdoor Lighting:

a. Commercial: No more than fifty percent (50%) of exterior lighting shall be permitted to be illuminated, or lighting shall be dimmed by 30% illuminance except for one hour before start of business, during regular business hours as determined by said business, and one hour following close of business unless exempt for safety or security concerns. Motion detectors may be used to restore lighting to 100% for safety. All outdoor lighting shall be turned off during daylight hours.

b. Property Used for Governmental and Public Purposes: Any zoning lot in any zoning district used for governmental or public purposes, except for street lighting, shall comply with the permitted hours and security lighting limitations for commercial lighting zones. Outdoor lighting of

the playing field of an organized sporting event on public property may remain illuminated until ~~thirty (30) minutes~~ one hour (1) hour after the conclusion of an event.

#### 4. Light Trespass:

- a. All site lighting shall be shielded so that substantially all directly emitted light falls within the property line. No illumination in excess of one-half foot-candle shall be permitted across the boundary of any adjacent residential property or a public street.
- b. No illumination shall produce direct, incident or reflected light that interferes with the safe movement of motor vehicles on public streets. Lighting prohibited by this provision shall include, but not be limited to any light that may be confused with or construed as a traffic-control device.
- c. Rope lighting shall not be used on a building, sign, or any property with non-residential zoning located adjacent to an arterial or collector street as identified on the Major and Collector Street Plan. This provision shall not apply to properties zoned as DTC.

#### F. Luminaire standards

1. Full Cutoff Requirement: All lighting regulated by this chapter shall be full cutoff.
2. Photocell/Timer Requirement for Parking Lot Lights: Parking lot lighting shall include photocells or timers as needed to regulate the hours of operation as required by this chapter and to prevent operation during daylight hours.
3. Canopy Requirement: All canopies must be skirted with a skirt depth of eight inches (8") or greater or use other means to limit light spill to within ten feet of the area covered by the canopy.

#### G. Procedural requirements

1. Plan Submission: For land development, redevelopment and new zoning applications where outdoor lighting is proposed, prior to final approval by Metro Plans Inspection a letter from an engineer licensed with the state of Tennessee shall be submitted to the Department of Codes Administration confirming that the plan complies with the requirements of this section. Engineer review shall be based on the following information:
  - a. A site plan complete with all structures, parking spaces, building entrances, traffic areas (both vehicular and pedestrian), vegetation that might interfere with lighting, and all adjacent uses. The site plan shall show and identify the location of each existing and proposed luminaire and shall specify its installed height, pole foundations, and method of mounting.
  - b. Iso-foot-candle plots for individual lighting installations, or ten feet by ten feet (10' x 10') illuminance grid plots for multi-luminaire lighting installations which shall demonstrate compliance with all applicable requirements set forth in this chapter. The plots shall indicate the location of each existing and proposed luminaire, the installed height of said luminaires, and the overall light levels in foot-candles and initial lumens on the entire zoning lot and at the property lines.

c. A summary table identifying the maximum and minimum light levels in foot-candles and initial lumens for all, but not limited to, parking areas, street or building entryways, signs, street lighting, canopies, architectural lighting and walkways.

d. A description of each luminaire identified in the site plan including, but not limited to:

- i. Manufacturer with website.
- ii. Lamp type.
- iii. Bulb type including CCT (Kelvin).
- iv. Model number.
- v. Photograph or catalog cut.
- vi. Photometric plan.
- vii. Light output in initial lumens.
- viii. Shielding or glare reduction devices.
- ix. Energy reduction and on/off control devices.

2. Post approval Alterations: Post approval alterations to lighting plans or intended substitutions for approved lighting equipment shall be submitted to the zoning inspector after review by a qualified engineer at the expense of the applicant and approval prior to issuance of an Use and Occupancy permit, with all plan submission requirements set forth in this chapter, prior to installation.

3. Inspections: The Department of Codes Administration shall have the right to conduct a post installation inspection to verify compliance with the requirements of this chapter and, if appropriate, to require remedial action within 30 days at the expense of the applicant.

4. Violations of this chapter shall be punishable as provided by Chapter 17.40, Article XIII of the Metropolitan Code.

5. Variances: Variances to the requirements of this chapter may be granted by the Board of Zoning Appeals as provided in Chapter 17.40, Article VIII of the Metropolitan Code.

Section 3. Be it further enacted, that this ordinance take effect 60 days after its passage and such change be published in a newspaper of general circulation, the welfare of The Metropolitan Government of Nashville and Davidson County requiring it.

### Analysis

This ordinance, as substituted, makes several additions to Title 16 and 17 of the Metropolitan Code of Laws regarding design and operation of outdoor electrical lighting to reduce light pollution consistent with International Dark Sky Association (IDSA) guidelines.

Changes to Section 16.20.150 of the Metropolitan Code include requirements for certain luminaries in open parking lots to reduce glare and require the use of occupancy sensors after business hours or between the hours of 11 p.m. to 4 a.m., at a minimum. Exterior lighting design for buildings would be required to comply with Section 17.28.100 of the Metropolitan Code.

The existing Section 17.28.100 of the Metropolitan Code would be deleted in its entirety and replaced with new requirements.

Currently, all site lighting must be shielded so that substantially all directly emitted light falls within the property line. No illumination in excess of one-half footcandle is permitted across the boundary of any adjacent residential property or public street. No illumination can produce direct, incident, or reflected light that interferes with the safe movement of motor vehicles on public streets. Further, rope lighting cannot be used on any building, sign, or non-residential property located adjacent to an arterial or collector street, except for properties zoned DTC.

This ordinance would apply to new commercial construction and the subsequent maintenance of new commercial construction, including any outdoor lighting luminaire. All lighting for residential and agricultural light applications would be covered only by the "Light Trespass" provisions in proposed section 17.28.100.E.4. Certain lighting, such as strobe lights, neon style colored light tubes, and lighting that causes distracting glare, would be prohibited. Certain outdoor lighting would be exempt, including temporary lighting for theatrical, television, performance areas and construction sites, as well as emergency lighting and lighting located within the Second Avenue Historic Preservation Zoning Overlay or Broadway Historic Preservation Zoning Overlay.

The ordinance would further create illumination standards. The maximum illuminated surface light level for outdoor parking lots, automobile convenience stations, and drive-in/drive-through canopies would be ten foot-candles. Other regulations include specific light direction and control requirements, regulations on correlated color temperature, permitted hours of outdoor light, and light trespass. Finally, the ordinance requires certain procedural requirements, including a plan submission for land development, redevelopment and new zoning applications where outdoor lighting is proposed.

This ordinance has been approved by the Planning Commission.