

**Model
Municipal Outdoor Lighting Ordinance
Hunterdon County**

PURPOSE AND MASTER PLAN STATEMENT

Provide outdoor lighting standards necessary to prevent the negative impacts of misdirected or excessive light caused by inappropriate or misaligned light fixtures producing glare, light trespass and skyglow. Such regulation is necessary to encourage energy conservation, to improve nighttime public safety and to prevent annoying and destructive light pollution.

1. DEFINITIONS

GLARE: The sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort or loss in visual performance and visibility.

IESNA: Illuminating Engineering Society of North America. An organization that recommends standards for the lighting industry. ***The IESNA is the recognized technical authority on illumination. www.iesna.org. The Society publishes nearly 100 varied technical publications, and works cooperatively with related organizations on a variety of programs and in the production of jointly published documents and standards. The American National Standards Institute and various national societies have adopted some IES publications. In addition to US recognition, IES practices are recognized by Canada, Mexico and European organizations.***

LIGHT TRESPASS: Any form of artificial illuminance emanating from a light fixture or illuminated sign that penetrates other property and creates a nuisance.

OBJECTIONABLE DIRECT GLARE SOURCE: Glare resulting from excessive levels of illumination or insufficiently shielded light sources, emanating from light fixtures in the field of view where the lens, lamp or reflector is offensively visible above a height of five (5) feet at a property line or a public roadway. ***Rule of Thumb – if the lamp (bulb) is objectionably visible from outside the illuminated property's boundary, then it's a direct glare source. Rule of Thumb: If you must squint to see due to glare within your field of view, then it's objectionable.***

OUTDOOR LIGHT FIXTURE: An electrically powered illuminating device, in-place outdoors for 30 days or more, containing a total light source of more than 1000 initial lumens per fixture (this is greater than a single 60 watt incandescent), including but not limited to devices used to illuminate any site, architectural structure or sign. ***This definition intends to cover both permanent lighting installations and temporary installations of 30 days or longer duration. Note the specific exemptions listed in 2.A. Lumens are the standard measurement of light output. Lumen output is***

shown on the packaging of light bulbs (along with wattage and bulb lifespan). The model ordinance uses lumens as the defining characteristic (instead of watts) because bulbs of similar brightness may consume vastly different wattages. Municipalities may opt for a different lumen level baseline (e.g., Clinton and Union Townships use 1500 lumens).

SHIELDED LIGHT FIXTURE: A light fixture with cutoff optics that allows no direct light emissions above a vertical cutoff angle of 90 degrees above nadir (straight down at perfect vertical), through the light fixture's lowest light emitting part. Any structural part of the light fixture providing this cutoff angle must be permanently affixed. ***IESNA / lighting industry language. In other words, a fixture that shines light (mainly) down and (slightly) outwards, but never projects light above the fixture. Cutoff optics aim light where it's needed and minimize sideways and upwards glare.***

LUMEN: Measurement of light output. One lumen is equal to the amount of light emitted by one candle that falls on one square foot of surface located one foot away from the candle.

FOOTCANDLE (fc): A unit of illuminance on a surface one foot square in area onto which there is a uniform flux of one lumen. ***Measured with a standard light meter or photometer. These meters typically cost between \$75 and \$300.***

ILLUMINANCE: The area density of the luminous flux incident at a point on a surface, expressed in footcandles (fc). ***A measurement of light on the illuminated surface. Measured by a light meter placed on the illuminated surface.***

LUMINANCE: The quantity of light ("brightness") reflected or emitted towards an observer, expressed in lumens per square foot. ***Used primarily to measure internally-illuminated signs. Most other applications use Illuminance (footcandles)***

HORIZONTAL ILLUMINANCE: The illuminance on a horizontal plane, expressed in footcandles (fc). ***E.g., to measure horizontal illuminance in a parking lot, the meter is laid on the pavement, sensor up, and the reading is noted in footcandles.***

VERTICAL ILLUMINANCE: The illuminance on a vertical plane, expressed in footcandles (fc). ***Typically used to measure glare and light trespass levels. To measure vertical illuminance the meter is held vertically, at eye level (5 feet), sensor towards light source, and a reading noted in footcandles.***

UNIFORMITY RATIO: The ratio of the brightest spot to the dimmest spot, or the ratio of the average brightness to the minimum brightness. ***This ratio is used to ensure the lit area is uniformly lit, with no overly-bright or overly-dim areas that would impact vision.***

2. GENERAL REQUIREMENTS (all uses)

2.A. EXEMPTIONS. This ordinance shall not apply to the following:

- (1) decorative holiday lighting from November 15 through the next January 15;
- (2) lighting required by law to be installed on surface vehicles and aircraft;
- (3) airport lighting required by law;
- (4) temporary emergency lighting;
- (5) temporary lighting other than security lighting at construction projects;
- (6) Outdoor light fixtures emitting less than 1000 lumens, except that all lights must meet the requirements of 4.A.2, regarding lights in setbacks and the number of lights permitted;
- (7) temporary fixtures installed for less than 30 days, except that, where feasible, such lights should be shielded or directed so as to avoid projecting hazardous or annoying glare beyond property boundaries.

Note the Model Ordinance as presented here permits lighting (even display/sign/advertisement lighting) on facilities open 24 hours a day. Thus facilities such as hospitals, active transportation centers and even 24-hour convenience stores may light all night, though they must meet illumination and spill/trespass requirements. Further, the Model Ordinance permits (shielded) security lighting to remain on all night. Additional discussion is in the Parking Lot section 3.E.1, note 1.

2.B. HEIGHT OF LIGHTS

1. Height of a light fixture shall be measured from ground level to its highest point and shall include the base.
2. Maximum height shall be 25 feet, but in no case higher than the principal building(s).
Lighting fixture height affects aesthetics, installation/maintenance costs, and energy conservation. See the attached Information Paper. Municipalities may wish to be more or less flexible on heights, even to the point of not limiting pole heights at all (as long as illuminance levels, glare and trespass requirements are met).

2.C. LIGHT TRESPASS. To control light trespass onto adjacent properties or streets, the maximum vertical illumination, when measured at a point five feet within the adjacent property line at a height of five feet and facing the light fixture(s), shall be no greater than 0.1 vertical footcandles. ***This permits only a minimal amount of light "spill" onto adjacent properties. Values above 0.1 fc constitute trespass. This value is roughly equivalent to a 150 watt reflectorized incandescent floodlight at a distance of 100 feet. Municipalities may wish to opt for even stricter levels.***

2.D. PLAN REQUIREMENTS. All site plans shall include a lighting plan showing subheadings 1-4 below. In addition, lighting plans for major site plans shall include subheadings 5 and 6:

1. The location and description of every outdoor lighting fixture and hours of operation, their aiming angle and mounting heights
2. A description of the outdoor light fixture including specifications such as lamps,

optics, cutoff angle, supports, poles and manufacturer's catalog cuts for each type

3. Foundation details for light poles

4. A schedule providing for the reduction of on-site lighting during the hours when the facility is not in operation to the levels necessary for security purposes.

5. Maintained horizontal illuminance, in footcandles (after depreciation) including the following: ***New lamps (bulbs) shine brighter at first, then settle in to a lower "maintained" brightness for most of their life.***

a. maximum

b. minimum

c. average during operating and nonoperating hours

d. maximum to minimum ratio

e. average to minimum ratio

6. A computer generated photometric grid showing the light distribution pattern in footcandle readings across the site and at the property line, at ten foot intervals. ***Most developers have the light fixture manufacturer or electric utility create this plan with computer software. A lighting plan may be compared to a topographic map that shows elevations (e.g., mountain heights). On the lighting plan the fc readings would be akin to elevation readings- the higher the fc, the brighter the area.***

2.E. CONSTRUCTION. All lighting fixtures and mounting structures shall be constructed in compliance with applicable construction codes.

3. NON-RESIDENTIAL (COMMERCIAL) USES

3. A. GENERAL:

1. Lighting colors and fixture types shall be consistent throughout the site and shall complement the architectural theme and landscaping of the site. Lighting levels shall comply with IESNA illuminance recommendations.
2. Light sources shall be shielded light fixtures as described in DEFINITIONS. Light fixtures shall not be aligned or focused to illuminate above the horizontal plane, except for fixtures described in 3.A.3 below.
3. Light fixtures used to illuminate flags, statues, or any other objects mounted on a pole, pedestal, or platform shall only use a narrow cone of light that will not extend beyond the illuminated object. In the case of flags that can move in the wind 360 degrees around the pole, the beam angle shall be based on a circle having a radius equal to the width of the flag, except that flags having a width of 12 feet or more shall not be illuminated by a beam with a radius greater than two-thirds of the width of the flag. ***Manufacturers now offer fixtures that can specifically illuminate these types of objects.***
4. Non-essential outdoor lighting fixtures, including display lighting, shall be reduced or turned off within one hour after the close of business. Non-essential outdoor lighting fixtures, including display lighting, which are not turned off at the close of business, shall be reduced or turned off by means of a timer within one hour after the close of business. ***A great deal of commercial lighting is used to advertise, not for security. Only security lights should remain on all night, and, where practical, these should be controlled by infrared sensors, motion sensors, or a security alarm system. However, municipalities with relatively large commercial districts may wish to permit a low level of all-night display lighting that does not violate the glare and/or light trespass provisions.***
5. All outdoor lighting fixtures, once properly installed, shall be permanently affixed in the approved position.
6. The following lighting used for advertising or promotion shall be prohibited:
 - a. search lights
 - b. laser lighting
 - c. lights that pulse, flash, rotate or simulate motion
 - d. lights that simulate traffic control signals
 - e. tower lighting (unless required by the FAA)
7. All lighting shall be subject to a post-development inspection to determine compliance with approved lighting requirements.

3.B. GROUND-MOUNTED BUILDING FAÇADE LIGHTING

1. With the exception of structures that have exceptional symbolic significance such as places of worship or public buildings of historical significance, building façades and other vertical structures shall not be illuminated, beyond the lighting permitted in section 3.A. above.
2. Where such exterior building or vertical structure illumination is permitted, it shall be approved by the Board, based on the following standards:
 - a. the maximum illumination on any vertical surface or angular roof structure shall not exceed [5.0] footcandles.

b. If the building surface is lighted, fixtures mounted on the building itself are preferred. If spot lighting is used, lighting fixtures shall be located, aimed and shielded so that light is directed only onto the building surface. No lighting fixture shall be directed toward adjacent streets.

c. 90% of the light shall be confined to the intended structure. ***This can be measured by standing at the edge of (e.g., corner) or behind a building and seeing if light shines beyond the edges. Municipalities may wish to discourage ground-mounted lighting altogether and instead fully encourage façade lighting with wall/building-mounted lighting.***

3.C. SIGN LIGHTING.

1. Illuminated building identification, other signs or advertisements shall be either internally illuminated or illuminated by shielded light fixtures mounted above the area to be lit.

2. IESNA illuminance and/or luminance recommendations shall not be exceeded. ***Sign lighting provisions should be cross-referenced with and limited by ordinances regulating signs. In the rare cases where top lighting or internal illumination is not feasible and good cause is shown, a design waiver can be granted for ground mounted lighting. The waiver should require that illumination be restricted to the sign area and, when viewed from any road or driveway or from the opposite side of that being illuminated, neither the luminous portions of the light fixture(s) nor any stray light shall be visible.***

3.D. LANDSCAPING. Where landscaping is to be illuminated, the Board shall first approve a landscape lighting plan. The plan must demonstrate that 90% of the light generated will be confined to the landscaping. A timer shall control all such landscape lighting and the Board shall approve the timing schedule.

3.E. PARKING AREAS

1. Parking Lots. Parking lot lighting shall provide adequate illumination and minimize glare and light trespass. Parking lot lighting shall meet the following illumination standards:

Parking Lots*	<u>Basic</u> ¹	<u>Enhanced Security</u>
	(Levels in footcandles)	
Minimum Horizontal Illuminance ²	0.2	0.5
Average Horizontal Illuminance ³	1.0	2.5
Uniformity Ratios (Horizontal Illum) ⁴		
Average to Minimum	5:1	5:1
Maximum to Minimum	20:1	15:1
Minimum Vertical Illuminance ⁵	0.1	0.25

Notes:

* Adapted From RP-20-98 Lighting for Parking Facilities prepared and published by the IESNA, New York, NY, 1998.

1. For typical conditions. The illuminance of parking facilities should be turned off

or reduced to security-only levels, during periods of non-use. The minimum (low point) value should not be less than 0.1 horizontal footcandle in susceptible areas of the property. Reductions should not be applied to facilities subject to intermittent night use.

2. Measured on the parking surface, without any shadowing effect from parked cars or trees.

3. Average horizontal illuminance shall not exceed 2.5 footcandles.

4. Uniformity ratios are to be used as a guide.

5. Measured at 5.0 feet above the parking surface at the point of lowest illuminance, excluding facing outward along the property lines. ***Rule of Thumb: Neither the minimums nor the maximums should be exceeded to ensure safe and adequate lighting. Uniformity ratios may be flexible to ensure the max / min illuminances are within the ranges. Designers/developers should start with a plan based on averages, then work out the details from there.***

2. Parking Garages. Parking Garage lighting shall not exceed IESNA illuminance and uniformity recommendations.

4. RESIDENTIAL USES

4.A. General:

1. Existing outdoor light fixtures that cause objectionable glare may be adapted to comply with this ordinance by adding a properly designed hood or shield, or by re-aiming the fixture.
2. Outdoor light fixtures shall not be located within the side yard setbacks or within the rear yard setbacks or 20 feet of the rear property line, whichever is less. The total number of exterior lamps located in front of the house (defined as including the front facade of the main house and extending outward to the front property line) shall be no more than 10 lamps., and the total number on the entire property shall be less than 15 .
Municipalities with high-density residential areas may wish to opt for different standards.

4.B. Security Lighting. Security lighting shall be controlled and activated by infrared sensors, motion sensors, a security alarm system or a panic button.

4.C. Decorative Lighting:

1. Whenever practicable, accent, architectural or building lighting shall be directed downward onto the building or object and not toward the sky or onto adjacent properties. Direct light emissions shall not be visible above the roof line or beyond the building/object edge.
2. Any accent, architectural or building lighting that is not regularly turned off by 10 p.m. shall be equipped with an automatic timer to ensure that it is off by 11 p.m.
3. Spotlighting on landscaping and foliage shall be confined to the target landscaping as much as possible and conform to the limitations/definition of Objectionable Direct Glare Source.

4.D. Enforcement: Residential Lighting may be enforced on the basis of a valid, formal complaint filed in writing with the Planning and Zoning Department.

5. AGRICULTURAL USES

5.A. Lighting on farms shall in general conform to the provisions of Section 4, Residential Uses. However, some farm activities require outdoor lighting which differs from what would typically be installed on a residential property.

5.B. Farm activities such as farmstands, Christmas tree farms, and agritourism, when they involve the entry onto the property of members of the public after dark, require adequate lighting for the outdoor areas used by employees, farmers, and customers. Appropriate fixtures should be provided for parking lots, walkways, display/sales areas and other facilities in use after dark in connection with the activity. The provisions of 3.E.1. Parking Lots may be used as a guide in providing such lighting. Due to the seasonal nature of many such activities, fixtures may be either permanent or temporary installations, but in both instances shall be shielded whenever possible. Such lighting shall have directional and glare control features, when necessary, to comply with Light Trespass requirements, and shall be turned off at the close of business.

5.C. Certain farm operations, such as harvesting, maintenance, loading and unloading of equipment, and care of large animals may take place during night hours and require appropriate outdoor lighting. Such lighting shall be shielded whenever possible, shall have directional and glare control features, when necessary, to comply with Light Trespass requirements, and shall be turned off when the activity is completed.

Devices to control glare or light trespass situations for seasonal or short-duration farm uses do not need to be commercially approved products. For example, a self-manufactured shield made from a clamp and a piece of sheet metal or opaque plastic would suffice so long as it controlled glare and light spillage and was strong enough to stay in position. Some activities, such as bringing large animals in from pasture at night, may require lighting which is less than optimally shielded, but should be directed so as to avoid spillage onto neighboring properties.

6. RECREATIONAL AND SPORTS FACILITIES

6.A. Recreational and sports facility lighting shall be shielded whenever possible. Such lighting shall have directional and glare control devices, when necessary, to comply with Light Trespass requirements. ***Several manufacturers offer very good “cutoff” sports lights that provide excellent field illumination and also minimize glare and trespass.***

6.B. All lighting for sports or recreational facilities, excluding security lighting, shall be equipped with automatic timing devices to turn off the lighting within one hour of the end of sports activity or the established closing time of the facility.

NOTE: IES publishes RP-6-01 “Sports and Recreational Area Lighting” that addresses lighting for nearly every type of sports activity. (E.g., what is the recommended illumination for a little league ballfield? A municipal/amateur ballfield? A pro ballfield?) Rather than list all possible sports areas/activities in this ordinance, or recommend IES levels be adhered to, municipalities can use the two paragraphs above as-is, or add IES detailed requirements themselves.

7. ROADWAY LIGHTING

7. A. Roadway lighting will occur at the discretion of the designated municipal entity when it provides a valid public benefit. Roadways shall only be illuminated after demonstration that passive devices (reflective signs, shoulder markers, center/shoulder lines, etc) are insufficient.

7.B. Streetlight Types: All new and replacement streetlights, including decorative streetlights, shall be shielded light fixtures. ***Many manufacturers now offer shielded/cutoff roadway lighting, in both “highway style cobra-head” lighting and decorative/antique/reproduction fixtures.***

7.C. Illuminance Levels:

1. Partial Streetlighting: Partial streetlighting shall not exceed IESNA levels for average illumination.

2. Continuous streetlighting: Average IESNA illuminance recommendations shall not be exceeded. IESNA average to minimum illuminance uniformity ratios shall be used as a guide for designing safe and adequate roadway lighting.

More rural municipalities may opt for no roadway lighting at all or minimal/partial lighting at only the most hazardous areas. The Hunterdon County Department of Roads, Bridges and Engineering first considers passive devices before turning to lighting.

Granted most roads in Hunterdon are controlled either by NJDOT or the county. However there may be instances where a resident requests a streetlight on a local street, or a developer proposes streetlighting in a new development. In those instances the ordinance should be employed.

Further, the ordinance may even be employed for state and county roads if the municipality advises the NJDOT/county that a local roadway lighting ordinance exists and requests NJDOT/county to adhere to its requirements. NJDOT has a “cutoff lighting first choice in design” policy that can complement a local roadway lighting ordinance. Communication is the key to having NJDOT and/or the county cooperate with the municipality on roadway lighting.

POLE HEIGHT DISCUSSION

Some communities may feel the need to specify limits on the heights of lighting poles. The following paragraphs should help communities decide how to address pole heights.

If the intention is to limit the daytime visual impact of tall light poles against landscape views, then shorter poles may help. But uniformity requirements (no areas too bright or too dim) may offset any aesthetic gains by causing an increase in the number of poles, and also increase installation/operation costs and limit/hinder energy conservation. More (lower) poles may also increase the amount of visual clutter during both the day and night.

Lights affixed to higher poles spread light over a wider area than lights affixed to shorter poles. Higher poles can utilize higher-wattage lamps, which are more energy efficient than lower wattage sources. Commercial lighting technology has come a long way and even lights on tall poles are available with sharp cutoff designs or shields that can effectively limit glare and light trespass. See the comparison images below



Four lights on 16-foot-high poles needed to evenly illuminate given area.



Two lights on 25-foot-high poles needed to evenly illuminate same area.

While smaller areas (parking lots of professional buildings and small strip malls) can most likely be adequately illuminated with pole heights less than 20', on the other hand larger areas (regional malls, large car dealerships and athletic fields) would be much more efficiently illuminated with lights on 25' to 35' poles, and even 50' poles for very large malls. Further, for effective, efficient aerial sports (e.g., baseball) field illumination IESNA recommends a minimum 70' pole height. Ordinance requirements for light trespass, illumination levels and uniformity can and must still be met.

In general, it is not recommended that a lighting ordinance limit pole heights. With good designs using fully shielded lights, poles with heights up to about 35 feet are minimally obtrusive in most situations. It is generally not recommended to restrict heights to below 25 feet.