

Town of Cary, North Carolina

Community Appearance Manual

Landscape, Lighting, and Statement of Architectural Compatibility



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February 1, 2003

Revised:

LIGHTING

Town of Cary **Community Appearance Manual**

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Purpose

The Town of Cary desires to enhance the beauty of the area for its citizens, both during the day and at night. This includes the restriction of light trespass, light pollution and glare so that safety and security will not be jeopardized and night vision will be enhanced. Lighting plans should be developed in conjunction with landscape plans, and coordinated so that potential conflicts between utility lines and plant materials are avoided, light is not blocked by tree canopies, and existing vegetation is protected by the use of established, shared, utility corridors.

Process

The Town of Cary requires that Lighting Plans be submitted as a part of their development plan approval process.

Applicability

These standards apply to both nonresidential and residential uses.

Required Lighting Plan Sheet Standards

- Shall be drawn clearly and legibly
- Sheet size 24" x 36"
- Number of sets submitted for new sites as required by the Planning Department; one set for revised lighting plan on an approved development plan or on an existing developed site
- All measurements in imperial units (inches, feet, etc.)

Required Elements to be Shown on Lighting Plan Sheets

- Proposed Lighting
 - Symbols designating type, size, and location
 - If symbols are used, include a lighting key on the right hand side of each lighting sheet
- Graphic representation and written description of each type of illuminating device, fixture, lamp, pole, support, reflector, and other devices (This may include, but is not limited to, catalog cuts by manufacturers and/or specification drawings.)
- A point-by-point footcandle diagram on a ten foot by ten foot grid that indicates the footcandles at the finish grade that cover the site and associated areas just beyond the property line to indicate the amount of light trespass
- Iso-footcandle curve may be used on projects with only two lights
- Photometric summary table showing maintained footcandles - minimum, maximum and average (The table must also show average to minimum uniformity ratio. Show max to min uniformity ratio and vertical footcandles where needed to meet specific requirements such as parking garages, walkways, etc.)
- Mounting height for each type of fixture plus raised foundation where applicable
- IESNA fixture cutoff classification for each fixture type

Required Submissions

- Statement that all site lighting will be installed in compliance with the Town of Cary standards (This statement shall be verified by a Town of Cary Inspector.)
- Show light locations on Landscape Plan

SITE LIGHTING LOCATIONS

Outdoor Lighting

Outdoor site lighting shall be selected, designed, located and installed so that light trespass onto public rights-of-way and nonresidential property adjoining residential property is significantly limited and direct glare is minimized.

Nonresidential Areas

The commercial areas shall comply with the prescriptive and performance criteria set forth in the outdoor lighting sections.

Nonresidential Parking Areas Contiguous to Public Streets and Roads

All outdoor lighting shall be designed and located such that the commercial parking lights must be at least 5 feet away from the public rights-of-way, or the light fixtures must be equipped with house-side shields, or the fixtures must provide a forward throw (IES Type IV) light distribution pattern.

Nonresidential Property Adjoining Residential Property

All outdoor lighting shall be designed and located such that the maximum illumination shall not exceed 1.5 maintained horizontal footcandles (FC) at the property line for cutoff lights and 0.4 for noncutoff lights.

(Note: *Maintained* footcandles account for light loss factors such as lamp lumen depreciation and luminaire dirt depreciation so new installations will not be unfairly penalized because no depreciation has taken place when checked.)

Public Rights-of-way

All lighting designs shall meet the requirements outlined in the current Policy Statement 13 - Street Lighting. As stated in Policy 13, the placement of street lighting along thoroughfares, marginal access streets and collector streets and in nonresidential areas shall be in accordance with the latest revision of the Illuminating Engineering Society's American National Standard (ANSI) for Roadway Lighting.

SITE LIGHTING LOCATIONS

Outdoor Lighting

Outdoor Sales Areas

Some businesses use an outdoor area to display the products they sell. An example would be an auto dealership. The following recommendations derived from the IESNA-RP-33-99 for these types of businesses will apply.

Table LG-1

Automotive Sales Areas		
	Maximum Illuminance on Pavement <i>(foot candles)</i>	Average to Minimum Ratio
Business Districts (highly competitive) <ul style="list-style-type: none"> • Adjacent to roadway • Other rows • Entrances • Driveways 	10-20 5-10 3-10 2-3	5:1 10:1 5:1 10:1

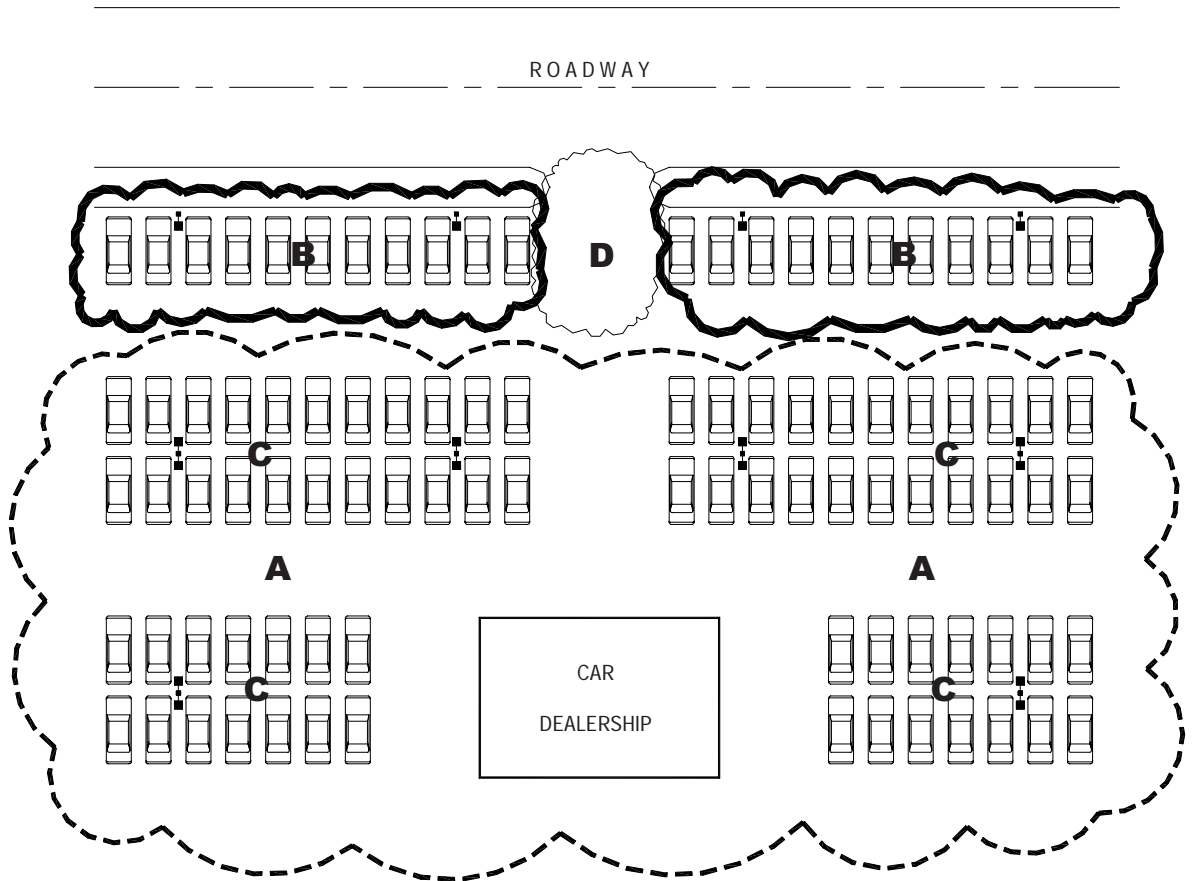
Canopies – Gas and Convenience Stores

Lighting levels for convenience stores, gas stations, etc. shall be adequate to facilitate the various activities taking place in such locations. Any illumination must comply with Town LDO requirements.

- Light fixtures shall be installed so that the lens cover is recessed or flush with the bottom surface (ceiling) of the canopy or flush with the bottom of the fixture if surface mounted (The canopy lip will extend down as necessary so that light is restrained to no more than 85 degrees from vertical)
- The light level shall not exceed 12 footcandles average maintained at the perimeter of the canopy and measured at ground level
- Lights shall not be mounted on the top or sides (fascias) of the canopy, and the sides (fascias) of the canopy shall not be illuminated

SITE LIGHTING LOCATIONS

Outdoor Lighting - Automotive Sales Area



- A** DRIVE AISLES (2 - 3 FC)
- B** CARS NEXT TO ROADWAYS (10 - 20 FC)
- C** CARS ELSEWHERE ON LOT (5 - 10 FC)
- D** DRIVEWAY (3 - 10 FC)

NOTE

1. Maximum foot candles at property line must still be maintained.

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LG-1

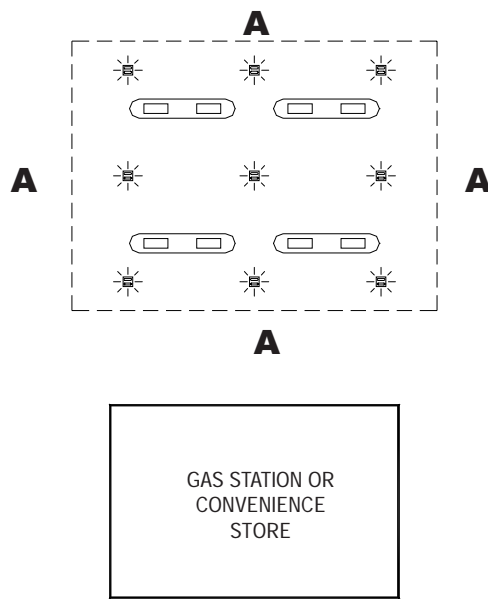
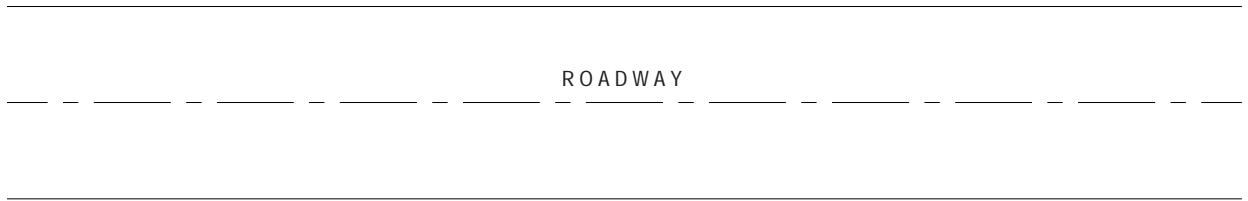
LIGHTING

Town of Cary **Community Appearance Manual**

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SITE LIGHTING LOCATIONS

Outdoor Lighting - Canopies for Gas and Convenience Stores



A LESS THAN OR EQUAL TO 12 FC
(average maintained under canopy)

NOTE

1. All fixtures are to be the same wattage.

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DETAIL NO:

LG-2

LIGHTING

SITE LIGHTING LOCATIONS

Outdoor Lighting

Open Parking Facilities

For lighted parking lots the minimum light level shall be no less than 0.2 footcandles. All light levels are measured at ground level. The minimum light level requirements vary depending on the activity classification. The specified minimum FC value outlined in the following table means that the lowest light level point or location in the parking lot must not exceed the minimum stated FC value or highest FC value if a range is specified. An average to minimum uniformity of 4:1 means that the average FC to minimum FC ratio cannot be worse (higher) than 4:1. The minimum FC plus the uniformity ratio indirectly limits the highest amount of light allowed.

Table LG-2

Source: Modified from the IESNA Lighting Handbook 8th edition

Light Levels for General Open Outdoor		
Use/Task	Maintained Footcandles	Uniformity Avg/Min
(a) Parking, residential, multi-family <ul style="list-style-type: none"> • Low to medium vehicular/pedestrian activity 	0.2 Min. to 0.7 Min.	4:1
(b) Parking, industrial/commercial/institutional/municipal <ul style="list-style-type: none"> • High activity, i.e. large/regional shopping centers/fast food facilities, major athletic/civic cultural events • Medium/low activity, i.e. community shopping, office parks, hospitals, commuter lots, cultural/civic/recreational events, residential neighborhood shopping, industrial employee parking, schools, church parking 	0.9 Min. 0.2 Min. to 0.7 Min.	4:1 4:1

NOTES

1. Illumination levels are horizontal on the task, e.g. pavement or area surface.
2. Uniformity ratios dictate that average illuminance values shall not exceed minimum values by more than the product of the minimum value and the specified ratio. For example, for commercial parking medium/low activity, the average maintained footcandles shall not be in excess of 2.8 (0.7 x 4).
3. A low/medium activity can be reclassified upward when appropriate with Cary Planning Department approval.
4. The tabular form covers the vehicular use area only. The actual lighting plan should show illumination for the entire site to the property lines.

SITE LIGHTING LOCATIONS

Outdoor Lighting - Open Parking Facility for Med /Low Activity



MUST NOT EXCEED:
0.7 FC (LOWEST POINT)
2.8 FC (AVERAGE OF ALL POINTS)

REF SEC:

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DETAIL NO:

LG-3

LIGHTING

SITE LIGHTING LOCATIONS

Outdoor Lighting - Recreation Facilities

Sportsfields and Tennis Courts

Lighting for sportsfields and tennis courts is generally in excess of general outdoor lighting levels. Recreation lighting levels established by the IESNA are to be used as the standard. Higher lighting levels for tournament or high league play are sometimes required and must be approved by the Town prior to construction. All sportsfields and tennis courts must meet the following minimum standards.

- Fixtures must not exceed 80 feet in mounting height (this includes bases and/or other mounting structures) unless approved by the Town of Cary Planning Department
- Fixtures must be fitted with the manufacturer's glare control package. If the manufacturer does not have a glare control package, the fixture specification must be changed to a manufacturer that offers a glare control package
- Fixtures must be designed with a sharp cutoff and aimed so that their light beams fall within the primary playing area and the immediate surroundings, so that off-site direct illumination is significantly restricted
- Lighting shall be extinguished no later than one hour after the event ends
- Town of Cary will have flexibility if facilities are not in the vicinity of residential development

Walkways, Greenways, and Bikeways

Proper lighting of walkway and bikeway areas is essential to their safe and comfortable use by pedestrian (herein assumed to include joggers and those on bikes and rollerblades). Many walkways and bikeways are adjacent to lighted roadways and no separate lighting system is required. If the roadway lighting does not adequately serve the walkway because of landscape obstructions or elevation changes, additional lighting may be required.

Crosswalks traversing roadways in the middle of long blocks and at street intersections should have specific illumination. Average vertical illuminance levels for special pedestrian security should be maintained. Also in areas of special security concerns where there are marginal areas such as between building fronts, or dense shrubbery, it is recommended that the area bordering these walkways for a width to 2 to 5 meters (6.5 to 16.5 ft.) on each side be lighted to at least one-third the level suggested for the walkway.

Walkways not adjoining roadways, and having minimal non-pedestrian traffic, need not be lighted continuously. Only hazards along the walkway such as stairs, abrupt changes in elevation, bridges, and curves should be lighted. Alternately, lighting the landscape on either side of the walkway is an acceptable method, since it lights the walkway surroundings. Lighting only the termination or resting points along the walkway is another useful technique. This approach gives pedestrians a visual clue about where important destinations are located.

Walkways in the middle of a park or large landscaped area need not be lighted continuously. Here a unique blend of lighting is required that covers key landscape features, selected buildings or shelters, resting points and any walkway hazards (e.g. stairs, abrupt changes in elevation, bridges, and curves). When the entire park scene is lighted, pedestrians can adequately see potential hazards in plenty of time. Careful design is needed to minimize disability glare from luminaires and to avoid lighting objects so they are seen only in silhouette.

BUILDING LIGHTING LOCATIONS

Parking Garage Facilities

Table LG-3

Recommended Maintained Illuminance for Parking Garages (Source: IESNA 9th Edition Handbook)		
	Minimum Horizontal Footcandle ⁽²⁾ <small>Footcandle ⁽⁴⁾</small>	Max to Min Horizontal Uniformity Ratios ⁽³⁾
Basic ⁽¹⁾	1	10:1
Ramps ⁽⁶⁾		
Day ⁽⁷⁾	2.0	10:1
Night	1.0	10:1
Entrance Areas ⁽⁸⁾		
Day	50	
Night	1.0	10:1
Stairways	2.0	

FOOTNOTES

- ¹ For typical conditions. While these values are intended to address personal security issues, some retailers may increase them to further offset perceived concerns. Top levels of garages open to the sky shall be less than 0.7 fc with an average to minimum uniformity ratio of 4:1 horizontal and 0.25 fc min vertical illuminance (source IESNA 9th edition handbook). The mounting height on the top level of a garage shall not be greater than 22 feet above the parking deck top floor including raised foundations and the light fixture classification shall be full cutoff.
- ² Measured on the parking surface, without any shadowing effect from parked vehicles or columns. For preliminary design, an average value of 50 horizontal lux (5 horizontal fc) for basic illuminance (and equivalent for other conditions) may be calculated.
- ³ The highest horizontal illuminance area, divided by the lowest horizontal illuminance area, should not be greater than the ratio shown.
- ⁴ Measured at 1.5 meters (5.0 ft.) above parking surface at the point of lowest horizontal illuminance, excluding facing outward along boundaries.
- ⁵ Applies to clearway ramps (no adjacent parking) but not to sloping floor designs.
- ⁶ Daylight may be considered in the design calculation.
- ⁷ A high illuminance level for about the first 20 meters (66 ft.) inside the structure is needed to effect a transition from bright daylight to a lower internal level.

Building Canopies

See section on Canopies.

Facades

The Purpose of lighting facades and building elements is to accent features. It is not to cause off-site glare or to light the entire building or facade.

- Minimum illumination on any vertical surface or angular roof shall not exceed 5.0 footcandles average maintained
- Lighting fixtures shall be carefully located, aimed, and shielded so that light is directed only onto the building façade (Lighting fixtures shall not be directed toward adjacent streets or roads. The use of 60 to 100 watt lighting and decorative ‘jelly jars’ is acceptable)
- To the extent practicable and where possible, lighting fixtures shall be directed downward rather than upward
- When upward aiming is used, placing low wattage fixtures with shields as needed close to the building to graze the façade is encouraged to minimize reflected light from windows and other surfaces that would be present from a flood design (Accenting architectural building elements is acceptable.)
- No lighting beams or bands are allowed on roofs or sides of buildings
- Flooding or washing entire walls with lighting is not allowed
- Floodlights or other lighting attached to poles to illuminate buildings is prohibited

These standards are usually set by selecting and/or restricting the type of equipment, mounting height limit, lamp lumens and other quantitative specifications associated with a lighting project. These standards are outlined below and throughout the lighting section of this Manual.

Fixture Types

There are many types of fixtures available on the market. Outlined below are various fixture types allowed in Cary. See pictures of various types of site and roadway fixtures in Detail LG-4.

- Flood
- Cobra head cutoff
- Decorative post light – noncutoff, cutoff and full cutoff
- Shoebox
- Cutoff wall packs

Fixture Cutoff Classifications

These classifications are defined by the IESNA and generally describe how the light intensity is distributed out of the fixture. This distribution has significance when specifying limits on light trespass and light pollution. The Town of Cary has approved the use of noncutoff and cutoff pole mounted fixtures. The mounting height for noncutoff fixtures shall be no greater than 16 feet. For cutoff fixtures, the mounting height shall be no greater than 35 feet. If a raised foundation is required in parking areas to protect the poles from automobile front bumpers, the raised foundation and pole may not exceed heights of 18 and 37 feet respectively.

Wall Packs

Wall pack fixtures on buildings may be used at entrances to a building to light unsafe areas. They are not intended to draw attention to the building or provide general building or site lighting. Wall packs on the exterior of the building shall be shielded (cutoff) so the light source (lamp) is not visible from off-site. Noncutoff wall packs are not approved for use.

Light Pollution

This usually describes upright or light that is spilling beyond its intended target and into the night sky. Examples might be a lighted sign or ground mounted building façade lighting. Light pollution can come from direct light going up or bounce light that hits the ground or pavement and then goes up. Full cutoff type fixtures required for signs will restrict all direct upright above horizontal, however there may be more contribution from bounce light since more of the direct light is directed downward coming out of the full cutoff fixture.

Mounting Height

The mounting height is defined as the distance from the ground to the center of the light source. The maximum mounting height for general outdoor lighting projects in the Town of Cary is 35 feet. An additional raised base not to exceed two feet is allowed pole protection is needed such as in parking lots. The maximum allowed height is 37 feet including a raised foundation. There is not a minimum mounting height restriction. Exceptions include sportsfields, tennis courts, and other approved hi-mast lighting installations.

Pole Design

The poles shall be designed and be of such strength to withstand normal weather conditions and wind not to exceed 90 miles per hour with gusts up to 120 miles per hour. They may be tapered or non-tapered. Approved materials may include but not be limited to fiberglass, steel, aluminum concrete, iron, and wood. Custom colors are also allowed provided they blend with the site and community where they are to be installed.

Pole Locations

Poles shall be located and fixtures aimed so that glare to passing motorists and others in any given area is minimized.

Lamp Lumens and Wattages

Specific lamp lumens and wattages are not required, however there will be indirect limitations placed on certain sizes through the performance criteria outlined later in this Manual.

Light Sources

Any light source may be used provided it has a minimum color rendering index of 21 or higher. This excludes low pressure sodium from use.

Exemptions

Exceptions to these required measures may be filed with the Town of Cary Planning Department. If justification is warranted, exceptions not outlined here may be granted.

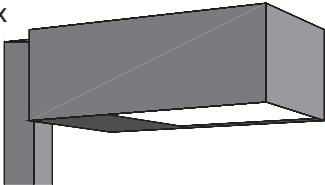
Grandfather Clause

- All development plans submitted after February 1, 2003 and any future projects will be required to comply with the requirements set forth in this Manual beginning with the date of enactment by the Town of Cary (February 1, 2003)
- All approved development plans under construction prior to the enactment of these requirements and all approved and completed projects are considered “grandfathered” which means that no changes are required in the existing lighting system (Maintenance on individual fixtures to include all fixture components [not including fixture housing] is permitted. A change in or replacement of the lighting system will require compliance. A change in light source is considered a lighting system change. In other words, the Owner may do normal maintenance of existing lighting - replace burned out lights, etc.)

STANDARDS

Fixture Types

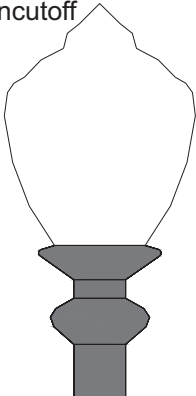
Shoebox



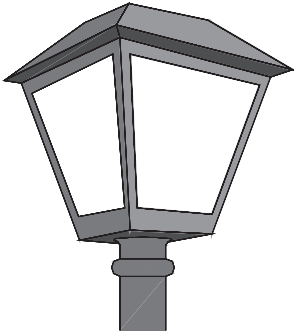
Cobra Head Full Cutoff



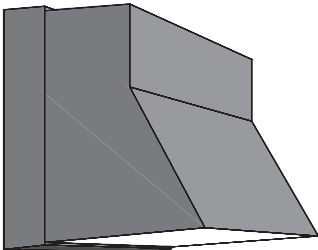
Decorative Acorn Post Noncutoff



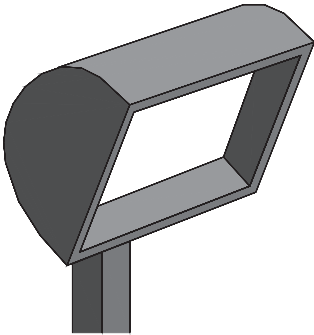
Decorative Colonial Post Noncutoff



Full Cutoff Wall Pack



Flood



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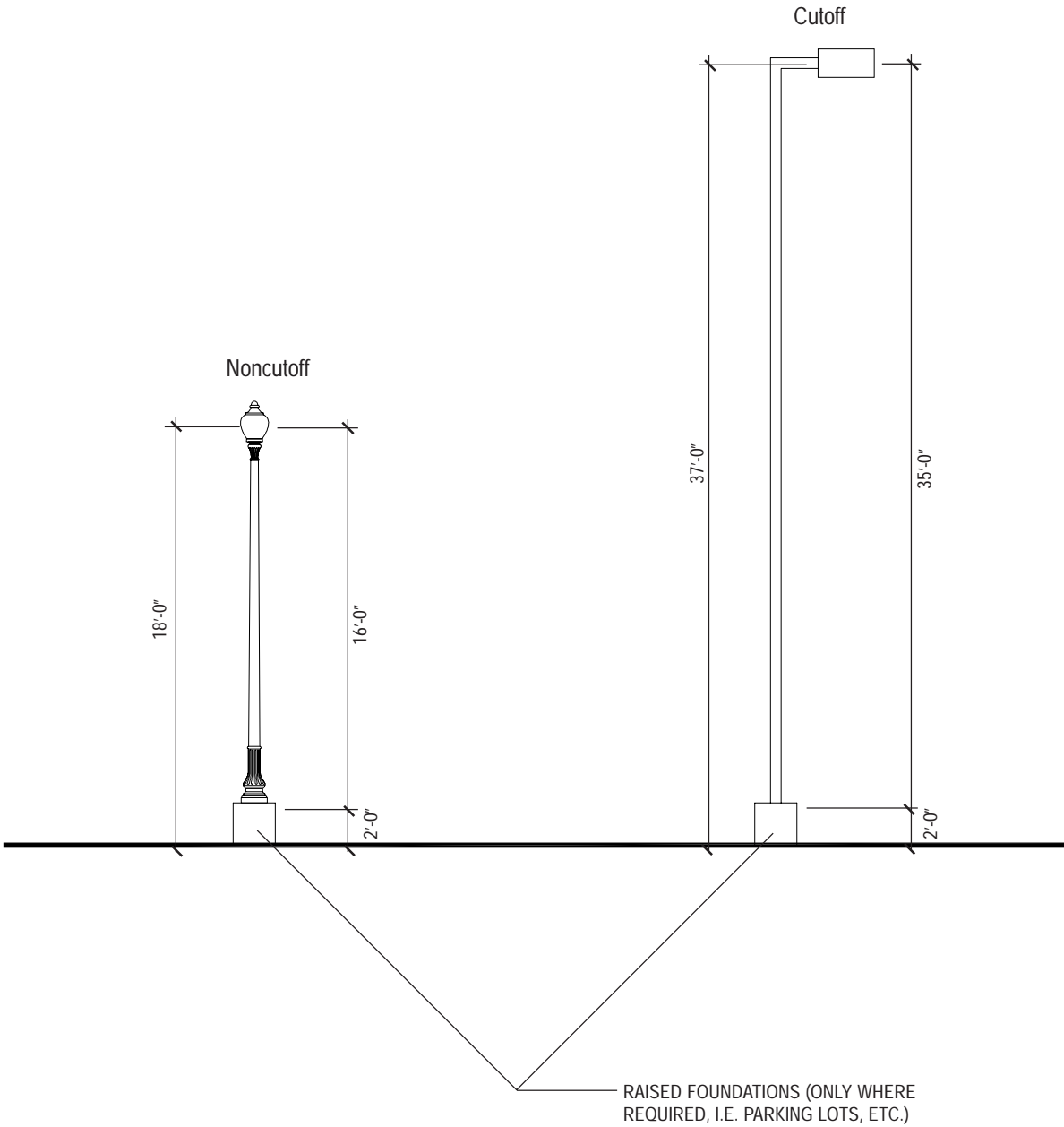
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LG-4

LIGHTING

STANDARDS

Off-roadway Maximum Mounting Heights



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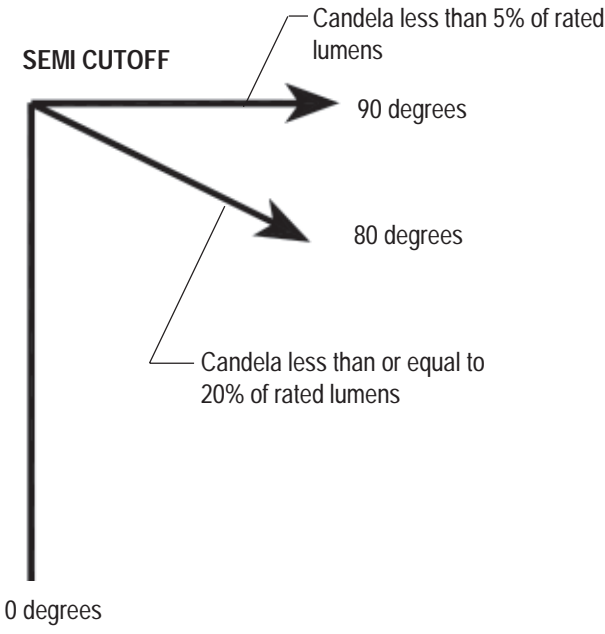
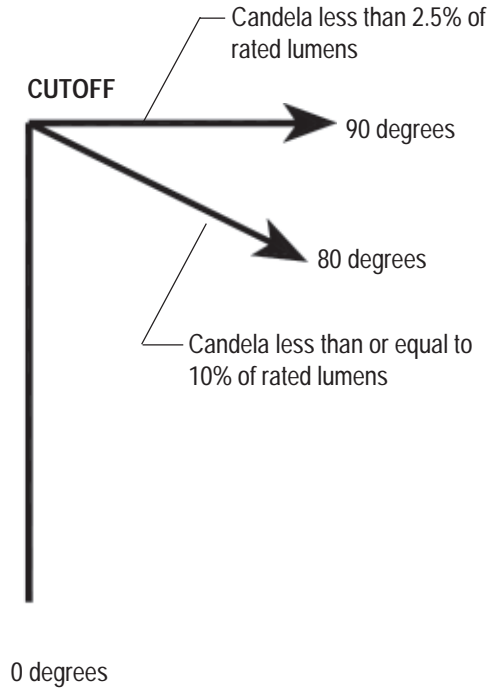
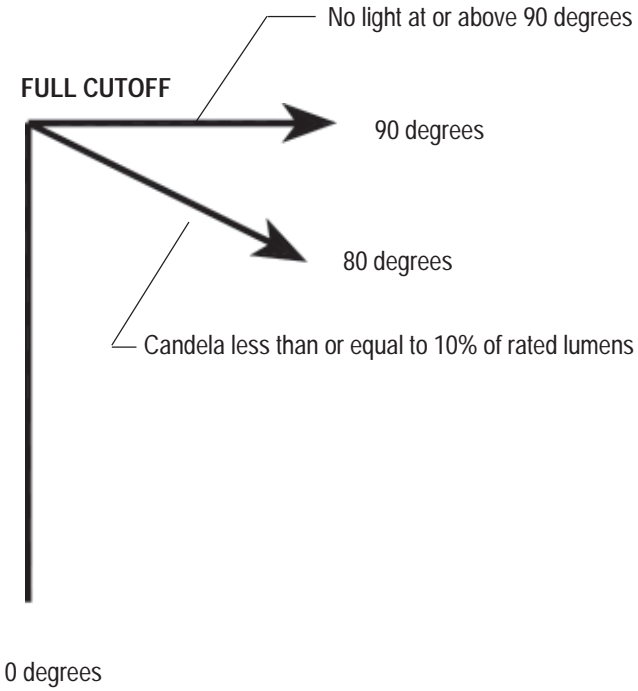
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LG-5

LIGHTING

STANDARDS
Cutoff Classifications



Source: ANSI/IESNA RP-8-00

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DETAIL NO:
LG-6

Light Levels

See section under **Site Lighting Locations** for reference to various performance criteria for the most common activities. If an application is not listed/discussed here, consult the IESNA 9th edition handbook for guidance or later approved edition.

Light Loss Factors

Light loss factors are allowed to adjust/compensate for the loss in light output as the lamp ages and the dirt accumulation in the fixture as it remains in service in the outdoor environment. The following chart outlines typical light loss factors used in the lighting industry for average dirt buildup conditions. If lower (more aggressive) factors are used, they must be approved by the Town of Cary Planning Department.

Table LG-4

Light Loss Factors	
Light Source	Typical Light Loss Factor
High Pressure Sodium (HPS)	.72
Metal Halide (MH)	.64
Mercury Vapor	.64

Uniformity Ratio

The uniformity ratio describes the smoothness of the lighting pattern. The most used ratios include average to minimum (Ave/Min) and maximum to minimum (Max to Min). The Ave/Min compares the average maintained footcandles to the minimum footcandle point in the lighted area. The requirement is 4:1 as the maximum allowed. A lower number such as 3:1 would provide a more smooth (better) uniformity and therefore would be automatically approved if 4:1 was the requirement. A higher ratio of 5:1 would provide less uniformity than 4:1 and will not meet a 4:1 requirement.

Lighting Curfews

The only Town of Cary lighting curfew (a given time of night when lighting must be turned off) applies to sportsfields. Otherwise dusk-to-dawn operation is acceptable.

Light Trespass

This term generally refers to unwanted light going beyond the property line and spilling over onto the neighboring property. It can also represent the direct light (glare) that reduces a person's vision or ability to see. Light trespass is addressed in other sections of this Manual and in the **Prescriptive** sections.

DEFINITIONS AND ABBREVIATIONS

Average to Minimum The ratio of average footcandles to the minimum footcandle point calculation or reading for a given area. This ratio is generally maintained footcandles but could be initial. This ratio is an indicator of lighting uniformity. The lower the ratio the better the uniformity.

Candlepower Luminous intensity. Candlepower is normally associated with a directional type fixture such as a floodlight.

Cutoff A luminaire light distribution where the candela per 1,000 lamp lumens does not numerically exceed 25 (2.5%) at a vertical angle of 90 degrees above nadir and 100 (10%) at a vertical angle of 80 degrees above nadir. This applies to all lateral angles around the luminaire.

Direct Light Light emitted directly from the lamp, off of the reflector or reflector diffuser, or through the refractor or diffuser lens, of a luminaire.

Fixture The assembly that houses the lamp or lamps and can include all or some of the following parts: housing, mounting bracket or pole, socket, lamp holder, ballast, reflector or mirror, and/or refractor or lens.

Flood or Spotlight Any light fixture or lamp that incorporates a reflector or a refractor to concentrate the light output into a directed beam in a particular direction with a wide or narrow beam. (These fixtures and lamp types are generally not allowed within the Town of Cary.)

Footcandle(s) The amount of light falling on a surface (measured or calculated). It can be quantified as one lumen per square foot. For an approximate conversion from lux to footcandles, divide by ten. The exact conversion is 10.76 lux equals one footcandle.

Footcandles (Initial) Footcandles that are calculated with no adjustment for dirt buildup in the fixture or lamp lumen depreciation. Initial footcandles should be measured when a lighting system is new and after 100 hours of lamp burn-in time. Car dealerships are often designed to initial footcandles.

Footcandles (Maintained) Footcandles that are calculated with an adjustment for a maintenance factor to include dirt buildup in the luminaire (fixture) and lamp lumen depreciation. The system is in effect over designed initially and then over time falls to a maintained footcandle level.

Footcandles (Average) The average of a number of points of footcandle calculations or footcandle readings in a given area. They could be initial or maintained.

Footcandles (Average Maintained) The average of a number of points of footcandle calculations or footcandle readings in a given area which have been adjusted to account for maintenance which includes luminaire dirt depreciation (LDD) and lamp lumen depreciation (LLD).

Full Cutoff A luminaire light distribution where zero candela intensity occurs at an angle of 90 degrees above nadir, and at all greater angles from nadir. Additionally, the candela per 1,000 lamp

DEFINITIONS AND ABBREVIATIONS

lumens does not numerically exceed 100 (10%) at a vertical angle of 80 degrees above nadir. This applies to all lateral angles around the luminaire.

Glare Light emitting from a luminaire with an intensity great enough to reduce a viewer's ability to see, and in extreme cases causing momentary reduction in sight.

Indirect Light Direct light that has been reflected or has scattered off of other surfaces.

Lamp The component of a luminaire that produces the actual light.

Light Trespass The shining of light produced by a luminaire beyond the boundaries of the property on which it is generally located and intended.

Lumens The total quantity of light emitted from a light source. One footcandle is one lumen per square foot. For the purpose of this ordinance, the lumen-output values shall be the INITIAL lumen output ratings of a lamp as listed in a lamp catalog.

Luminaire This is a complete lighting system, and includes a lamp or lamps and a fixture housing, reflector(s), refractor, etc.

Luminance What we commonly call brightness or the light coming from a surface. Luminance is composed of the intensity of light striking an object or surface and the amount of that light reflected back toward the eye. All surfaces have some reflecting qualities and therefore have luminance, light surfaces being more reflective than dark surfaces. The luminance of asphalt pavement and the moon can both be measured.

Lux A measurement of light falling on a given surface. One lux is one lumen per square meter. For an approximate conversion from lux to footcandles, divide by ten. The exact conversion is 10.76 equals one footcandle.

Max to Min The ratio of the maximum footcandle point calculation or reading to the minimum footcandle point calculation or reading for a given area. This ratio is generally maintained footcandles but could be initial. This ratio is an indicator of lighting uniformity. The lower the ratio the better the uniformity.

Maximum The maximum footcandle point calculation or reading in a given area. The maximum is generally maintained footcandles but could be initial.

Minimum The minimum footcandle point calculation or reading in a given area. The minimum is generally maintained footcandles but could be initial.

Mounting Height of Luminaire The mounting height of a luminaire shall be the vertical distance from the ground directly below the centerline of the luminaire to the center of the light source (lamp) in the luminaire.

DEFINITIONS AND ABBREVIATIONS

Noncutoff A luminaire light distribution where there is no candela limitation in the zone above maximum candela.

Outdoor Lighting The nighttime illumination of an outside area or object by any man-made device located outdoors that produces light by any means.

Pre Existing Luminaries Luminaries not conforming to this ordinance that were in place at the time this ordinance was voted into effect.

Semicutoff A luminaire light distribution where the candela per 1,000 lamp lumens does not numerically exceed 50 (5.0%) at a vertical angle of 90 degrees above nadir and 200 (20%) at a vertical angle of 80 degrees above nadir. This applies to all lateral angles around the luminaire.

Temporary Outdoor Lighting The nighttime illumination of an outside area or object by any man-made device located outdoors that produces light by any means for a limited period of time. This period can be specified by the Town.

Uniformity A description of the smoothness of the lighting pattern or the degree of intensity of light and dark areas in the roadway or area to be lighted. Uniformity is usually expressed as a ratio such as max to min or average to min. The lower the ratio the more uniform the lighting design.

Veiling Luminance The effect of stray light in the eye whereby visibility and visual performance are reduced. There is a reduction in contrast of a focused image on the retina of the eye. This reduction of an image from scattered light can be mimicked by adding a uniform “veil” of luminance to the object, the effect is considered to be equivalent to a veiling luminance or disability glare. An example of this is this would be with oncoming automobile headlights. Every luminous point in space acts as a source of stray light for nearby points, lines, and borders and reduces their contrast.

Veiling Luminance Ratio Ratio of the maximum veiling luminance of the light fixture in question in the area that is being lighted to the average luminance of the area being lighted. The higher the ratio the worse the disability glare and the lower the visibility. IESNA-RP-8-00 recommended ratios are 0.3 (0.3 to 1) for expressways and major roadways and 0.4 (0.4 to 1) for collector and local roads. (The determination of this ratio is a function of a combination of the road width, pole spacing, rated lamp lumens, mounting height and the classification or type of fixture [cutoff, semi-cutoff, or noncutoff]. Problems occur most often with noncutoff post mounted fixtures at low mounting heights [less than 20 feet] with low to medium lumen packages. To meet the ratio requirements, the spacing of poles may need to be as close as 25 or 30 feet staggered spacing with the use of 9500 lumens in a noncutoff post-mounted acorn fixture. Wider spacing can be accomplished with cutoff type distribution fixtures.)