

## **070 LIGHTING, STREET SIGNAGE, STREET MARKING**

### **070.01 LIGHTING STANDARDS**

#### 070.01.01 Intent and Purpose

070.01.01.01 Outdoor lighting shall be designed to provide the minimum lighting necessary to ensure adequate safety, night vision, and comfort, and shall not create or cause excessive glare on adjacent properties and public street ROW.

070.01.01.02 The use of LED lights is strongly encouraged. However, there are some areas where the use of LED lights is not appropriate at this time. Developers are encouraged to coordinate the type of lighting that will be approved for any given development with the Public Works Director early in the planning stage. LED lighting shall meet the light output and distribution detailed below.

#### 070.01.02 IESNA Cutoff Classifications (See the appendix for diagrams of these cutoff classifications.)

070.01.02.01 Full Cutoff: A fixture light distribution where no light intensity is emitted at or above a horizontal plane drawn through the bottom of the fixture and no more than 10% of the lamp's light intensity is emitted at or above an angle 10 degrees below that horizontal plane, at all lateral angles around the fixture.

070.01.02.02 Cutoff: A fixture light distribution where no more than 2.5% of a lamp's light intensity is emitted at or above a horizontal plane drawn through the bottom of the fixture and no more than 10% of the lamp's light intensity is emitted at or above an angle 10 degrees below that horizontal plane, at all lateral angles around the fixture.

070.01.02.03 Semi-Cutoff: A fixture light distribution where no more than 5% of a lamp's light intensity is emitted at or above a horizontal plane drawn through the bottom of the fixture and no more than 20% of the lamp's light intensity is emitted at or above an angle 10 degrees below that horizontal plane, at all lateral angles around the fixture

070.01.02.04 Non-cutoff: A fixture light distribution where there is no light intensity limitation in the zone above the maximum distribution of light intensity.

#### 070.01.03 Definitions – A comprehensive list of definitions are included in the Land Development Ordinance.

#### 070.01.04 Light Measurement Technique

070.01.04.01 Light level measurements shall be made at the property line of the property upon which the light to be measured is being generated. If measurement on private property is not possible or practical, light level measurements may be made at the boundary of the public street ROW that adjoins the property of a complainant or at any other location on the property of a complainant. Measurements shall be made at finished grade (ground level), with the light-registering portion of the meter held parallel

to the ground pointing up. The meter shall have cosine and color correction and have an accuracy tolerance of no greater than plus or minus five (5) percent. Measurements shall be taken with a light meter that has been calibrated within the previous two (2) years. Light levels are specified, calculated and measured in foot-candles (FC). All FC values are maintained foot-candles unless specified otherwise. See the definition for maintained foot-candles for maximum allowed light loss factors.

070.01.05 General Standards for Site Lighting

070.01.05.01 A lighting plan shall be provided for review as part of the preliminary subdivision plat or site plan. The lighting plan shall demonstrate a consideration for reduced energy consumption through the selection of energy efficient fixtures.

070.01.05.02 Unless otherwise specified, the maximum light level shall be 0.5 maintained foot-candle at any property line in a residential district, or on a lot occupied by a dwelling, congregate care or congregate living structure.

070.01.05.03 All floodlights shall be installed such that the fixture shall be aimed down at least forty-five (45) degrees from vertical. These lights shall be positioned such that any such fixture located within fifty feet (50) of a public street ROW is mounted and aimed perpendicular to the ROW, with a side-to-side horizontal aiming tolerance not to exceed fifteen (15) degrees from perpendicular to the ROW.

070.01.05.04 All flood lamps emitting 1,000 or more lumens shall be aimed at least sixty (60) degrees down from horizontal or shielded such that the main beam from the light source is not visible from adjacent properties or the public street ROW.

070.01.05.05 All wall pack fixtures shall be full cutoff fixtures.

070.01.05.06 All fixtures installed, owned, or leased by governmental or public agencies, or their agents, for the purpose of illuminating public streets are otherwise exempt from this regulation unless otherwise specified. Fixtures installed to light non-public streets are not exempt.

070.01.06 Lighting in Outdoor Areas (Residential and Non-Residential)

070.01.06.01 The mounting height of all outdoor lighting, except outdoor sports field lighting and outdoor performance area lighting shall not exceed thirty-seven (37) feet above finished grade, unless approved by the Town as having no adverse effect.

070.01.06.02 For lighted parking lots the minimum light level shall be no less than 0.2 foot-candles. All light levels are measured at ground level. The minimum light level requirements vary depending on the activity classification. The specified minimum FC value above 0.2 FC as outlined in Table 070.01 means that the lowest light level point or location in the parking lot shall not exceed the minimum stated FC value in the table (i.e. 0.9 FC for large shopping centers). An average to minimum uniformity ratio of 4:1 means that the average FC to minimum FC ratio cannot be worse (higher) than 4:1.

070.01.06.03 If an Owner/Developer wishes to have a higher light level, they must obtain approval from the Town, and must demonstrate a need for a higher light level.

Criteria considered and/or other changes that may be required when higher levels are requested include, but are not limited to, the following:

070.01.06.03.01 Safety and Security – The Illuminating Engineering Society of North America (IESNA) provides guidance in its 10th edition of the Lighting Handbook in chapter 22. Footnote number 2 reads: “If personal security or vandalism is likely and/or severe problem, a significant increase of the Basic level (.2 FC horizontal) may be appropriate.”

070.01.06.03.02 Adjacent Uses – An adjacent use that is non-residential with a higher light level (light surround) level may require more light to provide the same visibility than an adjacent property with less light (dark surround).

070.01.06.03.03 Full Cutoff Fixtures - In cases where a higher light level is approved, full cutoff fixtures may also be justified to better focus the lighting downward on the property to be lighted and reduce the amount of glare coming out of the fixtures.

070.01.06.03.04 Guideline for Increased Light Level - The Illuminating Engineering Society of North America (IESNA) provides guidance in its 10th edition of the Lighting Handbook in chapter 22. Footnote number 2 reads: “Many retailers prefer even higher light levels, with a specification of 10 lux (1 fc) minimum value.” This means that with the 4:1 average to minimum uniformity ratio requirement in this table, the maximum average FC value could increase from 3.6 to 4.0 FC.

070.01.06.03.05 The Town of Fuquay-Varina’s upper limit where a need for a higher lighting levels is demonstrated is 4.8 maximum average foot-candles. Therefore the upper limit for the minimum point of illumination is 1.2 FC with a 4:1 average to min. ratio. ( $1.2 \times 4 = 4.8$ )

070.01.06.04 Other than flood lights and flood lamps, all outdoor area and parking lot lighting fixtures of more than 2,000 lumens shall be cutoff or full cutoff fixtures, or comply with the exceptions listed below:

070.01.06.04.01 Historic/Architectural areas as designated by the Town. These areas include but shall not be limited to Downtown Center-1(DC-1) Zoning District, and Downtown Center -2(DC-2) Zoning District.

070.01.06.04.02 LED light fixtures shall be required for all sites and rights of way except as otherwise approved by the Town.

070.01.06.04.03 Non-cutoff decorative post-mounted fixtures may be used but shall be equipped with a solid top. Mounting heights of 18 feet or less above ground are allowed when the maximum initial lumens generated by each fixture does not exceed 9500 initial lamp lumens.

070.01.06.04.03.01 All metal halide, mercury vapor, fluorescent, induction, white high pressure sodium and color improved high pressure sodium lamps 9500 lumens and less used in non-cutoff fixtures shall be coated with an internal white frosting inside the outer lamp envelope.

070.01.06.04.03.02 All metal halide solid-top decorative post fixtures equipped with a medium base socket shall use either an internal refractive lens, a diffuse outer lens, or a wide-body refractive globe.

070.01.06.04.04 Dusk-to-dawn open bottom non-cutoff security lights shall be fully shielded to provide a full cutoff light distribution.

070.01.06.04.05 Temporary lighting for special events of short duration. Typically these are low wattage or low voltage applications for public festivals, and the observance of holidays, carnivals, and celebrations.

#### 070.01.07 Lighting for Vehicular Canopies

070.01.07.01 Areas under a vehicular canopy shall have an average maximum horizontal illuminance of thirty (30) maintained foot-candles (FC). Areas outside the vehicular canopy shall be regulated by the standards of Section 070.01.06 above. Lighting under vehicular canopies shall be designed so as not to create glare off-site. Acceptable methods include one or both of the following:

070.01.07.01.01 Recessed fixture incorporating a lens cover that is either recessed or flush with the bottom surface (ceiling) of the vehicular canopy that provides a full cutoff or fully-shielded light distribution.

070.01.07.01.02 Surface mounted fixture incorporating a flat glass that provides a full cutoff or fully-shielded light distribution.

#### 070.01.08 Outdoor Sports Field /Outdoor Performance Area Lighting

070.01.08.01 The mounting height of outdoor sports field and outdoor performance area lighting fixtures shall not exceed eighty (80) feet from finished grade unless approved by the Town Board of Commissioners.

070.01.08.02 All outdoor sports field and outdoor performance area lighting fixtures shall be equipped with a glare control package (louvers, shields, or similar devices).

070.01.08.03

070.01.08.04 The fixtures shall be aimed so that their beams are directed and fall within the primary playing or performance area. The maximum light level shall be 0.5 maintained foot-candle at any property line in a residential district, or on a lot occupied by a dwelling, congregate care or congregate living structure.

070.01.08.05 Up to 40% of non-conforming fixtures lighting sports fields may be replaced or otherwise changed with new non-conforming fixtures, however when over 40% of the fixtures are upgraded or otherwise changed, all the fixtures shall be brought into compliance with the requirements of these lighting standards.

070.01.08.06 The hours of operation for the lighting system for any game or event shall not exceed one hour after the end of the event.

070.01.09 Lighting of Outdoor Display Areas

070.01.09.01 Outdoor display areas where a nonresidential use is adjacent to another nonresidential use, the maximum average maintained illuminance shall not exceed twenty (20) maintained foot-candles. Outdoor display areas where a non-residential use is adjacent to any residential use, the maximum average maintained illuminance shall not exceed fifteen (15) maintained foot-candles and the fixtures shall be full cutoff.

070.01.09.02 All light fixtures shall meet the IESNA definition of cutoff fixtures unless specified otherwise. Forward throw fixtures (type IV light distribution, as defined by the IESNA) are required within twenty-five (25) feet of any public street ROW. Alternatively, directional fixtures (such as floodlights) may be used provided they shall be aimed in accordance with floodlights and flood lamps as described in Section 070.01.05 above.

070.01.09.03 The mounting height of outdoor display area fixtures shall not exceed thirty-seven (37) feet above finished grade, unless approved by the Town Staff as having no adverse effect.

070.01.09.04 For car dealership parking lots, the following provisions shall apply:

070.01.09.04.01 Only cutoff or full cutoff fixtures shall be used.

070.01.09.04.02 Mounting heights of up to a maximum of thirty-five (35) plus 2-foot raised base for parking areas shall be used when needed.

070.01.09.04.03 Lighting at the first row or closest paved display area adjacent to a public ROW, the car bumper shall not exceed a maximum average maintained illuminance of 20 foot-candles. This limit also applies to other merchandise display areas. Full cutoff fixtures shall be used in both locations.

070.01.09.04.04 Lighting in the non-merchandising areas of the parking lot shall be no higher than 5 FC average maintained. Cutoff or full cutoff fixtures shall be used.

070.01.10 Lighting of Buildings

070.01.10.01 Lighting fixtures shall be selected, located, aimed, and shielded so that direct illumination is focused exclusively on the building façade, plantings, and other intended site features, and away from adjoining properties and the public street ROW.

070.01.10.02 Illumination on any vertical surface or angular roof shall not exceed 5.0 FC average maintained.

070.01.10.03 Where possible, lighting fixtures shall be directed downward rather than upward. The Town Staff can waive this requirement in cases where it is impractical.

070.01.10.04 When upward aiming is used, placement of low wattage fixtures with shields (as needed) close to the building to graze the façade is required to minimize reflected light from windows and other surfaces. The Planning Department can waive this requirement in cases where it is impractical.

070.01.11 Permanent Signs

070.01.11.01 Lighting fixtures that externally illuminate signs shall be in compliance with the Land Development Ordinance.

070.01.12 Residential Subdivisions

070.01.12.01 This section applies to residential subdivision lighting for Single Family and Multi-Family developments. Specific lighting requirements and limitations for roadways, entries, accenting, landscaping, buildings, individual homes, and multi-family homes are to be referenced in the applicable sections contained herein. The following classifications of residences and/or facilities are addressed.

070.01.12.02 Individual Single Family homes located within a residential subdivision consisting of five or more homes shall be subject to the provisions of these lighting standards.

070.01.12.03 Multi-Family homes located within a residential subdivision consisting of apartments, condominiums, town houses, patio homes, cluster homes and assisted living facilities consisting of multi-story, multi-building communities and/or groups of homes shall be subject to the provisions of these lighting standards.

070.01.12.04 In residential subdivisions and along adjacent thoroughfares to the development, roadway lighting, if applicable, shall conform to the general type(s) of fixture classification(s) described in these lighting standards and in the Town's Land Development Ordinance light policy. These areas are characterized by low ambient light levels and are found in suburban and rural residential areas as well as some urban areas.

070.01.12.04.01 The placement of street lighting fixtures shall utilize LED lighting in residential areas and shall normally be at 400-foot intervals or less, except in the following situations:

070.01.12.04.01.01 If the roadway length is less than 400 feet, but more than 200 feet, a street light shall be provided at the end of the street

070.01.12.04.01.02 If the roadway length is less than 200 feet and a street light is placed at the intersection and no natural features create a problem, no street light shall be placed at the end of the roadway

070.01.12.04.01.03 The vertical and horizontal street alignment of natural features necessitates shorter spacing intervals.

070.01.12.04.02 A street light shall be provided at all street intersections in addition to the normal spacing requirement.

070.01.12.04.03 The placement of street lighting for streets of Type 3, 5, 7 and greater, shall be in accordance with the latest version of the Illuminating Engineering Society's, "American National Standard for Roadway Lighting," or NCDOT standard lighting requirements.

070.01.12.04.04 Fixtures along streets of Type 1, 2, 4, 5, 6, and 7 within a subdivision shall be the LED equivalent of either 5,800 or 9,500 lumen enclosed high pressure sodium lamps on the Public Electric Utility Company standard metal or fiberglass poles 25 feet in height minimum. The 5,800-lumen fixture shall be placed only at the end of cul-de-sacs.

070.01.12.04.04.01 Decorative light fixtures may be located in residential areas only in addition to the specifications stated above.

070.01.12.04.04.02 Optional decorative light fixtures shall be the LED equivalent to 9,500 lumen sodium vapor lamps mounted on Public Electric Utility Company black fiberglass or CCA wood green posts a minimum of 16 feet in height or the equivalent. The specified sodium vapor lamps may be allowed by Town Staff for issues with conformity to existing lighting in the area.

070.01.12.04.04.03 All fixtures along streets of Type 8 and greater shall be the LED equivalent to either 28,500 lumen enclosed high pressure sodium lamps on Public Electric Utility Company standard metal or fiberglass poles 30 feet in height or 50,000 lumen enclosed high pressure sodium lamps on Public Electric Utility Company standard metal or fiberglass poles 35 feet in height. The LED equivalent to the 28,500-lumen fixtures shall be used through residential areas as determined by the Town during the plan-approved process when spill over from the 50,000-lumen fixtures would be an issue. The specified sodium vapor lamps may be allowed by Town Staff for issues with conformity to existing lighting in the area.

070.01.12.04.05 An Owner/Developer may use decorative street lighting within a development in addition to Town standard street lighting provided:

070.01.12.04.05.01 Street light fixture types and locations shall meet the specifications set forth in this section.

070.01.12.04.05.02 The Owner/Developer and/or Homeowner's Association shall be responsible for all installation costs and monthly operation costs associated with the private streetlights.

070.01.12.04.05.03 The Owner/Developer and/or Homeowner's Association shall be responsible for any costs associated with deletion of the private street lights and any costs associated with Public Electric Utility Company.

070.01.12.04.05.04 The Owner/Developer shall inform all purchasers of property in the development of all responsibilities of the Homeowner's Association pertaining to private street lighting.

070.01.12.04.05.05 Private decorative lighting shall not be used as a substitute on streets of Type 8 or greater.

070.01.12.05 In residential subdivisions, the entry way by which motor vehicle traffic accesses the community roadways and any applicable signage shall be subject to the provisions of these lighting standards.

070.01.12.06 In residential subdivisions certain types of common facilities consisting of, but not limited to, Club Houses, Pool Houses, Recreational Halls, Sports Facilities, Maintenance Buildings as well as common grounds, walkways and parking areas are considered to be subject to the provisions of these lighting standards.

070.01.13 Holiday/Festive/Landscape Lighting

070.01.13.01 Holiday, landscape and festive lighting are exempt from these lighting standards.

070.01.14 Sidewalks, Side Paths, Greenways, and Parks

070.01.14.01 The walkway, pathway, or ground areas that are to be lighted shall be illuminated to a level of at least 0.2 and no more than 0.5 average horizontal maintained foot-candles.

070.01.15 Permitting and Approval Process

070.01.15.01 The applicant for any permit required for work involving outdoor lighting for commercial, office, industrial and institutional projects with a gross floor area of more than 3,000 square feet, residential projects other than single family dwellings of more than 10 units, all vehicular canopies and all outdoor display areas shall submit documentation at the time a preliminary subdivision plat or site plan is submitted for review and approval. The proposed lighting plan shall comply with the provisions of this lighting standard. The submission shall contain, but not be limited to the following, all or part of which may be part of or in addition to the information required elsewhere in these lighting standards:

070.01.15.01.01 A point-by-point foot-candle array in a printout format indicating the location and aiming of illuminating devices. The printout shall indicate compliance with the maximum maintained foot-candles required by this lighting standard.

070.01.15.01.02 Description of the illuminating devices, fixtures, lamps, supports, reflectors, poles, raised foundations and other devices (including but not limited to manufacturers or electric utility catalog specification sheets and/or drawings, and photometric report indicating fixture classification (cutoff fixture, wall pack, flood light, etc.)).

070.01.15.01.03 Street lighting plan shall include interior street lighting and street lighting along adjacent thoroughfares to the subdivision or site plan.

070.01.15.01.04 The Owner/Developer submitting for approval of a subdivision or site plan shall make application to the public electric utility company to comply with street lighting requirements, and pay required fees and installation costs to the public electric company.

070.01.15.01.05 The Owner/Developer shall obtain acknowledgement from the public electric utility company that all applicable fees and installation costs have been paid. The proposed street lighting plan and copies of documents showing payment to the public electric utility company shall be submitted for review by the

Public Works Director. The Public Works Director shall provide acknowledgment that the street lighting plan is approved prior to the final plat approval by the Town for recordation.

070.01.15.02 Projects that are not required to submit items identified in this section are still subject to comply with the provisions of these lighting standards and may be required to provide this information upon request by the Director Engineering at a later date.

070.01.15.03 The Town may permit an electrical contractor or an electric utility to repeatedly install the same equipment on different projects within the Town's corporate limits and ETJ. One submittal containing the specification sheets of a particular group of fixtures may be sufficient for the Inspections Department to modify the project requirement and require that only the other provisions of the lighting standards be met since the fixture specification provisions have already been met. This modification would conserve Town personnel and lighting supplier/installer resources.

## **070.02 STREET SIGNAGE**

070.02.01 Traffic control and street name signs within subdivisions which shall be maintained by the Town shall be consistent with the MUTCD. All specialty traffic control and street name signs and posts shall be approved by the Town Board of Commissioners.

070.02.02 All temporary stub outs for future interconnectivity shall have proper MUTCD barricade and signage in addition to the proper street extension. Please see Detail 060.12.

070.02.03 All public streets shall have approved standard street signs, which shall be provided by the Public Works Department at the expense of the Owner/Developer. Additional signage may be required by the Director of Engineering any time up to and during the 1-year warranty period at the expense of the Owner/Developer.

## **070.03 STREET MARKING**

070.03.01 All roadways shall be marked in accordance with the latest revisions of the MUTCD. Pavement markings shall be shown on roadway and subdivision plans and shall be installed prior to the issuance of COs for the development or final acceptance of the roadway. The pavement markings for all streets of Type 7 or greater shall be thermoplastic.

070.03.02 The pavement markings along streets of Type 8 or greater shall be installed such that the outside lanes are 13 feet in width to accommodate bicycle traffic, or a designated five (5) foot bicycle lane per the Community Transportation Plan and the Town Standard Specifications and Construction Details.

070.03.03 Additional pavement markings may be required by the Director of Engineering any time up to and during the 1-year warranty period at the expense of the Owner/Developer.

<b>Table 070.01 – Light Levels for Open Outdoor Parking Facilities</b>		
Use/Task	Maintained Foot-candles	Uniformity Avg/Min
Residential and Multi-Family Low to medium vehicular/pedestrian activity	Range from 0.2 Min to 0.7 Min	4:1
Industrial, Commercial, Institutional, Municipal High activity, i.e. large shopping centers/fast food facilities, major athletic/civic cultural events	0.9 Min	4:1
Industrial, Commercial, Institutional, Municipal 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	Range from 0.2 Min to 0.7 Min	4:1
Source: IESNA 10 <sup>th</sup> Edition Lighting Handbook (Medium and Low Activity Level recommendations have been combined and modified)		
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. Illumination levels are horizontal on the task, e.g. pavement or area surface.</li> <li>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 foot-candles shall not be in excess of 2.8 (0.7 x 4).</li> <li>3. The Town Planning Department shall be responsible for determining the activity level for a development. Any project that requests a light level that exceeds the foot-candle values outlined above must demonstrate a need for a higher light level, be approved by the Town Staff, and meet lighting trespass limits described herein.</li> </ol>		