CHAPTER 28
Pittsboro Lighting Ordinance

28.1 Purpose and Intent

The purpose of this Chapter is to control light trespass, pollution and glare so as not to adversely affect motorist, pedestrians, and land uses of adjacent properties inside the city limits and within the ETJ planning jurisdiction of the Town of Pittsboro except where existing state and town regulations preclude such jurisdiction.

Levels of illumination (light) to achieve a certain function or desired effect should also reduce or eliminate the hazardous aspects and nuisance of glare and lighting trespass for all exterior lighting installations. This includes but is not limited to façade building lighting, recreation and sports areas, public and private streets, parking areas and signs.

The intent of this chapter is to preserve and protect the nighttime use and enjoyment of all property through the use of good lighting practices and systems. With good design standards and professional installation and design, lighting systems can be installed to control glare and light trespass, and to conserve energy while maintaining security and productivity.

28.2 Light Measurement Technique

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 right-of-way that adjoins the property of the complainant or at any other location on the property of the 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 years. Light levels are specified, calculated and measured in footcandles (FC). All FC values are maintained footcandles unless specified otherwise. See maintained footcandles in the definitions section for maximum allowed light loss factors.

28.3 General Standards for Site Lighting

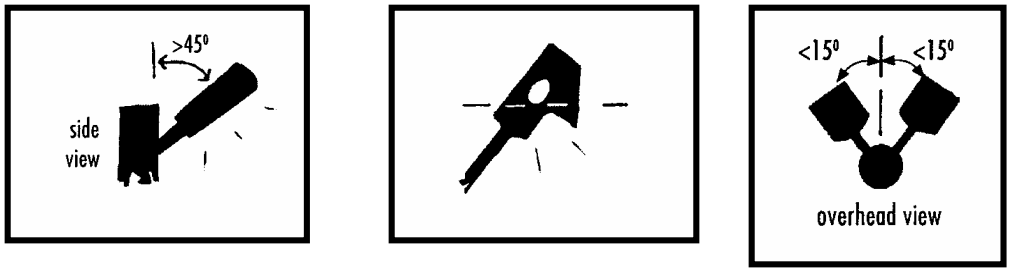
All outdoor site lighting shall conform to the following standards:

A. A lighting plan shall be provided for review at or before the preliminary phase of a project approval process (site plan review or building permit approval). The lighting plan shall demonstrate a consideration for reduced energy consumption through the selection of energy efficient fixtures.

B. Unless otherwise specified in the following subsections, the maximum light

level shall be 0.5 maintained footcandles at any property line in a residential district, or on a lot occupied by a dwelling, congregate care or congregate living structure. Floodlights shall not be aimed at residential property.

C. 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 right-of-way is mounted and aimed perpendicular to the right-of-way, with a side-to-side horizontal aiming tolerance not to exceed fifteen (15) degrees from perpendicular to the right-of-way. The town planning director may require shields to be installed on floodlights before, during or after the installation when needed to further reduce lighting trespass, glare and light pollution.



D. 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 right-of-way.

E. All wall pack fixtures shall be full cutoff fixtures.

F. Where land evevations to be lighted are higher or lower than a nearby highway, residential dwelling or other type of facility and the lighting installation causes offensive light trespass and/or glare, the town planning director may require internal or external shields to be installed on the fixtures at the time of the installation or afterwards. If shields do not correct the problem sufficiently, the planning department may direct that one or more of the following measures must be implemented:

1. change the aiming of offending fixtures,
2. change the location and/or mounting height or the offending poles,
3. change the light distribution pattern and/or type of offending fixtures or
4. remove the offending poles and fixtures from the site.

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

A. Other than flood lights and flood lamps, all outdoor area and parking lot lighting fixtures of more than 2,000 lumens shall be full cutoff fixtures, or comply with subsection (4) below. Dusk-to-dawn open bottom non-cutoff security lights must be fully shielded to provide a full cutoff light distribution.

B. The same or similar light source color temperature (K°) must be used on any one site that is part of a master-planned development (i.e. a mixture of metal

halide and high pressure sodium is not allowed in the same development). This applies to all street light fixtures and to area and parking lot light fixtures that are mounted on a pole or to the side of a building. Exceptions must be approved by the planning director.

C. 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 Planning Department as having no adverse effect.

D. 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 above 0.2 FC as 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 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. See the following table:

Light Levels for Open Outdoor Parking Facilities*		
Use/Task	**Maintained Footcandles**	**Uniformity Avg/Min**
(a) Parking, residential, multi-family • Low to medium vehicular/pedestrian activity	Range from 0.2 Min to 0.7 Min	4:1
(b) Parking, industrial/commercial/ Institutional/municipal • High activity, i.e. large shopping centers/fast food facilities, major athletic/civic cultural events	0.9 Min	4:1
• 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 8th Edition Lighting Handbook; Modifications: Medium and Low Activity Level recommendations have been combined and modified.

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 footcandles shall not be in excess of 2.8 (0.7 x 4).
3. The town planning director or his/her designee shall be responsible for determining the activity level for a development. Any project that requests a

light level that exceeds the footcandle values outlined above must demonstrate a need for a higher light level, be approved by the public Planning Director and meet lighting trespass limits described herein.

E. Criteria that can demonstrate a need for a higher light level or other changes that may be required when higher levels are used include but are not limited to:

1. Safety and Security – The Illuminating Engineering Society of North America (IESNA) provides guidance in its 9th 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."

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

3. Full Cutoff Fixtures with Shields - In cases where a higher light level is approved, full cutoff fixtures with shielding for designated fixtures may also be justified to better contain the lighting on the property to be lighted and reduce the amount of glare coming out of the fixtures.

4. Guideline for Increased Light Level - The Illuminating Engineering Society of North America (IESNA) provides guidance in its 9th 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." The Town of Pittsboro's upper limit where a need for higher lighting levels is demonstrated is 4.8 maximum average maintained footcandles. Therefore the upper limit for the minimum point of illumination is 1.2 FC with a 4:1 average to min. ratio. (1.2 x 4 = 4.8)

F. Exceptions to Open Parking Facility Standards:

1. Non-cutoff decorative post-mounted fixtures may be used but must 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.

2. 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.

3. All metal halide solid-top decorative post fixtures equipped with a medium base socket must use an internal refractive lens, a diffuse outer lens or a wide-body refractive globe as described in the definitions section.

4. 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.

G. Covered Parking Facilities

Garage parking facilities – light to IES recommendations outlined below:

Recommended Maintained Illuminance for Parking Garages:
Source: IESNA 9th Edition Handbook

	Minimum Horizontal[2]		Max to Min Horizontal Uniformity Ratios[3]	Minimum Vertical[5]	
	Lux	**Footcandle[4]**		**Lux**	**Footcandle[4]**
Basic[1]	10	1	10:1	5	.5
Ramps[6]					
Day[7]	20	2.0	10:1	10	1.0
Night	10	1.0	10:1	5	0.5
Entrance Areas[8]					
Day	500	50		250	25
Night	10	1.0	10:1	5	0.5
Stairways	20	2.0		10	1.0

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 not exceed 0.5-fc min.) with a max to min uniformity ratio of 15:1 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] Rounded conversion of lux to footcandles.

[5] Measured at 1.5 meters (5.0 ft.) above parking surface at the point of lowest horizontal illuminance, excluding facing outward along boundaries.

[6] Applies to clearway ramps (no adjacent parking) but not to sloping floor designs.

[7] Daylight may be considered in the design calculation.

28.5 Lighting for Vehicular Canopies

Areas under a vehicular canopy shall have an average maximum horizontal illuminance of twenty (20) maintained footcandles (FC). Areas outside the vehicular canopy shall be regulated by the standards of subsection 28.4.D 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:

A. 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.

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

28.6 Outdoor Sport Field/Outdoor Performance Area Lighting

A. 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 Board of Commissioners.

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

C. The fixtures must 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 footcandle at any property line in a residential district, or on a lot occupied by a dwelling, congregate care or congregate living structure.

D. Non-conforming fixtures lighting sports fields may be replaced or otherwise changed on 30% or less with new non-conforming fixtures, however when over 30% of the fixtures are upgraded or otherwise changed, all the fixtures must be brought into compliance with the requirements of these lighting standards.

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

28.7 Lighting of Outdoor Display and Sales Areas

The following provisions apply to outdoor display and sales areas except for car dealership parking lots, as specified in item (4) below:

A. Parking lot outdoor areas shall be illuminated in accordance with the requirements for subsection (f) above. Outdoor display areas where a non-residential use is adjacent to another non-residential use, the maximum average maintained illuminance shall not exceed twenty (20) maintained footcandles. 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 footcandles and the fixtures shall be full cutoff.

B. All light fixtures shall meet the IESNA definition of full 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 right-of-way. Alternatively, directional fixtures (such as floodlights) may be used provided they shall be aimed in accordance with subsection 28.3.C of this article.

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

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

1. Only cutoff or full cutoff fixtures shall be used.

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

3. Lighting at the first row or closest paved display area adjacent to a public right-of-way, the car bumper may not exceed a maximum average maintained illuminance of 20 footcandles. This limit also applies to other

merchandise display areas. Full cutoff fixtures shall be used in both locations.

4. Lighting in the non-merchandising areas of the parking lot shall be no higher than 5 FC average maintained. Full cutoff fixtures shall be used here.

28.8 Lighting of Buildings

A. 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 right-of-way.

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

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

D. 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 Town Planning Department can waive this requirement in cases where it is impractical.

28.9 Permanent Signs and Billboards

Lighting fixtures that externally illuminate signs shall be in compliance with the sign regulations of Article VI of the Zoning Ordinance. Billboards if allowed by the Town of Pittsboro, must always be lighted from the top down to reduce light pollution.

28.10 Residential Subdivisions

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 section contained herein. The following classifications of residences and/or facilities are addressed.

A. Single Family: 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.

B. Multi-Family: Multi-Family homes located within a residential subdivision consisting of apartments, condominiums, town homes, 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.

C. Roads: In residential subdivisions, roadway lighting, if applicable, must conform to the general type(s) of fixture classification(s) described in these

lighting standards. These areas are characterized by low ambient light levels and are found in suburban and rural residential areas.

D. Entry Way: 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.

E. Common Facilities: 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.

28.11 Walkways, Bikeways and Parks (Lighted Sections Only)

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

28.13 Permitting and Approval Process

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 5 units, all vehicular canopies and all outdoor display areas shall submit documentation at time of site plan or plot plan approval that the proposed lighting plan complies 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:

A. A lighting plan to scale is required that shows a point-by-point footcandle array on a 10' by 10' grid in a printout format indicating the location and aiming of illuminating devices. The printout shall indicate compliance with the maximum average maintained footcandles, light trespass and uniformity required by this lighting standard.

B. Description of the fixture types, lamps, poles, mounting height, raised foundations and the IESNA cutoff classification for the fixture and other devices (including but not limited to manufacturers or electric utility catalog specification sheets and/or drawings).

C. The above required plans and descriptions shall be sufficiently complete to enable the Administrator to readily determine compliance with the requirements of this Chapter.

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 town at a later date.

28.14 Exemptions

A. Lighting of the United States of America and State of North Carolina flags and other flags or insignia of any governemtal, non-profit or business organization.

B. Circus, fair, carnival, or other similar civic/community events.

C. Construction and emergency lighting are exempt from the provisions of this Article provided said lighting is temporary and is discontinued immediately upon completion of the construction work or abatement of the emergency necessitating said lighting.

D. Underwater lighting used for illumination of swimming pools and fountains.

E. Holiday, festive and landscape lighting.

28.15 Nonconformities

A. Any lighting fixture lawfully in place or approved by the Town prior to the adoption of these lighting standards shall be exempt from the provisions of Chapter 28. At the time that a non-conforming fixture is replaced, moved, upgraded, or otherwise changed, the fixture must be brought into compliance with the requirements of these lighting standards. Any expansion of, or addition to, an existing lighting system must conform to the requirements of these lighting standards.

B. Routine maintenance, including changing the lamp, ballast, starter, photo control, lens, and other required components, is permitted for all existing fixtures. When the fixture housing is changed, the fixture must come into compliance.

C. Property owners that install lighting fixtures after the effective date of these lighting standards and are found to be in non-compliance shall receive written notification and will be given ninety (90) calendar days from the date of written notification to bring the lighting system into compliance. Under extenuating circumstances such as unavailability of compliant equipment, the property owner may apply for an extension of time to be determined by the Town Planning Department.

Should the property owner fail to bring the lighting system into compliance, the owner shall be subject to a civil penalty of fifty dollars ($50.00) for each violation (i.e. each fixture, mounting height, light trespass, etc. out of compliance). Each day that a lighting violation remains out of compliance with the requirements of these lighting standards after the notification period shall constitute a separate violation. As an example, if there were 3 violations that were not brought into compliance for 10 days after the expiration of the

notification period, this would constitute a total of 30 violations at $50.00 civil penalty per violation.

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

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.

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.

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

Noncutoff—A fixture light distribution where there is no light intensity limitation in the zone above the maximum distribution of light intensity.

Definitions

Candela— A measure of luminous or light intensity in a certain direction. Useful in determining how much light is shining out of a fixture and in what direction.

Fixture— An assembly that holds the lamp (bulb) in a lighting system. It includes the elements designed to give light output control, such as a reflector (mirror) or refractor (lens), the ballast, housing, and the attachment parts.

Flood Lamp— A form of lighting designed to direct its output in a specific direction with a reflector formed from the glass envelope of the lamp itself. Such lamps are so designated by the manufacturers and are typically used in residential outdoor area lighting.

Flood Light— A form of lighting designed to direct its output in a diffuse, more or less specific direction, with reflecting or refracting elements located external to the lamp.

Footcandle (FC)— A quantitative unit measuring the amount of light (illumination) falling onto a given point. One footcandle equals one lumen per square foot.

Glare— The effect produced by a light source within the visual field that is sufficiently brighter than the level to which the eyes are adapted, to cause annoyance, discomfort, or loss of visual performance and ability.

HID— High intensity discharge lighting is a bulb type including mercury vapor, metal halide, high pressure or low-pressure sodium, which glow when an electric current is passed through a gas mixture inside the bulb.

IESNA—The Illuminating Engineering Society of North America, a non-profit professional organization of lighting specialists that has established recommended design standards for various lighting applications.

Illuminance— The amount of light falling on a surface-measured in lux or footcandles.

Internal Refractive Lens— A glass or plastic lens installed between the lamp and the sections of the outer fixture globe or enclosure. Refractive refers to the redirection (bending) of the light as it goes through the lens, softening and spreading the light being distributed from the light source thereby reducing direct glare.

Light Source— The element of a lighting fixture that is the point of origin of the lumens emitted by the fixture.

Light Trespass— Light emitted by a lighting installation that falls outside the boundaries of the property on which the installation is sited. This has adverse effects on residents, vehicle operators and pedestrians, the natural environment.

Lumen— A quantitative unit used to identify the amount of light emitted by a light source. A lamp is generally rated in lumens.

Maintained Footcandles— Illuminance of lighting fixtures adjusted for a maintenance factor accounting for dirt build-up and lamp output depreciation. The maintenance factor used in the design process to account for this depreciation cannot be lower than 0.72 for high-pressure sodium and 0.64 for metal halide and mercury vapor.

Medium Base— The size of lamp socket designed to accept a medium or Edison base lamp.

Outdoor Performance Area— An area permanently dedicated to the public presentation of music, dance, theater, media arts, storytelling, oratory, or other performing arts, whether publicly or privately owned, including but not limited to amphitheaters and similar open or semi-enclosed structures.

Outdoor Sports Field— An area designed for recreation (public or privately owned). These areas include, but are not limited to baseball/softball diamonds, soccer fields, football fields, golf courses, golf driving ranges, tennis courts, racetracks, firearm shooting ranges, and swimming pools.

Right-of-Way— An interest in land to the town which provides for the perpetual right and privilege of the town, its agents, franchise holders, successors, and assigns to construct, install, improve, reconstruct, remove, replace, inspect, repair, maintain, and use a public *street*, including related and customary uses of street rights-of-way such as sidewalks, bike paths, landscaping, mass transit facilities, traffic control, traffic control devices and signage, sanitary sewer, storm water drainage, water supply, cable television, electric power, gas, and telephone transmission and related purposes in, upon, over, below, and across the rights-of-way.

Temporary Lighting— Lighting used for a limited duration, but in no case longer than thirty (30) days.

Vehicular Canopy— A roofed, open, drive-through structure designed to provide temporary shelter for vehicles and their occupants while making use of a business' services.

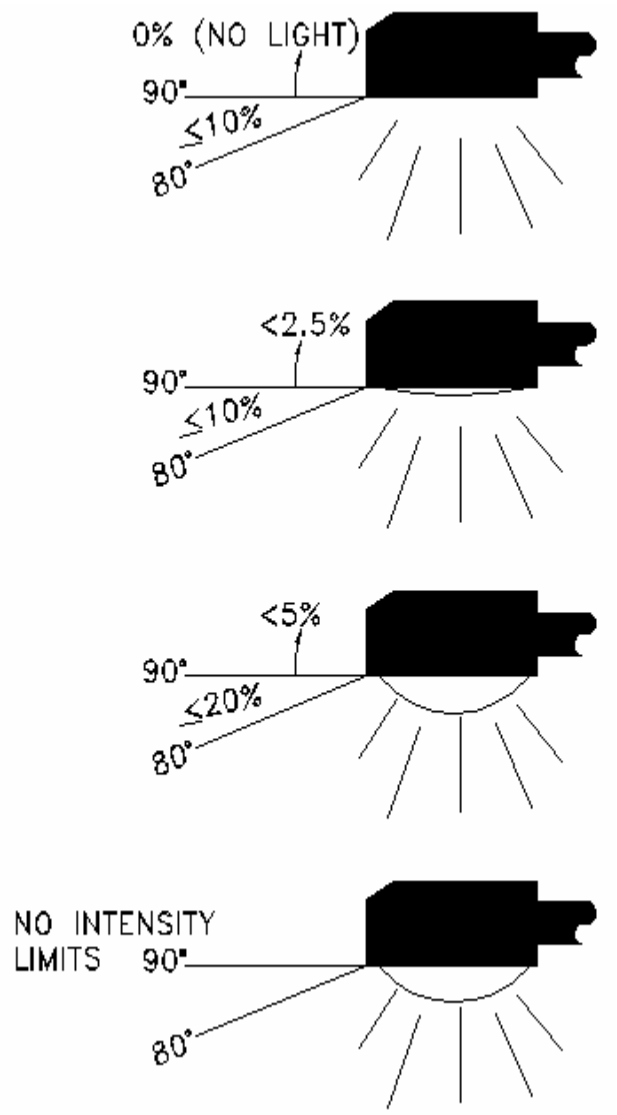
Wall Pack— A type of light fixture typically flush-mounted on a vertical wall surface.

Wide-body Refractive Globe— A translucent lamp enclosure used with some outdoor fixtures to provide a decorative look (including but not limited to acorn- and carriage light-style fixtures). "Wide-body" refers to a wider than average size globe (greater than 15.75" in

diameter). “Refractive” refers to the redirection (bending) of the light as it goes through the lens, rendering the light fixture more effective. Wide-body refractive globes are intended to soften and spread the light being distributed from the light source thereby reducing direct glare.

Appendix

Diagrams and Definitions of IESNA Cutoff Classifications:



1. 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.

2. 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.

3. 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

4. Noncutoff—A fixture light distribution where there is no light intensity limitation in the zone above the maximum distribution of light intensity.