

Outdoor Lighting Basics and Lighting Ordinances

**Presented at Chatham County
Commissioners Work Session
February, 2007**

Lighting Terms and Definitions

- Footcandle – amount of light falling on a surface
- Illuminance – amount of light expressed in footcandles
- Uniformity Ratio – measurement of how even the light is distributed onto a surface
- Lumen – total quantity of light emitted from a light source
- Watts – measurement of power
 - ▶ 1000 watts = 1 Kw
 - ▶ 1000 watt lamp (1 Kw) burned for 1 hour = 1 kWh
- Light Trespass – Unwanted light spilling outside property line
- Light Pollution – Unwanted light spilling up into the sky
- Glare – Effect produced when a light source in the visual field is brighter than the level which the eyes are adapted, causing annoyance, or discomfort, or loss of visual performance and ability

What's Incorrect About this Lighting Job?

- **High Light Level in dark surround**
- **Glare**
- **Light Pollution**
- **Light Trespass**



“Know your Terms”

Footcandles and Uniformity Ratios

There is a Huge Difference!

- **Footcandles**

- ▶ Initial or Maintained Footcandles
 - ◆ Maintained allows for depreciation
- ▶ Average or Minimum Footcandles
 - ◆ 1 FC Minimum is 3 to 5 times more than 1 FC average

- **Uniformity**

- ▶ Average to Min Uniformity
 - ◆ 4:1 typical for parking lots
- ▶ Max to Min Uniformity
 - ◆ 15:1 to 20:1 typical for parking lots

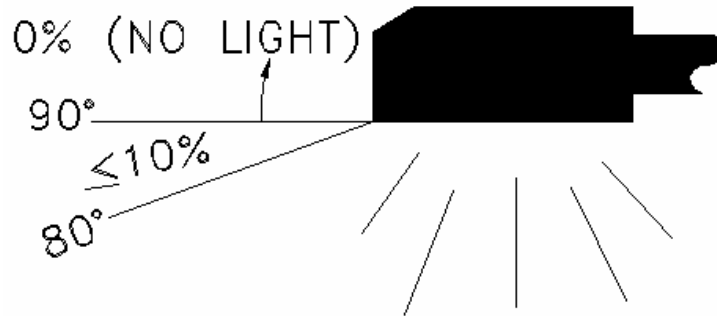
Expectations of a “Good” Outdoor Lighting System

- Feeling of Safety and Security
- Good Visibility
- Appropriate Light Level and Uniformity
- Energy Efficiency
- Low Maintenance
- Conformity with Lighting Ordinances

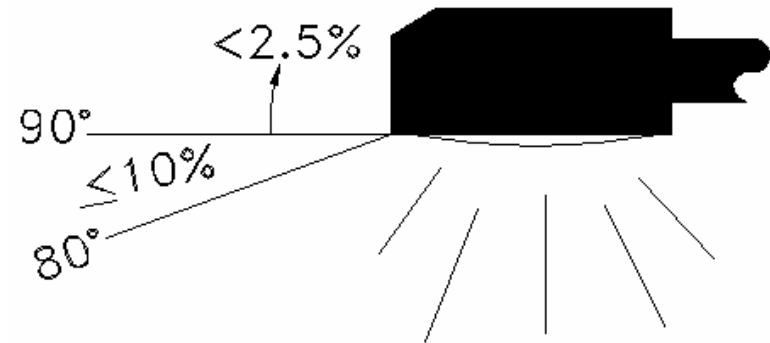
Lighting Research Indicators for Feeling Safe and Secure at Night

- When there is good visibility
 - ▶ People have more time to react to an oncoming attack
 - ▶ Lighting moves Crime but does not Prevent Crime
 - ▶ Criminals will go to another location and away from light to do their work
 - ▶ People feel secure to walk the property

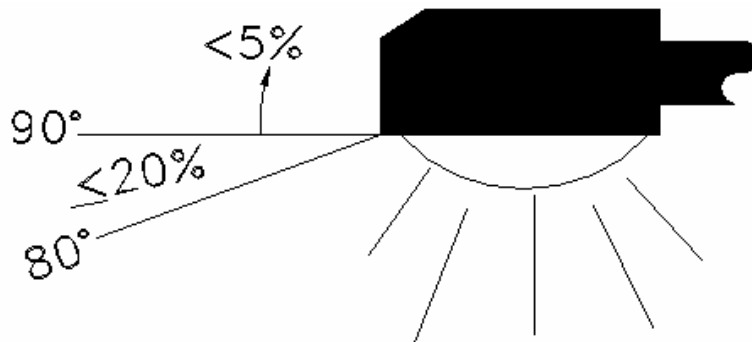
IESNA Cutoff Classifications for Fixtures



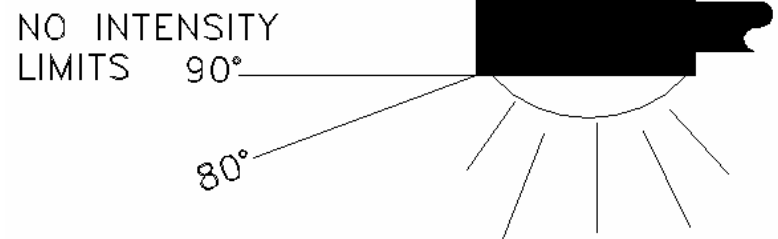
Full Cutoff



Cutoff

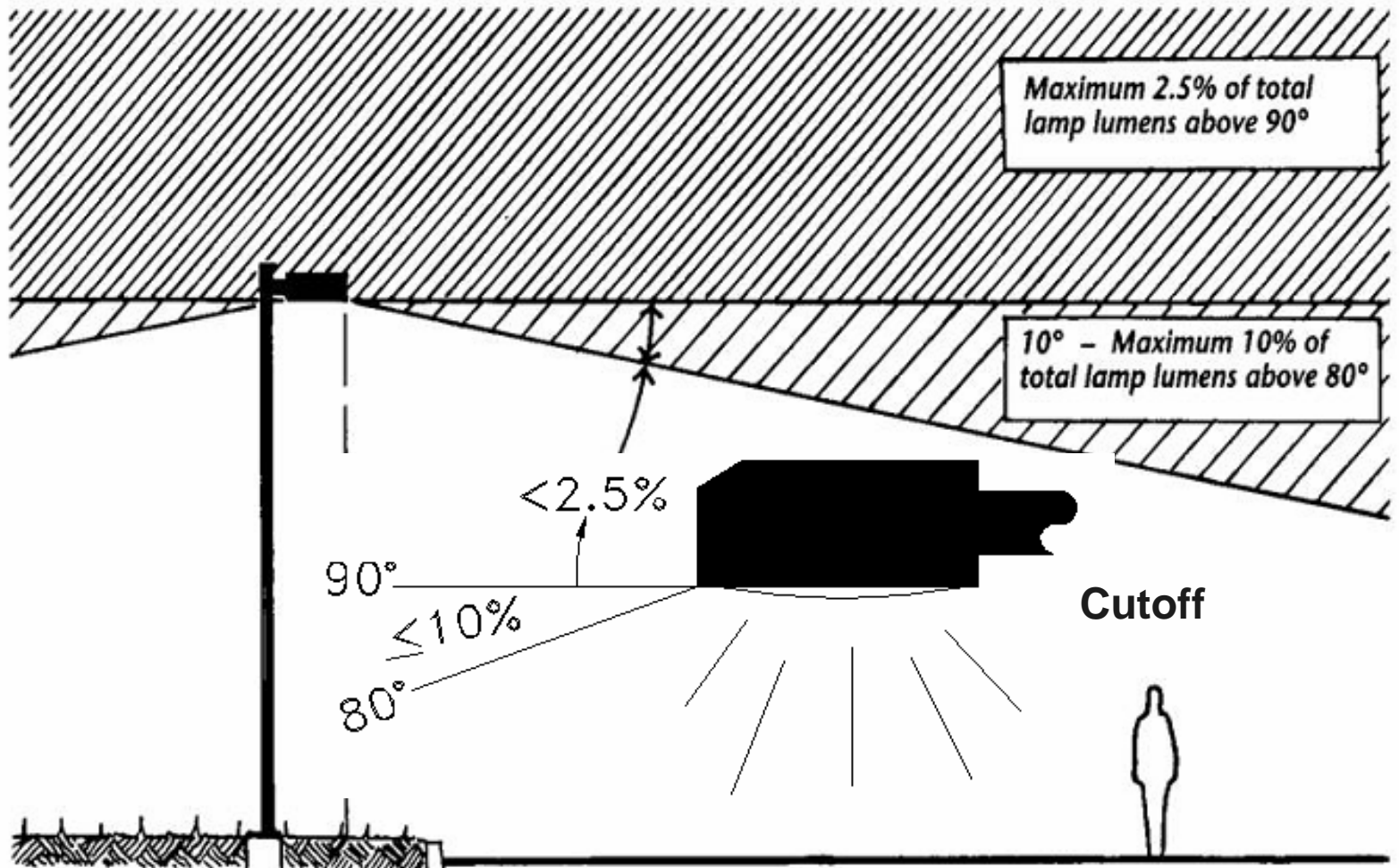


Semi-Cutoff



Non-Cutoff

What IESNA Cutoff Light Distribution is this luminaire providing?



New Standards Coming in 2007

- New Luminaire Classification System from the Illuminating Engineering Society of North America (IESNA)
- New Joint Model Lighting Ordinance from the IESNA and the International Dark-Sky Association (IDA)

Dusk to Dawn Area Light Fixtures

Semi-Enclosed



Non-Cutoff fixture

NightCap



Full Cutoff fixture

- Zero light above 90°
- Reduced light pollution
- Reduced glare

Roadway Cobra Head Fixtures



**Drop Lens
(Old)**



**Flat Lens
Full Cutoff
(New)**

Full Cutoff Shoebox Fixtures Provide Low Glare Light

- Shoebox fixtures are widely available in the marketplace from 100 watts to 1,000 watts
- Typical shoebox wattages are 250 and 400
- Available in High Pressure Sodium and Metal Halide.



Large Parking Areas



- **Cube fixture with vertical lamp position is a popular choice for large parking areas**
- **Available in marketplace in Cutoff and Full Cutoff light distributions**

Poor Uniformity Contributes to Low Visibility



Good Uniformity – A Key to Good Visibility



Wall Packs



Non-Cutoff



**Non-cutoff Wall Packs Produce
High Glare and
Reduced Visibility**

How To Get a Cutoff Wall Pack

Hard Way: Add a shield later



Preferred Way:
Specify Cutoff or Full
Cutoff Fixtures Up
Front



Vehicular (Gas) Canopy Lighting

- Drop Lens (traditional)

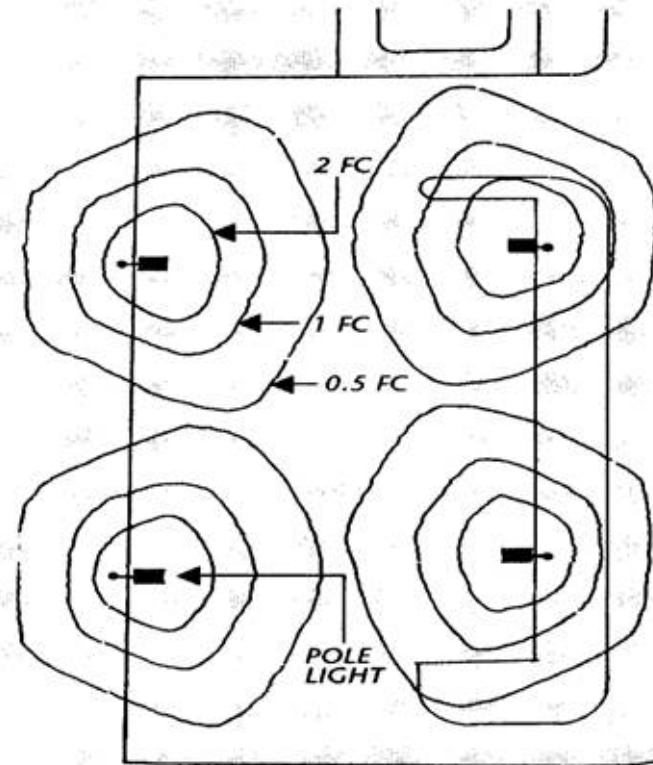
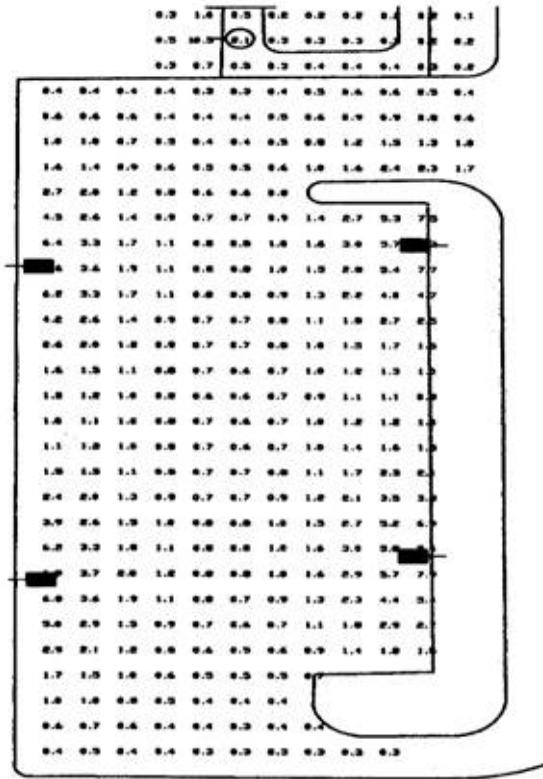


- Flat Lens (preferred)



**Source: “An Evaluation of 3 Types of Gas Canopy Lighting”
from the Lighting Research Center – 12/28/2001**

What is the Right Amount of Light?



PARKING LOT LIGHTING PLANS

1. Computer generated light level grid.
Readings in tenths of foot-candles.

2. Iso-Illuminance circles. Each circle indicates
an even light level. Readings in foot-candles.

Light Meters

- **Minolta TL-1 Meter**
 - ▶ **Approximate Cost \$495.00**
 - ▶ **Specify Footcandles or Lux when you purchase. Footcandles is suggested.**
 - ▶ **Measures down to 0.01 FC (needed for low outdoor light measurements)**
- **Cooke cal-LIGHT 400 Meter**
 - ▶ **Approximate Cost \$365.00**
 - ▶ **Measures Footcandles and Lux with switch**
 - ▶ **Measures down to 0.1 FC (must switch to Lux for low outdoor light measurements)**
 - ▶ **10 Lux (metric) = 1 Footcandle**

A “Good” Lighting Ordinance

- Reduces glare
- Reduces light trespass
- Reduces light pollution
- Encourages the use of efficient light sources
- Uses IESNA recommended light levels
- Does not jeopardize Safety and Security

Issues to Address with a Lighting Ordinance

- **High Light Levels**
- **Mounting Height Limit**
- **Light trespass (commercial to residential)**
 - **Amount of light spill allowed**
 - **Fixture cutoff classification**
 - **Glare from non-cutoff fixtures**
 - **Flood Light aiming**
- **Light Pollution**
 - **Fixture cutoff classification**
 - **Fixture types**
 - **Flood Light aiming**
- **Nonconformities (Grandfather provision)**
 - **What is being grandfathered**
 - **Maintenance & replacement policy**
 - **Penalties for nonconformity**

What is the Correct Lighting Solution?

- Use the right amount of light
- Reduce:
 - Light trespass
 - Light pollution
 - Glare
- Can Accomplish By:
 - Proper fixture and lamp choices
 - Proper shielding
 - Proper aiming
 - Proper pole placements