

Lighting Illumination Levels

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DEFINITIONS/TERMS OF PHOTOMETRY

FOOTCANDLE (fc)- A unit of measure of illuminance. A unit of illuminance on a surface that is one foot from a uniform point source of light of one candle and equal to one lumen per square foot. Footcandle values can be measured directly with handheld incident light meters. One footcandle is equal to 1 lumen cast per sq. ft. of surface. A typical sunny day can measure between 5,000 fc and 10,000 fc. An average living room measures about 30 fc. A full moon can provide 0.2 fc of illumination.

ILLUMINANCE (usually 'E' in formulas) is the total amount of visible light illuminating (incident upon) a point on a surface from all directions above the surface. This "surface" can be a physical surface or an imaginary plane. Therefore illuminance is equivalent to *irradiance* weighted with the response curve of the human eye.

Standard unit for illuminance is **Lux (lx)**, which is lumens per square meter (lm/m^2).

1 fc= 10.764 lx

HORIZONTAL ILLUMINANCE: The measure of brightness from a light source, usually measured in footcandles or lumens, which is taken through a light meter's sensor at a horizontal position on a horizontal surface.

VERTICAL ILLUMINANCE: The measure of brightness from a light source, usually measured in footcandles or lumens, which is taken through a light meter's sensor at a vertical position on a vertical surface.

UNIFORMITY RATIO describes the uniformity of light levels across an area. This may be expressed as a ratio of average to minimum or it may be expressed as a ratio of maximum to minimum level of illumination for a given area.

Example: U. ratio max. to min. = 4:1 for the given area, the lowest level of illumination (1) should be no less than 1/4 or "4 times less" than the maximum (4) level of illumination.

IESNA (state referenced IES): Illuminating Engineering Society of North America (also known as IES). The society has informed and educated members, the lighting community and consumers on the aspects of good lighting practice for over ninety years. The members of IESNA include architects, engineers, designers, educators, students, contractors, manufacturers, and scientists. IESNA provides technical guidelines and standards, professional journals, and educational training forums.

IACLEA: International Association of Campus Law Enforcement Administrators. IACLEA's goal is to advance public safety of educational institutions. The society represents over 1000 schools in US, Europe, Australia, Canada and elsewhere. In April 1996, IACLEA's Board of Directors adopted the "Recommended Crime Prevention and Campus Protection Practices for Colleges and Universities". The document included a provision suggesting higher lighting levels than the ones established by IESNA. These higher illumination standards were developed by IACLEA in order to provide another standard and to give campus security a justification for higher campus lighting level standards. IACLEA publishes a bimonthly newsletter and conducts annual conferences.

ICA- The International CPTED Association. ICA is committed to a creating safer and improved environment through the application of CPTED principles and strategies.

CPTED-Crime Prevention through Environmental Design. CPTED advocates that adequate design and proper use of the environment can reduce crime and fear of crime, thereby improving the quality of life.

DISCUSSION: FACTORS AFFECTING LIGHT LEVEL STANDARDS

Light level standards are affected by light quantity and quality desired, fixture efficiency and other applicable factors.

Quantity of light or the light output and light levels is measured in lumens, lux and footcandles. **Initial Lumens/ Footcandles** reflect the amount of light produced by a lamp when it is installed. Supply voltage variations, lamp's interaction with the ballast and dirt build up (**Luminaire Dirt Depreciation**) reduce the produced amount of light. Lessening of light output over time, while continuing to consume the same energy amounts (**Lamp Lumen Depreciation**) also reduces the light levels of the lamp and waists energy.

Maintained Footcandles show the light level after light loss factors are taken into account over a period of time. **Mean Lumens** show the average light output over the lamp's lifetime. When addressing lighting standards a provision for the light quantity depreciation over time due to multiple factors should be made.

Quality of light depends on the brightness, distribution and light color.

Photometric brightness (Luminance) is the amount of light leaving the lamp or reflecting from a surface. It is measured in footlamberts, candelas/sq. ft. and candelas/ square meter (metric). Brightness can produce levels of glare if not contained properly. Glare that comes directly from the light source is a **Direct glare**. **Reflected glare** occurs on the task surface. **Discomfort glare** does not blind but creates discomfort. **Disability glare** prevents vision and blinds. Every fixture has a Visual Comfort Probability (VCP) rating that reflects its level of visual comfort. Glare can severely interfere with visual comfort. High brightness ratios produce high contrast and can also create a visual fatigue during "transient adaptation", which is the adaptation process of the eye when brightness changes.

Light Color depends on the visible light spectrum and the wavelength composition of the lamp light (**Spectral power distribution**), the color of the light the lamp produces (**Color temperature** measured in Kelvin), the way the light source makes the color appear to human eyes and how well subtle variations in color shades are revealed (**Color rendering** -Color Rendering Index from 0-100). The higher the CRI is, the better the color rendition appears. An inappropriate color rendition can deceive the eye and supply it with wrong information.

Lamp examples:

Metal Halide Lamps are High Intensity Discharge Lamps (HID) and have high efficiency and good color rendition. These lamps are used in stadiums, warehouses and industrial settings.

High Pressure Sodium Lamps (HPS) are the most efficient of the HID family. Their color rendition, however, is not as good as the rendition of Metal Halide Lamps. HPS lamps are often used for street illumination.

Fixture efficiency is affected by two factors. The first factor is the amount of power (watts W) required for the fixture to work at any given time and the amount of light leaving the fixture (**Electrical Efficiency**). The second is how much light will be produced by the fixture and how much of it will be task efficient (**Fixture Efficiency**). An inefficient fixture can use the same amount of energy as an efficient one while producing less light.

Other criteria affecting the light level standards

Activity level in the area can change the requirement of light quantity and quality depending on security concerns and the function that takes place.

CPTED (Crime Prevention through Environmental Design) strives to create safer environments through sensitive design. The concept of Attractive Nuisance is a part of CPTED. The concept reflects the idea that a potentially harmful object that can draw the attention of a child and raise a desire to investigate or play. Examples: construction sites, equipment, ponds and fountains, tunnels, wells and others. CPTED establishes lighting guidelines based on the risk activity of the area.

Visual acuity is the ability to detect a different aspect of detail. Areas that require high security levels or detail differentiation may require high visual acuity. Excessive brightness or insufficient light can hinder visual acuity.

High Light Levels and vision.

At high light levels absolute sensitivity decreases, contrast threshold increases, the eyes switch to photopic (cone vision) vision.

Object recognition depends on the ability of the eye to discriminate differences in illumination within the object and against its environment, not on how bright the scene is.

CASE STUDIES

The following case studies are excerpts from lighting standards of the city of Gainesville and Alachua County, the host communities of University of Florida, along with examples from other higher education institutions and lighting associations. The paper also includes CPTED (Crime Prevention Through Environmental Design) lighting standards as another guideline and possible reference.

Alachua County, FL

- All lighting, regardless of location, shall be designed to prevent direct glare, light spillage, and hazardous interference with automotive, bicycle and pedestrian traffic on adjacent streets and properties.

Off-street parking requirements: Any off-street parking lot serving any use other than dwellings of three units per building or less shall meet the following off-street parking lot requirements:

- Illumination levels at the property line of all parking areas shall range between a minimum of **0.0** footcandles (**fc**) and a maximum of **1.0 fc** with as close to 0.0 fc when located next to residential areas.
- Mercury vapor fixtures shall not be permitted as a component of exterior design

RM-1 travel trailer park and campground district.

- *Street lighting.* All streets and driveways within the campground shall be lighted at night with electric lights providing a minimum average illumination of **0.2 fc**.

Pima Community College campuses, Tucson, AZ

Site lighting should not exceed thirty (30) feet in pole height. Site lighting illumination criteria shall be as follows:

- Open parking facilities: **0.6** minimum fc on pavement.
- Covered parking facilities during daytime: **50** fc at entrance(s), **10** fc at ramps and corners and **5** fc in general parking spaces.
- Covered parking facilities during nighttime: **5** fc minimum at entrance(s), ramps, corners and general parking spaces.
- All illuminance uniformity ratios shall be **4:1** (Average/Minimum).
- All proposed site lighting designs must be coordinated with the College Department of Public Safety (Campus Police).

California State University, College and Jr. College lighting policy

based on IES standards

Areas of campus activity:

- High Activity:
Major athletic events
Major cultural or civic events
- Medium Activity:
Community centers
Office building parking areas
Transportation parking (commuter lots, etc.)
Cultural, civic events
Recreational events
On-campus housing complex parking
- Low Activity:
Educational facility parking

Recommended Maintained Horizontal Illuminances for Parking Facilities

(Based on IES Lighting Handbook. Update to latest edition available.)

Open Parking Facilities (General Parking and Pedestrian Area; Vehicle use area only)

Level of Activity	Lux (min on pavement)	Fc (min on pavement)	Lux (ave on pavement)	Fc (ave on pavement)
High	10	0.9	22	2
Medium	6	0.6	11	1
Low	2	0.2	5	0.5

Covered Parking facilities

	Day		Night	
Areas	Lux (ave on pavement)	Fc (ave on pavement) sum of electric lighting and daylight	Lux (ave on pavement) sum of electric lighting and daylight	Fc (ave on pavement)
General Parking and Pedestrian areas	54	5	54	5
Ramps and Corners	10	0	54	5
Entrance areas	540	50	54	5

Range of Illuminances

	Lux	Fc
Stairways	100-150-200	10-15-20

Architectural Lighting

- All aisles, passageways and recesses within a building complex shall be illuminated with a "minimum maintained" **0.6 fc** of light during hours of darkness.

University of Iowa Campus Lighting Strategy

- **Street** lights should be located so that minimum light levels are **0.5 fc**
- Illumination levels of lights in adjacency to the building are reviewed on a case-to-case basis.

- **Walkways** (walks, river walks, walks in historic areas, walks along streets, isolated walks, walks near buildings, walks though public gathering spaces)
Min **0.2 fc**- max **1.2 fc**; This should be clarified by noting that **0.2 fc** is the minimum acceptable **0.3 fc** is the desired minimum.
Do not exceed **6:1** uniformity
- **Bike rack min ave. 5.0 fc**
- **Building entrance min ave. 5.0 fc**
- **Bus stop min ave. 2.0 fc**
- **Campus edge min ave. 3.0-4.0 fc**
Do not exceed **6:1** uniformity
- **Campus entrance min ave. 17.0 fc**
Do not exceed **3:1** uniformity
- **Emergency entrance min ave. 15.0 fc**
- **Maintenance/ Service min ave. 3.0 fc**
- **Open parking lot** High Activity = **0.9 fc**, Medium Activity = **min ave. 0.6 fc**, Low Activity = **min ave. 0.2 fc**
Do not exceed **4:1** uniformity
- **Covered parking lot (ramp) min ave. 4.0 –5.0 fc**

University of Central Florida Exterior Lighting:

- All site lighting is to be **high-pressure sodium** unless otherwise approved and directed by the university. As minimum lighting levels should conform to those levels put forth by **the Illuminating Engineering Society**.
- Exterior spaces adjacent to buildings shall have lighting levels in accordance with the latest edition of the ***Illuminating Engineering Society (IES) Lighting Handbook***.

Florida Atlantic University General Lighting Considerations

- For all FAU campuses except those in Broward County, it has been specified that exterior walkway and security lighting shall be Kim VL-series luminaries, 17” diameter, post top mount for single fixtures, high pressure sodium lamp, dark bronze finish round aluminum pole.

- **Roadways 0.6 av. maintained fc**, 6 to 1 uniformity ratio (avg. to min.)
- **Open parking 0.6 avg. maintained fc** on pavement 4 to 1 uniformity ratio (avg. to min.)
- **Pedestrian ways 0.6 avg. maintained fc**, 4 to 1 uniformity ratio (avg. to min.) (includes sidewalks, bikeways, exterior stairways)

Cornell University

Based on IESNA

- **Pathways-** pedestrian ways distant from roadways and, which are prone to criminal activity
Average maintained illuminance on pavement-
Medium Activity = **0.5 fc**, Low Activity = **0.2 fc**;
Ave.- Min. **Uniformity ratio 10:1**
- **Sidewalks-** medium activity level, adjacent to roadways, and which may be prone to criminal activity
Average maintained illuminance on pavement-
Medium Activity = **0.5 fc**, Low Activity = **0.2 fc**.
Ave.-Min. **Uniformity ratio 4:1**
- **Roadways-** collector roadways in intermediate areas.
Average maintained illuminance on pavement-
Medium Activity = **0.9 fc**, Low Activity = **0.6 fc**
Ave. -Min. **Uniformity ratio 4:1**
- **Roadways-** local roadways in intermediate areas.
Average maintained illuminance on pavement-
Medium Activity ave. = **0.7 fc**, Low Activity ave. = **0.4 fc**
Ave. -Min. **Uniformity ratio 6:1**
- **Parking**
Medium Activity = **0.6 fc** (minimum maintained illuminance on pavement)
Low Activity = **0.2 fc** (minimum maintained illuminance on pavement)
Ave. - Min. **Uniformity ratio = 4:1**

City of Gainesville, FL

- **Off-street parking facilities:**
 maintained average horizontal illuminance **2.5 fc**
 minimum horizontal illuminance **0.5 fc**
 Uniformity ratio (ave to min) shall be no greater than **5:1**
 Uniformity ratio (max to min) shall be no greater than **15:1**

- **Building entrances, stairways, ramps, main walkways:**
 Maximum average illumination of **25 fc** at ground level.
 Uniformity ratio **6:1**.

- **Roadways:**

Commercial area-Densely developed business area outside, as well as within, the central part of municipality. Nighttime vehicular and/or pedestrian traffic within such areas would be characterized as relatively heavy.

Intermediate area- Developed area outside, as well as within, the central part of the municipality comprised of libraries, community recreation centers, large apartment complexes, industrial buildings, or neighborhood retail stress, etc. Nighttime vehicular and/or pedestrian traffic within such areas would be characterized as moderate to moderately heavy.

Residential area- Developed area comprised of residential developments, or a mixture of residential and small commercial developments. This definition includes areas of single family homes, town houses, small apartment buildings, and conservation areas. Nighttime vehicular and/or pedestrian traffic within such areas would be characterized as light.

Roadway class	Sub class	Ave. fc	Max/Min Ratio	Ave/Min Ratio
Major	Commercial	1.6	10:1	3:1
	Intermediate	1.2	10:1	3:1
	Residential	0.8	12:1	3:1
Collector	Commercial	1.1	10:1	4:1
	Intermediate	0.8	12:1	4:1
	Residential	0.6	12:1	4:1
Local	Commercial	0.8	20:1	6:1
	Intermediate	0.7	20:1	6:1
	Residential	0.4	20:1	6:1

CPTED (Crime Prevention Through Environmental Design)

- Uniformity ratio (max to min) may range up to 6:1.

- The lighting levels specified are the minimum average levels acceptable.

High risk activity: ATM, Cluster Mail Boxes, Pay Phones, Gated Community Entries, Pedestrian tunnels and Covered Pedestrian walkways (breezeways), Bus/ Transit Shelters, All exterior entrances	4-5 fc
Medium high risk activity: Convenience stores, Covered Parking (carports), Fast Food, Pharmacies, Pool Halls, Loading Docks/Areas, Grocery stores (24 hour, immediate parking area), Establishments Licensed for the sale of Liquor, Parking Structures (10 fc daytime)	3-4 fc
Medium Risk Activity: Gas Stations, Entertainment/Amusement, Video Stores, Laundries, Banks, Restaurants (no liquor), Hotels/Motels, Video Halls, Card/Telemarketing, Malls	2-3 fc
Medium Low Risk Activity: Multi-Housing, Health Care, Industrial (night use), Preschools, Worship, Hospital, General Retail, Dental, Warehouse (night use), Educational, Storage, General office (night use), Grocery stores (non 24 hours)	1-2 fc
Low Risk Activity: Warehouse (day use), Office (day use only), Greenbelt, Car Dealers (after hours), Parks, Industrial (day use), Mini-storage, Retention areas, Walkways in Apartment Complexes	0.50-1 fc

CONCLUSION

IESNA and other groups specify basic lighting standards recommendations. Each university campus or governing agency constructs their own standards usually based on IESNA/ICLEA suggestions. Different security requirements, lighting conditions, climate and other factors lead to the variation of standards used in the country. Overly bright campuses have concluded to be environmentally irresponsible and energy wasteful by many higher education institutions. Universities across the country are currently exploring possibilities, comparing their codes to other schools and are improving the lighting standards adopted 20-30 years ago. Awareness of the results of light pollution brought by the Dark Sky Association and the desire for energy conservation are reshaping the codes of many institutions and are saving energy for future use.

The following tables are a summary of the case studies presented. The Illuminance (in footcandles) levels table compares the standards set by universities depending on the campus location. The Uniformity ratio tables present the ratio of Average Foot candles to Minimum Footcandles and the ratio of Maximum Footcandles to Minimum Footcandles, where available.

Resources:

1	Municode	http://www.municode.com
2	IESNA- Illuminating Engineering Society of North America	http://www.iesna.org/
3	ICLEA- International Association of Campus Law Enforcement Administrators	http://www.iaclea.org/about/index.htm
4	Prima Community College	http:// dco-proxima.dco.pima.edu/fclplan/FG_part2.htm
5	California State University, College and Jr. College	http://pdc.ucr.edu/docs/CHAP5d.HTM
6	University of Iowa	www.uiowa.edu/~fusfsg/campplan/light/plight2.pdf http://www.uiowa.edu/~fusfsg/campplan/light/plight9.pdf
7	UCF- University of Central Florida	http://www.fp.ucf.edu/guides/ccg/16CCG98.htm#LIGH
8	FAU- Florida Atlantic University (Supplement to cost containment guidelines for the state university system of Florida)	http://www.fau.edu/divdept/univarch/fp/forms/CCG.pdf
9	Cornell University	Lighting Master Plan Lighting Design INC 2001, Gary Steffy
10	Lighting Design Glossary	http://www.schorsch.com/kbase/glossary/
11	International Dark-Sky Association	http://www.darksky.org/infoshts/is077.html
12	GE Lighting North America Lighting Institute	http://www.gelighting.com/na/institute/quality.html

13	ICA (International CPTED (Crime Prevention Through Environmental Design) Association)	http://www.cpted.net/home.html
14	NLB- National Lighting Bureau	http://www.nlb.org/index.html
15	DiLouie G., Lane M. <i>Lighting Library</i>	http://www.searchspec.com/library/articles-indoor010.html
16	CEPTED	http://www.tempe.gov/tdsi/Planning/CPTED/
17	KWHLighting	http://www.kwhlighting.com/Merchant2/merchant.mv?Screen=CTGY&Category_Code=L-MH

Illumination Levels and Uniformity Ratio Comparison

Category	Illuminance Footcandles (fc)													
	UF fc ave.	City of Gainesville ave.	FDOT	Orange County	IES	IACLEA (fc) ave.	Univ. of CO (fc) ave.	The State Univ. of NY (fc) ave.	Ohio State Univ. Ave. - min (fc)	Univ. of Iowa (fc)	Pima Community College, AZ	CA State Univ., College Jr. College	FAU (fc)ave.	Cornell University
Primary Walkway	2.5 to 3.0	See IES Doc. DG-5-84		0.2 min. - 2.6 max.	Commercial = 0.9 min ²¹ -2.0 max	3.0	0.5 ave	3.0 ave ¹⁶	2.0 ave - 1 min.	0.2 ²¹ - 0.3 ¹²			0.6 ave	Medium = 0.5 ave.
Secondary Walkways	2.5 to 3.0	*		0.2 min. - 2.5 max.	Intermediate = 0.6 min ²¹ - 1.0 max	3.0	0.2 ave	2.0	1 ave - 0.25 min.	1.2 max				Low = 0.2 ave.
Plazas	2.5 to 3.0	*			Residential = 0.2 min - 0.5 max ²¹	3.0	0.4 to 1.8 ² ave	5 ¹ ave ¹⁹						0.5 ave. ²⁴
Bikeways		*			0.5 min to 1.0 max		0.6 ² ave							
Bicycle Parking Areas					1.0 min ¹⁹ - 2.0 max ²⁰	3.0				5 ave. min				
Major Streets (Arterial)	2.0 to 2.5	Commercial = 1.6 ave Intermediate = 1.2 ave Residential = 0.8 ave	see AASHTO Guide		Commercial = 1.2 min- 1.7 max Intermediate = 0.9 min- 1.3 max Residential = 0.6 min - 0.9 max			Not less than 2 ² ave Not less than 1.5 ² ave Not less than 1 ³ ave	2 - 0.667 min.	0.5 min.			0.6 ave	
Parking Lots	3.0 to 5.0	0.5 min to 2.5 max		0.6 min. - 3.6 max.	High= 3.6 ave-0.9 min Medium= 2.4 ave- 0.6 min Low= 0.8 ave- 0.2 min	General =3.0 to 5.0 Structured =5.0 to 8.0	0.9 ² ave 2 ² ave	2 ave ¹⁷ 3 ave ¹⁸	1 - 0.25 min. 2.4 -0.6 min ¹⁰	0.6 min ¹⁵ 0.9 max ¹⁵	0.6 ¹⁵ min 5 ¹⁴ min 50 at entrance ¹⁴	High activity = 0.9 min- 2ave ¹⁵ Medium activity = 0.6 min-1 ave ¹⁵ Low activity = 0.2 min- 0.5 ave ¹⁵	0.6 ¹⁵ ave	Medium = 0.6 min Low = 0.2 min
Minor Street (Collector)	2.0 to 2.5	Commercial = 1.1 ave Intermediate = 0.8 ave Residential = 0.6 ave			Commercial = 0.8 min- 1.2 max Intermediate = 0.6 min-0.9 max Residential = 0.4 min -0.6 max		Residential=0.2 ave			0.5 ave. min.	10 at ramps ¹⁴	5 ¹⁴ ave		Medium = 0.9 ave. Low = 0.6 ave.
Small Areas	1.5 to 2.0			5.0 max.	1.0 min - 5.0 max	5.0 ²⁸				5 ave. min				
Large Areas	1.5 to 2.5	25.0 max. ave.		5.0 max.										

Category	Uniformity Ratio (Ave. fc to Min. fc)													
	UF	City of Gainesville	FDOT	Orange County	IES	IACLEA	Univ. of CO	The State Univ. of NY	Ohio State Univ.	Univ. of Iowa	Pima Community College, AZ	CA State Univ., College Jr. College	FAU	Cornell University
Primary Walkway	3:1						5:1			6:1 ²⁵	4:1		4:1	Medium 4:1
Secondary Walkways	4:1						5:1			6:1 ²⁵	4:1		4:1	Low 10:1
Plazas	4:1						4:1 ² 5:1 ³							10:1 ²⁴
Bikeways							10:1 ¹							
Bicycle Parking Areas											4:1		6:1	
Major Streets (Arterial)	4:1	Commercial = 3:1 Intermediate = 3:1 Residential = 3:1	3:1 to 4:1		Commercial = 3:1 Intermediate = 3:1 Residential = 3.5:1						4:1			
Parking Lots	4:1	5:1			High=4:1 Medium=4:1 Low=4:1		4:1 ⁴ 3:1 ⁵			4:1 ²⁵	4:1	high 0.9min 2ave ¹⁵ medium 0.6min 1 ave ¹⁵ low 0.2min 0.5 ave ¹⁵	4:1	Medium 4:1 Low 4:1
Minor Street (Collector)	4:1	Commercial = 4:1 Intermediate = 4:1 Residential = 4:1			Commercial = 3:1 Intermediate = 3.5:1 Residential = 4:1		Residential=5:1					5 ¹⁴		Medium 4:1 Low 4:1
Small Areas	6:1										4:1			
Large Areas	6:1	6:1									4:1			

Category	Uniformity Ratio (Max. fc to Min. fc)						
	UF	City of Gainesville	FDOT	Orange County	IES	IACLEA	Univ. of Iowa
Primary Walkway	na						
Secondary Walkways	na						
Plazas	na						
Bikeways	na						
Bicycle Parking Areas							
Major Streets (Arterial)	na	Commercial = 10:1 Intermediate = 10:1 Residential = 12:1	10:1		Commercial = 5:1 Intermediate = 5:1 Residential = 6:1		
Parking Lots	na	15:1			20:1 ²² 15:1 ²³		
Minor Street (Collector)	na	Commercial = 10:1 Intermediate = 12:1 Residential = 12:1			Commercial = 5:1 Intermediate = 6:1 Residential = 8:1		
Small Areas	na						
Large Areas							

- ¹ Tertiary pathways
- ² Transportation Nodes
- ³ Sidewalks along major streets
- ⁴ General Parking and Pedestrian Area
- ⁵ Vehicle use area only
- ⁶ Area with heavy pedestrian and vehicular activity
- ⁷ Area with steady pedestrian and vehicular traffic
- ⁸ Area with light pedestrian and vehicular traffic
- ⁹ In areas of heavy congregation, building entrances, etc
- ¹⁰ High activity outdoor parking
- ¹¹ Minimum acceptable
- ¹² Desired minimum
- ¹³ Open Parking facilities (fc on pavement)
- ¹⁴ Covered Parking facilities -daytime(fc in general parking spaces
- ¹⁵ Open parking facilities:
High activity- major athletic, cultural or civic events
Medium activity- community centers, office building parking areas, recreational events, on-campus housing parking
Low activity- parking facilities, educational facility parking
- ¹⁶ Light levels given are for average horizontal fc with minimum levels between standards not less than 1/3 average values given and maximum values shall not exceed 4 times the average values
- ¹⁷ Small short time parking: Parking Areas of up to 100 cars where there is frequent turnover used by people unfamiliar with the surroundings
- ¹⁸ Large short time parking: Parking Areas of over 100 cars where there is frequent turnover used by people unfamiliar with the surrounding
- ¹⁹ Selfparking -Recommended pedestrian crosswalk illumination (Bicycle Federation of America) based on IES standard
- ²⁰ Attendant parking- Recommended pedestrian crosswalk illumination (Bicycle Federation of America) based on IES standard
- ²¹ Sidewalks -Recommended pedestrian crosswalk illumination (Bicycle Federation of America) based on IES standard
- ²² Basic security
- ²³ Enhanced security
- ²⁴ Pathways- pedestrian ways distant from roadways
- ²⁵ Do not exceed
- ²⁶ Building Entryways

NOTES:

City of Gainesville also has lighting illumination levels for Local Streets which also apply to roadways that traverse greenway corridors. The Ave. Footcandle standard for these roads is 0.4 to 0.8; Ave/Min Uniformity standard is 6:1; and the Max/Min Uniformity Standard is 20:1.

City of Gainesville "Large Area" exterior lighting standard also applies to recreational sports fields and security areas on the exterior of buildings.

Orange County "Large Areas" and "Small Areas" defined as fire lanes, driveways and building entrances.

Illuminance Levels shall be measured on the surface level

City of Gainesville and Orange County both have standards for controlling light spillage onto adjacent properties. This is most restrictive next to residential.

Average fc values