

16500 Lighting

Part 1: General

- 1.01 Guidelines for use with various lighting designs
- 1.02 Whenever possible, buildings should be designed so that a 2% daylight factor is achieved in spaces occupied for critical visual tasks.

Part 2: Design Guidelines - Interior Lighting

- 2.01 Follow EPA GreenLights recommendations and IESNA recommended lighting levels.
- 2.02 Use highly efficient lighting systems that improve lighting and meet the needs of the residents.
- 2.03 For typical four or eight foot fluorescent fixtures, use electronic ballasts and T-8 lamps.
- 2.04 Ballast General Specs - THD<10%, CCF<1.7, Power Factor>0.98, Operating Frequency>20kHz
- 2.05 Use Instant Start ballasts in all common areas (hallways, stairwells, etc.) and where operation time is expected to be greater than or equal to 3 hours per start. Use Rapid Start ballast for other areas.
- 2.06 T-8 Lamps General Specs - 32W, Rapid Start, 3500K Color Temperature, minimum 75 CRI
- 2.07 Use parabolic louvers in applicable areas to reduce glare.
- 2.08 Down lights should be compact fluorescent.
- 2.09 Restrooms - Do not use manual switches in restrooms. Use motion sensor systems (ultra-sonic) to control general lighting. Provide a minimum of one fixture in restrooms on emergency circuit to provide minimum light levels at all times (for security reasons).
- 2.10 See Section 00703 for Classroom Lighting requirements.
- 2.11 Under certain conditions, daylight dimming controls should be considered and implemented where economically feasible.
- 2.12 Maintain standard set of fixtures/tubes/components for facility. Minimize variations.
- 2.13 All hardware to have one-year warranty period following project acceptance.

Part 3: Design Guidelines - Emergency Lighting

- 3.01 Designs for emergency lighting systems shall comply with the Electrical Guidelines of the State Construction Office.
- 3.02 Additional information for emergency generator systems is included in Section 16200 of the Construction Guidelines.
- 3.03 All exit lights are to be LED type.

Part 4: Design Guidelines and Standards - Exterior Lighting

- 4.00 Scope -These Guidelines and Standards cover the appropriate choice of lighting levels to be applied and to the selection and application of lighting fixtures and poles to ensure consistent, adequate and uniform lighting in all areas external to buildings on each campus of the University.

Designers and engineers developing plans for lighting systems shall follow these standards or, should they seek a variance from these standards, submit any variations to the University's Architect's office and the Power Systems group in Facilities Operations

4.01 Definitions

Uniformity – The evenness of light distribution on any surface, measured as a comparison of average illuminance (light level) to minimum illuminance (light level) in any area, expressed as a mathematical ratio between the numerical illuminance's (light levels).

Illuminance (light level) – The amount of light, measured in foot-candles (US unit), that falls on a surface, either horizontal or vertical.

Color rendering index (CRI) – A measure of the trueness of color as seen or perceived reflecting from an object or surface under artificial light compared to the color as seen or perceived reflecting from that same object or surface in sunlight. A CRI of 100 (maximum ratio) means that the color of the object is the same in artificial light as in sunlight.

Transition lighting – The technique of blending illuminance or uniformity ratios when moving from an area of higher luminance or uniformity into an area having lower illuminance or uniformity.

4.02 Design StandardsA. Criteria - Luminance for campus areas -

Campus courtyards - Light levels shall be an average of 2.5 foot candles; uniformity of not more than 4:1, no area less than 1fc.

Campus walkways (All Campus Paths) - Light levels shall average 2.5 foot candles; uniformity of not more than 4:1, no walkway area less than 1fc.

Campus streets - Light levels shall be an average of 3 foot candles; uniformity of not more than 5:1, no area less than 1 fc.

Campus parking lots - Light levels shall be an average of 2 foot candles; uniformity of not more than 3:1, no area less than 1 fc.

All illuminance measurements are to be made on the horizontal plane with a certified light meter calibrated to NIST standards using traceable light sources. The calibration source shall be a color corrected CIE Illuminant A (2856 degrees K.)

Light sources

Campus walkways including those bordering parking areas or streets: Metal halide

Campus streets and drives: High pressure sodium

Campus parking lots: High pressure sodium

Building entrances and porches: Metal halide

Parking Decks: Metal halide

Fixture types

Campus walkways – Special lighting areas and courtyards – Kim SAR

Campus streets – Kim AR

Campus parking lots – Kim AR

Building entrances – Kim SAR

All fixtures are to have multivolt ballasts and medium cutoff photometrics. All fixtures to dark bronze.

Pole types

Campus walkways – 12 foot, round, anodized aluminum, dark bronze with 9” bolt circle

Campus streets – 30 foot, round, anodized aluminum, dark bronze with 12” bolt circle

Campus parking lots – 30-35 foot poles, round or square, anodized aluminum, dark bronze with 12” bolt circle.

- 4.02 Provide transition lighting between zones of different light levels.

Each building entrance and porch shall be lighted.

Freestanding bollard, cheek wall, step lights, or below grade fixtures are not acceptable and shall not be designed or installed.

Evaluate each site for fixture spacing and place lights considering unique site conditions (topography, obstructions, trees and anticipate growth of large tree canopies) when determining spacing and height of fixtures to achieve uniform lighting.

- 4.03 **Architectural and landscape lighting may be added to enhance the character of courtyards and other special campus places or landmarks.**

For aesthetics, use “white” light (metal halide) to render true nighttime color of the environment.

Front building facades of major hearth buildings and their architectural detailing may be highlighted at night.

Lighting fixtures on individual buildings will be appropriate to the character and materials of that building.

Building service area wall-mounted lighting fixtures should be full cutoff fixtures and standardized.

- 4.04 **Campus Open Spaces shall be lighted according to function and need.**

Plaza and Courtyard paths and hubs of interaction shall be uniformly lighted according to the criteria listed above.

Generally, Campus Greens shall be lighted at perimeters. In some cases, such as The Oval, where the lawn area of a Campus Green is subdivided and activity areas developed within the open space, area lighting in the center of the Green may be used.

Campus play fields shall be lighted for night time game use; field perimeter paths and connecting paths leading to play fields shall be lighted with pedestrian scaled, uniformly distributed lighting.

4.05 **Campus Streets and Parking Lots shall be lighted uniformly for nighttime use according to the criteria listed above.**

Provide Transition Zones from parking lot lighting levels to pathway lighting to avoid dark zones.

Provide uniform lighting with pedestrian-scaled lighting fixtures at bus stops, bike racks, and other pedestrian areas in and around parking lots. Avoid placements that may cause glare to drivers.

4.06 **Campus lighting shall avoid light pollution and light trespass in order to reduce inefficiency, sources of glare, and light that may be harmful to the nighttime environment and shall conform to the City of Raleigh Lighting Ordinance.**

Campus lighting shall be directed to the ground or only where needed and have a cutoff angle less than 45 degrees to eliminate light trespass from the site.

Lighting in residence hall areas shall not spill into residents’ windows.

Site lighting in greenhouse areas must be controlled to avoid light trespass on greenhouse plants.

4.07 **Lighting Fixtures - For consistency of materials, finishes, and luminaire types throughout campus, a menu of standard lighting fixture types has been developed.**

The following list of standard lighting fixture types may be used on campus. Street lights, parking, and pedestrian lights shall be the Kim Archetype Series (Archetype and Small Archetype). Use of the Holophane Utility Series Granville Luminaire may be used in the older parts of campus and shall be approved by the Office of the University Architect. Other lighting fixtures may be used on campus for special applications and those exceptions will be submitted for approval to the Office of the University Architect and Facilities Review.

Kim Archetype:

Street and Parking Lot Lights - Single Fixture, 30’ KIM Archetype

Fixture	1A/AR3/400HPS/MT/DB-P
Photocell Receptacle	A-25 (1 required for single)
Pole	KRS-30-5180A/DB-P

Street and Parking Lot Lights – Double Fixture, 30’ KIM Archetype

Fixture	2B/AR3/400HPS/MT/DB-P
Photocell Receptacle	A-25 (1 required for double)
Pole	KRS-30-5180B/DB-P

Pedestrian Area Lights – Single Fixture, 12’ KIM Archetype

Fixture	1A/SAR3/150MH/MT/DB-P
Photocell Receptacle	A-33
Restrike Ballast	
Pole	KRS-12-4120SA/DB-P

Holophane Utility Granville Series Luminaire and Barrington Series Pole:

Fixture	GVU100MHMTZ5NNUH (with up shield) AOL2003
Pier Mount Base	PM-CA/DB
Photocell Receptacle	H
Pole	B12/20/CI/DB

The model numbers listed above are for illustration only. The specifier should coordinate project specific items such as fixture arrangement and voltage on a project by project basis.

- 4.08 Older cast iron fluted poles and fixtures shall be reused or saved for use along streets and small parking lots in the older parts of campus.
- 4.09 Electrical Components - To facilitate maintenance, testing and repair, electrical components and ballasts should be a tray-mounted module that can be completely replaced by simply unplugging one connector and installing a new module. When selected fixtures do not have an accessible ballast tray; then, provide option with best maintenance accessibility.
- 4.10 Wiring - Site lighting shall be connected on separate circuits and photocells, or on a contactor installed in a building or other facility. Coordinate specifics with Facilities Operations, Power Systems group. Site lighting shall not be connected to a circuit for stairway, porch, or other ancillary fixtures. Wiring shall be continuous between poles and contain no splices except at junction boxes located near the base of each pole. Conduits for lighting circuits shall be Schedule 40 PVC and continuous from pole to pole, handhole, or junction vault. Conduit shall be direct buried (24" minimum, 30" maximum from finished grade). Conduit size shall be a minimum of 1" for single circuits or 2" minimum for multiple circuits.
- 4.11 Photocells - The photocell for site lighting shall be located on the outside of the building. The photocell shall be mounted not higher than 10 feet in an easily accessible location for maintenance, but not in an area that will remain dark, such as behind foliage, tree limbs, or from other building attributes. Parking lot and street lighting photocells shall be mounted on the top of the light pole in such a position that "light spill" from adjacent lights will not affect operation.
- 4.12 Pole Bases – Options
- A: Pole bases should be poured in place concrete with the top of the concrete approximately six inches above grade with chamfered edges. Wire entrances to the bases shall be made using 90 degrees rigid PVC or metal conduit elbows. Pole bases shall be anchor bolt type (minimum 3/4" bolt diameter) and include a ground rod poured integral to the base.
- B: Auger-type screw foundation installed with power equipment such as a digger truck. The base shall be 6" minimum hot dipped galvanized steel, 5' minimum long with a handhole approximately 18" below the pole anchor plate. The anchor plate shall have a bolt circle that varies from 9" to 14". (Example: ABChance, Catalog No. C11232JG4VL).
- 4.13 Bases shall be placed 2' to 3' behind pavement (walkways, streets, or parking surfaces) in mulch. Avoid placement in grassed areas. Provide a 3' diameter mulch mow strip in grassed areas.
- 4.14 Pole Hand-holes - Each pole is to have a metal or composolite handhold at each pole to provide access to wiring connections. Junction boxes shall be metal or Quazite Composolite or equal with the top labeled "ELECTRICAL".
- 4.15 Pole Numbering - Each pole number shall be labeled on the most visible face of the pole with a permanent 1" by 8" aluminum label securely attached to the pole with an appropriate

adhesive 60” from finished grade (+/- 6 “). The number schedule will be provided by Facilities Operations to coordinate with existing numbering methods.