

# NC State University Design and Construction Guidelines

## Division 26 Lighting

### Purpose

The following guideline provides information for various interior and exterior lighting designs for all non-classroom spaces. Classroom spaces are included as a separate guideline.

### General Requirements

#### A. Interior Lighting

1. Follow recommendations and recommended lighting levels in the latest editions of the North Carolina Energy Conservation Code (NCECC), the Illuminating Engineering Society of North America (IESNA), Energy Efficient Lighting Guidance Document for New Construction and Retrofits: The State of North Carolina (EELGD). This document supersedes the others referenced, except when Code is more stringent.
  - a) For animal production facilities, follow ASABE (American Society of Agricultural and Biological Engineers) light level standards.
2. The use of incandescent, HID, and fluorescent lighting is not permitted, unless the lighting requirements cannot be fulfilled by an LED fixture.
3. LED lights shall meet the following criteria:
  - Nationally recognized testing laboratory (NRTL) certified as recognized by the State of North Carolina
  - The most recent version of the Design Lights Consortium (DLC) certified
  - Correlated Color Temperature (CCT) of 4000K (nominal)
    - 4000K is the campus standard. CCT outside of this range shall be considered only in areas where there is a demonstrated architectural need or to match an existing standard in the building. For residential halls the standard is 3500K.
4. Occupancy sensors shall be dual-technology, IR Motion and ultrasonic whenever possible, with an additional dry contact output for BAS connection.
  - Occupancy/vacancy sensors shall turn off lights within a maximum of 30 minutes of last activity and shall be required in all spaces.
5. Provide a minimum of one egress light in multi-person restrooms that is backed up by emergency power.
6. Lighting fixtures in similar programmable spaces shall be of the same style and type.
7. When installing new LED fixtures, attic stock of either 3 spare fixtures or 3% of the installed quantity, whichever is greater, shall be provided to the Building Maintenance and Operations zone shop with purview of the building.
8. A small renovation within an existing facility may use replacement-in-kind to match

# NC State University Design and Construction Guidelines

## Division 26 Lighting

existing with the approval of NC State.

- B. A small renovation within an existing facility may use replacement-in-kind to match existing with the approval of NC State.
- C. Emergency Lighting
  - 1. All exit lights are to be LED.
  - 2. All emergency exit lighting shall be powered by an emergency generator circuit where possible, otherwise computer-based UL924 compliant shall be provided.
- D. Exterior Lighting – All lighting shall use LED luminaires and shall comply with the NC State Preferred Manufacturer’s List and bidding procedures.
  - 1. Design Standards for Pedestrian Areas - all campus paths, and the perimeter of courtyards and campus greens such as Mary Yarbrough Courtyard, Court of North Carolina, Scott Courtyard, University Plaza “The Brickyard,” and The Oval.
    - a) Average light levels shall be 1.0 foot-candle;
    - b) Uniformity of not more than 4:1;
    - c) No area less than 0.25 foot-candle;
  - 2. Design Standards for Campus Streets
    - a) Average light levels shall be 2.0 foot-candles;
    - b) Uniformity of not more than 5:1;
    - c) No area less than 0.40 foot-candle.
  - 3. Design Standards for Campus Parking Lots
    - a) Average light levels shall be 1.0 foot-candle;
    - b) Uniformity of not more than 3:1;
    - c) No area less than 0.30 foot-candle.
  - 4. Design Standards for Pole Bases
    - a) Pole bases shall be constructed using one of the following two options:
      - (1) Poured-in-place concrete – Poured in-place concrete bases shall have the following design parameters: Top of concrete 3” above grade; Chamfered edges; Conduit into bases shall be 90 degree rigid PVC or metal; Ground rod integral to the base; Bolt circle 9-14” in diameter depending on pole height; ¾” diameter anchor bolts.
      - (2) Auger-type screw foundation – Auger-type bases shall have the

# NC State University Design and Construction Guidelines

## Division 26 Lighting

following design parameters: 6" minimum hot dipped galvanized steel; 5' long minimum; Hand hole approximately 18" below the pole anchor plate; bolt circle 9 - 14" in diameter depending on pole size; 3/4" diameter anchor bolts.

- b) Pole bases shall be 2' to 3' beyond the edge of pavement (sidewalk, streets, or parking surfaces) and in softscape. Placement in grassy areas shall be avoided or limited.
5. All luminance intensity (candela) measurements shall 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 Kelvin).
  6. Free standing bollard, cheek wall, step lights, or below grade fixtures are not acceptable, unless approved by NC State.
  7. Correlated Color Temperature (CCT) of 4000K (nominal) lights are required.
  8. Wall mounted lighting fixtures may be used in service areas where pole mounted lights are not possible. Fixtures shall be full cut off and of uniform design aesthetic.
  9. Cast iron fluted poles and fixtures shall be salvaged for use by NC State.
  10. Electrical components shall be a tray-mounted module that can be completely replaced by unplugging one connector and installing a new module.
  11. Site lighting shall be connected on separate circuits and photocells or on a contactor installed on a building. 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, hand hole, or junction vault. Conduit size shall be a minimum of 1" for single circuits or 2" minimum for multiple circuits. Each pole shall have a hand hole to provide access to wiring connections. Junction boxes shall be metal or composite material with the top labeled "ELECTRICAL."
  12. The preferred system of exterior lighting controls is for every light fixture to have an integrated photocell. The photocell for the exterior lighting that is not mounted on poles shall be located not higher than 10 feet in an accessible exterior location for maintenance and in an area that receives adequate sunlight. Photocells shall be mounted in such a position that "light spill" from adjacent lights will not affect operation. Where photocells are not practical, timers shall be incorporated to control the operation of the lighting circuits.
  13. Lighting poles shall be numbered. Each pole number shall be labeled on the pole with a permanent 1" x 8" aluminum label securely attached to the pole with adhesive 60" above the finished grade (+/- 6"). The numbering schedule shall be provided by NC State to coordinate with existing numbering methods.
- E. Classroom Lighting
1. All 110 classrooms shall be designed to meet a minimum of 38 foot-candles of

# NC State University Design and Construction Guidelines

## Division 26 Lighting

dimnable general room lighting at the working surfaces. Light foot-candle readings in excess of 100 at the working surface will be considered excessive and may require correction.

2. Lighting design shall be zoned to allow for different light levels to be used simultaneously at the instructor's area and student seating with neither spilling onto the projection screen. Minimum of 4 zones: Student Seating Area, Instructor Area, Projection Area, Emergency Lighting.
  3. Light levels shall be uniform throughout the space to prevent pockets of poor visibility at the sides and corners of the room.
  4. Light Coverage in classrooms shall provide a uniform, shadow free, and glare free environment.
  5. Provide either dimmable parabolic lay-in or dimmable pendant mounted direct-indirect fixtures for general lighting applications.
  6. Coordinate any pendant fixtures with ceiling mounted equipment and all projection paths.
  7. Wall keypads must be easy to use and labeled to indicate lighting zone or preset.
  8. Locate keypad(s) at entry door(s) to each classroom.
  9. Occupancy sensors shall be dual-technology, IR Motion and ultrasonic whenever possible, with an additional dry contact output for BAS connection.
- F. Classroom Lighting Controls (110)
1. All classroom lighting systems shall have an individual controller located in the room and shall comply with the NC State Preferred Manufacturer's List and bidding procedures.
  2. The lighting controller main unit shall be located near the instructor teaching station on the instructional wall.
  3. The system shall accommodate a minimum of 4 scenes (General, Lecture, Movie, & Other).
  4. The lighting control system must support RS 232 or TCP/IP connectivity for remote management of classroom lighting and the module must be located in the 12" x 12" junction box for AV located in the classroom or control room if present.
  5. Locate lighting control system dimmer modules, boosters, etc. above the accessible ceiling at the lighting zone served.