DIVISION 26 00 00 ELECTRICAL

SECTION 26 09 00 INSTRUMENTATION AND CONTROL FOR ELECTRICAL SYSTEMS

1. GENERAL.
   A. Campus uses the Ubicquia photocell node. All light fixtures must be compatible.

2. PRODUCTS.
   B. Photocells and Astronomical Timers
      1. Ubicquia photocell. https://www.ubicquia.com/products/ubicell
         a. Key Technical Specifications:
            i. Dimensions: 103.5mm x 82.5mm
            ii. Power Surge Detection: 10kV/5KA
            iii. Power Supply: 90V to 506V (50/60 Hz)
            iv. Dimming Controls: 0-10V, DALI, DALI-2
            v. IP Rating: IP66
            vi. Impact Rating: IK07
            vii. Operating Temperature Range: Range -30^{o} C to +70^{o} C
            viii. Communication Module: LTE, CAT-1
            ix. Bands supported: B2/B4/B12
         b. If specified light fixtures do not offer the photocell node, it will be campus-provided.
      2. Astronomical timers can be used for building-mounted fixtures.

3. EXECUTION.
   A. Photocells.
      3. Any 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.
      4. Photocells shall be mounted in such a position that “light spill” from adjacent lights will not affect operation.
      5. Where photocells are not practical, timers shall be incorporated to control the operation of the lighting circuits.

SECTION 26 50 00 LIGHTING

1. GENERAL.
   A. Design shall follow the High Performance Building Requirements (HPBr) checklist for the State of Tennessee.

   B. Where appropriate, occupancy sensors and daylighting controls should be considered and are preferred.

   C. LED lighting is required in all areas and should be included in upgrade, renovation, and new construction projects.

D. Designers are required to provide campus a lighting specification package at DDP review. This package should include cut sheets and images of all proposed light fixtures in the project with coordinated fixture numbers or letters and locations clearly labeled.

E. Consideration for maintenance of lighting fixtures should be given in design: lift access must be feasible for cleaning and replacement. Verify with TTU Facilities.

F. Both interior and exterior fixtures should not be designed in such a way that they will catch and hold insects in the lenses.

G. Corridor lights shall have switches located in an area not accessible to the public.

SECTION 26 51 00 INTERIOR LIGHTING

1. GENERAL.
   A. Follow recommendations and recommended lighting levels in the latest editions of the Tennessee High Performance Building Requirements Manual, the Illuminating Engineering Society of North America (IESNA), and the lighting levels listed within this document.

   B. Design for a minimum of 38 FC and a maximum of 50 FC for all office areas.

   C. Meet and do not exceed minimum code lighting level requirements.

   D. The use of incandescent lighting is not permitted.

   E. The color temperature for Interior LEDs shall be 4000-degrees Kelvin.

   F. Down lights shall be LED. Down lights shall not be installed in a gypsum ceiling.

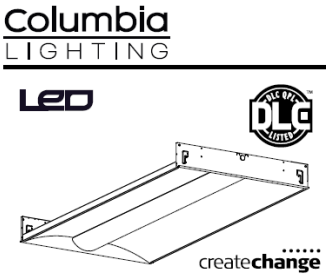
   G. Occupancy sensors shall be required in all the following spaces:
      1. Conference/Meeting Rooms
      2. Break Rooms
      3. Restrooms
      4. Private Offices
      5. Storage Rooms over 100 SF
      6. Computer Rooms over 100 SF

   H. Use occupancy sensor systems (ultrasonic) to control general lighting in restrooms. Provide a minimum of one fixture in restrooms on emergency circuit to provide minimum light levels at all times.

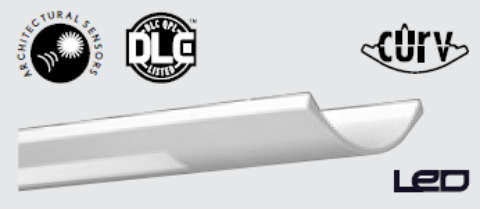
   I. Lighting fixtures in similar program spaces shall be of the same style and type.

2. PRODUCTS.
   A. Three manufacturer options shall be given for each type of light fixture specified in a project. Products shown below are examples of styles only.

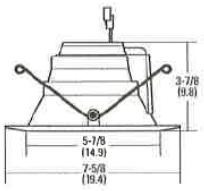
   B. ACCEPTABLE MANUFACTURERS.
      1. Interior Recessed Direct/Indirect
         a. Columbia Lighting LED LCAT24
         b. RAB
         c. Hubbell



      2. Interior Suspended Direct/Indirect
         a. Alera Lighting Curv LED
         b. RAB
         c. Hubbell



      3. Interior Recessed Downlight
         a. Lithonia Lighting LED Recessed Downlighting 6BP/60P
         b. RAB
         c. Hubbell



SECTION 26 52 00 EMERGENCY LIGHTING

1. GENERAL
   A. All emergency lighting should be powered by the building generator.

   B. For buildings without a generator, emergency lighting shall be powered by batteries.

SECTION 26 53 00 EXIT SIGNS

1. GENERAL.
   A. All exit signs should be LED type.

   B. Green light exit signs are preferred for new construction and full-building renovations.

   C. Exit signs should be blade style in new construction and full-building renovations.

   D. Match existing style and color for partial-building replacements.

SECTION 26 56 00 EXTERIOR LIGHTING

1. GENERAL.
   A. Design Standards for Pedestrian Areas, Includes campus walkways and activity areas within courtyards and plazas including bus stops, bike racks, and other pedestrian areas.
      a. Average light levels shall be 1.0 foot-candles
      b. Uniformity of not more than 4:1
      c. No area less than 0.25 foot-candle
      d. Campus courtyards and greens shall be lighted at perimeters

   B. Design Standards for Campus Streets
      a. Average light levels shall be 2 foot-candles
      b. Uniformity of not more than 5:1
      c. No area less than .04 foot-candle

   C. Design Standards for Campus Parking Lots
      a. Average light levels shall be 1 foot-candle
      b. Uniformity of not more than 3:1
      c. No area less than .03 foot-candle

   D. Design Standards for Pole Bases
      a. Pole bases shall be constructed using one of the following two options:
         i. Poured–in-place concrete – Poured in-place concrete bases shall have the following design parameters: Top of concrete 6” above grade; 24” diameter; 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.

         ii. Auger-type screw foundation – Auger-type bases shall have the 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 edge of pavement (sidewalk, streets, or parking surfaces) and in softscape or grass.

   E. 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).

   F. The color temperature for Exterior LEDs shall be 5,000-degrees Kelvin.

   G. Night lighting of front building facades of major campus buildings and their architectural detailing is acceptable. Consideration should be given to reduce light pollution.

H. Wall mounted lighting fixtures may be used in service areas where pole mounted lights are not possible. Fixtures shall be full cut off and standardized.

I. Existing cast iron fluted poles and acorn-head fixtures to be removed shall be salvaged and turned back over to Tennessee Tech.

2. PRODUCTS.

A. All exterior lighting shall be provided from acceptable manufacturers listed below and match surrounding areas in style.

B. Free standing bollard and cheek wall fixtures are acceptable but must be discussed with campus on a project-specific basis.

C. Exterior junction boxes shall be metal or Quazite Composolite material or equal.

D. All street and parking lot lighting fixtures shall have a 5-pin photocell connection if fixtures do not come with Ubiquia controllers.

E. Exterior Lamppost-style Pole Lights shall have fluted poles with flared bases, acorn heads, eagle finial (black), and interior style dark-sky cap. Exterior dark-sky caps will not be accepted.

F. All lamppost-style pole lighting shall be 12’ high. Coordinate with surrounding areas for continuity where different heights exist. Verify all deviations from 12’ poles with Campus Representative.

G. Exterior wall-mounted lighting shall be:

1. Decorative wall fixtures to match and complement the traditional style and scale of the building. For instance, traditional lantern-style sconce or pendant.

2. Typical finish for decorative fixtures shall be black.

3. Wall-wash fixtures shall be wedge-type sized to serve local lighting needs and designed to disappear on the building façade as much as possible. Typically, dark bronze finish is preferred on brick.

4. Consider mounting locations, height, and pedestrian traffic patterns particularly for large and protruding fixture-types.

H. ACCEPTABLE MANUFACTURERS.

1. Campus Standard exterior pedestrian light pole fixture.
   a. Lamp Head.
      i. Holophane, GVD3 P40 50K MVOLT MS GL3LU BK EG TBK PR7
         A. UBC UGU NA Ubicquia Controller, 5- or 7-pin.
         B. Eagle finial, black.
         C. Modern housing.
         D. Night-sky glass.
         E. No cover.
         F. No ribs and bands.

   b. Pole Base.
      i. Holophane, WDA 12 F5J 19D CO3 BK ABG
      ii. Wadsworth aluminum pole.
      iii. 12’ pole standard, exception noted above.
      iv. 5” diameter fluted shaft.
      v. 19” base with square pattern bolt circle.
      vi. 3x3 tenon.

   c. Banner Arms.
      i. Banner arms shall be specified separately when needed to accommodate the length of the banner.
      ii. Holophane, BA 18IN 1A CO F5J HB
      iii. Standard aluminum banner arm, 18”.
      iv. Single arm style.
      v. Clamp on banner arm mount.
      vi. 5” diameter fluted shaft.
      vii. Half sphere finial.

2. Acceptable substitute to Campus Standard exterior light pole fixture.
   a. Lamp Head.
      i. Sol-Lux K445
   b. No other substitutions will be accepted.

3. Exterior parking lot light pole fixture.
   a. Shall be a cobra-head type fixture.
   b. Basis of design: SLG Lighting ALFG1 series.

3. EXECUTION.
   A. Electrical components and ballasts shall be a tray-mounted module that can be completely replaced by unplugging one connector and installing a new module.

   B. Site lighting shall be connected on separate circuits and photocells.
      1. Wiring shall be continuous between poles and contain no splices except at junction boxes located near the base of each pole.
      2. Conduits for lighting circuits shall be Schedule 40 PVC and continuous from pole to pole, hand hole, or junction vault.
      3. Conduit size shall be a minimum of 1” for single circuits or 2” minimum for multiple circuits.
      4. Each pole shall have a metal or composite hand hole to provide access to wiring connections.
      5. Junction boxes shall have the top labeled “ELECTRICAL.”