

**PART 1: GENERAL**

**1.01 LUMINAIRES**

- A. This standard is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design for new construction and renovations. The responsibility of the engineer is to apply the principles of this section such that the University may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be justified through life cycle cost (LCC) analysis and submitted to the University for approval.
- B. Lighting design shall meet the requirements of the ASHRAE 90.1 as currently adopted by the State of Texas Energy Code and meet the recommended illumination levels of the current edition of the Illuminating Engineering Society of North America (IESNA) Lighting Handbook.
- C. In addition the lighting design shall target lighting power densities a minimum of 25% below the values allowed in the ASHRAE 90.1 Standard.
- D. For renovations where fixture replacements are not desirable, high efficiency retrofit kits are available from fixture manufacturers and third party sources that provide efficiencies equal to new high efficiency fixtures.
- E. Do not use low pressure sodium, mercury vapor or standard incandescent lamps.
- F. Utilize LED fixtures for all specialty lighting, under counter and exterior lighting.
- G. LED Approved Manufacturers
  - a. CREE or approved equal
- H. 2'x2' fixtures are not accepted by SHSU

**PART 2: PRODUCTS**

**2.01 INTERIOR LUMINAIRES**

**Fluorescent Lighting**

- A. Linear & Compact Lamps
  - 1. All linear fluorescent lamps installed within conditioned spaces shall be 4-foot straight tube, F28T8, 28-watt, high lumen output.
  - 2. All fluorescent lamps installed in unconditioned or refrigerated spaces shall be 4-foot straight tube, F32T8, 32-watt, high lumen output type.
  - 3. All linear 32 watt fluorescent lamps shall have a minimum rated life of 24,000 hours at 3 hours/start (instant start ballast), 95% or higher lumen maintenance

4. CCT of 5,000K and CRI  $\geq 80$
5. No eight-foot lamps allowed. Use combination of 4-foot lengths in 8 foot fixtures.
6. All screw and plug-in compact type fluorescent lamps installed within conditioned spaces shall operate by an electronic ballast with a power factor  $\geq 60\%$  for screw-in,  $\geq 95\%$  for plug-in, have a minimum rated lamp life of 10,000 hours at 3 hours/start, CCT of 5000K and CRI  $\geq 80$ . CFLs installed in unconditioned spaces will have the additional requirement of being operated by an electronic ballast designed for unconditioned spaces.

**B. Ballasts for linear lamps.**

1. Fluorescent ballasts shall be high frequency (see item 12 below), U.L. approved, CBM certified to operate as specified one, two or three T8 lamps
2. Shall be integrated circuit type electronic constant wattage, constant light output
3. Shall have a power factor  $\geq 95\%$
4. Shall have Class A sound rating
5. Shall be Class P thermally protected with automatic reset
6. Shall have a current crest factor less than 1.5
7. Shall have a total harmonic distortion (THD)  $< 10\%$ .
8. Where not separately switched three or four lamp fixtures may contain 3 and 4 lamp ballasts.
9. Ballast factor shall be 0.77 or 0.78 for Low Powered ballasts, between 0.85 and 0.90 for Normal Powered ballasts, and greater than 1.12 for high output ballasts.
10. Shall be program start and classified as NEMA premium efficiency
11. Shall be designed to accommodate multiple voltage input, have built in anti-striation technology and utilize parallel lamp operation circuitry
12. Ballasts shall further be designed such that the output frequency to the lamps is high enough (typically 40 kHz or greater) so as to not interfere with common infrared devices

**C. Prismatic acrylic diffusers for fluorescent fixtures shall be A12 pattern and at least 1/8" thick. Do not use styrene lenses.**

**D. Troffers with air handling capability are not allowed by the University.**

**HID Lighting**

- A. Mercury vapor and high & low pressure sodium lamps/luminaires are not allowed, only metal halide.
- B. "Open type" fixtures should not be used indoors due to safety concerns.

**C. PULSE Start Lamps**

- 1. Minimum rated lamp life shall be 20,000 hours for lamps >150 watt and 15,000 hours for lamps  $\leq 150$  watt
- 2. CCT of 4000K and CRI  $\geq 80$

**D. PULSE Start Ballasts**

- 1. HID ballast shall be multi-tap encased and potted thermally protected with a power factor  $\geq 90\%$ , constant wattage regulating and autotransformer type.
- 2. Ballast ambient operating temperature range shall be 20  to +130  F. compatible to the lamps chosen for specific burning position, and compensate for the loss in efficiency.
- 3. Provide isolation mounting and insulation of HID ballasts to reduce sound transmission or radiation.
- 4. Each HID ballast shall have a fast acting primary inline fuse built into the fixture assembly by the manufacturer

**LED Lighting**

**A. Screw-in retrofit lamps**

- 1. Shall meet DOE's Energy Star or Design Light Consortium performance criteria for qualified screw-in or pin-based LED lamps.
- 2. Shall have Lamp CCTs conforming to ANSI C78.377A color binning and utilize a 4 step MacAdam Ellipse Algorithm binning process (Philips Optibin or equal) within each retrofit lamp for greater CCT consistency.
- 3. The CCT shall be 5000K unless otherwise approved by the University. The CRI shall be  $\geq 80$ .
- 4. Each lamp shall have a power factor  $\geq 90\%$ .
- 5. Each lamp shall have total harmonic distortion (THD) <10%
- 6. Shall be tested in accordance with LM-79-08 electrical and photometric measurements. Provide to the University, test results of each unique lamp.

7. Shall be tested in accordance with LM-80 lumen depreciation test. Provide to the University, test results of each unique lamp. The L70 rated life result shall be a minimum of 25,000 hours for MR11, 16 and candelabra lamps; 40,000 hours for PAR 20, 30, 38 and BR30 lamps.
8. Shall carry a 5 year minimum product warranty covering failure of ALL electrical components.

**B. Luminaires**

1. The luminaire manufacturer shall be registered as a DOE Quality Advocate.
2. Shall meet DOE's Energy Star or Design Light Consortium performance criteria
3. The luminaire manufacturer shall provide the manufacturer's name of the LED being used in the luminaire.
4. Shall be UL, or ETL, listed and be furnished complete with LEDs and power supplies.
5. LED light source packages, arrays or modules used in the luminaire shall be tested in accordance with LM-80 lumen depreciation test. Provide to the University, test results of each unique package, array or module. The L70 rated life result shall be a minimum of 50,000 hours.
6. Shall be tested in accordance with LM-79-08 electrical and photometric measurements. Provide to the University, test results of each unique luminaire.
7. The CCT shall be 5000K unless otherwise approved by the University. The CRI shall be  $\geq 80$ .
8. Each luminaire shall have a power factor  $\geq 90\%$ .
9. In instances where the LED sources are to be mounted directly into the architecture, such as installing a strip LED by using an adhesive tape, the LED manufacturer shall provide a recommended heat sink volume adequate to achieve rated life at L70.
10. Each luminaire shall carry a 5 year minimum product warranty covering failure of ALL electrical components.

**C. Power Supplies**

1. LED power supplies shall operate LEDs within the current limit specification of the manufacturer
2. Shall operate from 60Hz input source and have input power factor  $>90\%$  and a minimum efficiency of 70% at full rated load of the driver.
3. Shall have short circuit and overload protection.

4. Shall have a minimum starting temperature of 0°F and a maximum case temperature rating of at least 70°C.
5. Power supply output shall be regulated to +/-5% across published load range.
6. Shall have a Class A sound rating.
7. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.
8. Shall contain no PCBs.
9. Shall carry a 5 year minimum warranty from date of manufacturer against defects in material or workmanship, including a replacement, for operation at or below the maximum case temperature specification. (For LED lamps and internal power regulation components for defects resulting in a fixture lumen depreciation >30%.)
10. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

**D. Exit Signs**

1. Fixtures shall be LEC or LED, hard wired, perimeter lit and preferably red on clear background type.
2. If a back-up circuit is not available, then exit sign must be a battery back-up type with self-diagnostics that shall perform both 30-day and annual 90-minute tests with LED indication.
3. Where it is not possible to run conduit, photo luminescent type may be used but will require prior University approval.
4. Tritium gas exit signs are not allowed.

**2.02 EXTERIOR LUMINAIRES**

A. The performance criteria is the same as interior luminaires plus the additional or “in lieu of” criteria below:

1. Lamp CRI shall be  $\geq 70$  for metal halide and LED light sources.
2. Shall be durable, corrosion resistant fixtures that are readily maintainable and have minimal luminaire O&M costs

B. The following luminaire descriptions are to establish design intent and to set a standard of quality. All luminaires shall be UL listed for wet or damp locations depending on the application.

1. Area and Parking Lot Luminaires: (NO EXCEPTIONS without prior approval)

**CREE - BETA LED Area Lighting Fixture:** LED Area Lighting “The Edge” Type V-short  
Model #: Beta LED# ARE-EDG-5S-R3-24-E-UL-BZ-350  
Spec: LED minimum Type V short 6000k 263ci Lumens voltage 120-270 wet listed  
Color: Dark Bronze

**Parking Lot Pole:**

United Lighting Standards 30’  
Model # SSHP-30-6-7-T2-TMB  
Specs: 6” Square hinged steel pole, height 30’

2. Pedestrian Walk, Plaza Light Standard (NO EXCEPTIONS without prior approval)

**CREE - BETA LED Fixture: The edge Round Luminaire**  
Model# BLD-EDR-5M-R5-06-E-UL-BZ-350  
Spec: LED, minimum 5,250 lumens voltage 120-270, wet listed  
Color: Dark Bronze

**Walkway Pole:**

United Lighting Standards 12’ Aluminum Pole  
Model # RSHA-1521-T2-DB  
Specs: Round hinged Aluminum pole, height 12’, shaft OD 5”  
Color: Dark Bronze

3. Wall Packs:

**CREE – BETA LED Fixture: The Edge LED Wall Pack**  
Model # SEC-EDG-3M-WM-04-D-UL-BZ-350-40K  
Spec: LED, minimum 3,343 lumens, voltage 120-277, wet listed  
Color: Dark Bronze

4. Parking Garage:

**COOPER LIGHTING – LUMARK**  
“QD” Quad cast Solid State LED  
Parking Garage/Canopy/Low-Bay Luminaire  
<20% Total Harmonic Distortion  
CCT 4000 multi voltage:120 – 277V 50/60hz  
Lumens 4,365  
TM-21 Lumen Maintenance (50,000 Hrs) - L70  
25 deg C >94% - >350,000  
40 deg C >93% - >250,000

5. Door Entry & Canopy Lighting:

**ENERGY TECH - LED Low Profile Canopy Light**  
Model # CP-VE-15/30W-45/60K-MV-BK  
Spec: LED, total watts (15 or 30), Light output (867 or 1699 lumens),  
Lumens per watt (60), CRI: >70, CCT 4500K (Neutral)  
Or 6000K Day Light, Voltage: Multi 100-277v 60Hz. PF > 0.989

## **PART 3: EXECUTION**

### **3.01 INTERIOR LIGHTING**

A. Professional Service Provider (PSP) shall provide a room by room, computer generated photometric lighting design for approval. All calculations and data shall be presented in the design development and construction documents. Also provide tabulated results of lighting power density calculations in W/sf showing the actual, the ASHRAE 90.1 allowable, and the 25% savings target per 1.01, C. Increased energy consumption of 10% or more must be reported in accordance with State Energy Code reporting procedures.

REFER: <http://www.seco.cpa.state.tx.us/tbec/statefunded.php>.

B. Applications other than standard general purpose lighting (T8 lamps), require presentation to the University. Use of specialty lamps requires prior University approval. Minimize the number of different lamp types used.

C. Emergency light fixtures shall have the LED emergency light indicator mounted such that it is visible from the ground.

D. Lay-in type fluorescent fixtures must have supports to structure at two opposing corners minimum. These supports are to be attached to the fixture housing. Ceiling supports are in addition to these supports.

E. Outlet boxes for lighting shall be 4" square or 4" octagon boxes mounted to the structure. These boxes may feed up to 4 light fixtures individually so that each fixture can be taken out of service without affecting the remainder of a circuit. Do not daisy chain light fixtures.

F. Stairwell light fixtures shall be located such that they may be reached safely with no more than an 8-foot ladder.

G. Lighting Designer shall verify installation meets design intent and operates properly unless a commissioning agent assumes this responsibility.

### **3.02 EXTERIOR LIGHTING**

A. All walkways, sidewalks, and parking lots shall be illuminated to levels recommended by the IESNA or as required to meet the University's security needs, whichever is higher.

B. Upon request from Utilities & Energy Management Electrical Distribution Division, all engineering calculations of illumination levels and lighting power density shall be presented in construction documents.

- C. Exterior lighting should be accomplished using lighting standards and wall packs. Lighting bollards, step and handrail lighting, tree lighting, and in-grade fixtures are not allowed.
- D. Exterior and site lighting shall be shown on site plan. List distances between poles, fixtures and other site lighting devices.
- E. Provide pole mounting height and pole base installation detail.
- F. Lighting Designer shall verify installation meets design intent and operates properly unless a commissioning agent assumes this responsibility.