

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Furnish and install complete lighting systems, wired, assembled and operable, which include but are not limited to the following:
  - 1. Luminaires
  - 2. Lamps and ballasts
  - 3. Mounting hardware
  - 4. Accessories as noted
- B. The materials and equipment herein specified shall be of new and furnished in accordance with the applicable standards.

### 1.2 SUBMITTALS

- A. Shop drawings for all fixtures shall be submitted and reviewed prior to fabrication. Any material produced prior to the review of shop drawings or samples, and not in conformance with the Contract Documents, shall be rejected with the Contractor bearing full responsibility and cost. Submit shop drawings for review, include the following:
  - 1. Luminaires
  - 2. Lamps
  - 3. Ballasts
  - 4. Photometric reports
  - 5. Point by Point calculations specific to the project.
  - 6. Accessories

### 1.3 WARRANTY

- A. Fluorescent ballasts shall be warranted against defects in material and workmanship for a period of no less than (3) years for electromagnetic ballasts, and (5) years for electronic ballasts, from the date of project completion regardless of the date of manufacture.
- B. HID ballasts shall be warranted against defects in material and workmanship for a period of no less than (2) year from the date of project completion regardless of the date of manufacture.
- C. All lamps shall be warranted for a period of no less than (1) year from the date of project completion. All failed lamps shall be replaced by the contractor as warranty service.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Luminaries shall bear the appropriate UL label for location, mounting position and operating conditions in which it is installed.
- B. Luminaries, ballasts and lamps shall each be of the same manufacturer and of identical finish, appearance, and performance. Luminaries which are pre-lamped before shipment

shall have identical lamp manufacturer. Mix and match of different lamp manufacturer shall not be acceptable.

- C. Recessed ceiling mounted luminaires shall be provided with appropriate frame and trim type compatible with ceiling construction.

## 2.2 LAMPS

### A. Fluorescent lamps

1. Unless specified on plans or in Lighting Fixture Schedule, the lamp color temperature shall be 4100 Kelvin (K).
2. Unless otherwise noted, lamps shall have a CRI (color rendering index) of 82 or greater.

### B. HID lamps

1. Metal halide lamps shall be phosphor coated and universal burning position type unless otherwise noted. Metal halide lamps shall incorporate a quartz shroud around arc tube to prevent outer jacket rupture in the event of a non-passive arc tube failure.
2. Metal halide lamps shall be of the type with lifetime color stability within +/- 200K. If not available for the type and wattage specified, metal halide lamps with the best color uniformity as per current industry standards shall be used.

### C. Compact Fluorescent

1. Unless specified on plans or in Lighting Fixture Schedule, the lamp color temperature shall be 4100 Kelvin (K).
2. Unless otherwise noted, lamps shall have a CRI (color rendering index) of 82 or greater.
3. Lamp base and fixture socket shall match pin configuration.

### D. Acceptable manufacturers

1. Fluorescent Lamps: Osram/Sylvania, of Philips
2. Metal Halide Lamps: Osram/Sylvania, GE or Philips

## 2.3 BALLASTS

### A. General

1. Ballasts shall be UL listed when installed in luminaire.
2. Ballasts shall be grounded appropriately as governed by NEC Article 410-E.
3. Ballasts shall be located within the luminaire for which it is operating unless specifically indicated on plans as remote ballast type.
4. Ballasts shall contain no PCB's in any indoor or outdoor installation unless otherwise noted.
5. Ballasts shall be rated weatherproof type where there is moisture present.
6. A permanent waterproof seal shall be factory provided where the wiring enters the ballast compartment of an outdoor luminaire installation.

### B. Electronic fluorescent ballasts

1. Electronic ballasts shall meet or exceed ANSI, IEEE, and FCC standards for lamp starting and operation, electro-magnetic interference, radio frequency interference suppression and line transient protection.
2. Electronic ballasts that operate more than one lamp shall be able to maintain full output of the companion lamp(s) after failure of any combination of lamp(s).
3. Rapid-start electronic ballasts shall provide soft/stable start of rapid-start lamps and maintain full cathode heat during operation.

4. Electronic ballasts shall be marked with manufacturer's name, part number, supply voltage, power factor, open circuit voltage, current draw for each lamp type and bear all applicable UL listings on housing.
- C. HID Ballasts
1. Metal halide ballasts shall be Lead-Peak Autotransformer type with current crest factor of 1.6 to 1.8 and voltage regulation of 10% allowable.
  2. HID ballasts shall be fused with manufacturer recommended size and type.
  3. HID ballasts shall bear all applicable UL listings on housing.
- D. Acceptable Manufacturers
1. Solid state ballasts (electronic): Osram Sylvania or, Quicktronic, or approved equal.
  2. Metal halide ballasts: Magnetek, Advance Transformer Co. or approved equal.
- 2.4 LUMINAIRES
- A. General
1. Escutcheon plates, coverplates, and finish trim hardware shall meet flush with ceiling, floor, wall or other surfaces to which they may be mounted.
  2. Luminaire construction shall allow initial installation of recessed luminaires without the presence of finish trim, diffusers or lens.
  3. Lamp sockets and reflector assemblies shall be securely fastened to luminaire housing to prevent rotation, adjustment or rocking of hardware during lamping or future relamping.
  4. Luminaire lenses shall be securely retained in a fashion so that relamping or accessing to luminaire will not dislodge lens.
  5. Luminaire lenses and diffusers shall be free from chromatic or spherical imperfections and have thermal characteristics capable of withstanding installed lamp temperatures.
  6. Pendant type luminaires shall be mounted to provide balanced construction with the use of swivel hanger. Swivel hanger shall be provided standard or ordered as accessory unless specified otherwise.
  7. Bracket type luminaires shall be specifically designed for type installation which is indicated.
  8. Luminaires shall be factory tested, prewired and preassembled unless otherwise specified or intended.
  9. Luminaires located in direct exposure to the weather to include rain, sleet and snow shall be marked "Suitable For Wet Locations" with UL label. Luminaires located outdoors but not in direct exposure to rain shall be marked "Suitable for Damp Locations" minimum rated.
  10. Where ceiling space is not accessible, luminaire housing shall provide access to luminaire junction box to comply with NEC section 370-29.
- B. Fluorescent Luminaires
1. Recessed fluorescent luminaires shall be constructed to limit ballast housing surface temperature in luminaire to 90°C with the following factors:
    - a. Voltage: 277V +5%
    - b. Room Ambient Temp: 25°C + 5%
    - c. Plenum Ambient Temp: 55°C +5%
    - d. Ceiling Material R Factor: 20
  2. Medium BiPin type lamp socket shall be fastened securely to housing via brackets or straps to eliminate excessive flexing or pressure during normal lamp installation. Socket should be replaceable without removing entire housing.

3. Medium BiPin type lamp sockets without a housing shall be secured with (2) appropriate screws or bolts to prevent misalignment.
  4. Fluorescent pin type sockets shall utilize corrosion-resistant "edge-wipe" type contacts.
  5. Steel metal fluorescent luminaire housing shall be constructed of die formed, heavy duty, cold rolled steel. Housing shall be welded using lap seam construction and corners mitered and free of burrs, cracks, gouges, scratches.
  6. Aluminum fluorescent luminaire housing shall be extruded or die formed in sections, which will positively interconnect to provide a rigid unit when assembled.
  7. Steel metal construction of fluorescent luminaires housing shall be ribbed, section or paneled to provide internal structure.
  8. Parabolic baffle optic control for fluorescent luminaires shall be semi-specular anodized, of low iridescent and constructed of sheet aluminum. Baffle shall be constructed to ensure rigidity and parabolic contours through interlocking cell assembly.
  9. Prismatic lenses shall be of virgin acrylic plastic pattern 12 (0.125 inches thick prestressed to span 48-inches) unless specified otherwise on plans.
  10. Fluorescent luminaires mounted in accessible ceiling areas shall utilize a plug together modular wiring system. The system shall be installed with all required fittings, plugs, and cord drops for a complete and operating system.
  11. Compact fluorescent luminaire shall incorporate an End of Life (EOL) protection device.
- C. HID Luminaires
1. HID luminaires shall be provided with porcelain, screw type mogul sockets UL listed for 1500W or higher at 600 volts where applicable.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Luminaires shall be installed complete with all accessories, glassware, canopies, sockets, reflectors, optics, wiring devices and supplied with new lamps of the type and wattage.
- B. All luminaires shall be supported in accordance with ASTM E-580 recommended guidelines for seismic restraint, as well as the latest version of the Uniform Building Code related to lateral and vertical bracing, including but not limited to:
- C. Junction box and ballast compartment shall be accessible from below when housing is installed in final position. Wiring shall be secured from damage when accessed for relamping.
- D. Fire rated gypsum board enclosures shall be constructed around all recessed luminaires that penetrate fire rated areas.
- E. Provide additional junction boxes as required where conductor exceeds factory provided junction box limitations.
- F. Installation shall be appropriately coordinated with all disciplines to insure proper ventilation and heat dissipation as required per manufacturer.
- G. Where luminaires are served from two sources, a barrier shall be provided to separate emergency source from normal source with notation indicating separate sources.

- H. Luminaires not utilizing modular wiring systems, shall be connected with minimum six (6) foot length of flexible metal conduit from a structurally mounted junction box.
- I. Wall mounted luminaires and junction boxes shall be rigidly supported to structure to provide adequate support during normal operation.
- J. Pendant luminaires shall be mounted in a uniform mounting height and in straight continuous rows. Final coordination with mechanical equipment and plumbing fixtures shall be made in the field to ensure consistent spacing and locations.
- K. All wall mounted fixtures shall be mounted to a supporting wall bracing material in addition to the junction box. The surface is secured to structural elements in the wall. The bracing shall be capable of supporting the weight of the fixture and comply with the manufacturer's requirements and recommendations.

### 3.2 FIELD TESTING

- A. Upon completion of installation, an operation test shall be conducted to show that all equipment operates in accordance with the requirement of this specification.
- B. All applicable tests shall be conducted in the presence of an University Representative and copies of any reports shall be provided.
- C. Reports shall indicate when and where the test was conducted and who was present.
- D. Upon completion of installations, luminaires requiring positioning shall be adjusted and aimed at final position.
- E. Exit signs shall be individually reviewed after installation completion to ensure directional arrows are properly provided and positioned.

**END OF SECTION**