

## PART 1 - GENERAL

### 1.1 SCOPE

- A. Furnish and install complete exterior lighting systems, wired, assembled and operable, except where specifically noted otherwise, which includes but not limited to the following:
  - 1. Luminaires
  - 2. Lamps and ballasts
  - 3. Mounting hardware
  - 4. Accessories as noted
  - 5. Poles
  - 6. Pole bases
  - 7. Anchor bolts and templates
  - 8. Spare lamps
- B. The materials and equipment herein specified shall be of new and domestic manufacturer and furnished in accordance with the applicable standards.

### 1.2 SUBMITTALS

- A. Shop drawings for all fixtures shall be submitted and approved before fabrication. Any material produced prior to the approval of shop drawings or samples, and not in conformance with the Contract Documents, shall be disapproved 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.

### 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 period of no less than (2) years from the date of project completion regardless of the date of manufacture.

## PART 2 - PRODUCTS

### 2.1 GENERAL

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

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

## 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. Acceptable manufacturers

1. Fluorescent Lamps: Osram/Sylvania, 800 XP series
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 CEC 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.
  - 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. Luminaires 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.

## 2.5 LUMINAIRE SUPPORT COMPONENTS

- A. Description: Comply with AASHTO LTS-3 for pole or other support structures, brackets, arms, accessories, base, and anchorage and foundation.
- B. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 80 mph with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
- C. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.
- D. Mountings, Fasteners, and Accessories: Corrosion-resistant items compatible with support components.
  - 1. Materials: Will not cause galvanic action at contact points.
  - 2. Mountings: Correctly position luminaire to provide indicated light distribution.
  - 3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.
  - 4. Anchor-Bolt Template: Plywood or steel.

## 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. Concrete Foundations: Comply with details for reinforcement and for anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
- C. All luminaires (where applicable) 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
- D. Where luminaires are served from two sources, a barrier shall be provided to separate emergency source from normal source with notation indicating separate sources.
- E. All wall mounted fixtures shall be mounted to a supporting wall bracing material in addition to the junction box. The bracing shall be installed behind the finished wall surface and be secured to structural elements in the wall. The bracing shall be capable of supporting the weight of the fixture and comply with manufacturer's requirements and recommendations.
- F. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.
- G. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.
- H. All exterior wall mounted fixtures shall be sealed watertight between the fixture housing or the canopy and the wall (or structure). Clear silicone caulking (or matching color), shall be used.

### 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 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.

**END OF SECTION**