

## SECTION 16510

### EXTERIOR LIGHTING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Division 0, including General and Supplementary Conditions, Division 1 Sections, and the Drawings, apply to this Section.
- B. Section 16010, Basic Electrical Requirements.
- C. Section 16050, Basic Electrical Materials and Methods.

##### 1.2 SECTION INCLUDES

- 1. Luminaires and lampholders
- 2. Lamps
- 3. Ballasts
- 4. Photocell switch
- 5. Poles and brackets

##### 1.3 SUBMITTALS

- A. Submit shop drawings, product data, test data, warranties, and other information as appropriate for the following:
  - 1. Luminaires
  - 2. Lamps
  - 3. Ballasts
  - 4. Photocell switch
  - 5. Poles
- B. Shop Drawings: Indicate construction details for products which are not manufacturer's standard, when product data does not adequately describe fixture physical characteristics, or upon request by Engineer.
- C. Product Data: Provide product data for each luminaire and lighting unit.
- D. Submit luminaire shop drawings in booklet form with a separate sheet for each luminaire type. Indicate clearly on each sheet the proposed luminaire "type" designation, manufacturer, luminaire lamp, and ballast designation.
- E. Submittals shall indicate materials, finishes, metal gauges, overall and detail dimensions, sizes of electrical and mechanical connections, fasteners, welds, joints, end conditions, provisions for the work of others and similar information.
- F. A photometric test report showing photometric candlepower distribution, brightness, coefficients of utilization, and paint reflectance shall be included for all fluorescent and HID fixtures. Photometric reports shall be prepared for actual fixture, lamp, lens, and ballast combination. Certify data as that taken under National Bureau of Standards calibrated test conditions according to standards of the Illuminating Engineering Society; upon request, submit photometric test of proposed fixture prepared by an independent testing laboratory such as ETL.
- G. The submittals shall state whether or not the fixture, as an assembly, has been UL tested and approved.

- H. Upon request, submit sample products for inspection. Provide luminaires identical with approved samples; retain approved samples at site for comparison until after all other luminaires have been shipped to site and installed. Transportation charges for samples shall be paid by Contractor. Unapproved samples will be returned at Contractor's expense. Upon notification of disapproval, immediately submit new samples that meet contract requirements.
- I. Upon request by Engineer, provide computerized illumination calculation data for specified interior or exterior areas in digital or isofootcandle format and in such detail as requested.
- J. Operating and Maintenance Instructions: Provide maintenance and operating instructions for battery powered lighting units. Include technical data sheets and parts ordering information for components used in all luminaires.

#### 1.4 REGULATORY REQUIREMENTS

- A. Furnish products listed by Underwriters Laboratories, Inc., ETL Testing Laboratories, or other testing firm acceptable to the Owner.
- B. Conform to requirements of ANSI/NFPA 70.
- C. Conform to requirements of NFPA 101.

#### 1.5 QUALITY ASSURANCE

- A. Warrant all lighting and components for one year after acceptance of the work and at no additional cost to the Owner, promptly provide and install replacements for luminaires or components which are defective in materials or workmanship; or repair installed equipment at the job site as necessary to restore first class operating condition. For any time during the warranty period that luminaires are not fully functional due to defects in materials or workmanship, provide, install, and remove suitable temporary lighting. Warrant replacement luminaires in a similar manner for a period of one year following replacement including replacement of defective replacements.
- B. Warrant ballasts, batteries, and occupancy sensors as further specified herein.
- C. Provide products of firms regularly engaged in the manufacture of interior luminaires or components of similar types and ratings to those required. Such products shall have been in satisfactory use in similar applications for not less than two years.

#### 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver luminaires and their components to job site, factory assembled and wired to the greatest extent practical, in strict accordance with approved shop drawings, samples, certificates and catalog cuts.
- B. Protect exposed finishes during manufacture, transport, storage and handling; replace damaged materials.
- C. Luminaires shall be stored under cover, above the ground, in clean, dry areas, and be tagged and/or marked as to type and site destination.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Provide lighting fixtures as listed on the Lighting, Lamping, and Fixture Schedule on the drawings and as specified herein that meet the performance and quality standard for that fixture. Substitutes shall be equal in all respects including mechanical, electrical, physical, performance, photometric, and quality characteristics except minor variances in construction details which do not affect overall quality or performance are permitted.
- B. Accessories: Provide required accessories for mounting and operation of each luminaire as indicated.

### 2.2 HID LUMINAIRES

- A. Exterior Housing: Diecast aluminum with five stage polyester powder paint finish, electrical components solidly heat-sink mounted to housing, type as described on the drawings.
- B. Ballast: High power factor, energy efficient UL 1029 and ANSI C82.4, constant wattage autotransformer (CWA) or regulator, high power factor type, designed to operate on the voltage system to which they are connected.
  - 1. For outdoor installations, provide single lamp ballasts with a minimum starting temperature of -20°F. Construct so that open circuit operation will not reduce its rated life.
  - 2. High Pressure Sodium (HPS) ballasts shall have a solid state igniter/starter with an average life in the pulsing mode of 10,000 hours at the intended ambient temperature. Igniter case temperature shall not exceed 90°C in any mode. Average life is defined as the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.
- C. Optics: High efficiency, spun or hydroformed aluminum or glass refractor similar to specified fixture, minimum photometric performance in accordance with fixtures listed on Lighting Fixture Schedule.

### 2.3 LAMPS

- A. Provide type and color indicated on the Lighting, Lamping, and Fixture Schedule.
- B. 400 watt clear metal halide HID.
  - 1. ANSI Specification Number M59.
  - 2. Operating position: base-up  $\pm 15^\circ\text{F}$ .
  - 3. Nominal bulb diameter: 3.5".
  - 4. Base type: Mogul screw.
  - 5. Nominal light center length: 5".
  - 6. Maximum overall length: 8.3".
  - 7. Lamp shall only be operated on ballasts designed for this type lamp.
  - 8. Initial rated lumen output shall be at least 41,000 lumens.
  - 9. Average rated lamp life shall be at least 20,000 hours when operated at ten (10) hours per start.
  - 10. Mean lumens at 40% of rated life shall be at least 28,000 lumens.
- C. Ballasts shall withstand line transients as defined in ANSI/C62.41.
- D. Ballast shall not contain polychlorinated biphenyls (PCBs) and shall be labelled "NO PCBs."
- E. Ballast shall have a warranty of three (3) years and a replacement labor allowance of \$10.

## 2.4 PHOTOCCELL SWITCH

- A. UL 773 or UL 773A, hermetically sealed cadmium-sulphide cell rated 240 volts ac, 60 hertz with single-throw contacts rated 1000 watts, and 600 volts.
- B. Mount switch in a cast weatherproof aluminum housing, with swivel arm mount, in a high impact resistant, noncorroding and nonconductive molded plastic housing, with an EEI-NEMA locking-type receptacle.
- C. The switch shall turn on below 3 footcandles and off at 3 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources. Mount a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition. Aim switch according to manufacturer's recommendations.

## 2.5 POLES

- A. Provide poles designed for wind loading of 100 miles per hour determined in accordance with AASHTO LTS-2 while supporting luminaires having effective projected areas for fixtures indicated. Poles shall be anchor base type designed for use with underground supply conductors. Anchor bolts shall be steel rod having a minimum yield strength of 50,000 psi; the top 12 inches of the rod shall be galvanized per ASTM A 153.
- B. Aluminum Poles: Provide aluminum poles manufactured of corrosion resistant aluminum alloys conforming to AASHTO LTS-2 for Alloy 6063-T6 or Alloy 6005-T5 for wrought alloys and Alloy 356-T4 (3,5) for cast alloys. Poles shall be seamless extruded or spun seamless type, and primed and painted factory finish. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire.
- C. Steel Poles: AASHTO LTS-2. Provide steel poles having minimum 11-gage steel with minimum yield/strength of 48,000 psi and primed and painted factory finish, color as indicated on the drawings. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Luminaire Pole Bases: Provided and installed by site contractor under Division 2, coordinate pole template with pole base and installation. Install poles on bases plumb; provide for adjustment.
- B. Pole locations and number of fixtures shown on civil drawings, coordinate with site contractor.
- C. Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location.
- D. Grounding: Ground noncurrent-carrying parts of equipment, including metal poles. Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.
- E. Insulation Resistance Test: Perform before and after connection of fixtures and equipment.
- F. Ground Resistance Tests: Perform ground continuity test.

- G. Field Tests: Upon completion of installation, conduct an operating test to show that the equipment operates in accordance with the requirements of this specification section.

### 3.2 ADJUSTING AND CLEANING

- A. Clean lenses and diffusers at completion of work.
- B. Aim adjustable luminaires and lampholders as indicated or as directed.
- C. Clean paint splatters, dirt, and debris from installed luminaires.
- D. Touch up luminaire and pole finish at completion of work.
- E. Relamp luminaires which have failed lamps at completion of work.

END OF SECTION