

**SECTION 26 56 00**  
**EXTERIOR LIGHTING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the furnishing, installation, and connection of exterior luminaries, controls, poles and supports.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.
- C. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.
- D. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Underground handholes and conduits.
- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
  - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
  - 2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, poles, luminaries, lamps and controls.
- C. Manuals: Two weeks prior to final inspection, submit four copies of operating and maintenance manuals to the Contracting Officer's Representative (COR). Include technical data sheets, wiring and connection diagrams, and information for ordering replacement parts.

D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the COR:

1. Certification that the materials are in accordance with the drawings and specifications.
2. Certification, by the Contractor, that the complete installation has been properly installed and tested.

#### **1.4 APPLICABLE PUBLICATIONS**

Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

A. Aluminum Association Inc. (AA):

AAH35.1-2006 .....Alloy and Temper Designation Systems for  
Aluminum

B. American Association of State Highway and Transportation Officials  
(AASHTO):

LTS-4-2003 .....Structural Supports for Highway Signs,  
Luminaries and Traffic Signals

C. American Concrete Institute (ACI):

318-2005 .....Building Code Requirements for Structural  
Concrete

D. American National Standards Institute (ANSI):

C57.12-2000.....General Requirements For Liquid-Immersed  
Distribution, Power, and Regulating  
Transformers

C81.61-2005 .....Electrical Lamp Bases

E. American Society for Testing and Materials (ASTM):

A123/A123M-2002 .....Zinc (Hot-Dip Galvanized) Coatings on Iron and  
Steel Products

A153/A153M-2001.....Zinc Coating (Hot-Dip) on Iron and Steel  
Hardware - AASHTO No.: M232

B108-03a -2003 .....Aluminum-Alloy Permanent Mold Castings

D3487-2000.....Mineral Insulating Oil Used in Electrical  
Apparatus

F. Federal Aviation Administration (FAA):

AC 70/7460-IK CHG 1-2000.....Obstruction Lighting and Marking

AC 150/5345-43E-1995....Specification for Obstruction Lighting  
Equipment

G. Illuminating Engineering Society of North America (IESNA)

HB-9-2000.....Lighting Handbook

RP-8-2000 (R-2005).....Roadway Lighting

H. National Electrical Manufacturers Association (NEMA):

C78.41-2001.....Electric Lamps - Guidelines for Low-Pressure  
Sodium Lamps

C78.42-2004 .....Electric Lamps - Guidelines for High-Pressure  
Sodium Lamps

C78.43-2005 .....Electric Lamps - Single-Ended Metal-Halide  
Lamps

C78.1381-1998.....(R 1997) Electric Lamps - 70-Watt M85 Metal-  
Halide Lamps

C82.4-2002 .....Ballasts for High-Intensity-Discharge and Low-  
Pressure Sodium Lamps (Multiple-Supply Type)

C136.17-2005 .....Roadway Lighting Equipment - Enclosed Side-  
Mounted Luminaries for Horizontal-Burning High-  
Intensity-Discharge Lamps

ICS 2-2005 .....Industrial Control and Systems Controllers,  
Contactors and Overload Relays Rated 600 Volts

ICS 6-2001 .....Industrial Control and Systems Enclosures

I. National Fire Protection Association (NFPA):

70-2005 .....National Electrical Code (NEC)

J. Underwriters Laboratories, Inc. (UL):

496-2004 .....Edison-Base Lamp holders

773-1995.....Plug-in, Locking Type Photo controls, for Use  
with Area Lighting

773A-2006 .....Non-industrial Photoelectric Switches for  
Lighting Control

1029-1994.....High-Intensity-Discharge Lamp Ballasts

1598-2004 .....Luminaries

**1.5 DELIVERY, STORAGE, AND HANDLING**

Steel Poles: Do not store poles on ground. Store poles so they are at  
least 305 mm (one foot) above ground level and growing vegetation. Do

not remove factory-applied pole wrappings until just before installing pole.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

Materials and equipment shall be in accordance with NEC, UL, ANSI, and as shown on the drawings and specified.

### **2.2 POLES**

#### **A. General:**

1. Poles shall be round steel, as shown on the drawings, and as specified. Finish shall be as specified on the drawings.
2. The pole and arm assembly shall be designed for wind loading of 161 km/hr (100 miles per hour), with an additional 30 percent gust factor, supporting luminaire(s) having the effective projected areas indicated. The effective projected area of the pole shall be applied at the height of the pole base as shown on the drawings.
3. Poles shall be embedded type designed for use with underground supply conductors. Poles shall have oval-shaped handhole having a minimum clear opening of 65 by 125 mm (2.5 by 5 inches). Handhole cover shall be secured by stainless steel captive screws.
4. Provide a steel-grounding stud opposite hand hole openings.
5. Provide a base cover matching the pole in material and color to conceal the mounting hardware pole-base welds and anchor bolts.
6. Hardware: All necessary hardware shall be 300 series stainless steel.

#### **B. Types:**

1. Steel: Provide steel poles having minimum 11-gage steel with minimum yield/strength of 48,000 psi and iron-oxide primed factory finish. Galvanized steel poles shall comply with ASTM A123 and A153. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Base covers for steel poles shall be structural quality hot-rolled carbon steel plate having a minimum yield of 36,000 psi.

### **2.3 FOUNDATIONS FOR POLES**

- #### **A. Foundations shall be cast-in-place concrete.**

- B. Foundations shall support the effective projected area of the specified pole, arm(s), and luminaire(s) under wind conditions previously specified in this section.
- C. Place concrete in spirally wrapped treated paper forms for round foundations, and construct forms for square foundations.
- D. Rub-finish and round all above-grade concrete edges to approximately 6 mm (1/4 inch) radius.
- E. Concrete shall have 3000 psi minimum 28 day compressive strength.
- F. Anchor bolt assemblies and reinforcing of concrete foundations shall be as shown on the drawings and meet ACI 318. Anchor bolts shall be in a welded cage or properly positioned by the tie wire to stirrups.
- G. Prior to concrete pour, install a copperclad steel ground rod, not less than 19 mm (3/4-inch) diameter by 3000 mm (10 feet) long, below each foundation. Drive the rod vertically under the foundation so not less than 1800 mm (6 feet) of rod is in contact with the earth. Remainder of rod may be in the concrete pour. Where rock or layered rock is present, drill a hole not less than 50 mm (2 inches) in diameter and 1800 mm (6 feet) deep, backfill with tamped fine sand and drive the rod into the hole. Bond the rod to the pole with not less than number 6 AWG bare copper wires. The method of bonding shall be approved for the purpose.

#### **2.4 LUMINAIRES**

- A. UL 1598 and NEMA C136.17. Luminaries shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and ballast heat and safe cleaning and relamping.
- B. IESNA HB-9 and RP-8 light distribution pattern types shall be as shown on the drawings.
- C. Incorporate ballasts in the luminaire housing except where otherwise shown on the drawings.
- D. Lenses shall be frame-mounted heat-resistant, borosilicate glass, prismatic refractors. Attach the frame to the luminaire housing by hinges or chain. Use heat and aging resistant resilient gaskets to seal and cushion lenses and refractors in luminary doors.
- E. Lamp sockets for high intensity discharge (H.I.D) fixture shall have locking type porcelain enclosures in conformance to the applicable requirements of ANSI C81.61 and UL 496.

- F. Pre-wire internal components to terminal strips at the factory.
- G. Bracket mounted luminaries shall have leveling provisions and clamp type adjustable slip-fitters with locking screws.
- H. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.
- I. IESNA Cutoff Category: cutoff

## **2.5 LAMPS**

- A. Install the proper lamps in every luminaire installed.
- B. Lamps to be general-service, outdoor lighting types.
- C. High-Pressure Sodium (HPS) Lamps: NEMA C78.42, wattage as indicated.  
Lamps shall have average rated life of 16,000 hours minimum for 35 watt lamps and 24,000 hours minimum for all higher wattages.
- D. Low-Pressure Sodium (LPS) Lamps: NEMA C78.41.
- E. Metal-Halide Lamps: NEMA C78.43 or NEMA C78.1381
- F. Mercury vapor lamps shall not be used.

## **2.6 HIGH INTENSITY DISCHARGE BALLASTS**

- A. For low voltage systems, the ballasts shall be the high efficiency, high power factor, copper-wound constant wattage type and shall meet the requirements of UL 1029 and NEMA C82.4.
  - 1. Ballasts shall operate the discharge lamp of the type, wattage, and voltage shown on the drawings.
  - 2. Ballasts shall have individual overcurrent protection (inline fuse holder) as recommended by the ballast manufacturer.
  - 3. Ballasts shall be capable of providing reliable starting of the lamps at minus 30 degrees C.
  - 4. Open-circuit operation shall not reduce the average life.
- B. For series systems, the ballasts shall be the high efficiency, high power factor, copper wound constant current type.
  - 1. Provide each ballasts with a film type lamp failure protector to prevent excessive secondary voltage.
  - 2. Provide ballasts to operate the discharge lamp of the type, wattage, and voltage shown on the drawings.
  - 3. Ballasts shall be capable of providing reliable starting of the lamps at minus 30 degrees C.
- C. Locate protective devices for ballasts to be accessible if the devices are not integral with ballasts.

- D. Each ballast shall operate not more than one lamp except where otherwise shown on the drawings.

## **2.7 LIGHTING CONTACTORS**

NEMA ICS 2, electrically held contactors. Rate contactors as indicated. Provide in NEMA enclosure conforming to NEMA ICS 6. Contactors shall have silver alloy double-break contacts and coil clearing contacts for and shall require no arcing contacts. Provide contactors with hand-off-automatic selector switch.

## **2.8 CONTROLS**

### **A. Each Lighting System:**

1. Shall be controlled by one of the following methods as shown for each system on the drawings:
  - a. A photocell to act as the pilot device. The photocell shall be the type which fails safe to the closed position meeting UL 773 or 773A.
  - b. A time clock to act as the pilot device.
  - c. A combination, photocell-time clock to act as dual pilot devices connected in series. The photocell shall provide the "on" function at dusk and the time clock(s) shall control specific circuit "off" functions during dark hours.
  - d. A time clock to act as the pilot device for a circuit (or circuits) when luminaries are individually photocell controlled.
  - e. The pilot devices shall control the power circuit through the contractor or relay as shown on the drawings.
2. Mount and connect photocells and time clocks as shown on the drawings.
3. Photocells shall have the following features:
  - a. Quick-response, cadmium-sulfide type.
  - b. A 15 to 30 second, built-in time delay to prevent response to momentary lightning flashes, car headlights or cloud movements.
  - c. Energizes the system when the north sky light decreases to approximately 1.5 footcandles, and maintains the system energized until the north sky light increases to approximately 3 to 5 foot candles.
4. Time clocks shall have the following features:
  - a. A 24-hour astronomic dial, motor-driven.

- b. A spring-actuated, reserve power mechanism for operating the timer during electrical power failures and that automatically winds the spring when the electrical power is restored.
- 5. The arrangement and method of control and the control devices shall be as shown on the drawings.

## **2.9 EXISTING LIGHTING SYSTEMS**

- A. For modifications or additions to existing lighting systems, the new components shall be compatible with the existing systems.
- B. New poles and luminaries shall have approximately the same configurations and dimensions as the existing poles and luminaries except where otherwise shown on the drawings.

## **PART 3 - EXECUTION**

### **3.0 INSTALLATION**

- A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.
- B. Steel Poles:
  - 1. Provide pole foundations with galvanized steel anchor bolts, threaded at the top end and bent 1.57 rad 90 degrees at the bottom end. Provide galvanized nuts, washers, and ornamental covers for anchor bolts. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath and the end of conduit. Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location.
  - 2. After the poles have been installed, shimmed and plumbed, grout the spaces between the pole bases and the concrete base with non-shrink concrete grout material. Provide a plastic or copper tube, of not less than 9 mm (3/8-inch) inside diameter, through the grout tight to the top of the concrete base for moisture weeping.
- C. Foundation Excavation: Depth shall be as indicated. Dig holes large enough to permit the proper use of tampers to the full depth of the hole. Place backfill in the hole in 150 mm (6 inch) maximum layers and thoroughly tamp. Place surplus earth around the pole in a conical shape and pack tightly to drain water away.



D. Photocell Switch Aiming: Aim switch according to manufacturer's recommendations. Mount switch on or beside each luminaire when switch is provided in cast weatherproof aluminum housing with swivel arm.

### **3.1 GROUNDING**

Ground noncurrent-carrying parts of equipment including metal poles, luminaries, mounting arms, brackets, and metallic enclosures as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable and listed for this purpose.

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