

**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.
- E. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Underground handholes and conduits.
- F. 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 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**

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 LUMINAIRES**

- A. UL 1598 and NEMA C136.17. Luminaires 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 luminaires 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

## **2.3 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.

## **2.4 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.

## **2.5 LIGHTING CONTACTORS**

NEMA ICS 2, electrically, mechanically held contactors. Rate contactors as indicated. Provide in NEMA 4 enclosure conforming to NEMA ICS 6. Contactors shall have silver alloy double-break contacts and coil clearing contacts for mechanically held contactor] and shall require no arcing contacts. Provide contactors with hand-off-automatic selector switch.

## **2.6 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.

## **2.7 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.

## **2.8 AUXILIARY EQUIPMENT**

- A. Parallel-Type Systems: Shall be supplied power as shown on the drawings.
- B. Series Type Systems:
  1. Provide components specifically for constant-current series type lighting systems.
  2. Constant-Current Transformers:
    - a. Self-cooled by natural convection, liquid-immersed, fully automatic, outdoor type.
    - b. Liquid shall be oil conforming to ASTM D3487, except where otherwise shown.
    - c. Temperature rises shall not exceed the following ANSI C57.12. test values for the respective insulation systems:
      - 1) Standard, 55 degrees C by resistance and 65 degrees C hottest spot.

- 2) Thermally upgraded, 65 degrees C by resistance and 80 degrees C hottest spot.
  - d. Core Coil Assemblies:
    - 1) Braced to withstand the stresses caused by the maximum current available under all conditions and rough handling during shipment.
    - 2) Cores, silicon steel.
    - 3) Coils, continuous windings without splices except for taps.
  - e. Bring primary and secondary leads out through wet-process, porcelain bushings, pressure-tight. Terminals shall be suitable for the specific cables being connected to them.
  - f. Shall have capacitors for power factor improvement. The value of power factor under the percent of full load rating shall be as shown on the drawings.
  - g. Shall regulate the secondary current within one percent over the entire load rating range while the primary voltage remains within five percent of the rated voltage.
  - h. Operation of the transformers shall not be adversely affected while the transformers are mounted five degrees off of perpendicular.
  - i. Provide tanks and covers of steel to meet NEMA and ANSI requirements; which are cleaned, phosphatized and painted at the factory with primer and the manufacturer's standard extremely durable finish.
  - j. Sound levels shall not exceed 45 db.
  - k. Standard ANSI features and accessories including a pressure relief device, ground pad, lifting provisions and diagrammatic nameplate.
  - l. Dimensions and configurations shall conform to the spaces designated for installations.
  - m. Install the transformers so they will have adequate air circulation for heat removal.
3. Controllers:
- a. Oil-immersed, rated-load-interrupter, outdoor type with heavy duty, silver-alloy contacts.
  - b. Oil, ASTM D3487.
  - c. Operate at 120 volts, 60 Hz.

- d. Have an auxiliary hand lever for manual operation during emergencies.
  - e. The depth below the oil surface of the contacts shall be not less than the depth of the switch mechanism.
  - f. Bring leads out through wet-process, porcelain bushings, pressure-tight. Terminals shall be suitable for the specific cables being connected to them.
  - g. Provide steel tanks and covers, thoroughly cleaned, phosphatized, and painted at the factory with primer and the manufacturer's standard durable finish.
  - h. Dimensions and configurations shall conform to the spaces designed for installations.
- 4. Provide protective relays to de-energize the control circuits for the controllers and thereby de-energize the series lighting load circuits when open circuit faults occur in the series lighting load circuits.
  - 5. Transformer, equipment enclosure, lightning arresters, primary and secondary protection shall be provided.
  - 6. Disconnecting Devices: Watertight, submersible types suitable for the cables being installed and for use in outdoor lighting systems.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.
- B. Photocell Switch Aiming: Aim switch according to manufacturer's recommendations. Set adjustable window slide for proper footcandles photocell turn-on.

#### **3.2 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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