

## SECTION 265600 - EXTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:

1. This Section specifies the exterior lighting fixtures for buildings, structures, and exterior areas.
2. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the drawings, and as specified herein.
3. The Contractor shall furnish and install all fixtures, as shown on the drawing. Fixtures shall conform to the types and manufacturers as hereinafter specified.
4. The Contractor shall furnish all lamps and necessary hangers, supports, wiring, etc., for installation of fixtures.

- B. Related Sections include the following:

1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings that are not specified in this section.
2. Applicable sections of Division 26 - Electrical

#### 1.3 DEFINITIONS

- A. CRI: Color-rendering index.
- B. HID: High-intensity discharge.
- C. LED: Light Emitting Diode.
- D. Luminaire: Complete lighting fixture, including ballast housing if provided.
- E. Pole: Luminaire support structure, including tower used for large area illumination.
- F. Standard: Same definition as "Pole" above.

#### 1.4 SUBMITTALS

- A. Shop Drawings: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, for the following:
  - 1. Lighting fixtures
  - 2. Poles
  - 3. Street light conductors
  - 4. Pull boxes/handholes
- B. Field quality-control test reports.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70, “National Electrical Code”

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store aluminum and concrete poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on poles until right before pole installation. Handle poles with web fabric straps.

### PART 2 - PRODUCTS

#### 2.1 STREET LIGHTS

- A. 25 Foot Street Light Luminaires – High Pressure Sodium
  - 1. Luminaires shall be of a size and type as manufactured by one of the following:

The following two paragraphs specify the 100 watt high pressure sodium street light fixtures used on Campus.

- 2. Lumark high pressure sodium Roadway Cobrahead, catalog no. HPRY-GL-2-100-MT, except with constant wattage auto-transformer high power factor internal ballast, multi-volt, power tray, and 2 inch slip fitter, with glass refractor, for use with 100 watt lamps.

3. General Electric high pressure sodium type M-250A2, catalog no. M2AR10S0A1GMS, multi-volt, constant wattage auto-transformer high power factor internal ballast, power door, and 2 inch slip fitter, with glass refractor, for use with 100 watt lamps.

B. 25 Foot Street Light Luminaires – LED

1. Luminaires shall be of a size and type as manufactured by the following:
2. Lumark LD-RC-T2-E03-E

C. 25 Foot Street Light Standards

1. Standards shall be aluminum poles, type as manufactured by one of the following:
2. Union Metal, Design 150-Y25, 25 foot single arm aluminum pole, 7 inch by 4.5 inch shaft, 4 inch by 8 inch hand hole, 2 inch slip fitter and 6 foot arm.
3. Union Metal, Design 150-Y25, 25 foot double arm aluminum pole, 7 inch by 4.5 inch shaft, 4 inch by 8 inch hand hole, 2 inch slip fitter and 6 foot arm.
4. Hapco catalog no. RTA25D7B4M16-01, 25 foot single arm aluminum pole 7 inch by 4-1/2 inch shaft diameter with plain base and 4 inch by 6 inch hand hole, 6 foot upsweep pipe arm and 2 inch slip fitter.
5. Hapco catalog no. RTA25D7B4M26-01, 25 foot double arm aluminum pole, 7 inch by 4-1/2 inch shaft diameter with plain base and 4 inch by 6 inch hand hole, 6 foot upsweep pipe arms and 2 inch slip fitter.
6. General Electric catalog no. RRTA-25-SA-6S-7.0-1-B, 25 foot single arm aluminum pole, 7 inch by 4-1/2 inch shaft diameter with plain base and 4 inch by 6 inch hand hole, 6 foot upsweep pipe arm and 2 inch slip fitter.
7. General Electric catalog no. RRTA-25-SA-6D-7.0-1-B, 25 foot double arm aluminum pole, 7 inch by 4-1/2 inch shaft diameter with plain base and 4 inch by 6 inch hand hole, 6 foot upsweep pipe arms and 2 inch slip fitter.
8. Street light standard anchor bolts shall be galvanized steel, size as noted on the drawing.

2.2 AREA LIGHTS

Use the following two paragraphs for concourse light fixtures on concrete poles. Generally this is what is used on Campus.

- A. High pressure sodium concourse lights shall be 100 watt high pressure sodium lamp, multi-tap, constant wattage auto-transformer high power factor ballast, distribution type II medium cutoff, one piece cast aluminum housing and chassis, dark bronze duranodic finish, with pole top adapter

for 2" tenon, Somerset by Holophane, Catalog No. SMST-100HP-MT-BZ-PM, SMST-LIA-BZ, or Tribute by Cooper Lighting - Lumark, Catalog No. HPTR-2F-100-MT-2F.

- B. LED concourse lights shall be 52 watt, 2-21 LED light bars, 4000K, type II distribution, die-cast aluminum construction, bronze finish with pole top adapter for 3" tenon, Talon Medium by McGraw-Edison, Catalog No. TLM-E02-LED-E1-T2-BZ-LCF with 3" McGraw-Edison tenon adapter Catalog No. MA1020.
- C. New area light poles shall be concrete, overall length 21'-3", 17'-0" above ground, with a 3" O.D. X 4-1/4" high tenon for use with the Holophane fixture and a 3" O.D. X 3-3/4" high tenon for use with the Cooper fixture, with two cable entrances on opposite sides of the pole, and a nominal 1-7/8" X 12" hand hole. Poles shall be one of the following:
1. Ameron International, Centrecon series catalog number SEQ-5.2SP with #512 natural polished finish; drawing number Q-7524, July 17, 1990.
  2. Lonestar Prestress Mfg., Inc. catalog number 211206 with 2" conduit and MSU Sample Brown polished finish; drawing number 1064-2B, March 11, 2005.
  3. StressCrete Limited catalog number E213-APT-G-S72 C/W 140-30/40 with S72 Spartan Sand polished finish; drawing number MSU213APT, December 8, 2004, Rev A.

Use the following paragraph when an aluminum pole is to be used with the concourse fixture.

- D. High pressure sodium concourse lights shall be 100 watt high pressure sodium lamp, multi-tap, constant wattage auto-transformer high power factor ballast, distribution type II medium cutoff, one piece cast aluminum housing and chassis, dark bronze duranodic finish, 15 foot square aluminum pole, Somerset by Holophane, Catalog No. SMST-100HP-MT-BZ-PM, SMST-LIA-BZ, CAXSQ16J/1 or Tribute by Cooper Lighting - Lumark, Catalog No. HPTR-2F-100-MT-2F, with pole SSA4X14WBZ or Hapco SSA14F4-4R00.

## 2.3 EXTERIOR BUILDING LIGHT FIXTURES

Type HC High pressure sodium concourse lights shall be 100 watt high pressure sodium lamp, multi-tap, constant wattage auto-transformer high power factor ballast, distribution type II medium cutoff, one piece cast aluminum housing and chassis, dark bronze duranodic finish, with wall mount bracket, Somerset by Holophane, Catalog No. SMST-100HP-24-BZ-PM-F2, SMST-WB-BZ, or Concourse III Design 20 by McGraw-Edison, Catalog No. CS7222-240V, CA14.

Type HW Outdoor wall bracket light fixture shall be Lumark "Wally Cutoff" or equal, high pressure sodium with high power factor ballast. Lamps wattage shall be as shown on drawing.

Type M Outdoor canopy light fixture Kirlin catalog no. 2208-24, or Prescolite catalog no. 1016S6-70HPSFE-M8, recessed square, 70 watt high pressure sodium lamp with satin aluminum outer trim. Voltage shall be 120 volts.

## 2.4 LAMPS

### A. HID Lamps

1. 100 Watt high pressure sodium lamps for 25 foot street light luminaires shall be General Electric Company catalog no. LU100/H/ECO, or equal Philips or Sylvania.
2. 150 Watt high pressure sodium lamps for 25 foot street light luminaires shall be General Electric Company catalog no. LU150/55, or equal Philips or Sylvania.
3. 250 Watt high pressure sodium lamps for 25 foot street light luminaires shall be General Electric Company catalog no. LU250, or equal Philips or Sylvania.

## 2.5 BALLASTS FOR HID LAMPS

- A. High pressure sodium light fixtures shall have a Payne Sparkman catalog number ULI-050S-NB Ultrasonic HPS Ignitor/No Blink ignitor for lamp ratings up to and including 150 watts.
- B. High pressure sodium light fixtures with lamp wattages above 150 watts to 400 watts shall use the Payne Sparkman catalog number ULI-100S ignitor. 1000 watt lamp fixtures shall use the Payne Sparkman catalog number ULI-250S ignitor.

## 2.6 STREET LIGHT CONDUCTORS

- A. Street light cable shall be three 600 volt insulated conductors with an overall jacket for direct burial installation. Cable shall be suitable for use in wet or dry locations; indoors or outdoors; in free air, cable trays, ducts, conduits, or direct burial in earth.
- B. Conductors shall be #4 AWG Class B concentric strand (7 strand) copper conductor.
- C. Conductors shall be insulated with a minimum of 45 mils of ethylene-propylene rubber (FR-EPR) Type III insulation.
- D. The cable shall consist of three conductors. One insulated 600 volt conductor shall be color black (phase), one 600 volt conductor shall be color white (neutral), and one 600 volt conductor shall be color green (ground) consistent with ICEA Method 3.
- E. The cable shall be assembled with the three conductors using flame retardant non-hygroscopic fillers in the cable interstices to preserve the round cable geometry and to limit water ingress and transmission.
- F. The cable jacket shall be lead-free flame retardant; water, sunlight, and oil resistant; thermoplastic Chlorinated Polyethylene (CPE). The cable jacket shall pass the -40 degree C. cold bend test. The jacket shall be a minimum thickness of 80 mils.

- G. The cable jacket shall be surface printed with the manufacturer's name, year of manufacture, gauge size, number of conductors, voltage rating, and pertinent U.L. information at 24 inch intervals.
- H. Conductors shall be manufactured and tested in accordance with this specification and the latest version of U.L. Standard 44 UL1277 Type TC-ER; ICEA S-95-658/NEMA WC70; and IEEE 1202, ICEA T-29-520, U.L. 1685, U.L VW-1.
- I. Conductor ends shall be sealed to prevent the ingress of water.
- J. Conductors shall be as manufactured by Draka, Catalog No. 400699.

## 2.7 STREET LIGHT AND AREA LIGHT PULL BOXES

- A. Street light pull boxes shall be 11" x 18" x 18" deep, Hubbell CDR catalog no. B1211818A box and C1211802A cover with penta-socket bolts and "STREET LIGHT" logo.

## 2.8 STREET LIGHT AND AREA LIGHT FUSING

- A. Fuses for street lights and area lights shall be Bussmann Tron in-line fuse holder and fuse, Type HEB-AA, 30A, 600V with KTK-5 fuse. Install one fuse in each phase conductor. Fuses shall be sized for the fixtures being protected.

## PART 3 - EXECUTION

### 3.1 LAYING OUT WORK

- A. All exterior light locations shall be staked out by the Contractor and approved by the Engineer prior to installation.

### 3.2 STREET LIGHTS

#### A. 25 Foot Street Light Bases

1. Bases for 25 foot street light poles and parking area lights shall be constructed as shown on the drawing. Bases shall be 18" diameter.
2. Bases shall be made of 3,000 psi strength, 6-AA limestone concrete mixture.
3. Install LFNC-B marked for concrete embedment and direct burial conduits to be left in base. Size and quantity as shown on drawings. LFNC-B shall be manufactured by Southwire Ultratight Type NM, Thomas and Betts XTRA Flex, or equal.
4. Chamfer top edge of the base with a one inch chamfer.

5. After the base has cured the form shall be removed.

- B. Install the street light standard with one nut above and one nut below the standard base. The nut below shall be used as a leveling nut.
- C. After the standard is plumb, grout the opening between the concrete base and standard base full from the conduit to the edge of the standard base.

### 3.3 GROUNDING

- A. Each street and walk light shall be grounded with a 5/8 inch x 8 foot copperweld ground rod driven adjacent to the base, covered by a minimum of 6 inches of earth and connected to the standard or post with a no. 6 bare copper wire.
- B. Provide Burndy GRC58 or equal ground rod connector.
- C. Install a No. 10 USE ground wire from the luminaire grounding lug to the hand hole and connect to the grounding rod conductor.

### 3.4 TRENCHING

- A. The Contractor shall use a trenching machine or back hoe in digging trench for conductors. Trench shall have a minimum width of 6 inches and a maximum width of 12 inches. Depth of trench shall be a minimum of 30 inches.
- B. Trench shall be free of stones or debris before conductors are installed.
- C. When backfilling, fill first 6 inches of trench with sand. Earth removed may only be used in this first 6 inches of fill if it is hand shoveled and kept free of stone, cinders, and other debris.
- D. All backfill placed under roadways, sidewalks, parking areas, or other surfaced areas shall be compacted to 95 maximum density. All backfill placed in lawn or field areas shall be compacted to 90 maximum density. Density tests shall conform to A.A.S.H. Test T-180 and field test T-147.
- E. Failures of any surface areas caused by settlement shall be repaired at the contractors expense for a period of 3 years after completion of contract.

### 3.5 STREET LIGHT PULL BOXES

- A. Pull Box Location
  - 1. A street light pull box shall be located at all locations where a three-way splice is made with the street light circuit cable or as otherwise shown on the drawings.

2. A street light pull box shall be located at all locations where a three-way splice is made with the street light circuit cable and a tap is made with the conductors feeding the light, or as otherwise shown on the drawings.
3. A box is not necessary where only a tap is made to serve the light, unless noted otherwise. The street light cable shall be looped in to and out of the light standard and the tap made in the handhole.

B. Pull Box Installation

1. Install street light conduits to enter the bottom of the street light pull box.
2. Install 6 inches of crushed peastone around the conduits to form a level base for the pull box to set on. Install the pull box on the peastone so that the top of the box even with grade.
3. Install crushed peastone inside the pull box to a depth of 2 inches around the conduits. Leave conduits extended a minimum of 3 inches above the peastone which will allow approximately 8" of room for cable splices.
4. Provide conduit end bells on all conduits that enter the street light pull box.

3.6 CONDUIT

- A. Install minimum 3 inch Sch 40 PVC conduit under all walks, roadways, parking lots, and all other hard surfaces.
- B. Install a locator ball at one of the sleeve for sleeves eight feet or less, and at both ends of the sleeve for sleeves over eight feet.
- C. Locator balls shall be 3M Dynatel EMS 4" extended range, color red, transmitting at a frequency of 169.8 kHz.

3.7 CONDUCTOR INSTALLATION

- A. Care shall be taken not to cross conductors in the trench.
- B. Connections Made In Street Light Standard or Area Light Pole.
  1. Extend the street light conductors up into pole so that 10 inches of each conductor is accessible out through hand hole.
  2. Install 3#10 AWG USE stranded copper conductors from luminaire to hand hole.
  3. Street light conductors shall be connected to luminaire conductors in hand holes using Polaris Electrical Connectors catalog number IT-1/0.



C. Connections Made In Street Light Pull Box

1. Extend the street light conductors up into pull box so that 24 inches of each conductor is accessible from the end of the conduit.
2. Install MSU street light cable from pull box to hand hole.
3. Street light conductors shall be connected to luminaire conductors in hand holes using Homac catalog no. RAB 1/0-3 (UPC 35042) for three conductor connections and Homac catalog no. RAB 1/0-4 (UPC 35043) for four conductor connections.

3.8 CONDUCTOR SPLICING

- A. Street light conductors shall be installed in continuous lengths from light to light with connections in the base of lights or street light pull boxes. Where a pipe in an existing base is filled, drill an additional hole in base to insert new conductors.
- B. A buried splice may only be made if conductors are to be cut and rerouted, extended where a light is removed, or if broken by another trade during construction. Buried splices shall be made in the following manner:
  1. Form conductors and cut to length so that ends of the three conductors to be spliced meet with no tension.
  2. Remove 3-1/2" jacket from the ends of each cable.
  3. Cut back each conductor's insulation just far enough so that the conductors will meet in the center of a sleeve and have from 1/8 to 1/4 inch of bare conductor showing on each end of the sleeve.
  4. Thoroughly clean the insulation of each conductor and the cable jacket of each cable end prior to applying heat shrink tubing to provide good adhesion.
  5. Apply the compression connectors.
  6. Apply 3-1/2 inch Raychem WCSM-20/6-1200-S heavy wall heat shrink tubing (or approved equal) over each conductor splice.
  7. Apply 12 inch Raychem WCSM-33/8-1200-SS heavy wall heat shrink tubing (or approved equal) over the three spliced conductors and the cable jacket overlapping the cable jacket a minimum of 2 inches beyond the edge of the each cable jacket.

3.9 STREET LIGHT AND AREA LIGHT FUSES

- A. Install Bussmann Tron in-line fuse holders and fuses in the luminaire.

### 3.10 EXTERIOR LIGHTING CONTROL

- A. Exterior building lights and site lights shall be controlled by the MSU Central Control system.
- B. The exterior building lights shall be served from one lighting panel thru a multi-pole lighting contactor with a Hand-Off-Auto switch. MSU Central Control shall be connected at the Auto position.
- C. The site lighting shall be served from one lighting panel thru a multi-pole lighting contactor with a Hand-Off-Auto switch. MSU Central Control shall be connected at the Auto position.
- D. The contactor control power shall originate from the same panel serving the lighting load.
- E. The lighting panels and contactors shall be located in the building electrical substation.

### 3.11 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
- C. Illumination Tests:
  - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
    - a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting."
    - b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
    - c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
    - d. IESNA LM-64, "Photometric Measurements of Parking Areas."
    - e. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265600