

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-85359	2019	98	135

**(A) NOTE**

Standards are intended to describe the equipment, material, and construction requirements for the Lump Sum Bid Item; Electric Lighting System. All construction items and materials shall be on the Roadway Lighting Systems and Equipment Prequalified List. The PQL is available on the KDOT website: www.ksoot.org, under "Doing Business as" - "Highway Contractors". All materials shall be submitted in the form of Catalog Cuts, and/or Shop Drawings for approval and acceptance by the Bureau of Transportation Safety and Technology.

**(B) CONSTRUCTION**

See Standard Specifications, Latest Edition, Sections 738 (HIGH MAST TOWERS), 814 (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS), & 1703 (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS EQUIPMENT). Locate all existing utilities prior to beginning work. Staking for controllers, poles, and junction boxes shall be done by the contractor, and approved by the engineer in charge.

**(C) STEEL LIGHT STANDARDS**

(1) Light standards shall be designed to comply with the 2013 Edition of the AASHTO Publication, Standard Specifications for Structural Supports for the Highway Signs, Luminaires, Traffic Signals, and KDOT Specification Special Provision 744 (STRUCTURAL METALS FABRICATION). Use Fatigue Category II. The light standards shall comply with the requirements of ASTM 607 with the exceptions and/or additions as listed in the Standard Kansas Department of Transportation Specifications, Latest Edition, Section 1608.2 (STRUCTURAL STEEL TUBING). The light standards with shall be one (1) section. The diameter of the standards shall be shown on the ROADWAY LIGHTING DETAIL SHEET TE201.

(a) BASE: The base shall be either a one (1) piece steel base complying with the requirements of ASTM A-27, Grade 65-35, a steel forged base complying with the requirements of ASTM A-668, Class C or a plate base complying with the requirements of ASTM A 36-77A. The base shall be secured to the bottom section by two (2) continuous electric arc welds. Field welds will not be allowed.

(b) MAST ARMS: The mast arms shall be fabricated from 2" (inch) standard pipe meeting the requirements of ASTM A-53 or ASTM A-35.

(c) FINISH: The base, mast arms, and light standards shall be galvanized according to ASTM A-123.

**(D) ELECTRICAL MATERIAL**

(1) PHOTO CELL:  
 Shall be solid state type, 1000 Watts, 1800 VA ballast, single pole, single throw, twist lock mounting, ANSI C136.10, ROHS compliant, UL listed, surge rated in excess of ANSI C136.10 to 20kV/10kA. Shall be made by the same manufacturer as the luminaire, and fail in the on mode.

(2) DUCT:  
 The duct for secondary cable underground shall be polyethylene duct with minimum tensile strength of 3100 psi duct to provide for 40% maximum fill. The duct sized shall meet ASTM D3485 (Latest Revision).

(3) DISTRIBUTION WIRE:  
 Shall be Type USE-2, stranded, annealed copper meeting the requirements of ASTM B-8 and ASTM B-33, and be the size specified in the plans.

(4) SECONDARY SERVICE CABLE IN CONDUIT:  
 Shall be copper single conductor cable for operation at 600 volts maximum. Material shall meet the applicable requirement of ICEA Standard S-105-692 and listed by UL as Type USE-2 for direct burial. Make splices in the secondary service cable inside of tower bases, pole bases, and junction boxes only. Contact the Bureau of Transportation Safety and Technology for approval of other splice locations. The conduit shall be polyethylene with minimum tensile strength of 3100 psi, sized to provide a 40% maximum fill, and shall meet ASTM D-3485 (Latest Revision).

(5) LED LUMINAIRES:  
 Shall have a housing of aluminum alloy casting, capable of mounting to a 2" (inch) mast arm, and in compliance with ANSI C136-37. Shall be IP-66 rated for optical assembly and IP-65 rated for electrical components, and shall have the following: three-hole terminal blocks for incoming #10 AWG AC lines, minimum 10kV/5kA surge protection, a 7-pin photo control receptacle with electronic photocontrol or shorting cap, and an electronic dimmable driver (power supply, rated for 100,000 hours). Shall be fully tested in accordance with IESNA Standard LM-79, pre-wired for installation, and shall maintain 70% of initial lumen output after 100,000 hours of operation. LED luminaire criteria: (lumen output, luminaire wattage, lumens per watt (minimum 100), input voltage, bug rating (max B3-U0-G3), CCT (4000k +/- 300k), CRI (minimum 70), photometric requirements, and distribution), and the photometric performance criteria: (maintained horizontal illumination, avg/min and max/min uniformity ratios) shall be determined by the project designer. Designers shall conform to the IESNA Standard RP-8-14 for required illumination, show the BASIS FOR DESIGN (ADDITIONAL CRITERIA) on the TE209, and submit a photometric report to the Bureau of Transportation Safety and Technology for approval.

(6) CONTROLLER:  
 The controller cabinet shall be constructed of 5052 alloy aluminum 0.125" (inch) thick. The cabinet shall be of clean cut design having no sharp edges, corners or projections. The circuiting shall be serviceable by means of a full length hinged door with padlock provisions. The controller shall have 600 volt rated molded case main and secondary breakers, twist-lock photo-cell socket, and electrically held contactors. The equipment within the controller shall be wired prior to delivery. The controller shall have a meter view window and a glass to allow light to the photo-cell that faces NORTH. All conductors coming in to the controller shall be identified with a permanent label.

(a) The main and secondary breakers shall have a mounting dimension of 1 3/8" (inch) wide x 4 1/2" (inch) high mounting holes shall be positioned to accommodate a breaker 2 3/4" (inch) wide side by side. See CONTROLLER DETAIL SHEET TE202.

(b) The contractor shall contact the power company prior to acquiring the lighting controller. An exposed ringless meter design and cover, 200 AMP 5 terminal meter socket with horn bypass, is an approved option for remote access if required by the power company.

**(E) GENERAL MATERIALS AND NOTES**

(1) MISCELLANEOUS HARDWARE:  
 Hardware that requires galvanizing or electroplating shall conform to the Standard Kansas Department of Transportation Standard Specifications, Latest Edition, Section 1703.2 (c) (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS EQUIPMENT).

(2) CONDUIT INSTALLATION:  
 Conduit shall be installed per Section 814.3 (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS) of the Standard Specifications and as noted. All electrical conduit above ground shall be metallic. Conduit attached to the bridge shall have expansion fittings installed at the ends of the bridge and at each expansion joint. All attachments to bridges shall have a Highway Right of Way Permit (DOT304), and Utility Attachment Permit (DOT 310) approved before work begins, in accordance with the current Kansas Department of Transportation Utility Accommodation Policy. When pulling wires through conduit, a pulling sock or other similar device shall be used to equalize pulling strain on the conductors.

(3) METALLIC CONDUIT:  
 See Standard Specification 1703.2 (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS EQUIPMENT). Shall be rigid steel conduit meeting the requirements of American Standard Specification C-80.1. Trenching for conduit will not be permitted through existing pavement. Jacking will not be permitted in District One unless approved by the engineer in charge of construction.

(4) METALLIC CONDUIT FITTINGS:  
 See Standard Specification 1703.2. Shall be zinc coated and shall meet the requirements of NEMA FB-1.

(5) NON-METALLIC CONDUIT:  
 (a) RIGID POLYVINYL CHLORIDE (PVC):  
 See Standard Specification 1703.2 (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS EQUIPMENT). Shall meet the requirements of NEMA TC-2, Federal Specifications No. WC 1094A and UL 651. Each length shall bear the Underwriters, Inc. Label. Non-metallic conduit fittings shall be fabricated from polyvinyl chloride meeting the requirements of NEMA TC-3, Federal Specifications No. WC 1094A and UL 514. Each shall bear the Underwriters, Inc. Label. The joints shall be made in accordance with the manufacturers recommendations.

(b) HIGH DENSITY POLYETHYLENE (HDPE):  
 See Standard Specification 1703.2 (ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS EQUIPMENT). Shall meet the requirements of ASTM F 2160, ASTM F 2176, and NEMA Standard TC-7. Shall be coilable, smooth wall, Schedule 40 or Schedule 80. A letter of certification (LOC) will be required from the conduit producer and/or resin producer. The conduit will need to be marked with ASTM F 2160 designation on the print line. Shall be continuous from outlet to outlet, with no splices allowed. Bend radii shall not exceed the manufacturer's recommendations. Cable fills should not exceed the values set by the NEC.

(5) GROUND:  
 Ground all metal parts including poles, controllers, junction boxes, and conduit used above ground with a No. 6 bare wire. Ground wire shall be a #6 AWG stranded bare copper wire and arrangement shall be as noted on plans. Ground rods shall be copper clad 3/4" (inch) diameter by 10' (foot) long.

(6) ANCHOR BOLTS:  
 Shall conform to the Standard Specification Section 1600 (FERROUS AND NON-FERROUS METALS) (Grade 55) with the following exception: Do not use cut threads, use rolled threads.

(7) BREAK-AWAY CABLE CONNECTORS:  
 The connectors shall provide a fused waterproof wiring connection that when subjected to strain consistent with a knockdown will separate without damage to wiring. When separation occurs, the connectors shall have no contacts exposed to present a shock hazard. The cable connectors shall meet the 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. Connector installation shall be as directed by the manufacturer.

(8) FRANGIBLE BASE:  
 Shall be cast aluminum to meet the 2013 Edition of the AASHTO Publication, Standard Specifications for Structural Supports for the Highway Signs, Luminaires, and Traffic Signals. The frangible base shall have high density plastic doors. The color shall be pigmented throughout to give the appearance of aluminum. The doors shall withstand temperature extremes of -70° to 150° f, and are compounded with U.V. inhibitors.

(9) JUNCTION BOXES (IN-GROUND):  
 The junction box shall be of sufficient size to facilitate the conduit and wiring as indicated in the plans. Junction boxes shall have the minimum nominal dimensions of 12" (inch) deep with a minimum physical opening of 130 square inches. In-ground junction boxes may be constructed of one of the following methods: Pre-cast concrete with a cast iron cover; Polymer concrete with a polymer concrete cover; fiberglass reinforced polymer body with a polymer concrete ring and cover; High density polyethylene body with polymer concrete ring and cover. The ring shall be securely attached to the body. All conductors coming in to the junction box shall be identified with a permanent label.

(a) Enclosures, boxes and covers are required to conform to all test provisions of ANSI/SCTE 77 2017 "Specification for Underground Integrity" for TIER 15 applications.

(b) The cover shall bear the logo "LIGHTING" clearly and permanently molded or etched into the cover.

(10) JUNCTION BOXES (ABOVE-GROUND):  
 Shall have the nominal dimensions of 12" (inch) by 12" (inch) by 6" (inch). The junction box shall be made of 14 gauge sheet metal (steel) with welded seams, knockouts and weather proof screw cover. Boxes shall be hot dipped galvanized in accordance with ASTM A-123 after fabrication. All conductors coming in to the junction box shall be identified with a permanent label.

(11) WEDGE TYPE STUD BOLT ANCHORS:  
 The contractor shall install two 3/8" (inch) x 3" (inch) wedge type anchors for conduit clamps. The anchors shall be wedge type made from carbon steel meeting AISI 12L14 steel. The minimum embedded depth shall be 1 3/4" (inch).

(12) CONDUIT CLAMPS WITH CLAMP BACKS:  
 The contractor shall install 2" (inch) conduit clamps with a compatible clamp back. Clamps shall be heavy duty steel to secure the 2" (inch) rigid conduit to structure. Conduit clamps are to be spaced at 6' (foot) intervals.

(13) CABLE GRIP SUPPORTS:  
 The contractor shall install one (1) cable support grip in each roadway lighting pole. The cable support grip shall be made of high grade, non-magnetic tin coated bronze strand. The cable support grip shall be capable of securing two (2) #10 AWG type USE-2 cables in a vertical position holding the weight of the cables and cable connectors off the luminaire assembly. See ROADWAY LIGHTING DETAILS SHEET TE201.

Drawn By : \$\$\$DGN\$SPEC\$\$  
 Plotted : \$\$YTIME\$\$  
 File : \$\$\$KDOTGRF\$\$\$

3	9/14/18	Labeling Conductors/Update ANSI 20017	J.P.	C.P.A.
2	1/16/18	Revised Notes/Changed LED Req	J.P.	C.P.A.
1	9/21/17	Updated AASHTO Req to 2013	J.P.	B.D.G.
NO.	DATE	REVISIONS	BY	APPD

**KANSAS DEPARTMENT OF TRANSPORTATION**  
**CONSTRUCTION AND MATERIAL**  
**REQUIREMENTS FOR**  
**HIGHWAY LIGHTING (CONVENTIONAL)**

**TE207**

FHWA APPROVAL	09/25/2018	APPD	Brian D. Gower
DESIGNED	V.H. DETAILED	V.H. QUANTITIES	TRACED
DESIGN CK.	C.A.L. DETAIL CK.	C.A.L. QUAN. CK.	TRACE CK.