

# 814 - ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS

## SECTION 814

### ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS

#### 814.1 DESCRIPTION

Install electric lighting systems and traffic signal items as shown in the Contract Documents.

##### BID ITEMS

Electric Lighting System  
Electric Conduit (\*) (\*\*)  
Electric Service Box  
Traffic Signal  
Traffic Signal Interconnect  
Emergency Vehicle System  
Loop Detector Replacement  
Loop Detector Replacement (Set Price)

##### UNITS

Lump Sum  
Linear Foot  
Each  
Lump Sum  
Lump Sum  
Lump Sum  
Linear Foot  
Linear Foot

\*Size

\*\*Type: Metallic or Non-metallic, no entry denotes either is allowed.

#### 814.2 MATERIALS

**a. General.** Provide equipment and materials for electric lighting system and traffic signal items that comply with **DIVISION 1700**. Provide all parts necessary to complete the electric lighting system or traffic signal or modify existing systems. Before starting any construction activities, submit for the Engineer's approval, a schedule of all equipment and materials for the highway lighting system or traffic signal. Submit 7 copies of catalog cuts, diagrams and drawings to the Bureau of Transportation Safety and Technology. The Engineer will accept or reject the equipment or materials within 2 weeks.

For concrete foundations, use Grade 3.0 concrete that complies with **SECTIONS 401, 402 and 1102**, and steel reinforcement that complies with **DIVISION 1600**, unless shown otherwise in the Contract Documents.

**b. Standard Fabrication.** Fabricate the standards as shown in the Contract Documents.

Provide straight standards with a maximum variation of 1 inch at the mid-point of 30 to 45-foot standards and  $\frac{3}{4}$  inch at the mid-point of 20 to 30-foot standards. A maximum static deflection (without wind load) of 4 inches is permitted for poles less than 30 feet in height and 4  $\frac{1}{2}$  inches for poles 30 feet or greater in height. Measure static deflections with mast arms and luminaries in place.

The design of the standard, the mast arm and method of attaching the mast arm to the standard must be approved by the Engineer.

**c. Loop Detector Replacement.** Provide materials that comply with the specifications of the loop detector owner. The information necessary to contact the owner is shown in the Contract Documents.

The Engineer will accept the materials based on catalog cuts and visual inspection.

**d. Loop Detector Replacement (Set Price).** If the Contract Documents do not designate loop detector replacement, the Engineer may approve the addition of loop detector replacements at the set price. The Contract Documents may designate loop detector replacements at the set price.

Provide materials that comply with the specifications of the loop detector owner. The information necessary to contact the owner is shown in the Contract Documents.

The Engineer will accept the materials based on catalog cuts and visual inspection.

#### 814.3 CONSTRUCTION REQUIREMENTS

**a. Codes and Regulations.** Perform all electrical work according to:

- National Electric Code.
- National Electric Safety Code.
- Regulations of the National Board of Fire Underwriters.

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- Rural Utility Service (RUS)
- Illumination Engineers Society (IES)
- Standards of the American Society for Testing and Materials (ASTM)
- American Accommodation Policy
- Local ordinances.
- Details in the Contract Documents.

Before starting any work on existing street lighting and circuits, obtain daily safety circuit clearance from the serving company. Before beginning work, pull cut-out plugs and warning signs posted at cut-out boxes.

### **b. General.**

(1) Provide and install all incidental parts not shown in the Contract Documents which are necessary to complete the electrical system or traffic signal or modify existing systems as shown in the Contract Documents. All utility hookups are subsidiary, unless shown otherwise in the Contract Documents.

(2) Provide continuous welds that develop the full strength of the member.

(3) Perform welds by the submerged arc process.

(4) Grind exposed welds flush with the base material.

(5) Smoothly finish all exposed edges of plates which make up the base assembly. Round all exposed corners of such plates to  $\frac{1}{8}$  inch radius.

**c. Removals and Excavations.** Perform removals of existing structures and excavations to minimize damage to existing structures and right-of-way.

Remove the existing concrete foundations (including anchor bolts) to the elevation shown in the Contract Documents.

Limit the excavation for the conduits, foundations and other appliances to that necessary for the installation of the equipment and materials. Do not excavate until immediately before installing the equipment and materials.

Place plastic warning tape (12 inches below the surface) directly over conduit.

Place excavated material where no damage and obstruction to vehicles and pedestrian traffic will occur. Do not impede surface drainage.

At the end of each day's work and at all times when construction operations are suspended, remove all equipment and other obstructions from the portion of the roadway open for use by public traffic.

**d. Backfill.** Place the backfill material in uniform layers (maximum 6 inches compacted) evenly on all sides of the structure. Compact the backfill using pneumatic tampers, vibratory compactors or other equipment approved by the Engineer. Compact the backfill to comply with the Contract Documents. If backfill requirements are not specified, compact each layer until no further consolidation is observed.

Remove surplus excavated material from the project and dispose on sites approved by the Engineer. Reseed the areas disturbed by the excavations. Hand seeding methods may be used.

**e. Replacing Damaged Improvements.** Replace all sidewalks, curbs, gutters, pavements and other improvements removed or damaged during installations of the lighting systems or traffic signals. Replace or reconstruct the removed or damaged improvements with the same type and quality of materials originally used. If part of an existing slab of concrete pavement or square of sidewalk is removed or damaged, replace the entire slab or square.

### **f. Foundations.**

(1) Concrete Foundations. Form the foundations and place the concrete according to **DIVISION 700**. Hold conduit ends and anchor bolts securely in the proper position when the concrete is placed.

Cure the concrete foundations with wet burlap or polyethylene for a period of 72 hours. Prevent concrete temperatures from falling below 32°F.

Do not attach poles until the concrete has cured for 14 days.

If a foundation can not be constructed as shown in the Contract Documents because of an obstruction, the Engineer will determine how to construct the foundation.

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(2) Screw-In Foundation Anchors. Pre-drilling holes for screw-in foundation anchors is prohibited. As the foundation anchors are screwed into the ground, make sure they are plumb. The pole base of the screw-in foundation anchor shall be level when the installation is complete.

Use the connectors to make minor leveling adjustments on poles with breakaway connectors. Use galvanized or cadmium plated shims or washers (maximum thickness ¼ inch) to make minor leveling adjustments on other types of poles. Only 1 shim or washer is allowed on any 1 anchor bolt, with a maximum of 2 shims or washers on any pole.

(3) Removal of Existing Foundations. Remove the designated existing foundations to the depth shown in the Contract Documents. Backfill the resulting holes according to **DIVISION 200**. Dispose of the removed foundations and anchor bolts.

**g. Conduit.**

(1) Run all conductors between standard locations, either in duct or conduit. Use conduit of the size and type shown in the Contract Documents. If desired, use larger size conduit at no additional cost to KDOT. Use the large size conduit for the entire length of the run from outlet to outlet. Do not use reducing couplings.

When PVC or HDPE is specified, install according to the manufacturer’s instructions.

When steel conduit is used, ream the ends of all conduits to remove burrs and rough edges. Make field cuts square and true so the ends will match for the full diameter. Do not use slip joints or running threads for coupling conduit. Use an approved threaded union conduit, if a standard coupling can not be used. Before couplings are made up, paint threads on all conduits with a rust preventative paint. Fit and tighten all couplings until the end of the conduits are brought together. Paint any damaged coating on conduit with rust preventative paint.

Thread and cap all steel conduit ends with standard pipe caps, until wiring is started. When caps are removed, provide threaded ends with approved conduit bushings.

Except factory bends, use conduit bends with a radius of greater than or equal to 6 times the inside diameter of the conduit. Where factory bends are not used, make conduit bends without crimping or flattening, using the longest radius practicable.

Mark the location ends of all conduit for future electrical circuits in structures with a "Y" a minimum of 3 inches high cut in the face of curb, gutter or wall directly above the conduit.

(2) Conduit Entrenched. On electric lighting projects where possible, and on surfacing projects as shown in Contract Documents, install the electrical conduit on straight lines and cover with compacted earth.

Place conduit as shown in the Contract Documents.

(3) Conduit Jacked. Use **TABLE 814-1** to determine the conduit depth. Place conduit under existing pavement by approved jacking or drilling methods. Do not disturb pavement without written permission of the Engineer. Keep jacking or drilling pits 2 feet clear of the edge of any type of pavement.

<b>TABLE 814-1: JACKED CONDUIT DEPTH</b>	
<b>Location Condition</b>	<b>Minimum Depth</b>
Pavement	36 inches below top of pavement.
Trenches on shoulder and in park areas	36 inches below natural ground level.
Finished surface in street areas	36 inches below the street surface.*
Railroad tracks	42 inches below top of tie.

\*Conduit may be laid on top of and secured to the existing pavement in curbed dividing strips.

(4) Vertically extend conduit set in standard bases approximately 3 inches above the foundation, or slope towards the base opening where transformer bases are used. Locate conduit entering through the bottom of a pull box near the ends to leave the major portion of the box clear. Terminate conduit entering concrete pull boxes 2 inches inside the box wall and 2 inches or greater above the bottom and slope to facilitate pulling of cable. At all outlets, enter the conduit from the direction of the run.

For conduit carried through existing culverts or bridge structures, pick up the trenched cable for 3 feet in the ground and run up the face of the culvert headwall to the nearest upper corner or top, through the culvert, down the opposite headwall and into the ground for 3 feet. Fasten conduit to concrete surfaces by means of approved clamps and fasteners.

Clean existing underground conduit to be incorporated into a new system with a mandrel, and blow out with compressed air.

Conduit runs shown in the Contract Documents may be changed with approval of the Engineer to avoid underground obstructions.

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**h. Electric Service Boxes.** Install electric service boxes as shown in the Contract Documents.

**i. Pull Boxes.** Install pull boxes as shown in the Contract Documents. To facilitate work, additional pull boxes may be used at the Contractor's expense.

**j. Expansion Fittings.** Install expansion fittings as shown in the Contract Documents, where conduit crosses an expansion joint in the structure. Provide each expansion fitting with a bonding jumper of No. 6 A.W.G. copper wire or equal.

**k. Wiring.** Neatly arrange and lace up wiring within junction boxes, transformer bases and on standards, etc. Do not splice cable in conduit or outside of pull boxes, splice boxes or standards, unless shown in the Contract Documents. When not fastened to existing structure or carried through conduit, lay conductor cable to the depth shown in the Contract Documents.

Use powdered soapstone, talc or other approved lubricant when inserting conductors in conduit.

Pencil, trim to conical shape and roughen conductor insulation before applying splice insulation.

When conductors and cables are pulled into the conduit, tape all ends to exclude moisture until the splices are made or terminal appliances are attached.

**l. Bonding and Grounding.** When a closed system enclosed in conduit is used, bond metallic cable sheaths, conduit and metal standards to form a continuous system, and effectively ground. When an open system such as an overhead wiring or direct burial underground is used, effectively ground only standards and service points, except where conduit runs used under pavement cross a water system.

Install ground electrodes as shown in the Contract Documents.

**m. Traffic Signal Interconnect.** Install traffic signal interconnects as shown in the Contract Documents.

**n. Emergency Vehicle System.** Install emergency vehicle systems as shown in the Contract Documents.

**o. Operating Instructions.** Provide all operating instructions to the Engineer.

**p. Loop Detector Replacement.** Install loop detectors as shown in the Contract Documents and as specified by the owner.

### 814.4 MEASUREMENT AND PAYMENT

If shown as a bid item in the contract, the Engineer will measure electrical conduit by the linear foot from the outside edge to outside edge of service boxes, junction boxes or traffic light footings.

Excavation, removal, backfilling and Grade 3.0 concrete are subsidiary.

The Engineer will measure electric lighting systems, traffic signal installations, emergency vehicle systems and traffic signal interconnects by the lump sum.

The Engineer will measure each electric service box.

The Engineer will measure the loop detector replacements by the linear foot of saw cut required for the installation.

Payment for "Electric Lighting System", "Electric Conduit", "Electric Service Box", "Traffic Signal", "Traffic Signal Interconnect", "Emergency Vehicle System" and "Loop Detector Replacement" at the contract unit prices and "Loop Detector Replacement (Set Price)" at the set price is full compensation for specified work.