

**OKLAHOMA DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISION  
FOR  
BRIDGE NAVIGATION LIGHTING**

These special provisions amend and where in conflict, supersede applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric.

*(Add the following:)*

**809.01 DESCRIPTION**

This work consist of furnishing labor, materials, equipment, and performing all operations in connection with the installation of the navigation lights for the bridge, and the power supply for the navigation lights. This work also includes electrical conduit, wiring, and any accessories required to complete the installation.

**809.02 MATERIALS**

**A. Power Supply**

Provide a power supply consisting of a wooden service pole, a service meter socket and enclosure, and lighting controls with a photoelectric control device. Provide materials of the power supply conforming to the following:

**(1) Service pole**

Provide a service pole with a minimum length of 30 feet (9.14 meter), and a minimum size of class 4 southern yellow pine. Ensure the pole provided is impregnated after incising with non-leaching, water borne preservative Chromate Copper Arsenate (CCA), type C, conforming to American Wood Preserver's Association (AWPA), Standard P5. The preservative application to the pole shall be in closed cylinder process in accordance with requirements of AWPA-C4, provided a retention of CCA dry salts of 0.6 pounds per cubic foot (9.6 kg/m<sup>3</sup>). All pole line hardware required for pole guying and for the messenger cable shall be provided and shall be standard materials manufactured for pole line construction. The guying and messenger cables shall be stainless steel or hot-dipped galvanized steel, manufactured for pole line construction. All steel hardware shall be hot-dipped galvanized. Additional devices and hardware shall be included, when required by the local utility company, to complete the installation of the service pole.

**(2) Meter Socket**

Provide meter sockets that are U.L. listed, housed in Nema 3R enclosure, conforming to the metering requirements of the local utility company. Ensure the meter socket has a rating of 100 amps, for 120 volt service, provided with all stainless steel hardware for pole mounting, and is coated with an additional epoxy or urethane coat over the paint finish for corrosion resistance.

### **(3) Lighting Controls**

Provide lighting controls consisting of a 2 pole, 30 amp AC magnetic lighting contactor, a double-throw without center OFF control switch, a single pole 15 amp circuit breaker, a photocontrol device and a secondary surge arrester. Ensure all lighting control devices are enclosed in a Nema 4X, stainless steel enclosure, provided with stainless steel hardware for pole mounting.

### **(4) Main Disconnect**

Provide the main disconnect as a single pole, 20 amp, enclosed circuit breaker. Ensure the circuit breaker enclosure is Nema 4X, stainless steel with an external operating handle and padlocking provisions. Ensure that the operating handle can be lockable in both ON and OFF positions. Include all stainless steel hardware for pole mounting of the enclosure.

## **B. Navigation Lights**

Provide four 180 degree, red navigation lights to mark the margin of the navigable channel, and two 360 degree, green navigation lights to mark the center line of the navigable channel. Install and orient all navigation lights as shown on the drawings, and display them from sunset to sunrise each night of the year, and at other times when the visibility is less than one mile (1.6 km). Ensure the navigation lights are of sufficient candlepower as to be visible against the background lighting from an approaching vessel at a distance of at least 2,000 yards (1.8 km) for 90 percent of the nights of the year.

Wire the navigation lights for 120 volt AC and each equip them with dual 100-watt, 20,000-hour, long-life, incandescent lamps and a transfer relay for switching power to the secondary lamp upon primary lamp failure. Design each navigation light to have a pivot which permits rotation of the light from its normal down position to its up position for relamping. Ensure each navigation light is equipped with a spring-loaded latch for pivoting such that the light shall be automatically latched in its down position, when lowered, for normal operation and in its up position, when raised, for relamping. Provide a corrosion-resistant, metallic pull-chain that allows the latch to be released from the roadway. Provide a blue lamp-out indicator on the opposite end of the light stem, in its normal up position, which will light when the lamp of the navigation light is out.

## **C. Cast Junction and Pull Boxes**

Provide junction and pull boxes that are Nema 4, cast iron with hot-dipped galvanized finish. Furnish boxes with mounting lugs and installed with cast cover, gasket and stainless steel mounting hardware. Drill a 1/4-inch (6.35 mm) hole on the bottom side of the box for drain. Install the box so that the hole is located at the low end of the box after installation.

## **D. Electrical Conductor**

Provide single conductor cable that is 600 volt rated, U.L. listed as type RHW or XHHW with cross-linked polyethylene, heat and moisture resistant insulation, soft annealed, stranded copper per ASTM B-3, class B stranding per ASTM B-8.

## **E. Electrical Conduit**

Ensure that all exposed, rigid metallic conduits and fittings for outdoor installation are fabricated with hot-dip galvanized steel, conforming to ANSI Standard C80.1 and U.L. Standard UL6, and have a factory-applied, polyvinyl-chloride (PVC) exterior coating with a nominal 40-mil (1 mm) thickness. Ensure the galvanized surfaces of the conduit and fittings are coated with an epoxy-acrylic primer before plastic coating. Ensure that a urethane coating is applied to the interior with a nominal 2-mil (0.05 mm) thickness. The urethane interior coating shall afford sufficient flexibility to permit field bending without cracking or flaking of the interior coating. Ensure that the conduit clamps, straps, U-bolts, couplings, fittings, and elbows used with PVC coated conduits have the same coating as the conduit. Repair breaks, scars, or other interruptions in the PVC coating as per the conduit manufacturer's recommendations. Provide flexible PVC sleeves which extend to overlap the PVC coating on the conduit, concealing all threaded joints of the conduit connection, for conduit "C" bodies, "L" bodies, pulling elbows, and couplings. Provide sleeves with a 40-mil (1 mm), nominal thickness.

Provide direct burial conduits that are Polyvinyl Chloride (PVC), U.L. listed, schedule 40, conforming to Nema Standard TC-2.

### **809.04 CONSTRUCTION METHODS**

Perform navigational lighting work in accordance with the contract drawings and specifications. Conform to the requirements of the National Electrical Code (NEC), and to all applicable local regulations and rules of the utility company.

Construct the power supply in accordance with the National Bureau of Standards Handbook 81 Safety Rules for the Installation and Maintenance of Electric Supply and Communications Lines. Coordinate with the local utility company in locating, installing and connecting the power supply. Local "excavator alert" organizations should be contacted prior to trenching or boring operations. It is the Contractor's responsibility to locate and avoid damaging any other in-ground services in the area where excavation is to occur.

Install and adjust each navigation light with hanger stem plumb. After the final installation and adjustment, energize and visually inspect the navigational lighting system from a distance not less than 500 yards (457 meters) to ensure the proper alignment and correct aiming of each light in accordance with the intended markings of the navigable channel as shown on drawings. Correct any misalignment or incorrect aiming of the lights to the satisfaction of the Engineer.

Perform construction of the navigational lighting in accordance with the following sections of the 2009 Oklahoma State Department of Transportation Standard Specifications for Highway Construction:

- Section 801 for general requirements and circuit testing
- Subsection 802.04 for the installation of electrical conduit
- Subsection 811.04 for the installation of electrical conductor

Perform bonding and grounding in accordance with subsection 801.04B, and Article 250 of the NEC.

**A.** Install electrical conduit in accordance with the following:

- (1) Repair all nicks, cuts, exposed surfaces of conduit joints and abrasions to PVC coating on the rigid conduit with the factory-supplied repair compound. Ensure the compound forms a uniform coating and adheres to the original coating.
- (2) Equip conduit terminations with an insulated bushing to avoid abrasion on the wire insulation. Terminate conduit entering boxes, cabinets and enclosures with insulated throat grounding bushing, and bond them to ground with bare copper grounding conductor.
- (3) Provide bends made with an approved hickey or conduit bending machine. Use tools that provide protection of the PVC coating during bending.
- (4) Provide expansion/deflection fittings to compensate for expansion or contraction for conduits crossing each expansion joint of the bridge. Provide expansion/deflection fittings that allow sufficient movement, as required at each location.
- (5) Cap open conduits and exercise the necessary precautions to prevent the lodgement of dirt, plaster or foreign materials in conduits, fittings and boxes during the course of installation. Free or replace conduit which becomes clogged of these accumulations.
- (6) Carefully open conduit ends closed during construction to prevent foreign materials from entering the conduit. Do not use conduits which have been crushed or deformed.
- (7) Cap conduits and conduit sleeves for use by others until used. Ensure all conduits through walls, floors, and ceilings are water-tight.
- (8) Tightly connect all conduit connections to provide good electrical conductivity for grounding throughout the entire length of the conduit run, including flexible conduits.
- (9) Provide all empty conduits with a suitable pull wire or a nylon rope, or other approved type with not less than 10 inches (254 mm) of slack at each end of the pull wire. Tag each accessible end of the empty conduit with a plastic tag, identifying the purpose of the conduit and the location of the other end.
- (10) Inspect the conduit system after installation, and prior to pulling wires, for any kink, crush, or deformation. Replace damaged conduit with its kind and its entire length between connections.
- (11) Examine or test the interior of the conduit system for any accumulation of dirt or foreign materials which may have entered the conduit during installation by snaking through all conduit runs with a ball mandrel, brush and snake. Free conduit which has become clogged of these accumulations, or replace the entire length of the conduit run between connections.

**B.** Installation the electrical conductor in accordance with the following:

- (1) Clean the inside of all conduits of any dirt, moisture or other foreign materials before pulling conductors. Pull conductors in conduits after an application of suitable lubricant that will have no injurious effect on the insulation of the conductor. Do not use oil or grease.
- (2) Verify that circuits are wired as indicated on drawings, and are continuous and free of shorts, opens and unintentional grounds. Energize and test each circuit to ensure the continuity and the proper connections of the circuit. Test other electrical equipment as recommended by the manufacturer.

**809.05 METHOD OF MEASUREMENT**

*Bridge Navigation Lighting* will not be measured for payment. The complete system consisting of four 180 degree red lights, two 360 degree green lights, incoming electric service (power supply), boxes, conduits and wiring furnished and installed for the bridge will be paid for on a lump sum basis.

**809.06 BASIS OF PAYMENT**

Payment for *Bridge Navigation Lighting* will be made on a lump sum basis. The unit price bid includes furnishing, installing, and testing a complete navigational lighting system with associated conduit, wiring and appurtenances as shown on the drawings and as described herein for the bridge. This lump sum price also includes all coordination, permit acquisition, arrangements with and charges by the local utility company for the electric service connection.

| <b>Pay Item:</b>                  | <b>Pay Unit:</b> |
|-----------------------------------|------------------|
| <i>BRIDGE NAVIGATION LIGHTING</i> | LUMP SUM         |

No additional compensation will be awarded for the replacement of conduit which becomes clogged during installation.

No additional compensation will be awarded for realigning misaligned navigation lights.