

**SIGN LIGHTING SYSTEMS**

**DESCRIPTION**

Furnish and install all electrical equipment and components, luminaires, service poles and related service equipment, conduit, wire, and all other hardware; design alternate luminaire systems; and test to provide complete lighting systems for overhead sign structures.

Perform all work in accordance with the National Electrical Code (NEC).

These specifications are for materials and equipment to construct and put in working order the proposed lighting system(s); however, they may not show or describe every fitting, minor detail, or feature. Perform the work according to the best practice of the trade.

Have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors in accordance with Article 4 of Chapter 87 of the General Statutes for those actually performing the work.

**MATERIALS**

**(A) General:**

Refer to Division 10:

Sign Lighting Systems .....	Section 1097
Organic zinc repair paint .....	Article 1080-9

**(B) Submittals:**

Submit for approval catalog cuts and/or shop drawings for materials propose for use on the project. Allow thirty days for review on each submittal. Do not use materials that have not been approved on the project. Submit eight copies of each catalog cut and/or drawing and show on each the material description, brand name, stock number, size, rating, and manufacturer's specification. Include in the submittals sufficient information to verify compliance with the specifications, and reference each material to the appropriate contract pay item. In addition to catalog cuts, include in submittals for luminaires the manufacturer's isofoot-candle charts and coefficient of utilization graphs, ballast replacement part numbers, and wiring diagrams.

Catalog cut transmittals shall be generated using the NCDOT Signing Section's online qualified products list (SQPL). The online SQPL is located at:

<http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/SIGN/qpl/qpl.html>

If a product complies with the requirements of the NCDOT Standard Specifications for Roads and Structures and isn't contained in the online SQPL, the submittal process guidelines are online at:

[http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/SIGN/qpl/equipment\\_submittal.html](http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/SIGN/qpl/equipment_submittal.html)

## CONSTRUCTION METHODS

### (A) Layout:

The Engineer will establish the actual location of service poles. The plans show the approximate location of service poles based on available project data. Mark the proposed location of circuits, ducts, and all other components for approval prior to installation.

Submit a drawing showing all underground conduits and cable dimensioned from fixed objects or station marks.

### (B) Conduit Installation:

Install conduit as shown in the plans, and in accordance with NEC requirements for an approved watertight raceway.

Attach the conduit system to and install along the structural components of the overhead sign assembly. Attach conduit to structural components with beam clamps or stainless steel strapping. Install strapping according to the strapping manufacturer's recommendations. Do not use welding or drilling to fasten conduit to structural components.

Support conduit suspended from concrete portions of a bridge by galvanized clamps. Attach clamps to the concrete with 1/4 inch concrete expansion anchors.

Space the conduit fasteners at no more than 4 feet for conduit 1 1/2 inch and larger, or at no more than 6 feet for conduit 1 1/4 inches and smaller. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

Locate underground conduit as shown in the plans at a minimum depth of 30 inches and extend a minimum of 2 feet past the edge of pavement or paved shoulder. Either metallic or nonmetallic underground conduit may be used.

Where conduit is required beneath pavement, bury the conduit at the required depth prior to paving, or bore and jack the conduit beneath the pavement. Do not cut pavement to install conduit or use "water jetting" as an installation method. Produce openings by boring and jacking which are not more than 1 inch larger than the outside diameter of the conduit. Plug any abandoned opening for bored and jacked conduit as the Engineer directs.

Install buried conduit in a trench with essentially vertical walls that is no wider than necessary for easy installation of the conduit. Backfill in accordance with Article 300-7.

Clean conduit after installation by "snaking" with a mandrel of a diameter not less than 85% of the nominal diameter of the conduit. Seal the ends of underground conduit with temporary caps and, after installation of circuits; plug the ends with oakum. Coat field cut threads and other uncoated metal or damaged galvanizing with 2 coats of organic zinc repair paint. Ream the ends of rigid conduit.

### **(C) Wiring Methods:**

Bury underground circuits at the depth shown in the plans and surrounded with at least 3 inches of sand or earth backfill free of rocks and debris. Compact backfill in 6 inch layers. Do not splice underground circuits unless specifically noted in the plans.

Color code all conductors per the NEC (grounded neutral-WHITE; grounding-BARE or GREEN), and use BLACK and RED phase conductors. Approved marking tape, paint, or sleeves may be used in lieu of continuous colored conductors for No. 8 AWG and larger. Do not mark a white conductor in a cable assembly any other color. It is permissible to strip a white, red, or black conductor to be used as a bare equipment grounding conductor.

Install joints, taps, and splices only at locations indicated in the plans.

Make joints, taps, and splices in junction boxes and enclosures by either of the following methods:

1. Cut and remove the insulation only as far as necessary to make a secure mechanical and electrical connection. Use a removable type connector (split-bolt, set screw, wire nut, etc.), and cover with self-vulcanizing rubber tape, applied in half-lap layers to give a smooth covering at least twice the thickness of the original insulation. Use a self-fusing type putty rubber tape in tape form that can be wrapped, stretched, or molded around irregular shapes for smooth insulation build-up. Apply two layers of vinyl plastic tape, half-lap, over the rubber tape. Use vinyl plastic tape that is 7-mil, (0-2200 degrees F, and ultraviolet, abrasion, moisture, alkali, acid, and corrosion resistant.
2. Install an approved manufactured mechanical or compression connector, with factory-made waterproof insulating boots, in accordance with procedures and tools specified by the manufacturer.

Make joints, taps, and splices located underground in direct buried circuits as follows: Cut and remove the insulation only as far as necessary to make a secure mechanical and electrical connection. Use a compression type connector, installed according to procedures and tools specified by the manufacturer. Apply vinyl plastic tape over the connector and bare conductor. Encase the entire connection with a manufactured splicing kit. Use a kit with an insulating and moisture-sealing field-mixed epoxy resin compound and snap-together mold forms. Install the kit as specified by the manufacturer. Encase no more than one "leg" (phase, neutral, or equipment grounding conductor) in each epoxy resin compound mold for individual conductor circuits. For cabled conductor circuits, encase no more than one circuit in each epoxy resin compound mold.

**(D) Grounding and Bonding:**

Include an equipment grounding conductor of the type and size shown in the plans, with each set of circuit conductors.

Bond all metal conduit, enclosures, luminaires, and structures together and ground with the equipment grounding conductor to the grounding electrode.

Protect grounding electrode conductors with rigid galvanized steel conduit that is bonded to the grounding electrode conductor at each end.

**(E) Equipment Mounting:**

Mount equipment securely at locations and dimensions shown in the plans and make sure it is plumb and level. Install fasteners as recommended by the manufacturer, and space them evenly. Use all mounting holes and attachment points for attaching enclosures to structures.

Locate straps and buckles as shown in the plans and install them per the manufacturer's instructions.

Use holes for expansion anchors that are the size recommended by the manufacturer of the anchors. Drill and thoroughly clean them of all debris.

Provide one key operated, pin tumbler, dead bolt padlock, with brass or bronze shackle and case, conforming to Military Specification MIL-P-17802E (Grade I, Class 2, Size 2, Style A), for each electrical panel and switch on the project. Key all padlocks alike and provide 6 keys to the Engineer.

If a new sign is to replace an existing sign, adjust the position of the luminaires in accordance with the plans for the new sign if necessary.

**(F) Luminaires and Lamps:**

Provide lamps for all luminaires and clearly mark the installation date on the mogul base of High Intensity Discharge (HID) lamps.

**(G) Inspection:**

Comply with all local ordinances and regulations. Prior to the start of any electrical work, apply for and obtain all permits and/or licenses required by local regulation. Be responsible for having each system inspected and approved by the licensed city, county, or state electrical inspector who has jurisdiction where the systems are located.

Inspection by the local electrical inspectors will neither eliminate, nor take the place of, inspection by the Department.

Furnish written certification to the Engineer that the local electrical inspector having jurisdiction has approved the system(s). Provide this approved electrical inspection certificate prior to final acceptance of the project.

Be responsible for having the power turned on.

**(H) Electrical Service:**

Coordinate all work to ensure that electrical power of the proper voltage, phase, frequency, and ampacity is available to complete the project. Contact the utility company, make application, pay all deposits and other costs to provide necessary electrical service. The Contractor will be reimbursed for the actual verified cost of any utility company charges.

The Engineer will provide authorization to the Contractor for electrical service to be obtained in the name of the Department and for the monthly power bills to be sent directly from the utility company to the Department. The Department will be responsible for direct payment of monthly power bills received from the utility company.

**(I) Performance Tests:**

The Engineer will not accept lighting systems for overhead sign structures until the lighting system is operational, including automatic control equipment and all other apparatus, without interruption or failure attributable to poor workmanship or defective material for a period of 2 consecutive weeks. The Engineer will inspect all lights and equipment for normal operation. Perform these tests and make all repairs and replacements needed.

**LUMINAIRE RETRIEVAL SYSTEMS**

Luminaire retrieval system shop drawings shall be submitted directly to the NCDOT signing section for review and approval. The retrieval system must be capable of holding all sign luminaires at their designed positions and to allow all luminaires and electrical connections to be maintained from the roadway shoulder without lane closures. The system shall be capable of utilizing more than one circuit if required by plans.

**ALTERNATE LUMINAIRES**

If furnished luminaires, other than those shown on the plans are proposed for use, prepare and submit for approval a complete design for the proposed lighting system for each overhead sign assembly. Base such design on high pressure sodium luminaires and conform to Illuminating Engineering Society (IES) criteria. Design the luminaries for signs sized and spaced as shown in the plans.

Submit designs for alternate luminaires for approval prior to submitting shop drawings for the overhead sign structures. Coordinate the design for the lighting system with the design of the overhead sign assembly, and show any changes necessitated by the alternate luminaire design on appropriate shop drawings.

Provide photometric data for each sign for review of the alternate luminaire design. Include in the data a point-by-point foot-candle chart showing readings along the sign face at one-foot intervals, vertically and horizontally, based on the proposed alternate luminaire design spacing. Submit an isofoot-candle diagram for the luminaire. State the mounting height on the isofoot-candle diagram. If the mounting height shown on the isofoot-candle chart differs from the horizontal distance from the bottom of the sign face to the center of the luminaire, furnish the correction multiplier.

**COMPENSATION**

The work covered by this section will be paid for at the contract lump sum price for each Sign Lighting System \_\_\_\_\_.

Payment will be made under:

Static Lighting System for Overhead Sign Assembly\_\_\_\_\_Lump Sum

Luminaire Retrieval System Lighting for Overhead Sign Assembly\_\_\_\_\_Lump Sum