



## PROJECT SPECIAL PROVISIONS LIGHTING

### 1.00 DESCRIPTION

The work covered by this Section consists of furnishing, installing, connecting, and placing into satisfactory operating condition roadway lighting at locations shown on the plans. Perform all work in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (Standard Specifications).

Perform all work in conformance with Division 14 of the Standard Specifications except as modified or added to by these Special Provisions. Install all bore pits outside the clear zone, as defined in the AASHTO Roadside Design Guide or as directed by the Engineer.

In addition to the requirements of Division 1400, other specific Sections of the Standard Specifications applicable to the work on this project are listed below.

Section 1401	High Mount Standard and Portable Drive Unit
Section 1402	High Mount Foundation
Section 1403	High Mount Luminaires
Section 1404	Light Standards
Section 1405	Standard Foundation
Section 1406	Light Standard Luminaires
Section 1408	Light Control System
Section 1409	Electrical Duct
Section 1410	Feeder Circuits
Section 1411	Electrical Junction Boxes
Section 1413	Portable Construction Lighting

### 2.00 WIRING METHODS

#### 2.10 DESCRIPTION

Amend Section 1400-4(F) to include the following:

Pull conductors by hand, or use motorized cable-pulling equipment designed for pulling multiple cables into conduit. Use sheaves or rollers, as required to prevent damage to conductor insulation. Do not use an automobile to generate cable pulling forces. Use equipment similar to the Greenlee model UT2 cable pulling system, or Engineer approved equal.

### 3.00 INSPECTIONS

### **3.10 DESCRIPTION**

Amend Section 1400-5 to include the following:

Provide the personnel and equipment necessary for removing and replacing fuseholders and/ or operating circuit breakers, to facilitate the insulation resistance test described elsewhere in the Special Provisions.

A "LIGHTING SYSTEM INSPECTION CHECKLIST" is included at the back of these Special Provisions. Coordinate with the project inspector, to have the checklist items inspected as work progresses and at the end of the project, to prevent delays in preparing the final inspection punch list.

### **4.00 PERFORMANCE TESTS**

#### **4.10 DESCRIPTION**

Amend Section 1400-6 to include the following:

Provide a calibrated MegOhmMeter, with certification that calibration was done recently (within one year of use). Provide a meter manufactured by Fluke, Amprobe, Biddle, or Engineer approved equal. Present the meter for inspection, at the pre-lighting-work meeting described elsewhere in these Special Provisions.

Removing water from the conduit of a faulty circuit is not considered a repair. Water in the conduit allows current to flow between skinned places in the conductors insulation. If a circuit fails the insulation resistance test, and removing water allows the circuit to pass, replace the conductors and re-test the new circuit.

### **5.00 CONSTRUCTION PHASING**

#### **5.10 DESCRIPTION**

Amend Section 1400-11 to include the following:

Schedule a pre-lighting-work meeting before beginning work on the lighting system. Include staff members from the prime contractor, electrical sub-contractor, Resident Engineer's office, and the Lighting/ Electrical squad in the Roadway Design Unit in Raleigh.

### **6.00 LIGHT CONTROL SYSTEM**

#### **6.10 DESCRIPTION**

Same as Section 1408-1.

#### **6.20 MATERIALS**

Amend Section 1408-2 of the Standard Specifications as follows:

The completed light control system shall be marked "Suitable for Use as Service Equipment", in a prominent location in the enclosure, in accordance with NEC article 409.110.

Provide a polymer concrete (PC junction box measuring 36"L x 24"W x 18"H (PC36) and meeting the requirements of Section 1411 of the Standard Specifications.

**6.30 CONSTRUCTION METHODS**

Amend Section 1408-3 of the Standard Specifications to add the following:  
Install PC36 junction box within 2' of edge of pad in front of Control System. Stub all feeder circuit conduits and spare conduits from Control System in this junction box. See plans for conduit sizes. Place pull cord in any unused conduits and cap unused conduit in junction box.

**6.40 MEASUREMENT AND PAYMENT**

Measurement will be in accordance with Section 1408-4.

Payment will be made under:

Light Control Equipment, RW, 240/480V, 150A ..... Each

**7.00 HIGH MOUNT STANDARD**

**7.10 DESCRIPTION**

Same as Section 1401-1.

**7.20 MATERIALS**

Amend paragraph five (5) of Section 1401-2 of the Standard Specifications as follows:

Have the design of the support including base plate and anchorage conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, and the Interim Specifications valid at the time of letting. Fatigue Category II shall be used in design. The welding design and fabrication shall be in accordance with Article 1072-20.

The support shall be designed for the wind velocity shown on the plans.

Test all base plate to upright welds using magnetic particle testing (MPT) prior to galvanizing. All base plates must be tested at 100%.

The two criteria listed below shall apply to 60-ft, 80-ft, 100-ft and 120-ft high mount light poles.

1. Provide 8 or more anchor rods for each pole.

2. Provide base plate thickness of at least 2.5 inches.

### 7.30 CONSTRUCTION METHODS

Amend Section 1401-3 to include the following 9/4/08 anchor nut tightening procedure.

#### **Anchor Rod Nut Tightening Requirements for Metal Poles**

Prior to installation

Protect the anchor rod threads from damage prior to installation and during installation.

Prior to installation of the rods in the foundation, turn nuts onto and off the rods, well past the elevation of the bottom of the leveling nuts. Turn by the effort of one worker using an ordinary wrench without a cheater bar. Report to the Engineer thread damage requiring unusually large effort.

During installation

1. Place leveling nuts (bottom nuts) on the anchor rods.
2. Place leveling nut washers on top of the anchor rod leveling nuts.
3. Place a rigid template on top of the leveling nuts to check the level of the nuts. If the anchor nut and washer cannot be brought into firm contact with the template, then beveled washers shall be used.
4. Verify that the distance between the bottom of the leveling nut and the top of the concrete foundation is no more than one anchor rod diameter. If an upright is required to be back-raked, then the distance between the bottom of the leveling nut and the top of the concrete foundation should be no more than one anchor rod diameter, averaged over the anchor rod group.
5. Place the base plate and structural element to which it is attached. However, do not attach to the upright element, during tightening of the anchor nuts, cantilever beams or arms with span in excess of 10 feet. Luminaire arms and fixtures may be attached prior to standing the pole on the foundation.
6. Place top nut washers.
7. Do not use lock washers.
8. Lubricate threads and bearing surfaces of top nuts. Lubricant shall be beeswax, stick paraffin, or other approved lubricant.
9. Place top nuts. If the anchor nut and washer cannot be brought into firm contact with the base plate, then beveled washers shall be used.
10. Tighten top nuts to snug tight. A snug-tight condition is defined as the washer and nut being in full contact with the base plate, and the application of the full effort of a workman on a 12-inch wrench. Turn top nuts in increments following a star pattern (using at least two full tightening cycles).
11. To ensure proper pretensioning, after all top nuts have been brought to snug-tight condition, repeat the procedure on the leveling nuts. Turn leveling nuts in increments following a star pattern (using at least two full tightening cycles).
12. At this point, verify if beveled washers are required. Beveled washers are necessary under the leveling nut or top nut if any face of the base plate has a slope greater than 1:20 and / or

- any nut can not be brought into firm contact with the base plate.
13. Before further nut turning, mark the reference position of the nut in the snug-tight condition with a suitable marking (ink or paint that is not water-soluble). Mark on the corner at the intersection of two flats with a corresponding reference mark on the base plate at each nut. After tightening, verify the nut rotation.
  14. Achieve pretensioning by turn-of-nut method. Turn the top nuts to 1/6 of a turn. Do so in a star pattern using at least two full-tightening cycles.
  15. After installation, ensure that firm contact exists between the anchor rod nuts, washers, and base plate on any anchor rod installed.
  16. For overhead sign assemblies: The span type truss or the cantilever truss may be placed on the uprights or attached to the upright at this time. For signal support structures: The span wires or mast arms may be attached to the upright at this time.
  17. After a period of no less than 4 days, and no more than 2 weeks, and in the presence of the Engineer, use a torque wrench to verify that a torque at least equal to 600 foot-pounds is provided on each top nut. For cantilever structures, verify the torque after erection of the remainder of the structure and any heavy attachments to the structure.
  18. If any top nut torque reveals less than 600 foot-pounds of effort is required to move the nut, then tighten the nut to no less than 600 foot-pounds.
  19. Calibrate, at least annually, the torque indicator on the wrench used for tightening the nuts. Provide the Engineer a certification of such calibration.
  20. Because inspection or re-tightening of the leveling nuts would be prevented, and to reduce moisture retention and associated corrosion, do not place grout under the base plate.

**7.40 MEASUREMENT AND PAYMENT**

Measurement will be in accordance with Section 1408-4.

Payment will be made under:

100' HIGH MOUNT STANDARD ..... Each

**8.00 ELECTRICAL JUNCTION BOXES**

**8.10 DESCRIPTION**

Provide junction boxes and cast-metal boxes encased in concrete of the appropriate type at locations noted on the plans, complete with all necessary covers, conduits, duct, and hardware, in accordance with the contract.

**8.20 MATERIALS**

Use junction boxes (PC) which are stackable, and have bolted covers and are sized as shown in the plans.

Have the junction box meet or exceed the Tier 15 requirements of the ANSI/SCTE 77 specification at the time of letting. Third party certification of ANSI/SCTE 77 shall be provided upon request.

Provide a junction box which is open bottom with a foot unless specifically noted as closed bottom on the plans.

Provide a standard Electric logo on the cover unless specifically noted otherwise on the plans.

Provide a minimum of 2 size 3/8" hex head stainless steel cover bolts and inserts.

Backfill beneath and around the boxes a minimum of 12" using #67 washed stone in conformance with Section 1005 and Section 545.

Provide cast-metal (BR) box, replaceable frame, and cover that are hot dipped galvanized with factory or field drilled conduit entrances. Provide a cover with checkered imprint, pry bar slots, and reinforcing ribs for heavy loading, neoprene gasket, and brass or stainless steel bolts. Provide a blind tapped (1/4" NC thread minimum) boss on interior of box for grounding.

### **8.30 CONSTRUCTION METHODS**

Install conduits and ducts before the junction boxes are set in place. Do not rest the bottom of the box directly on conduits, ducts or cables.

Place the top of the box on the same grade as the surrounding area except raise it 3" inches minimum to allow the backfill material to be sloped to prevent surface drainage from entering the box. Perform backfilling with sufficient care that no part of the junction box, conduit or duct is displaced or moved out of alignment. Place backfill material in 6 inch layers and compact to a density comparable to the adjacent undisturbed material.

Locate junction boxes for best routing of conduit and duct, and to minimize drainage problems. Do not locate boxes in useable shoulders or pavements or other areas where they may be subjected to traffic loadings.

Stub the ends of conduit and duct up vertical as near the top of the box as practical and seal. Arrange wiring so that it will not lay in the bottom of the box.

Place sealant between the cover and box to prevent surface drainage from entering the top of the box.

Install cast-metal (BR) boxes and arrange conduits and ducts to best fit field conditions. Place boxes, conduit, and ducts as the work is built up, thoroughly bonded and accurately spaced and aligned. Place boxes with covers flush with surface of concrete (generally traffic side of median barrier).

Place mastic between the cast metal box frame and the cast concrete barrier, as shown on plans to allow easy replacement of the frame.

**8.40 MEASUREMENT AND PAYMENT**

*Electrical junction boxes* \_\_\_ will be measured and paid for as the actual number of the appropriate type and size junction boxes that have been installed and accepted. Payment for the conduit, duct and wiring will be paid for under other contract items. Items used for splicing are considered incidental to this pay item.

Payment will be made under:

ELECTRICAL JUNCTION BOXES (TYPE)..... Each

**9.00 PORTABLE CONSTRUCTION LIGHTING**

**9.10 DESCRIPTION**

Work covered by this section shall be in accordance with Section 1413 of the Standard Specifications except as modified below.

**9.2 MATERIALS**

Use materials as specified in Section 1413-2.

**9.3 TOWER LIGHT**

Use tower lights as specified in Section 1413-3.

**9.4 MACHINE LIGHTS**

Amend Section 1413-4 to include the following:

Balloon lights are an acceptable alternate luminaire for machine lights.

**9.5 CONSTRUCTION METHODS**

Use construction methods as specified in Section 1413-5.

**9.60 MEASUREMENT AND PAYMENT**

Measurement and payment for Portable Construction Lighting shall be in accordance with Section 1413-6 of the Standard Specifications.



LIGHTING SYSTEM INSPECTION CHECKLIST

Date \_\_\_\_\_

PROJECT # \_\_\_\_\_  
CONTROL SYSTEM \_\_\_\_\_

1. Line Voltage:  $\phi_A$  -G \_\_\_\_\_  $\phi_B$  -G \_\_\_\_\_  $\phi_A$  -  $\phi_B$  \_\_\_\_\_
2. Control System ID \_\_\_\_\_
3. Conductors Numbered \_\_\_\_\_
4. Main CB Rating \_\_\_\_\_
5. Feeder CB Rating \_\_\_\_\_
6. Control CB Rating \_\_\_\_\_
7. Selector Switch Label and Operation \_\_\_\_\_
8. Damaged Galvanizing \_\_\_\_\_
9. Grounding Electrode Conductor \_\_\_\_\_
10. Main Bonding Jumper \_\_\_\_\_
11. Photocontrol Operation \_\_\_\_\_
12. Clean Enclosure \_\_\_\_\_
13. Certificate of Inspection \_\_\_\_\_
14. Meg Circuits: #1  $\phi_A$  -G \_\_\_\_\_ #2  $\phi_A$  -G \_\_\_\_\_ #3  $\phi_A$  -G \_\_\_\_\_  
 $\phi_B$  -G \_\_\_\_\_  $\phi_B$  -G \_\_\_\_\_  $\phi_B$  -G \_\_\_\_\_  
 $\phi_A$  -  $\phi_B$  \_\_\_\_\_  $\phi_A$  -  $\phi_B$  \_\_\_\_\_  $\phi_A$  -  $\phi_B$  \_\_\_\_\_  
#4  $\phi_A$  -G \_\_\_\_\_ #5  $\phi_A$  -G \_\_\_\_\_ #6  $\phi_A$  -G \_\_\_\_\_  
 $\phi_B$  -G \_\_\_\_\_  $\phi_B$  -G \_\_\_\_\_  $\phi_B$  -G \_\_\_\_\_  
 $\phi_A$  -  $\phi_B$  \_\_\_\_\_  $\phi_A$  -  $\phi_B$  \_\_\_\_\_  $\phi_A$  -  $\phi_B$  \_\_\_\_\_
15. Amperage: #1  $\phi_A$  \_\_\_\_\_  $\phi_B$  \_\_\_\_\_ #2  $\phi_A$  \_\_\_\_\_  $\phi_B$  \_\_\_\_\_ #3  $\phi_A$  \_\_\_\_\_  $\phi_B$  \_\_\_\_\_  
#4  $\phi_A$  \_\_\_\_\_  $\phi_B$  \_\_\_\_\_ #5  $\phi_A$  \_\_\_\_\_  $\phi_B$  \_\_\_\_\_ #6  $\phi_A$  \_\_\_\_\_  $\phi_B$  \_\_\_\_\_
16. Verify Wire Size \_\_\_\_\_
17. Verify Lights on Correct Circuits \_\_\_\_\_
18. Print Pocket With As-Built Plans in Panel \_\_\_\_\_

**LIGHT STANDARDS**

1. Proper ID's \_\_\_\_\_
2. Breakaway Fuseholders, Proper Line/Load Connections \_\_\_\_\_
3. Foundation Elevations \_\_\_\_\_
4. Breakaway Bases \_\_\_\_\_
5. Conductor ID's in Base \_\_\_\_\_

**HIGH MOUNT STANDARDS**

1. Verify ID's \_\_\_\_\_
2. Portable Drive and case Turned Over to Traffic Services \_\_\_\_\_
3. Operation of Lowering Device: HM1 \_\_\_ HM2 \_\_\_ HM3 \_\_\_ HM4 \_\_\_ HM5 \_\_\_ HM6 \_\_\_
4. Connection at Carrier Ring: HM1 \_\_\_ HM2 \_\_\_ HM3 \_\_\_ HM4 \_\_\_ HM5 \_\_\_ HM6 \_\_\_
5. Door Secure and Not Removable \_\_\_\_\_
6. Wire Mesh at Base \_\_\_\_\_
7. Lay of Cable on Winch \_\_\_\_\_
8. Luminaires Level and Secure \_\_\_\_\_
9. Grounding \_\_\_\_\_
10. Verify Rating of CB \_\_\_\_\_
11. Date Code on Lamps \_\_\_\_\_

**JUNCTION BOXES**

1. Verify Cleanness \_\_\_\_\_
2. Verify Conductor ID's \_\_\_\_\_
3. Verify Location, Elevation and Cover Secure \_\_\_\_\_
4. Ground Rod Connections \_\_\_\_\_
5. Insulation of Joints and Splices \_\_\_\_\_
6. Sealing of Conduits \_\_\_\_\_

**GENERAL: Two-week Test Period** \_\_\_\_\_