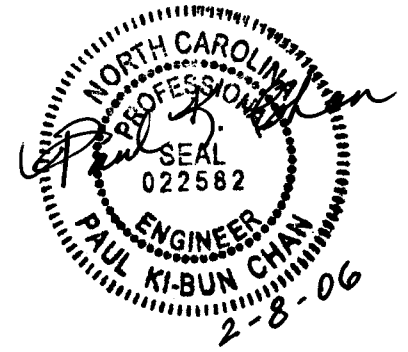


99
PROJECT SPECIAL PROVISIONS
Lighting



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) and the *Roadway Standard Drawings* and as amended below.

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 by the 2002 AASHTO Roadside Design Guide or as directed by the Engineer.

Standard Specifications applicable to the work on this project are listed below.

Section 1400	Roadway Lighting
Section 1401	High Mount Standard and Portable Drive Unit
Section 1403	High Mount Luminaires
Section 1407	Electric Service Pole and Lateral
Section 1409	Electrical Duct
Section 1410	Feeder Circuits
Section 1411	Electrical Junction Boxes

Refer to Traffic Control Plans for time restrictions and lane closure requirements.

2.00 ROADWAY LIGHTING

2.10 DESCRIPTION.

Provide Roadway Lighting as specified in Section 1400 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below.

2.20 MATERIALS.

Provide materials as specified in Section 1400-2 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below:

(B) Conduit:

Use conduit and duct that is either metallic (Rigid Metallic Conduit) or non-metallic (Polyvinyl Chloride or High Density Polyethylene), as noted on the plans and as described below.

Use HDPE conduit with an outer diameter to minimum wall thickness ratio that complies with ASTM D 3035, Standard Dimension Ratio (SDR) 13.6. Provide conduit that meets UL Standard 651B HDPE.

Provide conduit that meets or exceeds the following:

ASTM D 638	Tensile Strength – 3,000 psi, minimum Elongation – 400 percent, minimum
ASTM D 1238	Melt Index – 0.4 maximum
ASTM D 1505	Density – (0.941-0.955g/cc)
ASTM D 1693	Condition B – 20 percent failure, maximum
ASTM D 2444	Impact – NEMA Standards Publication Number TC7
ASTM D 3350	Cell Classification – 334420 or 344420

Ensure HDPE conduit is resistant to benzene, calcium chloride, ethyl alcohol, fuel oil, gasoline, lubricating oil, potassium chloride, sodium chloride, sodium nitrate, and transformer oil, and is protected against degradation due to oxidation and general corrosion. Furnish conduit with a coefficient of friction of 0.09 or less in accordance with Telcordia GR-356.

Furnish factory lubricated, low friction, coilable, conduit constructed of HDPE. Furnish conduit with nominal diameter as required. Provide conduit with smooth outer wall and ribbed inner wall. Ensure conduit is capable of being coiled on reels in continuous lengths, transported, stored outdoors, and subsequently uncoiled for installation without affecting its properties or performance.

2.30 CONSTRUCTION METHODS.

Construct as specified in Section 1400-4 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below:

(D) Operation of Equipment:

Install all bore pits outside the clear zone.

(I) Concrete Foundations:

Use concrete foundation dimensions verified in accordance with the details shown on the plans or approved drawings. Construct concrete foundations in accordance with Section 825. Use class A concrete, meeting the requirements of Section 1000 and reinforcing steel which conforms to the requirements ASTM-A615, Grade 60, Deformed.

Perform foundation excavations that conform to the applicable requirements of Section 410. Construct the sides of the excavation to conform as nearly as practicable to the required dimensions. Place concrete against undisturbed soil unless otherwise permitted. If large discontinuities in the required configuration of the excavation are created by the removal of boulders or due to any other causes, backfill the excavation and compact as provided for in Section 410. Re-excavate the foundation to the proper dimensions. If rock or boulders are encountered during the excavation, they shall be removed to a depth sufficient to obtain the stability necessary to support the structure for the design loads.

Form foundations with prefabricated cardboard forms down to 6" min. below top of ground. Concrete shall be cast against undisturbed soil. If temporary shoring is required in conjunction with the excavation, smooth steel pipe of the specified diameter shall be installed and retracted as concrete is cast against undisturbed soil. If permanent casing, either smooth or corrugated, is used it shall be pushed or screwed into undisturbed soil and then cleaned of debris prior to casting concrete. No water shall be allowed to accumulate before or during the casting.

Set the top of foundation elevation relative to the surrounding ground surface as shown on the plans. Chamfer corners at the top of foundation. Give exposed vertical concrete surfaces an ordinary surface finish and exposed horizontal concrete surfaces a float finish. Use galvanized steel hardware cloth or welded wire fabric, between the top of foundation and bottom of mounting base if indicated on the plans or other sections of the specifications. Attach hardware cloth to anchor bolts with size AWG 14 copper wire or small gage galvanized wire.

3.00 HIGH MOUNT STANDARD

3.10 DESCRIPTION.

Provide High Mount Standards as specified in Section 1401 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below.

3.20 MATERIALS.

(A) High Mount Standard:

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 I shall be used in design. The welding design and fabrication shall be in accordance with Article 1072-20 of the Standard specifications. Provide anchor bolts and washers in accordance with Section 1072-7 of the 2002 *NCDOT Standard Specifications for Roads and Structures*.

The support is to 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 shall be tested at 100%.

3.30 MEASUREMENT AND PAYMENT.

The measurement and payment for High Mount Standards shall be in accordance with Section 1401 of the Standard Specifications.

4.00 HIGH MOUNT FOUNDATION

Provide High Mount Foundation as detailed in drawing Detail Number 1402D01 attached with the plansheets, and as specified here. Section 1402 of the 2002 *NCDOT Standard Specifications for Roads and Structures* is replaced with the following.

4.10 DESCRIPTION.

Construct a concrete foundation for a high mount standard 75' or greater in height, including concrete, reinforcing steel, placing of the anchorage assembly, conduits, forms, shoring, excavation and backfilling.

4.20 MATERIALS.

Use materials which are new and in accordance with Subarticle 1400-4 (I) and as amended above.

4.30 CONSTRUCTION METHODS.

Construct foundations in accordance with Subarticle 1400-4(I), and as shown on Roadway Standard Drawing 1402.01. Either the Engineer or the Contractor may choose to construct foundations as specified under Site Specific High Mount Foundation described below. The Standard Drawing is based upon the following assumed soil parameters:

Total Unit Weight = 120 pcf
Friction Angle = 30 degrees
Cohesion = 0 psf

The groundwater elevation is assumed to be at a depth of 7 feet below the ground surface and the ground surface is assumed to be level. If the Engineer determines these assumed conditions are not applicable to a specific site, or the Contractor chooses not to use the Standard Drawing, a site specific foundation design is required.

Arrange anchor bolts symmetrically about the center of the foundations, brace securely and hold in the proper position and alignment. Reinforcing steel shall be hooked or bent per ACI code, and tied sufficiently to retain its proper shape during concrete placement.

Provide PVC conduits in the foundation concrete as shown on Roadway Standard Drawing 1402.01.

(A) Site Specific High Mount Foundation:

If the assumed soil parameters are not applicable to a specific site, the Engineer may require a site specific foundation design. Conditions requiring a site specific design include but are not limited to very soft or loose soil, muck (generally, standard penetration test (SPT) blow counts per foot less than 4), weathered rock or hard rock (generally, SPT refusal). The Engineer may also require a site specific design if the groundwater elevation is shallower than 7 feet or the ground surface is steeper than 2:1 (H:V). If the Engineer requires a site specific design, rough grade the site (within 3 feet of final grade) and ensure accessibility for a drill rig. Notify the Department when the site is accessible. Within four weeks of notification, the Department will perform a subsurface investigation and provide a site specific foundation design. Payment will be made for the actual quantity of concrete required for high mount foundations based upon the site specific foundation design provided by the Department.

In lieu of using Roadway Standard Drawing 1402.01, the Contractor may choose to provide a site specific foundation design. If the Contractor chooses to provide a site specific design, perform a subsurface investigation, and submit the site specific foundation design to the Department for approval, in accordance with the requirements listed below. If the Contractor provides a site specific design, payment will be made for the plan quantity of concrete for high mount foundations shown in the Standard Drawing, and no additional payment will be made for the costs of the subsurface investigation and foundation design.

Subsurface Investigation:

Perform a boring at each high mount foundation location and provide boring data on an NCDOT Standard Boring Log form. Download this form from the NCDOT ftp site at <http://www.ncdot.org/doh/preconstruct/highway/geotech/contractserv/investigation/Documents/>. A licensed geologist or a professional engineer licensed in the State of North Carolina and employed by an NCDOT Highway Design Branch pre-qualified Geotechnical Engineering Firm shall seal each boring log. Use only an NCDOT Highway Design Branch pre-qualified Geotechnical Engineering Firm to conduct the subsurface investigation. Perform the investigation only after rough grade (within 3 feet of final grade) is achieved.

Locate the boring within 3 feet of the center of the high mount foundation. Drill the boring a minimum of 5 feet deeper than the foundation depth required by Roadway Standard Drawing 1402.01. Conduct Standard Penetrating Tests at 1 ft, 2.5 ft, 5 ft, 7.5 ft, 10 ft, and every 5 ft after 10 ft below the rough grade, in accordance with ASTM D-1586. A boring may be terminated above the minimum depth required (10 ft below the foundation elevation), if one of the following conditions occur: (a) a total of 100 blows have been applied in any 2 consecutive 6-in. intervals; (b) a total of 50 blows have been applied with less than 3-in. penetration.

104

Foundation Design:

Use only an NCDOT Highway Design Branch Pre-Qualified Geotechnical Engineering Firm to provide a site specific foundation design. A North Carolina Licensed Professional Engineer shall seal all design calculations, drawings and recommendations. Submit 8 copies of the subsurface investigation and foundation design to the Engineer for approval and allow 30 days for review.

Design foundations in accordance with the wind zone load shown on the plans. Provide reinforced concrete design in accordance with Section 13.6.2, allowable stress design method, of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals (including interims).

Consider sloping ground in the design, if applicable. Design the foundations to provide horizontal movements of less than 1/2 inch at the top of the foundation.

Provide a three foot (3') level work area around each high mount foundation with cut and fill slopes extended to final grades as directed.

4.40 MEASUREMENT AND PAYMENT.

The quantity of foundations to be paid for will be the number of cubic meters of concrete necessary to construct foundations in accordance with the dimensions authorized by the Engineer.

The quantity of foundations, measured as provided above, will be paid for at the contract unit price per cubic meter for "High Mount Foundations".

Payment will be made under:

High Mount FoundationsCubic meter

5.00 HIGH MOUNT LUMINAIRES

5.10 DESCRIPTION.

Provide High Mount Luminaires as specified in Section 1403 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below.

5.20 MATERIALS.

Provide ballast capable of operating a high pressure sodium lamp from a source with a nominal voltage as shown on the plans with a tolerance of ±10%. Provide luminaires with IES Distribution: Medium, Cutoff, Type V, and the wattage shown on the plans. NCDOT will evaluate photometric data for submitted luminaire to ensure adequate light output from the fixture.

5.30 MEASUREMENT AND PAYMENT.

The measurement and payment for High Mount Luminaires shall be in accordance with Section 1403 of the Standard Specifications.

LIGHT CONTROL SYSTEM

6.10 DESCRIPTION.

Provide Light Control System as detailed in drawing Detail Number 1408D01 attached with the plansheets, and as specified in Section 1408 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below.

6.20 MATERIALS.

Provide a NEMA type 3R stainless steel enclosure with drip shield, and conform to NEC Article 312 and mount the device so the NEC clearance will be provided, except use 1½" where "not specified" is noted in tables for minimum wire bending space.

The neutral bar shall be bonded to the panel.

Mount components to the back panel with manufacturer supplied mounting brackets or permanently attached screw studs.

Provide multi-tap solderless load side box lugs in the service circuit breaker, or distribution terminal blocks of the appropriate size for multi circuit connections. The completed light control system shall be labeled "Suitable for Use as Service Equipment," in a prominent location in the enclosure, in accordance with NEC Article 230.66. If the control system is not made in a certified UL 508 Panel Shop, a third party, recognized by the Department of Insurance as having the authority, shall label the control system.

6.30 MEASUREMENT AND PAYMENT.

The measurement and payment for Lighting Control Systems shall be in accordance with Section 1408 of the Standard Specifications.

7.00 ELECTRICAL DUCT

7.10 DESCRIPTION.

Provide Electrical Duct as specified in Section 1409 of the 2002 *NCDOT Standard Specifications for Roads and Structures* and as amended below.

7.20 MATERIALS.

Use electrical duct that is non-metallic rigid PVC (Polyvinyl Chloride) heavy wall conduit, HDPE (High Density Polyethylene) Standard Dimension Ratio (SDR) 13.6 or

rigid galvanized steel conduit, in accordance with the Subarticle “1400-2(B) Conduit” as amended in this Scope of Work.

7.30 CONSTRUCTION METHODS.

(d) HDPE conduit may be installed by directional drilling in accordance with the following:

1. Pre-Approvals and Minimum Depth Requirements:

Obtain approval before beginning drilling operations.

At all points where HDPE conduit will traverse under roadways, driveways, sidewalks, or “Controlled Access Areas” including entrance/exit ramps, maintain a minimum depth of 4 feet or 8 times the back reamer’s diameter, whichever is deeper. For an installation that runs parallel to a controlled access area or entrance/exit ramps maintain a minimum depth of 30 inches below finished grade. Maintain a minimum clearance of 30 inches below finished grade when crossing ditch lines. For the following structures, the minimum clearance requirements are:

Man-made Structure	Minimum Clearance Requirement
Bridge foundation	5’ horizontal & 4’ vertical (clearances greater than minimum horizontal should continue to use the 4V:5H ratio, i.e., 10’ horizontal should be no deeper than 8’)
Drainage pipes 60” or less	1’ above or below [while maintaining a minimum depth of 30” below grade]
Drainage pipes greater than 60”	1’ above or 4’ below [while maintaining a minimum depth of 30” below grade]
Box Culverts	1’ above or 4’ below [while maintaining a minimum depth of 30” below grade]
Slope protection	2’ below
Slope protection foundation footing	5’ below

Guarantee the drill rig operator and digital walkover locating system operator are factory-trained to operate the make and model of equipment provided and have a minimum of one year experience operating the make and model of drill rig. Submit documentation of the operators' training and experience for review at least two weeks before start of directional drilling operations.

Provide a means of collecting and containing drilling fluid/slurry that returns to the surface such as a slurry pit. Provide measures to prevent drilling fluids from entering drainage ditches and storm sewer systems. Prevent drilling fluid/slurry from accumulating on or flowing onto pedestrian walkways, driveways, and streets. Immediately remove all drilling fluids/slurry that are accidentally spilled.

2. Directional Drill Operations:

Provide grounding for the drill rig in accordance with the manufacturer's recommendations.

Place excavated material near the top of the working pit and dispose of properly. Backfill pits and trenches to facilitate drilling operations immediately after drilling is completed.

Use drill head suitable for type of material being drilled and sized no more than 2 inches larger than the outer diameter of the conduit. Direct drill to obtain proper depth and desired destination. Pressure grout with an approved bentonite/polymer slurry mixture to fill all voids. Do not jet alone or wet bore with water.

During drilling operation, locate drill head every 10 feet along drill path and before traversing underground utilities or structures. Use digital walkover locating system to track drill head during directional drilling operation. Ensure locating system is capable of determining pitch, roll, heading, depth, and horizontal position of the drill head at any point.

Once drill head has reached final location, remove head, and install back reamer of appropriate size (no more than 2 inches larger than outer diameter of conduits) to simultaneously facilitate back reaming of drill hole and installation of conduit. Back reamer is sized larger than actual conduits to ensure conduits are not adversely subjected to deviations caused by the original drill operation and are as straight as practical in their final position.

The intent of these specifications is to limit the diameter of the actual drill shaft/hole so that it is no more than 2 inches larger than the conduit outer diameter. The 2-inch larger diameter may be accomplished during the original bore or during the back reaming/conduit installation process.

Once installation of conduit has started, continue installation without interruption so as to prevent conduit from becoming firmly set. Apply bentonite/polymer slurry mixture during conduit installation.

Upon completion of conduit installation, perform a mandrel test on conduit system to ensure conduit has not been damaged. Furnish non-metallic mandrel with a diameter of approximately 50% of the inside diameter of the conduit in which it is to be pulled through. If damage has occurred, replace the entire length of conduit and ensure that pull line is re-installed.

3. Drilling Fluids:

Use lubrication for subsequent removal of material and immediate installation of the conduit. The use of water and other fluids in connection with directional drilling operations will be permitted only to the extent necessary to lubricate cuttings. Do not jet alone or wet bore with water. Use drilling fluid/slurry consisting of at least 10 percent

high-grade bentonite/polymer slurry to consolidate excavated material and seal drill hole walls.

Transport waste drilling fluid/slurry from site and dispose of in a method that complies with local, state and federal laws and regulations.

4. Conduit Splicing:

With prior approval, install a junction box at locations where splicing or coupling of conduit is necessary. Otherwise, splicing or joining of HDPE conduit is prohibited.

7.40 MEASUREMENT AND PAYMENT.

The measurement and payment for Electrical Duct shall be in accordance with Section 1409 of the Standard Specifications.