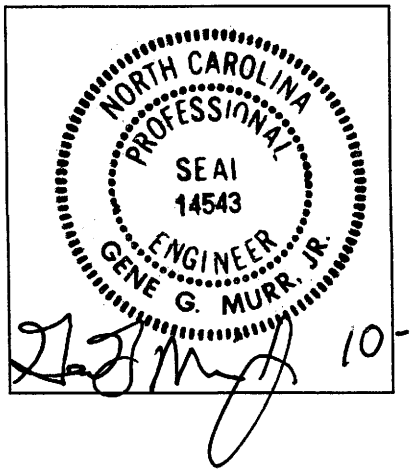

Project Special Provisions

(Version 06.6)

Signals and Intelligent Transportation Systems

Prepared By: _____
30-Sep-09

Contents

1. 2006 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2006 Standard Specifications are revised as follows:

1.1. General Requirements (1098-1)

Page 10-268, Subarticle 1098-1(H)

In the first paragraph, revise the second sentence to "Ensure service disconnects are listed as meeting UL Standard UL-489 and marked as being suitable for use as service equipment."

In the second paragraph, revise the first sentence to "Furnish NEMA Type 3R meter base rated 100 Ampere minimum that meets the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with minimum of 167 degrees F insulated wire."

In the second paragraph, last item on page, revise to "With or without horn bypass."

Page 10-269, Subarticle 1098-1(H)

Revise the second line to "Listed as meeting UL Standard UL-414."

In the first full paragraph on page, remove the first sentence.

Revise the last paragraph to "If meter base and electrical service disconnect are supplied in the same enclosure, ensure assembly is marked as being suitable for use as service equipment. Ensure combination meter and disconnect mounted in a pedestal for underground service is listed as meeting UL Standard UL-231. Otherwise, ensure combination meter and disconnect is listed as meeting UL Standard UL-67.

1.2. Loop Lead-in Cable (1098-8)

Page 10-274, Delete article and replace with the following:

Furnish lead-in cable with two conductors of number 14 AWG fabricated from stranded tinned copper that complies with IMSA Specification 50-2 except as follows:

Ensure conductor is twisted with a maximum lay of 2.0 inches, resulting in a minimum of 6 turns per foot.

Provide a ripcord to allow cable jacket to be opened without using a cutter.

Provide length markings in a contrasting color showing sequential feet and within one percent of actual cable length. Ensure character height of the markings is approximately 0.10 inch.

1.3. Underground Conduit – Construction Methods (1715-3)

Page 17-10, Subarticle 1715-3(B) Section (1), Revise 1st paragraph, 2nd sentence to:

Install rigid metallic conduit for all underground runs located inside railroad right-of-way.

1.4. Inductive Detection Loops – Construction Methods (1725-3)

Page 17-20, Subarticle 1725-3, In the first paragraph, revise the first sentence to:

"Between where loop conductor pairs leave saw cut in pavement and junction boxes, twist loop conductor pairs a minimum of 5 turns per foot."

1.5. Loop Lead-in Cable – Measurement and Payment (1726-4)

Page 17-20, Delete first paragraph and replace with the following:

Lead-in cable will be measured and paid as the actual linear feet of lead-in cable furnished, installed, and accepted. Measurement will be made by calculating the difference in length

markings located on outer jacket from start of run to end of run for each run. Terminate all cables before determining length of cable run.

2. ELECTRICAL REQUIREMENTS

Ensure that an IMSA certified, or equivalent, Level II traffic qualified signal technician is standing by to provide emergency maintenance services whenever work is being performed on traffic signal controller cabinets and traffic signal controller cabinet foundations. Stand by status is defined as being able to arrive, fully equipped, at the work site within 30 minutes ready to provide maintenance services.

Loop Specifications and Station Type Descriptions

Volume Monitoring Stations (ATR)

A Volume Monitoring Station (ATR) is comprised of two inductance loop sensors in each lane of travel (Array) and one or more sites located on the shoulder situated on a segment of a variety of highway types. An array consists of two 6 foot by 6 foot inductance loops with four turns of wire, grout, sealant, wiring, and cable. A site consists of one 25-foot fiberglass pole, one 10 foot by 6 inch by 6 inch pressure treated wood post, metal conduit for home runs and grounding wire, PVC conduit for telephone, and one hand hole box located within a 10 foot by 10 foot concrete pad. A solar panel is mounted at the top of the fiberglass pole and the equipment cabinet, provided by the Traffic Survey Unit, is mounted to the pressure treated wood post. PVC conduit is run from the edge of pavement to the site with additional hand hole boxes provided as specified. Grounding arrays are installed on the shoulder in compliance with Traffic Survey Unit grounding specifications. Adjustments to any of these specifications to accommodate local site conditions may be done at the discretion of the NCDOT and must be approved in writing by the Electronic Systems Section Supervisor. The station list provides a description of work planned at each station including number of arrays and number of sites. Stations are located on a variety of highway types and the appropriate type of traffic control for each location must be used. Some locations may require lane closures to be operated at night or on weekends. The Equipment list and standard details provide additional information.

Interstate Control Stations (IC/RC)

An Interstate Control Station (IC) is comprised of a single inductance loop sensor in each lane of travel (Array) and one or more sites located on the shoulder situated on a segment of interstate highway. A Ramp Control Station (RC) has the same configuration as an Interstate Control Station but is located on major ramps at an interchange. An array consists of one 6 foot by 6 foot inductance loop with four turns of wire, grout, sealant, wiring, and cable. A site consists of an access box with a terminal strip mounted on a 10' U Channel signpost, metal conduit for home runs, and one hand hole box located within a 6' x 6' concrete pad. PVC conduit is run from the edge of pavement to the site with additional hand hole boxes provided as specified. Adjustments to any of these specifications to accommodate local site conditions may be done at the discretion of the NCDOT and must be approved in writing by the Electronic Systems Section Supervisor. The station list provides a description of work planned at each station including number of arrays and number of sites. All stations are located on the interstate highway system and will require the appropriate type of traffic control for this type of facility and the conditions found at each station. Some locations will require lane closures to be operated at night or on weekends. The Equipment List and Standard Details provide additional information.

Materials and equipment shall conform with the specified equipment list. This contract specifies the installation of new and upgrades to existing IC/RC stations at twenty one (21) locations. Station IC 9110 (item 140) includes installation of 4 arrays in 2 lanes at an existing station in addition to the standard IC installation. The Contractor must coordinate all operations with the Traffic Survey Unit so that site locations can be staked, inspectors can monitor Contractor activities, inspections can be performed as specified, sensor arrays are tested prior to installation, and IC/RC stations are tested and accepted after installation.

SECTION 2. DETECTORS

2.1 GENERAL

The Contractor shall furnish and install inductive roadway loops at the locations according to the specifications set forth below.

2.2 IC/RC and ATR DETECTORS

2.2.1 INDUCTANCE LOOP AND LEAD-IN MATERIALS

Loop and lead-in material furnished and installed by the Contractor for this project shall be new and free of defects. The detector loop wire shall be composed of 19 strand copper conductor insulated by a polyvinyl chloride compound. The size of the conductor shall be 14 AWG. All loop home run leads shall be loosely encased in a tube of a polyvinyl compound. The maximum outside diameter of the loop wire with tube shall not exceed 0.250 inches plus or minus 0.010 inches.

Detector lead-in cable shall be composed of stranded tinned copper conductors. The 2 conductors will be individually insulated with a polyethylene compound. The size of the conductors shall be 14 AWG. The insulated conductors shall be twisted into pairs and laid in a compact cable form with an aluminum Mylar tape applied around the pair.

2.2.2 LOOP INSTALLATION

The Contractor shall furnish all loop wire and lead-in wire for this project. Loop and lead-in materials furnished and installed shall be new and conform to the NCDOT **2006** Standard Specifications for Roads and Structures.

The loop conductor shall run continuously, unspliced, through the conduit beginning at the cabinet or access box to the roadway, making four (4) turns for the loop and return through the conduit to the cabinet or access box. The loop conductors or lead-in cable shall be of sufficient length to allow ten (10) feet of conductor to be neatly coiled at the cabinet or access box to allow sufficient length for termination of the conductors inside the cabinet or access box. Loop conductors and lead-in cable shall be enclosed in conduit from the pavement edge to the hand hole box. Loop conductors and lead-in cable shall be enclosed in a polyvinyl compound tube for the entire length of the home run saw

cuts and extend a minimum of six (6) inches into the conduit. All loop conductors and lead-in cables shall be sealed in the pavement cuts for the entire length of pavement cut.

Splices shall use the following technique:

STEP 1. Strip loop wire, stager wire cuts;
STEP 2. Connect bare conductors by twisting or crimping using bare butt connector and solder with resin core solder;

STEP 3. Insulate each solder joint separately by coating with moisture proof sealant, applying shrink wrap and then apply second moisture proof sealant coat.

The loop wires or lead-in cables wires shall be twisted together with a minimum of four to five turns per foot for its entire length of run through the conduit and pull box leading to the wiring box.

The saw cuts for the detector loops shall be a clean, well defined cut a minimum of 5/16 inches in width without damage to adjacent pavement areas. The depth of the saw cut shall be no less than 2.50 inches and no more than 3.00 inches. The depth of the saw cut shall be checked frequently and it should be at a constant value. The saw cuts shall be overlapped to provide full depth at all corners. All saw cuts requiring a right angle turn shall be cut at a diagonal 12" from the corner of the loop to prevent sharp wire bends. The Contractor will pre-mark the corners of each loop and mark the direction the loop lead-in wire is to exit the pavement. Prior to starting the loop sawing operation, the Contractor shall use a chalk line or equivalent method to outline the perimeter of the loop on the pavement and routes for lead-in cables. The saw cut in the pavement should not deviate by more than one (1) inch from the chalk line. No payment will be made for loops with deviations greater than 2 inches and the cost of same shall be deducted from the site contract cost for the site work at a cost of $1.85 per linear foot of saw cut.

Once the loop saw cut has been cleaned using a high pressure mixture of air and water and dried using compressed air, the Contractor shall place approximately 1/4 inch of sealant in the bottom of the slot prior to installing the wire (This will help provide total encapsulation). Any other techniques used to encapsulate the loop wire must be approved by the Engineer prior to installation at any station.

All loops shall be wound in a clockwise manner. A loop shall be wound in the same direction as adjacent loops of a multiple loop installation. The loop wire shall be placed in the saw cut such that there are no kinks or curls, no straining or stretching of the wire, and without damage to the wire or its insulation. The loop wire shall be installed as far down in the slot as possible and be secured in the bottom of the slot with a nonconductive tie-down material spaced 12 to 18 inches apart in the slot. The tie-down material should be approximately 1". Each turn of the loop wire will be placed in the slot and tamped into place, prior to placing the next turn of wire. Sharp objects or tools shall not be used to seat the loop wire.

The Contractor shall tag and identify the clockwise "lead" of each loop. The Contractor shall identify each loop in each hand hole box and at the 25-foot fiberglass pole.

The saw cut for the loop lead-in wires shall be carried to a minimum distance of twelve (12) inches from the edge of the pavement or gutter, from that point, the loop lead-in wires will be carried to the edge of pavement in a 1.0-inch PVC conduit. The 1.0" PVC conduit should be installed at a 30 degree to 60 degree angle. After the loop wires are installed in the conduit, the Contractor shall install a foam material in the conduit to prevent sealant from filling the conduit. The foam material should be installed 1 inch below the roadway surface. Once the loop wires
have been checked and found to meet the minimum requirements as specified herein, the Contractor shall furnish and install a sealant to completely seal the 1.0" conduit from the foam material to the roadway surface. There will be a minimum of 1 inch of cover over the loop wire. All tie down material must be removed from the sealant prior to the final coverage of the wires. No 1.0" conduit can be filled to more than 3/4" full with lead-in cables.

The integrity of the insulation shall be checked by applying a megger between one end of the loop lead-in conductor and the nearest reliable electrical ground. In the event that no available ground exists, a suitable ground will be established. The Contractor shall provide the continuity reading, resistance reading and megger reading for each loop and loop lead-in wire to the Engineer or inspector on a form that will be provided by the Engineer. If acceptable, the loop shall be sealed. A minimum of three feet of excess lead-in wire will be left in the cabinet for wiring purposes.

The saw cut shall be filled to the level of the roadway surface with the sealant or as recommended by the sealant manufacturer. There will be a minimum of 1 inch of cover over the loop wire. Neither a trough nor a mound shall be formed at the roadway surface. The sealant should completely surround the wires and displace all air voids in the saw cut. Excess sealant shall be removed and/or blotted with saw dust or approved equal. Sand and other abrasive materials shall not be used as a slot filler or to blot/absorb excess sealant. After hardening, the sealant shall be ground flush with the surface of the pavement. Sufficient time for the sealant to harden shall be allowed before opening a lane for traffic.

2.2.3 LOOP SEALANT

The Contractor shall furnish and embed traffic loop sealant for traffic signal loop wire in saw cuts in bituminous or portland cement pavement and shall be a one or two component material consisting of either elastomer, polyurethane, or epoxy. When dry, the sealant will be flexible and not rigid. The material shall be environmentally safe. The loop sealant shall be approved by the Engineer prior to using same. The loop sealant shall be black or asphalt gray.