VOLUME MONITORING STATIONS (ATR) AT CHERRY LANE BRIDGE

+/- 118+00 EB/NB and +/- 213+00 WB/SB

Note: The Contractor is advised that the work on this item shall be for the Array's ONLY(install loops & tie to pull box). The sites should be viable and should not need work done. Any reference to the site is for information only.

The Contractor is to notify Michael Ashbrook, with the Electronic Systems Unit in Raleigh, at (919) 733-4796, or Kevin Sullivan , with the Electronic Systems Unit in Raleigh, at (919) 218-4522 or (919) 733-4796 two weeks prior to installation of this item. Kevin Sullivan may also be emailed at kcsullivan@dot.state.nc.us.

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. Some locations may require lane closures to be operated at night or on weekends.

Materials and equipment shall conform with the specified equipment list. This contract specifies the installation of new and/or upgrades to an existing ATR station. The Contractor must coordinate all operations with the Traffic Survey Unit so that inspectors can monitor Contractor activities, inspections can be performed as specified, sensor arrays are tested prior to installation, grounding tested during installation, and ATR stations are tested and accepted after installation.

2.2 IC/RC and ATR DETECTORS

2.2.1 INDUCTANCE LOOP AND LEAD-IN MATERIALS

The installation of these items shall also comform to the standard drawings attached entitled Site Detail 1, Detail ATR 1 and Detail ATR 3.

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.

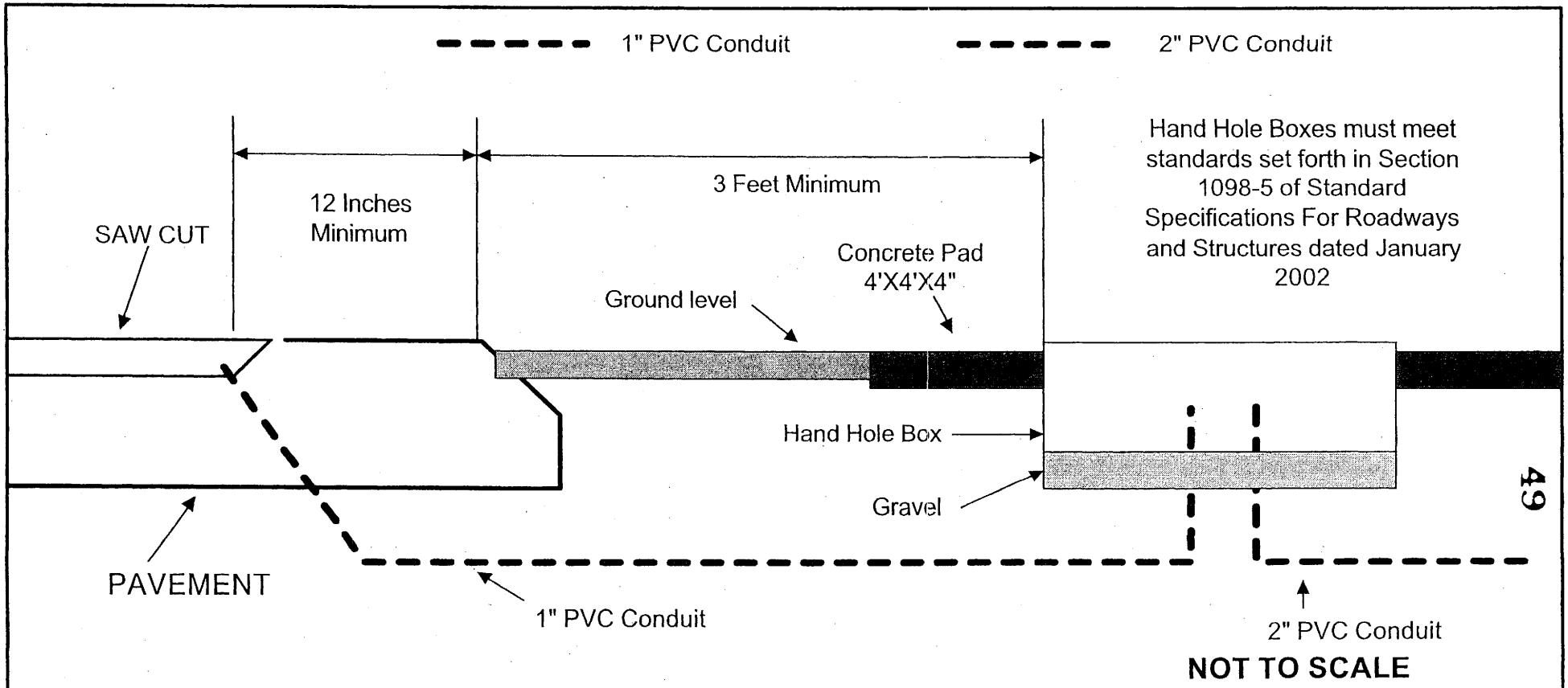
The saw cut shall be filled to the level of the roadway surface with the sealant or as recommended by the sealant manufacturer. There will be a minimum of 1 inch of cover over the loop wire. Neither a trough nor a mound shall be formed at the roadway surface. The sealant should completely surround the 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.

Loop sealer to be used with TSU Traffic Monitoring Sites is: ProSeal 6006 EX.

Standard Detail Site 1: **Hand Hole Box Details**



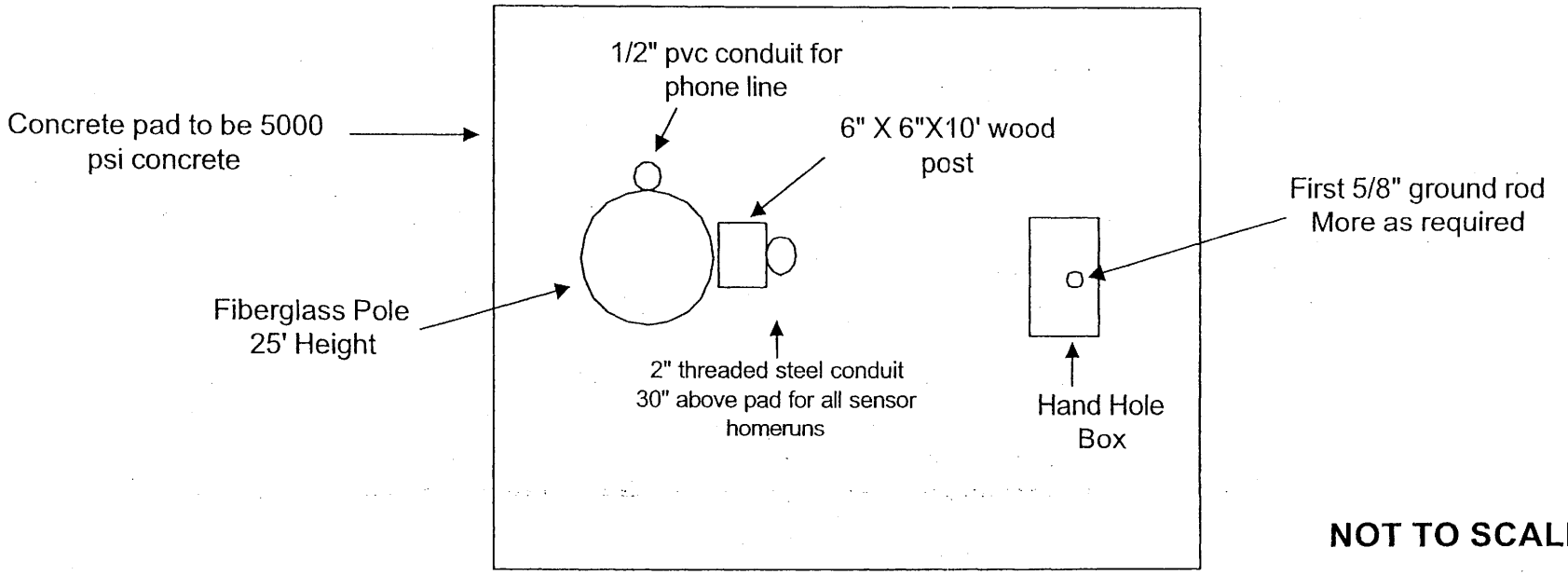
Notes
1: Concrete pad 4"X4"X4" typical.
2: All PVC conduit shall be buried with a minimum of 30" coverage.
4: All drill holes for conduit must be a minimum of 12" from the edge of the pavement.
5: Hand Hole Boxes must be installed a minimum distance of 3' from the edge of the pavement. Actual distance from the edge of the pavement will be based on site conditions.
6: Variations from specifications must be approved in writing by the Electronic Systems Section Supervisor.

North Carolina Department of Transportation
Transportation Planning Branch
Traffic Survey Unit

Standard Site Detail 1

Preparer: Michael H. Ashbrook 10/26/05
Reviewer: Kent L. Taylor, P.E.

Standard Detail ATR 1: **ATR SITE SPECIFICATIONS**



NOT TO SCALE

Notes

1: Concrete pad 10'X10'X4" typical.
2: Wood post 6"x6"x10' typical.
3. 6"X6" wood post must be framed by 2"X4" material to create a form around the post before the concrete is poured.
4:Conduit for telephone connection is stubbed out to the edge of the concrete pad at a depth of 12" typical.
5: Poles and cabinet are oriented so that the fiberglass pole is furthest from the edge of the pavement.
6: Variations from specifications must be approved in writing by the Electronic Systems Section Supervisor.

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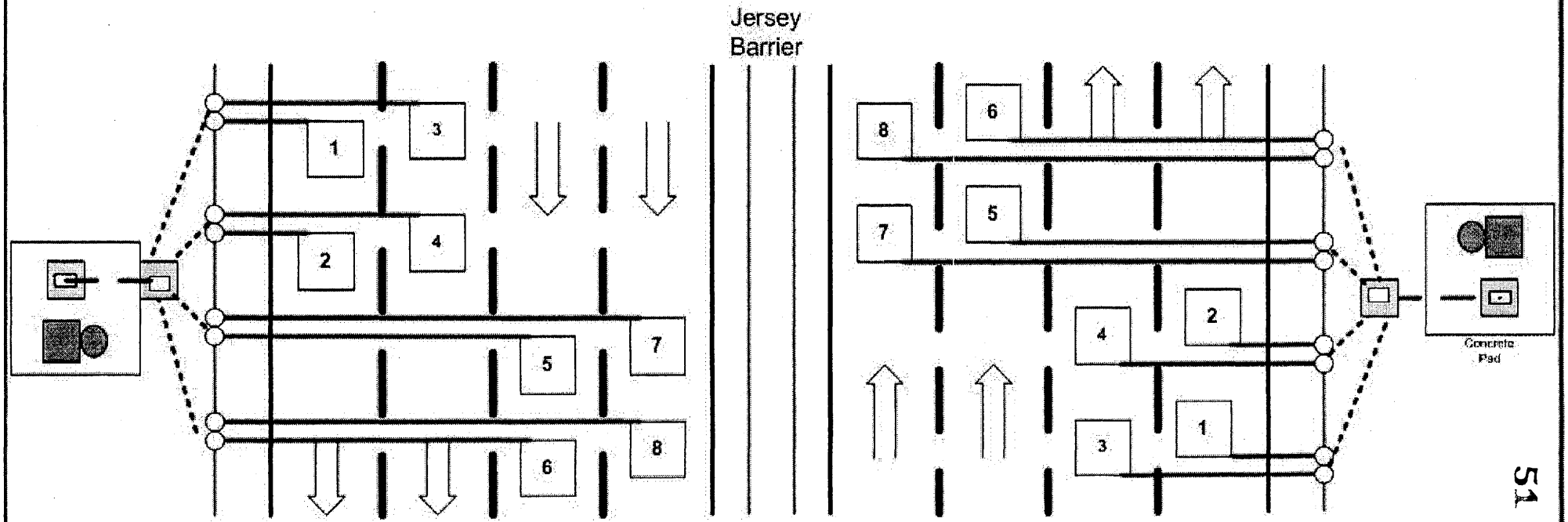
Standard Detail ATR 1

Preparer: Michael Ashbrook 10/26/05
Reviewer:Kent L. Taylor, P.E.

Standard Detail ATR3



Loop Homerun twisted 3-4 turns per ft. from the corner of the loop to the cabinet with 10' of excess left in the cabinet for termination

1" PVC conduit buried 30" containing loop homerun

2" PVC conduit buried 30"

Drill hole for transition from pavement to buried 1" PVC conduit. Drill hole must be located min. of 12" from edge of pavement

Pole and Cabinet

Hand Hole Box

INDUCTIVE DETECTION LOOPS AND LEAD – IN CABLE FOR DEEP CUT INSTALLATION DURING A MILLING OPERATION

The installation of inductive detection loops and lead-in cable shall be in accordance with Section 1725 & 1726 of the 2006 Standard Specifications and the following provisions:

The Contractor is to notify the Engineer Forty-Eight (48) hours in advance of this operation before interfering with the existing Signal Loops.

Loops are to be installed prior to the milling operation. Loops will be installed using the deep cut installation as shown on the Standard Drawing and in conjunction with Standard Drawing 1725. The Contractor should note that the details of loop wire at pavement edge as noted on Standard Drawing 1725.01 sheet 2 of 3 **must be followed**. If the loop is cut during the milling operation the Contractor will be required to reinstall the loop wire at his cost.

Compliance with the correct saw cut and correct installation of backer rod to hold the loop wire in the bottom of the saw cut is imperative to insure milling does not damage the loop wire. Avoid excessive use of backer rod as it may encapsulate the loop wires.

Loops shall be fully functional before and after the milling operation. All loops should be fully functional prior to the final layer of surface course and before final acceptance of the project.

To Be Used on the following Ramps Only:
I-40/I-85 EB/NB Off Ramp to Jimmie Kerr Road, Exit 150
I-40/I-85 EB/NB Off Ramp to NC 119, Exit 153
I-40/I-85 EB/NB Off Ramp to Mebane Oaks Road, Exit 154
I-40/I-85 WB/SB Off Ramp to Mebane Oaks Road,Exit 154
I-40/I-85 WB/SB Off Ramp to NC 119, Exit 153
I-40/I-85 WB/SB Off Ramp to Jimmie Kerr Road, Exit 150

Note: Section 1725, Article 1725-2 refers to Article 1098-7. The correct Article is 1098-8.
Section 1726, Article 1726-2 refers to Article 1098-8. The correct Article is 1098-9

Measurement and Payment
Measurement and payment will be made as noted in the 2006 Standard Specifications, Section 1725 and Section 1726.

Pay Item

Inductive Loop Sawcut	LF
Lead - In Cable ( )	LF