TO:

SUPERSEDED BY EB 97-006 EFFECTIVE 2/14/97

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

SUBJECT: INDUCTANCE LOOP INSTALLATION DETAIL CHANGES

Subject Code: 7.27-1. -680 & 7.27-2-680

Distribution: [30] Main Office [32] Regions [34] Special

Code: 84-17

Date: March 23, 1984

Supersedes: 83-16

APPROVED:

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Engineering Instruction "83-16 Inductance Loop Vehicle Detector Installations" issued revision to Standard Sheet 680-9 and some changes to the Standard Specification requiring that loop wires be encased in separate plastic tubing. In the summer of 1983, a series of classes were held for Department Maintenance Forces on the new methods.

During these classes it became apparent that some additional changes should be made to the Specifications and Standard Sheets to clear up problem areas and improve the installation. In general, the changes suggested and actions taken as a result of them are as follows:

1. That Standard Sheet 680-9R1 be modified to require that the pavement or curb be scored to leave a permanent mark indicating the location of the conduit run. This was done.

2. That the splice detail be modified on Standard Sheet 680-9R1 and in §680-3.26 to conform to Section 680-3.16 (Cable Splices) Method No. 1. This change was made to standardize the splicing details thereby easing field inspection. By the attached proposal insert note, §680-3.26 has been modified to incorporate this change and the Standard Sheet appropriately modified.

3. That payment for the conduit and its installation be made under separate items since this is expensive work. Designers should include quantities of Item 206.03, Conduit Excavation and Backfill, either 680.520203 Flexible Liquid Tight Steel Conduit or 680.520703 Rigid Plastic Conduit - Type I or II to cover this work. The Standard Sheet and §680-5.07 have been modified to include these changes.

4. Section 724-22, Roadway Loop Embedding Sealer, has been modified to require that the expiration date of the materials shall be marked on each container.

This Engineering Instruction and Standard Sheet 680-9R2 shall become effective with the letting of September 6, 1984.

INDUCTANCE LOOP

Make the following changes to the Standard Specifications of January 2, 1981:

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Delete S680-3.26, Inductance Loop Installation, in its entirety and substitute the following:

"680-3.26 Inductance Loop Installation. Loops shall be installed in accordance with the details specified on the plans, Standard Sheets or as directed by the Engineer. Loop dimensions shall be as specified on the plans.

Pullboxes, conduits and curb cuts shall be completed before beginning the loop installation.

The loop shall be outlined on the pavement to conform to the specified configuration. A power saw shall be used to cut a slot in the pavement. The cut shall be 3/8 inch in width and of the depth specified on the Standard Sheets. The corners shall be cored, drilled or chipped out as shown on the Standard Sheets. Sharp edges in the corners shall be smoothed. All saw cuts and corners normally shall be of the same depth.

Immediately after sawing, the slot and pavement shall be flushed with clean water to remove the saw slurry. Filtered compressed air shall be used to remove all dust and moisture from the slot. If the slot is damp, do not proceed with the installation until it is dry. Hot air may be used to dry the saw slot.

At the edge of pavement or curb a one inch minimum diameter, Metal Steel Conduit, Zinc Coated, Flexible Liquid-Tight Steel Conduit or Rigid Plastic Conduit shall be installed between the pavement and pullbox in accordance with details specified on the Standard Sheets. The curb or pavement shall be cut or scored to leave a permanent mark to show where the conduit runs under the curb or pavement.

The loop wire shall be installed starting at the roadside pullbox around the loop for the specified number of turns and back to the pullbox. Splices shall not be permitted outside the pullbox. The wire shall be depressed in the slot without the use of sharp objects which might damage the wire insulation. The loop shall be held in place every two feet with one inch (approximate) strips of rubber, neoprene, flexible tubing or foam backer rod as approved by the Engineer. These hold down strips shall be left in place when the slot is filled with Roadway Loop Embedding Sealer.

The pair of loop wires between the edge of pavement and the splice to the shielded lead-in cable in the pullbox shall be twisted together with at least five turns per foot.

The splice between the loop wires (twisted pair) and the shielded lead-in cable shall be moisture proof and shall have a dielectric strength at least equal to that of the original insulation.

The bared conductor ends shall be either twisted and soldered or joined using an uninsulated, size coded solderless type connector of the correct size using an appropriate crimping tool. The splice shall be reinsulated in accordance with Standard Specification 680-3.16, Cable Splices, Method No. 1 except that heat shrinkable polyolefin tubing may be used as an alternate to the rubber tape; also, the first layer of PVC tape and sealing agent shall be extended as needed to cover a minimum of one inch of the inductance loop wire tube. The polyolefin tubing shall be at least as thick as the original insulation. Upon completion of the reinsulating, a final waterproof coating shall be applied over the entire splice.

The loop wires (twisted pair) and the splice to the shielded lead-in cable within the pullbox shall be held by wire hangers as near as possible to the top of the box in order to prevent their immersion in water. The shielded lead-in cable shall be continuous (no splices) from the splice to the loop wires to the controller cabinet terminals. The drain or ground wire in the shielded cable shall be grounded at the controller cabinet terminals only.

The completed loop installation including the shielded lead-in to the controller cabinet shall have a minimum of 50 megohms leakage resistance to ground. This resistance shall be tested before the loop is sealed in the pavement and after the splice is made between the loop wires (twisted pair) and shielded lead-in. Resistance to ground shall be tested in accordance with the Insulation Resistance Test in S680-3.32.

When it is determined that the resistance to ground requirements are met, the slot shall be filled with Roadway Loop Embedding Sealer. The pavement temperature shall be at least 40°F and rising before the sealer is placed. All work involving the sealer shall be done in compliance with the manufacturer's specifications. When the Loop Embedding Sealer has set sufficiently to open the loop to traffic, but the surface remains tacky, the loop may be dusted with cement dust to facilitate opening the loop to traffic."

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Delete S680-5.07 Inductance Loop Installation in its entirety, and substitute the following:

> "S680-5.07 Inductance Loop Installation. The unit price bid per linear foot shall include the cost of all pavement sawing and drilling, loop embedding sealer, and pavement cut-outs. Inductance Loop Wire, Pullboxes, Shielded Lead-in Cable, Vehicle Detector Inductance Loop, Conduit, and Conduit Excavation and Backfill shall be paid under their respective items."

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Delete S724-20, INDUCTANCE LOOP WIRE, in its entirety and substitute the following:

"724-20 INDUCTANCE LOOP WIRE

SCOPE. This specification covers the material requirements for wire used in inductance loop vehicle detectors.

MATERIALS AND CONSTRUCTION. The inductance loop wire shall consist of No. 14 AWG, National Electrical Code Type THHN-THWN or XHHW stranded single conductor copper wire. The exterior jacket of the wire shall be marked at regular intervals with the proper type letter or letters, the manufacturer's name or trademark, the AWG size, and the maximum rated voltage.

The loop wire shall be protected by a continuous flexible vinyl or polyethylene plastic tubing of .184 inch minimum I.D., .031 inch minimum wall thickness, and 0.26 inch maximum O.D., having a smooth bore. The tubing shall not adhere to the loop wire in any way and shall be capable of resisting deterioration from oils, solvents and temperatures up to 100°C. The tubing shall also be highly abrasion resistant and remain flexible from -30°C to 100°C.

BASIS OF ACCEPTANCE. Acceptance of inductance loop wire will be based on manufacturer's certification of compliance with these specification requirements."

Also, delete 724-22, ROADWAY LOOP EMBEDDING SEALER, in its entirety and substitute the following:

"724-22 ROADWAY LOOP EMBEDDING SEALER

SCOPE. This specification covers the material requirements for Roadway Loop Embedding Sealer used when installing inductance loops.

MATERIALS AND CONSTRUCTION. Roadway Loop Embedding Sealer shall be used to encapsulate Traffic Signal Loop Wires embedded in highway materials. The sealer shall be cold applied and may be a one or two component system, the viscosity of which shall be sufficient to allow the material to be either poured or placed under pressure and fully encapsulate the loop wires. The Sealer shall be curable at temperatures of 40°F and above.

When the Sealer is bonded to common paving materials, it shall have sufficient strength and resiliency to withstand stresses due to vibrations and differences in expansion and contraction as a result of temperature changes or traffic conditions. The Sealer shall be compatible with the sheathing or covering of loop inductance wires.

Chemical Resistance: Cured Sealer shall be resistant to most chemicals and solvents, including salts, acids, hydrocarbons, etc.

Packaged stability of each component in original unopened containers, stored in temperatures between 32°F and 100°F shall be a minimum of six months. The expiration date shall be marked on each container.

REQUIREMENTS:

Requirements for materials with a Shore A hardness between 15 and 40:

Property	Requirements Minimum	Maximum	Test Method
Pot Life, minutes @ 72°F	15	-	DOT Test Method 724-40E
Curing Time (tack free surface) hours @ 72°F	-	2	DOT Test Method 724-40E
Tensile Strength, psi	50	-	ASTM D412
Elongation, percent	150	-	ASTM D412
Hardness, Shore A	15	40	ASTM D2240
Water Absorption, percent	-	1.0	DOT Test Method 724-40E
Adhesion to Asphalt Concrete lbs.	200	-	
Adhesion to Concrete, lbs.	50	-	DOT Test Method 724-40E
Extension, inches.	.25	-	DOT Test Method 724-40E
Accelerated Weathering	No cracking, checking, chalking, shrinkage, or breaking - 180° bend at 0F Per DOT Test Method TM 724-40E		

724-22 ROADWAY LOOP EMBEDDING SEALER

Requirements for materials with a hardness between Shore A 50 and Shore D 65:

Property	Requirements Minimum	Maximum	Test Method
Pot Life, minutes @ 72°F	15	-	DOT Test Method 724-40E
Curing Time (tack free surface) hours @ 72°F	-	2	DOT Test Method 724-40E
Tensile Strength, psi	400	-	ASTM D412
Elongation, percent	20	-	ASTM D412
Hardness, Shore A	50	-	DOT Test Method 724-40E
Shore D	-	65	DOT Test Method 724-40E
Water Absorption, percent	-	1.0	DOT Test Method 724-40E
Adhesion to Asphalt Concrete, lbs.	500	-	DOT Test Method 724-40E
Adhesion to Concrete, lbs.	300	-	DOT Test Method 724-40E
Extension, inches	.12	-	DOT Test Method 724-40E
Accelerated Weathering	No cracking, checking, chalking or shrinkage Per DOT Test Method TM 724-40E		

BASIS OF ACCEPTANCE. Applications for approval of Roadway Loop Embedding Sealer shall be submitted to the Materials Bureau by the manufacturer accompanied by a one gallon sample of the product and all pertinent sealer information including, but not limited to, manufacturer's sealant test results, sealant application procedures and safety precautions. Upon approval by the Materials Bureau, the name of the product will be placed on an "approved list" of Roadway Loop Embedding Sealers for use on asphalt and/or concrete pavements based on the compatibility of the sealer with the pavement material. The product may then be accepted on the basis of the brand labeled on the container.