

## SECTION 660 INDUCTIVE LOOP DETECTORS

### **660-1 Description.**

Install inductive loop detectors, harnesses, and loop assemblies.

### **660-2 Materials.**

Use inductive loop detectors, pre-formed loop assemblies and loop sealant currently listed on the Department's Approved Products List (APL). Ensure that all loop detectors are marked in accordance with Section 603 and the markings are visible after installation.

### **660-3 Installation Requirements.**

**660-3.1 Inductive Loop-Detector Units:** Install inductive loop detector units and cable harnesses in accordance with the manufacturer's instructions and the Design Standards, Index No. 17781. Adjust the operating frequency of each detector unit, if required, to prevent crosstalk of the units.

**660-3.2 Saw Cuts:** Use a chalk line or equivalent method to outline the perimeter of the loop on the pavement and routes for lead-in cables. Do not allow the saw cut in the pavement to deviate by more than 1 inch [25 mm] from the chalked line. Ensure that all saw cuts are free of any dust, dirt or other debris and completely dry prior to the installation of the loop wire, loop wire twisted pair lead or lead-in cable.

Make saw cuts in accordance with the Design Standards, Index No. 17781. Ensure that the top conductor of the loop wire or lead-in cable is a minimum of 1 inch [25 mm] below the final surface of the roadway.

**660-3.3 Loop Wire:** Ensure that all loops are wound in a clockwise manner and the first turn of the loop wire is placed in the bottom of the saw cut, with each subsequent turn placed on top of the preceding turn. Push the loop wire to the bottom of the saw cut with a non-metallic tool which will not damage the insulation.

Tag and identify the clockwise "lead" of each loop.

Use alternate polarity on adjacent loops.

Ensure that the hold down material is non-metallic and is not longer than 1 inch [25 mm] and that the distance from the top of the hold down material to the final surface of the roadway is not less than 3/4 inch [19 mm].

Twist the loop wire a minimum of five turns per 1 foot [300 mm] to form a loop wire twisted pair lead from the edge of the loop to the pull box.

Splice the loop wire twisted pair lead to the lead-in cable in the pull box. Place only one loop wire twisted pair lead in a saw cut.

Ensure that the distance between a twisted loop wire pair lead within the roadway is a minimum of 6 inches [150 mm] from any other twisted loop wire pair lead or loop, until they are within 1 foot [300 mm] of the edge of pavement or curb, at which point they may be placed closer together.

Prepare and apply the loop sealant in accordance with the manufacturer's instructions. Ensure that the loop sealant has cured completely before allowing vehicular traffic to travel over the sealant.

**660-3.4 Lead-In Cable:** Place the lead-in cable in the bottom of the saw cut. Do not damage the insulation.

Install no more than four lead-in cables in a saw cut. Ensure that the hold down material is not longer than 1 inch [25 mm] and that the distance from the top of the hold down material to the final surface of the roadway is not less than 3/4 inch [19 mm].

Prepare and apply the loop sealant in accordance with the manufacturer's instructions. Ensure that the loop sealant has cured completely before allowing vehicular traffic to travel over the sealant.

#### **660-4 Splicing And Termination Requirements.**

**660-4.1 Splicing:** Splice lead-in cable to the loop wire in accordance with Design Standards, Index No. 17781. Perform the splicing in a pull box located off the roadway, not in the roadway itself.

Splice the black conductor of the lead-in cable to the clockwise "lead" of the loop.

Ensure that the ends of the cable jackets, twisted pair and lead-in, are encased in the loop splice material.

Ensure that each loop has an individual return to the cabinet and series splicing is performed on a separate terminal block in the cabinet.

**660-4.2 Terminations:** Using insulated terminal lugs, terminate lead-in cables or twisted pair loop wire on a terminal strip which is located in the controller or detector cabinet. Use a calibrated ratchet type crimping tool to attach the lugs to the conductors of the lead-in cable or twisted loop wire.

#### **660-5 Loop Assembly Identification.**

Identify and tag each loop assembly in the controller or detector cabinet by lane and movement number.

Example:

Outside lane- Movement 6

Center lane- Movement 6

Inside lane- Movement 6

#### **660-6 Testing Requirements.**

**660-6.1 Series Resistance:** Obtain Department of Transportation Traffic Signal Resistance Measurement Data Sheets from the Engineer. Measure and record the series resistance of each loop assembly on these Data Sheets. Leave a copy in the controller cabinet.

If the series resistance of a loop assembly is greater than 10  $\Omega$ , inspect the loop assembly to find the cause of the excessive resistance. Correct the cause of the excessive resistance at no additional cost to the Department.

**660-6.2 Insulation Resistance:** Measure and record the insulation resistance of each loop assembly, and verify that the resistance is greater than 100 M $\Omega$ . Use a 500 V<sub>DC</sub> insulation megger to measure the resistance. Reference all measurements to a good earth ground (ground rod, metallic water pipe, etc.), with a resistance to ground of less than 25  $\Omega$ . Disconnect the transient suppression devices from the loop assemblies before taking any measurements. If the insulation resistance is less than 100 M $\Omega$ , determine if the lead-in cable or the loop wire is causing the problem, and replace the defective cable or loop wire at no additional cost to the Department.

#### **660-7 Turn On Requirements.**

Connect the loop assemblies to the appropriate inductive loop vehicle detectors and tune the detectors in accordance with the manufacturer's instructions. Separate the operating frequencies of vehicle detectors, in adjacent lanes, by at least 2 kHz.

#### **660-8 Method of Measurement.**

**660-8.1 General:** Measurement for payment will be in accordance with the following tasks.

**660-8.2 Furnish and Install:** The Contract unit price each for Inductive Loop Detector and per assembly for Loop Assembly, furnished and installed, will include all equipment, materials as specified in the Contract Documents and all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation.

**660-8.3 Furnish:** The Contract unit price each for Inductive Loop Detector, per assembly for Loop Assembly, per gallon [liter] for Loop Sealant, per foot [meter] for Loop Material and for each

Inductive Loop Detector Accessories, furnished, will include all equipment and materials as specified in the Contract Documents, plus all shipping and handling costs involved in delivery as specified in the Contract Documents.

**660-8.4 Install:** The Contract unit price each for Inductive Loop Detector and per assembly for Loop Assembly, installed, will include all loop sealant, miscellaneous materials, labor, and equipment necessary for a complete and accepted installation.

The Engineer will supply the inductive loop detector, harness, lead-in cable, and loop wire.

**660-8.5 Modify:** The Contract unit price per assembly for Loop Assembly, modified, will include all lead-in cable, saw cuts, miscellaneous materials as specified in the Contract Documents, connecting new lead-in cable to an existing loop and installing and terminating the lead-in cable to the location designated in the Contract Documents, and all labor and equipment necessary for a complete and accepted installation.

### **660-9 Basis of Payment.**

**660-9.1 Inductive Loop Detector:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

|                   |                                 |
|-------------------|---------------------------------|
| Item No. 660- 1-  | Inductive Loop Detector - each. |
| Item No. 2660- 1- | Inductive Loop Detector - each. |

**660-9.2 Loop Assembly:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

|                   |                               |
|-------------------|-------------------------------|
| Item No. 660- 2-  | Loop Assembly - per assembly. |
| Item No. 2660- 2- | Loop Assembly - per assembly. |