CHAPTER 15 – VEHICLE DETECTION

VEHICLE DETECTION

Vehicle detectors act as the "eyes" of the traffic signal controller thereby allowing it to become "traffic responsive." The loss of even one vehicle detector could greatly disrupt the timing of the signal resulting in traffic backup. Because vehicle detection is a vital part of the traffic control signal system, great care must be exerted when installing vehicle detectors. Locations of vehicle detectors range from at or near the stop line to up to 750 feet back from the stop line.

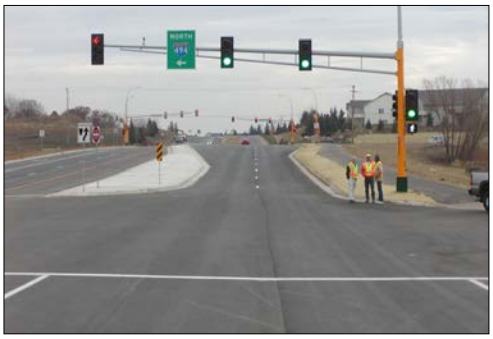

Figure 15-1: Detectors in Pavement

It is necessary to locate lane markings and crosswalks to correctly locate vehicle detectors that are in the pavement. Vehicle detectors should be marked after pavement markings have been determined or placed.

Other types of detector units (video, microwave, sonic) will need to be located per the contract documents, manufacturer's instructions, and/or as directed by the engineer.

Vehicle loop detector materials, installation requirements, approved loop detector conductors, test reports, requirements for inductance, and number of turns will be identified within the contract documents.

MnDOT approved loop sealants and MnDOT approved loop detector splice encapsulation kits are listed on MnDOT's Approved/Qualified Products List (APL).

15.1 Three Types of Vehicle Detection

There are four different types of vehicle detection used by MnDOT on traffic control signal system projects. The contractor must refer to the contract documents for the type of vehicle detection system that is required for the specific traffic control signal project. The three types are presented below:

- Preformed rigid PVC conduit loop detectors
- Saw cut loop detectors
- Video detection

15.1.1 PREFORMED RIGID PVC CONDUIT LOOP DETECTORS

Preformed rigid PVC conduit loop detectors are the most common type of vehicle detector that MnDOT currently uses on a typical traffic control signal system project. Standard Plate 8132 will have all the requirements for a complete installation of this type of detector.

Figure 15-2: Preformed Rigid PVC Conduit Loop Detectors

These types of detectors are either placed in the class 5 roadway base before pavement installation or they may be required to be milled into the existing pavement.

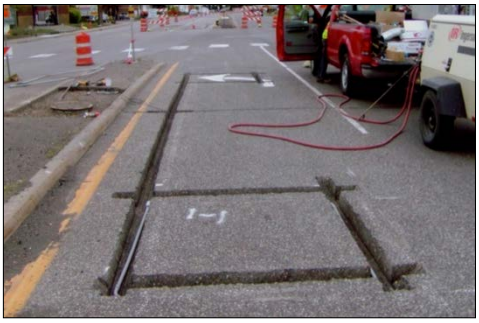

Figure 15-3: Preformed Rigid PVC Conduit Loop Detector

15.1.2 SAW CUT LOOP DETECTORS

When saw cut loop detectors are required, the requirements are on Standard Plate 8130. The steps presented below should be taken for saw cut loop detectors.

Figure 15-4: Saw Cut Loop Detectors

Mark loop detectors and loop conduit locations on the pavement. If necessary, adjust the location of the loops to avoid cracks and joints in the pavement.

If cracks or pavement joints are encountered, refer to Standard Plate 8130 for complete details of installation requirements.

Install loop detectors in the roadway before bituminous wearing course is placed.

It is essential to maintain required depth of trench or saw cut throughout, including the corners of the loop, to ensure the loops will survive future roadway milling operations.

After sawing and drilling is complete, clean all foreign materials from loop detector saw cuts.

Dry sawing does not require water flushing.

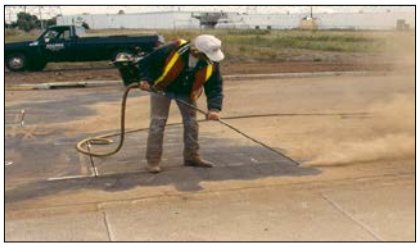

Figure 15-5: Air Flushing

Before installation of loop detector conductors, a bead of MnDOT-approved loop detector sealant must be placed in the saw cut. Ensure that the dowels are installed in the corners of the saw cut prior to winding the loop detector conductor.

Figure 15-6: Water Flush Saw Cuts

Install clean, dry, continuous loop detector conductor wound in a clockwise direction allowing 6 extra feet of conductor within the handhole. Lay the loop detector wire in the saw cut and push them to the bottom of the saw cut with a blunt instrument to avoid damaging the tubing or conductors.

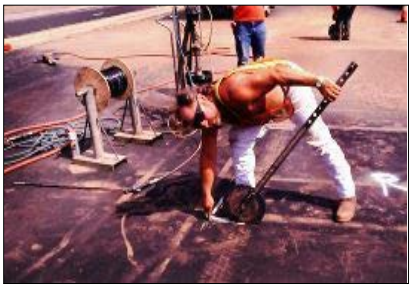

Figure 15-7: Placing Saw Cut Loop Detector Conductor

Install 1/2-inch diameter by 1 inch backer rods at 24 inch intervals to ensure that the conductors remain at the bottom of the saw cut.

Figure 15-8: Backer Rod Installation

After all sawing and drilling is complete, clean and flush all foreign materials from loop detector saw cuts and general area of loop detector using a high-pressure air and water mix. Dry all loop detector saw cuts and general loop area prior to installation of sealant and conductors. Loop wire must be clean when it is installed. If necessary place loop wire in a plastic bag to ensure it remains clean.

Figure 15-9: Seal the Conduit

Twist the loop conductor pairs for the entire length of the loop detector lead-in conduit at a minimum rate of three turns per foot.

Seal the loop detector conduit at the roadway end with duct seal to prevent loop sealant from entering the conduit. Test the loop before the sealant is placed in the saw cut.

Figure 15-10: Approved Sealant

Seal saw cut loop conductors with an approved loop detector sealant (see MnDOT's APL) as per manufacturer's recommended procedures.

Do not overfill the saw cut with sealant.

Figure 15-11: Loop Detector Cable Splices

15.1.3 HANDHOLE CONSIDERATIONS FOR BOTH SAW CUT AND PREFORMED LOOPS

To run the loop wire to the handhole, it is necessary to install a conduit from the road surface to the handhole. Drill a hole a minimum of 18 inches from the curb apron or edge of pavement or joint between the road and the shoulder at an approximate 45-degree angle at the intersection of the loop saw cuts. The hole must be large enough to install 1-1/4 inch PVC conduit or rigid steel conduit (RSC). A ¾ inch PVC or RSC is acceptable when installing a single loop.

Figure 15-12: Roadway to Handhole Conduit

Ream the end of the conduit so that the insulation on the wires is not damaged during installation. The conduit must be inserted far enough into the hole so that the bottom is one inch below the bottom of the saw cut.

Figure 15-13: Drill Hole for Conduit

When installing preformed rigid PVC loops, the conduit must be continuous from the loop to the handhole. Install a conduit end bell bushing on the handhole end of the conduit. It is necessary to place a one inch metallic washer over the roadway end of the lead-in conduit so that the lead-in conduit can be found if the loop goes dead.

15.1.4 PVC AND SAW CUT LOOP DETECTOR SPLICING

The steps to PVC and saw cut loop detector splicing include the following:

- Properly prepare and clean the loop detector conductors.
- The ends of the roadway loop detector conductors are to be soldered to the loop detector lead-in cable. After being soldered, install an appropriate sized wire nut and scuff the conductor insulation with the provided emery cloth before splice kit installation.
- Splice the loop detector conductors according to the approved method and approved splice kit. (See contract documents for approved splice kit and splicing method).
- Loop detector splice kits must be installed in a manner to ensure that they are suspended and secured near the top of the handhole so that they are accessible if water freezes in the handhole.

Figure 15-14: Suspended Splice Kits

Testing

The steps to PVC and saw cut loop detector testing include the following:

- Test each loop detector in accordance with 2565.3G.
- The loops must be tested for resistance, inductance and a Meg Ω reading to ground at the signal cabinet. The test results must be recorded on a form similar to the one found in the Appendix of this Field Guide. Three copies of the report must be given to the project engineer for distribution (signal cabinet, ESS, and the district traffic office).

Figure 15-15: Detector Testing

- If the readings are not within the design parameters, there is a problem with the installation, or materials, and the loop will have to be reinstalled. These procedures will ensure a good functioning loop detector.
- Refer to contract documents for complete details on loop materials, installation, and testing.

15.1.5 VIDEO DETECTION SYSTEMS

Some MnDOT projects will require video detection systems. All material and installation requirements for video detection systems are contained in the contract documents.

Figure 15-16: Video Detection

Figure 15-17: Bell Camera 360 degree Horizon to Horizon view

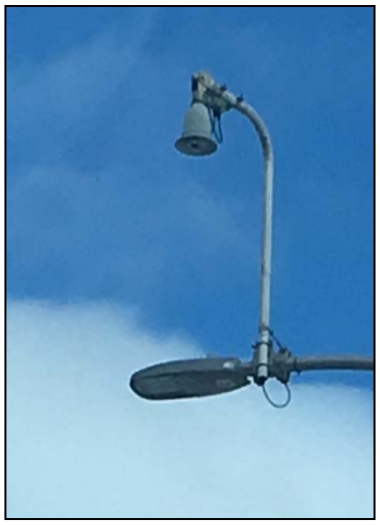

Figure 15-18: Installed Bell Camera 360 degree Horizon to Horizon view

15.2 Chapter 15 Resources

- Standard Plates 8130, 8132
- MnDOT's Approved/Qualified Products List (APL)