Vehicle Detector Loop Installation

Tips & guidelines for installation of vehicle detector loops in pavement

Inductive loop vehicle detection is still the most reliable and cost-effective method of vehicle detection in today's traffic and parking applications. The electronic circuitry in the Diablo Controls vehicle detectors is very reliable, and its production and testing are controlled very tightly. This assures the customer of getting the most reliable electronic package available. But this is only part of the story. The proper installation of the loop system is something for which the installer must take responsibility, and indeed, is the key to reliable vehicle detection. It has been the experience of most agencies and installers that a properly installed loop system should last the life of the roadbed. The loop "system" includes the loop wire in the street and all of the feeder cable back to the detector unit located at the gate operator or traffic controller cabinet.

We would like to offer a few tips and guidelines to follow for the proper installation of vehicle detectors and street loops.

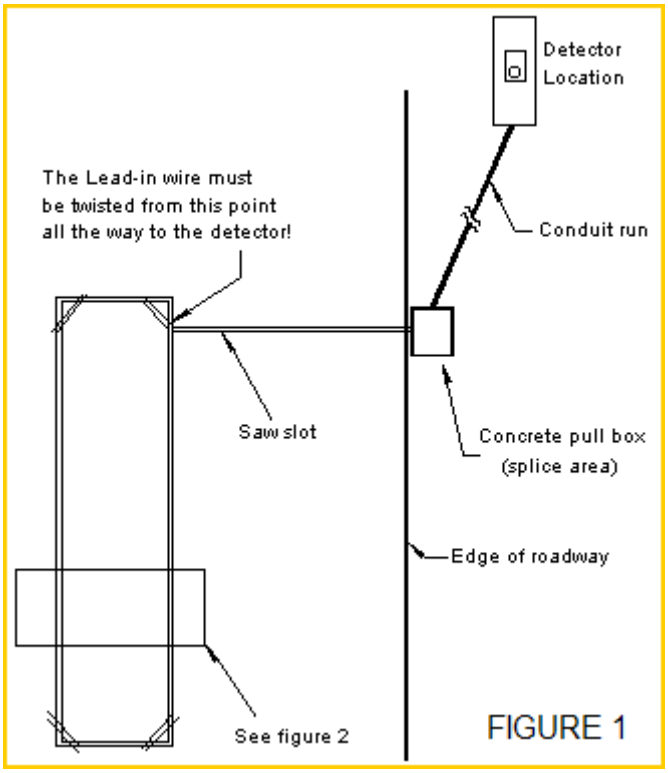
First, if there are old loops present, remove all of the existing street loop(s). An old loop in the pavement can act as a shorted turn and can cause a low sensitivity situation.

The loop wire to be installed in saw-cuts, should be #18 AWG or larger, stranded and tinned copper wire. We recommend the use of at least #16 wire for mechanical strength. Good wire is typically inexpensive compared to the re-work expense if a failure occurs. Cross-link polyethylene (XLPE) insulation with a voltage rating of 600V is the wire to use if a cold sealant is used. If a hot tar sealant is used then a cross-link polyethylene with an additional polyester jacket should be used, also with the 600 volt rating. Cross-link polyethylene wire is recommended over PVC insulated wire or nylon jacketed wire such as THHN or TFFN.

The lead-in wire should also be two conductor twisted, #16 AWG or larger stranded wire . It is recommended that this wire also have a high density polyethylene insulation.

The sawcut is one one of the most important parts of the loop installation process. The pavement is typically cut to a depth of approximately 4 to 5 cm (1-1/2 to 2 inches) using a 6 mm (1/4 inch) wide blade. The slot is then cleaned with water and then blown out with compressed air. This will assure that all sharp particles are removed from the slot. The corners of all square or rectangular loops should have 45 degree cuts to prevent sharp corners from puncturing the loop wire. Start the 45 degree cuts about 8 to 12 inches from the corners of the loop. The turns of wire are then installed in the bottom of the slot and held into place with foam backer rod (See figure 2). This will assure that the wire is held in place when the sealant is added to the slot.

Loop wires should be twisted at least 6 turns per foot from the point where they leave the loop and start toward the side of the roadway - down the lead-in slot. The sealant used in the loop and lead-in slot should be pliable and should "give" with temperature changes in the pavement.

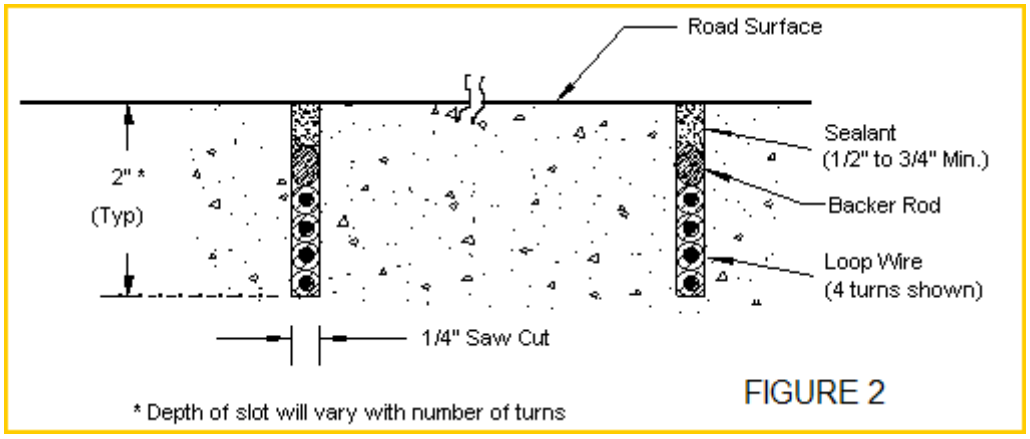


The roadway loop shown above is a typical configuration for a street or roadway installation. The loop shown is cut with a street saw with straight slots. The corners are cut with 45 degree cuts to prevent sharp corners. The two wires leave the rectangular loop and are placed in another slot to exit the roadway. The wires used in the main loop and the exit slot must be one continuous piece. No splices can be made in any part of the installation. The two wires are twisted around each other at least 6 times per foot and placed in the saw cut leaving the roadway.

Apply loop sealant to this saw cut as well as the main loop. The wires are then spliced to the lead-in cable at the concrete pull box. All splices must be soldered!

Do Not Use wire nuts or crimp type connectors! Tinned copper crimped connections can be used to hold the wires together as long as they are then soldered!

Most parking and access control applications use unshielded, twisted lead-in cable. Many times the lead-in cable used, is the same loop wire twisted with a drill to maintain at least the 6 turns per foot twist in the wire. Using lead-in wire that is twisted is even more important if lead in-wire from different loops are routed back to the detectors in the same conduit.



The detail above shows a cross section of the wire slot with 4 turns of wire installed. Notice the backer rod holding the loop wires in the slot. The sealant should completely fill the slot up to the surface of the roadway. The top of the backer rod should be at least 1 inch below the level of the pavement.

The number of turns of wire used in the loop is determined largely by the size of the loop. Please refer to the table below for the suggest number of turns. Increase the number of turns by 1 if the lead-in length exceeds 150 m (500 ft).

Loop Size		Number of Turns
0.6 x 1.2 m or smaller	2' x 4' or smaller	5
1 x 1 m to 1.2 x 2 m	3' x 3' to 4' x 6'	4
2 x 2 m to 2 x 10 m	6' x 6' to 6' x 30'	3
2 x 15 m or larger	6' x 50' or larger	2

Some years ago when detectors had limited sensitivity, people began experimenting with different loop configurations. Today we have a variety of loop shapes in use: rectangular, square, round, triangular and combinations of these. In addition, agencies have tried connecting multiple loops electrically in various series and parallel configurations. Several things must be considered when designing street loops for vehicle detection.

The length of the lead-in cable will affect the overall sensitivity of the detection area. This is a consideration only for extremely long lead-in cables from 150 to 300 m (500 to 1000 ft) or more. If the lead-in cable of a loop is less than 100 m (300 ft), as is the case of most installations, then the sensitivity will not be adversely affected. Many Diablo Conntrols detectors have a range of sensitivity settings which will compensate for even the longest lead-in lengths.

The biggest inductance change that a detector will "see" is when the loop area is entirely covered by a vehicle. For traffic applications where the detection zone must cover a large area, the vehicle detector sensitivity adjustment may have to be increased slightly for loops which

cover an area larger than the area of the vehicle. For example, in traffic applications, a loop which is 2 m (6 ft) feet wide but 15 m (50 ft) long will be somewhat less sensitive to the presence of a small motorcycle than a smaller 1 x 1 m (4 ft by 4 ft) loop. The detector sensitivity may have to be raised one or two levels for the motorcycle to be adequately detected by this large loop.

Multiple loops are often connected to the same detector to provide a larger detection area. This practice can lead to sensitivity problems if the loop area is quite large. The same large area of detection can be obtained by connecting the loops to separate detectors or connecting a fewer number of loops to each detector. If multiple detectors, and multiple loops, are to be used for one detection area, it will be necessary to parallel the relay (or solid state) outputs together.

Many of the Diablo Controls Inc. vehicle detectors are covered with U.S. Patent number US 7,132,959 B2 - "Non-Interfering Vehicle Detection". This feature minimizes the effect of crosstalk between street loops. Cross talk is the result of two or more loops or feeder cables affecting each other. Detectors experiencing cross talk will usually intermittently pick up a false "detect" or worse, drop a "detect" when cars are indeed present. To minimize crosstalk possibility, the street loops should be placed as far apart as possible. A good rule is to place loops at least 1.2 m (4 ft) apart.

Loops installed in the vicinity of swinging or sliding gates, need special consideration. The gate should not come closer than 1.2 m (4 ft) from the loop at any time while it is closing or opening.