Saw Cut loop Installation

Materials used in the construction of the loops are important. The loop wire must be 16AWG stranded tinned wire with cross-link polyethylene (XLPE) insulation rated for 600 volts. This wire is flexible enough to work within the saw cut, which minimizes any possibility of damage to the insulation, and the wire gage is large enough so the serial resistance (continuity) of the loop is low. Moisture can cause significant changes in the dielectric constant if the insulation, which results in frequency shift. Since PVC, TFFN, THHN, and THHN-THWN absorb moisture and crack easily they should be avoided. The XLPE insulation has increased moisture and solvent resistance, and exceptional aging characteristics. Moisture and solvents in the blacktop pavement or oil spills from vehicles are major cause of long term insulation damage that causes intermittent loop lockups and false detection. Because the current is too low to overcome the long-term oxidation, which occurs with the use of wire nuts, Phase Research highly recommends all wire-to-wire splices be soldered and insulated with heat shrink or electrical tape.

Use only a commercial type of loop sealant designed for traffic loops. Pavement and sealant (of the saw cut) failures are most common. Deformation such as cracking, rutting, potholes, or shoving can cause the loop wire to be strained resulting in breakage and wire insulation wear. If the sealant fails, the loop may become exposed or foreign materials may infiltrate the saw cut.

Phase Research recommends *backer rod* to ensure the wires are in place and do not vibrate. Vibration or wire movement will cause a false detection. In the area of the loop installation, inspect the pavement for large cracks or any evidence of pavement movement. Parts of the pavement may move after you have installed the loops and may damage the wire and cause false detection. If the wire is to be completely covered, it is essential that no voids exist, which would allow water to collect. The water during a freeze/thaw cycle will push the wire out of the slot causing a loop failure.

The loop wire should be away from electrical noise. Power lines running under the loop wiring could be detected as cars when the electrical current changes. Locate the loop at least six (6) feet from any power lines.

Avoid placing the loop in the close proximity of large metal objects such as metal overhead doors or gates. The detector would not be able to determine the difference between the door and the vehicle. Locate the loop at least four (4) feet from any moving metal objects, dumpsters, doors, gates, etc.

Review the diagrams shown on the following pages.

1. Install junction boxes under cashier's window and pick-up window as show in figure 1.

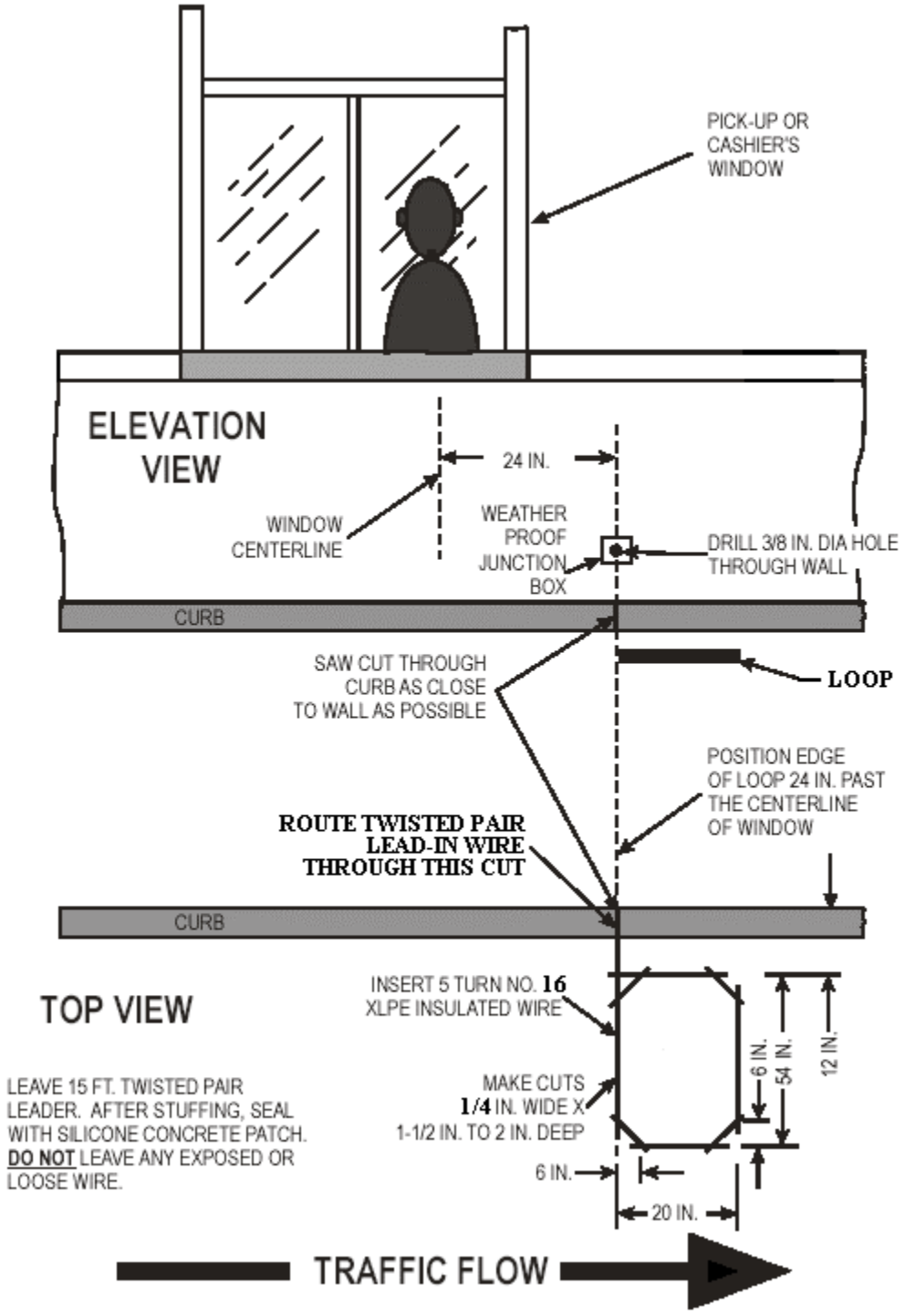

Figure 1

2. If possible so not to expose wire, install conduit.

3. Make sure the pavement surface in the area that the loops are to be installed is dry and free of debris.

4. Mark the saw cut pattern on the surface of the drive-thru pavement as shown in figure 2. The pavement should be marked in a way so the saw operator can follow the pattern easily and the pattern cannot be erased by the flow of water from the saw. Position the loop so the back edge is 24 inches past the centerline of the window. For best operation, the loop should be located so it is approximately under the front axel of the vehicle when it is stopped at the window.

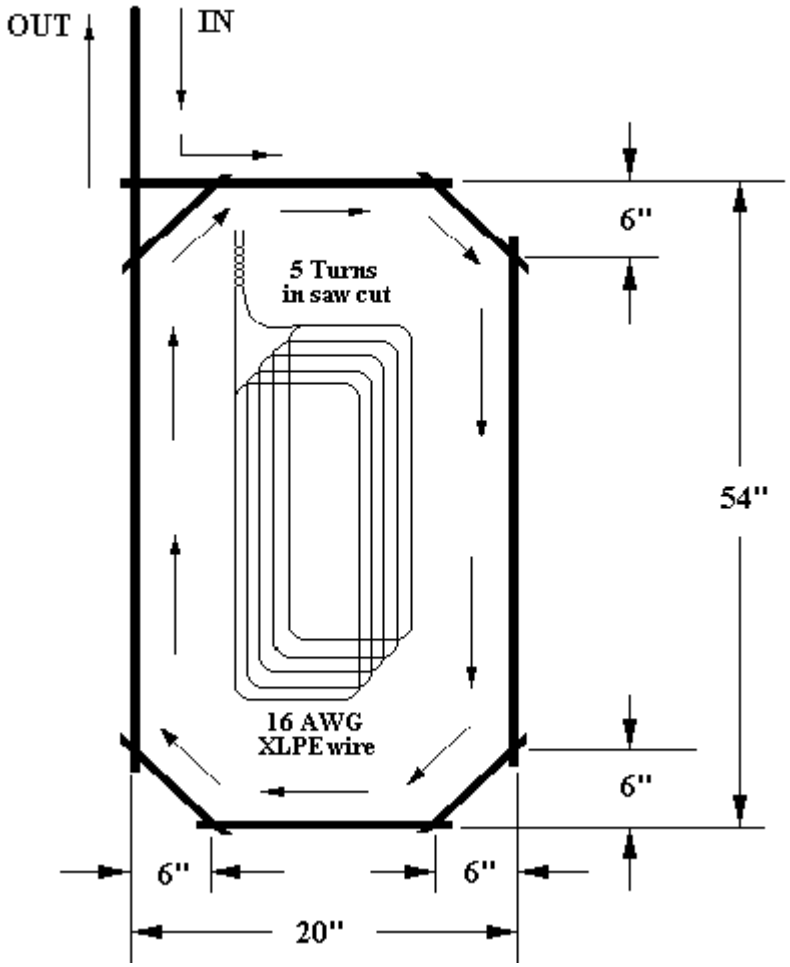

Figure 2

5. Using a diamond blade saw, make saw cuts 1½ to 2 inches under the surface of the drive-thru pavements surface. All 90° angled corners needs to be chamfered so the wires do not change direction sharply but gradually at a 45° or less angle. Core drilling the corners achieve the same effect but is not recommended because sharp edges still remains in the corner area.

6. Make saw cuts as shown in figure 1 through the curb and as close to the building wall as possible.

7. Drill a 3/8-inch diameter hole through the wall as shown in figure 1. This hole should be located in the approximate location of the junction box for that particular window (cashier/pick-up).

8. The saw cut should be cleaned out and allowed to dry. Compressed air is useful in removing the debris and helps in the drying process. All debris should also be removed from the surrounding area of the saw cut so that it isn't accidentally pushed back in.

9. Start laying the 16 AWG XLPE loop wire into the saw cut from the termination lead-in out towards the loop. Continue around the loop in a *clockwise* fashion for five turns as shown in figure 2, and finally return to the lead-in termination Be sure to route wire through the 45° diagonal cuts (avoid the 90° square corners) to prevent damage to the wire insulation. The wire must be wound using one continuous piece of wire. Do Not Use Spliced Wire In The Slot! The wire must be carefully and firmly installed into the saw cut slot to avoid damage to the insulation. Using sharp objects such as screwdrivers, putty knifes, and thin sheets of metal can damage the insulation and must not be used.

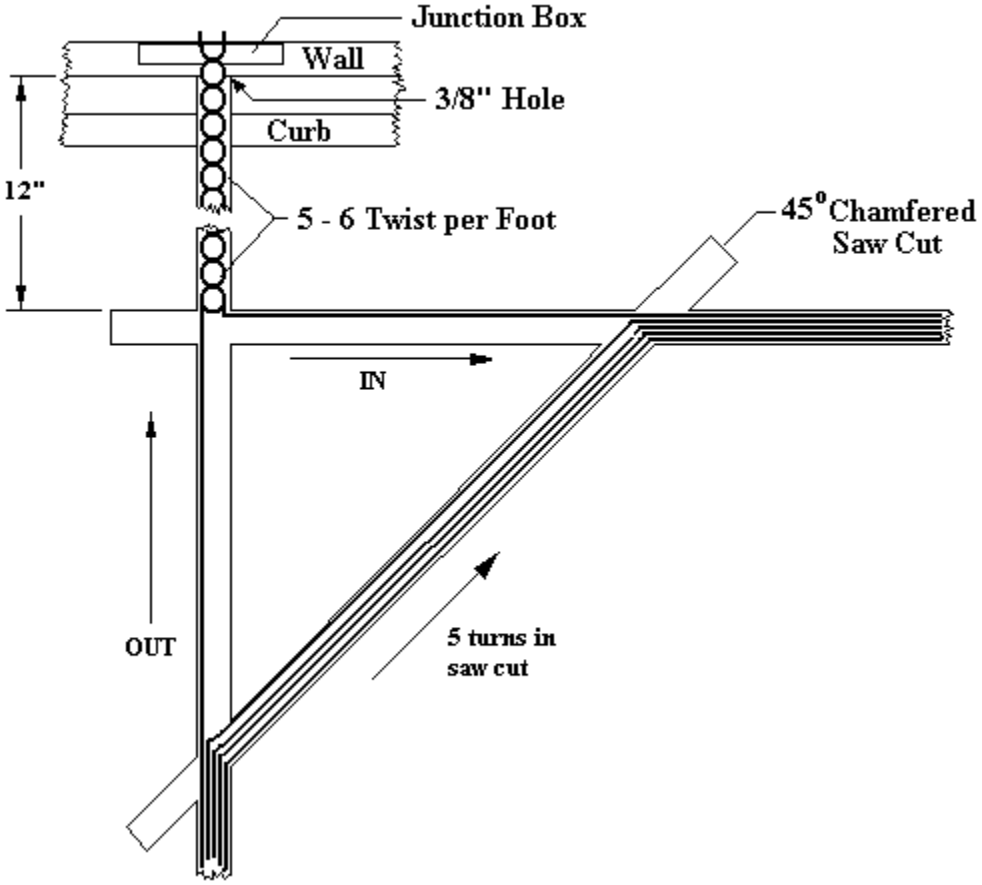

Figure 3

10. Make a twisted pair lead-in wire of the remaining wire. The twist should be a minimum of 5 – 6 turns per foot. Hold the twist together tightly with electricians tape to prevent movement and false calls.

11. The wire must be held tightly in the bottom of the saw cut slot by means of backer rod. Backer rod is an extruded round low density Polyethylene Foam material and should approximately .375 inches in diameter for a ¼ inch wide saw cut. It is highly flexible and compresses easily for installation. It should be used for the entire perimeter of the loop, as well as the saw cut between the corner of the loop and the point where the saw cut slot exits the pavement.

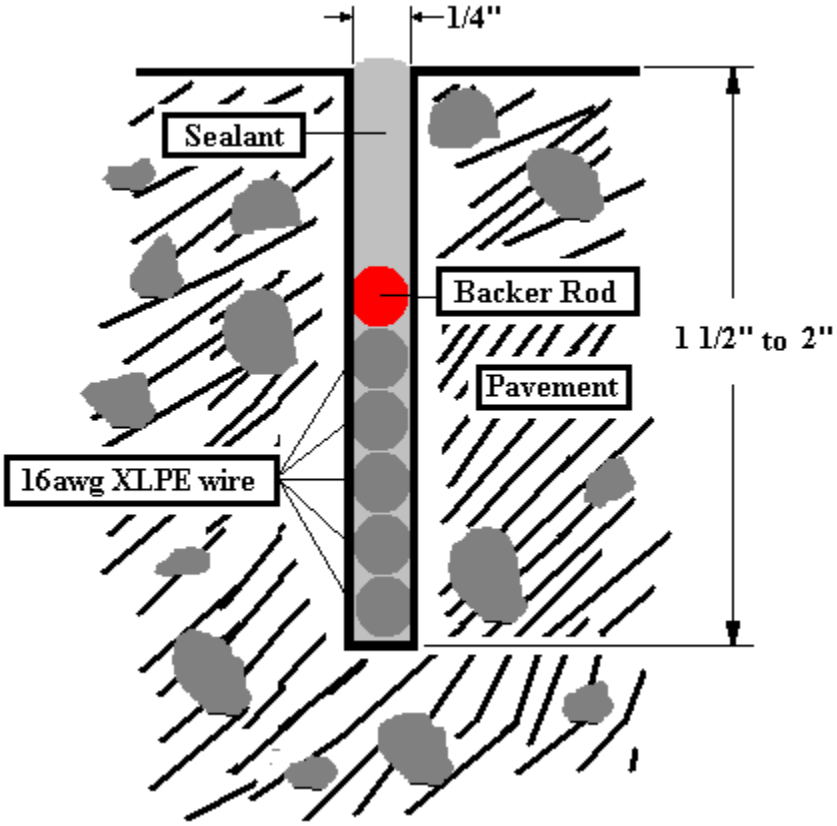

Figure 4

12. Route the lead-in wire through saw cut and hole into building and into the junction box.

13. Using an Ohmmeter, check the resistance of the loop wire at the junction box. The Ohmmeter should read approximately 0.5 to 1.0 ohms. If a short or open is detected, replace the wire.

14. All or any splices that are made are made at the end of the leader wire and must be soldered. WIRE NUTS ARE NOT ALLOWED. Crimp type terminals should be soldered for additional security and screws on the terminal strip securely tightened down. Adding lock

washers is a further deterrent to the screws loosening up with time and vibration. Splices should be protected with heat shrink and/or electricians tape. When soldering do not use a direct flame. Use an appropriate soldering iron (gas powered or electric) when soldering. All parts must be clean and free from dirt and grease. Try to secure the work firmly. "Tin" the iron tip with a small amount of solder. Do this immediately, with new tips being used for the first time. Heat all parts of the joint with the iron for under a second or so. Continue heating, and then apply sufficient solder only (use a normal electrical solder and **not** plumbers solder), to form an adequate joint. It only takes two or three seconds at most, to solder the average joint. *Do not move wires until the solder has cooled.* Moving the wire while the solder is hot will cause "cold" solder joints

15. After you are positive the loop is functioning properly and the wire is not damaged, seal all saw cuts with sealant appropriate to the application and pavement. Hard setting epoxies should not be used with asphalts. Caution should be observed when using hot sealants, as high temperatures can damage or destroy wire insulation. DO NOT LEAVE ANY EXPOSED OR LOOSE WIRES.

NOTE: You may want to complete the installation prior to sealing saw cuts with silicon concrete patch.