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TFFN / THHN Wire Test

Observations of TFFN / THHN wire installed in asphalt or concrete as a saw-cut loop

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Purpose:

- Observe and record what happens when TFFN / THHN wire is installed in asphalt or concrete in direct sunlight.

Hypothesis:

If TFFN / THHN wire is installed in asphalt or concrete, then the wire will short to ground intermittently.

Materials:

- 120ft 18AWG TFFN Home building wire, coiled
- Pot half full of water*
- Burner
- Thermometer
- Electronic Insulation Tester (Megger)
- Camera for documentation purposes

* Water was chosen to simulate asphalt/concrete because its temperature is easily changed through heat.

Procedure:

Testing area was prepared by placing the pot with water on top of the burner with the heat off. TFFN wire was put inside water so the wire was completely submerged. The megger was attached to the wire and a reading was taken. The thermometer was put into the water and the burner was turned on to heat the water. As the temperature rose to 65º, 90º, 125º, 145º, and 160º readings were recorded, photographed, and documented. The study was completed once the temperature reached 160º.

Figure 1

Picture of type of wire used and the testing area

Results:

Water Temperature in °F	Megger Reading in Mega-Ohms
65 °	2000 MΩ
90 °	1000 MΩ
125 °	200 MΩ
145 °	50 MΩ
160 °	>5 MΩ

Data Recorded.

Results show a decrease in Meg-ohms as temperature rises. Detector manufacturers recommend a reading of over 100 mega-ohms for a detection to work properly.

Conclusion:

TFFN (or equivalent THHN) wire will short to ground and fail to work if installed in concrete or asphalt.

What this means, BD Loops comments:

TFFN / THHN wire is a cheap home building wire bought from Home Depot, commonly used in saw-cut applications. TFFN / THHN wire is designed to be installed in walls run through conduit, it is not designed for direct burial installations. On a normal windless day asphalt can easily reach up to 160ºF in direct sunlight. This problem occurs intermittently and causes problems for installers by having more repeat service calls and distributors get returned functional detectors. Therefore it is to your benefit to never use or recommend TFFN / THHN wire.

BD Loops Test Results

Conducting the same test with BD Loops 3/16” preformed saw-cut loops.

Results:

Water Temperature in °F	Megger Reading in Mega-Ohms
65 °	2000 MΩ
90 °	2000 MΩ
125 °	2000 MΩ
145 °	2000 MΩ
160 °	2000 MΩ
180 º	2000 MΩ

Data Recorded.

Results show that installation of BD Loop’s preformed loop is far superior than TFFN / THHN wire. Even at 180º BD Loops still perform at their best.

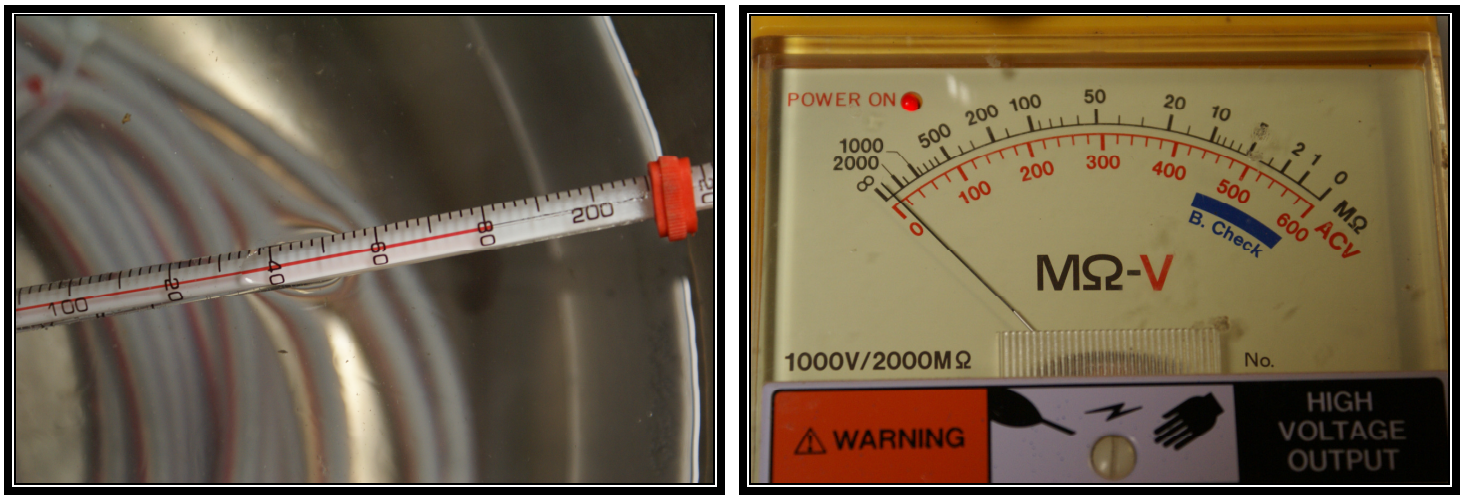

Figure 2

Picture of a BD Loops saw-cut in 180º water with a reading over 2000 MΩ

Conclusion:

Always recommend and install a BD Loops preformed loop for all saw-cut applications to avoid costly repeat service calls, failed loops, and returned detectors.