

RADIODETECTION Application Note

Low-Voltage Testing of High-Voltage Cables Reduces Cable Stress.

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The purpose of this application note is to inform maintainers of high-voltage cables of the many low-stress options available for fault locating on their primary (and secondary) systems.

A leading Canadian electricity T&D utility recently suffered a major fault on a 14kV primary cable. One redundant circuit continued to serve their customers but getting the failed circuit back in operation was very important. If the one remaining circuit failed, there would be a major problem.

An electrical testing contractor was brought in with a thumper truck to locate the fault. Thumpers operate on the principle of applying a high voltage to the cable and walking the path of the cable while listening for a muffled ‘thump’ caused by the cable fault arcing underground. If the fault does not immediately show itself, a higher and higher voltage is applied.

In this instance, the cable was thumped for five and one-half (5 ½) hours at voltages up to 35,000 volts and the fault **was still not found**. However, there is a strong chance that the cable under test was weakened by operation for 5 ½ hours at more than double its working voltage. Dielectric breakdown causing further failures on thumped cables is well documented.

The low voltage test methods referred to are a utility locator with an earth-fault locating “A-Frame”; and a Time Domain Reflectometer (TDR), also known as Cable Radar or Pulse-Echo-Tester. The maximum voltage of locators and TDRs is usually well under 50V and cause no damage to cables. Further information on A-frames and TDRs can be found at www.radiodetection.com

Over the past few years, other Canadian utilities have invested in modern training and equipment to find cable faults using low-voltage test methods. Whereas they used to thump virtually 100% of their faults, the use of an “A-Frame” now finds 75-80% of their faults. A further 20% are found using the TDR, leaving only a few that still require thumping. Cable faults in ducts are often not locatable with an a-frame, but TDRs still work fine.

The only faults that cannot be found with these low-voltage methods are ‘flashing’ faults where the cable holds lower voltages, perhaps 500V but not 5000V. However, a TDR will often aid this scenario as well, showing the position of splices. Now when thumping, check the location of splices first and more carefully and this will usually show up a trouble much faster with a minimum of thumping.

An added benefit is in equipment cost and training. A suitable locator will typically be in the C\$7000-8000 range and TDRs cost around C\$5000. Use of these devices is easier and safer than a thumper and training should take no more than one day plus some practice.

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Radiodetection and its associated companies specialize in the design and manufacture of products for the location and maintenance of underground pipes and cables. Our aim is to be viewed as the supplier of choice of 'high performance' quality equipment using advanced product technologies. We are also committed to both design innovation and customer support.

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