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Applications
Engineering Note

Locating Buried Cable

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It is often necessary to locate buried optical fiber cable to prevent dig-ups during construction, to access fibers for termination, to effect repairs, or for other reasons. The ability to locate a buried cable, however, can be affected by several variables. These include, but are not limited to: cable depth, cable design, the presence of other buried objects in the vicinity of the cable, the type and quality of the cable locator used, and operator proficiency.

Most modern cable locators are simply transceivers (combination transmitters and receivers) operating at a specific frequency. In one of the more common designs, the transmitter portion applies a radio frequency signal to a metallic cable member. The cable armor is frequently used for this purpose, although other materials such as metallic strength members may be used. The current of the locator transmitter signal will produce a time-varying magnetic field around the cable that can be detected by the locator receiver. The receiver, a copper wire antenna, locates the cable by measuring the voltage induced as it cuts through the magnetic field.

The intensity of the magnetic field is lower further away from the cable. Consequently, cables become harder to locate the more deeply they are buried. The locator also measures the strength the received signal to pinpoint cable location. Depending on the orientation of the antenna relative to the cable, a peak or null will be generated at the point where the antenna cuts through the most magnetic lines of flux. If the magnetic field around the conductor is round, then this point occurs when the antenna is directly over the cable (closest point) and allows for accurately locating the cable. If, however, the magnetic field is distorted, then the peak or null may not occur directly over the cable and the cable's position may be marked erroneously.

There are a number of factors that can cause a distortion of the magnetic field around cables; the primary one being the presence of other large buried metallic objects. For example, if the cable is buried in the vicinity of a metallic water or gas pipeline, the piping can significantly distort the magnetic field generated by the locator transmitter. This occurs because metal pipe has a higher magnetic permeability than the surrounding soil. The distorted magnetic field can cause the locator to incorrectly interpret the location and/or depth of the cable.

There are other means of locating buried cables but the basic detection methodologies are the same, therefore they are susceptible to the same errors and inefficiencies as the radio frequency detection method. The signals used in the audio frequency detection method also propagate a finite distance in the air. Therefore, if the receiver is too close to the transmitter, signals received through the air may result in inaccuracies in marking the location buried cable.

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Because of the large number of variables involved, there is no way to guarantee the ease and accuracy with which buried fiber optic cable may be located. Operator proficiency is perhaps the single most important variable. It is also the one over which the contractor typically has the most control.

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