Cable Lore

ANACONDA

BY POWER CABLE ENGINEERING AND RESEARCH

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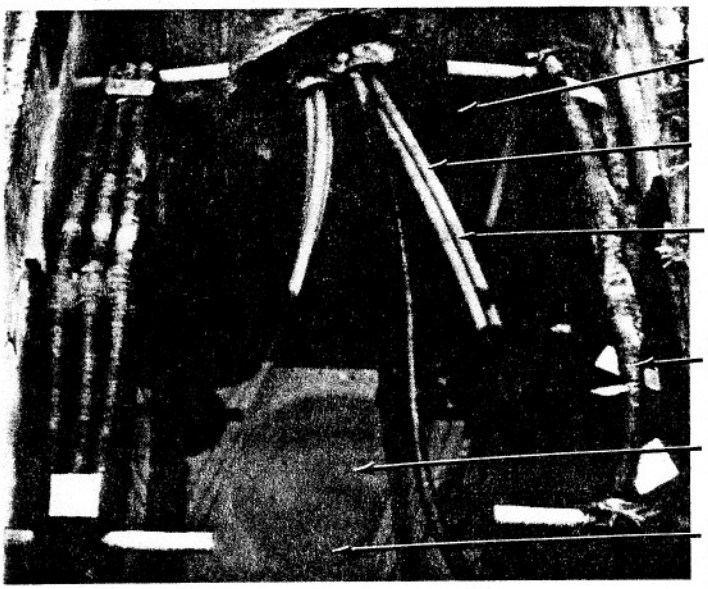
BELOW GRADE APPLICATIONS

Cables used in below-grade applications — in duct or directly-buried — are also subjected to the electrical, mechanical and oxidation stresses seen in above-grade situations. (See Cable Lores 42-45) However, mechanical stresses can be more severe. For example, freezing and thawing of the surrounding soil subjects directly-buried cables to mechanical stresses that can deform or damage cable components. Further, dry backfill and the confines of a duct are thermal insulators, which limit heat dissipation, increase average conductor temperatures, and produce local hot spots. This means a cable installed in a duct or directly-buried must perform very well in a cyclic aging test. The fact that EP does not have the longitudinal shrink-back, radial expansion and flow characteristic of XLPE at temperatures above 100C is even more important for below-grade than for above-grade applications.

Cables installed below-grade, whether in conduit or directly-buried, are almost always exposed to water. Water, combined with electrical stress, is a harsh environment, because the cable's resistance to thermal and electrical stresses can be reduced. The best test for evaluating and predicting the survival of a cable in damp or wet below-grade environments is a long-term EMA (Electrical Moisture Absorption) test which simulates the effect of water on cable in an accelerated manner. In this test, EP cables consistently outlast XLPE cables, usually lasting at least twice as long. This greater resistance to water and electrical stress is another important reason for preferring EP-insulated cables over XLPE cables in below-grade applications.

A typical underground cable installation is illustrated below:



(1) Ambient Air Temperature

(2) Voltage

(3) Elevated Temperatures Due to Current Loading or Temperatures of Conduit

(4) Mechanical Stress

(5) Ambient Water Temperature

(6) Water Exposure

Depending on the operating conditions at this particular location, the cable will be exposed to various combinations of temperature, current, voltage, mechanical stress and moisture during its service life.

In the EMA Test, diagrammed below, the same factors are applied simultaneously in worst conditions to provide acceleration of the test. The most important factors to consider are keyed by number in the photos and in the table below: