

Cable Lore

ANACONDA 

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CABLE CONSTRUCTION INTEGRITY

Once a power cable is installed and goes to work an interesting series of events is initiated that go a long way in determining the efficiency and reliability of the insulation. Geographical location, season of year, current load, chemical environment and proximity to other cables literally put the cable in motion. These events must be anticipated and a cable must be designed to retain its integrity when exposed to this cycle of application.

Testing and experience offer good guidance for proper choice of materials and establishing limits or tolerances for physical and chemical environments. A battery of selected electrical tests will offer reliable criteria for proper selection of the dielectric or insulation. Sound cable design theory backed with test data and experience assist in putting together a working construction. With all this engineering a big question has yet to be answered - will individual components in the cable construction work together and perform their intended functions when cycled through the various conditions encountered in application?

A review of several conditions and their effect on a cable construction will be adequate for illustrating the scope of this problem:

- (1) Geographical location and season changes will cause the components, especially conductors and metallic shields to expand when hot and contract when cooled.
- (2) Load requirements will vary with seasons, time of day, and power requirements of manufacturing plants, etc. Insulations will expand and contract.
- (3) Proximity to other cables will influence thermal environment, causing fluctuation in cable dimensions.

Note that heat and changing of physical dimensions are common to all these situations and these conditions can cycle.

It becomes obvious that cable components in a cable design must be able to breathe or work together without separating or forming voids that could become focal points for corona deterioration and ultimately cable failure.

Once materials for a cable construction have been chosen for electrical, physical and chemical properties the resulting cable is subjected to a specially designed test called a "Cyclic Aging Test." This test will predict whether this cable design will retain its integrity when exposed to the cycling conditions encountered in actual service. The standard test is divided into two periods of 21 days. During the first period the cable is subjected to 2 times rated voltage and 85 C conductor temperature. The voltage is applied continuously and the elevated temperature for 8 hours per day. During the second period the cable is subjected to 3 times rated voltage and 95 C conductor temperature. The voltage is applied continuously and the elevated temperature for 8 hours per day.

During cyclic aging tests the cables are monitored daily. Power factor measurements and corona-level measurements are made. Power factor measurements are especially sensitive for monitoring insulation deterioration. Corona-level measurements indicate whether voids or separation are occurring - for example, between the insulation and shielding system. Stable values of both during the 42-day cycling periods indicate that materials are holding up well and that they are working together. This is construction integrity.

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