Cable Lore

ANACONDA

BY POWER CABLE ENGINEERING AND RESEARCH

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LESS THAN 10% OF THE INQUIRIES FOR ENGINEERING DATA SUPPLY SUFFICIENT BACKGROUND FOR PROCESSING WITHOUT ADDITIONAL FOLLOW-UP BY PHONE, TELETYPE OR LETTER.

Contributing to the store of knowledge might be sufficient reward for a pure research laboratory but the scientific facts gathered by a commercial R & D group must be translated into "bucks". The coefficient of friction of rubber on steel is interesting, but can be more financially rewarding if the data is extrapolated into the energy required to pull a Durasheath conductor through a conduit.

One of the basic functions of R & D is to gather scientific facts and present them in a fashion that will be useful in the commercial promotion of wire and cable products. The work of R & D is like an iceberg, only a small mass appears on the surface. An abdundant resource lays untapped in files requiring only some imagination and talent to put it to work.

Requests for engineering data are somewhat like filling out income tax forms. You can take the easy way and fill out the short form or take full advantage by filling out the long form. This requires considerable background data and is time consuming, but often the end result is worth the effort.

Usually requests for engineering data are quite nebulous. The easy way out is to use the short form -- look it up in a table -- often this is adequate for estimates but requires more refinement in the final phases of cable application.

A recent inquiry for the ampacity on a specific interlocked armor cable illustrates the futility and expense of supplying this data without adequate preliminary information. The time consumed was 7 days, requiring 6 teletypes and 1 phone call.

As a rule of thumb, the more nebulous the inquiry, the more nebulous the answer. A good solid inquiry demands a solid answer.

TABLE 101 -- C-51

FACTORS INFLUENCING CURRENT RATINGS

1. Circuit Characteristics

   1.1 Voltage
   1.2 Current (a-c or d-c)
   1.3 Frequency
   1.4 Load Factor

2. Cable Construction

   2.1 Number of conductors
   2.2 Construction of conductors (Concentric, annular, segmental, etc.)
   2.3 Kind of insulation
   2.4 Shielding, if any
   2.5 Kind of sheath or covering, if any
   2.6 Kind of protective covering, if any (Fibrous, metal tape, wire armor, etc.)
   2.7 Overall diameter

3. Cables in Underground Ducts

   3.1 Ambient earth temperature
   3.2 Variation in mean atmospheric temperature with respect to ambient earth temperature
   3.3 Heat conductance of surrounding earth
   3.4 Number of ducts
   3.5 Size of ducts
   3.6 Spacing of ducts
   3.7 Material of ducts and structure
   3.8 Depth of structure below surface
   3.9 Kind of pavement, if any
   3.10 Proximity to other sources of heat
   3.11 Number of loaded cables in each duct
   3.12 Number of loaded cables in a structure

4. Cables in Conduit

   4.1 Ambient air temperature
   4.2 Number of conduits
   4.3 Size of conduits
   4.4 Spacing of conduits
   4.5 Material of conduits
   4.6 Enclosure of conduits, if any
   4.7 Proximity to other sources of heat
   4.8 Number of loaded cables in each conduit
   4.9 Number of loaded conduits in a group

5. Cables in Air

   5.1 Ambient air temperature

6. Cables in Water

   6.1 Ambient water temperature
   6.2 Variation in mean atmospheric temperature with respect to ambient water temperature

7. Cables in Earth

   7.1 Ambient earth temperature
   7.2 Variation in mean atmospheric temperature with respect to ambient earth temperature
   7.3 Heat conductance of earth
   7.4 Number of loaded cables in trench
   7.5 Spacing of cables
   7.6 Depth of cables below surface
   7.7 Proximity to other sources of heat

8. Single-Conductor Cables with Short-circuited Sheath

   8.1 Number of phases
   8.2 Spacing of cables
   8.3 Kind of sheath
   8.4 Kind of protective covering, if any
   8.5 Method of bonding

A large number of the requests for engineering data are for current ratings. Although basically governed by the maximum allowable conductor temperature which will limit insulation deterioration, there are a number of factors which influence the current carrying capacity of insulated cables for a given set of conditions. Some of these factors were listed in the old C-51 Publication. These factors form such an excellent framework for the type of background required to supply significant engineering data that they bear repeating. In summary, before requesting complete engineering data:

(1) Make certain that the work involved by R & D is justified, using monetary return as the criteria.

(2) Use the following table from the old C-51 Publication as a guide for necessary background information.

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