TECHNICAL NEWS

from

THE OKONITE COMPANY

Engineering Information for the Professional Engineer

March 16, 1999 **Edition: 001**

*These issues of **"Technical News"** are intended to provide your design firm and your electrical engineering staff with information that will allow you to better understand wire and cable constructions and applications.*

Our first issue of **"Technical News"** deals with the subject of **DC HIGH POTENTIAL FIELD TESTING**. This article covers the proof testing of medium voltage cables, rated 2001 - 35,000 volts. Many engineers are confused by the data, and the many situations that can cause inconsistent readings and erroneous interpretations. Hopefully this information will be helpful in understanding this very important cable issue.

If you have any questions please call your local Okonite District Office for assistance. If you do not know how to contact your local office you can easily determine that by visiting Okonite's web site at www.okonite.com.

This discussion is confined to the high voltage proof testing of medium voltage cables; rated 2001 to 35,000 volts.

Users are confronted with the task of proving cable quality after installation via a test technique and an interpretation of the test results.

The test technique is known as the hi-pot test; where a dc voltage is impressed between the conductor and the grounded metallic shield.

The recommended DC field acceptance test voltage is shown in the following table:

High voltage field acceptance test prior to being placed in service

Rated Voltage Phase to Phase	dc Hi-Pot Test (15 Minutes*)		dc Hi-Pot Test	
	Wall - mils	kV	Wall - mils	kV
5000	90	25	115	35
8000	115	35	140	45
15000	175	55	220	65
25000	260	80	320	95
28000	280	85	345	100
35000	345	100	420	125
46000	445	130	580	170
69000	650	195	650	195

Note: *If the leakage current quickly stabilizes, the duration may be reduced to 10 minutes.

The data recorded during the test is a level of current, micro-amperes, commonly referred to as leakage current. This current is measured for each minute during the 15 minute test period. The leakage current is dependent on the applied voltage, the insulation resistance of the cable insulation, and any other series resistance in the circuit.

The theoretical leakage current can be derived knowing the test voltage and calculated insulation resistance. Using this calculated value as a go/no-go quality acceptance criteria is the most abused use of data in our industry.

The dc leakage current is a sensitive measurement and as such subject to variables which can easily swing the readings leading to erroneous interpretation.

The following conditions will cause high leakage current readings:

(a) Cable ends too close to grounded object. Sometimes when cables are tested inside an enclosure, clearance is not adequate and flash over or high leakage results. Adequate end clearance is essential. Ends should be clean and have adequate spacing from any ground point or any adjacent surface.

(b) Cables tested with all the accessories attached. Before testing cables which are spliced and terminated, be sure to verify that the splices and terminations can withstand the same dc voltages as the cable. Certain type of splices, terminations or other accessories can be seriously damaged when tested at the high dc voltage potentials required for cables.

(c) Insufficient end leakage path including cleanliness. Surface leakage currents can occasionally flow along the surface of the stripped back insulation surface. They may not be detectable by sight or by ear, but they may generate a high reading on the leakage current meter. Humidity, wind and surface conditions have a major effect on this current. A well cleaned end with a polyethylene bag applied helps to overcome this problem.

(d) Variable voltage source. A variable voltage source can be a difficult problem in trying to read a steady state leakage current. The variable voltage supply to the test set causes the ammeter to oscillate during the test giving false indication that current is oscillating due to quality of cable insulation. If this occurs some type of voltage stabilization on the supply to the test equipment is recommended.

The absence of an increase in current with time is a practical criterion for acceptance. Relying solely on the absolute calculated value of leakage current is setting much too rigid an acceptance standard even for laboratory measurements. Field readings must be evaluated with due recognition of the installation environment, end preparation, experience of the test technician and accessibility of the cable ends.

The leveling off or decrease in the leakage current during the test duration indicates an acceptable test.

An industry reference for this subject is, IEEE Standard 400 titled "IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field".

Subsequent mailings of "Technical News" and other Okonite publications covering a variety of issues will be forwarded to you in the near future.

If there is any specific information you would like us to provide to you or topics you would like us to discuss, please reference your request on the form below and return to The Okonite Company, P.O. Box 340, Ramsey, NJ 07446 - Attention E. Loyka or E-Mail: loyka@okonite.com.

From:

Company: _____

Address:

_____

_____

E-Mail Address: _____

Phone Number: _____

Topic of interest:

_____

_____

_____

_____

_____

_____

Mail to: Eric Loyka
The Okonite Company
P.O. Box 340
Ramsey, New Jersey 07446
E-Mail: loyka @ okonite.com