ACTION (Continued)

c. With two of the above required off-site A.C. circuits inoperable, demonstrate the OPERABILITY of two diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter, unless the diesel generators are already operating; restore at least one of the inoperable off-site sources to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours. With only one off-site source restored, restore at least two off-site circuits to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

d. With two of the above required diesel generators inoperable, demonstrate the OPERABILITY of two off-site A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; restore at least one of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two diesel generators to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.8.1.1.1 Each independent circuit between the off-site transmission network and the on-site Class 1E distribution system shall be:

a. Determined OPERABLE at least once per 7 days by verifying correct breaker alignments and indicated power availability.

b. Demonstrated OPERABLE at least once per 18 months during shutdown by transferrring unit power supply from the normal circuit to the alternate circuit.

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PDR ADOCK 05000302
P PDR

FILE: CR3
EQ 2-5-1

49 Day Street
Seymour, Connecticut 06483
(203) 888-2591

the kerite company

March 9, 1981

Florida Power Corporation
P.O. Box 14042
St. Petersburg, FL 33733

ATTENTION: S.F. ULM, PROJECT ENGINEER

Dear Sir:

SUBJECT: CRYSTAL RIVER UNIT #3
SUBSTATION CABLE

REF: FPC LETTER OF JANUARY 19, 1981

Relative to your question about continuous submersion in water, we respectively state the following:

Based on our extensive experience with regular Kerite Insulation, upon which Kerite FR Insulation is compared, that the condition described will not in any way adversely affect the cables' performance.

The following point is made, that salt water submersion is less severe than submersion in pure water.

Enclosed is EM205 that forms the basis for our conclusion.

Yours truly,

THE KERITE COMPANY

From the office of: E. N. Sleight
Assistant Vice President
National Generation

Norma H Dube

Signee: Norma H. Dube
Administrator, Power Plant
Generation

NHD:ss
Enclosure

ENGINEERING MEMORANDUM NO. 205 April 30, 1979

(Supersedes EM 205 April 11, 1978

and EM 205A May 25, 1977)

DETERMINING TEMPERATURE RATING OF FR INSULATED AND HTNS JACKETED KERITE CABLES FOR OPERATION IN WET AND ALTERNATE WET AND DRY LOCATIONS

Temperature 'rating' of cables for wet and alternate wet and dry locations is established utilizing the Arrhenius techniques but incorporating a reference material to relate actual field performance of cables to the higher temperature continuous moisture absorption tests on small insulated wires. This relationship is then used to predict the 'water aging' of material in field service that do not have an extended operating history.

The reference material used is regular Kerite, which has had an extended service history encompassing in excess of one hundred million feet of many construction types in all environments and at conductor operating temperatures of 70 to 75°C and cable surface temperatures of 60 to 65°C.

The method by which this analysis is performed is described as follows:

The basis for comparison between insulations is the "insulation resistance". Tests have shown that this electrical parameter is representative of aging in wet environments. Change in capacitance and dissipation factor, however, is also measured. Samples energized with 600 volts AC, or not energized, showed no significant effect on the electrical Parameters measured. (Ref. 1)

One further question was whether current loading retarded or accelerated any electrical degradation. A laboratory test to answer this question (15-3 Lab Test Sheet No. 227 dated March 29, 1970, reference 2) gave no indication that current loading affected 'electricals'.

Having identified the relevant aging factors to be time and water temperature, the relationship between materials was selected to be based on the time to reach one-half of the original IR value. Other criteria could have been selected; however, the one-half IR point was something achievable in reasonable time periods.

Test points in water for Kerite were at 90°C, 75°C and 52°C, and for FR insulation (HI-70) and HTNS jacket (HI-70) 90°C and 75°C were used.

On this basis, compounds having essentially identical 'aging' slopes are expected to age similarly under similar environmental service conditions and their operating temperatures for equivalent aging would therefore be relatable. Thus, from the attached chart, the performance of Kerite having a proven service record of more than forty years at insulation surface temperatures of 60°C and higher, it is seen that the equivalent continuous water immersion time at 60°C to reach one-half IR is 1950 hours. Also, from the chart, for FR Insulation and HTNS jacket, the water temperature required to reduce the IR to one-half the original level in 1950 hours is 82°C. This analysis indicates that the FR jacket can be rated 22°C higher than Kerite. This material, however, is conservatively rated at 90°C. (References 1,3, and 4)

In actual service, cables fully immersed in water will tend to have their surface temperatures approach the temperature of the water. Therefore, attempting to establish a conductor temperature rating for cable (assumed to be dry) may not be as significant as determining what the environmental water temperature will be; however, this analysis provides a good comparison between newer materials and service-proven materials for general use conditions.

Laboratory tests to determine the effects of alternate wet and dry environments have also been conducted and indicate that continuous water immersion is more severe. (References 5,6,7 and 8).

It should be noted that salt water immersion is less severe than tap water. Refer to Product Evaluation Report No. 177, dated March 8, 1974 (Reference 9).

Also, the addition of a jacket over the cabled insulated conductors shows a significant improvement of IR performance (Reference 10).

Laboratory References

The information presented above and on the attached plot has been based on the references given below. The data has been collected as part of a continuing water absorption program and represents that which is presently available. These references are available for audit at the Kerite Company in the Engineering Department.

1. Engineering Project No. 75-40. Sample Nos. 38A, 39A, 38B and 39B.
2. Engineering 15-3 Lab Test Sheet 227, March 29, 1970
3. Chemical Lab Records, Samples 75-118 (1971), 75-119 (1971), 75-87 (1965), 52-24 (1960), 75-123 (1971)
4. 15-3 Lab Book-B, Pages 147, 182
5. Engineering Project No. 75-40, Electrical Lab Report No. 599.
6. A.Hvizd, Jr.'s Project No. 213, Reported December 21, 1967
7. 15-3 Lab Test Sheet No. 267 - FR Insulation, July 27, 1970
8. Engineering Project No. 75-40 - FR Insulation
9. Product Evaluation No. 177, March 8, 1974
10. 15-3 Lab Book-B, Sample 1 MCB

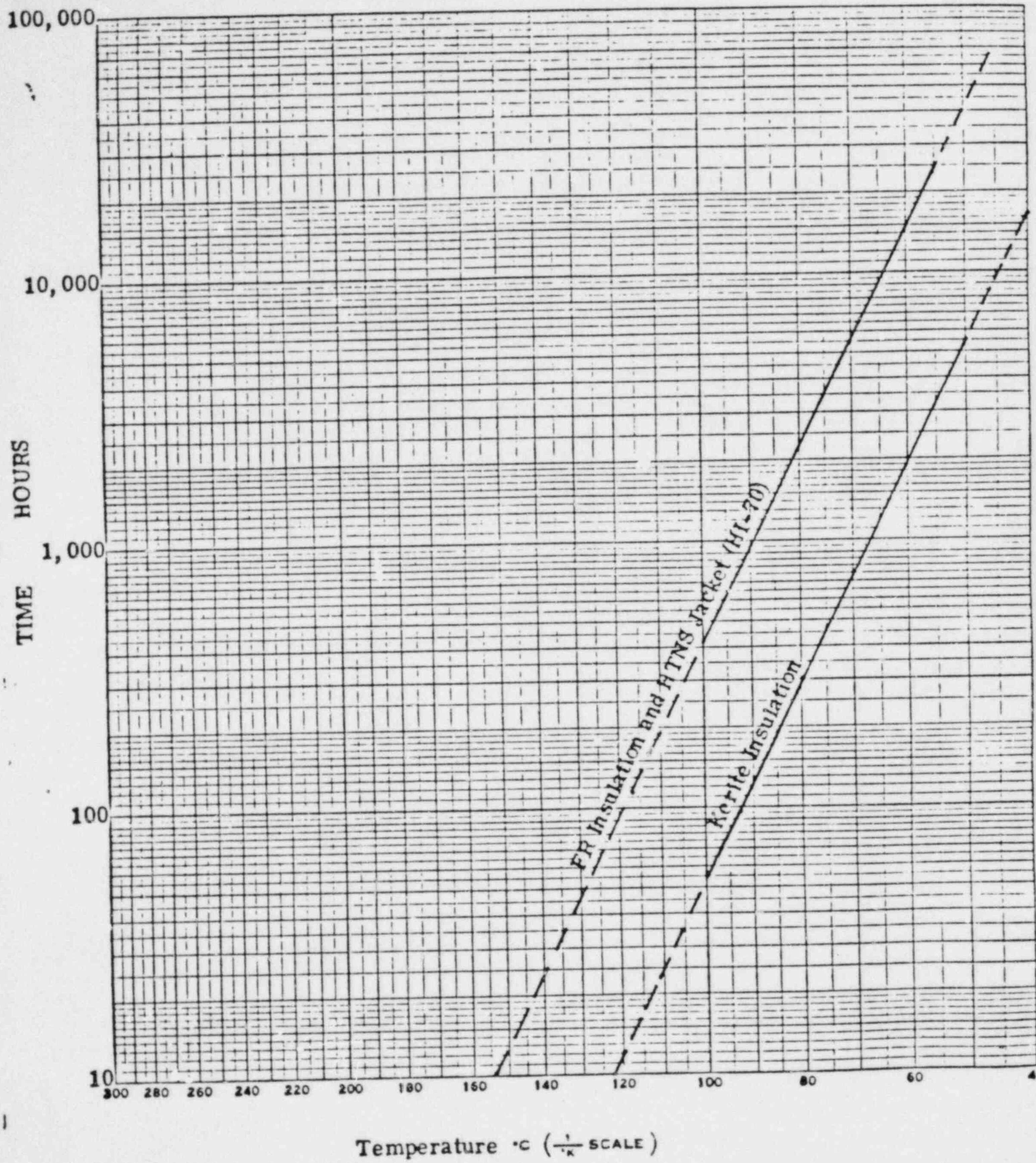
R. E Fleming
Electrical Engineer

REF/ jm
Attachments

cc: Book Holders

APPROVED
J. B. Gardner, V. P. of Engineering

Determining Temperature Ratings of FR Insulation and HTNS Jacketed Cables for Operation in Wet Locations (HI-70)



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