FILE

ESSEX GROUP, INC.

POWER CONDUCTOR DIVISION

PROJECT REPORT

Report Number : PE-53

Date: May 7, 1980

APPROVED
This approval does not relieve the Contractor from any part of his responsibility for the correctness of design, details and dimension.
TENNESSEE VALLEY AUTHORITY
Date SEP 23 1980
W.W. CHANDLER

TITLE:

MAIN STEAM LINE BREAK (MSLB)

Test On Aged And Irradiated Cable Specimens

PROCEDURE:

Manufacture and prepare samples of Class 1E cable for aging and subsequent submittal to Isomedix, Inc. for irradiation and simulation of Main Steam Line Break Temperature and Pressure Profile.

CONCLUSION:

Specimens of Class 1E EP insulated conductor having successfully withstood the effects of heat aging to 40 years at 90C, irradiation to a level of 2.05×10^8 Rads (Co_{60}) and a MSLB temperature and pressure profile according to the requirements of the TVA Specification are judged to be fully qualified for service according to the referenced specifications.

REFERENCE:

TVA Specification 25.016 Item 93 Contract 6-825722
Isomedix Radiation Certification
Essex Arrhenius Plot (Class 1E EP)

Respectfully submitted,

J. L. Steiner
Chief Engineer

SEQUOYAH

8204090461 820407
PDR ADOCK 05000327
P PDR

QUALIFICATION CRITERIA:

Specimens submitted shall withstand the following exposure. All specimens shall withstand all tests with the exception that both thermally aged and unaged cables shall be submitted.

1- Heat aging - where applicable - for 149 hours at 162C. Arrhennius Plot available.

2- Exposure to Co_{60} source to a total exposed dose of 200 Megarad at a rate of exposure not to exceed 1 Megarad per hour.

3- Temperature and pressure specified for the time specified by the TVA contract 6-825722.

4- Withstand application of 80 volts/mil of insulation for 5 minutes.

DISCUSSION:

Three specimens of single conductors (#12 AWG, .030" wall Class 1E EP insulation) were aged in a circulating air oven for 149 hours at 162C and two (2) were not. Specimens were subjected to the radiation from a Cobalt 60 source to a total dose of 205 Megarads. The specimens were then coiled onto a mandrel and inserted into a pressure vessel. At this point the vessel was flooded and the insulation resistance (IR) was measured. One specimen gave a comparatively low reading but the decision was made to test. Steam was admitted to the vessel to simulate the pressure, temperature and time of the postulated MSLB event according to the profile attached. Steam was readmitted to the levels shown in the profile to provide test margin. Specimens had IR measurements taken at the two ensuing 346F plateaus. The vessel was cooled, the specimens removed and subjected to 2400 volts AC (60Hz) while submersed in tap water. End of Test.

DATA:

SPECIMEN #	AGED	IR_1	IR_2	IR3	IR4	HiPot
1	YES	14T	.28T	2.5M	39M	OK
2	YES	8.2T	35M	35M	1.1M	OK
3	YES	11T	1.3M	1.1M	1.3M	OK
4	NO	2.8T	.4T	18M	19M	OK
5	NO	17T	.4T	26M	6.4M	OK

NOTES: IR_1 After aging (if applicable) before irradiation

IR_2 After irradiation

IR_3 First 346F plateau

IR_4 Second 346F plateau

T 10^{12} ohms

M 10^6 ohms

ISOMEDIX

December 20, 1979

To: Richard Prins
Component Testing

From: David P. Constantine
Production Manager

Subject: Irradiation for Essex International

This will summarize parameters pertinent to the irradiation of one (1) double mandrel wrapped with 31 cable samples as per your SRR No. 0047, dated October 29, 1979.

The mandrel was placed in a Cobalt-60 gamma field and exposed at each of 4 quadrants, as marked on the mandrel. By integrating the dose rate at any point on the mandrel during its 4-position exposure, an average dose rate was obtained which, when multiplied by the total exposure time, yields total dose.

The mandrel was exposed for 289 hours at an average dose rate of 0.71 megarads per hour. The calculated dose based on dosimetry is 205 megarads. Incorporating the ±3% accuracy of the dosimetry system, therefore, the reported minimum dose is 200 megarads.

Dosimetry was performed using Harwell Red 4034 Perspex dosimeters, utilizing a Bausch and Lomb Model 710 spectrophotometer as the readout instrument. This system is calibrated directly with NBS, with the last calibration being May 30, 1979. A copy of the dosimetry correlation report is available upon request.

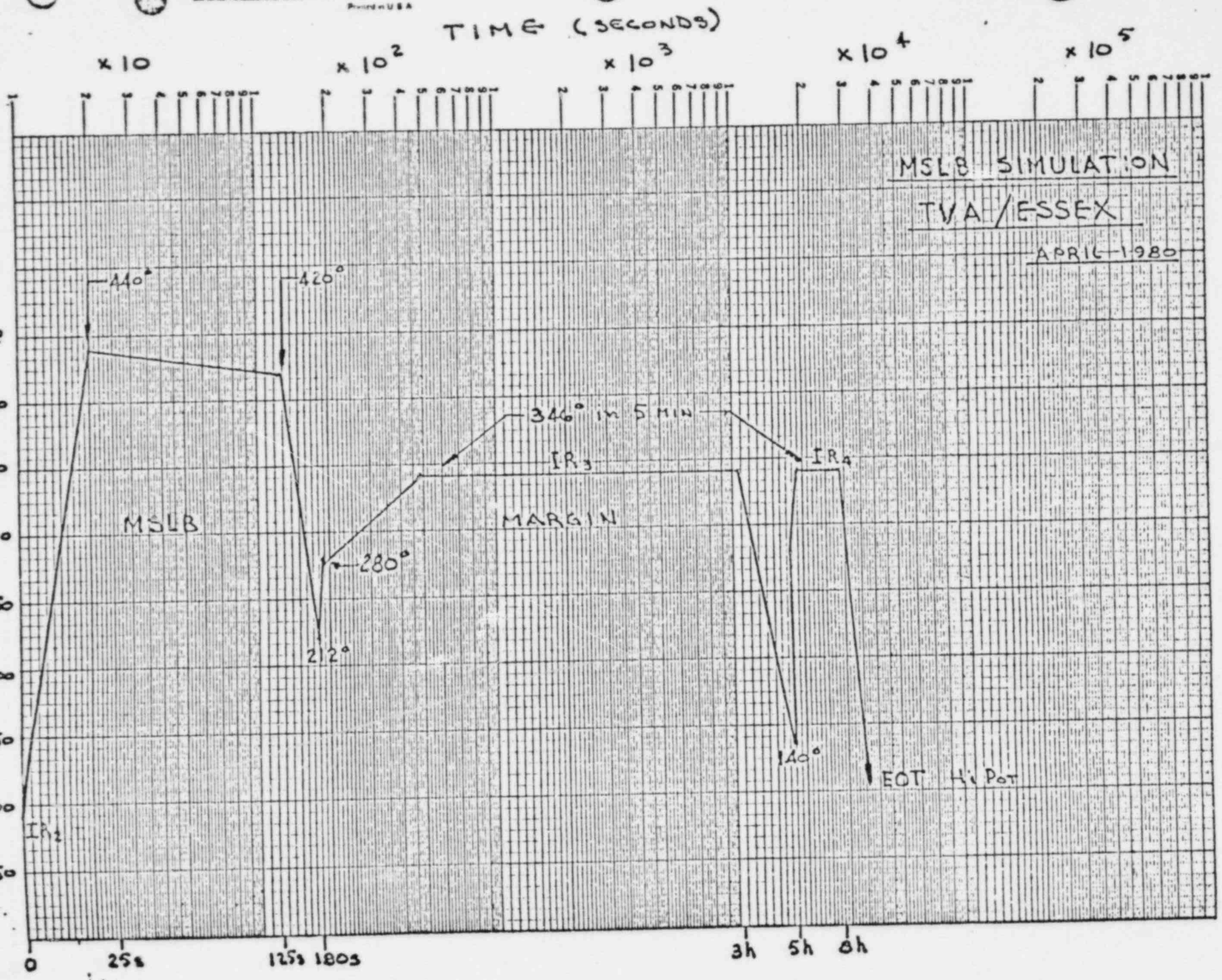
Irradiation was conducted in air at ambient temperature and pressure. Radiant heat from the source heated the samples somewhat, but the temperature did not exceed 90°F, as indicated by previous measurements on an oil solution in the same relative position.

Irradiation was initiated on November 9, 1979, and was completed on December 29, 1979.

David P. Constantine

David P. Constantine

DPC:vt


TIME (SECONDS)
x 10
x 10²
x 10³
x 10⁴
x 10⁵
MSLB SIMULATION
TVA/ESSEX
APRIL-1980
440°
420°
346° in 5 MIN
IR₃
IR₄
MSLB
MARGIN
280°
212°
140°
EOT Hi Pot
IR₁
450
400
350
300
250
200
150
100
50
TEMPERATURE (°F)
0
25s
125s
180s
3h
5h
8h
TIME