TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

April 3, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

Please refer to TVA's letter dated March 27, 1985 which transmitted an updated status list concerning our compliance with NUREG-0588 for unit 1 of the Watts Bar Nuclear Plant. Enclosure 1 clarifies our March 27, 1985 letter and enclosure 2 contains a detailed update which has been added to aid the staff in its review of this item.

If you have any questions concerning this matter, please get in touch with K. Mali at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer
Nuclear Engineer

Sworn to and subscribed before me
this 3rd day of April 1985.

Paulette H. White

Notary Public
My Commission Expires 8-24-85

Enclosures (2)
cc: U.S. Nuclear Regulatory Commission (Enclosures)
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT
STATUS OF EQUIPMENT QUALIFICATION
TO SATISFY 10 CFR 50.49

By fuel loading of Watts Bar Nuclear Plant unit 1, the status of equipment for which additional qualification actions must be completed to satisfy 10 CFR 50.49 will be as follows:

Status Code	Status	Number of Issues
IV	Issues Requiring Replacement, Relocation, or Shielding	0
III	Issues Requiring Additional Qualification Tests	4
II	Issues Requiring Completion of Documentation	0*

* The incore thermocouple system cables are status Code II but have been included with related devices as a common issue under status Code III.

Status Details

Status Code	Issue	Devices Affected	Estimated Completion of Qualification
III	Incore Thermocouple System	16 Sets[1] of Splices, Connectors and Cables	6/30/85
III	Non-1E Circuits[2]	5 Motor Control Centers and 17 Power Distribution Panels Containing Molded-Case Circuit Breakers	11/30/85
III	Insulated Cables[3]	5 Families of Cables	11/30/85
III	1E Circuits[4]	Approximately 133 Coated Terminal Blocks	11/30/85

NOTES

(1) NUREG-0737 and the Draft Watts Bar Technical Specifications only require 16 channels of incore thermocouples. However, TVA has committed to qualify all 65. The number above reflects the number of thermocouples required for operation while actually classed as status code II; cables are included here as a common system issue with related devices.

(2) A test program is being conducted for molded case circuit breakers used in non-1E associated circuits in motor control centers and power distribution panels. This action was required by the NRC as a result of a telephone conference call on March 25, 1985. During the week ending March 30, 1985, TVA determined as a result of its investigation of molded case circuit breakers questioned by NRC, that molded case circuit breakers previously considered qualified per EQSs-EEB-PNL-1 and EEB-BD-242 had not been tested adequately to demonstrate performance of their safety function. This affects 13 additional power distribution panels. However only two additional types of breakers are involved. They have been included in the test program discussed above. The test program contains breakers made by four different manufacturers.

(3) Generic Cable Qualification

a. Per EQS-EEB-CBL-17, TVA has previously established acceptable qualification of TEF cables.

b. Per EQS-EEB-CBL-12 (copy attached), type EPSJ cable is now considered qualified based on additional vendor information.

c. As itemized below, five families of cables are being tested as committed to on December 18, 1984 by TVA.

Cable Family	Manufacturers
PJ	Cyprus Wire and Cable Plastic Wire and Cable
CP	Cyprus Wire and Cable Plastic Wire and Cable Simplex Wire and Cable Essex
PX	American Insulated Wire Essex
MS	Belden Corporation Times Wire and Cable
Triaxial	ITT-Supprenant

(4) A test program is being conducted to verify qualification of coated terminal blocks, including the following GE types: EB-5, EB-25, and CR151B. The coating is Dow Corning RTV 3140.

ATTACHMENT

EQS-EEB-CBL-12

Revision	1	2	3		
Preparer/Date R.A. McInturff 12-11-81					
Reviewer/Date J.F. Wagner 12-14-81					

Unit No. 1 and 2
EQS No. EEB-CBL-12
TVA ID No.
Type EPSJ Cable
Rev. 3

WBN EQUIPMENT QUALIFICATION SHEET (EQS)

Manufacturer and Model No. See Table 3.11-8A, sheet 1004
Verification of Table Information (Table 3.11-8A sheet 1004)

X Equipment Type - The equipment has been identified as per TVA ID number designations (such as, MOV, SOV).

X Location - The location has been identified (such as, inside primary containment, annulus, individually cooled rooms, general spaces, or area affected by HELB outside primary containment).

X Component - A unique TVA ID number has been assigned (such as, 1-FSV-68-308).

X Function - A functional description of the component has been given (such as, steam generator blowdown).

X Contract No., Manufacturer, and Model No. - The contract number, manufacturer, and model number have been given.

X Abnormal or Accident Environment - All abnormal or accident environmental conditions applicable to this equipment have been identified either in tables or by references to figures from tables.

X Environment to Which Qualified - The environment to which the equipment has been qualified is addressed in either the tables or the environmental analysis attached.

X Category - A category of a, b, c, or d has been defined for the equipment.

X Operation and Accuracy Required and Demonstrated - The operation and accuracy required and demonstrated have been defined.

Qualification Status (check if applicable, NA if not)

Qualified Life (If equipment is qualified, indicate the qualified life with a numerical entry): 40 years R3

X Qualification Report and Method - A qualification report and the method of qualification has been identified on the Table Input Data Sheet (TIDS).

NA Environmental Analysis - An environmental analysis has been done, attached to the EQS, and independently reviewed by the responsible organization.

X Qualification by Similarity (If applicable) - A justification for qualification by similarity is attached to the EQS considering all the above factors and referenced to the appropriate tables.

X Qualification of Several Exact Components (If applicable) - When an EQS is used for more than one item, a list of all exact components is given as an appendix with all references to appropriate tables with justification for qualification considering all the above factors.

NA Interim Qualification (If applicable) - (Open item) - Component has been determined to be qualified only for a limited interim operation, an NCR has been written, and plan of action has been determined to yield a qualified component.

Term of Interim Qualification _____

NCR No. _____

NA Unqualified Component - (Open item) - (If applicable) - Component has been determined to be unqualified; the following is attached to EQS: NCR number, reason for non-qualification, and justification of continued operation. R3

NCR No. _____

EPS Family (EPS, EPSJ, EPSMJ) (Contracts 87365, 822173-3, 823412-2, 824443-1, 825471, 827295, 827337, and 827750)

The EPS cables consist of ethylene-propylene rubber insulation with a chlorosulfonated-polyethylene jacket. The cable was supplied by Anaconda, Collyer, and Okonite. This cable was constructed, tested, and accepted in accordance with TVA Standard Specification 25.016, Flame-Retardant, Cross-Linked Polyethylene-Insulation, Low Voltage Wire and Cable and Ethylene-Propylene Rubber-Insulated, 5-15kV cable prior to January 1980 or TVA Standard Specification 25.015, Ethylene-Propylene Rubber or Nonchlorinated, Mineral-Filled, Cross-Linked, Polyethylene-Insulated, 5-15kV cable after January 1980. TVA Standards S-68-516 and S-19-81 (such as physical properties, and methods of testing for tensile strength and elongation of the insulation and jacket materials). The TVA specification included provisions for source inspection of factory testing and required submittal of certified test reports to assure compliance with the specification. The manufacture of all this cable was controlled by a TVA-approved vendor QA program.

The following LOCA/SLB tests are representative of the EPS cables which are presently installed:

The Okonite Company test report form G-3 dated September 7, 1977, "Qualification of Okoguard Ethylene-Propylene Rubber Insulation for Nuclear Plant Service." Refer to letter from Okonite dated January 14, 1985 (EEB 850117 010), and February 20 (EEB 850222 011). (See Appendix 2).

The Okonite Company test report form G-2 dated May 2, 1977, "Qualification of Okoguard Ethylene-Propylene Rubber Insulation for Nuclear Plant Service." Refer to letter from Okonite dated January 14, 1985 (EEB 850117 010), and February 20 (EEB 850222 011). (See Appendix 2).

Franklin Research Center Test Report F-C5160-1 dated May 21, 1980, "Qualification Tests of Electrical Cables in a Simulated Loss-of-Coolant Accident (LOCA) Environment," prepared for Collyer Insulated Wire. Refer to letter from Collyer dated January 17, 1985 (EEB 850122 013). (See Appendix 2).

The Okonite Company Engineering Report No. 355 dated September 17, 1981, "Main Steam Line Break Qualification Test on Okonite, Okonite-FMR, X-Olene-FMR, and Okoguard Insulations." Refer to letters from Okonite dated January 14, 1985 (EEB 850117 010), and February 20 (EEB 850222 011). (See Appendix 2).

Prepared/Date Don Ang 4/1/85

Reviewer/Date R. L. Mills/4-1-85

015091.01

EPS Family (EPS, EPSJ, EPSMJ)

Franklin Research Center Test Reports F-C4350-3 and F-C4350-4, both dated July 1976, "Tests of Electrical Cables Subjected to Thermal Aging, Gamma Radiation, and a Loss-of-Coolant Accident Simulation." Refer to Anaconda's letter dated February 21, 1985 (EEB 850225 008). (See Appendix 2).

The test reports demonstrate that the EPS cables are suitable for Class 1E service in nuclear power generating stations in accordance with appropriate guidelines presented in IEEE Standards 323-1974 and 383-1974.

The LOCA/SLB tests included radiation at 200 megarads for the LOCA tests and 55 megarads for MSLB tests.

The tests included a LOCA at 346°F, 113 psig, 100% relative humidity, and a MSLB at 455°F and 32 psig.

The environmental conditions that the cables are exposed to are as follows:

	Normal	Abnormal	Accident
Temperature:	110°F	120°F	220°F
Relative Humidity:	80%	90%	100%
Pressure (psia):	ATM(-)	ATM	24.4
Radiation (40 year):	$1x10^8$ rads	N/A	N/A
(Acc.)	N/A	N/A	$5x10^7$ rads
Chemical Spray:	N/A	N/A	N/A

The tests included cable samples from Anaconda, Okonite Company, and Collyer Insulated Wire. The results of these tests adequately demonstrate that the EPS cables are fully qualified for 40 years of service in their installed environments and will perform satisfactorily both during and after a design basis accident.

Prepared/Date Don Ayp 4/1/85

Reviewer/Date R. L. Mills/4-1-85

015091.01

THE OKONITE COMPANY

320 Interstate North, Suite 420
Atlanta, Georgia 30339
404: 953-3510

January 14, 1985

EEB '85 0117 010

Tennessee Valley Authority
Design Engineering Branch
Electrical Engineering Section
400 West Summit Hill Drive
W8C126
Knoxville, TN 37902

EEC ENGR BRANCH
JAN 28 '85
In | Out | Noted

Attention: Mr. F. W. Chandler, Chief

Reference: Your Letter 1-8-85
Sequoyah & Watts Bar Nuclear Plants
Insulated Conductors
Type EPSJ, PXJ and PXMJ
Contracts 78K5-824443-1 and 81K5-827750

Dear Mr. Chandler,

The conductors furnished on the above referenced contracts are:

CONTRACT 81K5-827750:

TVA/Item #	TVA/Mark	Okonite/F.O.	Okonite/PC#	TVA/Type
1	WNC-1	01-0697-1	1/C 4/0 - 115-23-2930	EPSJ
2	WNB-1	01-0697-2	1/C 2/0 - 115-23-2928	EPSJ

CONTRACT 78K5-824443-1:
Schedule I

1	WGB-1	03-6771-1	2/C 12 - 202-09-2731	PXMJ
2	WFB-1	-2	2/C 10 - -2831	PXMJ
3	WFG-1	-3	7/C 10 -2837	PXMJ
4	WMB	-4	3/C #8 - 113-09-2803	PXMJ
5	WMQ	-5	3/C #4 -2813	PXMJ

Schedule II

6	WNC-1	07-2660-1	1/C 4/0 - 115-23-2956	EPSJ
7	WNE-1	-2	1/C 400 -2968	EPSJ

Schedule IV

23	WDO	07-2660-3	1/C 400 - 112-12-2578	PXJ

Preparer/Date Don Ang 3-30-85

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Reviewer/Date AWThomas 3-30-85

WM

The Type EPSJ Okoguard insulation compounds are exactly the same compounds (chemically) as the insulation compounds tested and discussed in the following reports:

1. Test Report G3, dated 9/7/77 "Qualification of Okoguard Ethylene-Propylene Rubber Insulation for Nuclear Plant Service".
2. Test Report G2, dated 5/2/77 "Qualification of Okoguard Ethylene Propylene Rubber Insulation for Nuclear Plant Service".
3. Engineering Report #355, dated 9/17/81 "Main Steam Line Break Qualification Test on Okonite, Okonite FMR, X-Olene-FMR and Okoguard Insulations".

The Type PXJ Cable is covered under:

1. Okonite N1 (Revised 7/3/78) "Qualification of Okonite Ethylene-Propylene Rubber Insulation for Nuclear Plant Service".
2. Engineering Report #355, dated 9/17/81 "Main Steam Line Break Qualification Test on Okonite, Okonite-FMR, X-Olene-FMR and Okoguard Insulations".

The Type PXMJ is covered by:

1. FN-2 (10/28/80) "Qualification of Okonite-FMR Flame Retardant Ethylene-Propylene Rubber Insulation for Nuclear Plant Service".
2. Engineering Report #355, dated 9/17/81 "Main Steam Line Break Qualification Test on Okonite, Okonite-FMR, X-Olene-FMR and Okoguard Insulations".

If there are any questions, please contact us.

Very truly yours,

John H. Reed

John H. Reed
Sales Representative

jr/mk

Encls. (5)

1/17/85 - FWC:PAD
cc: MEDS, W5B63 C-K

THE OKONITE COMPANY

320 Interstate North, Suite 420
Atlanta, Georgia 30339
404: 953-3510

EEB '85 0222 011

February 20, 1985

Tennessee Valley Authority
Design Engineering Group
Electrical Engineering Section
400 West Summit Hill Drive - W8C126
Knoxville, TN 37902

Attention: Mr. F. W. Chandler, Chief

Reference: Sequoyah, Watts Bar, Hartsville and Phipps Bend Nuclear Plants Insulated Conductors Types EPSJ, PXJ, PXMJ Contracts 78K5-823412-2, 78K13-824701, 78K5-824749, 79K5-825342-1, 80K6-827320-2

Bell, BF, SQN, WB, Para. (16)
SQN (16)
WB (16) HTN/PB (16) SQN (16)

Gentlemen:

The conductors furnished on the above referenced contracts are:

TVA Item #	TVA Mark	Okonite F.O.#	Okonite P/C #		TVA Type
Contract 78K5-823412-2 - Schedules III, VI and VIII					
12	WND	03-6518-1	300	114-24-2873	EPSJ 8KV
13	WNE	03-6518-2	400	114-24-2872	EPSJ 8KV
14	WNF	03-6518-3	500	114-24-2875	EPSJ 8KV
23	WNE-1	03-6517-1	400	114-24-2872	EPSJ 8KV
25	WNG	03-6512-1	750	114-23-2549	EPSJ 8KV
Contract 78K13-824701					
1	WDA	01-3568-1	#10	112-11-2132	PXJ
2	WDB	01-3568-2	#10	112-11-2131	PXJ
3	WDC	01-3568-3	#10	112-11-2133	PXJ
4	WDC-1	01-3568-4	#10	112-11-2136	PXJ
Contract 78K5-824749					
1	WDD-1	03-6772-1	500	112-12-2581	PXJ
2	WFA-1	03-6672-2	#8	113-09-2803	PXMJ
3	WHL-1	03-6672-3	#14	202-09-2166	PXMJ

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The Okonite Company
Page #2

TVA Item #	TVA Mark	Okonite F.O.#	Okonite P/C #	TVA Type
Contract 79K5-825342-4				
1	WDB-1	07-2939-1	112-12-2674	PXJ
2	WDD-1	07-2939-2	112-12-2678	PXJ
3	WDE-1	07-2939-3	112-12-2679	PXJ
4	WDF-1	07-2939-4	112-12-2686	PXJ
5	WDG-1	07-2939-5	112-12-2687	PXJ
6	WDH-1	07-2939-6	112-12-2689	PXJ
7	WDJ-1	07-2939-7	112-12-2690	PXJ
8	WDK-1	07-2939-8	112-12-2692	PXJ
9	WDN-1	07-2939-9	112-12-2694	PXJ
10	WDO-1	07-2940-1	112-12-2578	PXJ
11	WDP-1	07-2940-2	112-12-2581	PXJ
12	WDV-1	07-2940-3	112-12-2672	PXJ
87	WDB-1	07-2941-1	112-12-2674	PXJ
88	WDD-1	07-2941-2	112-12-2678	PXJ
89	WDE-1	07-2941-3	112-12-2619	PXJ
90	WDF-1	07-2941-4	112-12-2686	PXJ
91	WDG-1	07-2941-5	112-12-2687	PXJ
92	WDH-1	07-2941-6	112-12-2689	PXJ
93	WDJ-1	07-2941-7	112-12-2690	PXJ
94	WDK-1	07-2941-8	112-12-2692	PXJ
95	WDN-1	07-2941-9	112-12-2694	PXJ
96	WDO-1	07-2942-1	112-12-2578	PXJ
97	WDP-1	07-2942-2	112-12-2581	PXJ
98	WDV-1	07-2942-3	112-12-2672	PXJ
Contract 80K6-827320-2 - Item 2 only				
2	WDB	07-3228	112-12-2769	PXJ

The Type EPSJ Okoguard insulation compounds are exactly the same compounds (chemically) as the insulation compounds tested and discussed in the following reports:

1. Test Report G3, dated 9/7/77 "Qualification of Okoguard Ethylene-Propylene Rubber Insulation for Nuclear Plant Service".
2. Test Report G2, dated 5/2/77 "Qualification of Okoguard Ethylene Propylene Rubber Insulation for Nuclear Plant Service".
3. Engineering Report #355, dated 9/17/81 "Main Steam Line Break Qualification Test on Okonite, Okonite FMR, X-Olene-FMR and Okoguard Insulations".

The Type PXJ Cable is covered under:

1. Okonite N1 (Revised 7/3/78) "Qualification of Okonite Ethylene-Propylene Rubber Insulation for Nuclear Plant Service".
2. Engineering Report #355, dated 9/17/81 "Main Steam Line Break Qualification Test on Okonite, Okonite-FMR, X-Olene-FMR and Okoguard Insulations."

The Type PXMJ is covered by:

1. FN-2 (10/28/80) "Qualification of Okonite-FMR Flame Retardant Ethylene-Propylene Rubber Insulation for Nuclear Plant Service".
2. Engineering Report #355, dated 9/17/81 "Main Steam Line Break Qualification Test on Okonite, Okonite-FMR, X-Olene-FMR and Okoguard Insulations".

If there are any questions, please contact us.

Very truly yours,

John H. Reed

John H. Reed
Sales Representative

jr/mk

2/22/85 - FWC:DEC
cc: MEDS, SL26 C-K

THE OKONITE COMPANY

Prepared by: D.L. Sculthorpe 10-10-8
Reviewed by: J.F. Wagner 10-10-84

Post Office Box 340
Ramsey, New Jersey 07446
201-825-0300/Cable: Okonite

QUALIFICATION OF OKOGUARD ETHYLENE-PROPYLENE RUBBER INSULATION FOR NUCLEAR PLANT SERVICE (5kV CABLE & FIELD SPLICE)

The Okonite Company's continuing Research and Development activities as a compounder of elastomeric materials has led to an evolutionary development of Okoguard to its present form as a clean, red dielectric. This evolutionary development has resulted in substantial improvements in physical strength, lower water absorption rates and higher dielectric strength over those experienced by the earlier excellent ethylene-propylene Okoguard formulations.

INDEX

Okonite Form No.	Title
(a)	Qualification of Okoguard Ethylene-Propylene Rubber Insulation and Field Splice Materials for Nuclear Plant Service
(b)	Aging, Radiation and LOCA Testing Okoguard Ethylene-Propylene Rubber Insulated Cables and Field Splice Materials for Nuclear Power Generating Stations
(c)	Moisture Resistance - Okoguard Ethylene-Propylene Rubber Insulated Cables

Loss of Coolant Accident Simulation

The unaged and radiated sample and thermally aged and radiated samples were then placed in a autoclave and subjected to the temperature-pressure profile for simulation of a LOCA condition as specified in the IEEE Std. No. 323-1974. This profile is shown in Figure II, attached. At the end of the 30 day exposure in the autoclave the samples were removed, bent around a mandrel not greater than 40 times the overall diameter and then subjected to a final 5-minute ac withstand test at 80 volts per mil while immersed in tap water at room temperature. The samples were then returned to the autoclave for an additional 100 day post LOCA test and maintained at 212 F, 0 psig, 100% relative humidity. At the end of this post LOCA period the samples were removed, again bent around a mandrel of 40 times the overall diameter and electrically tested at 80 volts per mil while immersed in tap water at room temperature.

Conclusion

The samples of Okoguard 5 kV cable with a field splice in place unaged and thermally aged to the Arrhenius curve shown in Figure I, were radiated to a total dosage of 200 megarads minimum, and then subjected to a LOCA condition as shown in Figure II, all in accordance with IEEE Standard 383-1974. Throughout the exposure the cables were energized with rated potential and current and insulation resistance measurements taken weekly. At the conclusion of the LOCA and post LOCA condition the cables were then subjected to and withstood an 80 V/mil ac proof test.

The satisfactory test results are evidence that the Okoguard insulation and a field splice made from Okoguard T-95 tape and Okonite #35 jacketing tape are suitable for the designed service in Nuclear Power Generating Plants.

References

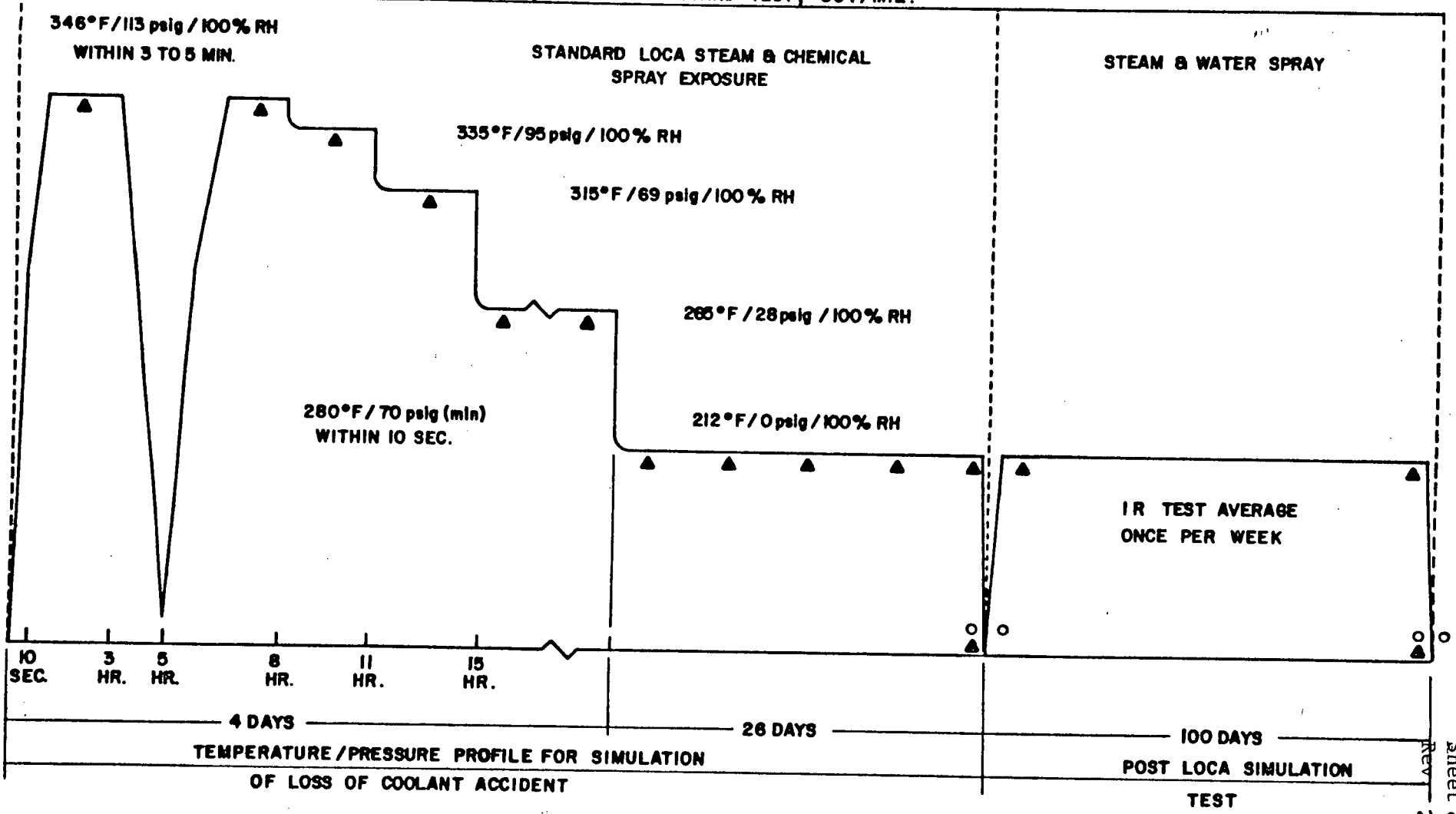
(1) IEEE Standard No. 383-1974
IEEE Standard for Type Test of Class IE Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations, April 15, 1974

(2) IEEE Standard No. 323-1974
IEEE Standard for Qualifying Class IE Equipment for Nuclear Generating Stations, February 28, 1974

(3) IEEE Standard No. 323-A-1975
Supplement to the Foreword of IEEE 323-1974
IEEE Standard for Qualifying Class IE Equipment for Nuclear Generating Stations

FIGURE II CABLE QUALIFICATION TEST PROFILE FOR LIFE & LOCA CONDITIONS

LEGEND: ▲ INSULATION RESISTANCE MEASUREMENT ; O AC WITHSTAND TEST, 80V/MIL.



THE OKONITE COMPANY

Post Office Box 340
Ramsey, New Jersey 07446
201-825-0300/Cable: Okonite

QUALIFICATION OF OKOGUARD ETHYLENE-PROPYLENE RUBBER INSULATION FOR NUCLEAR PLANT SERVICE

The Okonite Company's continuing Research and Development activities as a compounder of elastomeric materials has led to an evolutionary development of Okoguard to its present form as a clean, red dielectric. This evolutionary development has resulted in substantial improvements in physical strength, lower water absorption rates and higher dielectric strength over those experienced by the earlier excellent ethylene-propylene Okoguard formulations.

INDEX

Okonite Form No.	Title
(a)	Qualification of Okoguard Ethylene-Propylene Rubber Insulation for Nuclear Plant Service
(b)	Aging, Radiation and LOCA Testing Okoguard Ethylene-Propylene Rubber Insulated Cables for Nuclear Power Generating Stations
(c)	Moisture Resistance - Okoguard Ethylene-Propylene Rubber Insulated Cables
(d)	Vertical Tray Flame Test - IEEE Standard #383

Figure 1 shows the Arrhenius curve for Okoguard insulation compared with that of Butyl insulation. Butyl was first introduced in 1946 and has had extensive use ever since. Examination of some of the original Butyl compounds shows that the materials are still flexible after twenty-five to thirty years of service. Realizing that Okoguard insulation is superior to that of Butyl by a factor of approximately six, it is logical to anticipate a life in excess of a generating station's designed life of 40 years.

Extrapolation of the plots to operational temperatures constructed from experimental data at high temperatures leads to very considerable errors in terms of life. We have consistently found extrapolation of experimental data to predict designed life results in far shorter predicted life than actually experienced by older, well-established materials in actual service.

Radiation Exposure Test Program

Samples of single conductor #4/0 AWG, .175" Okoguard insulation, were thermally aged to simulate 40 year design life condition. The aging was performed at 150C for three weeks, a point actually above the Arrhenius curve of .030" Okoguard insulation shown in Figure I. As pointed out above, use of the Arrhenius technique on thin wall, newer insulations compared with the same analysis on those of well established insulations which have excellent service records is a reliable method of demonstrating the desired 40 year life expectancy.

After aging the heavier wall 0.175" Okoguard insulation to the Arrhenius curve of Figure I we found the actual percentage elongation for the sample was in excess of 85% indicating the compound was still very viable. Using the Arrhenius techniques on the light wall samples permitted us to show the anticipated 40 year life expectancy by comparison with existing materials. Using the same technique on heavier walls that actually will be used in a generating station application at the same temperature time period and noting the very high percentage retention of elongation thus reinforces this expected life.

Loss of Coolant Accident Simulation

The thermally aged and radiated cables were then placed in an autoclave and subjected to the temperature-pressure profile for simulation of a LOCA condition as specified in the IEEE Standard No. 323-1974. This profile is shown in Figure II, attached. At the end of the 30 day exposure in the autoclave the samples were removed, bent around a mandrel not greater than 40 times the overall diameter and then subjected to a final 5-minute ac withstand test at 80 volts per mil while immersed in tap water at room temperature. The samples were then returned to the autoclave for an additional 100 day Post-LOCA test and maintained at 212F, 0 psig, 100% relative humidity. At the end of this Post-LOCA period the samples were removed, again bent around a mandrel of 40 times the overall diameter and electrically tested at 80 volts per mil while immersed in tap water at room temperature.

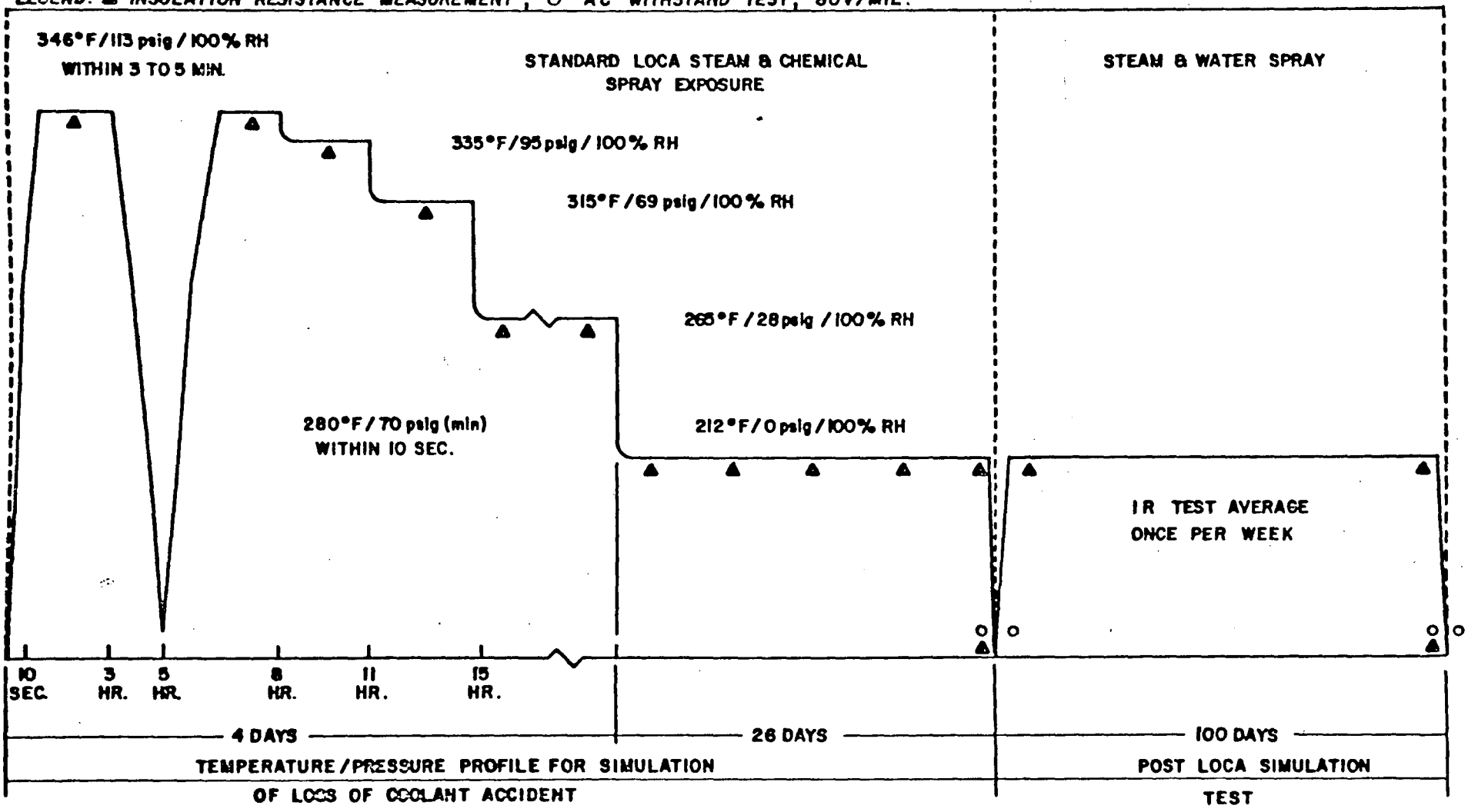
Conclusion

The Okoguard samples were thermally aged to the Arrhenius curve shown in Figure I radiated to a total dosage of 200 megarads minimum, and then subjected to a LOCA condition as shown in Figure II, all in accordance with IEEE Standard 383-1974. Throughout the exposure the cables were energized with rated potential and current and insulation resistance measurements taken weekly. At the conclusion of theLOCA and Post-LOCA condition the cables were then subjected to and withstood an 80V/mil ac proof test.

The satisfactory test results are evidence that Okoguard insulation is suitable for th
Nuclear Power Generating Plants

FIGURE II CABLE QUALIFICATION TEST PROFILE FOR LIFE & LOCA CONDITIONS

LEGEND: ▲ INSULATION RESISTANCE MEASUREMENT ; O AC WITHSTAND TEST, 80V/MIL.



THE OKONITE COMPANY
Ramsey, New Jersey 07446

September 17, 1981

ENGINEERING REPORT NO. 355

MAIN STEAM LINE BREAK QUALIFICATION TEST ON OKONITE, OKONITE-FMR, X-OLENE-FMR AND OKOGUARD INSULATIONS

Introduction

A design basis event (DBE) main steam line break test (MSLB) was performed on Okonite, Okonite-FMR, X-Olene-FMR, and Okoguard insulations. These insulations have previously been qualified for nuclear plant use in prior LOCA tests. The purpose of the MSLB was to determine if these insulations could maintain an electrical load during such an event. The test profile was based on a customer's postulated MSLB parameters with margin added. IEEE Standards 383-1974 and 323-1974 were incorporated in the test program.

As described in this report, qualification testing was performed by Isomedix, Inc. and Approved Engineering Testing Laboratories in two MSLB tests. These tests are documented in report numbers 558-1021 (September 22, 1980) and 558-1077 (April 8, 1981) and are available for audit at Okonite headquarters.

Conclusion

All four insulations were qualified to the MSLB-DBE described herein. All samples met the specific performance requirements established prior to testing. These requirements are described in the body of this report.

Procedure

Qualification to the MSLB-DBE for all four insulations was accomplished in two tests. Okoguard, Okonite-FMR and X-Olene-FMR were tested in the first MSLB test. Okonite insulation was qualified in the second test.

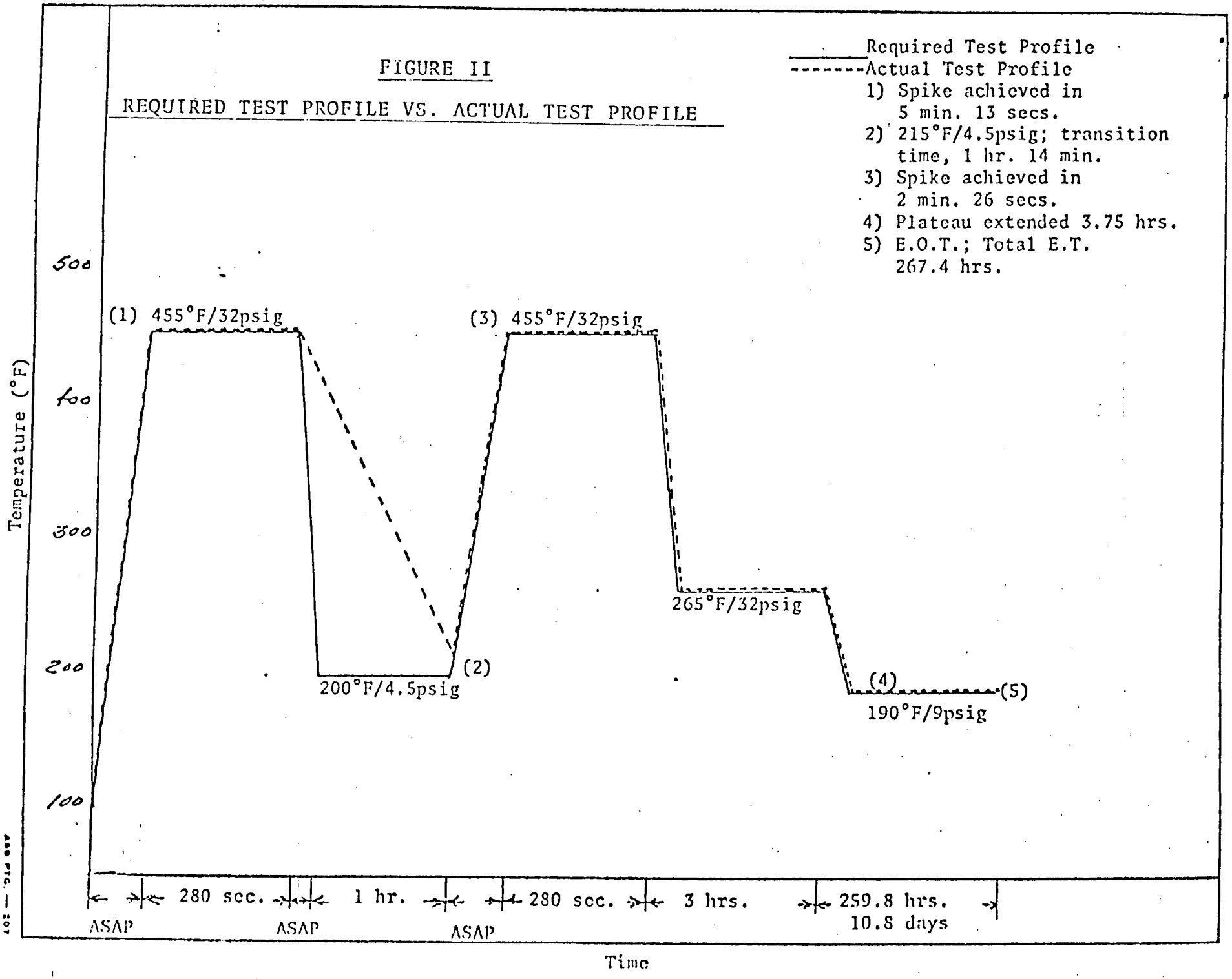
With the exception of sample preparation and thermal aging, the first test was performed by Isomedix, Inc. Okonite was responsible for sample preparation and aging. In the second test Okonite again performed the sample preparation and thermal aging. Isomedix was contracted for irradiation services. AETL performed the MSLB and post MSLB tests. For both tests, the reports were written by AETL.

The following samples were selected for testing.

Set	Description
(A)	5kV, 1/C #6 AWG (7X) bare copper, .020" extruded semiconducting screen, .090" extruded Okoguard EPR, .030" extruded semiconducting insulation screen, .005" bare copper shielding tape: Four samples - fifteen feet (effective). Reference No. 01-3663-1

FIGURE II

REQUIRED TEST PROFILE VS. ACTUAL TEST PROFILE



Collyer Insulated Wire
A Division of
GULF + WESTERN MANUFACTURING COMPANY

100 Higginson Avenue
Lincoln, R. I. 02865
(401) 723-7800

EEB '85 0122 013

EEB-CBL-12
Appendix 2, Rev 2
Sheet 14 of 21

January 17, 1985

Mr. F. W. Chandler
Chief, Electrical Engineering Branch
Tennessee Valley Authority
400 West Summit Hill Drive, W8C126
Knoxville, TN 37902

Dear Mr. Chandler:

In response to your letter of January 11, 1985, concerning cable furnished to you by Collyer, we have checked the compound used on your Contract No. 77K5-822173-3. Watts Bar insulated conductor

To the best of our knowledge, the compound is chemically exactly the same as that used in the referenced report.

If you have any further questions, please feel free to contact me.

Sincerely yours,

James Kushner
Vice President - Engineering

JK:sjr

1/22/85 - FWC:STM
cc: MEDS, W5B63 C-K

ELEC ENGR BRANCH
JAN 22 '85

	In	Out	Noted
FWC			
JBK			
RCW			
LC	1-24		
JW		DW	
G	R	W	
MFP			
MRB	MCB	FT	
B E	G	R	S
MJS			
GR	CS	GT	
A G	HR	WR	
WHD			
WAG			
OTH			
JBK			
GRO			
LTP			
RRR			
RBR			
JLS			
WEK			
C H	S	W	

- DA 25

1 597

dba

QUALIFICATION TESTS OF ELECTRICAL CABLES IN A SIMULATED LOSS-OF-COOLANT ACCIDENT (LOCA) ENVIRONMENT

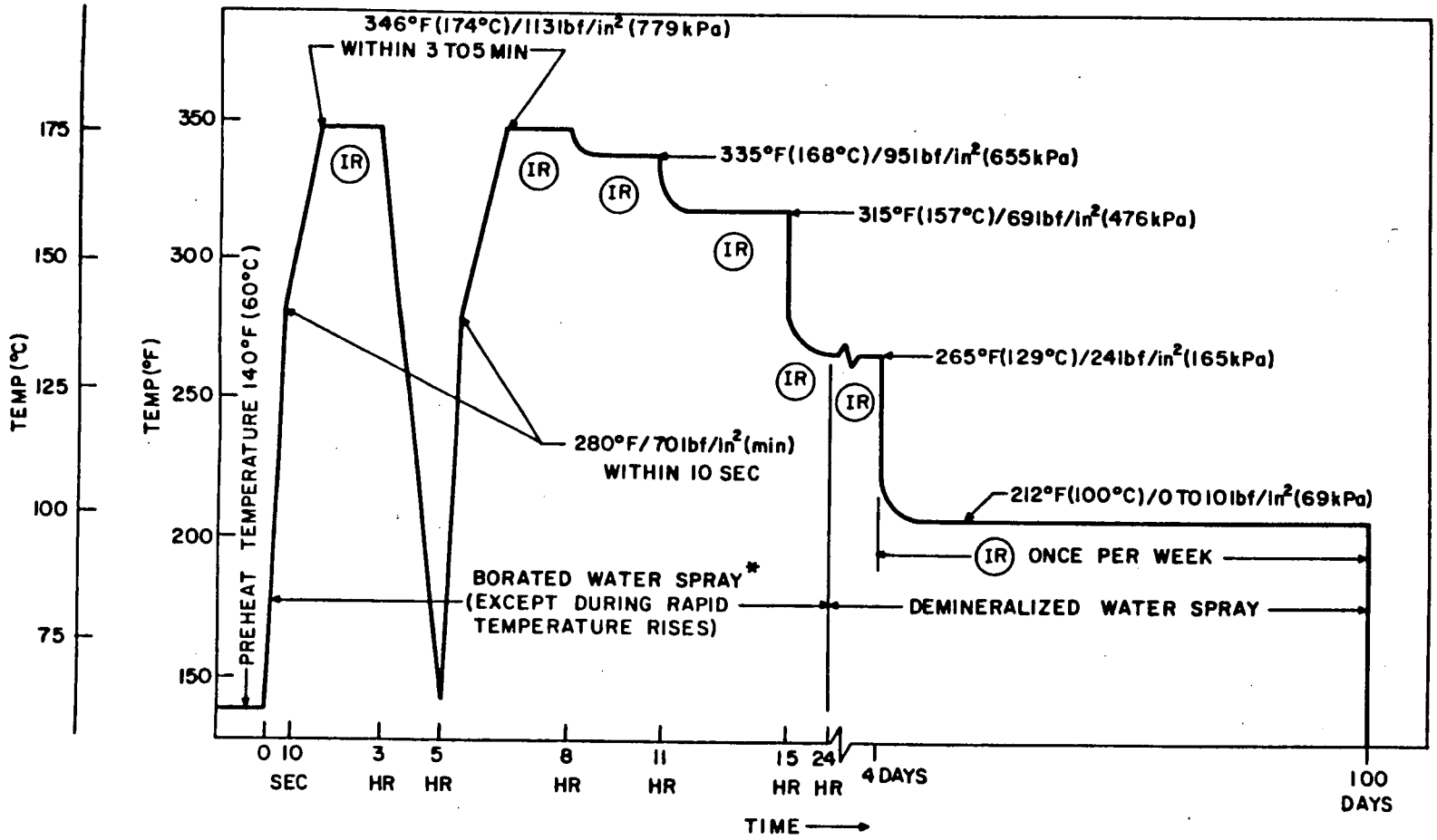
FRC FINAL REPORT
F-C5160-1

Prepared for

Collyer Insulated Wire
100 Higginson Avenue
Lincoln, Rhode Island 02865

May 21, 1980

Franklin Research Center
A Division of The Franklin Institute
The Benjamin Franklin Parkway, Phila., Pa. 19103 (215) 448-1000



*Chemical-spray solution consisted of:

- o 3000 ppm boron as boric acid
- o 0.064 molar sodium thiosulfate
- o 100 ppm hydrazine
- o Sufficient sodium hydroxide to obtain pH = 10.5 @ 77°F (25°C)

(IR) = Insulation resistance

Temperature tolerance = ±5°F (3°C)
Pressure tolerance = ±5 lbf/in² (34 kPa)

Δ Except during initial temperature/pressure transients.

Figure 4. Temperature/Pressure Profile for Simulation of Loss-of-Coolant Accident (LOCA) Environment

Franklin Research Center
A Division of The Franklin Institute
Franklin
A Division of

ANACONDA
POWER CABLE COMPANY

EEB-CBL-12
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EEB '85 0225 008

ELEC ENGR BRANCH
FEB 25 '85

February 21, 1985

Tennessee Valley Authority
400 West Summit Hill Drive W8C126
Knoxville, TN 37902

Attn: Mr. F. W. Chandler
Chief, Electrical Engineering Branch

Subj: Insulated Conductors Type EPSJ
Contracts - 76K5-87365-BFN WBN
79K8-825471-WBN
80K8-827337-WBN
80K5-827295-SQN

Ref: Your letters dated January 8, 1985, January 18, 1985 and January 30, 1985.

Dear Sir:

Enclosed are two sets of Anaconda's environmental qualification data for your Type EPSJ insulated conductors.

1. FIRL Technical Report F-C4350-4
2. FIRL Technical Report F-C4350-3

Report F-C4350-4 should be applicable to the contracts 79K8-825471, 80K8-827337 and 80K5-82795. While report F-C4350-3 applicable to 76K5-87365.

We sincerely hope that you can use this information.

Sincerely yours,

T. H. Ling

T. H. Ling
Sr. Technical Consultant

THL:rh

cc: Don Arp - TVA

A subsidiary of CABLEC CORPORATION
Anaconda Power Cable Company
Mail and Office Address
East 8th Street
Marion, IN 46952

Telephone
317-664-2321

Refer to office at:
901 E. 86th St.
Indpls., IN 46240
317-253-3505

2 757

Technical

Report

Final Report
F-C4350-3

TESTS OF ELECTRICAL CABLES SUBJECTED TO THERMAL AGING, GAMMA RADIATION AND A LOSS-OF-COOLANT ACCIDENT SIMULATION

Prepared for

The Anaconda Company
Marion, Indiana

July 1976

THE FRANKLIN INSTITUTE RESEARCH LABORATORIES
THE BENJAMIN FRANKLIN PARKWAY • PHILADELPHIA, PENNSYLVANIA 19103

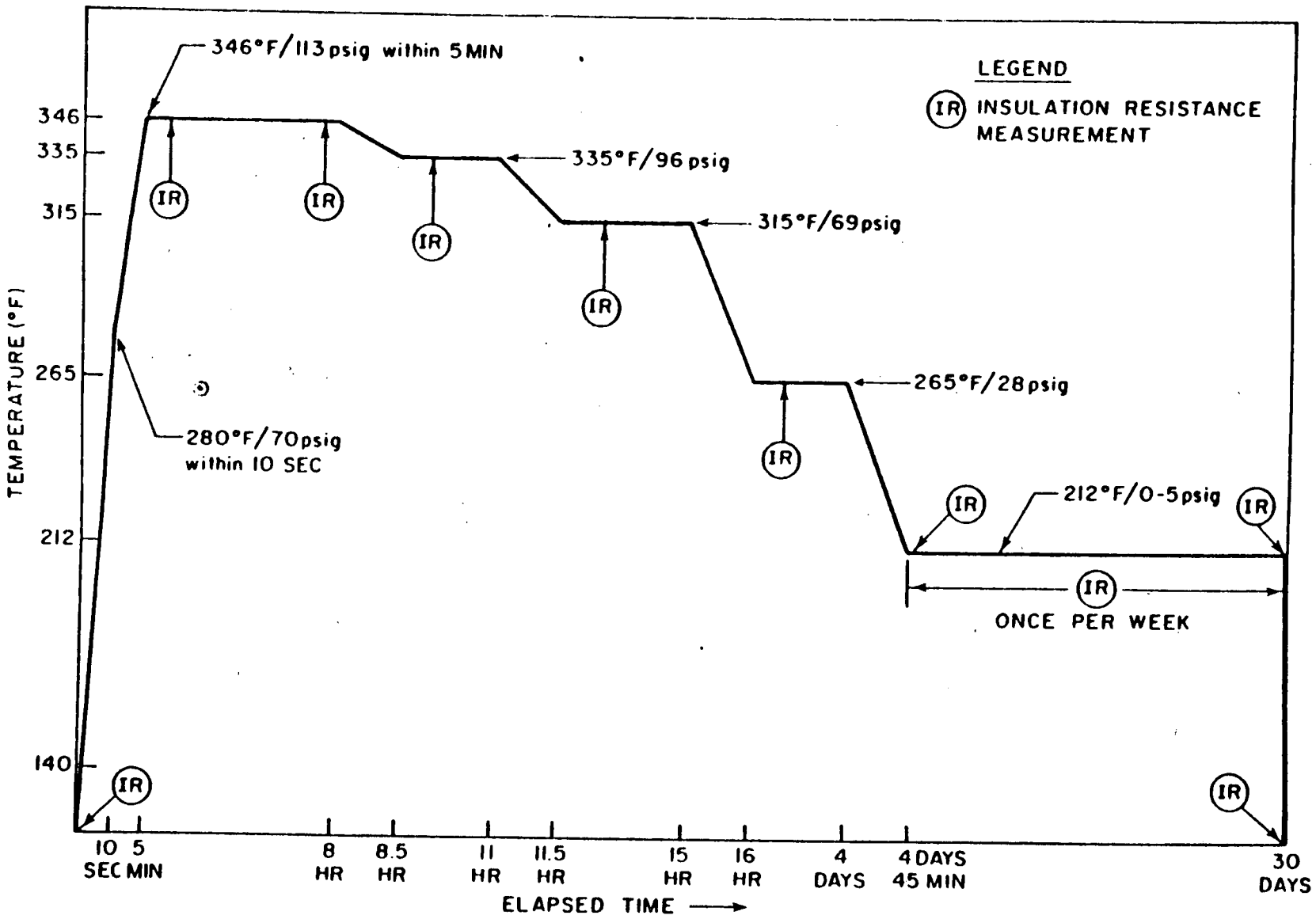

Figure 2. Temperature/Pressure Profile for Simulation of Loss-of-Coolant Accident (LOCA) Environment

F-C4350-3

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Technical Report

Final Report
F-C4350-4

TESTS OF ELECTRICAL CABLES
SUBJECTED TO THERMAL AGING, GAMMA RADIATION
AND A LOSS-OF-COOLANT ACCIDENT SIMULATION

Prepared for

The Anaconda Company
Marion, Indiana

July 1976

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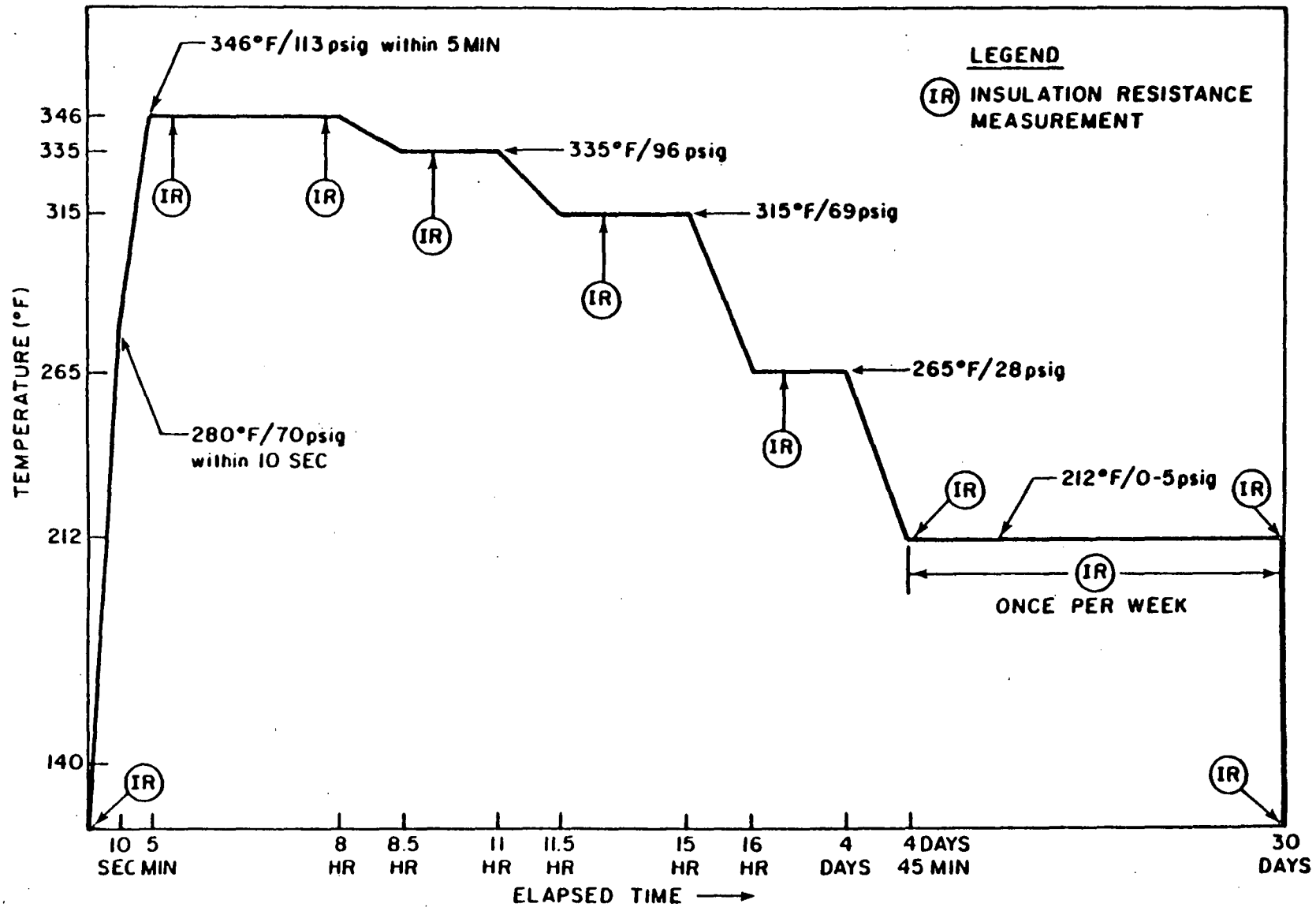

Figure 2. Temperature/Pressure Profile for Simulation of Loss-of-Coolant Accident (LOCA) Environment

F-C4350-4

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT

RESOLUTION STATUS
FOR EQUIPMENT QUALIFICATION

Please refer to TVA's letter dated February 19, 1985 to the NRC regarding qualification of equipment in accordance with 10 CFR 50.49. Since the referenced letter, a number of tiems have been qualified except as identified in section B below, all devices previously classified as status code IV have been qualified by replacement or relocation. The following status updated is provided.

A. Qualification Actions Recently Completed:

1. EQSs-EEB-0057 and -0073:

   Testing has been successfully completed and the valve positioners are qualified.

2. EQS-EEB-0058 and -0060:

   Qualified equipment has been installed.

3. EQS-MEB-30-0006 and MEB-65-0009 and -0010:

   Qualified equipment has been installed.

4. EQSs-MEB-30-0117 and -30-0119:

   Qualified equipment has been installed.

B. Qualification Actions to be Completed before Fuel Loading:

1. EQS-NEB-68-14:

   Refer to item 2 in the discussion of "Open Items" of the referenced TVA letter: The reactor coolant system wide range pressure transmitters will be replaced before fuel loading.

2. EQS-NEB-30-27:

   Qualified equipment is scheduled for installation by April 5, 1985.