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REAUDIT OF THE ENVIRONMENTAL QUALIFICATION OF
SAFETY-RELATED ELECTRICAL EQUIPMENT AT THE ENRICO
FERMI ATOMIC POWER PLANT, UNIT NO. 2

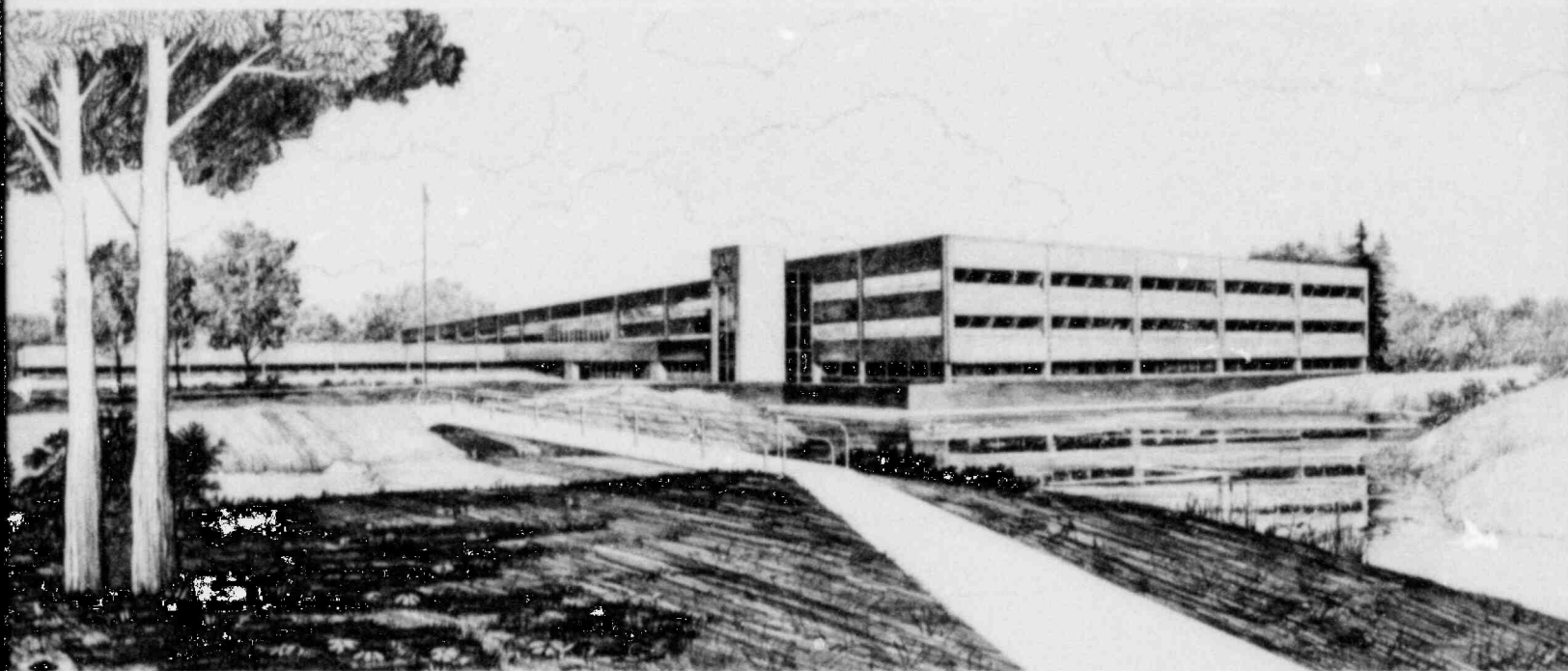
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U.S. Department of Energy

Idaho Operations Office • Idaho National Engineering Laboratory



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INTERIM REPORT

REAUDIT OF THE ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED
ELECTRICAL EQUIPMENT AT THE ENRICO FERMI ATOMIC POWER PLANT, UNIT NO. 2

Docket No. 50-341

Martin F. Hinton
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Reliability and Statistics Branch
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EG&G Idaho, Inc.

ABSTRACT

The Enrico Fermi Atomic Power Plant, Unit No. 2 was audited to determine the environmental qualification of safety-related electrical equipment. Results of the audit are summarized in this report.

FOREWORD

This report is supplied as part of the "Equipment Qualification Case Reviews" being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Engineering, Equipment Qualification Branch by EG&G Idaho, Inc., Reliability and Statistics Branch.

The U.S. Nuclear Regulatory Commission funded the work under the authorization, B&R 20-19-02-15, FIN No. A6453.

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REAUDIT OF THE ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT AT THE ENRICO FERMI ATOMIC POWER PLANT, UNIT NO. 2

1.0 INTRODUCTION

On December 14-18, 1981, a team comprised of representatives from the NRC staff and EG&G Idaho, Inc. conducted a re-audit of environmental qualification of safety-related electrical equipment at the Enrico Fermi Unit No. 2 Power Station. The initial audit (performed on July 13-17, 1981 and reported by EGG-EA-5534, August 1981) indicated that the Enrico Fermi Environmental Qualification program was incomplete. The work effort consisted of: (1) a pre-audit review of the licensee's submittal, (2) an audit of the licensee's central files for selected items, and (3) a visual inspection of the installed equipment items for which the central files were audited. A table that shows equipment qualification status is provided in Appendix A. Summaries of the central file reviews are provided in Appendix B.

2.0 EVALUATION

The audit indicated that four of 150 equipment items are qualified. This accounts for 27 of approximately 1500 Plant Identification System (PIS) component numbers. To complete the qualification program, the Detroit Edison Company (DECO) has committed to testing 81 equipment items and replacing another 65 equipment items. If any part of the testing or replacement program has not been completed by two months prior to fuel load, DECO will submit justification for interim operation.

There are two items of concern remaining as a result of the site visit. First is the question of safety-related cables in conduit, subjected to submergence. There are cable pull boxes that either need to be qualified for submergence or they cannot be considered as a protection against submergence. DECO has stated that they will qualify the conduit system fixtures. The second item of concern is proper penetration protection for component enclosures. This concern is due to a difference in tested box connectors and installed box connectors on the Rosemount 1153 transmitters.

3.0 CONCLUSIONS

The re-audit shows a considerable improvement from the July 13-17, 1981 audit findings. It is concluded that, on completion of the commitments made by DECO concerning their Environmental Qualification Program, the program is adequate and in accordance with NUREG-0588.

4.0 REFERENCES

1. Detroit Edison Company Enrico Fermi Unit No. 2, Docket No. 50-341 Response to NUREG-0588 Equipment Environmental Qualification, Revision 2.
2. Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment, NUREG-0588.
3. IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations, IEEE Std 323-1974.

APPENDIX A
EQUIPMENT QUALIFICATION STATUS

APPENDIX A
EQUIPMENT QUALIFICATION STATUS

<u>Page</u> ⁽¹⁾	<u>Manufacturer</u>	<u>Model</u>	<u>Description</u>	<u>No. of Items</u>	<u>Action</u> ⁽²⁾ <u>Plan</u>	<u>Deficiencies</u> ⁽³⁾
1	Agastat	EGPI-001	Relay	6	R10-83	All except A
2	Agastat	GPIC	Relay	150	T5-83	ND
3	Allen-Bradley	1492-CA1	Terminal Blocks	9 ⁽⁴⁾	R8-83	ND
4	Anaconda	EP	Cable	3	T7-82R	R
5	ASCO	NP8320	Solenoid Valve	7 1	Qualified T7-82R	O/C-Q, I/C-R
6	ASCO	HT8317	Solenoid Valve	18	R1-83	QL, DBA
7	ASCO	THT8262	Solenoid Valve	12	T7-83	ND
8	ASCO	WP8316	Solenoid Valve	4	R1-83	ND
9	ASCO	HVA-90-405-2A	Solenoid Valve	370	T2-83	ND
10	ASCO	832322	Dual Solenoid Valve	2	R1-83	ND
11	ASCO	8316C37	Solenoid Valve	2	R1-83	ND

<u>Page</u> ⁽¹⁾	<u>Manufacturer</u>	<u>Model</u>	<u>Description</u>	<u>No. of Items</u>	<u>Action</u> ⁽²⁾ <u>Plan</u>	<u>Deficiencies</u> ⁽³⁾
12	ASCO	8320	Solenoid Valve	14	R1-83	ND
13	ASCO	8321A3	Solenoid Valve	2	R1-83	ND
14	ASCO	8320A10	Solenoid Valve	2	R1-83	ND
15	ASCO	8320A90	Solenoid Valve	6	R1-83	ND
16	Auto-Timing & Control	319B006QIC	Delay Timer	2	T1-83	ND
17	AUVAL	C4988-15	Solenoid Manifold Assembly	8	R1-83	ND
18	Barksdale	B2T-M12SS	Pressure Switch	1	R10-83	A, R, QL
19	Barksdale	D2H-M80SS D2H-M150SS	Pressure Switch	3	R10-83	A, QL, R, DBA
20	Barton	288	Differential Pressure Switch	4	R8-82	A, R, QL
21	Barton	289	Differential Pressure/Flow Switch	6	R10-83	A, R, DBA, QL

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
22	Barton	368	Flow Transmitter	8	R8-83	ND
23	Barton	384/S321	Flow/Pressure Transmitter	6	R8-83	ND
24	Boston	Bostrad 7E	Cable	1	T7-82R	R
25	Buchanan	427, 430	Terminal Blocks & End Piece	4	R10-83	DBA, QL
26	Buchanan	358/330	Fuse Block & End Section	11	R1-83	ND
27	Bussman	2919	Fuse Block 2P	2	R1-83	ND
28	Bussman	4513	Fuse Block 1P	2	R1-83	ND
29	Bussman	FNM	Fuse	11	R1-83	ND
30	Bussman	FRS	Fuse	447	R1-83	ND
31	Chromalox	S-1202	1.2 KW Space Heater	2	R8-83	ND
32	Conax	7087	Electrical Penetration	23	T6-83	QL, R, DBA
33	Conax	Copper Constantan	Thermocouple	8	R1-83	ND
34	Connectron	NU-2	Terminal Blocks	5	T7-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action Plan ⁽²⁾	Deficiencies ⁽³⁾
35	Crittenden	B13410	Control Transformer	2	T7-83	ND
36	CUSCO	604V1	Pressure Switch	8	R8-83	ND
37	CUSCO	674D8005	Differential Pressure Switch	8	R8-83	ND
38	Delphi	B5G-1B6-C	Hydrogen Cell	2	T7-83	ND
39	Delphi	B6G-1B6-C	Oxygen Cell	2	T7-83	ND
40	Delphi	Armstrong 11AV	Air Cool Fan Heat Exchanger	2	T7-83	ND
41	Dwyer	3000-0	Pressure ⁽⁵⁾ Differential Switch	2	R8-83	ND
42	Elma	5965A	Power Supply	16	R10-83	ND
43	Fenwall	22810	Temperature Switch	2	T7-83	A, R, DBA, QL
44	Fenwall	35003-0	Temperature Switch Controller	2	R8-83	ND
45	Fenwall	35680-4-255	Thermo Element	2	R8-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
46	Fisher	546	Temperature E/P Converter	2	T4-83	ND
47	GE	5K	Motor	8	Qualified	Q
48	GE	237X731G001	Radiation Monitor Detector	6	T1-84	QL, R, a
49	GE	194X927G011	Radiation Monitor	4	T1-84	QL, R, DBA, nd
50	GE	112C3144G008	Intermediate Range Detector	16	T1-84	QL, R, DBA, nd
51	GE	163C1154G002	Power Range Detector	43	T1-84	QL, R, DBA, nd
52	GE	112C2218G001	Voltage Pre Amp	8	T1-84	QL, R, DBA
53	GE	136B1302G002	Guide Tube Valve Assembly	5	T1-84	QL, R, DBA, nd
54	GE	Vulkene Supreme	Cable	1	T7-82R	R
55	GE	Flame-Resistant Vulkene	Cable	1	T7-82R	R
56	GE	EPR/Neoprene	Cable	1	T7-82R	R
57	GE	2A9078102	200W Heater	2	T7-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
58	GE	CR2940UB203F	Selector Switch	6	T2-83	All except A
		CR2940WA202C	Push Button Switch			
59	GE	CR206B1	Pump Starter	2	T7-83	ND
60	GE	555111	Differential Pressure/Flow Transmitter	10	R10-83	A, R, DBA, QL
61	GE	556120	Pressure Transmitter	6	R10-83	QL, R, DBA, A
62	Hays-Republic	T-00252A-4	Differential Pressure Transmitter	8	R8-83	ND
63	HESCO	HET501	90 KW Heater	2	R8-83	ND
64	Hoffman	AEK460	Door Inter- lock Solenoid	8	Disc. ⁽⁶⁾	ND
65	INDEECO	26SS5F54	24 KW Air Heater	2	R8-83	ND
66	ITE	HE3B015 HE3B030 HE3B060 EF3-B015 FJ3-B150	Circuit Breaker	12	T7-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
67	ITE	EF3-A010 EF3-L050	Circuit Breaker	4	T7-83	ND
68	ITE	5641-DA, DB, DC	Fused Discon- nect Switch	156	T7-83	ND
69	ITE	D10S4	Fused Discon- nect Switch	2	T7-83	ND
70	ITE	5641-DACAB 5641-DBDAB 5641-DCEAB	Non-Reversing Starter	20	T7-83	ND
71	ITE	A103C12	Contactor	2	T7-83	ND
72	ITE	A203C12	Non-Reversing Starter	2	T7-83	ND
73	ITE	5641-R-DACAB 5641-R-DBDAB 5641-R-DCEAB	Reversing Starter	121	T7-83	ND
74	ITE	5641-SW-DCEAB	2 Speed Motor Starter	4	T7-83	ND
75	ITE	G30T	Thermal Overload	11	T7-83	ND
76	ITE	2032-T3, T4, T6, T10	Control Transformer	154	T7-83	ND
77	ITE	J10, J20	Relay	24	T7-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
78	ITE	5642-DXCAB 5642-DKDAB 5642-DUGAB	Contactor	8	T7-83	ND
79	ITE	Tu1-F120	Motorized Operator	2	T7-83	ND
80	ITE	F20C12	Transient Suppressor	4	T7-83	ND
81	ITE	5640, 5600	Motor Control Center	7	T7-83	ND
82	ITT-Royal Electric	SIS	Wire	2	R7-82	ND
83	Kulka	MAI-60, GDI-30F, MDG	Terminal Blocks	1	T6-83	QL, R, DBA
84	Leeds & Northrup	Electromax III	Temperature/ Flow Con- troller	6	T5-83	ND
85	Leeds & Northrup	10970-3	E/P Converter	2	R8-83	ND
86	Leeds & Northrup	1913	Flow Transmitter	1	R8-83	ND
87	Limitorque	SMB, SBD	Valve Opera- tor (inside containment)	16	T12-82	QL, R, DBA

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
88	Limatorque	SMB, SMC, SBD	Valve Operator	129	T10-82	QL, DBA, do
89	Love	56-838	Temperature Switch	9	T7-83	QL, DBA, do
90	Marathon	6012-DJ-5V 6006-DJ-5V	Terminal Blocks	6	R8-83	ND
91	Midwest Electric Product	4CT16	Current Transformer	3	T7-83	ND
92	NECI	N145C3224	Temperature Element	50	R10-83	QL, DBA
93	Okonite	Okonite Okolon	Cable	6	T7-82R	R
94	Omega	ICSS-14U-12	Thermocouple	4	R8-83	ND
95	Potter Brumfield	KRPI-IAG	Relay	12	T7-83	ND
96	Pyco	22--1021-02-06	Temperature Detector	16	R8-83	ND
97	Raychem	Flamtrol	Cable	1	T7-82R	R
98	Red Band Electric	8A0	EECW Pump Motor	2	R8-83	ND
99	Reliance	P21G71PFZ	Fan Motor	2	R8-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action Plan ⁽²⁾	Deficiencies ⁽³⁾
100	Reliance	P28611CG15EZ ⁽⁷⁾	Fan Motor	2	R8-83	ND
101	Reliance	278919A1, A4, A8, A9	Fan Motor	4	R8-83	ND
102	Reliance	721804-YB	Pump Motor	2	T7-83	ND
103	Robertshaw	83843	Level Switch	6	T2-83	QL, R, DBA
104	Robertshaw	83844-B1	Level Switch	2	T2-83	ND
105	Rockbestos	Firewall III	Cable (single conductor)	1	T7-82R	R, nd
106	Rockbestos	Firewall III	Cable (Coaxial)	1	T7-82R	R, nd
107	Rosemount	1151	Pressure Transmitter	108	T7-83	QL, R, DBA, a, do
108	Rosemount	1152	Pressure Transmitter	8	R11-83	QL, R, DBA, a, do
109	Rosemount	1153, Series B	Pressure Transmitter	10	Qualified	Q
110	Rosemount	510DU	Trip Unit	156	T7-83	QL, R, DBA, A, do
111	Ross	2773A5905	Solenoid Valve	2	R1-83	ND
112	Rotron	DR313	Pump Motor	2	R8-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action Plan ⁽²⁾	Deficiencies ⁽³⁾
113	Rowan	2190E	Relay	12	T7-83	ND
114	Rowan	2190-E02AA 2190-E20AA 2190-E21AA	Relay	6	T7-83	ND
115	Rowan	B025-L7	Control Transformer	120	T7-83	ND
116	Shawmut	TRI/ONIC	Fuse	6	T7-83	QL, R, a
117	Shawmut	K-5	200 Amp Fuse	6	T7-83	QL, DBA, do, a
118	Shawmut	A6Y	Fuse	18	T7-83	QL, DBA, do, a
119	Skinner	L2DB5150	Solenoid Valve	1	R1-83	ND
120	Square D	QMB	Quick Break Fuse Discon- nect	2	T7-83	QL, R, DBA, all
121	Square D	Q0130H	Circuit Breaker	2	R10-83	ND
122	Square D	9055-B0-115	Current Relay	2	T7-83	ND
123	Square D	Q0T1515	Circuit Breaker	16	R10-83	ND
124	Square D	9001-KS-11-B-18	Key Operated Selector Switch	2	R10-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
125	Static-O-Ring	5N-AA3-X95PT 6NAA21	Pressure Switch	3	R10-83	ND
126	Static-O-Ring	6P3-K3M4C	Pressure Switch	8	T7-83	ND
127	Static-O-Ring	15R3-KYIC	Flow Switch	4	T7-83	ND
128	Target Rock	72 V	Solenoid Valve	10	T(8)	ND
129	Target Rock	7567 F	Solenoid Valve	15	T1-83	ND
130	Target Rock	78 U	Solenoid Valve	8	T1-83	ND
131	Target Rock	Position Switch of 72 V	Position Switch	12	T1-83	ND
132	Thermo Electric	Type K	Thermocouple	14	R10-83	ND
133	Thermo Electric	Type T	Thermocouple	26	R1-83	ND
134	Time-Trol	1182	Autotrans- former Assembly	2	T7-83	ND
135	Time-Trol	1066ZC3-125EX	SCR Power Controller	2	T7-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action ⁽²⁾ Plan	Deficiencies ⁽³⁾
136	United Electric	93	Temperature Switch	2	T5-83	ND
137	United Electric	J300K/455	Level Switch	8	T2-83	ND
138	Weed	601-1A-3-C-1-5-0-0	Resistance Temperature Detector	9	R10-83	QL, R
139	Weed	RTD-550-1669	Resistance Temperature Detector	2	T5-83	ND
140	Weidmuller	SAK (Melamine)	Terminal Blocks	2(9)	Qualified	Q
141	Weidmuller	SAK (Phenolic)	Terminal Blocks	1	T7-82	R
142	Westinghouse	ARB300VAC	Relay	22	T5-83	ND
143	Westinghouse	A200M2CAC, 1CAC	Motor Starter W/OL	4	R10-83	ND
144	Westinghouse	182T (SBDP)	Fan Motor	2	R10-83	ND
145	Westinghouse	05-2CH4-TBDP-MKB 05-15H4-TBDP-MKB	Fan Motor	5	R10-83	ND
146	Westinghouse	TBFC	Blower Motor 20 HP	2	R10-83	ND
147	Westinghouse	AF 73	Fan Motor	1	R10-83	ND

Page ⁽¹⁾	Manufacturer	Model	Description	No. of Items	Action Plan ⁽²⁾	Deficiencies ⁽³⁾
148	Westinghouse	MTA, MTC	Control Transformer	6	T7-83	ND
149	Westinghouse	A201K2CA A201KOCA	Power Contractor	4	R10-83	ND
150	Westinghouse	FB3010, FB3030 FB3060, FB3070	Circuit Breaker	8	T7-83	ND

(1) Page number refers to Volume III--Action Plans.

(2) Action Plan is designated by prescript, completion date, and postscript.

Prescript:

R = replace
T = test

Postscript:

R - radiation test only

(3) Deficiency designators: Caps = Utility stated deficiency, Lower Case = EG&G stated questionable area. A = aging, ND = no data, QL = qualified life not established, O/C = outside containment, DO = demonstrated operability, I/C = inside containment, RH = relative humidity, DBA = inadequate DBA, Q = qualified, R = radiation.

(4) One PIS number listed in Volume III not found in Volume II.

(5) Volume II summary sheets call this "Local Hi Flow Pump."

(6) Solenoid being disconnected. Signs being posted. Personnel Safety only.

(7) Model number listed as P28611CG15EZ on Vol. III Table of Contents and in Volume II summary sheets, listed as P26G11CG15EZ in Volume III, page 100.

(8) In Volume III test date is given as "Jan. 1, 198 ." From context, the assumed date is January 1, 1983.

(9) 1 PIS number listed in Volume III, 2 found in Volume II.

APPENDIX B
SUMMARIES OF CENTRAL FILE REVIEWS

APPENDIX B

SUMMARIES OF CENTRAL FILE REVIEWS

Item: Raychem Flamtrol Cable

PIS #2R340000400

This cable is used in the containment as part of the Plant Electrical System for emergency power.

The specified harsh environment for the cable is 340°F, 100% RH, 56.2 psig, 1.98×10^9 Rads total integrated dose, and demineralized water spray. The required operability under the harsh environment is 100 days.

The documentation file includes a draft "Interim Report of Flamtrol Thermal Aging Study," Raychem Lab Report 5058, dated February 1976, and "Tests of Raychem Thermofit Insulation Systems Under Simultaneous Exposure to Heat, Gamma Radiation, Steam and Chemical Spray While Electrically Energized," FRC report F-C4033-3, dated January 1975, and prepared for Raychem by the Franklin Institute Research Laboratories. While the latter report is written to primarily address the splices, the cable is identified and discussed. (Another report in this series, F-C4033-1, was written for the cables.)

The test parameters are 357°F and 70 psig with a steam atmosphere, chemical spray, and a total integrated dose of 2×10^8 Rads. Operability was demonstrated for 30 days and was extended by Arrhenius methodology to 100 days. A qualified life of 33 years was established by a 150°C, 168 hour aging test extended by Arrhenius method.

A comparison of the above data shows acceptable testing with the exception of radiation. The applicant had identified this as a deficiency and intends to perform testing to be completed by July 1, 1982. The reviewer agrees with the applicant's assessment of qualification status.

Item: Rockbestos Firewall III Single Conductor Cable PIS #2R340000000501

This cable is used in the containment for circuit continuity of Class 1E circuits in the Plant Electrical System.

The specified harsh environment for the cable is 340°F, 100% RH, 56.2 psig, demineralized water spray, and a total integrated dose of 1.98×10^9 Rads. The required operability time under the harsh environment is 100 days.

The documentation file includes two test reports, "Qualification of Firewall III Class 1E Electrical Cables," dated July 7, 1977 and having no report number, and "Qualification of Firewall III Class 1E Electrical Cables (Irradiation Cross-Linked Insulation)," dated May 1, 1981, Rockbestos report number QR 1806. These test reports only differ in the amount of post-LOCA operability demonstrated, either of which is satisfactory for this application. The demonstrated test parameters are 346°F, 113 psig, 100% RH,

chemical spray, and irradiation of 2×10^8 Rads. Operability was shown for 365 days.

A comparison of the above data shows acceptable testing with the exceptions of only 6°F temperature margin and insufficient radiation. The applicant intends to perform testing for radiation to be completed by July 1, 1982. The applicant has also shown that the temperature profiles have considerable margin and that both the required profiles and the test profiles maintain higher-than-calculated temperatures for longer times. The reviewer agrees with the applicant's assessment of this equipment.

Item: Weidmuller SAK (Melamine) Terminal Blocks

PIS #2R340000901002

These terminal blocks are used in the reactor building as part of the Plant Electrical System for emergency power.

The specified harsh environment for the terminal blocks is 130°F (LOCA), 137°F (HELB), 15% RH (LOCA), 100% RH (HELB), and 5.4×10^6 Rads total integrated dose. The required operability under the harsh environment is 100 days.

The documentation includes a Franklin Research Center test report, F-C4959, "Qualification Test Program for Terminal Blocks," dated October 1978. This report shows test parameters of 266°F, greater than 90% RH, and a total integrated dose of 2.2×10^8 Rads. By Arrhenius analysis the qualified life is 30 years and DBA operability is 100 days.

The test was a 168-hour test, designed as an aging test to achieve a qualified life of 40 years. The use of this test for both qualified life and DBA determination creates requirements for justification of methods in sequence selection, ramp time, and DBA monitoring. DBA testing prior to irradiation is acceptable due to the minor severity of the DBA environment when compared to the 79°F and 71% RH that are the normals. The ramp time is inconsequential because the tested components were directly exposed to the test environment while the terminal blocks in the plant are enclosed and the enclosure internal temperature will lag the atmospheric temperature. The terminal blocks are of simple construction and continuous monitoring of the electrical characteristics is not critical to this application.

The reviewer agrees with the applicant's assessment of this equipment.

Item: Weidmuller SAK (Phenolic) Terminal Blocks

PIS #2R340000901001

These terminal blocks are used in containment as part of the Plant Electrical System for emergency power.

The specified harsh environment for the terminal blocks is 340°F, 100% RH, 56.2 psig, 1.98×10^9 Rads total integrated dose, and demineralized water spray. The required operability time under the harsh environment is 100 days.

The documentation file includes a Franklin Research Center Test Report, "Qualification Test Program for Terminal Blocks," F-C5205-3, dated

October 1979. This report shows test parameters of 492°F, 113 psig, a steam environment, chemical spray, and a total integrated dose of 2×10^8 Rads. By Arrhenius analysis the qualified life is 39.4 years and the DBA operability demonstrated is 100 days. Qualification is dependent on protection from direct spray. Aging is based on 294°F for 168 hours.

A comparison of the above data shows acceptable testing with the exception of radiation. The applicant has identified this as a deficiency and intends to perform testing to be completed by July 1, 1982. It should be noted that, while there was no apparent degradation of the electrical characteristics, after the above irradiation from Cobalt-60 gamma, warping of the terminal blocks did occur. The applicant is aware of this and will carefully monitor the terminal blocks during the additional testing.

The reviewer agrees with the applicant's assessment of qualification status.

Item: ASCO Solenoid Valve (Model #NP8320A177E)

This unit is a pilot valve for air operated containment isolation valves in the Reactor Water Cleanup System outside the drywell. The harshest specified DBE environment for this location (zone 18) is 137°F and 100% R.H. at 0 psig with a total integrated radiation dose of 5.4×10^6 Rad. The required operability time is one minute.

The referenced file (EF2-052) included a Qualification Summary Report (QSR), Qualification Evaluation Report (QER), an Isomedix Test Report (#AQS21678/TR Rev. A), vendor correspondence, and the Arrhenius Analyses to extend qualified life and to normalize the tested to the required (FSAR) DBE profile. In addition, three questions were asked during the audit. Two of these were with regard to the tested valves being "identical to" or "similar to" the units to be installed. The QER and QSR indicate the valves are identical. The test reports show only that they are similar. The differences are in coil voltage, body material, and solenoid enclosure type. The organic materials used are the same in all cases and the installed solenoid enclosures are of a higher standard than were those tested. DECO has agreed to revise the QER and QSR to say the installed units are only similar to the tested units.

The third question was with regard to the derivation of the activation energy, ϕ , to be used in the analyses. In the analysis ϕ was derived from the 10°C rule. This was shown to be conservative in this case, and was, therefore, accepted. It should be noted that DECO has agreed to include the questions asked during the audit and the answers given as part of the central files. However, the affected analyses should be redone to reflect the proper ϕ and the source of the value used. The documentation presented plus the answers for the questions asked supported the applicant's statement of qualification of this item in the environment specified.

Item: ASCO Solenoid Valve (Model #NP832094E)

This unit is a pilot valve for air operated containment isolation valves in the Reactor Water Recirculation System inside the drywell

(zone 22). The most severe environment postulated for this location is a LOCA with extremes of 340°F, demineralized water spray, 100% R.H., and 56.2 psig with a required integrated radiation dose of 1.98×10^9 Rads (Beta + Gamma), 1.49×10^8 Rads (Gamma). The operability time required is six hours.

The referenced file (EF2-052) is the same as that which was reviewed for the ASCO NP8320A177E valve. Therefore, the discussion of the files presented herein for that unit also applies to this valve.

The reviewers agree with the conclusions drawn by the applicant; i.e. the valve is not qualified for use in the drywell due the required radiation levels.

Item: Okonite Cable (Type: Okonite Okolon)

This cable type is used in the Plant Electrical System in motor control centers and distribution cabinets and in the drywell. The DBE environment specified for zone 19 outside the drywell is 137°F and 100% R.H. at 0 psig with a total integrated radiation dose of 5.4×10^6 Rad. The LOCA environment for inside the drywell (zone 22) is 340°F, demineralized water spray, 100% R.H. at 56.2 psig and a total integrated radiation dose of 1.98×10^9 Rads (Beta + Gamma), 1.49×10^8 Rads (Gamma). The operability time required for this cable in both locations is 100 days.

The referenced file (EF2-082) contained a QSR, QER, a complete Okonite test report (unnumbered), vendor communication records and Arrhenius Analyses to extend qualified life and to normalize the tested to the required (FSAR) DBE profile. During the audit of this file two questions were asked and two comments were made. All questions and comments were answered and the answers will be included in the DECO central files. The questions were in regard to the meaning of the terms "Okolon" and "Okoprene." DECO state that "Okolon" is a unique identifier for chloro-sulfonated polyethylene cable jackets, whereas "Okoprene" is the trade name for neoprene jackets. The comments were in regard to the incorrect transfer of information between the test report, the QER, and the summary sheets. DECO stated that the errors will be corrected.

We agree with the conclusions drawn by the applicant. That is:

- a) The Okonite Okolon cable is qualified for use in zone 19 outside the drywell, and
- b) The Okonite Okolon cable is not qualified for use inside the drywell due to the required radiation levels.

Item: General Electric Cable (Flame-Resistant Vulkene)

This cable type is used in the drywell (zone 22) as part of the Plant Electrical Wire and Cable System. The DBE environment for zone 22 is 340°F, demineralized water spray, and 100% R.H. at 56.2 psig with a total integrated radiation dose of 1.98×10^9 Rad (Beta + Gamma), 1.48×10^8 Rads (Gamma). The operability time required is 100 days.

The file reviewed (EF2-085) included a QSR, QER, Test Report (#F-C 4497-2), vendor correspondence, and the Arrhenius Analyses to extend qualified life and to normalize the tested to the required (FSAR) DBE profiles. The file stated that "Flame-Resistant Vulkene" was not commercially sold and that the correct name is "Non-Chlorinated Flame-Resistant Vulkene" (NCFR). DECO was asked to verify that the installed cable was actually NCFR Vulkene, because this name was not used for the equipment summary sheets. DECO answered that neither of the two types of cable has been purchased for Fermi 2. It was included in the submittal because authorization to use this cable has been given. When, and if, such cable is purchased, DECO will obtain the correct name and update the files and summary sheets accordingly. The documentation presented plus the answers to the questions asked during the audit support the applicant's position that this cable is not qualified for use in the drywell due to the radiation levels required.

Item: General Electric Cable (Vulkene Supreme)

This cable type is used in the drywell (zone 22) as part of the plant electrical wire and cable system. The DBE environment for zone 22 is 340°F, demineralized water spray, and 100% R.H. at 56.2 psig with a total integrated radiation dose of 1.98×10^9 Rads (Beta + Gamma), 1.48×10^8 Rads (Gamma). The operability time required is 100 days.

The file reviewed (EF2-084) included a QSR, QER, Test Report (#F-C 5285-1), vendor correspondence, and the Arrhenius Analyses to extend qualified life and to normalize the tested to the required (FSAR) DBE profiles. The documentation presented and reviewed supported the applicant's contention that this cable type is not qualified for use in the drywell due to the radiation levels required.