VIRGINIA ELECTRIC AND POWER COMPANY

RICHMOND, VIRGINIA 23261

July 2, 1979

Norman C. Moseley, Director
Division of Reactor Operations Inspection
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Serial No. 90A
PO/DLB:baw
Docket No.: 50-338
License No.: NF -4

Subject: IE Bulletin 79-01
North Anna Power Station Unit No. 1

Dear Mr. Moseley:

This letter is in response to IE Bulletin 79-01, "Environmental Qualification of Class IE Equipment."

In response to IE Bulletin 79-01, we directed our architect-engineer (A-E) and our NSSS supplier to review the environmental qualification of all class IE electrical equipment at North Anna Units No. 1 and 2.

This review by our A-E has been completed for Unit No. 1. Results are included as Table 1, which contains all class IE equipment, both safety related and non-safety related, that was procured by the A-E.

Only two potential qualification problems have been identified:

1. Chiller Equipment
The chiller equipment room contains control and relay room air conditioning equipment. The chiller equipment room is located adjacent to the turbine building and has a ventilation duct which is open to the turbine building. Under a postulated condition such that a steam line break in the turbine building directs a jet of steam directly into the area of the ventilation duct, the temperature in the chiller equipment room could reach 211°F. We have no information indicating qualification of the chiller equipment under these conditions. Chiller equipment affected is listed on pages 1, 2, 3 and 10 of Table 1.

2. Safeguards Building Ventilation Fans
The emergency ventilation fans located in the safeguards building, designed as seismic Class I, are provided for ventilation of the recirculation spray and safety injection pumps area in the unlikely event the ventilation exhaust system is disabled. The ventilation exhaust system is run by two seismic Class I fans located in the auxiliary building and has the capability of diverting the effluent through the common iodine filter bank. Ventilation is designed to limit temperatures during warm weather to a maximum of 120°F and

during cool weather to a minimum of 75°F. The spaces containing the recirculating spray and safety injection pumps and their valve rooms are subject to potential radioactive contamination from plant leakage. Our A-E has estimated that under accident conditions the radiation dose to the emergency ventilation fans could reach approximately 10^{6} rads. We have no information on the qualification of these fans to such a radiation exposure.

We will continue to pursue qualification or an alternate resolution of these two outstanding items and will inform you of our actions on or about July 31, 1979.

Qualification data for safety-related equipment provided by the NSSS vendor are included in documents which have previously been submitted to the NRC as vendor proprietary. In many cases the non-proprietary versions of these documents which we have received are not sufficiently detailed to determine qualification. We have made arrangements to receive more detailed documents and will forward qualification data in a subsequent submittal on or about July 31, 1979.

IE Bulletin 79-01A was received following the final preparation of the attachment. Several ASCO solenoid valves previously identified as not qualified have been replaced or will be replaced as soon as possible. These valves were located in the RCS sampling system. Our letter, serial no. 466, dated June 14, 1979, and addressed to Mr. Victor Stello provides additional information.

Very truly yours,

C. M. Stallings

C. M. Stallings
Vice President-Power Supply
and Production Operations

cc: James P. O'Reilly, Director
Office of Inspection and Enforcement
Region II

North Anna Power Station Unit No. 1
Environmental Qualification of A-E Supplied
Class 1E Equipment

Table 1

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
ntrol & Relay Room A/C Chillers st.nghouse; 1-HV-E--A,B,C; D. MA-247; located in chiller room.	MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	None	None	None
-ling Pumps - Air Conditioning Bingham-Willamette Company; HV-P-20A,B,C; 1-HV-P-21A,B,C; O. MA-276; located in Chiller Room.	MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	None	None	None

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
Air Conditioning Self-Cleaning Strainers - Elliot Company; 1-HV-S-1A,B; P.O. NA-[illegible]; located in Chiller Room.	MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	None	None	None
Propeller Fan - Aerovent Fan Company, Incorporated; 1-HV-F-24; P.O. NA-241; located in Chiller Room.	MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	1. High ambient temperature 211°F at saturated atmosphere	Vendor's reply to TLX inquiry	TLX-3-29-79 - W. B. Shumacher & J. E. Krechting

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
tor Operated Valves - Fisher vernor Company - Continental vision - Field P.O. - Natkin 88514-2008, located in charcoal filter rt from Chiller Room.	MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	None	None	None
art of automatic strainer sembly)				

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
. KK-255/1255 V alum. power cable neral Cable) -3 Triplex 1000 MCM -4 3/c 500 MCM alum. armor -6 3/c 1250 MCM alum. armor -5 3/c 1250 MCM st. armor -10 1/c 2000 MCM -12 3/c 1000 MCM alum. armor -13 3/c 4/0 AWG. alum armor -14 Triplex 4/0 AWG. -9 1/c 1500 MCM	Loss of Coolant Accident (LOCA) Radiation: 1 x 10⁸ rads (based on 6 months LOCA). In addition the 40 year radiation dose of 4 x 10⁴ rads must be considered for a total possible radiation dose of 1.04 x 10⁸ rads.	2 x 10⁸ rads	Test	General Cable Letter dated 12-22-71

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. MA-256/1256 600 V Alum. Power Cable (General Cable) MCB-5 Triplex 500 MCM MCB-7 Triplex 250 MCM MCB-11 Triplex 2/0 AWG. MCB-12 Triplex 1 AWG.	Loss-of-Coolant Accident (LOCA) 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10^7 rads Spray: 0-4 hrs. Solution of boric acid (2000-2900 ppm boron) buffered to a pH of 8.5 to 11 with NaOH. >4 hrs similar solution with a pH of 7 to 9	Loss-of-Coolant Accident (LOCA) Irradiated to .55 x 10^8 rads 900 psig & 340°F for 4 hrs 62 psig & 310°F for 1 hr 20 psig & 260°F for 43 hrs 2.5 psig & 260°F for 5 days Spray: Throughout test cycle solution consisting of a 2000 ppm solution of boron as boric acid buffered with H_2OH to a pH of 9.0 Irradiated an additional 1.45 x 10^8 rads bringing the total exposure to 2 x 10^8 rads	Test - Sequential	General Cable Letter dated 12-22-71

Equipment Description & Mark. No.		Description of Accident Environment	Environment to Which Equip. is Qualified	Manner of Qualificat on	Qualification Document
P.O. NA-128/1128 600 V Cu. Power Cable Okonite		Loss-of-Coolant Accident (LOCA)	Loss-of-Coolant Accident (LOCA)	Test - Sequential	Okonite's Engineering Report No. 141 dated 2/29/72 Additional Supporting Documents Outline of Franklin Institute Research Laboratory report F-C3694 IEEE Transaction Paper T 74 048 4
MCA-20	1/c 250 MCM	288°F	8 to 30 Min		
MCA-21	1/c 2/0 AWG	Reduce from 280°F to 150°F	30 to 60 Min		
MCB-15	Triplex #4 AWG	150°F	>60 Min		
MCB-16	Triplex #6 AWG	45 psig	8 to 30 Min		
MCB-17	3/c #8 AWG	Reduce from 45 to 0 psig	30 to 60 Min		
MCB-18	3/c #10 AWG	0 psig	>60 Min		
MCA-19	3/c #12 AWG	7.2 x 10⁷ rads			
		Spray: 0-4 hr Solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH >4 hr Similar solution with a pH of 7 to 9	Aged 168 hr @ 121°C Irradiated to 2 x 10⁸ rads PWR exposure: 80 psig @ 324°F For 4 hr 16 psig @ 252°F For 7 days Spray: 10,000 ppm boric acid Buffered with NaOH to a pH of 10.5 throughout the PWR exposure period Boiling Water Reactor Exposure (BWR) A series of transient cycles each consisting of a rise to a specified press and temp for a specified time and a gradual return to initial conditions. Following transient cycles 100 day exposure to live steam 0 psig, 212°F BWR exposure includes a transient cycle at 104 psig at 345°F for 3 hours and 20 min.		
		Main Steam Line Break (MSLB) 430°F 0 to 2 Min 280°F 2 to 60 Min 141°F >60 Min 40 psig 0 to 60 Min 0 psig >60 Min 3 x 10⁷ rads	MSLB Same as "Description of Accident Environment"	Test - Analysis Maximum calculated surface temperature during limiting MSLB is 335°F which does not exceed qualification temperature of 345°F given in BWR exposure portion of LOCA qualification. Pressure and Radiation - Test Refer to LOCA qualification.	MSLB Qualification Documents FSAR Section 3C and response to Comment 7.17 (Note to be revised to include this item).

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA-359/1359 High Temperature Cable Cerro Wire and Cable Company MCA-15 Triplex 250 MCM MCA-17 Triplex #2/0 AWG MCA-33 4/c 2-#8 and 4-#12 MCA-61 7/c #12 AWG MCB-36 4/c #16 AWG MCB-37 2/c #8 AWG	Loss of Coolant Accident (LOCA) 280°F 0 to 30 Min Reduce from 280°F to 150°F 30 to 60 Min 150°F >60 Min 65 psig 0 to 30 Min Reduce from 65 to 0 psig 30 to 60 Min 0 psig >60 Min 7.2 x 10^7 rads Spray: 0-4 hr Solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH >4 hr Similar solution with a pH of 7 to 9 MSLB 430°F 0 to 2 Min 280°F 2 to 60 Min 165°F >60 Min 60 psig 0 to 60 Min 0 psig >60 Min 3 x 10^7 rads	LOCA Irradiated to 2 x 10^8 rads 50 psig and 276°F 12 hr Spray: Last 2 hr of 12 hr period with a solution of borated water containing approximately 1,720 ppm of boron as boric acid Reduced to 5 psig and 164°F over an unspecified time with spray continuing 164°F at 5 psig for the remainder of the 7 day period without spray F-C 750 indicates that in an earlier test the spray was buffered with NaOH to ph of 9 MSLB Same as "Description of Accident Environment"	Test - Sequential Temperature - Analysis Maximum calculated surface temperature during limiting MSLB is 335°F which does not exceed qualification temperature of 460°F given in Rockbestos' (formerly Cerro) letter dated 4/25/77 Pressure and Radiation - Test Refer to LOCA Qualification	Franklin Institute Research Laboratory Report F-C2857 Cerro's Supplement to F.I.R.L. Report F-C2857 Franklin Institute Research Laboratory Report F-C2750 Cerro's Supplement to F.I.R.L. Report F-C2750 FSAR Section 3C and response to Comment 7.17 Rockbesto's letter dated 4/25/77 LOCA qualification documents

Equipment Description & Mark No.		Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA-312/1312 600 V Control Cable Cerro Wire and Cable Company)		Loss of Coolant Accident (LOCA)	LOCA	Test - Sequential	Franklin Institute Research Laboratory Report F-C2857 Cerro's Supplement to F.I.R.L. Report F-C2857
MCA-33	2/c #2 AWG	280°F	Irradiated to 2 x 10^8 rads		
MCA-34	1/c #14 AWG	Reduce from 280°F to 150°F	50 psig and 276°F 12 hr		
MCA-35	2/c #14 AWG	150°F	Spray: Last 2 hr of 12 hr period with a solution of borated water containing approximately 1,720 ppm of boron as boric acid		
MCA-36	3/c #14 AWG	45 psig			
MCA-37	5/c #16 AWG	Reduce from 45 to 0 psig	Reduce to 5 psig and 164°F over an unspecified time with spray continued		
MCA-38	7/c #16 AWG	0 psig			
MCA-39	9/c #14 AWG	7.2 x 10^7 rads	160°F at 5 psig for the remainder of the 7 day period with no spray		
MCA-40	12/c #14 AWG	Spray:			
MCA-44	1/c #12 AWG	0-4 hrs Solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH			
MCA-45	2/c #12 AWG				
MCA-47	4/c #12 AWG	>4 hr similar solution with a pH of 7 to 9			
MCA-49	7/c #12 AWG				
MCA-57	4/c #10 AWG	MSLB	MSLB		
MCA-77	4/c #10 AWG	430°F 0 to 2 Min	Thermally aged for 1300 hrs @ 150°C. Irradiated at a rate 0.30 x 10^6 rads per hr for total dose of 1.01 x 10^8 rad.	Test - Sequential	Rockbestos Company Report 13-10407-EQS8-13-2 Test was performed on cable of a similar construction as that supplied in P.O. NA-312 and 1312
MCB-43	2/c #8 AWG	290°F 2 to 60 Min			
MCB-44	2/c #6 AWG	165°F >60 Min	Spray: Solution of 6,000 ppm Boron and hydrazine solution maintain at a pH value of between 8.6 and 10.0 for 349 hrs.		
MCB-45	4/c #6 AWG	40 psig 0 to 60 Min			
		0 psig >60 Min	376°F @ 58 psig 0 to 13 min		
		3 x 10^7 rads	376°F @ 62 psig 13 to 15 min		
			366°F @ 62 psig 15 to 20 min		
			337°F @ 60 psig 20 to 25 min		
			327°F @ 60 psig 25 min to 3.6 hrs		
			Reduce from 327°F @ 60 psig to 242°F @ 12 psig 3.6 to 349. hrs		

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA-265/1265 300 V Instrument Cable (Boston Insulated Wire and Cable) ~~NGA-40~~ 4/c No. 14 AWG NGA-55 45/c No. 14 AWG NGA-67 19/c No. 14 AWG NGA-68 12/c No. 14 AWG NGA-69 2/c No. 14 AWG NGA-70 18/c No. 14 AWG NGB-35 2/c No. 14 AWG NGB-39 3/c No. 14 AWG	LOCA 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10^7 rads Spray: 0-4 hrs solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH >4 hrs similiar solution with a pH of 7 to 9	LOCA Irradiated to 1 x 10^8 rads 280°F at 45 psig 60 min 205°F at 0 psig 24 hrs Spray: Throughout 25 hr period Solution of 0.20 molar boron as boric acid with the pH adjusted to 8-8.5 with a 0.019 molar solution of NaOH	Test - Sequential	B.I.W. Letters dated 1-17-72 12-14-71
	Main Steam Line Break (MSLB) 430°F 0 to 2 min 280°F 2 to 60 min 145°F >60 min 60 psig 0 to 60 min 0 psig >60 min 1 x 10^7 rads	MSLB Same as "Description of Accident Environment"	Temperature - Analysis Maximum calculated surface temperature during limiting MSLB is 343°F which does not exceed qualification temperature of 460°F given in B.I.W. letter dated 10-12-76. Pressure and Radiation - Test refer to LOCA qualification	FSAR Section 3C and response to comment 7.17 B.I.W. letter dated 10-12-76 LOCA Qualification documents

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. MA-252 Thermocouple Extension Wire (Cerro Wire and Cable) MCB-68 1 pair No. 16 Copper-Constantan MCB-69 1 pair No. 16 Iron-Constantan	Loss of Coolant Accident (LOCA) 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10^7 rads Spray: 0-4 hrs Solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH >4 hrs similar solution with a pH of 7 to 9	LOCA Irradiated to 2 x 10^8 rads 50 psig at 276°F 12 hrs Spray: Last 2 hrs of 12 hr period solution of borated water containing approximately 1720 ppm of boron as boric acid Reduce to 5 psig and 164°F over an unspecified time with spray continued. 160°F at 5 psig for the remainder of 7 day period without spray. F-C2750 indicates that in an earlier test the spray was buffered with NaOH to a pH of 9	Test - Sequential	Franklin Institue Research Laboratory Report F-C2857 Cerro's Supplement to F.I.R.L. Report F-C2857 Franklin Institute Research Laboratory Report F-C2750 Cerro's Supplement to F.I.R.L. Report F-C2750

Equipment Description & Mark No.		Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA-375/1375 5 Kv Alum. Power Cable (Okonite)		Radiation		Test	Okonite's Engineering Report No. 181 dated 2/29/72 Additional Supporting Documents Outline of Franklin Institute Research Laboratory Report F-C3694 IEEE Transaction Paper T74 044 6
NGA-6	3/c 500 MCM	4.2 x 10^7 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 3 x 10^7 rads must be considered for a total possible radiation dose 7.2 x 10^7 rads.	3 x 10^8 rads		
NGA-12	3/c 1000 MCM				
NLA-3	Triple 1000 MCM				
NLA-13	3/c #4/0 AWG				

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. MA-)84/1384 600 V Aluminum Power Cable Okonite MCB-5 Triplex 500 MCM MCB-7 Triplex 250 MCM MCB-11 Triplex #2/0 AWG. MCB-12 Triplex #1 AWG.	Loss-of-Coolant Accident (LOCA) 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10^7 rads Spray: 0-4 hr Solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH. >4 hr Similar solution with a pH of 7 to 9.	LOCA Aged 168 hr at 121°C Irradiated to 2 x 10^8 rads PWR Exposure: 324°F at 80 psig 0 to 4 hr 252°F at 16 psig for 7 days Spray: 10,000 ppm boric acid buffered with NaOH to a pH of 10.5 throughout the PWR exposure period. Boiling Water Reactor Exposure: A series of transient cycles each consisting of a rise to a specified pressure and temperature for a specified time and a gradual return to intial condition. Following transient cycles 100 day exposure to live steam @ 45 psig @ 212°F.	Test - Sequential	Okonite's Engineering Report No. 141 dated February 29, 1972 Additional supporting Documents Outline of Franklin Institute Research Laboratory Report F-C3694 IEEE Transaction Paper T 72 044 4

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. CA-392/1392 300 V Instrument Cable (Cerro Wire and Cable) MCA-67 19/c No. 16 AWG. MCA-68 12/c No. 16 AWG. MCA-70 18/c No. 16 AWG. MCB-35 2/c No. 16 AWG. MCB-39 3/c No. 16 AWG.	LOCA 280°F 0 to 30 min. Reduce from 280°F to 150°F 30 to 60 min. 150°F >60 min. 45 psig 0 to 30 min. Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10^7 rads Spray: 0-4 hrs solution of boric acid (2000-2100 ppm boron) buffered to pH of 8.5 to 11 with NaOH >4 hrs similar solution with a pH of 7 to 9 MSLB 430°F 0 to 2 min 280°F 2 to 60 min 145°F >60 min 40 psig 0 to 60 min 0 psig >60 min 3 x 10^7 rads	LOCA Aged 1300 hrs. @ 150°C Irradiated to 2 x 10^8 rads 280°F @ 70 psig 0 to 10 sec rise to 346°F @ 10 sec to 5 min 913 psig 346°F @ 113 psig Reduce to 340°F 5 min to 3 hr 280°F @ 70 psig 5 hr to 5 hr & 10 sec Rise to 346°F 5 hr + 10 sec to 5 hr + 5 min 346°F @ 113 psig 5 hr & 5 min to 8 hrs 335°F @ 93 psig 8 hr to 11 hr 315°F @ 69 psig 11 hr to 15 hr 265°F @ 28 psig 15 hr to 4 day 212°F @ 0 psig 4 day to 30 day Spray: 1st 24 hrs of 30 day period - solution of the following composition 0.2% molar H_3BO_3 0.06% molar $Na_2B_4O_7$ NaOH to make pH between 9-11 Following above 30 day LOCA period and additional period of 100 day at 200°F. MSLB Same as "Description of Accident Environment"	Test - Sequential Temperature - Analysis Maximum calculated surface temperature during limiting MSLB is 343° which does not exceed qualification temperature of 460° given in Rockbestos (formerly Cerro) letter dated 4-25-77 Pressure and Radiation - Test Refer to LOCA Qualification	Rockbestos (formerly Cerro) Letter dated 2-21-75 and its attached report FSAR Section 3C and response to comment 7.17 Rockbestos letter dated 4-25-77 LOCA qualification document

Equipment Description & Mark. No.		Description of Accident Environment		Environment to which Equip. is Qualified		Manner of Qualification	Qualification Document
P.O. NA-608/[illegible] Thermocouple Extension Wire Boston Insulated Wire & Cable		Loss-of-Coolant Accident (LOCA)		LOCA		Test - Sequential	B.I.W. letters dated: 2-7-75 1-17-72 12-14-71
MCB-68	1 pair #16 copper-constantan	280°F	0 to 30 Min	Irradiated to 1 x 10⁸ rads			
		Reduce from 280°F to 150°F	30 to 60 Min	280°F at 45 psig	60 min		
		150°F	>60 Min	205°F at 0 psig	24 hrs		
		Reduce from 45 to 0 psig	30 to 60 Min	Solution of 0.20 molar boron as boric acid with the pH adjusted to 8-8.5 with a 0.019 molar solution of NaOH for 25 hr period.			
		0 psig	>60 Min				
		7.2 x 10⁷ rads					
		Spray:					
		0-4 hrs Solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH					
		>4 hr Similar solution with a pH of 7 to 9					

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. MA-422/1922 Triaxial Cable (Boston Insulated Wire & Cable) MCA-72 Triax	Loss-of-Coolant Accident (LOCA) 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10⁷ rads Spray: 0-4 hr. Solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH. >4 hr Similar solution with a pH of 7 to 9.	LOCA Irradiated to 2 x 10⁸ rads 300°F & 60 psig 0 to 15 min Reduce to 252°F & 16 psig 15 to 45 min 252°F & 16 psig 45 min to 13 day Spray: Throughout 13 day period. A solution of 2,000 ppm boric acid buffered to a pH of 8 to 8.5 with NaOH. Following above, an additional 17 days exposure to 200°F & 0 psig.	Test - Sequential	B.I.W.'s Engineering Comments No. 26665-EP Rev. 4 (specifically Test No. 75C008)

ent Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
a-804/1404 Cu. Power Cable-Heat Tracing (e)	Loss-of-Coolant Accident (LOCA)	LOCA	Test - Sequential	Franklin Institute Research Laborat Report F-C3694
2/C #10 AWG	280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10⁷ rads Spray: 0-4 hr Solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH. >4 hr Similar solution with a pH of 7 to 9.	Aged 14 days at 250°F Irradiated to .5 x 10⁸ rads and aged at 240°F for 7 days For 31 day period 280°F/70 psig 0 to 10 sec Rise to 346°F/ 113 psig 10 sec to 5 min 346°F/113 psig 5 min to 3 hr Reduce to 340°F 3 hr to 5 hr 280°F/70 psig 5 hr to 5 hr and 10 sec Rise to 346°F/ 113 psig 5 hr and 10 sec to 5 hr and 5 min 346°F/113 psig 5 hr and 5 min to 8 hr 335°F/95 psig 8 hr to 11 hr 315°F/69 psig 11 hr to 15 hr 265°F/28 psig 15 hr to 4 day 212°F/0 psig 4 day to 31 day Spray: Continuously for 31 day period solution of 2,000 ppm boron as boric acid buffered with NaOH to a pH to 9-11. Irradiated to 1.5 x 10⁸ rads during the 31 day period. Total 2 x 10⁸ rads		Additional Supporting Data IEEE Transaction Paper T 74 044 04

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
Motor Operated Valves - Elliot Company: 1-HOV-HV-115-1, 2 1-HOV-HV-116-1, 2; P.O. NA-299; located in Chiller Room as components of self-cleaning strainers.	MSLB in turbine bldg. Equipment in Chiller Room exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	None	None	None
Chiller Room Sump Pumps - Johnston Pump Company: 1-DB-P-10A, 03; P.O. NA-421; locat 1 in Chiller Room.	MSLB in turbine bldg. Equipment in chiller room exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes 30 minutes. 2. High ambient moisture content-saturated steam, 100% RH for duration of steam discharge - 30 minutes.	1. High ambient temperature 211°F at saturated atmosphere	Vendor reply to TLX inquiry	TLX 3-28-79 - John Anderson to J. E. Krechting

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
Centrifugal Fans - Buffalo Forge Co., P.O. NA-294 1. 1-HV-F-40A,B located in Auxiliary Bldg., El. 291'-10" Axial Flow Fans - Joy Mfg. Co., P.O. No. NA-201: 1-HV-F-71A,B located in Safeguards Bldg., El. 247'-6"	LOCA - Fan motors exposed to: 1. Radiation Zone IV 40 yr dose + LOCA dose = 880 + 160 = 1040 rads LOCA - Fan motors exposed to: 1. Radiation 40 yr dose - 1 x 10^8 rads	Radiation Dose of 7 x 10^8 rads None	Vendor's reply to TLX inquiry None	TLX-3-29-79 - W. B. Shumacher J. E. Krechting None

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA 333/7333 Reactor Containment Electrical Penetration - CONAX Connectron Inc. No. W533 Polysulfone Terminal Blocks	**Loss-of-Coolant Accident (LOCA)** 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10^7 rads Spray = 0 to 4 hours / ion of boric acid (2000-2100 ppm '· buffered to a pH of 8.5 to 11.0 with NaOH. Beyond 4 hours similar solutio with a 7 to 9. **Main Steam Line Break (MSLB)** 430°F 0 to 2 min 280°F 2 to 60 min 165°F >60 min 40 psig 0 to 60 min 0 psig >60 min 3 x 10^7 rads	LOCA Radiation: 2.5 x 10^7 rads minimum 253°F & 25 psig 0 to 30 sec 282°F & 45 psig 30 to 60 sec 285°F & 45 psig 60 to 90 sec 298°F & 57.5 psig 90 to 120 sec 282° & 46 psig 2.5 to 4 min 289°F & 49 psig 4 to 5 min 300°F & 56 psig 5 to 10 min 293°F & 47 psig 10 to 15 min 287°F & 47 psig 15 to 30 min Range Thermo aging 300°F for 74 hr Spray: Solution boron 3,900 ppm Buffered to 7.7 pH at a +190°F, 10 gpm for 30 min. 340°F & 0 psig For 240 hr	Test	Conax Corp. Test Report IPS-107

...ment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
...ification NAS-90-22 . No. MA-..3 ...l Transmitters ...RS151A and B	**Loss-of-Coolant Accident (LOCA)** 280°F 0 to 30 min Reduce from 280°F to 150°F 30 to 60 min 150°F >60 min 45 psig 0 to 30 min Reduce from 45 to 0 psig 30 to 60 min 0 psig >60 min 7.2 x 10⁷ rads Spray = 0 to 4 hours solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11.0 with NaOH. Beyond 4 hours similar solution with a 7 to 9. **Main Steam Line Break (MSLB)** 430°F 0 to 2 min 280°F 2 to 60 min 165°F >60 min 40 psig 0 to 60 min 0 psig >60 min 3 x 10⁷ rads	**LOCA** 282±1°F 0 to 60 min 280>150°F 60 to 180 min 150°F 180 min to 14 days 45 psig 0 to 60 min 45>0 psig 60 to 150 min 13.5 psia 150 min to 14 [illegible] Radiation Exposure 2 x 10⁸ rads Spray = 15,000 ppm boric acid buffered to a pH of 10.5 with NaOH solution for 4 hours. Spray density = 0.15 gpm per ft². **MSLB** As above	Test - Sequential Radiation and Environmental Exposure. Spray Exposure performed on a separate instrument	Franklin Institute Research Laboratories (FIRL) Report F-C3834 Isomedix Inc. Test Report dated Nov. 1975

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Equipment Description & Part No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
NAMCO Model EA-180 Limit Switches Located on the following Control Valves TV-BD 100B, D, F CC 101B CC 102B, D, F CC 105A, B, C DA 100B DG 100B RM 100C VG 100B SS 100A SS 101A SS 102A SS 104A SS 106A SS 112A	Loss-of-Coolant Accident (LOCA) 280°F — 0 to 30 min Reduce from 280°F to 150°F — 30 to 60 min 150°F — >60 min 45 psig — 0 to 30 min Reduce from 45 to 0 psig — 30 to 60 min 0 psig — >60 min 7.2 x 10^7 rads Spray: 0-4 hrs solution of boric acid (2000-2100 ppm boron) buffered a pH of 8.5 to 11 with NaOH > hrs similar solution with a pH of 7 to 9 Main Steam Line Break (MSLB) 430°F — 0 to 2 min 280°F — 2 to 60 min 165°F — >60 min 80 psig — 0 to 60 min 0 psig — >60 min 3 x 10^7 rads	LOCA Heat aging @ 200°F for 200 hrs mechanical aging 100,000 cycles under electrical load 340°F — 0 to 3 hrs Reduce from 340°F to 120°F — 3 to 5 hrs SEQUENCE REPEATED 250°F — to 3.5 days 200°F — 3.5 to 30 days 70 psi — 0 to 8 hrs 30 psi — 8 hrs to 30 days Radiation Exposure 2.0# x 10^8 rads Spray: Boric acid and water buffered to a pH of 10-11 with NaOH solution for 4 days, water spray for 26 days spray density = .015 gpm/ft. MSLB Maximum surface temperature is 285°F per ESG calculation #1712-ES-197-0 dated 3-16-78 and is well below qualification temperature Radiation Exposure see LOCA Test.	Sequential Test - Heat Aging Mechanical Aging Radiation Exposure Seismic Testing LOCA Test MSLB Calculation	Report Entitled: *Qualification of NAMCO controls limit switch Mode EA-180 to IEEE Standards 344 (*75) 323 (*74) and 382 (*72)* dated 3-3-78 and revised 4-7-78 ESG Calculation #1712-ES-197-0 dated 3-16-78

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. KA-176/5176 Motor control Centers (Klockner Moeller) MCC-1N1-2N MCC-1N1-2S MCC-1J1-2N MCC-1J1-2S	Loss of Coolant Accident (LOCA) Radiation: 1 x 10⁸ rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10⁴ rads must be considered for a total possible radiation dose of 1.04 x 10⁸ rads.	Minimum total integrated doses of 1.8 x 10⁸ rads of gamma source radiation.	Test	Klockner-Moeller letter dated 3/14/79

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
Motor Operated Valves				
...Mo. 0194 (Flanged & Wafer Type Butterfly Valves)	Loss-of-Coolant Accident (LOCA)			
...SW-108A, B (Component Cooling ...t Exchanger Iso.) ...x Bldg Tunnel Area)	Radiation: 1 x 10^4 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10^4 rads must be considered for a total possible radiation dose of 1.04 x 10^4 rads.	Radiation Level: 40 yr integrated - 3 x 10^7 rads	2.0 x 10^7 rads gamma radiation at Isomedix, Inc. Parsippany, NJ	Limitorque Report No. B0003
...SW-111A, B (Fuel Pool Cooler ...lation) ...x Bldg Lower Level)				
...No. 024. (S.S. Valves 2 1/2" ...larger) ...-103A, B, C, D (Containment ...)	Radiation: 1 x 10^4 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10^4 rads must be considered for a total possible radiation dose of 1.04 x 10^4 rads.	40 yr integrated - 3 x 10^7 rads	Same as above	Limitorque Report No. B0003
...RE-155A, B (Containment Iso. ...tion				
...RS-156A, B (Containment Iso. ...tion)			Unknown	Letter from Vendor C. Bell (GI March 10, 1979
...Motors				
...No. 0127 (Recirculation Spray ...ps) ...-2A, B	Radiation: 1 x 10^4 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10^4 rads must be considered for a total possible radiation dose of 1.04 x 10^4 rads.	Radiation Level 10^4 rads		

Equipment Description & Mark No.

P.O. NA-313/1313
Reactor Containment Electrical Penetrations - Conax

Item 1 of 2

Penetration Assemblies

Type IA - Instrumentation
IB - Control
IC, IIA, IIB, IIC, IID and IIE - Low Voltage Power
III - Triaxial
IV - Thermocouples

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)

280°F	0 to 30 min
Reduce from 280°F to 150°F	30 to 60 min
150°F	>60 min
45 psig	0 to 30 min
Reduce from 45 to 0 psig	30 to 60 min
4.2 x 10^7 rads	

Spray:
0-4 hrs solution of boric acid (2,000-2,100 PPM boron) buffered to a pH of 8.5 to 11.0 with NaOH beyond 4 hrs similar solution with a pH of 7 to 9.

Environment to Which Equip. Is Qualified

Chemical Spray - From 0-30 min. No chemical spray was introduced from 30 min to 10 days assembly was subjected to spray solution:
Boron content was .23 molar as H_3BO_3
NaOH = 10^{-4} to 4 x 10^{-2} molar
pH = 5.0 to 8.0

Pressure and Temperature

Pressure >45 psig & >280°F	0 to 30 Min
Decrease from 45 psig to 0 psig and 280°F to 245°F	0 To 30 Min
150°F + 20°F & 0 psig - 4°F	30 To 60 Min 1 hr to 10 days

Radiation

1 x 10^8 rads gamma radiation minimum

Manner of Qualification

Penetration assemblies were tested by using a prototype with characteristics pertinent to each individual type. This was first exposed to radiation then pressure and temperature and finally chemical spray.

Qualification Document

Conax report "Maximum Emergency Environmental Test Report for Electrical Penetration Assemblies" No. IPS-73.4 dated 5/13/75

Radiation Test Almaraz service test conax report IPS-137.

Equipment Description & Mark No.

Item 2 of 2

Splices (Field and Factory)

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)

280°F	0 to 30 min
Reduce from 280°F to 150°F	30 to 60 min
150°F	>60 min
45 psig	0 to 30 min
Reduce from 45 to 0 psig	30 to 60 min
0 psig	>60 min

4.2×10^7 rads

Spray:

0 to 4 hrs solution of boric acid (2,000-2,100 PPM boron) buffered to a pH of 8.5 to 11.0 with NaOH beyond 4 hrs similar solution with a pH of 7 to 9.

Environment to Which Equip. Is Qualified

Chemical Spray - From 0* -240 hr spray continuously with a solution of the following contents:

Boron content = .23 molar (2,300 PPM)

NaOH content = 10^{-4} to 4×10^{-2} MOLAL

pH = 7.7 to 7.8

Temperature and Pressure

280°F & 45* psig	0 to 30 min
Reduce from 45 to 0 psig	30 to 60 min
Reduce from 280°F to 148°F	30 to 60 min
Raised from 148°F 150°F	1 to 240 hrs

Radiation

10×10^7 rads gamma radiation minimum

Manner of Qualification

Splices were made using various representative cable types and sizes which had been attached to a prototype penetration assembly. The prototype was first subjected to radiation exposure, then temperature, pressure and chemical spray concurrently.

Qualification Document

Conax Report "Test Procedure and Report on Electrical Terminations Subjected to Design Basis Accident Environment" No. IPS-137 dated 10/5/73

Radiation: Almaraz Service Test Conax Report IPS-137.

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA-311/313 Reactor Containment Electrical Penetration Assembly Item 1 of 2 Penetration Assemblies Type IA - Instrumentation Type IB - Control Type IC, IIA, IIB, IIC, IID and IIE - Low Voltage Power	Main Steam Line Break (MSLB) 830°F — 0 to 2 min 280°F — 2 to 60 min 365°F — >60 min 60 psig — 0 to 60 min 0 psig — >60 min 3.6 x 10⁶ rads	(MSLB) 280°F — 0 to 30 min Range 292°F to 220°F — 30 to 60 min Range 245°F to 146°F (Note 1) — 60 to 1300 hr Range 67 to 56 psig — 0 to 30 min 0 psig — >30 min 2.3 x 10⁷ rads gamma radiation minimum NOTE 1 - Temperature qualification by analysis per Qualification Document #2.	(MSLB) Penetration assemblies were tested by using a prototype with characteristics pertinent to each individual type. This was first exposed to radiation then pressure and temperature.	(MSLB) 1. CDOAX Report "Maximum Emergency Environmental Test Report for Electrical Penetration Assemblies," No. IPS-73.4 dated May 13, 1975. 2. FSAR Appendix 3C "Safety Related Equipment Temperature Transients During the Limited Main Steam Line Break" and NRC Comment 7.77 of the same subject.

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. MA-111/1111 Reactor Containment Electrical Penetrations - CONAX Item 1 of 2 Splices (field and factory)	(MSLB)	(MSLB)	(MSLB)	(MSLB)
	Main Steam Line Break (MSLB)			
	430°F 0 to 2 min 240°F 2 to 60 min 165°F >60 min 40 psig 0 to 60 min 0 psig >60 min 3.4 x 10⁸ rads	Raise from 109°F to 253°F 0 to 30 sec Raise from 253°F to 290°F 1 to 2 min 282°F 2 to 30 min Range 344°F to 294°F 30 to 60 min Range 340°F to 150°F 60 min to 240 hr 0 to 24 psig 0 to 30 sec 45° psig 1 to 30 min 0 psig 30 min to 240 hr 2.5 x 10⁷ rads gamma radiation minimum MYTE 1 - Temperature Qualification by analysis per Qualification Document #2.	Splices were made using various representative cable types and wires which had been attached to a prototype penetration assembly. The prototype was first subjected to radiation exposure, then temperature and pressure, concurrently.	1. CONAX Report "Test Procedure and Report on Electrical Terminations Subjected to Design Basis Accident Environment" No. IPS-103 dated October 5, 1973. 2. FSAR Appendix 3C "Safety Related Equipment Temperature Transients During the Limited Main Steam Line Break" and NRC Comment 7.17 of the same subject.

Equipment Description & Mark No.	Description of Accident Environment		Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
P.O. NA-153 Inside Recirc. Spray Pump Motor General Electric - 300 hp, 460 v, 1,1[illegible] S.F., Class B insulation, Model: 5K6315JIB	Loss-of-Coolant Accident (LOCA) 280°F Reduce from 28°F to 150°F 150°F 45 psig Reduce from 45 to 0 psig 0 psig 7.2 x 10^7 rads Spray: 0 to 4 hr solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11.0 with NaOH. Beyond 4 hrs similar solution with a pH of 7 to 9.	0 to 30 min 30 to 60 min. >60 min. 0 to 30 min 30 to 60 min >60 min	Loss-of-Coolant Accident (LOCA) Pressure and Temperature - 45 psig at 275-280°F from 0-30 min. Pressure was reduced to 0* psig at 300°F ±5°F within next 30 min. During this 60 min steam exposure motor was sprayed with chemical solution at 20 gpm. Motor was at full load throughout. Four cycles were run as described above, stopping motor between each cycle to take readings. At the fifth cycle till end of 7 day temp reduced to 150°F at 0 psig and sprayed continuously with chemical solution. Radiation - Motor was exposed to an equivalent dose of 2 x 10^8 rads at a dose rate of ~0.5 x 10^6 rads/hr Chemical Spray - Spray continuously 0-7 days with a water solution of boric acid, lithium hydroxide and sodium hydroxide with the following concentrations: Boron - 0.23 molar (as boric acid) lithium hydroxide - 1.0 x 10^{-4} molal sodium hydroxide - 1.0 x 10^{-2} molal The above will result in a pH of 5.5 to 6.5.	Motor was tested sequentially by first subjecting it to the cumulative radiation dose and then the steam/-chemical spray with elevated temperature and pressure.	Topical Report on G.E. Vertical Induction Motors Inside Containment Recirculation Spray Pump Motors Surry Power Station - Second Addendum to Cover Heat Aging, Radiation Exposure, Vibration, Steam/Chemical Spray Exposure Qualification Tests - Docket Nos 50-280 and 50-281 by M. W. Shee Vertical Motor Products Section General Electric Company, San Jose, California June 12, 1973 (pages 36 to 66)

TRANSCRIBED

Equipment Description & Mark No.	Description of Accident Environment		Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
MR-255 Inside Recirc. Spray Pump Motor General Electric 300 hp, 480 v, 1.15 S.F., Class B Insulation, Model: 5K6319KJ1A	Main Steam Line Break (MSLB) 430°F 280°F 165°F 40 psig 0 psig 3 x 10^7 rads	0 to 2 min 2 to 60 min >60 min 0 to 60 min >60 min	Main Steam Line Break (MSLB) Temperature - Motor was qualified to the design environment by analysis. Pressure - See LOCA qualification for this motor. Radiation - Motor was exposed to an equivalent air dose of 2 x 10^4 rads at a dose rate of <0.5 x 10^4 rad/hr.	The motor was qualified by utilizing the LOCA qualification test results i.e., radiation exposure, temperature, pressure. A heat transfer calculation was performed (Ref. FSAR, Section 3C) to obtain the maximum surface temperature that will be experienced during a MSLB. This value (271°F) was then compared to the value (280°F) that the motor was tested for. Since the motor was qualified for the LOCA at a temperature of 280°F, the lower surface temperature of 271°F proved the acceptable operation of the motor during a MSLB.	1. Final Safety Analysis Report - Section 3C, (pages 1 to 21) 2. Topical Report on GE Vertical Induction Motors - Inside Containment Recirculation Spray Pump Motors - Surry Power Station - Second Addendum to Cover Heat Aging, Radiation Exposure, Vibration, and Steam/Chemical Spray Exposure Qualification Tests - Docket Number 50-280 and 50-281 by M. W. Sheets Vertical Motor Products Section, General Electric Company - San Jose, California June 12, 1973 (pages 36 to 64)

Equipment Description & Mark No.	Description of Accident Environment		Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
MOV-8D 100A, B, C, D, E, F	Loss-of-Coolant Accident (LOCA)		LOCA	Sequential Test	Franklin Institute
CC 100A, B, C	280°F	0 to 30 min	460°F 0 to 2 min		
CC 101A, B	Reduce from 280°F		Reduce from 460°F	Radiation Allowed by	Research Laboratories
CC 102A, B, C, D, E, F	to 150°F	30 to 60 min	to 340°F 2 to 8 min	Environmental Exposure	(FIRL) Test Report F-C4539
CC 103A, B			Reduce from 340°F		
CC 104A-1, A-2, B-1, B-2, C-1, C-2	150°F	>60 min	to 240°F 8 to 35 min		
CC 105A, B, C	45 psig	0 to 20 min	150°F 52 min to 14 days		
CV 150A, B, C, D	Reduce from 45		129 psia 0 to 2 min		
DA 100A, B	to 0 psig	30 to 60 min	118 psia 2 to 32 min		
DG 100A, B			Reduce from 118>		
LM 100A, B, C, D, E, F, G, H	0 psig	>60 min	to 25 psia 32 to 34 min		
LM 101A, B	7.2 x 10^7 rads		13.5 psia 52 min to 14 days		
RH 100A, B	Spray:				
SI 100A, B	0-4 hrs Solution of boric acid		Radiation Exposure 5 x 10^7 rads		
SI 101A, B	(2000-2100 ppm boron) buffered to				
SS 100A, B	a pH of 8.5 to 11 with NaOH >4 hrs				
SS 101A, B	similar solution with a pH of 7 to 9				
SS 102A, B					
SS 103A, B					
SS 104A, B	Main Steam Line Break		MSLB		
SS 106A, B	430°F	0 to 2 min	Encompassed by above LOCA Test		
SP 107A, B	280°F	2 to 60 min			
SJ 112A, B	165°F	>60 min			
VG 100A, B	40 psig	0 to 60 min			
	0 psig	>60 min			
MS 111A,B *	3 x 10^7 rads				

...ip. Description & Mark No.	Description of Accident Environment	Environment to Which Equip. is Qualified	Manner of Qualification	Qualification Document
...D. No. PA-9? ... V Switchgear ...-ES-03 (1B1) ...-ES-04 (1J1) ...-ET-01 (1B1) ...-ET-02 (1J1)	Loss-of-Coolant Accident (LOCA) Radiation: - 1 x 10* rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10* rads must be considered for a total possible radiation dose of 1.04 x 10* rads.	Loss-of-Coolant Accident Radiation - 1 x 10* rads	Loss of Coolant Accident Tested	Loss of Coolant Accident Letters dated 3/21/79 and 4/25/79 certifying compliance with IEEE 323 ITT Imperial Corp

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Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
Marathon Series 200 and 1500 terminal blocks (Phenolic) Connectron Type NSE-3, NSS-3 and PSU's Terminal Blocks. (Nylon) Thermo-Electric Terminal Block No. 3225 (Thermosetting Phenolic) GE Terminal Blocks EB5 and EB25 (Phenolic) Westinghouse Type TBAL Terminal Blocks (Nylon)	Loss-of-Coolant Accident (LOCA) Radiation: 1×10^4 rads (Based on 4 month LOCA). In addition, the 40 year radiation dose of 4×10^4 rads must be considered for a total possible radiation dose of 1.04×10^4 rads.	Radiation: Unfilled Phenolic can withstand a gamma exposure dose over 1×10^4 rads before there is any significant effect on the phenolic. Radiation: Nylon has been test to a gamma exposure dose over 10^4 rads with no effect.	Terminal Block material was compared with identical material for the effects high level radiation	REIC Report No. 21 Radiation Effect Information Center, Columbus, Ohio. Buchanan Product Manual Insert 2.1 Rev. 8/23/76

Equipment Description & Part No.	Description of Accident Environment		Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
Okonite Termination Tape Field Purchased	Loss-of-Coolant Accident (LOCA)		LOCA	Test - Sequential	Okonite's Engineering Report No. 141 dated February 29, 1972
T-95 Insulating Tape T-35 Jacketing Tape	280°F	0 to 30 min	Age. 168 hr at 121°C Irradiated to 2 x 10^8 rads		
	Reduce from 280°F to 150°F	30 to 60 min			
	150°F	>60 min	PWR Exposure:		
	45 psig	0 to 30 min	80 psig@324°F for 6 hours		
	Reduce from 45 to 0 psig	30 to 60 min	16 psig@252°F for 7 days		
	0 psig	>60 min	Spray 10,000 ppm boric acid buffered with NaOH to a pH of 10.5 throughout the PWR exposure period.		
	7.2×10^8 rads				
	Spray:		BWR Exposure:		
	0-4 hr solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH or Similar solution with a pH of 7 to 9		A series of transient cycles each consisting of a rise to a specified press. and temp. for a specified time and a gradual return to initial conditions. Following transient cycles 100 day exposure to live steam 0 psig, 212°F		
	Main Steam Line Break (MSLB)		MSLB	Temperature - Analysis	S&W Calculation ES-100 "Equipment Temperature Transient for Okonite Tape Splices"
	330°F	0 to 2 min	Same as "Description of Accident Environment"	Maximum calculated surface temperature during limiting MSLB is 270°F which does not exceed qualification temperature of 324°F given in Okonite Engineering Report No. 141.	Okonite's Engineering Report No. 141 dated February 29, 1972
	280°F	2 to 60 min			
	165°F	>60 min		Pressure and Radiation - Test	
	40 psig	0 to 60 min		Refer to LOCA qualification	
	0 psig	>60 min			
	3×10^7 x As				

Equipment Description & Mark No.	Description of Accident Environment	Environment to Which Equip. Is Qualified	Manner of Qualification	Qualification Document
	Loss-of-Coolant Accident (LOCA)			
Raychem heat shrinkable field splicing material WCSF type coated with Type-M adhesive	Radiation: 1 x 10^8 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10^5 rads must be considered for a total possible radiation dose of 1.04 x 10^8 rads.	Postulated loss-of-coolant accident with a radiation exposure of 1.5 x 10^8 rads plus an additional 5 x 10^7 rads of gamma irradiation for a total qualified dose of 2 x 10^8 rads	Combined thermal and radiation aging period followed by a simultaneous exposure to steam, chemical spray and gamma radiation	Raychem Technical Report F-CR033, Jan. 1975
Raychem high voltage terminations HVT	Radiation: 1 x 10^8 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10^5 rads must be considered for a total possible radiation dose of 1.04 x 10^8 rads.	Irradiation of the materials in a cobalt 60 gamma source at 0.50 mrads per hour to total doses of 2 x 10^8 rads	Sequence of test 1st thermal aging then irradiation	Raychem Report #71100 Revision 1
Raychem high voltage bus connecters HVBC	Radiation: 1 x 10^8 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10^5 rads must be considered for a total possible radiation dose of 1.04 x 10^8 rads.	Irradiation of the material with 5 x 10^7 rads	Sequence of test 1st thermal aging followed by irradiation	Letter from Raychem dated 4/24/79 and EPSERT PRO Raychem Report ET1508/1