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Mr. James P. O'Reilly, Director
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, GA 30303

H. B. ROBINSON STEAM ELECTRIC ~~PLANT~~, UNIT NO. 2
DOCKET NO 50-261
LICENSE NO. DPR-23
IE BULLETIN 79-01B - NINETY-DAY REPORT ADDENDUM

Dear Mr. O'Reilly:

Attached you will find our supplemental response to the IE Bulletin 79-01B, Ninety-Day Report. This addendum provides additional environmental qualification information which was not available at the time of our previous submission, July 7, 1980.

Yours very truly,

L. W. Eury
Vice President
Power Supply

CSB:tma*

Attachment

Sworn to and subscribed before me this 29 day of August, 1980.

Beverly K. Menges
Notary Public

My commission expires November 17, 1982

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

United States
Nuclear Regulatory Commission
Docket No. 50 - 261
License No. DPR - 23

ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

H. B. ROBINSON E. G. PLANT
UNIT 2

NRC IE BULLETIN 79-01B
(90-DAY REPORT)

CAROLINA POWER & LIGHT COMPANY

RALEIGH, NORTH CAROLINA

FIRST ISSUE

JUNE 1980

PREPARED BY: CAROLINA POWER & LIGHT COMPANY
RALEIGH, NORTH CAROLINA

	Revision	Date		Revision	Date
1.	1	8/21/80	4.		
2.			5.		
3.			6.		

TABLE 1.3.1

H. B. ROBINSON CALCULATED RADIATION ACCUMULATION

AREA (1)	YR. ACCUM. (2)	40 YR. ACCUM. (2)	ELEV.(ft)
1. CV Operating Deck (Pressure)	4.8×10^{0}	1.9×10^{2}	280
2. CV Lower Level Polar Crane	5.7×10^{1}	2.3×10^{3}	233
3. CV Second Level-Seal Table Rm.	8.5×10^{0}	3.4×10^{2}	254
4. Reactor Coolant Pump - Bay A	1.1×10^{4}	4.4×10^{5}	243
5. Reactor Coolant Pump - Bay B	2.8×10^{4}	1.1×10^{6}	243
6. Reactor Coolant Pump - Bay C	9.6×10^{3}	3.9×10^{5}	243
	7.2×10^{3} (3)	2.9×10^{5} (3)	

(1) See figure 1.3.1 for locations.
(2) Calculations in (RADs)
(3) Total Containment (Averaged)

TABLE 1.3.2

REACTOR COOLANT SYSTEM DOSES

LOCATION	DOSE r/hr
PIPE CENTER	820
PIPE ID	470
PIPE OD	200
GENERAL AREA	50

TABLE 1.3.3

EQUIPMENT TOTAL RADIATION ACCUMULATION BY LOCATION AND LOCA OPERATING TIME

Component	Location	Level (ft) (Approx.)	Time Of Operation	Radiation Exp. (40 yrs)[1]	Accident[3] Radiation Exp.	Margin (10%)	Total Anticipated Radiation Exposure
TRANSMITTERS							
PT-444[2]	CV	231.5	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-445[2]	CV	231.5	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-456[2]	CV	231.5	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-457[2]	CV	231.5	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-455	CV	231.5	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
LT-474	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-475	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-476	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-477	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-484	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-485	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-486	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-487	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-494	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-495	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-496	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-497	CV	233	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
LT-459[2]	CV	230	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
LT-460[2]	CV	230	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
LT-461[2]	CV	230	30 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
FT-474	CV	231.5	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
FT-475	CV	231.5	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
FT-484	CV	231.5	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
FT-485	CV	231.5	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
FT-494	CV	231.5	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
FT-495	CV	231.5	1 DAY	2.3×10^3	3.5×10^6	3.5×10^5	3.8×10^6
FT-940	RAB	230	30 DAYS	-	1.0×10^6[6]	1.0×10^5	1.1×10^6
FT-943	RAB	230	30 DAYS	-	1.0×10^6[6]	1.0×10^5	1.1×10^6
PT-934	RAB	230	30 DAYS	-	1.0×10^6[6]	1.0×10^5	1.1×10^6
PT-940	RAB	230	30 DAYS	-	1.0×10^6[6]	1.0×10^5	1.1×10^6
PT-943	RAB	230	30 DAYS	-	1.0×10^6[6]	1.0×10^5	1.1×10^6
MOV							
V-866A	CV	241	1 HR.	2.3×10^3	9.5×10^5	9.5×10^4	1.0×10^6
V-866B	CV	241	1 HR.	2.3×10^3	9.5×10^5	9.5×10^4	1.0×10^6
V869	RAB	241	30 DAYS	-	1.0×10^6	1.0×10^5	1.1×10^6
V-744A	CV	240	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
V-744B	CV	240	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5

RI

RI

TABLE 1.4.2 (Continued)

31.	SGB-FCV-1931B	Steam generator B blowdown line	R1
32.	SGB-FCV-1932A	Steam generator C blowdown line	
33.	SGB-FCV-1932B	Steam generator C blowdown line	
34.	SGB-FCV-1933A	Steam generator A sample line	
35.	SGB-FCV-1933B	Steam generator A sample line	
36.	SGB-FCV-1934A & B	Steam generator B sample line	
37.	SGB-FCV-1935A	Steam generator C sample line	
38.	SGB-FCV-1935B	Steam generator C sample line	
39.	RM-1	Radiation monitoring pump outlet	
40.	RM-2	Radiation monitoring pump inlet	
41.	RM-3	Containment outlet	
42.	RM-4	Containment inlet	
43.	IVSW-PCV-1922A	Isolation valve seal water system	
44.	IVSW-PCV-1922B	Isolation valve seal water system	
45.	HVAC-V12-6	Containment ventilation isolation valve	
46.	HVAC-V12-7	Containment ventilation isolation valve	
47.	HVAC-V12-8	Containment ventilation isolation valve	
48.	HVAC-V12-9	Containment ventilation isolation valve	
49.	HVAC-V12-10	Containment ventilation isolation valve	
50.	HVAC-V12-11	Containment ventilation isolation valve	
51.	HVAC-V12-12	Containment ventilation isolation valve	
52.	HVAC-V12-13	Containment ventilation isolation valve	
53.	V841A, B	Boron Injection Tank Recirculation	

SYSTEM: SAFETY INJECTION EQUIPMENT/COMPONENTS

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
2/C SHIELDED #16	INSTRUMENTATION CABLE	X	X
AMP #16/9 INSULATED	TERMINAL LUG	X	X
3/C #19/22	CABLE	X	X
HEAT SHRINK TUBING	CABLE SPLICE	X	X
C-3	ELECTRICAL PENETRATION	X	
D-2	ELECTRICAL PENETRATION	X	
D-8	ELECTRICAL PENETRATION	X	
D-9	ELECTRICAL PENETRATION	X	
SILICONE RUBBER TAPE #70	CONNECTION PROTECTION	X	
2/C #16, 3/C #16	CONTROL CABLE	X	X
1 C 500 MCM	POWER CABLE		X

(1) When a component is not identified by plant identification number, the manufacturer, model number, serial number, etc., will be used.

(Rev-1)

SYSTEM: CHEMICAL & VOLUME CONTROL		EQUIPMENT/COMPONENT	
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
2/C #16	CONTROL CABLE	X	
3/C #19/22 (2)	CABLE		X
2/C #16, 3/C #16	CONTROL CABLE	X	X
SILICON RUBBER TAPE #70	MOTOR CABLE SPLICE	X	
HEAT SHRINK TUBING	CABLE SPLICE	X	
C-3	ELECTRICAL PENETRATION	X	
D-9	ELECTRICAL PENETRATION	X	

(1) When a component is not identified by plant identification number, the manufacturer, model number, serial number, etc., will be used.

3.1 DOCUMENTATION REFERENCE SHEET (continued)

49. KERITE COMPANY - Letter dated August 5, 1980
enclosures: LOCA QUALIFICATION OF KERITE 1000 VOLT FR/FR CONTROL CABLE
LOCA QUALIFICATION OF KERITE 1000 VOLT HTK/FR POWER CABLE

R1

Facility: H. B. Robinson #2

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD (4)	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: ALL Plant ID No. Component: CABLE 3/C #16, 2/C #16, 500 MCM, 3/C 19/#22 Manufacturer: KERITE Model Number: HIGH TEMP, FIRE RESISTANT Function: FIELD CABLE Accuracy: Spec: Demon: Service: CONTROL AND LOW POWER Location: CONTAINMENT	Operating Time	CONTINUOUS	50 DAYS		49	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	346	6	49	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	128		49	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100		49	SIMULTANEOUS TEST	NONE
	Chemical Spray		H_3BO_3 NaOH		49	SIMULTANEOUS TEST	NONE
	Radiation	1.4×10^7	2.0×10^8	(1)	49	SIMULTANEOUS TEST	NONE
	Aging		40 YEARS	6	49	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

R1

NOTES:

(1) See Section 1.3.2
(2) See accident profile - Temperature - Figure 3.1.1
(3) See accident profile - Pressure - Figure 3.1.2
(4) See Section 3.2.4

R1

The electrical connectors (Crouse-Hinds Model Number ((RPC-317-160-S01N/S08N)) used with the penetrations consist of an extruded aluminum shell with a hard anodized finish. The connector pins/sockets are silver-plated copper. The insert material is diallyl phthalate with a thin wafer of silicone rubber provided for sealing purposes.

Diallyl phthalate can withstand radiation exposure between 10^8 and 10^{10} RADS with little or no permanent degradation. The silicone rubber seal wafer is positioned between two plugs of diallyl phthalate and will not be significantly affected by irradiation. The connector proper should not be affected by normal plant life operation of forty (40) years or the added accident radiation dosage as presented in Table 1.3.3.

The anodized finish provides protection sufficient to enable specifying connector to be corrosion resistant to salt spray for 300 days (exceeds MIL C-5015D and MIL-E-4970A). Connector design provides watertight installation if properly performed and will exclude water by hose spray or stream.

No significant degradation due to thermal aging should be experienced by the connector during operation plant life due to materials used in design and/or fabrication. The connector design temperature range is -80°F to 275°F and is sufficient to meet the operating and LOCA temperature range established for H. B. Robinson.

The electrical penetrations utilize a combination of five- (5) and six- (6) foot lengths of single or multiconductor cable to connect the penetration feedthrough conductors to the field cable inside and outside containment. These "pigtail" cable were installed by the manufacturer and sleeved at the penetration end with heat strength tubing. For selective conductors, connectors were installed while the majority of pigtail cables required butt-style splicing for field cable connection. IRI

The cabling used for pigtails was provided by CP&L/Ebasco specification/purchase and shipped to Crouse-Hinds Company for fabrication use. For the Low Voltage Power, (600V) electrical penetrations, 500 MCM Kerite cable with HI TEMP conductor insulation was provided (see Section 3.2.4 for qualification evaluation). For Low Voltage Control and Power (600V) electrical penetrations, 3/C #16 and 2/C #16 Kerite cable with FR conductor insulation was provided (see Section 3.2.4 for qualification evaluation). For Instrumentation (600V) electrical penetrations 2/C #16 (shielded) and 4/C #16 (shielded), Continental Wire and Cable Company cable with PVC conductor insulation was provided. No qualification data is available for this cable. CP&L has initiated a qualification test program to determine the ability of this cable to meet IEEE 323-1974 requirements using FSAR established accident parameters. Spare pigtails will be used and cable splices per Section 3.2.5 will be utilized to maintain plant configuration during tests. Wyle Laboratories will perform the tests per Qualification Plan 543/4464/ES dated July 10, 1980. Testing and reporting will IRI

require thirty-five (35) weeks--after Receipt of Order. Major time factor will be thermal aging to achieve forty- (40) years' operating life before LOCA testing can be performed. After review of results, a report will be sent to NRC detailing any action by CP&L dictated by these tests. RI

RI

These PVC insulated pigtails are used for instrumentation or within circuits which must perform their functions after short elapsed time periods; therefore, their long-term operability problems should not affect plant response to accident conditions. Results of the qualification test program will determine the ultimate disposition of these pigtails. If replacement is required, a plan and schedule for accomplishment will be included in the report already stated above. RI RI

3.2.2 Electronic Transmitters

H. B. Robinson's original design and specification called for installation and use of Fisher and Porter electronic transmitter for the measurement of Pressure, Level and Flow parameters. As stated within CP&L response to NRC IE Bulletin 79-01 and the 45-day response to NRC IE Bulletin 79-01B CP&L preference, to obtain better operation and maintenance performance, is to change out the existing transmitters within containment--to be replaced by Rosemounts' Model No. 1153A.

Environmental tests performed on Fisher & Porter's transmitters (Model No. 10B2496) indicate failure occurs during the high temperature, steam/chemical spray testing stage while attempting to qualify to IEEE 323-1971 parameters. (Reference WCAP 9157 Environmental Qualification of Safety-Related Class IE Process Instrumentation).

Qualification testing of Rosemount Model 1153, Series A, per Rosemount Report No. 3788 states that the transmitter is qualified per the requirements of IEEE 323-1971. Missing from this report is the aging parameter not required for IEEE 323-1971 but necessary for complete LOCA qualification. Recent Rosemount testing to qualify a transmitter to meet IEEE 323-1974 requirements has resulted in failure. A combination of thermal aging, irradiation and chemical spray test specification parameters has resulted in failed components. The initial failed element was an O-ring comprised of sulphur cured polyethylene rubber. This allowed steam/chemical spray to affect electronic components. The O-ring mode of failure is attributed to high temperature vs. time necessary for the Arrhenius curve time compression to satisfy aging test requirements.

This testing failure does not preclude the use of the Rosemount 1153A within H. B. Robinson containment as it has successfully performed within the H. B. Robinson accident parameters of temperature, pressure and radiation levels. Transmitters located in containment will be required to perform within a maximum time period of twenty-four (24) hours following accident. O-ring failure due to high temperature should not occur during this time period. Reviewing Table C-1 of Appendix C, NRC IE Bulletin 79-01B, Thermal and Radiation Aging Degradation of Selected Materials, shows that polyethylene rubber has a potential for significant aging at ten (10) years and an allowable radiation susceptibility of 10^7 RADS before serious degradation occurs. Evaluating the above establishes the need to perform periodic changeout of transmitter O-rings.

Additionally, the time span to which Rosemount will qualify its IEEE 373-1974 transmitters is ten (10) years. To assure that listed transmitters within H. B. Robinson containment remain qualified a ten- (10) year replacement cycle will be adopted.(1)

For long-term accident mitigation, Fisher & Porter transmitters, Model Nos. 10B2496 and 50EP1041, located within the Reactor Auxiliary Building are used. Transmitter identification numbers are FT-940, FT-943, PT-934, PT-940 and PT-943. As these transmitters are not exposed to the LOCA accident environment, but will see the elevated radiation levels associated with reactor coolant recirculation, qualification is limited to their radiation withstand capability.

Westinghouse WCAP 7744, Environmental Testing of Engineered Safety Features Related Equipment states that transmitters have been successfully tested to a level of 2.0×10^8 RADs. The transmitters in use, therefore, are considered qualified for the application and functions stated within this report.

Westinghouse has been requested to supply the specific data and/or reports associated with the testing program, and it will be available for review after receipt.

3.2.3 Motor-Operated Valves

Within containment at H. B. Robinson four (4) motor operators are used for valve actuation for the listed equipment in this report. They are: V-744A and V-744B, Auxiliary Cooling System and V-866A and V-866B, Safety Injection System. They are Limitorque Models SMB-00 (V-866A,B) and SMB-3, with motor brake (V-744A,B). Torque motors for V-744A&B have been wound with Class H insulation. V-866A&B Torque motors and V-744A&B motor brakes are wound with Class B insulation. | R1

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(1) Additional design changes/improvements by Rosemount would be followed to adopt improved components or materials to minimize changeout cycles.

Basically, silicon rubber cable insulation is designed and recommended for high temperature applications. CP&L has no plans to conduct separate testing to further qualify this cable.

For limit switch and solenoid valve operation, a Kerite fire-resistant conductor insulation with overall fire-resistant jacket cable is in use within containment.

Inspection of in-containment field cable hookup to limit switches and solenoid valves performed the week of August 18, 1980 through August 22, 1980 determined that Kerite fire-resistant conductor insulation with overall fire-resistant jacket cable is used.

The Kerite Company has attested to the ability of this cable supplied for H. B. Robinson to withstand the FSAR LOCA conditions of temperature, pressure and radiation. In addition, test qualification included forty- (40) year aging, borated spray and 100% relative humidity to meet IEEE 323-1974 and IEEE 383-1974 requirements. Referenced reports are: R1

FIRL Report F-C4020-1 dated March 1975.

Kerite Proprietary Engineering Memo No. 178 entitled, "Determining Temperature Ratings of Cables and Preaging Requirements for LOCA Simulation Tests," dated December 27, 1974 (superseded by EM178A dated May 1, 1979).

For motor power required for valve operation, a Kerite HI TEMP conductor insulation with asbestos fillers, nylon binder tape, neoprene treated tape, with fire-resistant jacket reinforced with a cotton sleeve cable is in use within containment.

For containment fan power, a Kerite HI TEMP conductor insulation with overall fire-resistant jacket, reinforced by cotton sleeve cable is in use within containment.

The Kerite Company has attested to the ability of this cable supplied for H. B. Robinson to withstand the FSAR LOCA conditions of temperature, pressure and radiation. In addition, test qualification included forty- (40) year aging, borated spray and 100% relative humidity exposure to meet IEEE 323-1974 and IEEE 383-1974 requirements. Referenced reports are: R1

FIRL Report F-C4020-2 dated March 1975.

Proprietary Engineering Memo No. 178 entitled, "Determining Temperature Ratings of Cables and Preaging Requirements for LOCA Simulation Tests" dated December 27, 1974 (superseded by EM 178A dated May 1, 1979 and EM 178B dated December 1, 1979).

4.0 Conclusions

The electrical equipment listed within the H. B. Robinson emergency safeguard systems and associated plant system instrumentation (Reference Section 2.0) were evaluated by equipment groups (Reference Section 3.2) and are summarized as follows:

4.1 Electrical Penetrations

Containment sleeve sections--qualified by individual manufacturer's test reports and similar type qualification testing.

Additional action required--None

Conductor Pigtails--penetrations having Kerite insulated pigtail cables are considered qualified by manufacturer's testing program and submitted report penetrations having PVC conductor, and jacket insulation are considered not qualified. Separate qualification testing program is being initiated and contracted. Results will determine whether additional actions are necessary. When obtained, they will be presented by report to the NRC. Analysis of operating time radiation exposure concludes that plant can continue operation until tests are completed and reviewed. R1

Electrical Connectors--considered qualified by analysis of materials.

Additional action required--None

4.2 Electronic Transmitters

Selected replacement of in-containment transmitters identified within this report will be performed starting with the 1980 summer outage. Completion may require additional outage span. At present, no fully qualified transmitter is available. Rosemount 1153A transmitters qualified to IEEE 323, 1971 version, will be used. A program of periodic transmitter housing O-ring replacement (during yearly calibration check) will provide spray protection if it occurs. When a fully qualified transmitter is available from industry, an evaluation will be performed to determine if further replacement is required. To assure operational capability, a ten- (10) year transmitter replacement schedule will be adopted to be modified when Rosemount can certify longer life equipment is available.

4.3 Motor-Operated Valves

The Limitorque motor operators listed are considered qualified by similar type testing as reported within qualification reports available from Westinghouse and Limitorque.

Additional action required--None

4.4 Electrical Cable

The identified silicone rubber insulated cables and the Kerite insulated cables are considered qualified by similar type testing as reported within qualification reports available from the manufacturers.

Additional action required--None

(Inspection held in containment August 18, 1980 through August 22, 1980 concluded no PVC field cable in use to the identified instrumentation and switches.) R1

4.5 Cable Terminals and Splices

Selected replacement of in-containment terminals and splices identified within this report will be performed during the 1980 summer outage. Terminals and splices are considered qualified by similar type testing performed by the manufacturer and reported within available qualification reports.

Additional action required--None

4.6 Solenoid Valves

Selected replacement of in-containment solenoid valves identified within this report will be performed during the 1980 summer outage. The ASCO valves specified as replacements are considered qualified by similar type testing performed by the manufacturer and reported within available qualification reports. Noted in the manufacturer's report is the certified life of 4.4 years for the coil and elastomers for these solenoid valves. These elements will be replaced on a four- (4) year cycle to maintain complete operational capability.

Additional action required--None

4.7 Level Switches

Original plans for replacement of the non-qualified containment sump level switches with qualified equipment is no longer considered necessary. The function of level determination is