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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

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PREPARED BY: CAROLINA POWER & LIGHT COMPANY
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3.			6.		

ENVIRONMENTAL QUALIFICATION OF
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NRC Bulletin 79-01B
(90-Day Report)

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1.0 GENERAL

1.1 Introduction

The United States Nuclear Regulatory Commission Office of Inspection and Enforcement Bulletin 79-01B issued on January 17, 1980 required two responses—a 45-day and 90-day report. Carolina Power and Light responded to the 45-day report on March 10, 1980. The submitted volume is used as a base document for this 90-day report which will be referenced, extracted and updated within this volume to comply with the total requirements of IE Bulletin 79-01B and subsequent NRC Region meeting minutes.

The 45-day report provided an overview listing of all electrical equipment within the Engineered Safety Systems which is required to function under the postulated accident conditions and did not limit the listing to only Class IE equipment. It also was concerned with equipment inside and outside the containment related to the detection of accident conditions, initial actuation of safety systems and the long-term mitigation of postulated events.

The postulated events covered within containment are LOSS OF COOLANT ACCIDENT (LOCA) and MAIN STEAM HIGH ENERGY LINE BREAK (MSLB). Also covered was the HIGH ENERGY LINE BREAK (HELB) inside and outside of containment.

Review of the 45-day report indicates only a small number of electrical equipment is exposed to any actual harsh accident environment which would endanger functioning if not designed and qualified to withstand the postulated conditions. All other identified equipment must perform within near normal environments during and after postulated accident events. Therefore this report will be limited to detailing in full the qualification of equipment identified as within the postulated accident environment. An area of exception is the RHR pump compartment which will have high radiation level fluid circulating through the pumps and piping during the mitigation aspect of accident condition. Therefore, electrical equipment outside of containment exposed to these radiation levels are also included in this report.

Additionally, the LOCA environment is more limiting when compared with Steam Line Breaks or High Energy Line Breaks within containment.[1] Therefore, the LOCA parameters will be used when qualifying or reviewing qualifications programs for all the accident conditions associated with the safety electrical equipment addressed in this report.

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[1] Recent study performed for NRC IE Bulletin 80-04 (Analysis of a PWR Main Steam Line Break with Continued Feedwater Addition) indicates a maximum containment pressure of 34.4 psig and a temperature of 257°F attained. Therefore, LOCA conditions still remain as limiting parameters for qualification.

1.2 Preparation of Report

The preparation of this 90-day report proceeded as follows:

The A/E; Ebasco Services, Incorporated, was consulted to establish validity of data associated with original purchase orders and vendor preshipment testing.

The NSSS supplier, Westinghouse, was consulted to establish qualification coverage of electrical equipment in containment by WCAP or manufactured product testing programs.

Original manufacturers of containment electrical equipment and manufacturers of replacement equipment and hardware were contacted to provide qualification test programs/reports related to the types of equipment supplied.

Plant operating report data from original commercial operation date was reviewed to determine any electrical equipment failure trends.

Factors affecting operational life and accident condition performance were compiled and a program of preventative maintenance and/or replacement devised.

Reviewed the qualification parameters and compared them with current data to obtain realistic qualification values.

Compared current data against the previously submitted 45-day report and revised forms.

Compiled a testing program, where required, to establish or complete qualification of the safety electrical equipment where data is unavailable.

1.3 Report Parameters

1.3.1 Flood Level

The H. B. Robinson containment lower level consists of a reactor vessel sump area and compartmented base floor. The floor level elevation is at 228 feet.

The sump geometry will account for a filled volume of 68,000[2] gallons of water. The containment geometry is such that each additional 100,000 gallons will add a one- (1) foot depth of water within containment.

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[2] Reference Appendix II to H. B. Robinson 10th Semi-Annual Operating Report.

The anticipated volume of water available to flood the containment during an accident is 451,000 gallons. This is comprised of Refueling Water Storage Tank, Accumulators, Spray Addition Storage Tank, and Reactor Coolant Loop water volumes emptied within containment.

This will produce a floor flood level of approximately 3.67 feet or a flood elevation of 231.67 feet within containment. Three (3) instruments mounted on the shield wall at a level of 230 ft. will be covered by the postulated flood elevation. These are LT-459, LT-460 and LT-461, associated with pressurizer water level alarming. These instruments are not essential to the mitigation of containment flood condition. Therefore, their assumed failure under submergence will not necessitate relocation or replacement. The lowest mounted elevation of electrical equipment used for accident detection and mitigation is 231.5 feet.

This represents an instrument immersion depth of two (2) inches which should not impair performance or require submergence performance testing.

For illustration purposes each identified class IE equipment location is listed and compared with the established flood level on the enclosed Environmental Qualification of Electrical Equipment Required to Function Under Postulated Accident Conditions forms.

1.3.2 Radiation

Inside containment accumulated radiation dosage for forty-(40) year life and single accident incident for H. B. Robinson had been designated as 1.5×10^8 RADS.(3) This figure, when applied, was used for design performance and testing requirement within equipment specifications.

This figure is one of a series of calculated values associated with Westinghouse NSS supplied plants. Initially a point kernel attentuation program modeled on the R. E. Ginna nuclear plant was used in 1971 to derive an accumulated dosage figure of $\gtrsim 2.0 \times 10^8$ RADS. A refinement of this figure was performed by Westinghouse to accommodate the requirements of IEEE 323, 1974. The resultant figure of 1.5×10^8 RADS in the original issuance of WCAP 8587, Westinghouse Environmental Qualification of NSSS Class IE Equipment, was stated as conservative and subject to revision when the source term issue was resolved. Noted within this environmental program is the differential parameter for radiation exposure of equipment inside containment by physical location.

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(3) FSAR Section 7A.

Subsequent revision of WCAP 8587 accounts for location of equipment by level within containment to establish radiation exposure during both operation and under accident condition. A figure of 2.7×10^7 RADS is established as the most significant dosage accumulated.

For consideration within this report the radiation service condition of 1.4×10^7 RADS[4], determined by use of IE Bulletin 79-01B, Appendix B, will be used when reviewing in containment electrical equipment. This figure is representative of H. B. Robinson parameters and depicts a thirty- (30) day integrated gamma dose.

Dose rates as listed in Table 1.3.1 have been used to evaluate equipment by location and application within containment to determine forty- (40) year life dose accumulation. To support these radiation levels an evaluation was made of data accumulated during actual plant operation. Six separate radiation readings at varied plant locations were collected during sequential years. Approximate locations are shown in Figure 1.3.1. Radiation readings are charted on Figure 1.3.2 and Table 1.3.1 projects the data for a forty- (40) year operating period.

Operating time after design event occurrence will determine the additional radiation dose accumulated. After the application of a ten (10) percent margin, a total radiation dosage is listed in Table 1.3.3. This total dosage will be used for comparison with equipment tests performed and/or calculated values to determine overall qualification.

Outside of containment areas where recirculation fluids from inside containment are encountered the radiation dose of 4×10^6 RADS as stated within section 4.3.2 of IE Bulletin 79-01B represents the anticipated total dosage found at the outer diameter of pipe carrying Reactor Coolant water for a period of thirty (30) days after postulated event.

Use of Table 1.3.2 indicates a 4:1 ratio between pipe outer diameter and general area where affected electrical equipment is located. Therefore, a one- (1) month accumulated dose of 1.0×10^6 RADS is what can be expected within the RHR compartment when evaluating qualification of electrical equipment used to establish recirculation of containment sump water.

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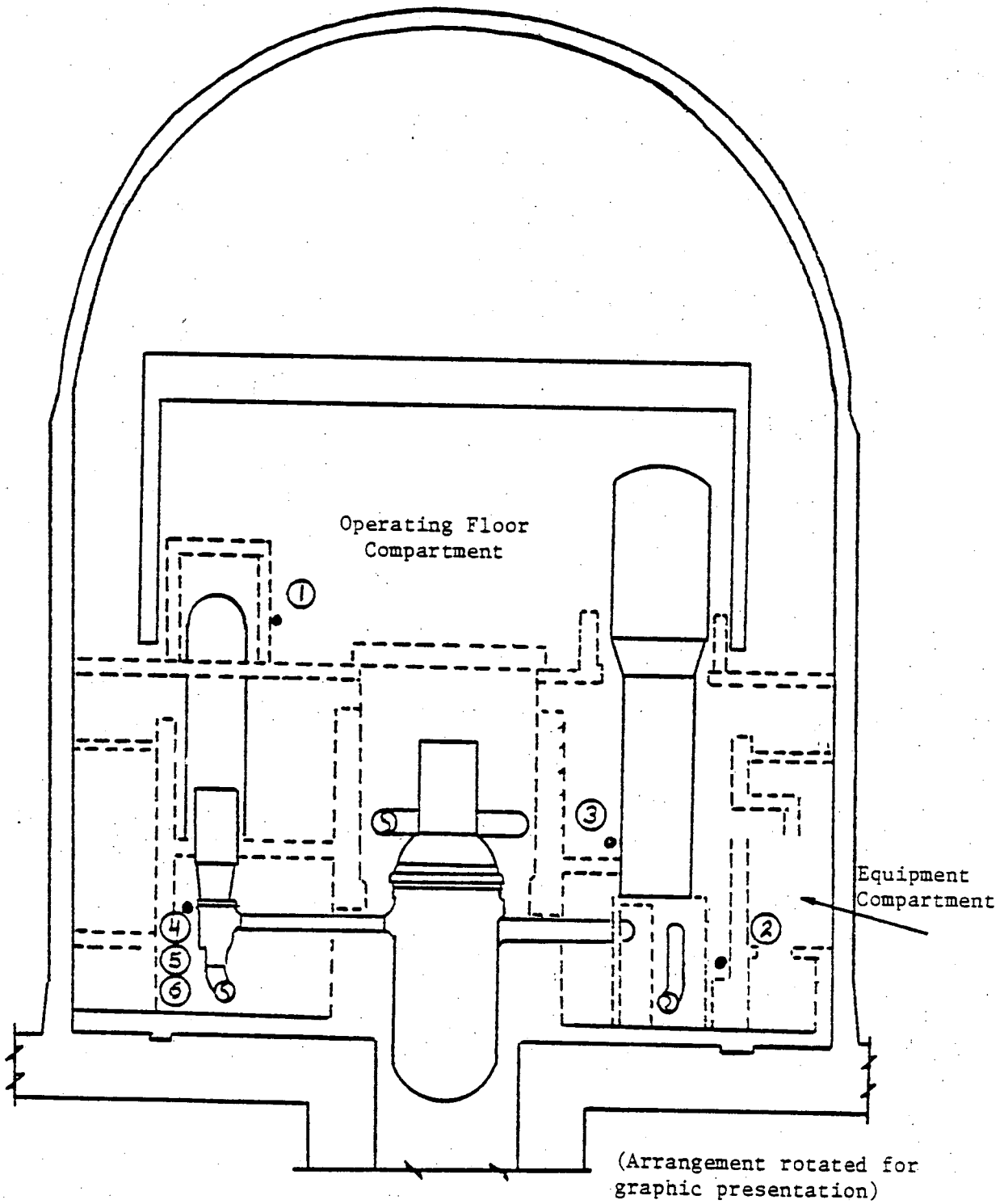
(4) See Appendix A to this report for calculations.

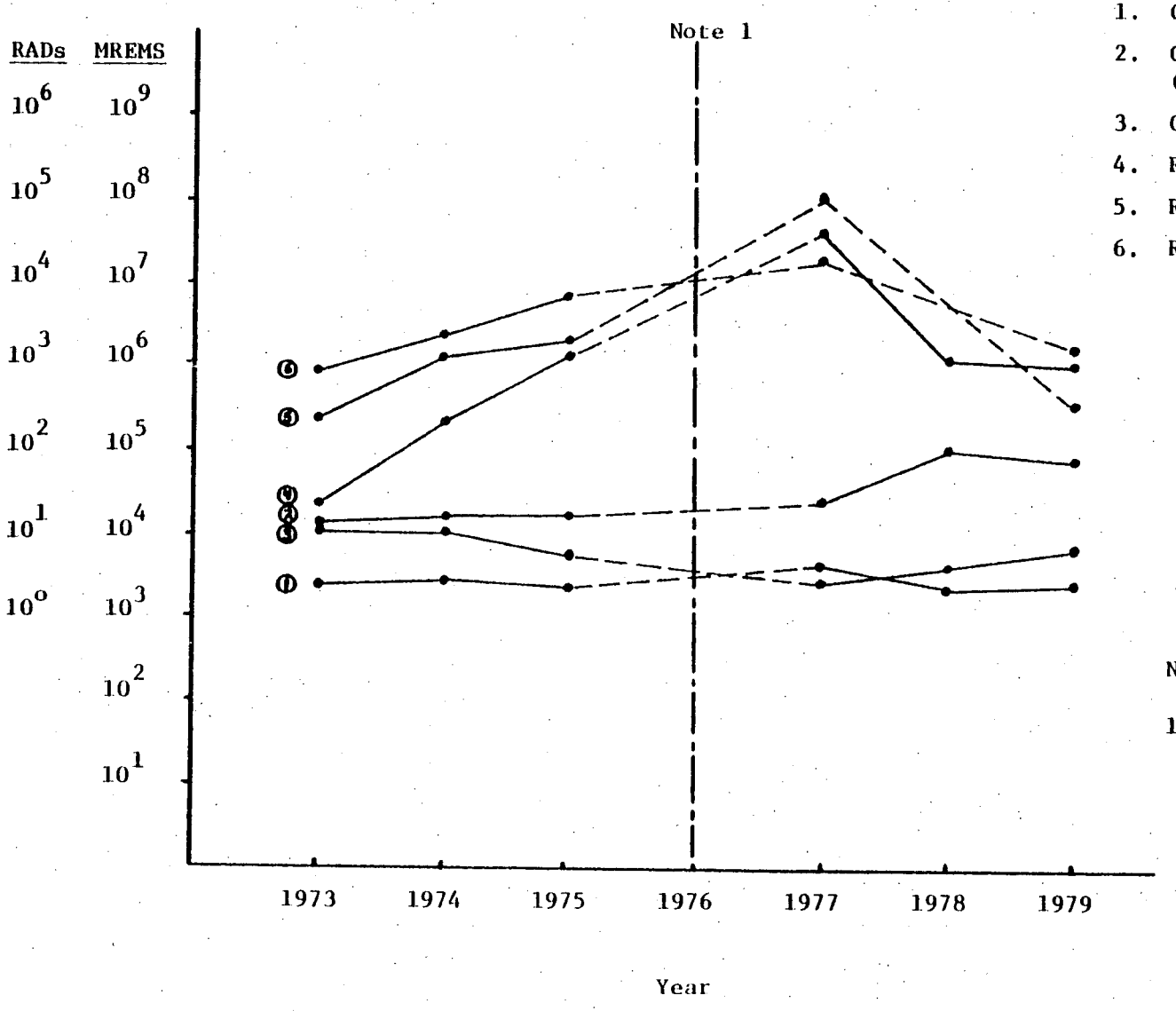
H.B. ROBINSON REACTOR CONTAINMENT RADIATION LEVEL MEASUREMENT LOCATIONS



1 CV Operating Deck (Pressurizer)
2 CV Lower Level Polar Crane Wall (Regen. Heat Exchanger)
3 CV Second Level Seal Table Room
4 Reactor Coolant Pump Bay A
5 Reactor Coolant Pump Bay B
6 Reactor Coolant Pump Bay C

Figure 1.3.1

H. B. ROBINSON CONTAINMENT RADIATION LEVEL MEASUREMENTS



Recording Stations

1. CV Operating Deck (pressurizer)
2. CV Lower Level Polar Crane Wall (Regen. Heat Exchanger)
3. CV Second Level - Seal Table Room
4. Reactor Coolant Pump BAY-A
5. Reactor Coolant Pump BAY-B
6. Reactor Coolant Pump BAY-C

Notes:

1 No data recorded for the year 1976

._____. Known data

._ _ _. Extrapolated data

Figure 1.3.2

TABLE 1.3.1

H. B. ROBINSON CALCULATED RADIATION ACCUMULATION

AREA (1)	YR. ACCUM. (2)	40 YR. ACCUM. (2)	ELEV.
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	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-445[2]	CV	231.5	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-456[2]	CV	231.5	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-457[2]	CV	231.5	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
PT-455	CV	231.5	5 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 DAYS	2.3×10^3	-	-	1.4×10^7[5]
LT-460[2]	CV	230	30 DAYS	2.3×10^3	-	-	1.4×10^7[5]
LT-461[2]	CV	230	30 DAYS	2.3×10^3	-	-	1.4×10^7[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	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

TABLE 1.3.3 (Continued)

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
V-860A	RAB	212	30 DAYS	-	1.0×10^6	1.0×10^5	1.1×10^6
V-860B	RAB	212	30 DAYS	-	1.0×10^6	1.0×10^5	1.1×10^6
V-861A	RAB	212	30 DAYS	-	1.0×10^6	1.1×10^5	1.1×10^6
V-861B	RAB	212	30 DAYS	-	1.0×10^6	1.1×10^5	1.1×10^6
V-863A	RAB	212	30 DAYS	-	1.0×10^6	1.1×10^5	1.1×10^6
V-863B	RAB	212	30 DAYS	-	1.0×10^6	1.1×10^5	1.1×10^6
CVC-381	RAB	240	30 DAYS	-	1.0×10^6	1.1×10^5	1.1×10^6
SOLENOIDS							
V12-7	CV	233	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
V12-9	CV	233	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
V12-11	CV	233	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
V12-13	CV	233	5 MIN.[4]	2.3×10^3	9.5×10^5	-	9.5×10^5
MOTORS							
HVH-1	CV	275	3 HRS.	1.9×10^2	3.1×10^6	3.1×10^5	3.4×10^6
HVH-2	CV	275	3 HRS.	1.9×10^2	3.1×10^6	3.1×10^5	3.4×10^6
HVH-3	CV	275	3 HRS.	1.9×10^2	3.1×10^6	3.1×10^5	3.4×10^6
HVH-4	CV	275	3 HRS.	1.9×10^2	3.1×10^6	3.1×10^5	3.4×10^6
ELECTRICAL PENETRATIONS							
Type 2	CV	234 -246	30 DAYS	2.3×10^3	-	-	1.4×10^7[5]
TEMPERATURE ELEMENTS							
TE-412B	CV	243	(7)	1.1×10^6	-	-	1.5×10^7[5]
TE-412D	CV	243	(7)	1.1×10^6	-	-	1.5×10^7[5]
TE-422B	CV	243	(7)	1.1×10^6	-	-	1.5×10^7[5]
TE-422D	CV	243	(7)	1.1×10^6	-	-	1.5×10^7[5]
TE-432B	CV	243	(7)	1.1×10^6	-	-	1.5×10^7[5]
TE-432D	CV	243	(7)	1.1×10^6	-	-	1.5×10^7[5]

(1) Extrapolated from plant data (See Table 1.3.1)

(2) Equipment located in instrument cabinets.

(3) Calculation based on IE Bulletin 79-01B, Appendix B. CHARTS/GRAPHS, Procedures for Evaluating Gamma Radiation Service Conditions.

(4) Charts/Graphs per IE Bulletin 79-01B, Appendix B allow calculation to a minimum of 1 hour exposure. This figure is conservative—no margin required.

(5) Total Integrated Radiation for accident condition (30 days) per IE Bulletin 79-01B, Appendix B. CHARTS/GRAPHS.

(6) Calculation based on Accident Radiation figure - 2×10^7 RADS.

(7) Not required for DBE—used only for outside containment MSLB protection.

1.3.3 Aging

Since class IE electrical equipment; specified, designed and built for H. B. Robinson did not require continued thermal and radiation aging called for under present qualification programs each component has to be reviewed using broad spectrum data sources. Three (3) sources have been selected as best meeting the requirements of IE Bulletin 79-01B. These are: (1) identification of similar equipment tested more recent than H. B. Robinson's equipment, (2) reinterpretation of existing test data performed during qualification testing but not specifically for aging purposes, and (3) evaluation of equipment materials for susceptibility to degradation due to thermal and radiation exposure.

Aging data available per the three categories above for listed components in section 3.0 of this report will be shown within the ENVIRONMENT, Qualification column of the System Component Evaluation Work Sheet forms. For the third category listed above degradation susceptibility sources utilized are: (1) NRC IE Bulletin 79-01B, Environmental Qualification of Class IE Equipment, Appendix C, (2) Radiation Effects Design Handbook, Section 3, NASA CR-1787, and (3) A Review of Equipment Aging Theory and Technology, (Draft Copy) EPRI RP-890-1.

Empirical data to date for H. B. Robinson gives a time base of ten (10) years' life for the electrical equipment identified within the Master List of Electrical Equipment Required to Function Under Postulated Accident Condition. No significant failure rate has been experienced at H. B. Robinson with the listed equipment and only routine maintenance and alignment/calibration procedures have been required.

1.4 Engineered Safety Feature Systems Electrical Equipment

The following engineered safety feature systems were identified as having electrical equipment required to function under the defined accident conditions:

- o Safety Injection
- o Containment Isolation
- o Air Recirculation
- o Containment Spray

Electrical equipment associated with these systems is listed in Tables 1.4.1, 1.4.2, and 1.4.3. The FSAR lists the above as Engineered Safety Feature Systems. They are segregated by plant design systems and identified as to their functions by

use of reference sheet 2.1 within Section 2.0, Master List of Electrical Equipment Required to Function Under Postulated Accident Conditions of the 45-day report previously submitted. The reference sheet 2.1 of this report segregates the equipment to be further evaluated and details additionally identified systems and equipment.

Graphic portrayal of the listed instrumentation by accident function is located in figures 2.1.1 through 2.1.4 within the 45-day report submitted by CP&L in March 1980 and are not repeated for this submittal.

The environmental test profiles used for qualification programs included in the 45-day report have not been resubmitted for this report. It is noted that the formal documents referred and used to substantiate qualification contain the formated environmental profiles required. When these documents are reviewed for qualification confirmation, the profiles can be checked for plant accident parametric coverage.

TABLE 1.4.1

EQUIPMENT LIST FOR SAFETY INJECTION AND AIR RECIRCULATION

1. V478, 488, 498 Main Feedwater Valve
2. V479, 489, 499 Bypass Feedwater Valve
3. V867 A, B Boron Injection Inlet
4. V870 A, B Boron Injection Discharge
5. V866 A, B Hot Leg Injection (a)
6. V744 A, B Core Deluge
7. Safety Injection Pump Motor A, B, C
* 8. Residual Heat Removal Pump Motor A, B
9. Service Water Pump Motor A, B, C, D
10. Service Water Booster Pump Motor A, B
*11. Containment Fans HVH-1, 2, 3, 4
12. Auxiliary Feedwater Pump Motor A, B
13. Containment Spray Pump Motor A, B
14. V878 A, B Safety Injection Pump Crosstie

* Equipment used for Air Recirculation

(a) Removed from automatic activation by Safety Injection Signal.

TABLE 1.4.2

EQUIPMENT LIST FOR CONTAINMENT ISOLATION (PHASE A)

1.	CVC-200A	Letdown orifice isolation
2.	CVC-200B	Letdown orifice isolation
3.	CVC-200C	Letdown orifice isolation
4.	CVC-204A	Letdown line isolation
5.	CVC-204B	Letdown line isolation
6.	PS-956A	Sample line isolation (pressurizer steam)
7.	PS-956B	Sample line isolation (pressurizer steam)
8.	PS-956C	Sample line isolation (pressurizer liquid)
9.	PS-956D	Sample line isolation (pressurizer liquid)
10.	PS-956E	Sample line isolation (hot leg)
11.	PS-956F	Sample line isolation (hot leg)
12.	PS-956G	Sample line isolation (accumulator)
13.	PS-956H	Sample line isolation (accumulator)
14.	RC-HC-516	Pressurizer relief tank to gas analyzer
15.	RC-HC-519A	Primary water to pressurizer relief tank
16.	RC-HC-519B	Primary water to pressurizer relief tank
17.	RC-HC-553	Pressurizer relief tank to gas analyzer
18.	CC-HC-739	Component cooling from excess letdown heat exchanger
19.	SI-855	Nitrogen supply for the accumulators
20.	WD-1721	Reactor coolant drain tank pump discharge
21.	WD-1722	Reactor coolant drain tank pump discharge
22.	WD-1723	Containment sump to waste holdup tank
23.	WD-1728	Containment sump to water holdup tank
24.	WD-1786	Vent header from reactor coolant drain tank
25.	WD-1787	Vent header from reactor coolant drain tank
26.	WD-1789	Gas analyzer from reactor coolant drain tank
27.	WD-1794	Gas analyzer from reactor coolant drain tank
28.	SGB-FCV-1930A	Steam generator A blowdown line
29.	SGB-FCV-1930B	Steam generator A blowdown line
30.	SGB-FCV-1931A	Steam generator B blowdown line

TABLE 1.4.2 (Continued)

31.	SGB-FCV-1931B	Steam generator B blwodown line
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

TABLE 1.4.3

EQUIPMENT LIST FOR CONTAINMENT SPRAY
ACTUATION AND CONTAINMENT ISOLATION
PHASE B

1. Containment Spray Pump A, B
2. V880 A, B, C. D - Containment Spray Discharge Valves
* 3. V381 - Reactor Coolant Pump Seal Water Return Line
* 4. V626 - Reactor Coolant Pump Thermal Barrier Cooling Water Return Line
* 5. V735 - Reactor Coolant Pump Thermal Barrier Cooling Water Return Line
* 6. V716 A, B - Reactor Coolant Pump Cooling Water Inlet Line
* 7. V730 - Reactor Coolant Pump Bearing Oil Cooler Cooling Water Return Line
* 8. V1-3A, V1-3B, V1-3C - Main Steam Isolation Valves

* Equipment used for Containment Isolation Phase B

TABLE 1.4.4

EQUIPMENT LIST FOR LONG TERM ACCIDENT MITIGATION

1. Residual Heat Removal Pump Motor A, B
2. V869 Hot Leg Injection
3. V860 A, B C.V. Sump to RHR Suction
4. V861 A, B C.V. Sump to RHR Suction
5. V863 A, B RHR Discharge to SI/Spray Suction

ENVIRONMENTAL QUALIFICATION OF
ELECTRICAL EQUIPMENT
NRC IE Bulletin 79-01B
(90-Day Report)

2.0 MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

ENVIRONMENTAL QUALIFICATION OF
ELECTRICAL EQUIPMENT
NRC IE Bulletin 79-01B
(90-Day Report)

2.1 REFERENCE SHEET

(2) Component is not exposed to DBE. No qualification required. Evaluation Work Sheet is not included in this report. See H.B.Robinson 45-day report on IE Bulletin 79-01B for data and evaluation.

(3) Component is not exposed to DBE but used for long term accident mitigation. Evaluation Work Sheet included in the report.

(4) Component was not included in H.B.Robinson 45-day report on IE Bulletin 79-01B . Evaluation Work Sheet included in this report.

(5) Component is required for Main Steam Line Break detection only. Evaluation Work Sheet included in this report.

(6) Component is being replaced by another more significantly qualified component. See Evaluation Work Sheets this report for replacements. For known qualification information on this component seeH.B.Robinson 45-day report on IE Bulletin 79-01B.

SYSTEM: SAFETY INJECTION

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
FT-940 (3) (4)	FLOW TRANSMITTER		X
FT-943 (3) (4)	FLOW TRANSMITTER		X
PT-934 (3) (4)	PRESSURE TRANSMITTER		X
PT-940 (3) (4)	PRESSURE TRANSMITTER		X
PT-943 (3) (4)	PRESSURE TRANSMITTER		X
PT-950 (2)	PRESSURE TRANSMITTER		X
PT-951 (2)	PRESSURE TRANSMITTER		X
PT-952 (2)	PRESSURE TRANSMITTER		X
PT-953 (2)	PRESSURE TRANSMITTER		X
PT-954 (2)	PRESSURE TRANSMITTER		X
PT-955 (2)	PRESSURE TRANSMITTER		X
LS-1925A (4)	LEVEL SWITCH	X	
LS-1925B (4)	LEVEL SWITCH	X	

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

SYSTEM:
SAFETY INJECTION (continued)

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
V-841A (2)	VALVE, SOLENOID		X
V-841B (2)	VALVE, SOLENOID		X
V-866A	VALVE, MOTOR OPERATOR	X	
V-866B	VALVE, MOTOR OPERATOR	X	
V-867A (2)	VALVE, MOTOR OPERATOR		X
V-867B (2)	VALVE, MOTOR OPERATOR		X
V-869 (3) (4)	VALVE, MOTOR OPERATOR		X
V-870A (2)	VALVE, MOTOR OPERATOR		X
V-870B (2)	VALVE, MOTOR OPERATOR		X
V-878A (2)	VALVE, MOTOR OPERATOR		X
V-878B (2)	VALVE, MOTOR OPERATOR		X
V-880A (2)	VALVE, MOTOR OPERATOR		X
V-880B (2)	VALVE, MOTOR OPERATOR		X
V-880C (2)	VALVE, MOTOR OPERATOR		X

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

SYSTEM: SAFETY INJECTION (continued)

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
V-880D (2)	VALVE, MOTOR OPERATOR		X
SI-A (2)	SAFETY INJECTION PUMP, MOTOR		X
SI-B (2)	SAFETY INJECTION PUMP, MOTOR		X
SI-C (2)	SAFETY INJECTON PUMP, MOTOR		X
CS-A (2)	CONTAINMENT SPRAY PUMP, MOTOR		X
CS-B (2)	CONTAINMENT SPRAY PUMP, MOTOR		X

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

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
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: REACTOR COOLANT

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
LT-459 (6)	LEVEL TRANSMITTER	X	
LT-460 (6)	LEVEL TRANSMITTER	X	
LT-461 (6)	LEVEL TRANSMITTER	X	
PT-444 (6)	PRESSURE TRANSMITTER	X	
PT-445 (6)	PRESSURE TRANSMITTER	X	
PT-455 (6)	PRESSURE TRANSMITTER	X	
PT-456 (6)	PRESSURE TRANSMITTER	X	
PT-457 (6)	PRESSURE TRANSMITTER	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: REACTOR COOLANT		EQUIPMENT/COMPONENTS	
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
2/C SHIELDED #16	INSTRUMENTATION CABLE	X	
AMP #16 INSULATED	TERMINAL LUG	X	
B-2	ELECTRICAL PENETRATION	X	
B-5	ELECTRICAL PENETRATION	X	
B-9	ELECTRICAL PENETRATION	X	
CROUSE HINDS RPC-317-160-SOIN/S08N	CONNECTOR, ELECTRICAL	X	X
CROUSE HINDS RPC-117-150-POIN/P08N	CONNECTOR, ELECTRICAL	X	X

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

SYSTEM: MAIN STEAM			
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
FT-474 (6)	FLOW TRANSMITTER	X	
FT-475 (6)	FLOW TRANSMITTER	X	
FT-484 (6)	FLOW TRANSMITTER	X	
FT-485 (6)	FLOW TRANSMITTER	X	
FT-494 (6)	FLOW TRANSMITTER	X	
FT-495 (6)	FLOW TRANSMITTER	X	
PT-474 (2)	PRESSURE TRANSMITTER		X
PT-475 (2)	PRESSURE TRANSMITTER		X
PT-476 (2)	PRESSURE TRANSMITTER		X
PT-484 (2)	PRESSURE TRANSMITTER		X
PT-485 (2)	PRESSURE TRANSMITTER		X
PT-486 (2)	PRESSURE TRANSMITTER		X
PT-494 (2)	PRESSURE TRANSMITTER		X
PT-495 (2)	PRESSURE TRANSMITTER		X
PT-496 (2)	PRESSURE TRANSMITTER		X

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

SYSTEM: MAIN STEAM (Continued)			
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
PT 464 (2)	PRESSURE TRANSMITTER		X
PT 466 (2)	PRESSURE TRANSMITTER		X
PT 468 (2)	PRESSURE TRANSMITTER		X
V1-3A (2)	VALVE, SOLENOID		X
V1-3B (2)	VALVE, SOLENOID		X
V1-3C (2)	VALVE, SOLENOID		X

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

SYSTEM: MAIN STEAM 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 INSULATED	TERMINAL LUG	X	X
B-1	ELECTRICAL PENETRATION	X	
C-1	ELECTRICAL PENETRATION	X	
HEAT SHRINK TUBING	CABLE SPLICE	X	
SILICON RUBBER TAPE 70	CONNECTION PROTECTION	X	
3/C #16 2/C #16	CONTROL CABLE		X
CROUSE-HINDS RPC-317-160-SO1N/SO8N	CONNECTOR, ELECTRICAL	X	X
RPC-117-150-PO1N/PO8N	CONNECTOR, ELECTRICAL	X	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: FEEDWATER			
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
LT-474 (6)	LEVEL TRANSMITTER	X	
LT-475 (6)	LEVEL TRANSMITTER	X	
LT-476 (6)	LEVEL TRANSMITTER	X	
LT-477 (6)	LEVEL TRANSMITTER	X	
LT-484 (6)	LEVEL TRANSMITTER	X	
LT-485 (6)	LEVEL TRANSMITTER	X	
LT-486 (6)	LEVEL TRANSMITTER	X	
LT-487 (6)	LEVEL TRANSMITTER	X	
LT-494 (6)	LEVEL TRANSMITTER	X	
LT-495 (6)	LEVEL TRANSMITTER	X	
LT-496 (6)	LEVEL TRANSMITTER	X	
LT-497 (6)	LEVEL TRANSMITTER	X	
V-478 (2)	VALVE, SOLENOID		X
V-479 (2)	VALVE, SOLENOID		X

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

SYSTEM: FEEDWATER (Continued)

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
V-488 (2)	VALVE, SOLENOID		X
V-489 (2)	VALVE, SOLENOID		X
V-498 (2)	VALVE, SOLENOID		X
V-499 (2)	VALVE, SOLENOID		X
AFW-A (2)	FEEDWATER PUMP, MOTOR		X
AFW-B (2)	FEEDWATER PUMP, MOTOR		X

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

SYSTEM: FEEDWATER	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 INSULATED	TERMINAL LUG	X	X
HEAT SHRINK TUBING	CABLE SPLICE	X	
C-1	ELECTRICAL PENETRATION	X	
C-2	ELECTRICAL PENETRATION	X	
C-4	ELECTRICAL PENETRATION	X	
C-9	ELECTRICAL PENETRATION	X	
3/C #16, 2/C #16	CONTROL CABLE		X
SILICON RUBBER TAPE	CONNECTION PROTECTION	X	
CROUSE-HINDS RPC-317-160-SO1N/SO8N	CONNECTOR, ELECTRICAL	X	X
CROUSE -HINDS RPC-117-150-PO1N/PO8N	CONNECTOR, ELECTRICAL	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: AUXILIARY COOLING

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
V-626 (2)	VALVE, MOTOR OPERATOR		X
V-716A (2)	VALVE, MOTOR OPERATOR		X
V-716B (2)	VALVE, MOTOR OPERATOR		X
V-730 (2)	VALVE, MOTOR OPERATOR		X
V-735 (2)	VALVE, MOTOR OPERATOR		X
V-744A	VALVE, MOTOR OPERATOR	X	
V-744B	VALVE, MOTOR OPERATOR	X	
RHR-A (3)	RESIDUAL HEAT REMOVAL PUMP, MOTOR		X
RHR-B (3)	RESIDUAL HEAT REMOVAL PUMP, MOTOR		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:

AUXILARY COOLING (RESIDUAL HEAT REMOVAL)

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
V-860A (3) (4)	VALVE, MOTOR OPERATOR		X
V-860B (3) (4)	VALVE, MOTOR OPERATOR		X
V-861A (3) (4)	VALVE, MOTOR OPERATOR		X
V-861B (3) (4)	VALVE, MOTOR OPERATOR		X
V-863A (3) (4)	VALVE, MOTOR OPERATOR		X
V-863B (3) (4)	VALVE, MOTOR OPERATOR		X

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

SYSTEM: AUXILIARY COOLING EQUIPMENT/COMPONENTS

COMPONENTS

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

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
TE-412B (5)	TEMPERATURE ELEMENT	X	
TE-412D (5)	TEMPERATURE ELEMENT	X	
TE-422B (5)	TEMPERATURE ELEMENT	X	
TE-422D (5)	TEMPERATURE ELEMENT	X	
TE-432B (5)	TEMPERATURE ELEMENT	X	
TE-432D (5)	TEMPERATURE ELEMENT	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: REACTOR PROTECTION	EQUIPMENT/COMPONENTS		
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
4/C SHIELDED #16	INSTRUMENTATION CABLE	X	X
AMP #16	TERMINAL LUG	X	
C-4	ELECTRICAL PENETRATION	X	
C-9	ELECTRICAL PENETRATION	X	
CROUSE-HINDS RPC-317-160-S01N/S08N	CONNECTOR, ELECTRICAL	X	X
CROUSE-HINDS RPC 117-150-P01N/P08N	CONNECTOR, ELECTRICAL	X	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: SERVICE AND COOLING WATER			
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
SW-A (2)	SERVICE WATER PUMP MOTOR		X
SW-B (2)	SERVICE WATER PUMP, MOTOR		X
SW-C (2)	SERVICE WATER PUMP, MOTOR		X
SW-D (2)	SERVICE WATER PUMP, MOTOR		X
SWB-A (2)	SERVICE WATER BOOSTER PUMP, MOTOR		X
SWB-B (2)	SERVICE WATER BOOSTER PUMP, MOTOR		X

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

SYSTEM: SERVICE AND COOLING WATER — EQUIPMENT/COMPONENTS

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
1/C 500 MCM	POWER CABLE		X
RUBBER TAPE	MOTOR CABLE SPLICE		X

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

SYSTEM: CHEMICAL & VOLUME CONTROL

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
CVC-200A (6)	VALVE, SOLENOID	X	
CVC-200B (6)	VALVE, SOLENOID	X	
CVC-200C (6)	VALVE, SOLENOID	X	
CVC-381 (3)(4)	VALVE, Motor Operator		X

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

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
SILICON RUBBER TAPE #70	MOTOR CABLE SPLICE	X	
HEAT SHRINK TUBING	CABLE SPLICE	X	

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

SYSTEM: HVAC

COMPONENTS

Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
V12-6 (2)	VALVE, SOLENOID		X
V12-7 (6)	VALVE, SOLENOID	X	
V12-8 (2)	VALVE, SOLENOID		X
V12-9 (6)	VALVE, SOLENOID	X	
V12-10 (2)	VALVE, SOLENOID		X
V12-11 (6)	VALVE, SOLENOID	X	
V12-12 (2)	VALVE, SOLENOID		X
V12-13 (6)	VALVE, SOLENOID	X	
HVH-1	FAN, MOTOR	X	
HVH-2	FAN, MOTOR	X	
HVH-3	FAN, MOTOR	X	
HVH-4	FAN, MOTOR	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: HVAC	EQUIPMENT/COMPONENT		
COMPONENTS			
Plant Identification Number (1)	Generic Name	Location	
		Inside Primary Containment	Outside Primary Containment
3/C #16, 2/C #16	CONTROL CABLE	X	X
AMP #16	TERMINAL LUG	X	X
C-3	ELECTRICAL PENETRATION	X	
C-6	ELECTRICAL PENETRATION	X	
C-8	ELECTRICAL PENETRATION	X	
D-1	ELECTRICAL PENETRATION	X	
D-3	ELECTRICAL PENETRATION	X	
D-5	ELECTRICAL PENETRATION	X	
HEAT SHRINK TUBING	CABLE SPLICE	X	
1/C 500 MCM	POWER CABLE	X	
SILICON RUBBER TAPE #70	CONNECTION PROTECTION MOTOR CABLE SPLICE	X	

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

ENVIRONMENTAL QUALIFICATION OF
ELECTRICAL EQUIPMENT
NRC IE Bulletin 79-01B
(90-Day Report)

3.0 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

ENVIRONMENTAL QUALIFICATION OF
ELECTRICAL EQUIPMENT
NRC IE Bulletin 79-01B
(90-Day Report)

3.1 DOCUMENTATION REFERENCE SHEET

1. Specification CPL-R2-E3 - Containment Structure Electrical Penetrations
2. Westinghouse Letter CPL-77-550 (Electrical Penetrations)
3. Crouse Hinds Quality Control Inspection Reports (Electrical Penetrations)
4. NPR Penetration - Steam Incident and Helium Leakage Tests-with attached Stress Analysis Report
5. Ebasco Specification: CPL-R2-E13, Electrical cable, I&C
6. Ebasco Specification: CPL-R2-E14, Electrical Cable, 4160v and 480v
* 7. Ebasco Specification: CPL-R2-E-1, Motor Operators for Valves
* 8. Westinghouse Specification: E-676258, Motor Operated Valves
* 9. Westinghouse Specification: E-676270, Control Valves
* 10. Ebasco PO NY-435227 to McIntosh Equipment Corp. for Containment Level Switches
* 11. Ebasco Specification CPL-R2-IN-7, Level Switches
* 12. Westinghouse Specification 676410, Instruments, general, inside containment
13. Crouse Hinds Connector Data, Electrical Penetrations
14. WCAP - 7410-L Vol. I Environmental Testing of ESF Related Equipment

* References not used within the 90-Day Report.

3.1 DOCUMENTATION REFERENCE SHEET (continued)

15. WCAP - 7410-L Vol. II Environmental Testing of ESF Related Equipment

16. WCAP - 9003 Fan Cooler Motor Unit Test

17. WCAP - 7744-L Environmental Testing of ESF Related Equipment

18. WCAP - 7829-L Fan Cooler Motor Unit Test

19. WCAP - 8587 Environmental Qualification of Westinghouse NSSS Class IE Equipment

* 20. H. B. Robinson Modification and Setpoint Revision No. 212 MSLB Transmitter Shielding

21. Postulated Pipe Failure Analysis Outside of Containment

* 22. Rosemount Test Report 117415 Rev. B, Model 1152 Transmitter

23. Rosemount Test Report 3788, Model 1153A Transmitter

* 24. Rosemount Product Data Sheet 2256, Model 1151 Transmitter

* 25. Rosemount Test Report 97215A, Model 1151 Transmitter

* 26. Rosemount Test Report 127227 Rev. A, Model 1151 Transmitter

* 27. ASCO Service Bulletin, Solenoid Valves

* 28. WCAP-7153 Investigation of Chemical Additions for Reactor Containment Sprays

29. Vendor Drawing 5379-4093 Motor Terminal Lead

30. Emergency Instructions (E.I. - 1) Incident Involving Reactor coolant System Depressurization

* 31. FSAR, pg. 5.1.2-28, Electrical Penetrations

* 32. FSAR, pg. 7.5-11, Environmental Capability

3.1 DOCUMENTATION REFERENCE SHEET (continued)

* 33. FSAR, pg. 6.3-14 to 6.3-20, Fan Cooler Evaluation

34. FSAR, pg. 6.2-14, Motor Design Criteria

35. FSAR, pg. 6.2-31,32, Pump & Valve motor Criteria

36. FSAR, pgs. 6.3-4, 6.3-10, Air Recirculation System Criteria

* 37. FSAR, pg. 6.4-12, Containment Spray System Criteria

38. FSAR, Section 7, Amendment 7A, Component Environmental Testing Program

* 39. Standard Manufacturer's Testing Program to Meet Design Criteria

40. FSAR, pg. 7.5-11, Operating Time Requirements

41. Rosemount Report 37821, Model 1153 Transmitter

42. Limitorque Test Report FP-3271

43. Qualification Tests for a Modular Penetration, Report AB-11/12/13

44. RAYCHEM, Technical Report F-C4033-3, Tests of Raychem Thermofit Insulation Systems Under Simultaneous Exposure to Heat, Gamma Radiation, Steam and Chemical Spray

45. AMP Engineering Test Report 110-11516, Engineering Test Report on AMP Radiation Resistant 150°C PIDG and Plasti-Grip Style Terminals for Class IE Service in Nuclear Power Generating Plants

46. Continental Wire & Cable Company, Technical Report F-C2935, Test of Electrical Cables Under Simulated Post-Accident Reactor Containment Service

47. ASCO Test Report No. AQS21678/TR, Revision A, Qualification Tests of Solenoid Valves by Environmental Exposure to Elevated Temperature, Radiation, Wear Aging, Seismic Simulation, Vibration Endurance, Accident Radiation and LOCA Simulation

48. WCAP - 9157 Environmental Qualification of Safety Related Class 1E Process Instrumentation

Facility: H. B. Robinson #2

Sheet 1 of 25

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: SAFETY INJECTION Plant ID No. FT-940(1) Component: FLOW TRANSMITTER Manufacturer: FISHER & PORTER Model Number: 10B2496PBBABBB Function: SAFETY INJECTION Accuracy: Spec: ± 1/2% Demon: Service: HEADER FLOW (Hot Leg) Location: REACTOR AUXILIARY BLDG. Flood Level Elev: (2) Above Flood Level: Yes No	Operating Time	30 DAYS	2 HRS.	38	17	SIMULTANEOUS TEST	NONE
	Temperature (°F)	AMBIENT	287	38	17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	38	17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	38	17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	-	-	-	-	
	Radiation	1.1×10^6	2×10^8	(3)	17	SEQUENTIAL TEST	NONE
	Aging						
	Submergence	NOT REQUIRED	-	-	-	-	

(1) Transmitter not exposed to DBE - Long-term mitigation radiation exposure only
(2) Not involved in containment flood postulation
(3) See Section 1.3.2
(4) See Section 3.2.2 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: SAFETY INJECTION Plant ID No. FT-943(1) Component: FLOW TRANSMITTER Manufacturer: FISHER & PORTER Model Number: 10B2496PBBABBB Function: SAFETY INJECTION Accuracy: Spec: Demon: Service: HEADER FLOW (Cold Leg) Location: REACTOR AUXILIARY BUILDING	Operating Time	30 DAYS	2 HRS.	38	17	SIMULTANEOUS TEST	NONE
	Temperature (°F)	AMBIENT	287	38	17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	38	17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	38	17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	-	-	-	-	
	Radiation	1.1×10^6	2×10^8	(3)	17	SEQUENTIAL TEST	NONE
	Aging						
Flood Level Elev: (2) Above Flood Level: Yes No	Submergence	NOT REQUIRED	-	-	-	-	

(1) Transmitter not exposed to DBE - Long-term mitigation radiation exposure only
(2) Not involved in containment flood postulation
(3) See Section 1.3.2
(4) See Section 3.2.2 for evaluation.

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: SAFETY INJECTION Plant ID No. PT-934 (1) Component: PRESSURE TRANSMITTER Manufacturer: FISHER & PORTER Model Number: 50EP1041BCXA Function: BORON INJECTION Accuracy: Spec: Demon: Service: TANK HEADER PRESSURE Location: REACTOR AUXILIARY BLDG.	Operating Time	30 DAYS	2 HRS.	38	17	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	287	38	17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	38	17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	38	17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	-	-	-	-	-
	Radiation	1.1×10^{6}	2×10^{8}	(3)	17	SEQUENTIAL TEST	NONE
	Aging						
Flood Level Elev: (2) Above Flood Level: Yes No	Submergence	NOT REQUIRED	-	-	-	-	-

(1) Transmitter not exposed to DBE - Long-term mitigation radiation exposure only
(2) Not involved in containment flood postulation
(3) See Section 1.3.2
(4) See Section 3.2.2 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: SAFETY INJECTION Plant ID No. PT-940(1) Component: PRESSURE TRANSMITTER Manufacturer: FISHER & PORTER Model Number: 50EP1041 Function: SAFETY INJECTION Accuracy: Spec: Demon: Service: HEADER PRESSURE (Hot Leg) Location: REACTOR AUXILIARY BUILDING	Operating Time	30 DAYS	2 HRS.	38	17	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	287	38	17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	38	17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	38	17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	-	-	-	-	-
	Radiation	1.1×10^{6}	2×10^{8}	(3)	17	SEQUENTIAL TEST	NONE
	Aging						
Flood Level Elev: (2) Above Flood Level: Yes No	Submergence	NOT REQUIRED	-	-	-	-	-

(1) Transmitter not exposed to DBE - Long-term mitigation radiation exposure only
(2) Not involved in containment flood postulation
(3) See Section 1.3.2
(4) See Section 3.2.2 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: SAFETY INJECTION (1) Plant ID No. PT-943 Component: PRESSURE TRANSMITTER Manufacturer: FISHER & PORTER Model Number: 50EP1041BCXA Function: SAFETY INJECTION Accuracy: Spec: Demon: Service: HEADER PRESSURE (Cold Leg) Location: REACTOR AUXILIARY BUILDING	Operating Time	30 DAYS	2 HRS.	38	17	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	287	38	17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	38	17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	38	17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	-	-	-		
	Radiation	1.1×10^{6}	2×10^{8}	(3)	17	SEQUENTIAL TEST	NONE
	Aging						
Flood Level Elev: (2) Above Flood Level: Yes No	Submergence	NOT REQUIRED	-	-	-	-	

(1) Transmitter not exposed to DBE.- Long-term mitigation radiation exposure only
(2) Not involved in containment flood postulation
(3) See Section 1.3.2
(4) See Section 3.2.2 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (5)		
System: SAFETY INJECTION Plant ID No. V-866A (1) Component: MOTOR OPERATOR Manufacturer: LIMITORQUE Model Number: SMB-00 Function: HOT LEG INJECTION Accuracy: Spec: Demon: Service: MOTOR OPERATED VALVE-SIS Location: CONTAINMENT 241	Operating Time	1 HR	7 DAYS	38	14	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	308	35, 38	14, 17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	75	35	14, 17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100	35	14, 17	SIMULTANEOUS TEST	NONE
	Chemical Spray	H_3BO_3 N_aOH	H_3BO_3 N_aOH		14	SEQUENTIAL TEST	NONE
	Radiation	1.0×10^6	2×10^8	(4)	17	SEQUENTIAL TEST	NONE
	Aging		40 YRS		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT REQUIRED					

NOTES:
(1) Same data this sheet applies to V-866B.
(2) See accident profile - Temperature - Figure 3.1-1.
(3) See accident profile - Pressure - Figure 3.1-2.
(4) See Section 1.3.2.
(5) See Section 3.2.3 for evaluation.

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (3)		
System: SAFETY INJECTION Plant ID No. V869 Component: MOTOR OPERATED Manufacturer: LIMITORQUE Model Number: SMB-00 Function: HOT LEG INJECTION BORON INJECTION Accuracy: Spec: Demon: Service: MOTOR OPERATED VALVE Location: REACTOR AUXILIARY BLDG.	Operating Time	(1)	7 DAYS	30	14	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	308	35	14,17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	35	14,17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	35	14,17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	H_3BO_3 NaOH		14,17	SEQUENTIAL TEST	NONE
	Radiation	1.1×10^6	2.0×10^8	(2)	17	SEQUENTIAL TEST	NONE
	Aging	-	40 YRS.		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67 Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

(1) To be used intermittantly during mitigation of LOCA
(2) See Section 1.3.2.
(3) See Section 3.2.3 for evaluation.

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System:SAFETY INJECTION Plant ID No. LS-1925A Component: LEVEL SWITCH Manufacturer: MADISON Model Number: 5602 Function:CONTAINMENT SUMP WATER LEVEL MEASUREMENT Accuracy: Spec: 1/2" in Demon: cremen Service:DETECT WATER LEVEL CHANGES Location: CONTAINMENT 228'	Operating Time	CONTINUOUS	NONE	-	-	-	(5)
	Temperature (°F)	(2)	NONE	-	-	-	(5)
	Pressure (PSIA)	(3)	NONE	-	-	-	(5)
	Relative Humidity (%)	100	NONE	-	-	-	(5)
	Chemical Spray	H_3BO_3 NaOH	NONE	-	-	-	(5)
	Radiation	1.4×10^7	NONE	-	-	-	(5)
	Aging		NONE	-	-	-	(5)
Flood Level Elev: 231.67 Above Flood Level: Yes No	Submergence		NONE				

(1) Same data this sheet applies to LS-1925B
(2) See accident profile - Temperature - Figure 3.1-1
(3) See accident profie - Pressure - Figure 3.1-2
(4) See Section 3.2.7 for evaluation
(5) Function to be superceded by two channels of analog measurement equipment. No qualification testing required.

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (5)		
System: AUXILIARY COOLING Plant ID No. V-744A (1) Component: MOTOR OPERATOR Manufacturer: LIMITORQUE Model Number: SMB-3 Function: REACTOR CORE DELUGE Accuracy: Spec: Demon: Service: MOTOR-OPERATED VALVE-SIS Location: CONTAINMENT 245'	Operating Time	5 MIN	7 DAYS	40	14	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	308	35, 38	14, 17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	75	35	14, 17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100	35	14, 17	SIMULTANEOUS TEST	NONE
	Chemical Spray	H_3BO_3 N_aOH	H_3BO_3 N_aOH		14	SEQUENTIAL TEST	NONE
	Radiation	9.5×10^5	2×10^8	(4)	17	SEQUENTIAL TEST	NONE
	Aging		40 YRS		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence						

NOTES:
(1) Same data this sheet applies to V-744B.
(2) See accident profile - Temperature - Figure 3.1-1.
(3) See accident profile - Pressure - Figure 3.1-2.
(4) See Section 1.3.2.
(5) See Section 3.2.3 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: AUXILIARY COOLING Plant ID No. V860A Component: MOTOR OPERATED Manufacturer: LIMITORQUE Model Number: SMB-1 Function: CV SUMP TO RHR SUCTION Accuracy: Spec: Demon: Service: MOTOR OPERATED VALVE Location: REACTOR AUXILIARY BLDG.	Operating Time	(2)	7 DAYS	30	14	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	308	35	14,17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	35	14,17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	35	14,17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	H_3BO_3 NaOH		14,17	SEQUENTIAL TEST	NONE
	Radiation	1.1×10^6	2.0×10^8	(3)	17	SEQUENTIAL TEST	NONE
	Aging	-	40 YRS.		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE	-				

(1) Same data this sheet applies to V860B
(2) To be used intermittantly during mitigation of LOCA.
(3) See Section 1.3.2.
(4) See Section 3.2.3 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: AUXILIARY COOLING Plant ID No. V861A(1) Component: MOTOR OPERATED Manufacturer: LIMITORQUE Model Number: SMB-1 Function: CV SUMP TO RHR SUCTION Accuracy: Spec: Demon: Service: MOTOR OPERATED VALVE Location: REACTOR AUXILIARY BLDG. Flood Level Elev: 231.67 Above Flood Level: Yes No	Operating Time	(2)	7 DAYS	30	14	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	308	35	14,17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	35	14,17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	35	14,17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	H_3BO_3 NaOH		14,17	SEQUENTIAL TEST	NONE
	Radiation	1.1×10^6	2.0×10^8	(3)	17	SEQUENTIAL TEST	NONE
	Aging	-	40 YRS.		17	SEQUENTIAL TEST	NONE
	Submergence	NOT APPLICABLE					

(1) Same data this sheet applies to V861B
(2) To be used intermittantly during mitigation of LOCA.
(3) See Section 1.3.2.
(4) See Section 3.2.3 for evaluation.

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (4)		
System: AUXILIARY COOLING Plant ID No. V863A Component: MOTOR OPERATED Manufacturer: LIMITORQUE Model Number: SMB-00 Function: RHR DISCHARGE TO SI SPRAY SYSTEM Accuracy: Spec: Demon: Service: MOTOR OPERATED VALVE Location: REACTOR AUXILIARY BLDG.	Operating Time	(2)	7 DAYS	30	14	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	308	35	14,17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	35	14,17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	35	14,17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	H_3BO_3 NaOH		14,17	SEQUENTIAL TEST	NONE
	Radiation	1.1×10^6	2.0×10^8	(3)	17	SEQUENTIAL TEST	NONE
	Aging	-	40 YRS.		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

(1) Same data this sheet applies to V863B
(2) To be used intermittantly during mitigation of LOCA.
(3) See Section 1.3.2.
(4) See Section 3.2.3 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (5)		
System: AUXILIARY COOLING Plant ID No. RHR-A (1) Component: MOTOR, PUMP Manufacturer: WESTINGHOUSE Model Number: 506UPZ Function: CIRCULATE SUMP WATER & BORATED REFUELING WATER TO REACTOR COOLANT SYSTEM-POST LOCA Accuracy: Spec: Demon: Service: RESIDUAL HEAT REMOVAL PUMP - SIS Location: AUXILIARY BUILDING	Operating Time	CONTINUOUS	CONTINUOUS	34, 35		(4)	(2)
	Temperature (^{o}F)	85 (AVG) AMBIENT	90^{o}-C RISE	35, 19		(4)	(2)
	Pressure (PSIA)	15	15	35, 19		(4)	(2)
	Relative Humidity (%)	AMBIENT	AMBIENT	35, 19		(4)	(2)
	Chemical Spray	NOT REQUIRED	NOT REQUIRED				
	Radiation	1.1×10^{6}	2.0×10^{8}	19 (3)	18	SEQUENTIAL TEST	NONE
	Aging		40 yrs.		18	SEQUENTIAL TEST	NONE
Flood Level Elev: N/A Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:
(1) Same data this sheet applies to RHR-B.
(2) Motor not exposed to DBE, no qualification testing needed.
(3) See Section 1.3.2
(4) Information to be obtained from manufacturer.
(5) See Section 3.2.8 for evaluation

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: REACTOR PROTECTION Plant ID No. TE-412B (1) Component: TEMPERATURE ELEMENT Manufacturer: ROSEMOUNT Model Number: 176KF Function: MAIN STEAM LINE BREAK MONITOR Accuracy: Spec: Demon: Service: T_{AV}-REACTOR COOLANT LOOP #1 SIS GENERATION Location: CONTAINMENT 243'	Operating Time	1 HR.	2 WKS.	21	48	SIMULTANEOUS TEST	NONE (5)
	Temperature (^{o}F)	(2)	320	21	48	SIMULTANEOUS TEST	NONE (5)
	Pressure (PSIA)	(3)	81	21	48	SIMULTANEOUS TEST	NONE (5)
	Relative Humidity (%)	100	100	21	48	SIMULTANEOUS TEST	NONE (5)
	Chemical Spray	-	H_3BO_3 NaOH		48	SIMULTANEOUS TEST	NONE (5)
	Radiation	1.5×10^7	1.0×10^8	(4)	48	SEQUENTIAL TEST	NONE (5)
	Aging		40 YRS. + 2 WKS.		48	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Same data this sheet applies to TE-412D
(2) See accident profile - Temperature - Figure 3.1-1
(3) See accident profile - Pressure - Figure 3.1-2
(4) See Section 1.3.2
(5) Not required for DBE - used only for outside containment Main Steam line Break protection

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: REACTOR PROTECTION Plant ID No. TE-422B (1) Component: TEMPERATURE ELEMENT Manufacturer: ROSEMOUNT Model Number: 176 KF Function: MAIN STEAM LINE BREAK MONITOR Accuracy: Spec: Demon: Service: T_{AV} - REACTOR COOLANT LOOP #2 STS GENERATION Location: CONTAINMENT 243'	Operating Time	1 HR.	2 WKS.	21	43	SIMULTANEOUS TEST	NONE (5)
	Temperature (°F)	(2)	320	21	43	SIMULTANEOUS TEST	NONE (5)
	Pressure (PSIA)	(3)	81	21	43	SIMULTANEOUS TEST	NONE (5)
	Relative Humidity (%)	100	100	21	43	SIMULTANEOUS TEST	NONE (5)
	Chemical Spray	-	H_3BO_3 NaOH		43	SIMULTANEOUS TEST	NONE (5)
	Radiation	1.5×10^7	1.0×10^8	(4)	43	SEQUENTIAL TEST	NONE (5)
	Aging		40 YRS. + 2 WK. POST ACCIDENT		43	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Same data this sheet applied to TE-422D
(2) See accident profile - Temperature - Figure 3.1-1
(3) See accident profile - Pressure - Figure 3.1-2
(4) See Section 1.3.2
(5) Not required for DBE - only used for outside containment Main Steam Line Break protection

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: REACTOR PROTECTION Plant ID No. TE-432B (1) Component: TEMPERATURE ELEMENT Manufacturer: ROSEMOUNT Model Number: 176KF Function: MAIN STEAM-LINE BREAK MONITOR Accuracy: Spec: Demon: Service: T_{VA} -REACTOR COOLANT LOOP #3 - SIS. Location: GENERATION CONTAINMENT 243'	Operating Time	1 HR.	2 WKS.	21	43	SIMULTANEOUS TEST	NONE (5)
	Temperature (°F)	(2)	320	21	43	SIMULTANEOUS TEST	NONE (5)
	Pressure (PSIA)	(3)	81	21	43	SIMULTANEOUS TEST	NONE (5)
	Relative Humidity (%)	100	100	21	43	SIMULTANEOUS TEST	NONE (5)
	Chemical Spray	-	H_3BO_3 NaOH		43	SIMULTANEOUS TEST	NONE (5)
	Radiation	1.5×10^7	1.0×10^8	(4)	43	SEQUENTIAL TEST	NONE (5)
	Aging		40 YRS. + 2 WKS.		43	SEQUENTIAL TEST	
Flood Level Elev: 231.67 Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Same data this sheet applies to TE-432D
(2) See accident profile - Temperature - Figure 3.1-1
(3) See accident profile - Pressure - Figure 3.1-2
(4) See Section 1.3.2
(5) Not required for DBE - only used for outside containment main steam line break protection

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (3)		
System: CHEMICAL & VOLUME Plant ID No. CVC-381 Component: MOTOR OPERATOR Manufacturer: LIMITORQUE Model Number: Function: REACTOR COOLANT PUMP SEAL WATER RETURN Accuracy: Spec: Demon: Service: Location: 240' REACTOR AUXILIARY BLDG.	Operating Time	(1)	7 DAYS	30	14	SIMULTANEOUS TEST	NONE
	Temperature (^{o}F)	AMBIENT	308	35	14,17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	35	14,17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	35	14,17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	H_3BO_3 NaOH		14,17	SEQUENTIAL TEST	NONE
	Radiation	1.1×10^6	2.0×10^8	(2)	17	SEQUENTIAL TEST	NONE
	Aging		40 YRS.		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

(1) To be used intermittantly during mitigation of LOCA
(2) See Section 1.3.2
(3) See Section 3.2.3 for evaluation

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (5)		
System: HVAC Plant ID No. HVH-1 (1) Component: MOTOR, FAN Manufacturer: WESTINGHOUSE Model Number: 685.5-S Function: TRANSFER HEAT FROM CONTAINMENT TO SERVICE WATER Accuracy: Spec: Demon: Service: CONTAINMENT FAN COOLER Location: CONTAINMENT 275'	Operating Time	3 hrs.	24 hrs. +	36	16	Simultaneous Test	None
	Temperature (°F)	(2)	315	36	16	Simultaneous Test	None
	Pressure (PSIA)	(3)	75-95	36	16	Simultaneous Test	None
	Relative Humidity (%)	100	100	36	16	Simultaneous Test	None
	Chemical Spray	H_3BO_3 NaOh	H_3BO_3 NaOh	34	16	Simultaneous Test	None
	Radiation	3.4×10^6	1.41×10^8	(4)	15	Sequential Test	None
	Aging		40 yrs.	-	15	Sequential Test	None
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Same data this sheet applies to HVH-2, HVH-3, HVH-4
(2) See accident profile - Temperature - Figure 3.1-1
(3) See accident profile - Pressure - Figure 3.1-2
(4) See Section 1.3.2.
(5) See Section 3.2.8 for evaluation.

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: ALL Plant ID No. SEE NOTE(1) Component: ELECTRICAL PENETRATION Manufacturer: CROUSE-HINDS Model Number: 1.2.2 (745) 1.2.5 (751) 1.2.2 (747) 1.2.4 (749) Function: ACCIDENT CONDITION MONITORING Accuracy: Spec: Demon: Service: PROVIDE CABLE CONTINUITY THROUGH CONTAINMENT SHELL Location: CONTAINMENT 234' - 246'	Operating Time	CONTINUOUS	105 hrs.	1	2,43	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	340	1	2,3,4,43	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	75	1	2,3,4,43	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100	1	2,4,43	SIMULTANEOUS TEST	NONE
	Chemical Spray	-	H_3BO_3 NaOH		43	SIMULTANEOUS TEST	NONE
	Radiation	1.4×10^7	2.13×10^8	(6)	43	SEQUENTIAL TEST	NONE (5)
	Aging	40	524 hrs. @ 150 C (40 yrs)	1	43	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Data this sheet applies to penetrations B-1,B-2,B-5,B-9,C-1,C-2,C-3,C-4,C-6,C-8,C-9,D-1,D-2,D-3,D-5,D-8,D-9
(2) See accident profile - Temperature - Figure 3.1.1
(3) See accident profile - Pressure - Figure 3.1.2
(4) See Section 3.2.1 for evaluation
(5) Qualification established for penetration cartridge only. Pigtail cable requires separate testing as reported in Section 3.2.1
(6) See Section 1.3.2

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SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (6)		
System: ALL Plant ID No. SEE NOTE(1) Component: TRANSMITTER Manufacturer: ROSEMOUNT Model Number: 1153A Function: REPLACEMENT COMPONENT Accuracy: Spec: ± ¼% Demon: Service: Location: CONTAINMENT	Operating Time	1 HR.-1 DAY	67 HRS.	38	23	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	350	38	23	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	135	38	23	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100		23	SIMULTANEOUS TEST	NONE
	Chemical Spray	H_3BO_3 NaOH	H_3BO_3 NaOH		23,41	SIMULTANEOUS TEST	NONE
	Radiation	3.8×10^6	4.4×10^7	(5)	23	SEQUENTIAL TEST	(4)
	Aging	-	NOT WITHIN MFGR. TEST PROGRAM				(4)
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence						

NOTES:

(1) Replacement transmitter to be supplied for: PT-444, PT-445, PT-455, PT-456, PT-457, LT-474, LT-475, LT-476, LT-477, LT-484, LT-486, LT-487, LT-494, LT-495 LT-496, LT-497, LT-459, LT-460, LT-461, FT-474, FT-475, FT-484, FT-485, FT-494, FT-495, LT-485

(2) See accident profile - Temperature - Figure 3.1-1

(3) See accident profile - Pressure - Figure 3.1-2

(4) Replacement transmitters tested under IEEE 323-1971 format, Rosemount currently performing transmitter testing to meet IEEE-323-1974 requirements.

Facility: H. B. Robinson #2

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (5)		
System: ALL Plant ID No. SEE NOTE (1) Component: SOLENOID, VALVE Manufacturer: ASCO Model Number: NP831665E NP8316E35E 206-381-2U Function: REPLACEMENT COMPONENT Accuracy: Spec: Demon: Service: Location: CONTAINMENT 283'	Operating Time	5 min.	30 days	40	47	Simultaneous Test	None
	Temperature (^{o}F)	(2)	346	40	47	Simultaneous Test	None
	Pressure (PSIA)	(3)	125	40	47	Simultaneous Test	None
	Relative Humidity (%)	100	100	40	47	Simultaneous Test	None
	Chemical Spray	H_3BO_3 NaOH	H_3BO_3 NaOH		47	Simultaneous Test	None
	Radiation	9.5×10^5	2.0×10^8	(4)	47	Sequential Test	None
	Aging	-	40 yrs. & 4.4 yrs.	(5)	47	Sequential Test	None
Flood Level Elev: 231.67 Above Flood Level: Yes No	Submergence	Not Applicable					

NOTES:

(1) Replacement solenoid valves to be supplied for: V12-7, V12-9, V12-11, V12-13, CVC-200A, CVC-200B
(2) See accident profile - Temperature - Figure 3.1-1
(3) See accident profile - Pressure - Figure 3.1-2
(4) See Section 1.3.2
(5) See Section 3.2.6 for evaluation

Facility: H. B. Robinson #2

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: ALL Plant ID No. Component: CABLE 4/C #16, 2/C #16, Shielded Manufacturer: CONTINENTAL WIRE & CABLE Model Number: CC2115 Function: FIELD CABLE Accuracy: Spec: Demon: Service: INSTRUMENTATION Location: CONTAINMENT	Operating Time	CONTINUOUS	240 hrs.		46	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	340	5	46	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	115		46	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100		46	SIMULTANEOUS TEST	NONE
	Chemical Spray		H_3BO_3		46	SEQUENTIAL TEST	NONE
	Radiation	1.4×10^7	1.0×10^8	(1)	46	SEQUENTIAL TEST	NONE
	Aging			5	(4)		
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

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 for evaluation

Facility: H. B. Robinson #2

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	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	(5)		(5)		
	Temperature (°F)	(2)	(5)	6	(5)		
	Pressure (PSIA)	(3)	(5)		(5)		
	Relative Humidity (%)	100	(5)		(5)		
	Chemical Spray		(5)		(5)		
	Radiation	1.4×10^7	(5)	(1)	(5)		
	Aging		(5)	6	(5)		
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

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
(5) Qualification information requested from KERITE Co.

Facility: H. B. Robinson #2

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification (3)		
System: CHEMICAL & VOLUME Plant ID No. CVC-381 Component: MOTOR OPERATOR Manufacturer: LIMITORQUE Model Number: Function: REACTOR COOLANT PUMP SEAL WATER RETURN Accuracy: Spec: Demon: Service: Location: 240' REACTOR AUXILIARY BLDG.	Operating Time	(1)	7 DAYS	30	14	SIMULTANEOUS TEST	NONE
	Temperature (°F)	AMBIENT	308	35	14,17	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	ATMOS.	75	35	14,17	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	AMBIENT	100	35	14,17	SIMULTANEOUS TEST	NONE
	Chemical Spray	NOT REQUIRED	H_3BO_3 NaOH		14,17	SEQUENTIAL TEST	NONE
	Radiation	1.1×10^6	2.0×10^8	(2)	17	SEQUENTIAL TEST	NONE
	Aging		40 YRS.		17	SEQUENTIAL TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

(1) To be used intermittantly during mitigation of LOCA
(2) See Section 1.3.2
(3) See Section 3.2.3 for evaluation

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: ALL Plant ID No. Component: CABLE SPLICES (1) Manufacturer: RAYCHEM Model Number: 1000-12N, 500-12N, 300-12N, 200-12N, 115-6N, 070-6N Function: SINGLE CONDUCTOR AND MULTICONDUCTOR CABLE SPLICING Accuracy: Spec: Demon: Service: ELECTRICAL PENETRATIONS Location: CONTAINMENT 234' - 246'	Operating Time	CONTINUOUS	30 days		44	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	357		44	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	85		44	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100		44	SIMULTANEOUS TEST	NONE
	Chemical Spray		H_3BO_3 NaOH		44	SIMULTANEOUS TEST	NONE
	Radiation	1.4×10^7	2.0×10^8	(5)	44	SEQUENTIAL TEST	NONE
	Aging		7 days @ 302°F 5×10^7 RAD		44	SIMULTANEOUS TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Plant procedure developed and approved for installation and checkout - M-521 (Revision 0)
(2) See accident profile - Temperature - Figure 3.1.1
(3) See accident profile - Pressure - Figure 3.1.2
(4) See Section 3.2.5 for evaluation
(5) See Section 1.3.2

SYSTEM COMPONENT EVALUATION WORK SHEET

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: ALL Plant ID No. Component: TERMINALS, CABLE (1) Manufacturer: AMP Model Number: 52979 (wire size 20 - 16) Function: CONDUCTOR BUTT SPLICE Accuracy: Spec: Demon: Service: ELECTRICAL PENETRATIONS Location: CONTAINMENT 234' - 246'	Operating Time	CONTINUOUS	16 days		45	SIMULTANEOUS TEST	NONE
	Temperature (°F)	(2)	351		45	SIMULTANEOUS TEST	NONE
	Pressure (PSIA)	(3)	85		45	SIMULTANEOUS TEST	NONE
	Relative Humidity (%)	100	100		45	SIMULTANEOUS TEST	NONE
	Chemical Spray		H_3BO_3 NaOH		45	SIMULTANEOUS TEST	NONE
	Radiation	1.4×10^7	2.1×10^2	(5)	45	SEQUENTIAL TEST	NONE
	Aging		40 yrs.		45	SIMULTANEOUS TEST	NONE
Flood Level Elev: 231.67' Above Flood Level: Yes No	Submergence	NOT APPLICABLE					

NOTES:

(1) Plant procedure developed and approved for installation and checkout - M-521 (Revision 0)
(2) See accident profile - Temperature - Figure 3.1.1
(3) See accident profile - Pressure - Figure 3.1.2
(4) See Section 3.2.5 for evaluation
(5) See Section 1.3.2

3.2 Electrical Equipment Qualification Evaluation

3.2.1 Electrical Penetrations and Connectors

The H. B. Robinson Nuclear Power Plant electrical penetrations are cartridge types with provisions for continuous pressurization. They were manufactured by Crouse-Hinds Company (Syracuse, N. Y.) to a Westinghouse design and specification CPL-R2-E3. Location within containment forms a grid pattern extending from elevation 234 feet to 246 feet. This places the penetrations above the established containment flood level of 231.67 feet. The electrical penetrations utilized by identified safety class electrical equipment are designated: Low Voltage (600V) 500 MCM, Low Voltage (600V) 3/C 19/#22, Low Voltage Control and Power (600V) 2/C #16, 3/C #16, and Instrumentation (600V) 2/C #16, 4/C #16 shielded. These types consist of a mixture of one-, two- and three-conductor cable interfaces and appropriate shields. Individual conductors are carried through the penetration and end in either a 60-inch or 72-inch pigtail. 2/C #16 and 4/C #16 pigtails are grouped and attached to electrical connectors (Crouse-Hinds model number RPC-317-160-SOIN/SO8N) to provide the appropriate cable match. The connectors are located in cable trays and lie in the horizontal plane. The cable tray runs are located essentially on the outside diameter of the polar crane shield wall to route cable to the respective instrumentation or control equipment.

The electrical penetration material which is located within containment and exposed to accident environment conditions consists of stainless steel (container) ceramic plate (conductor spacer) PVC and Kerite formula (conductor insulation) and aluminum (electrical connectors).

By specification each penetration type was designed to perform under the LOCA environmental conditions of pressure and temperature depicted within the H. B. Robinson FSAR (shown as Figure 3.1.1 and 3.1.2 in this report). Test information is recorded in References 3 and 4.

The CP&L Brunswick Nuclear Power Plant uses Westinghouse designed and fabricated electrical penetrations which are similar to those in use at H. B. Robinson. A greater degree of testing was performed on these penetrations with results found in Reference 43. Briefly summarized:

Thermal cycling - 20°C to 135°C (5 cycles)
Pre-aging - 524 hrs. @ 70°C (40 years)
Radiation - 2.13×10^8 RAD
Steam Test - Temperature, Pressure, Humidity and Spray (per report)

Due to the dual nature of the electrical penetrations, one side in containment the other outside, mock-up of only the in-containment area is required for testing purposes. The data recorded and referenced above should validate qualification of the H. B. Robinson penetrations.

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" cables were installed by the manufacturer and sleeved at the penetration end with heat shrink tubing. For selective conductors, connectors were installed while the majority of pigtail cables required butt-style splicing for field cable connection.

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 will initiate a test program to determine qualification of this cable. A spare pigtail will be removed from containment and shipped to a Test Laboratory. This cable has achieved a ten- (10) year operation and irradiation history to date. Additional aging for twenty- (20) year and forty- (40) year life is planned with accident conditions per IEEE 323, 1974 and H. B. Robinson parameter profiles to follow. Negotiations are underway with a Test Laboratory, and when completed, a test program and schedule will be included as a revision to this report.

Another Low Voltage Power (600) electrical penetration configuration uses 3/C 19/#22 cable which has not been fully identified by the penetration manufacturer. At present, it is stated that one (1) of two (2) electrical penetrations of the type fabricated for H. B. Robinson has pigtails of Kerite FR conductors insulation. The type of insulation for the other electrical penetration cannot be identified by records. Inspection of this penetration's pigtails will be performed during the July 1980 plant shutdown to determine cable insulation type. Any identified PVC insulated cable will be testing in the same program stated above for the instrumentation penetrations.

The suspected 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 proposed test program will determine the ultimate disposition of these pigtails. If replacement is required, a plan and schedule for accomplishment will be included as a revision to this report.

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. Torque V-866A&B Torque motors and V-744A&B motor brakes are wound with Class B insulation.

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

Model SMB-00 has a Peerless built torque motor and Model SMB-3 has a Reliance built torque motor.

Qualification testing of Limitorque motor operators was performed by Franklin Institute Research Laboratories and the test reports included in Westinghouse WCAP 7410-L, Environmental Testing of Engineered Safety Features Related Equipment. Limitorque Model SMB-0s, with and without motor brake, and Class B and Class H insulation were used during the tests. The results are applicable to the Models SMB-00 and SMB-3 used at H. B. Robinson as differences are dimensional and in torque rating only.

The qualification testing performed by FIRL encompasses the temperature, pressure, relative humidity and chemical spray parameters for H. B. Robinson; therefore, the Limitorque motor operations within containment are considered qualified per these parameters for H. B. Robinson operation.

Of concern was motor brake operation due to the results of FIRL Final Report F-C2485-01, Tests of a Limitorque Valve Operator and Motor Brake Assembly, Both with Class B Insulation Under Simulated Reactor Containment Post Accident Steam and Chemical Environments. Failure of the motor brake with subsequent valve operator failure was reported as occurring after seven (7) days within the test program. Performance prior to this time was recorded as satisfactory. Since the H. B. Robinson application of the motor brake, valve operator combination occurs within five (5) minutes after LOCA initiation, it is concluded that the intended function of this equipment will be met by the installed equipment; no further qualifying or changeout is planned.

Radiation exposure and aging tests are described within Westinghouse WCAP 7744, Environmental Testing of Engineered Safety Features Related Equipment. Total irradiation to 2×10^8 RADS and a thermal aging equivalent to forty (40) years is reported. Support data for these tests are on request from Westinghouse and will be made available for review when received.

Outside of containment for long-term accident mitigation are additional Limitorque motor valve operators which will be exposed to elevated radiation levels only. These are V-860A, V-860B, V-861A, V-861B, V-863A, V-863B, V-869. The Limitorque models used are SMB-00 and SMB-1. No motor brakes are associated with these operators. As stated previously, Westinghouse WCAP 7744 reports a test which achieved irradiation levels of 2×10^8 RADS with no failures encountered. CP&L has requested copies of the test data from Westinghouse, and it will be made available upon receipt. No other accident environment parameters are experienced at this location; therefore, CP&L considers these motor valve operations qualified for their intended use and location.

3.2.4 Electrical Cable

The electrical equipment in containment and reported within the equipment list of this report is connected by either single conductors or multiconductor cables. These cables run via cable trays and conduit from the electrical penetrations to the equipment. Connections to the electrical penetrations are made by individual or grouped cable splices, or by electrical connectors. At the equipment end, formal component terminals with overall tape or crimped terminals with overall tape are used for connection.

The connectors used (Crouse-Hinds Model No. RPC-117-150-POIN/PO8N) were supplied with the electrical penetrations and mounted on the matching cable during construction. For details concerning qualification of this connector, see Section 3.2.1. For details concerning cable splices and terminals see Section 3.2.5.

The electrical cable used for equipment hookup is divided into three (3) classifications:

- o multiconductor - 2/C #16, 3/C #16, 3/C 19/#22
- o multiconductor - 2/C #16, 4/C #16 (single drain wire utilized as shield)
- o single conductor - 500 MCM

The unshielded multiconductor cable is used to power the identified motor-operated valves (3C 19/#22), control the identified solenoid valves and provide limit switch outputs (2/C #16, 3/C #16). The shielded multiconductor cable is used for analog signals obtained from the listed transmitter and the listed RTD temperature elements (2/C #16, 4/C #16 shielded). The single conductor cable (500 MCM) provides power for the containment fans (HVH-1 through HVH-4). The shielded cables used for containment instrumentation utilize the provided electrical connectors at the penetration end.

For instrumentation within containment, a silicon rubber conductor insulation with glass binder, an untinned bare copper drain wire and an overall silicon rubber jacket cable is used. The manufacturer, Continental Wire and Cable Company, used their formulated insulation type CC-2115. This formulation has been tested by the Franklin Institute Research Laboratories under Continental Wire and Cable Company instruction. Final Report F-C2935 dated, October 1970 with addendum dated November 1970, details the testing specifics which included a preconditioning (aging) period of six (6) hours at $151^{\circ}F$, and a subsequent test achieved exposures of 1×10^{8} RADS. Also included was a chemical spray for one hundred and twenty (120) hours. The combined data for this cable insulation material indicates there should be no problems associated with LOCA pressure, temperature, humidity, spray, or radiation. At this time aging is the only unknown variable.

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.

(At this time, there is on record a large usage of PVC insulated conductors with overall PVC jacket at H. B. Robinson. To be assured that Kerite cable is in place within containment as stated, CP&L will inspect the hookup to solenoids and limit switches during the outage scheduled to begin July 26, 1980. Results of the inspection will be included as a revision to this document along with appropriate qualification data.)

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.

(CP&L has requested qualification information from Westinghouse as plant turnkey supplier and Kerite Company as cable manufacturer to meet IE Bulletin 79-1B requirements. To date this information has not been received. After data review, CP&L will revise this document accordingly.)

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.

(CP&L has requested qualification information from Westinghouse as plant turnkey supplier and Kerite Company as cable manufacturer to meet IE Bulletin 79-01B requirements. To date this information has not been received. After receipt and data review, CP&L will revise this document accordingly.)

3.2.5 Cable Terminals and Splices

As no qualification information could be obtained on the current in containment cable splices to the listed electrical equipment, it was decided to change out the splices with qualified components, prescribed tools and approved procedure. This changeout will be commenced and completed during the plant outage scheduled to start July 26, 1980.

Individual conductor splices will utilize AMP Nuclear Pre-insulated Environmentally Sealed Splices, wire size 20-16 AWG, T&B 2-way Cable Connectors for Copper Cable, 500 MCM and T&B 2-way Cable Connectors for Copper Cable, #9 AWG. The splice/connector component will be crimped to the designated conductors using the manufacturer's specified crimping tool.

An appropriate sized RAYCHEM SHRINK TUBING will be applied over the individual conductor splice and heat shrunk using the manufacturer's specified torch. For the two- (2) and three- (3) conductor cables after the individual conductors are spliced and sleeved an overall jacket RAYCHEM SHRINK TUBING will be applied and heat shrunk.

The work described above has been detailed within H. B. Robinson S.E.P. Modification and Setpoint Revision Form No. M-521 (Revision 0) and will be the means to sign off the completed work.

AMP terminals utilized as splices have been qualified per the H. B. Robinson accident parameters. AMP Engineering Test Report 110-11516 dated March 3, 1980, describes a program that included 40-year aging total irradiation exposure of 2.0×10^8 RADS, maximum temperature of 370° F, maximum pressure of 75 PSIA and a borated chemical spray lasting approximately 16 days. The results of this documented test are acceptable to CP&L that the terminals to be used in changeover are fully qualified.

RAYCHEM Thermofit Insulation Systems (heat shrink tubing) used to complete the replacement splice have been qualified per the H. B. Robinson accident parameters. Franklin Institute Research Laboratories Technical Report F-C4033-3 dated January 1975 describes a program that included 40-year aging, total irradiation exposure of 2.1×10^8 RADS, maximum temperature of 351°F, maximum pressure of 85 PSIA and a borated spray in excess of nine days. The results of this documented test are acceptable to CP&L that the heat shrink tubing to be used in changeover is fully qualified.

3.2.6 Solenoid Valves

As reported in CP&L responses to NRC IE Bulletins 79-01 and 79-01B (45-day report), the listed solenoid valves in containment are to be replaced by qualified equipment. The in-place ASCO solenoid valves have not exhibited poor performance or required excessive maintenance. When manufactured and supplied, ASCO

Company was not required to maintain the QC/QA procedures and programs necessary to allow traceability and certification needed for qualification.

The replacement valves are also ASCO Company equipment Model Nos. NP831665E, NP8316E35E and 206-381-2U used singly or in combination to achieve their valving function. These solenoid valve types were included in a qualification testing program to meet IEEE Standards 323, 344, and 382. Results of this testing are published in AUTOMATIC SWITCH COMPANY. Test Report No. AQS21678/TR, Revision A, entitled Qualification Tests of Solenoid Valves by Environmental Exposure to Elevated Temperature, Radiation, Wear Aging, Seismic Simulation, Vibration Endurance, Accident Radiation and LOCA Simulation.

The test parameters subjected the valves to a maximum temperature of 346°F, a maximum pressure of 125 PSIA, a relative humidity of 100%, a borated spray during the LOCA simulation and a total radiation of 2.0×10^8 RADS. The test results are divided into two (2) parts--first the evaluation of the elastomers and coil materials and second the valve mechanisms and housing. The elastomers and coil materials, as reported, are qualified for a 4.4 year life (includes a 10% margin figure). The valve proper is qualified for a 40-year life.

This will require the coils and elastomers to be replaced on a scheduled basis to maintain the serviceability of the entire valve as well as its qualification. The proposed schedule is replacement of stated components on a four- (4) year cycle. Replacement will be performed during the closest outage or refueling to that time period.

With the maintaining of the replacement component schedule, CP&L considers the ASCO solenoid valves fully qualified within H. B. Robinson parameters and need do no further testing or qualifying.

3.2.7 Level Switches

As reported in CP&L's responses to NRC IE Bulletins 79-01 and 79-01B (45-day report), containment level switches (LS-1925A, LS-1925B) located within containment sump would be replaced with qualified equipment as the in-place equipment was never qualified. As supplied, the level switches are magnetic in operation and provided incremental one- (1) foot level data as water would rise in the sump. This equipment could operate completely submerged.

A market search did not uncover any source of qualified equipment for replacement purposes. However, a parallel investigative effort by CP&L to meet the requirements of NRC NUREG 0578, TMI Short-Term Lessons Learned, ACRS2 Containment Water Level Indication, has concluded that there should be an analog level signal generated for combined sump and containment water level to aid in reporting and mitigating TMI type accident conditions--if ever experienced.

The current incremental level switches, Madison Model 5602 Switch Units with Type 316 Stainless Steel Stem, 10 ft. 6 inches long, with eight (8) 316 Stainless Steel Floats and one (1) Dry Contact Switch at each level, wired with 22AWG conductors with Silicone Rubber insulation, will remain in place. The function of these switches will be assumed by the analog system. The schedule for completion of installation is January 1, 1980. CP&L will take no further action on these level switches in conjunction with NRC IE Bulletin 79-01B.

3.2.8 Motors

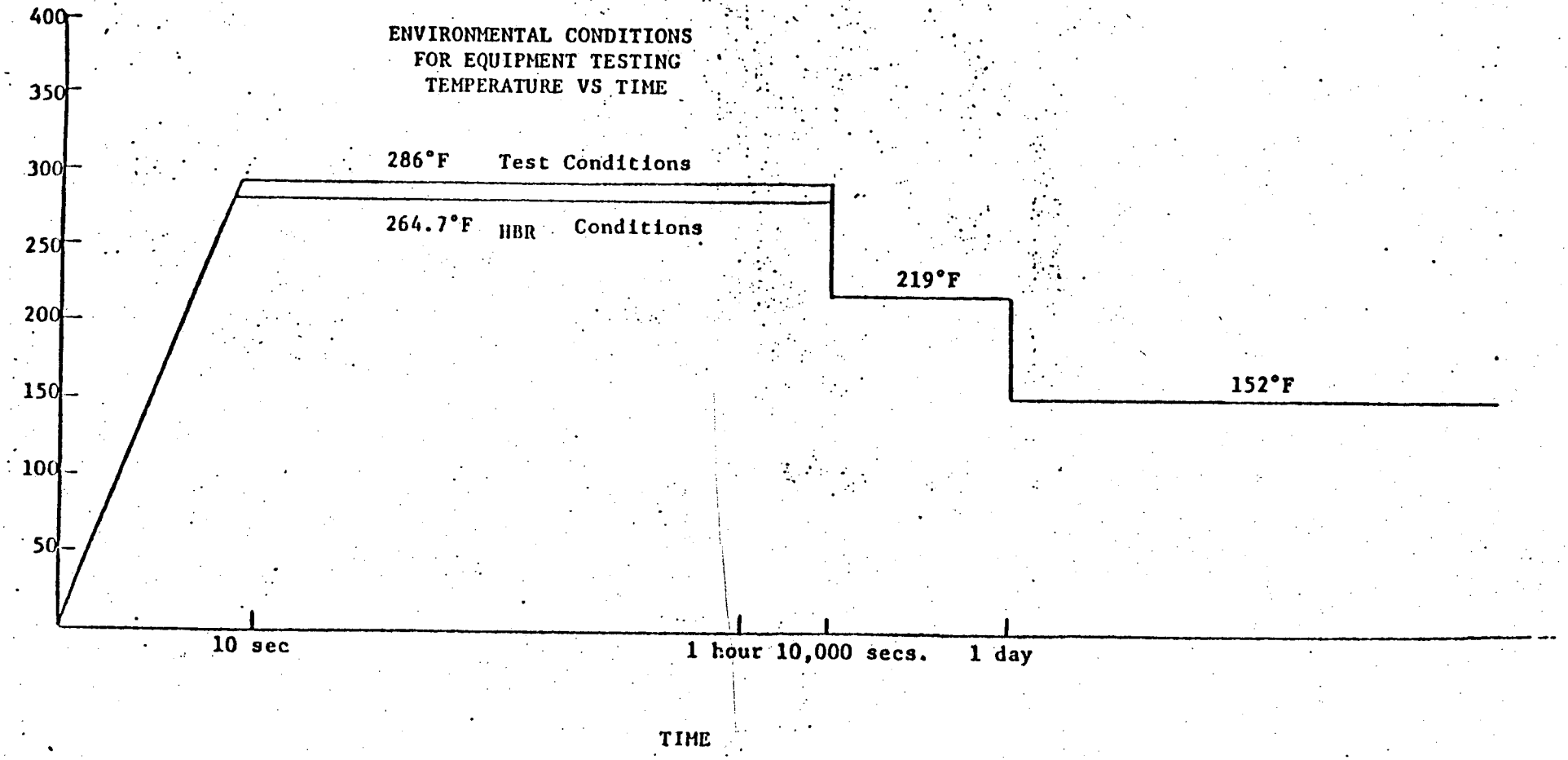
Within containment at H. B. Robinson included in the equipment list for the report is one (1) motor type. This is a Westinghouse Type 685.5-S used with the containment fans. There are four (4) fans mounted in containment designated HVH-1 through HVH-4.

Qualification testing on a complete motor/fan assembly and on individual motor elements has been performed by Westinghouse. Results are published within WCAP-9003, Fan Cooler Motor Unit Test, 1969; WCAP-7829, Fan Cooler Motor Unit Test, 1972. WCAP-9003 testing included: thermal pre-aging to an equivalent of seven (7) years, a maximum pressure of 95 psia, a maximum temperature of $315^{\circ}F$, and use of borated spray for thirty-five (35) hours. WCAP-7829 testing included: total irradiation of equipment/components to 2×10^{8} RADs, pre-aging to a 40-year life expectancy.

Evaluation of the test reports concludes that the H. B. Robinson accident parameters are covered by the test envelopes and parameters performed on the similar Westinghouse motor/components subjected to qualification testing. Therefore, the containment fan motors at H. B. Robinson are considered qualified.

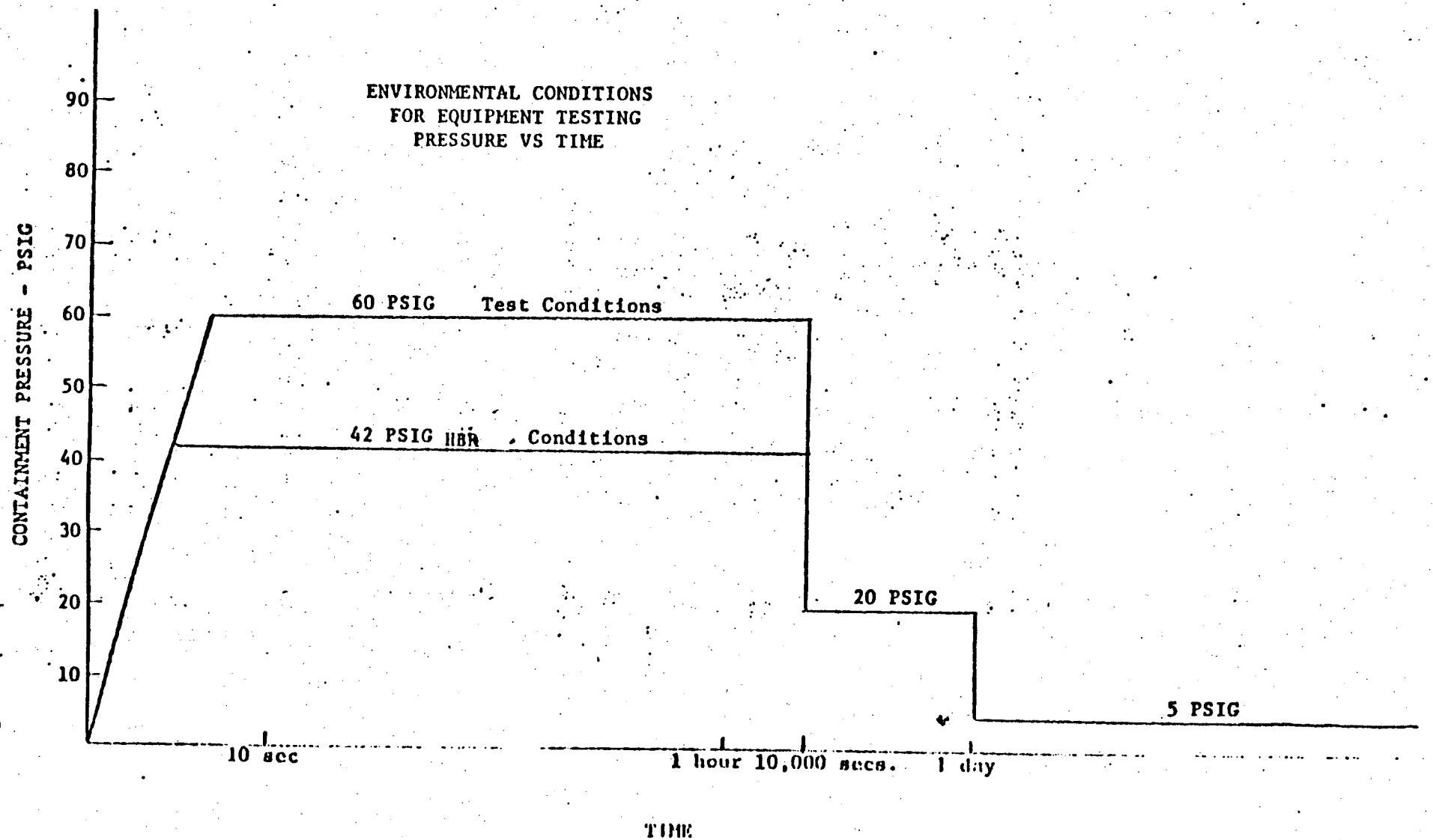
Outside of containment, the RHR pump motors are in use during long-term mitigation of LOCA conditions. The only accident parameters experienced by these pumps/motors is radiation. The most susceptible elements/components of the motors are covered by the testing reported within WCAP-7829. Since the RHR pump motors are of a similar type and motor windings are Thermalastic Epoxy insulated, it is concluded that the RHR pump motor is qualified for the service intended and the environment experienced during post LOCA.

Data supporting the Westinghouse testing reported within the stated WCAPs has been requested from Westinghouse and will be available for review upon receipt.



CONTAINMENT TEMPERATURE vs. TIME

Figure 3.1.1



CONTAINMENT PRESSURE vs. TIME

Figure 3.1.2

Amendment 7

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 report (to be verified by report revision after receipt and review of manufacturer's test report) penetrations having PVC conductor, and jacket insulation is 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 included as a revision to this report. Analysis of operating time radiation exposure concludes that plant can continue operation until tests are completed and reviewed. When finalized, the test program schedule and parameters will be forwarded to the NRC as a revision to this report.

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

Due to ambiguity of records, an inspection within containment will be performed during 1980 outage to determine if any PVC field cable was used for instrumentation or switch hookup. If present, a decision to include within the penetration pigtail test program will be made and reported to the NRC via revision to this report.

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

being assumed by a dual analog system provided in the TMI Short-Term Lessons Learned program.

Additional action required--None

4.8 Motors

The Westinghouse motors listed are considered qualified by similar type testing as reported within qualification reports and documents available from Westinghouse.

Additional action required--None

Where required above, the plant will assume a periodic maintenance program to inspect as well as replace stated elements and components. This will assure ability to withstand harsh environmental conditions, if experienced, and provide the necessary safeguard functions as designed or modified.

APPENDIX A

Calculations per Appendix B of IE Bulletin 79-01B to Determine Total Anticipated Radiation

VOLUMETRIC CALCULATIONS FOR EQUIPMENT COMPARTMENT

Step 1:

Reactor Power Level = 2300 MWth
Containment Volume = 2.1×10^6 ft.^{3}

30-day dose = 1.4×10^7 RADS

Step 2:

36" Wall (Concrete Shielding)

Dose = 1.5×10^3 RADS

Step 3:

Compartment Volume = 2.8×10^5 ft.^{3}

Correction Factor = 0.45

$0.45(1.4 \times 10^7) + 1.5 \times 10^3 = 6.3015 \times 10^6$
$= 6.3 \times 10^6$ RADS (30-day dose)

Step 4:

1/2 hour Correction Factor = 0.09 $0.09(6.3 \times 10^6) = 5.7 \times 10^5$ RADS

1 hour Correction Factor = 0.15 $0.15(6.3 \times 10^6) = 9.5 \times 10^5$ RADS

24 hour Correction Factor = 0.55 $0.55(6.3 \times 10^6) = 3.5 \times 10^6$ RADS

Time (hrs.)	Dose (RADS)	Dose + 10% Margin (RADS)
1/2	5.7×10^5	
1	9.5×10^5	1.0×10^6
24	3.5×10^6	3.8×10^6

VOLUMETRIC CALCULATIONS FOR OPERATING FLOOR COMPARTMENT

Step 1:

Reactor Power Level = 2300 MWth
Containment Volume = 2.1×10^6 ft.^{3}

30-day dose = 1.4×10^7 RADS

Step 2:

Not Applicable

Step 3:

Compartment Volume = 1.6×10^6 ft.^{3}

Correction Factor = 0.80

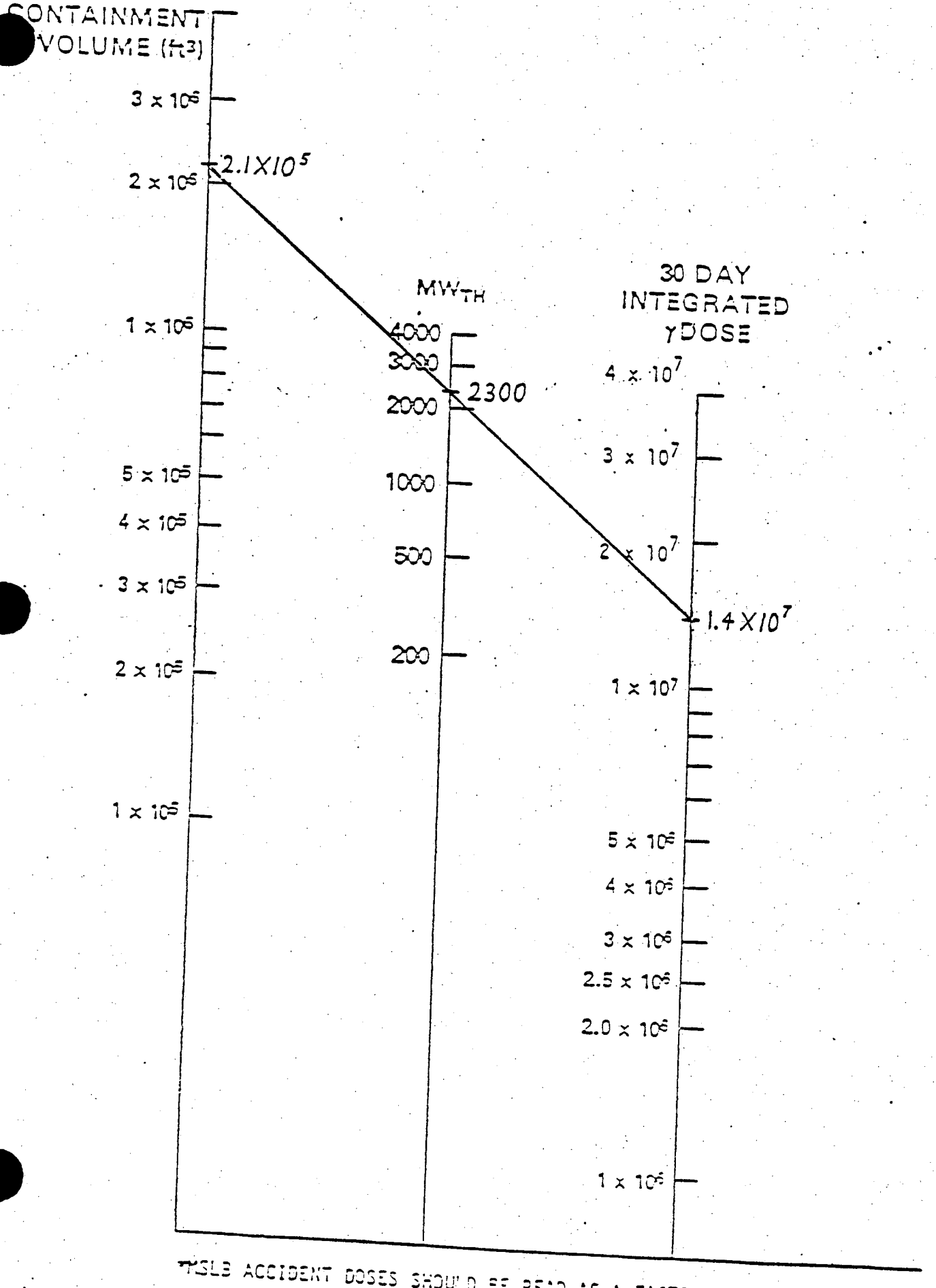
$0.08(1.4 \times 10^7) = 1.12 \times 10^7$ RADS (30-day dose)

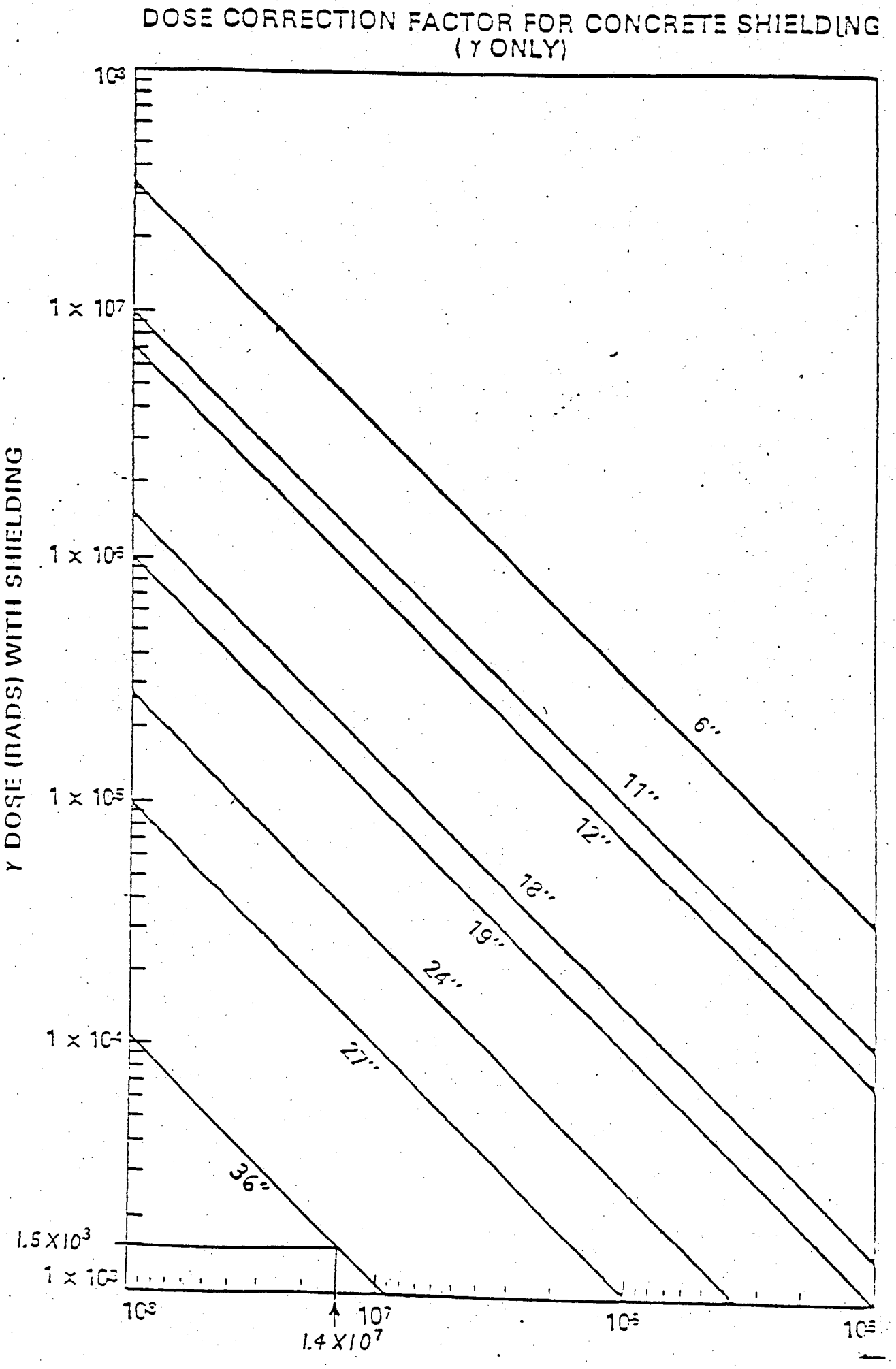
Step 4:

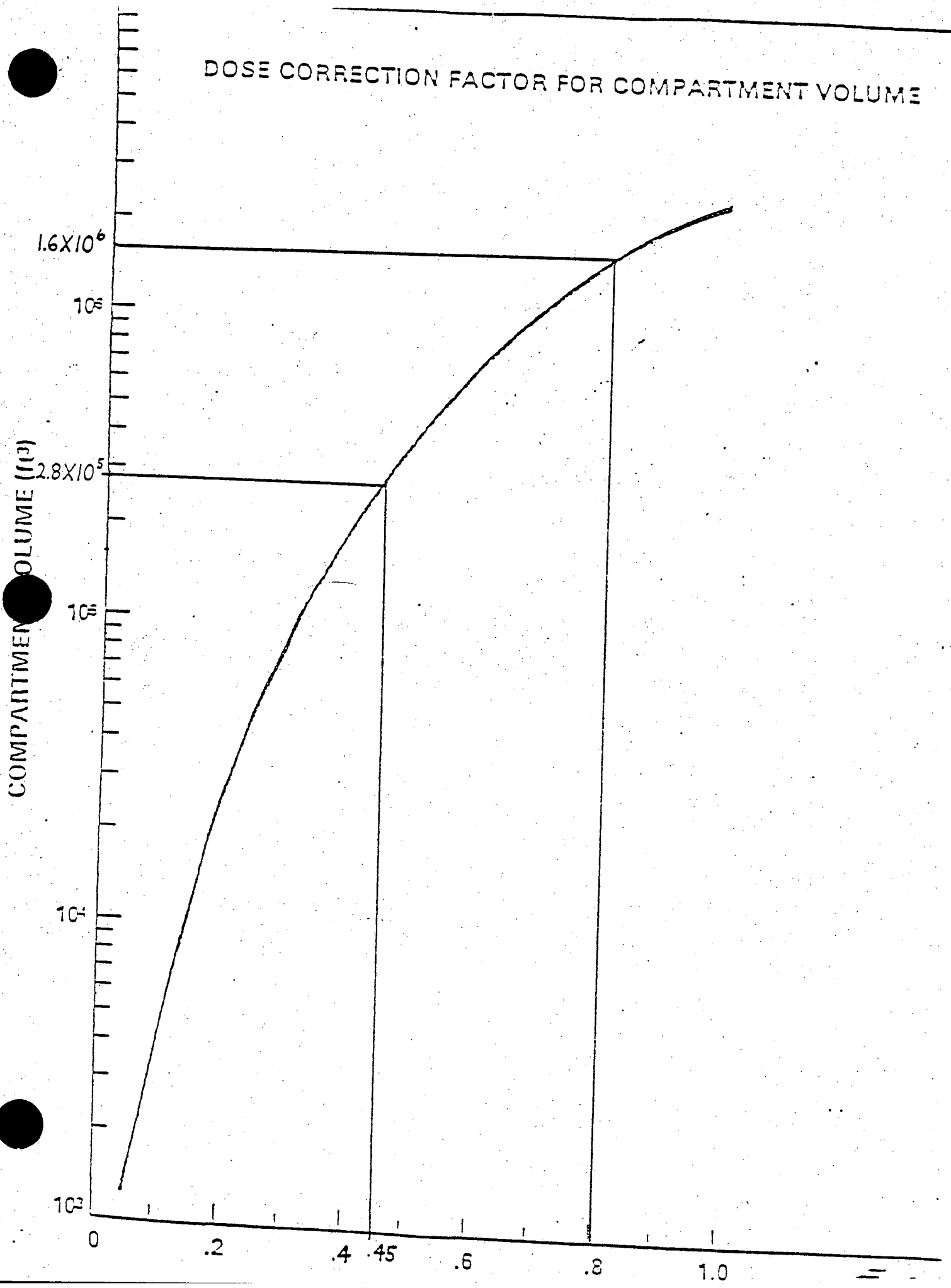
1/2 hour Correction Factor = 0.09 $0.09(1.12 \times 10^7) = 1.0 \times 10^6$ RADS

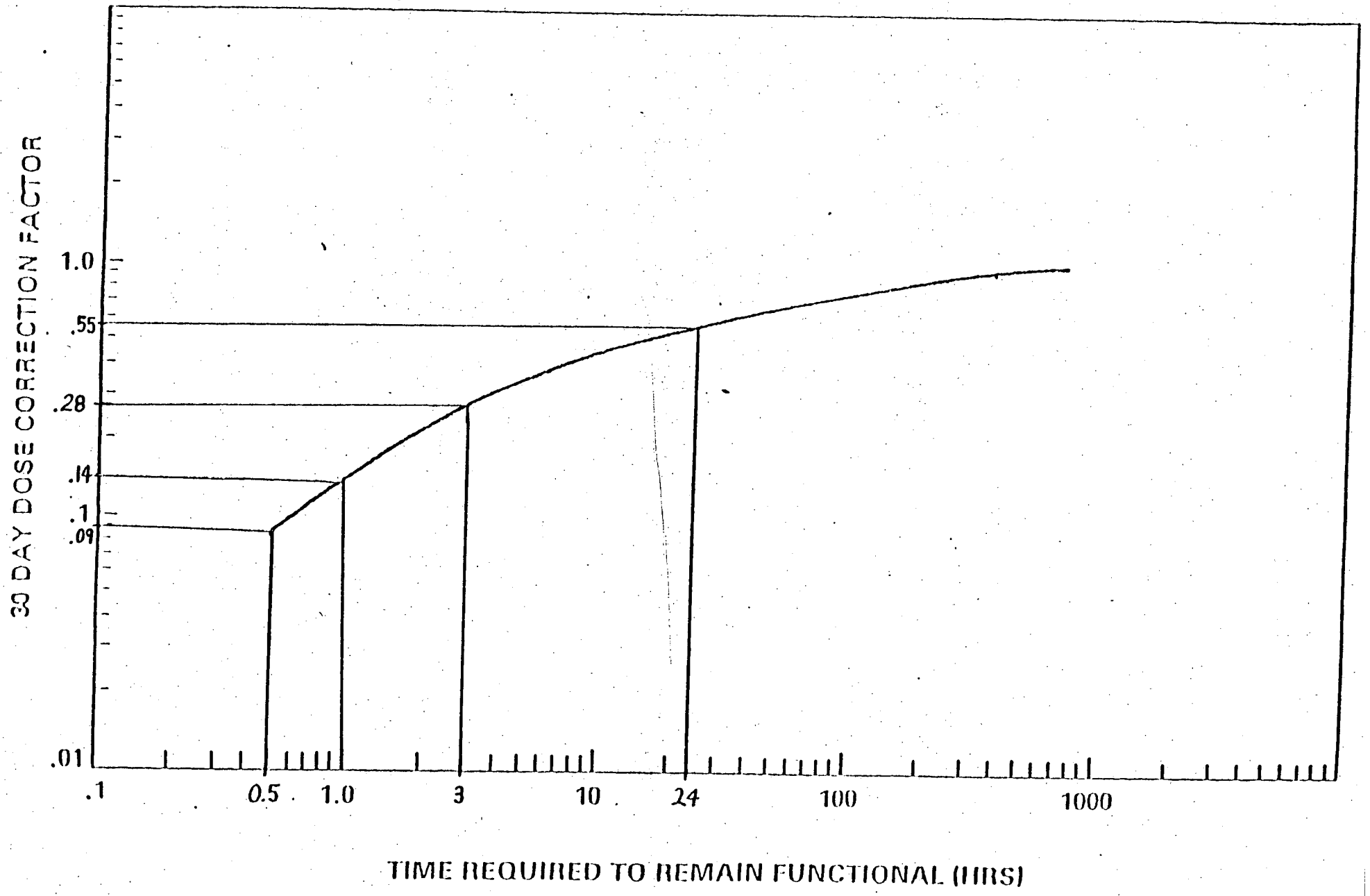
3 hour Correction Factor = 0.28 $0.28(1.12 \times 10^7) = 3.1 \times 10^6$ RADS

Time (hrs.)	Dose (RADS)	Dose + 10% Margin (RADS)
1/2	1.0×10^6	------
3	3.1×10^6	3.4×10^6


CONTAINMENT VOLUME (ft3)
3 x 10^6
2 x 10^6
1 x 10^6
5 x 10^5
4 x 10^5
3 x 10^5
2 x 10^5
1 x 10^5
2.1X10^5
MWTH
4000
3000
2000
1000
500
200
2300
30 DAY INTEGRATED γDOSE
4 x 10^7
3 x 10^7
2 x 10^7
1.4X10^7
1 x 10^7
5 x 10^6
4 x 10^6
3 x 10^6
2.5 x 10^6
2.0 x 10^6
1 x 10^6
*MSLB ACCIDENT DOSES SHOULD BE READ AS A FACTOR OF 10 LESS


DOSE CORRECTION FACTOR FOR CONCRETE SHIELDING
(γ ONLY)
γ DOSE (RADS) WITH SHIELDING
1 x 10⁸
1 x 10⁷
1 x 10⁶
1 x 10⁵
1 x 10⁴
1.5 X 10³
1 x 10³
6"
11"
12"
18"
19"
24"
27"
36"
10⁵
10⁶
10⁷
1.4 X 10⁷
10⁸


DOSE CORRECTION FACTOR FOR COMPARTMENT VOLUME
COMPARTMENT VOLUME (ft³)
1.6X10⁶
10⁶
2.8X10⁵
10⁵
10⁴
10³
0
.2
.4
.45
.6
.8
1.0


30 DAY DOSE CORRECTION FACTOR
1.0
.55
.28
.14
.1
.09
.01
.1
0.5
1.0
3
10
24
100
1000
TIME REQUIRED TO REMAIN FUNCTIONAL (HRS)