Wisconsin Electric POWER COMPANY
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February 22, 1983

Mr. H. R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

Attention: Mr. R. A. Clark, Chief
Operating Reactors Branch 3

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
PROPRIETARY INFORMATION IN TECHNICAL EVALUATION REPORTS
ON ENVIRONMENTAL QUALIFICATION OF
SAFETY-RELATED ELECTRICAL EQUIPMENT
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Mr. Clark's letter dated December 22, 1982 forwarded a Safety Evaluation Report (SER) and a Technical Evaluation Report (TER) prepared by the Franklin Research Center concerning the environmental qualification of safety-related electrical equipment for each unit at the Point Beach Nuclear Plant. Portions of the information supplied in the TER's included test reports and other documents which contained information which had previously been accorded proprietary protection. Wisconsin Electric was requested to contact the owners or originators of this information and clearly identify which information still required proprietary protection and provide the specific rationale and justification for this protection.

As discussed in our letter to you dated January 26, 1983, we provided the TER's to the Westinghouse Electric Corporation, the owner of the information, and requested that they complete a review of this information and clearly identify the proprietary details. Westinghouse has completed this task. For your convenience we have attached a listing, by Equipment Item Number and page, of those sheets from the TER's which still contain proprietary information. Please note that except for item numbers 69 and 70, those equipment item numbers listed apply to the TER's for both Point Beach Nuclear Plant, Units 1 and 2. Item numbers 69 and 70 refer only to the Unit 2 TER.

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We have also enclosed each of those pages identified as containing proprietary information. The specific elements of information contained on those pages which are maintained by Westinghouse to be proprietary have been deleted. Applications for withholding of this information together with affidavits presenting the specific rationale and justification for providing this protection from public disclosure were submitted to the NRC when the proprietary documents, from which the information for these TER pages was extracted, were originally submitted. These applications and affidavits are still relevant and are the basis for continued proprietary treatment.

Please notify us if you have any question concerning these matters.

Very truly yours,

C. W. Fay

Vice President - Nuclear Power

C. W. Fay

Enclosures

Copy to NRC Resident Inspector

LISTING OF PAGES CONTAINING PROPRIETARY INFORMATION IN TECHNICAL EVALUATION REPORT ON ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

EQUIPMENT ITEM NUMBER	PAGE NUMBER
Item No. 66	3a 5g
Item No. 69 (UNIT 2 ONLY)	3a 5c 5d 5e 5h 5i
Item No. 70 (UNIT 2 ONLY)	3a 5g

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

NOTES:

The Licensee cited Reference: PGR 639 as evidence of qualification.

With respect to Reference 639 FRC notes that the information base is not easily ascertained. Reference PGR 639 (WCAP-7410-L, Vol. I of II, Section 4) describes environmental testing programs performed on process instrumentation such as pressure and differential pressure transmitters manufactured by ITT-Barton, Fischer & Porter, and Foxboro. FIRL Reports F-C2639 and F-C2667 are cited by Westinghouse as evidence of qualification for pressure and temperature steam environmental accident conditions. FIRL Report F-C2639 describes results of three tests conducted on various Foxboro and Fisher & Porter transmitters. Test No. 1 was conducted using four pressure transmitters as test specimens, Test No. 2 was conducted using four differential pressure transmitters, and Test No. 3 was conducted using two specimens previously tested in Test No. 2 plus two new pressure transmitters. A Foxboro differential pressure transmitter, Serial No. 2013081, was used as a test specimen in Test No. 2. Due to difficulty in maintaining a constant input differential pressure, this transmitter was retested in Test No. 3. F-C2639 did not specifically state the test temperature/pressure profile utilized in Test No. 3; however, the report implied that the same generic environmental profile was reasonably duplicated in all three tests. Following the environmental tests, Foxboro unit Serial No. 2013081 was seismically tested and subsequently radiation tested.

With respect to Reference 639, FRC notes that:

The referenced test stated that a Foxboro differential pressure transmitter, Serial No. 2013081, was used as a test specimen.

The Guidelines require that equipment exposed to radiation as an environmental service condition must be qualified to integrated dose levels which are a combination of the normal operating dose level plus the accident dose level. A gamma dose of 20 Mrd is considered adequate for general PWR containment areas. The Licensee stated that the total integrated radiation level after a DBE is 160 Mrd. FRC presumes that the difference between 160-Mrd and 20-Mrd values is in part due to beta radiation contribution. The referenced test stated that the Foxboro transmitter, Serial No. 2013081, became inoperative during the first [ ] hours of the irradiation test at an integrated dose of [ ] Mrd. Westinghouse stated that the unit would be examined to establish the cause of

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

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failure. If the cause of failure could not be corrected, Westinghouse suggested shielding the units, which are required to operate long-term post-accident, so that total dosage would be less than 1 Mrd. FRC concludes that beta radiation doses are not significant for qualification of this equipment. In addition, FRC concludes that sufficient evidence of test specimen transmitter's performance (accuracy and stability), prior to failure during the test, does not exist to warrant a determination of satisfactory operation up to a level of [redacted] Mrd. Therefore, the transmitter qualification to the anticipated radiation environment is deficient due to evidence of failure during the type test.

The Guidelines require that equipment exposed to chemical sprays must be qualified for the most severe chemical environment by either test or analysis. In addition, the effects of enclosure pressure boundary integrity and fluid in-leakage must be considered. As discussed previously, these transmitters could become submerged in the chemical solution. The test program has not addressed the potential for chemical attack on elastomer seals and gaskets. Documentation providing evidence (in the form of [redacted] testing or analysis) that the performance of this equipment is not degraded due to containment spray solution should be provided.

The Guidelines require that equipment operational modes during testing should be representative of the actual plant application requirements. In addition, failure criteria should include instrument accuracy requirements. The referenced test stated that the maximum error of the Serial No. 2013081 transmitter's output signal during LOCA environmental testing was [redacted] in 0 to 10 seconds and [redacted] for the total test duration. FRC concludes that this is presumably unacceptable and reflects failure of the transmitter to perform with adequate stability. Unless the Licensee provides justification for acceptability of this maximum error range, FRC concludes that the unit has failed to qualify under environmental testing.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

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The Guidelines require that the test chamber temperature/pressure profile envelop the service conditions for a time equivalent to the period from the initiation of the accident until the service conditions return to normal values. As stated in the referenced test report, the test chamber time-dependent temperature/pressure profile exceeded the postulated accident profile for [ ] but did not totally envelop the required environmental service conditions. The referenced test time duration, stated to be [ ] minutes, did not envelop the required accident profile 8.3-hour interval. The required environmental service conditions are such that the temperature returns to normal (125°F) and the calculated worst-case pressure returns to normal (0 psig) in 8.3 hours after the initiation of the accident.

The Guidelines require that radiation exposure should be applied during the test sequence concurrent with or prior to the temperature and pressure/steam environment if it is known that the device contains materials which can be degraded by irradiation. FRC notes that the unit was seismically tested and subsequently irradiated after the temperature and pressure/steam environmental testing. It has been established that the transmitter is susceptible to radiation exposure as a result of testing. In light of this, FRC concludes that the test sequence for this device should have included irradiation exposure prior to or concurrent with the temperature/pressure testing.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

LICENSEE RESPONSE

R. The Reactor Coolant System loop RTDs were only tested to [ ] Rads gamma and were not thermally aged during qualification testing. The above radiation dose allows over 10 years of normal operation followed by one week of post-LOCA containment radiation. This would be sufficient time after a postulated accident to place the plant in a stable condition such that the RTDs would not be required. In addition, back-up indication such as steam generator saturation pressure or Residual Heat Removal system temperature are available depending on the mode of plant cooling. Therefore, continued safe operation of the plant is assured. It is our intention to continue evaluation of the present RTDs for thermal aging and a higher radiation dose in order to fully qualify these RTDs to the DOR Guidelines. High normal ambient temperatures and high normal radiation dose rates make the environmental qualification of these components extremely difficult. It is our intention to replace them with fully qualified RTDs by the environmental qualification deadline, if possible.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	Not stated	Combined with DBE exposure	
Radiation Aging, Dose Rate			
Radiation Aging, Method			
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	Not stated	Not stated	
Operational Aging (-/4.2/-)	N/A	N/A	
Other Age Conditioning (-/4.2/-)	N/A	N/A	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	10 years (Radiation only)	Post-accident RCS	Note 9,10 X
Normal Ambient Temperature	130°F	120°F	
Normal Ambient Radiation	Not stated	200 R/h	
Normal Ambient Humidity	Not stated	Not Stated	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	—	Not stated	
On-Going Analysis of Failures and Degradation (7.0/-/-)	—	N/A	
Margin (General) (6.0/3.0/3.0)		Not stated	
Margin (NUREG-0588, Cat. I) (-/3.2/-) 1. Temperature (+15°F) 2. Pressure (+10%, 10 psig max) 3. Radiation (not required) 4. Time (+10%, +1 hour + function time minimum)	Not stated		

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NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
ACCIDENT CONDITIONS			
LOCA/MSLB/HELB/Uncontrolled (4.1, 4.2, 4.3.1, 4.3.3/ 1.1, 1.2, 1.5/1.1, 1.2, 1.5)	LOCA/MSLB	S L B	
Radiation Type	Gamma	Gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	150 Mrd	Not Applicable	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	—	1.6 Mrd/h	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	—	N/A	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	—	Not stated	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	*	[ ] Mrd	X
Plateout Dose Considered (-/1.48/1.48)	—	Not stated	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	*	100 Mrd	

* Licensee has stated 150 Mrd accident plus 300 Mrd for 40 years operation.

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NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS			
Rate of Temp./Press. Increase	12°F/3.4psig/s	[ ]	
Peak: °F/psig/RH/Time	278/53/100/25s	[	
	274/53/100/20m		Notes 12,13
Decrease To: °F/psig/RH/Time	208/15/100/1h		
Decrease To: °F/psig/RH/Time	155/-/100/-		
Decrease To: °F/psig/RH/Time		]	
Equipment Surface Temperature (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	—	Not stated	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	Test	Test	Note 14
Spray Composition (4.1.4/1.3, 2.2.8/1.3, 2.2.8)	1.16w/o H_3BO_3 0.5 w/o NaOH pH > 8.5 (after sumping)	1.14w/o boric acid 0.17 wt% NaOH	X
Spray Density (gpm/ft^2)	Not stated	Not stated	Note 14 X
Spray Duration	Not stated	Not stated	Note 14 X
Submergence Duration (4.1.3/2.2.5/2.2.5)	N/A	N/A	
In-Leakage Considered (5.2.6, 5.3.2/-/-)	N/A	N/A	
Time to Submergence	N/A	N/A	
Dust Environment (-/2.2.11/2.2.11)	N/A	N/A	

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

NOTES:

Note 5

Westinghouse has stated 2-out of-3 RTDs must meet accuracy requirements corresponding to reactor trip (narrow range temperature) and post-accident monitoring (wide-range temperature) applications. A failure is permitted if it is random, i.e., not indicative of common mode failure. No rationale was provided for the 2-out of-3 acceptance criteria or technical bases for determining when a failure is not common mode. See related Note 6.

Note 6

WCAP - 9157 reports accuracy requirements of ± 5%. Testing performed did not provide information on worse case error under design basis accident conditions. Also, the qualification program did not address the ability of the RTDs' time response with respect to primary loop temperature changes and trip points under SLB conditions. It appears this information is an important consideration for this device.

Rosemount specifications on DWG 176KF (Rev E) states:

[ ]

WCAP - 9157 indicated that calculated temperatures based on manufacturer's resistance tables at the 32°F calibration point were not within specified accuracy (i.e. exceeded [ ] criterion). Calculated temperatures were [ ] below the calibration temperature of 32°F. Calibration temperatures of 525°F and 625°F were not used in the test program.
The Rosemount specification drawings, Dwg. No. 176KF (Rev.J) and 176KS (Rev, E) state

[ ]

[ ] within the repeatability [ ] environmental test calibration at 250° F.

One of three 176KF RTDs was not [ ] limits during the post

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

NOTES:

Note 7

The test described in WCAP 9157 consists of an initial 24 H transient period with temperature/pressure decreasing to [ ] A [ ] exposure at [ ] conditions is taken as equivalent to a 13 day severe environment exposure at [ ] (In-containment average temperature over a 2 week period following a SLB is [ ] according to WCAP 9157.)

The basis for accelerating test time is a simple chemical reaction rate law model given on pg 2-7 of WCAP 9157. (This model is more conservative than an Arrhenius model based on similar governing materials and temperatures)

Acceleration of the test interval through increased test temperatures is not usually acceptable for steam exposures. (e.g. LOCA conditions) For the temperatures [ ] and the devices considered here however, a test [ ] duration of [ ] after the initial 24 H transient period should be acceptable by engineering judgment.

Long-term post-accident operating period (e.g. 1 year) functional capability has not been addressed by the licensee.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

NOTES:

Note 9

Radiation doses for RTDs are based on application. Gamma dose for wide range RCS post-accident monitoring is determined from centerline dose in primary loop (hot leg) piping; narrow range reactor trip RTD dose is taken as ~~the~~ dose surface on this piping. [687]

Note 10

Qualified life claim in WCAP-9157 of [ ] is based on dose rate and operating time calculations performed by Westinghouse. Thermal aging has not been included in the qualified life evaluation. See note 15 .

Note 12

Peak test chamber controlled pressure is stated as 66 psig; however, no additional pressure data has been provided in WCAP 9157

Facility setup supplies steam at saturated conditions except for initial transient period where superheating is possible. 100% RH is assumed at saturation conditions.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

Note 13

Conditions stated are for test profile. Actual temperature data was provided for the first 25 S only. This data indicated an overshoot to approximately [ ] F at 25 S.

Note 14

Spray density and duration are not stated. WCAP 9157 indicates on pg 5-1 that spray can be injected via spray nozzles or main inlet steam piping to test chamber. No information is provided on specific approach used in this test.

Note 15

Rosemount Dwgs. 176KF and 176KS state that the lead termination area should be limited to 200° F. Based on the construction of the RTD and reactor coolant piping temperatures this temperature specification appears to be easily exceeded. Thermal aging of component parts has not been addressed by test or analysis.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

LICENSEE RESPONSE TO NRC SER

GG. The electrical cable splices used inside containment for safety-related applications were made up in accordance with Bechtel Drawing No. SK-E-165 using Raychem Type SFR heat shrinkable tubing (silicone rubber) as confirmed by Westinghouse letter WEP-78-531 dated June 28, 1978. The environmental qualification tests for these splices were documented in WCAP-7410L. The environmental tests included thermal aging to the equivalent of [ ] years, irradiation to [ ] Rads gamma radiation, and a three week LOCA simulation which included chemical spray and 100% relative humidity. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning response to the PBNP environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging. The chemical spray consisted of a 1.5 weight percent solution of boric acid (H_3BO_3) buffered with sodium hydroxide (NaOH) to a pH value of approximately 9.25. Since all postulated PBNP accident parameters are enveloped by the test profiles, the splices are considered fully qualified to the DOR Guidelines.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Acceptance Criteria (5.2.5/2.2.1/2.2.1)	N/A	maintain loading pass Hi pot.	
Accuracy (5.2.5/-/-)		N/A	
Number of Specimens		18	
Test Instruments Calibrated		yes	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)		N/A	
Test Duration (5.2.1/-/-)		2 > days	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	~24 hrs.	NA	
Required Function Time	1 year	↓	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	N/A		
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)		Thermal age Irradiate LOCA simulation	
1. Representative Sample			
2. Baseline Data			
3. Performance Extremes			
4. Thermal Aging			
5. Radiation Aging			
6. Wear Aging			
7. Vibration/Seismic			
8. DBE Exposure			
9. Post-DBE Exposure			
10. Inspection			
Aging (5.2.4, 7.0/4.0/4.0) Thermal Aging/Basis	40 yrs	[- -	Silmic Kenite]
Material Aging Evaluation (7.0/-/-)	yes	yes	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	No	No.	
Radiation Aging, Type	Gamma	Gamma.	

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NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	Not stated	pre accident dose	
Radiation Aging, Dose Rate			
Radiation Aging, Method			
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)		N/A	
Operational Aging (-/4.2/-)			
Other Age Conditioning (-/4.2/-)			
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 years		
Normal Ambient Temperature Normal Ambient Radiation Normal Ambient Humidity	Not stated	N/A	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	pt Beach Program		
On-Going Analysis of Failures and Degradation (7.0/-/-)			
Margin (General) (6.0/3.0/3.0)	N/A		
Margin (NUREG-0588, Cat. I) (-/3.2/-) 1. Temperature (+15°F) 2. Pressure (+10%, 10 psig max) 3. Radiation (not required) 4. Time (+10%, +1 hour + function time minimum)			

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NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
ACCIDENT CONDITIONS			
LOCA/MSLB/HELB/Uncontrolled (4.1, 4.2, 4.3.1, 4.3.3/ 1.1, 1.2, 1.5/1.1, 1.2, 1.5)	LOCA	LOCA	
Radiation Type	Gamma	Gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	1.5×10^8	[ ]	
Radiation Dose Rate (rd/hr)	Not stated	Not stated	
Radiation Qual. Method (5.3.1/-/-)			
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)		N/A	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)			
Radiation Dose (Normal + Accident) (4.1.2/-/-)			
Plateout Dose Considered (-/1.48/1.48)			
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)			

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS			
Rate of Temp./Press. Increase	Not Stated	Not stated.	
Peak: °F/psig/RH/Time	278/53/-/1000s		
Decrease To: °F/psig/RH/Time	see profile p-5f		
Decrease To: °F/psig/RH/Time			
Decrease To: °F/psig/RH/Time			
Equipment Surface Temperature (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	N A	N/A.	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	N/A	Test	
Spray Composition (4.1.4/1.3, 2.2.8/1.3, 2.2.8)	H_3BO_3-NaOH Solution pH:7.9-10.0	Boric Acid (1.5%) by weight. NaOH to make pH=9.	
Spray Density (gpm/ft^2)	Not Stated	2 hrs Not Stated	
Spray Duration			
Submergence Duration (4.1.3/2.2.5/2.2.5)			
In-Leakage Considered (5.2.6, 5.3.2/-/-)			
Time to Submergence			
Dust Environment (-/2.2.11/2.2.11)			

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 54

LICENSEE RESPONSE TO NRC SER

H. The temperature profiles for the specification and the qualification test are essentially equal. The specification temperature was computed using extremely conservative assumptions. The highest possible superheat temperature from a steam leak at the highest secondary pressure was calculated for the peak temperature. This also assumed no cooling by the surrounding air or equipment and that a jet of steam impinges directly on the affected equipment. The test temperature during qualification was maintained for a much longer duration than the duration of peak temperature from a steam line break outside containment. Therefore, the internal temperatures of the equipment being tested (e.g., valve motor operators) reached higher levels during qualification testing than that which could result from a short-duration steam line break accident. Electrical cables are run in conduits near high energy lines so that direct steam impingement on cables is impossible. Therefore, the temperature profile of the test is considered adequate to qualify the equipment to the specification temperature profile.

V. The Limitorque Model SMB valve motor operators inside containment (or near a high energy line outside containment) have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. 80003 (Qualification References 1B and 16B, respectively). The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." All safety-related valve operators inside containment are located outside the primary shield walls where the ambient temperatures during operation are maintained by design at less than 105°F and by experience at less than 100°F. Safety-related valve operators in the auxiliary building outside containment have ambient temperatures which are maintained between 65 and 85°F. The qualification tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintanance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning reponse to the environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [illegible] Rads gamma. The tests documented by Test Report No. 80003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including the geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

LICENSEE RESPONSE TO NRC SER (Continued)

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours as documented in WCAP-7410L. The test included chemical spray with a 1.5 weight precent solution of boric acid (H_3BO_3) buffered to a pH of 7.85 with sodium hydroxide (NaOH). The pH is at the bottom of the pH range specified. The short required operating time of the units (maximum of 14 hours and usually only 30 minutes) would not allow a slightly higher pH solution to significantly increase the chemical corrosion of the units over that solution which was used in the test. The boric acid concentration was much higher in the test than that required for PBNP. The specified temperature and pressure profiles were both enveloped by the test profiles. The operators were tested successfully periodically throughout the [ ] hours of testing. The operators were exposed to saturated steam at [ ] psig for an additional [ ] after which they failed to operate properly. The cause of the failure was analyzed and determined to be the entry of chemical spray into the unit through the motor lead cutouts. The motor lead cutouts are sealed at PBNP with flexible conduit and associated fittings. Although these fittings have not been qualified, their design indicates that no significant amounts of chemical spray could enter the units via this path. In addition, the tests documented by Test Report 80003 demonstrate that the units can survive a saturated steam environment at 10 psig for at least 16 days. This demonstrates their qualification for operation in 100% relative humidity and steam for long periods of time. The valve operators would therefore be considered qualified for an operating time of 24 hours following a design basis accident except as limited by the radiation qualification of the operator. The qualified level of radiation integrated dose postulated for the PBNP containment reaches 2×10^7 Rads at approximately 12 hours following a design-basis accident. Therefore, these valve operators are considered qualified for a maximum operating time of 12 hours in a LOCA or HELB environment inside containment.

In conclusion, these Limitorque valve operators are considered qualified for LOCA or HELB environments inside containment, 100% relative humidity, chemical spray, 2×10^7 Rads gamma radiation, a 40 year lifetime, and an operating time following an accident of 12 hours.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 54

NOTES:

Note (2) continued

"During the past 18 years, few operating problems have been experienced because of inadequate radiation resistance of lubricants. In irradiated zones, factors other than radiation levels, such as elevated temperatures, moisture or ozone are almost always the limiting factors. Conventional petroleum based lubricants are available which have sufficient radiation resistance to lubricate mechanisms subject to radiation under almost all operating conditions in CANDU generating stations."

The licensee did not document the similarity between the tested lubricant and that employed in the installed equipment. Therefore, conclusions regarding the radiation qualification status of the lubricant employed in the installed equipment could not be drawn from the results of tests reported in PGE 3229. It should be noted that the impact of changes in lubricant characteristics, due to radiation exposure, on equipment could not be determined; e.g. bearing life, seal integrity. Therefore, the applicability of the lubricant test data to installed equipment remains a questionable consideration.

3) PGE # 639, which includes supporting documentation for qualification of the lubricant to temperature, pressure, humidity and chemical spray, provides the results of tests on an SMB-0 Limitorque Valve Operator and a motor-brake assembly. The valve operator failed the test due to penetration of chemical spray into the unit through the motor lead cutouts. The valve operator operated satisfactorily throughout the first day of testing but failed after remaining inoperative at [ ] saturated steam for [ ] additional days. The

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 56

LICENSEE RESPONSE TO NRC SER

H. The temperature profiles for the specification and the qualification test are essentially equal. The specification temperature was computed using extremely conservative assumptions. The highest possible superheat temperature from a steam leak at the highest secondary pressure was calculated for the peak temperature. This also assumed no cooling by the surrounding air or equipment and that a jet of steam impinges directly on the affected equipment. The test temperature during qualification was maintained for a much longer duration than the duration of peak temperature from a steam line break outside containment. Therefore, the internal temperatures of the equipment being tested (e.g., valve motor operators) reached higher levels during qualification testing than that which could result from a short-duration steam line break accident. Electrical cables are run in conduits near high energy lines so that direct steam impingement on cables is impossible. Therefore, the temperature profile of the test is considered adequate to qualify the equipment to the specification temperature profile.

V. The Limitorque Model SMB valve motor operators inside containment (or near a high energy line outside containment) have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. 80003 (Qualification References 1B and 1SB, respectively). The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." All safety-related valve operators inside containment are located outside the primary shield walls where the ambient temperatures during operation are maintained by design at less than 105°F and by experience at less than 100°F. Safety-related valve operators in the auxiliary building outside containment have ambient temperatures which are maintained between 65 and 85°F. The qualification tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning reponse to the environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [illegible] Rads gamma. The tests documented by Test Report No. 80003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including the geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 56

LICENSEE RESPONSE TO NRC SER (Continued)

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours as documented in WCAP-7410L. The test included chemical spray with a 1.5 weight precent solution of boric acid (H_3BO_3) buffered to a pH of 7.85 with sodium hydroxide (NaOH). The pH is at the bottom of the pH range specified. The short required operating time of the units (maximum of 14 hours and usually only 30 minutes) would not allow a slightly higher pH solution to significantly increase the chemical corrosion of the units over that solution which was used in the test. The boric acid concentration was much higher in the test than that required for PBNP. The specified temperature and pressure profiles were both enveloped by the test profiles. The operators were tested successfully periodically throughout the [ ] hours of testing. The operators were exposed to saturated steam at [ ] psig for an additional [ ] days after which they failed to operate properly. The cause of the failure was analyzed and determined to be the entry of chemical spray into the unit through the motor lead cutouts. The motor lead cutouts are sealed at PBNP with flexible conduit and associated fittings. Although these fittings have not been qualified, their design indicates that no significant amounts of chemical spray could enter the units via this path. In addition, the tests documented by Test Report B0003 demonstrate that the units can survive a saturated steam environment at 10 psig for at least 16 days. This demonstrates their qualification for operation in 100% relative humidity and steam for long periods of time. The valve operators would therefore be considered qualified for an operating time of 24 hours following a design basis accident except as limited by the radiation qualification of the operator. The qualified level of radiation integrated dose postulated for the PBNP containment reaches 2×10^7 Rads at approximately 12 hours following a design-basis accident. Therefore, these valve operators are considered qualified for a maximum operating time of 12 hours in a LOCA or HELB environment inside containment.

In conclusion, these Limitorque valve operators are considered qualified for LOCA or HELB environments inside containment, 100% relative humidity, chemical spray, 2×10^7 Rads gamma radiation, a 40 year lifetime, and an operating time following an accident of 12 hours.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 56

NOTES:

Note (2) continued

"During the past 18 years, few operating problems have been experienced because of inadequate radiation resistance of lubricants. In irradiated zones, factors other than radiation levels, such as elevated temperatures, moisture or ozone are almost always the limiting factors. Conventional petroleum based lubricants are available which have sufficient radiation resistance to lubricate mechanisms subject to radiation under almost all operating conditions in CANDU generating stations."

The Licensee did not document the similarity between the tested lubricant and that employed in the installed equipment. Therefore, conclusions regarding the radiation qualification status of the lubricant employed in the installed equipment could not be drawn from the results of tests reported in PGE 3229. It should be noted that the impact of changes in lubricant characteristics, due to radiation exposure, on equipment could not be determined; e.g. bearing life, seal integrity. Therefore, the applicability of the lubricant test data to installed equipment remains a questionable consideration.

3) PGE # 639, which includes supporting documentation for qualification of the lubricant to temperature, pressure, humidity and chemical spray, provides the results of tests on an SMB-0 limitorque Valve Operator and a motor-brake assembly. The valve operator failed the test due to penetration of chemical spray into the unit through the motor lead entrance. The valve operator operated satisfactorily throughout the first day of testing but failed after remaining inoperative at [ ] saturated steam for [ ] additional days. The

LICENSEE RESPONSE TO NRC SER

V. The Limitorque Model SMB valve motor operators inside containment (or near a high energy line outside containment) have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. 80003 (Qualification References 18 and 168, respectively). The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." All safety-related valve operators inside containment are located outside the primary shield walls where the ambient temperatures during operation are maintained by design at less than 105°F and by experience at less than 100°F. Safety-related valve operators in the auxiliary building outside containment have ambient temperatures which are maintained between 65 and 85°F. The qualification tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning reponse to the environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Test Report No. 80003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including the geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours as documented in WCAP-7410L. The test included chemical spray with a 1.5 weight precent solution of boric acid (H_3BO_3) buffered to a pH of 7.85 with sodium hydroxide (NaOH). The pH is at the bottom of the pH range specified. The short required operating time of the units (maximum of 14 hours and usually only 30 minutes) would not allow a slightly higher pH solution to significantly increase the chemical corrosion of the units over that solution which was used in the test. The boric acid concentration was much higher in the test than that required for PBNP. The specified temperature and pressure profiles were both enveloped by the test profiles. The operators were tested successfully periodically throughout the [ ] hours of testing. The operators were exposed to saturated steam at [ ] psig for an additional [ ] days after which they failed to operate properly. The cause of the failure was analyzed and determined to be the entry of chemical spray into the unit through the motor lead cutouts. The motor lead cutouts are sealed at PBNP with flexible conduit and associated fittings. Although these fittings have not been qualified, their design indicates that no significant amounts of chemical spray could enter the units via this path. In addition, the tests documented by Test Report 80003 demonstrate that the units can survive a saturated steam environment at 10 psig for at least 16 days. This demonstrates their qualification for operation in 100% relative humidity and steam for long periods of time. The valve operators would therefore be considered qualified for an operating time of 24 hours following a design basis accident except as limited by the radiation qualification of the operator. The qualified level of radiation integrated dose

LICENSEE RESPONSE TO NRC SER (Continued)

postulated for the PBNP containment reaches 2×10^7 Rads at approximately 12 hours following a design-basis accident. Therefore, these valve operators are considered qualified for a maximum operating time of 12 hours in a LOCA or HELB environment inside containment.

In conclusion, these Limitorque valve operators are considered qualified for LOCA or HELB environments inside containment, 100% relative humidity, chemical spray, 2×10^7 Rads gamma radiation, a 40 year lifetime, and an operating time following an accident of 12 hours.

X. These valves are used to assist in placing the plant in a cold shutdown condition via the RHR cooling mode. Since the PBNP was not licensed to require reaching cold shutdown following a design basis event, the RHR system and these valves are not safety-related. As discussed in Note V, these valves would be qualified to operate for 24 hours following a design-basis accident except for the radiation qualification level of 2×10^7 Rads on the operator itself. The motors are qualified to [redacted] Rads. Since the specified radiation dose does not take credit for shielding (see General Note 5) and the operators are outside the primary shield, these operators could only experience a postulated dose reduced by a factor of approximately 2.7 by the shield (see WCAP-8587, p. 6-8). The unshielded radiation at 24 hours following a postulated LOCA is 2.7×10^7 Rads. The shielded dose at 24 hours of 1×10^7 Rads is well within the operator's qualification level of 2×10^7 Rads. Therefore, these operators are considered qualified for an operating time of 24 hours following a design-basis accident.

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LICENSEE RESPONSE TO NRC SER

V. The Limitorque Model SMB valve motor operators inside containment (or near a high energy line outside containment) have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. B0003 (Qualification References 1B and 16B, respectively). The tests included thermal aging to the equivalent of greatar than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." All safety-related valve operators inside containment are located outside the primary shield walls where the ambient temperatures during operation are maintained by design at less than 105°F and by experience at less than 100°F. Safety-related valve operators in the auxiliary building outside containment have ambient temperatures which are maintained between 65 and 85°F. The qualification tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning reponse to the environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Test Report No. B0003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including the geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours as documented in WCAP-7410L. The test included chemical spray with a 1.5 weight precent solution of boric acid (H_3BO_3) buffered to a pH of 7.85 with sodium hydroxide (NaOH). The pH is at the bottom of the pH range specified. The short required operating time of the units (maximum of 14 hours and usually only 30 minutes) would not allow a slightly higher pH solution to significantly increase the chemical corrosion of the units over that solution which was used in the test. The boric acid concentration was much higher in the test than that required for PBNP. The specified temperature and pressure profiles were both enveloped by the test profiles. The operators were tested successfully periodically throughout the [ ] hours of testing. The operators were exposed to saturated steam at [ ] psig for an additional [ ] days after which they failed to operate properly. The cause of the failure was analyzed and determined to be the entry of chemical spray into the unit through the motor lead cutouts. The motor lead cutouts are sealed at PBNP with flexible conduit and associated fittings. Although these fittings have not been qualified, their design indicates that no significant amounts of chemical spray could enter the units via this path. In addition, the tests documented by Test Report B0003 demonstrate that the units can survive a saturated steam environment at 10 psig for at least 16 days. This demonstrates their qualification for operation in 100% relative humidity and steam for long periods of time. The valve operators would therefore be considered qualified for an operating time of 24 hours following a design basis accident except as limited by the radiation qualification of the operator. The qualified level of radiation integrated dose

LICENSEE RESPONSE TO NRC SER (Continued)

postulated for the PBNP containment reaches 2×10^7 Rads at approximately 12 hours following a design-basis accident. Therefore, these valve operators are considered qualified for a maximum operating time of 12 hours in a LOCA or HELB environment inside containment.

In conclusion, these Limitorque valve operators are considered qualified for LOCA or HELB environments inside containment, 100% relative humidity, chemical spray, 2×10^7 Rads gamma radiation, a 40 year lifetime, and an operating time following an accident of 12 hours.

W. These valves are used to assist in the prevention of boron precipitation following a large break LOCA and may be operated up to 14 hours following an accident. As discussed in Note V, these valves would be qualified to operate for 24 hours following a design-basis accident except for the radiation qualification level of 2×10^7 Rads on the operator itself. The motors are qualified to [illegible] Rads. Since the specified radiation dose does not take credit for shielding (see General Note 5) and the operators are outside the primary shield, these operators could only experience a postulated dose reduced by a factor of approximately 2.7 by the shield (see WCAP-8587, p. 6-8). The unshielded radiation dose at 24 hours following a postulated LOCA is 2.7×10^7 Rads. The shielded dose at 24 hours of 1×10^7 Rads is well within the operators qualification level of 2×10^7 Rads. Therefore, these operators are considered qualified for an operating time of 24 hours following a design basis accident.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 62

NOTES:

"were tested successfully periodically throughout the 24 hours of testing."

This is not the case, however, because the last reported operation of the unit was at t = 8 hrs after the start of the test and the units were not operated again until the attempts at the end of the test were unsuccessful.

3. The licensee has not provided an analysis which justifies the claim of a 40 year qualified life.

a) The following is a summary of the thermal aging that was performed:

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
FGR #1639			
GEARED LIMIT SWITCH			NONE
TORQUE SWITCH			NONE
'COMPLETELY ASSEMBLED' OPERATIONAL MVA" electric motor with disc type brake			NONE
FGR # 1662			
COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
MVA & 2 test motors	199.8 hrs	165°F/100% RH/ Ø psig	NONE

J. CONCLUSIONS

6. REFERENCES

APPENDICES

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 63

LICENSEE RESPONSE TO NRC SER

V. The Limitorque Model SMB valve motor operators inside containment (or near a high energy line outside containment) have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. B0003 (Qualification References 1B and 16B, respectively). The tests included thermal aging to the equivalent of greatar than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." All safety-related valve operators inside containment are located outside the primary shield walls where the ambient temperatures during operation are maintained by design at less than 105°F and by experience at less than 100°F. Safety-related valve operators in the auxiliary building outside containment have ambient temperatures which are maintained between 65 and 85°F. The qualification tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning reponse to the environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Test Report No. B0003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including the geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours as documented in WCAP-7410L. The test included chemical spray with a 1.5 weight precent solution of boric acid (H_3BO_3) buffered to a pH of 7.85 with sodium hydroxide (NaOH). The pH is at the bottom of the pH range specified. The short required operating time of the units (maximum of 14 hours and usually only 30 minutes) would not allow a slightly higher pH solution to significantly increase the chemical corrosion of the units over that solution which was used in the test. The boric acid concentration was much higher in the test than that required for PBNP. The specified temperature and pressure profiles were both enveloped by the test profiles. The operators were tested successfully periodically throughout the [ ] hours of testing. The operators were exposed to saturated steam at [ ] psig for an additional [ ] days after which they failed to operate properly. The cause of the failure was analyzed and determined to be the entry of chemical spray into the unit through the motor lead cutouts. The motor lead cutouts are sealed at PBNP with flexible conduit and associated fittings. Although these fittings have not been qualified, their design indicates that no significant amounts of chemical spray could enter the units via this path. In addition, the tests documented by Test Report B0003 demonstrate that the units can survive a saturated steam environment at 10 psig for at least 16 days. This demonstrates their qualification for operation in 100% relative humidity and steam for long periods of time. The valve operators would therefore be considered qualified for an operating time of [ ] hours following a design basis accident except as limited by the radiation qualification of the operator. The qualified level of radiation integrated dose

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 63

NOTES:

"were tested successfully periodically throughout the 24 hours of testing."

This is not the case, however, because the last reported operation of the unit was at t = 8 hrs after the start of the test and the units were not operated again until the attempts at the end of the test were unsuccessful.

3. The licensee has not provided an analysis which justifies the claim of a 40 year qualified life.

a) The following is a summary of the thermal aging that was performed:

IGR # 1639

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
GEARED LIMIT SWITCH			NONE
TORQUE SWITCH			NONE
"COMPLETELY ASSEMBLED OPERATIONAL MVA" electric motor with disc type brake			NONE

IGR # 1662

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
MVA #2 test motors	199.8 hrs.	165°F/100% RH/ 0 psig	NONE

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LICENSEE RESPONSE TO NRC SER

U. The Limitorque Model SMB valve motor operators outside containment at Point Beach Nuclear Plant have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. 80003 (Qualification References 18 and 16B, respectively).

The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." The tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning response to the PBNP environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Report No. 80003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours (documented in WCAP-7410L) and for HELB conditions outside containment for a duration of 16 days (documented by Test Report 80003). The qualification of these valve operators for 100% relative humidity is demonstrated by the successful tests in saturated steam at elevated temperatures for [ ] hours in one test and 16 hours in another test.

Therefore, these Limitorque valve operators are considered generically qualified for 100% relative humidity, 2×10^7 Rads gamma radiation, and a 40 year lifetime. Since these valve operators have successfully operated for years in their normal environment and since elevated temperatures and high humidity are not expected in the auxiliary building where these operators are located, the operators are judged to be qualified for a minimum operating time of one year.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 64

NOTES:

2. The licensee has not provided an analysis which justifies the claim of a 40 year qualified life.

a) The following is a summary of the thermal aging that was performed:

PGR #639 COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
GEARED LIMIT SWITCH			NONE
TORQUE SWITCH			NONE
"COMPLETELY ASSEMBLED" OPERATIONAL MVA" electric motor with disc type brake			NONE

PGR # 662 COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
MVA & 2 test motors	199.8 hrs.	165°F/100% RH/ 0 psig	NONE

b) In addition, a line steam test was performed (PGR #639) on a "completely assembled MVA" by piping steam into the limit switch compartment for 9 hours.

c) There is no evidence in PGR #639 that the geared limit switch or torque switch that were thermally aged were actually installed in any of the

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 65

LICENSEE RESPONSE TO NRC SER

V. The Limitorque Model SMB valve motor operators inside containment (or near a high energy line outside containment) have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. B0003 (Qualification References 18 and 18B, respectively). The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." All safety-related valve operators inside containment are located outside the primary shield walls where the ambient temperatures during operation are maintained by design at less than 105°F and by experience at less than 100°F. Safety-related valve operators in the auxiliary building outside containment have ambient temperatures which are maintained between 65 and 85°F. The qualification tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning reponse to the environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Test Report No. B0003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including the geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours as documented in WCAP-7410L. The test included chemical spray with a 1.5 weight precent solution of boric acid (H_3BO_3) buffered to a pH of 7.85 with sodium hydroxide (NaOH). The pH is at the bottom of the pH range specified. The short required operating time of the units (maximum of 14 hours and usually only 30 minutes) would not allow a slightly higher pH solution to significantly increase the chemical corrosion of the units over that solution which was used in the test. The boric acid concentration was much higher in the test than that required for PBNP. The specified temperature and pressure profiles were both enveloped by the test profiles. The operators were tested successfully periodically throughout the [ ] hours of testing. The operators were exposed to saturated steam at [ ] psig for an additional [ ] days after which they failed to operate properly. The cause of the failure was analyzed and determined to be the entry of chemical spray into the unit through the motor lead cutouts. The motor lead cutouts are sealed at PBNP with flexible conduit and associated fittings. Although these fittings have not been qualified, their design indicates that no significant amounts of chemical spray could enter the units via this path. In addition, the tests documented by Test Report B0003 demonstrate that the units can survive a saturated steam environment at 10 psig for at least 16 days. This demonstrates their qualification for operation in 100% relative humidity and steam for long periods of time. The valve operators would therefore be considered qualified for an operating time of [ ] hours following a design basis accident except as limited by the radiation qualification of the operator. The qualified level of radiation integrated dose

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 65

NOTES:

exceed the qualification profile. However, the manufacturer has done tests with superheated conditions and the licensee should investigate their applicability to this equipment item.

1. The licensee has not provided an analysis which justifies the claim of a 40 year qualified life.

a) The following is a summary of the thermal aging that was performed:

PGR # 639

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
GEARED LIMIT SWITCH			NONE
TORQUE SWITCH			NONE
"COMPLETELY ASSEMBLED" OPERATIONAL MVA"			NONE
electric motor with disc type brake			NONE

PGR # 662

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
MVA & 2 test motors	199.8 hrs.	165°F/100% RH/ 0 PSIG	NONE

b) In addition, a loss steam test was was performed (PGR # 639) on a "completely assembled MVA" by piping steam into the limit switch compartment for 9 hours.

LICENSEE RESPONSE TO NRC SER

U. The Limitorque Model SMB valve motor operators outside containment at Point Beach Nuclear Plant have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. 80003 (Qualification References 18 and 168, respectively).

The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." The tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning response to the PBNP environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Report No. 80003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including geared limit switches, torque switches, seals, and lubricants to 2×10^7 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours (documented in WCAP-7410L) and for HELB conditions outside containment for a duration of 16 days (documented by Test Report 80003). The qualification of these valve operators for 100% relative humidity is demonstrated by the successful tests in saturated steam at elevated temperatures for [ ] hours in one test and 16 hours in another test.

Therefore, these Limitorque valve operators are considered generically qualified for 100% relative humidity, 2×10^7 Rads gamma radiation, and a 40 year lifetime. Since these valve operators have successfully operated for years in their normal environment and since elevated temperatures and high humidity are not expected in the auxiliary building where these operators are located, the operators are judged to be qualified for a minimum operating time of one year.

2. The licensee has not provided an analysis which justifies the claim of a 40 year qualified life.

a) The following is a summary of the thermal aging that was performed:

PGR #1639

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
GEARED LIMIT SWITCH			NONE
TORQUE SWITCH			NONE
"COMPLETELY ASSEMBLED OPERATIONAL MVA" electric motor with disc type brake			NONE

PGR #1662

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
MVA & 2 test motors	199.8 hrs.	165°F/100% RH/ ϕ psig	NONE

b) In addition, a leak steam test was was performed (PGR #639) on a "completely assembled MVA" by piping steam into the limit switch compartment for 9 hours.

c) There is no evidence in PGR #639 that the geared limit switch or torque switch that were thermally aged were actually installed in any of the

8. REFERENCES

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LICENSEE RESPONSE

R. The Reactor Coolant System loop RTDs were only tested to [ ] Rads gamma and were not thermally aged during qualification testing. The above radiation dose allows over 10 years of normal operation followed by one week of post-LOCA containment radiation. This would be sufficient time after a postulated accident to place the plant in a stable condition such that the RTDs would not be required. In addition, back-up indication such as steam generator saturation pressure or Residual Heat Removal system temperature are available depending on the mode of plant cooling. Therefore, continued safe operation of the plant is assured. It is our intention to continue evaluation of the present RTDs for thermal aging and a higher radiation dose in order to fully qualify these RTDs to the DOR Guidelines. High normal ambient temperatures and high normal radiation dose rates make the environmental qualification of these components extremely difficult. It is our intention to replace them with fully qualified RTDs by the environmental qualification deadline, if possible.

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NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	Not stated	Combined with DBE exposure	
Radiation Aging, Dose Rate			
Radiation Aging, Method			
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	Not stated	Not stated	
Operational Aging (-/4.2/-)	N/A	N/A	
Other Age Conditioning (-/4.2/-)	N/A	N/A	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	10 years (Radiation only)	Post-accident RCS	Note 7 X
Normal Ambient Temperature	170°F	120°F	
Normal Ambient Radiation	Not stated	200 R/h	
Normal Ambient Humidity	Not stated	Not Stated	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	—	Not stated	
On-Going Analysis of Failures and Degradation (7.0/-/-)	—	N/A	
Margin (General) (6.0/3.0/3.0)		Not stated	
Margin (NUREG-0588, Cat. I) (-/3.2/-)	Not stated		
1. Temperature (+15°F)			
2. Pressure (+10%, 10 psig max)			
3. Radiation (not required)			
4. Time (+10%, +1 hour + function time minimum)			

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 69

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
ACCIDENT CONDITIONS			
LOCA/MSLB/HELB/Uncontrolled (4.1, 4.2, 4.3.1, 4.3.3/ 1.1, 1.2, 1.5/1.1, 1.2, 1.5)	LOCA/MSLB	S L B	
Radiation Type	Gamma	Gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	150 Mrd	Not Applicable	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	—	1.6 Mrd/h	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	—	N/A	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	—	Not stated	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	450 Mrd *	[redacted]	X
Plateout Dose Considered (-/1.48/1.48)		Not stated	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)		[redacted]	

* Licensee has stated 150 Mrd accident plus 300 Mrd for 40 years operation.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 69

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS			
Rate of Temp./Press. Increase	12°F/3.6 psig/5		
Peak: °F/psig/RH/Time	278/53/100/25s 274/53/100/20m		Notes 8,9
Decrease To: °F/psig/RH/Time	208/15/100/1h		
Decrease To: °F/psig/RH/Time	155/-/100/-		
Decrease To: °F/psig/RH/Time			
Equipment Surface Temperature (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	—	Not stated	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	Test	Test	Note 10
Spray Composition (4.1.4/1.3, 2.2.8/1.3, 2.2.8)	1.16 w/o H_3BO_3 0.3 w/o NaOH (after sump mixing)	1.14w/o boric acid 0.17 wt% NaOH	X
Spray Density (gpm/ft^2)	Not stated	Not stated	Note 10 X
Spray Duration	Not stated	Not stated	Note 10 X
Submergence Duration (4.1.3/2.2.5/2.2.5)	N/A	N/A	
In-Leakage Considered (5.2.6, 5.3.2/-/-)		N/A	
Time to Submergence		N/A	
Dust Environment (-/2.2.11/2.2.11)		N/A	

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 69

NOTES:

Note 6

The test described in WCAP 9157 consists of an initial 24 H transient period with temperature/pressure decreasing to [ ] A [ ] day exposure at [ ] F conditions is taken as equivalent to a 13 day severe environment exposure at [ ] F. (In-containment average temperature over a 2 week period following a SLB is [ ] F according to WCAP 9157.)

The basis for accelerating test time is a simple chemical reaction rate law model given on pg 2-7 of WCAP 9157. (This model is more conservative than an Arrhenius model based on similar governing materials and temperatures)

Acceleration of the test interval through increased test temperatures is not usually acceptable for steam exposures. (e.g., humid conditions) For the temperatures [ ] and the devices considered here however, a test duration of [ ] days vice [ ] days after the initial 24 H transient period should be acceptable by engineering judgment.

long-term post-accident operating period (e.g., 1 year) functional capability has not been addressed by the licensee.

Note 7

Qualified life claim in WCAP-9157 of [ ] years is based on dose rate and operating time calculations performed by Westinghouse. Thermal aging has not been included in the qualified life evaluation.

NOTES:

Note 8

Peak test chamber controlled pressure is stated as 66 psig; however, no additional pressure data has been provided in WCAP 9157

Facility setup supplies steam at saturated conditions except for initial transient period where superheating is possible. 100% RH is assumed at saturation conditions.

Note 9

Conditions stated are for test profile. Actual temperature data was provided for the first 25 S only. This data indicated an overshoot to approximately [ ] F at 25 S.

Note 10

Spray density and duration are not stated. WCAP 9157 indicates on pg 5-1 that spray can be injected via spray nozzles or main inlet steam piping to test chamber. No information is provided on specific approach used in this test.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 70

LICENSEE RESPONSE TO NRC SER

U. The Limitorque Model SMB valve motor operators outside containment at Point Beach Nuclear Plant have either Reliance or Peerless motors with Class B insulation. Generic environmental tests on these operators are documented in Westinghouse WCAP-7410L and Limitorque Test Report No. 80003 (Qualification References 18 and 168, respectively).

The tests included thermal aging to the equivalent of greater than 40 years at an ambient temperature of 40°C (104°F) assuming the "10°C Rule." The tests also included mechanical and vibration aging. The potential for unexpected degradation due to aging is addressed by periodic inspections, electrical tests, and mechanical tests. Periodic maintenance keeps these valve operators in an "as new" condition over their 40 year qualified life. See Wisconsin Electric's September 11, 1981 letter to Mr. Harold R. Denton concerning response to the PBNP environmental qualification SER (specifically Enclosure 1, Section 3.7) for a further discussion of aging.

The tests documented by WCAP-7410L included irradiation of both Reliance and Peerless motors with Class B insulation to [ ] Rads gamma. The tests documented by Report No. 80003 included irradiation of Reliance motors with Class B insulation to greater than 2×10^8 Rads gamma and irradiation of the operators including geared limit switches, torque switches, seals, and lubricants to 2×10^8 Rads gamma.

The operators were successfully tested for LOCA conditions inside containment for a duration of [ ] hours (documented in WCAP-7410L) and for HELB conditions outside containment for a duration of 16 days (documented by Test Report 80003). The qualification of these valve operators for 100% relative humidity is demonstrated by the successful tests in saturated steam at elevated temperatures for [ ] hours in one test and 16 hours in another test.

Therefore, these Limitorque valve operators are considered generically qualified for 100% relative humidity, 2×10^8 Rads gamma radiation, and a 40 year lifetime. Since these valve operators have successfully operated for years in their normal environment and since elevated temperatures and high humidity are not expected in the auxiliary building where these operators are located, the operators are judged to be qualified for a minimum operating time of one year.

LICENSEE RESPONSE TO NRC SER

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 70

NOTES:

2. The licensee has not provided an analysis which justifies the claim of a 40 year qualified life.

a) The following is a summary of the thermal aging that was performed:

PGR #639

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
GEARED LIMIT SWITCH			NONE
TORQUE SWITCH			NONE
"COMPLETELY ASSEMBLED OPERATIONAL MVA" electric motor with disc type brake			NONE

PGR # 6062

COMPONENT	TIME	TEMPERATURE	TECHNICAL BASIS
MVA & 2 test motors	199.8 hrs.	165°F/100% RH/ ϕPSig	NONE

b) In addition, a line steam test was was performed (PGR #639) on a "completely assembled MVA" by piping steam into the limit switch compartment for 9 hours.

c) There is no evidence in PGR #639 that the geared limit switch or torque switch that were thermally aged were actually installed in any of the