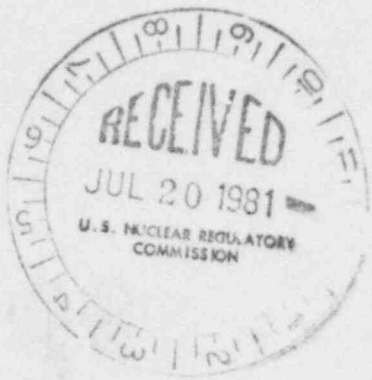
DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

July 15, 1981



Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: McGuire Nuclear Station
Docket Nos. 50-369, 50-370

Dear Mr. Denton:

The attached information is provided in compliance with the provisions of McGuire License No. NPF-9, condition 2.C.(7)(c). Also included is a description of the planned testing to be conducted on the D. G. O'Brien electrical penetration connectors as discussed in a meeting with the NRC Staff on July 6, 1981.

It should be noted that the NRC Staff's Safety Evaluation Report on equipment qualification was issued on April 17, 1981. However, it was not until the July 7-10 meeting that the NRC Staff was in a position to provide clarification on what was expected of licensees in reponse to the SER's. The short time between this meeting and our required submittal date did not give Duke Power Company adequate time to incorporate all of the staff guidance into this submittal. Accordingly, this submittal includes only equipment located inside containment. Equipment located outside containment in potential harsh environments, including high radiation and high energy line break (HELB), will be addressed in a separate submittal by August 15, 1981.

Very truly yours,

William O. Parker, Jr.

GAC:pw
Attachment

cc: Ms. M. J. Graham
Resident Inspector - NRC
McGuire Nuclear Station

Mr. James P. O'Reilly, Director
U.S. Nuclear Regulatory Commission
Region II

A048
S
1/1

McGuire Nuclear Station - Unit 1
Environmental Qualification of Class 1E Equipment

NRC letters dated October 15, 1979 and February 15, 1980 concerning the environmental qualification of Class 1E equipment defined the NRC Staff's requirements with respect to NUREG 0588, Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment. Basically, the Staff's requirements were as follows:

1) Provide a table listing by generic type all Class 1E equipment including the appropriate qualification data for the equipment. The format for this table was provided in the Staff's October 15, 1979 letter.

2) Review the adequacy of the environmental qualification for the equipment identified in Item 1 above with respect to the Staff's position described in NUREG 0588, document the degree of conformance, and justify any deviations.

Furthe., the NRC issued a Memorandum and Order on May 23, 1980 establishing NUREG 0588 as the requirement which applicants must meet in order to satisfy General Design Criterion 4 relating to the environmental qualification of Class 1E equipment.

In response to the NRC Staff's requests for information in this matter, Duke Power Company has conducted a thorough review of the environmental qualification of Class 1E equipment located in a potentially harsh environment. A summary of the findings of this review was provided to the NRC Staff in submittals dated January 18, 1980, August 13, 1980, and October 14, 1980.

On April 17, 1981 the NRC Staff issued Supplement 5 to the McGu e Nuclear Station Unit 1 SER which contained the Staff's evaluation of the McGuire Unit 1 NUREG 0588 submittal. It is the purpose of this document to provide the additional information necessary to resolve the items identified by the Staff in both the SER text and in the accompanying tables.

SER Text - Paragraph 3.1

This paragraph of the SER addresses the completeness of the Class 1E equipment qualification re .ew from a systems standpoint. In this paragraph the Staff requested that the main steam isolation system be addressed or that proper justification be provided for not addressing the system. We have concluded that the Class 1E components of the main steam isolation system were erroneously omitted from our NUREG 0588 submittal and that the qualification of these components will be addressed in the next revision to the submittal. The revision is scheduled for September 15, 1981.

SER Text - Paragraph 3.2

This paragraph of the SER addresses the basis of the service conditions identified in the NUREG 0588 submittal. In this paragraph the Staff requested verification that the containment spray system is not subject to a disabling single - component failure. It has been verified that the McGuire Unit 1 containment spray system as described in the McGuire FSAR, Section 6.5 is not subject to a disabling single component failure.

SER Text - Paragraph 3.3

This paragraph of the SER addresses the temperature, pressure, and humidity conditions inside the containment resulting from a LOCA or MSLB. In this paragraph the Staff requested that the profile for the MSLB be extended from 1000 seconds to 10^5 seconds. In a review of the MSLB scenario, it was determined that within 10 minutes into a MSLB event, all feedwater flow to the affected steam generator will be terminated. Following the blowdown and subsequent dryout of the affected steam generator, the containment temperature decreases rapidly due to the termination of steam release. After 20 minutes following a main steamline rupture, the containment temperature is less limiting than the temperature exhibited following a postulated rupture of the reactor coolant system. Therefore, it is not necessary to extend the MSLB profile to 10^5 seconds.

In this paragraph the Staff also questioned the use of the LOCA temperature in the upper containment as the limiting temperature. The question is based on the fact that the hydrogen skimmer fans take suction from the lower containment and discharge in the upper containment following either a LOCA or MSLB. In a review of this concern it was determined that the discharge of the hydrogen skimmer fans into the upper containment will have no adverse effect on any Class 1E equipment also located in the upper containment for the following reasons:

1. The actuation of both the hydrogen skimmer fans and the containment air return fans is delayed 10 minutes from receipt of a containment high pressure signal. This means that the lower containment temperature will have already begun to decrease prior to initiation of these fans.

2. The actuation of the hydrogen skimmer fans is concurrent with the actuation of the containment air return fans; therefore, mixing provided by the containment air return fans will negate any potential temperature in the upper containment due to hydrogen skimmer fan discharge increase. This is evident from the capacities of the fans: hydrogen skimmer fans - 3,200 cfm; containment air return fans - 30,000 cfm.

3. The hydrogen skimmer fans are located at elevation 820 which is approximately 50 feet above the operating check. There is no Class 1E equipment located in the direct discharge path of these fans.

SER Text - Paragraph 3.5

This paragraph of the SER addresses submergence. In this paragraph the Staff noted that the NUREG 0588 submittal identified certain safety-related motor operated valves including associated cables that are located below the maximum post-LOCA water level. The Staff requested that an assessment of the failure modes of these components be provided with consideration of the effects of their potential submergence on any other safety function including the potential of misleading information being supplied to the operator. The Staff further requested that this review consider operating time, across the spectrum of events, in relation to the time of submergence.

In a review of the safety-related motor operated valves located below the maximum post-LOCA water level, it was determined that for all defined events the valve motor operators will perform their safety function prior to becoming submerged. The flood level will reach the lower most safety-related valves at approximately 5 minutes into an accident situation. These valves, however, will have moved to their safety position at approximately 15 seconds into an accident situation and are not required to reposition subsequent to submergence. This time interval provides adequate margin to assure the completion of the required safety function. Additional information concerning these valves is found in the McGuire FSAR, Section 15.4.1.3.

The aspect of misleading information being supplied to the operator is under review. Further information on this matter will be provided in an update to this report.

SER Text - Paragraph 3.6

This paragraph of the SER addresses chemical spray. In this paragraph the Staff requested additional information regarding the concentrations of the chemical sprays used in the various qualification programs. We have reviewed the qualification programs for the Class 1E equipment located inside the containment and have provided the requested information as appropriate on the attached table.

SER Text - Paragraph 3.7

This paragraph of the SER addresses the aging of safety-related equipment. In this paragraph the Staff discusses the aging requirements for valve operators qualified in accordance with IEEE 382-1972 and continuous duty motors located inside containment qualified in accordance with IEEE 334-1971. The Staff also discusses the aging program for other safety-related equipment.

For the safety-related valve operators (motor and solenoid) located inside containment, a review of the qualification documentation shows that these operators were mechanically, thermally, and radiation aged to an equivalent 40 year service life in accordance with IEEE 382-1972 prior to DBE testing. Additionally a review of the qualification documentation for safety-related

continuous duty motors installed inside the containment shows that these motors were mechanically, thermally, and radiation aged to an equivalent 40 year service life in accordance with IEEE 334-1971 prior to DBE testing. Maintenance schedules have been established for these valve operators and continuous duty motors that will assure that the 40 year life of the equipment is maintained.

For other equipment, addressment of aging was not a requirement in qualification programs committed to IEEE 323-1971 (i.e., Category II equipment). However, with the wealth of in-service experience covering a variety of equipment types, no significant in-service aging mechanisms have been identified which could prejudice the qualification tests performed on new equipment within a few years from start-up.

Duke Power Company is evaluating the in-containment Class 1E equipment and will report at the time of discovery any equipment for which significant aging mechanisms are identified including the justification for continued use and/or reasonable alternative action. This on-going investigation will necessarily be very time consuming and will rely heavily on EPRI research, NRC studies, NPRDS information, IE Bulletins and Circulars, and industry research and testing. Duke is an active member of the EPRI/Utility Advisory Group on Equipment Qualification and the AIF Subcommittee on Equipment Qualification and is participating in the current efforts to develop an industry position in regard to the aging issue.

In addition to the program described above, there are several on-going programs within Duke Power Company which address the surveillance, maintenance, and replacement aspects of SER Text - Paragraph 3.7. These programs are described below.

The Incident Investigation Program provides for the evaluation of equipment failures. As part of this program any components that may have degraded and caused equipment failure would be identified and appropriate corrective action taken. Identification of a component which degrades unacceptably over a period of time would result in either (1) replacement of the component with a better component or (2) establishment of a periodic replacement schedule for the component based on the length of time the original component functioned. In either of these two cases, the potential for future failures is diminished with a resultant increase in reliability and safety. Failures are also evaluated to determine whether any systematic trends exist. Additionally, the Maintenance Management Program presently under development will provide trend information on a wide variety of equipment problems. This is a computer based system with the capability to identify recurring equipment problems. As problems related to aging or degradation are identified similar corrective action to that metioned above can be taken.

SER Text - Paragraph 3.8

This paragraph of the SER addresses the basis for the calculated radiation doses both inside and outside the containment. In this paragraph the Staff questioned the radiation dose value range identified for inside the containment since certain values were below the Staff's screening criteria. A review of this situation indicates that the equipment which has a 40 year plus accident TID that is less than the Staff's screening criteria is only required for a shortterm function and is, therefore, not exposed to a high radiation dose prior to performing its safety function.

SER Text - Paragraph 3.9

This paragraph of the SER addresses margin. It should be noted that where margin has been identified as a potential deficiency for a given piece of equipment, it has been addressed on the attached tables.

SER Text - Paragraph 4

This paragraph of the SER addresses the Staff's assessment of the individual equipment items identified in Duke Power Company's NUREG 0588 submittal. The potential deficiencies identified by the Staff on a per equipment basis are addressed on the attached tables.

McGUIRE NUCLEAR STATION - UNIT 1
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED INSIDE CONTAINMENT

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Transmitter - Pressurizer Pressure (Lower containment)	Barton	763 (Lot 2)	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 2.5×10^6 R Chem Spray: N/A	Temp: 380 F Press: 75 psig RH: 100% Rad: 5×10^7 R Chem Spray: Boric acid and sodium hydroxide soln.	SI initiation (<5 min.)	5 minutes post DBE	± 10%	Max. Error 7.7% (5 min)	WCAP 9885 Method: Test

SER Item

CS: These transmitters are not exposed to any degradation from the effects of chemical spray prior to performing their safety function.

A : Aging was not a requirement in the qualification program for the Barton (LOT2) transmitters, which was developed to address IEEE-323-1971. Radiation aging, however, has been adequately addressed by the LOT 2 testing program. The materials and components used do not have a known thermal aging mechanism (as compared to Appendix C of IE Bulletin 79-01B) that could affect the performance of the transmitters during the first two fuel cycles of reactor operation. Upon the completion of Barton LOT 4 tests, which include aging, our intent is to demonstrate the similarity of the Barton LOT 4 and LOT 2 transmitters and thus obtain a proven qualified life.

M : The qualification tests demonstrate that the trip accuracy requirement is maintained for up to five (5) minutes and probably much longer although that was not the intent of the program. Once the protection signal is generated, it is "locked-in" by the protective system and will not reset regardless of the transmitter's subsequent performance. The qualification program also verifies that the transmitters will continue to operate for at least four (4) months post-accident within a relaxed accuracy requirement which provides additional margin for the five-minute trip requirement.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Transmitter - Pressurizer Level (Lower containment)	Barton	764 (Lot 2)	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 1.4×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 380 F Press: 75 psig RH: 100% Rad: 5×10^7 R Chem Spray: Boric acid and sodium hydroxide soln.	2 weeks post DBE	4 months post DBE	± 25%	Max. Error 15%	WCAP 9885 Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: As documented in WCAP-9885, the chemical spray consisted of 2750 ppm boric acid dissolved in water and adjusted to a pH of 8.5 by sodium hydroxide, which is representative of the range of pH values permitted in the long term.

A : Aging was not a requirement in the qualification program for the Barton (LOT 2) transmitters, which w , developed to address IEEE-323-1971. Radiation aging, however, has been adequately addressed by the LOT 2 testing program. The materials and components used do not have a known thermal aging mechanism (as compared to Appendix C of IE Bulletin 79-01B) that could affect the performance of the transmitters during the first two fuel cycles of reactor operation. Upon the completion of Barton LOT 4 tests, which include aging, our intent is to demonstrate the similarity of the Barto.. LOT 4 and LOT 2 transmitters and thus obtain a proven qualified life.

M : This deficiency was deleted per discussions with M. Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Transmitter - S/G Level (NR) (Lower containment)	Barton	764 (Lot 2)	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 2.3×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 380 F Press: 75 psig RH: 100% Rad: 5×10^7 R Chem Spray: Boric acid and sodium hydroxide soln.	Reactor trip (≤5 min.) Plus 4 months post DBE	4 months post DBE	Trip Function: + 5% (5 min) PAM Function: ± 25% (4 mo)	≤ 5% (5 min) Max Error 15% (4 mo) (Note 5)	WCAP 9885 Method: Test

SER Item -

CS: Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: As documented in WCAP-9885, the chemical spray consisted of 2750 ppm boric acid dissolved in water and adjusted to a pH of 8.5 by sodium hydroxide, which is representative of the range of pH values permitted in the long term.

A : Aging was not a requirement in the qualification program for the Barton (LOT 2) transmitters, which was developed to address IEEE-323-1971. Radiation aging, however, has been adequately addressed by the LOT 2 testing program. The materials and components used do not have a known thermal aging mechanism (as compared to Appendix C of IE Bulletin 79-01B) that could affect the performance of the transmitters during the first two fuel cycles of reactor operation. Upon the completion of Barton LOT 4 tests, which include aging, our intent is to demonstrate the similarity of the Barton LOT 4 and LOT 2 transmitters and thus obtain a proven qualified life.

M : The qualification tests demonstrate that the trip accuracy requirement is maintained for up to five (5) minutes and probably much longer although that was not the intent of the program. Once the protection signal is generated, it is "locked-in" by the protective system and will not reset regardless of the transmitter's subsequent performance. The qualification program also verifies that the transmitters will continue to operate for at least four (4) months post-accident within a relaxed accuracy requirement which provides additional margin for the five-minute trip requirement.

The qualification program utilized a 15-day test period simulating a four-month post-DBE environment based on conservative aging procedures referenced in WCAP-9885. This conservative basis (0.5 ev in the Arrhenius equation) ensures that adequate margin exists.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
RTD - RCS Temperature (NR) (Lower containment)	Rosemount	176 KF	Temp: 327 F Press: 14.8 psig RH: 100% Rad: $1X10^8$R Chem Spray: N/A	Temp: 332 F Press: 66 psig RH: 100% Rad: $1x10^8$R Chem Spray: Boric acid and sodium hydroxide soln.	Reactor Trip (< 5 min)	5 min Post SLB	± 0.2%	± 0.2%	WCAP 9157 and Duke letter Parker to Denton dated December 19, 1979 Method: Test/Analysis

SER Item

CS: These RTD's are not exposed to any degradation from the effects of chemical spray prior to performing their safety function.

A : Addressment of aging was not a requirement in qualification program for these RTD's which was developed to meet the requirements of IEEE-323-1971. Furthermore, in-service experience with the type of equipment supplied by Westinghouse shows that it is highly unlikely that a significant in-service mechanism exists which could prejudice the qualification tests performed by Westinghouse on new equipment. In addition, radiation aging has been adequately addressed by the Westinghouse test program. A marginal application of one material (ethylene propolene rubber) has been identified in Appendix C of IE Bulletin 79-01B. The RTD's will be replaced within 10 years unless it can be shown that the EPR is a non-critical material.

M : Based on the radiation test of 1 x 10^8 gamma, the RTD's qualified life would be in excess of 40 years plus five minutes post-SLB. If the EPR is judged to be a critical material, the life would be limited to 10 years. The Rosemont RTD qualification test program utilized a 6-day test period simulating a 52-day post-DBE environment based on conservative aging procedures. This test documented by WCAP-9157 ensures that adequate margin exists.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
RTD - RCS Temperature (WR) (Lower containment)	Rosemount	176 KS	Temp: 327 F Press: 14.8 psig RH: 100% Rad: $1X10^8$R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 332 F Press: 66 psig RH: 100% Rad: $1x10^8$R Chem Spray: Boric acid and sodium hydroxide soln.	2 weeks post DBE	2 weeks Post DBE	± 0.2%	± 0.2%	WCAP 9157 and Duke letter Parker to Denton dated December 19, 1979 Method: Comparison to Model 176 KF Test/Analysis

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: The chemical spray solution consisted of 1.146 wt. % boric acid and 0.17 wt. % NaOH dissolved in H_2O which corresponds to a pH of 8.5 and is representative of the range of pH values permitted in the long term.

A,M: Addressment of aging was not a requirement in qualification program for these RTD's which was developed to meet the requirements of IEEE 323-1971. Furthermore, in-service experience with the type of equipment supplied by Westinghouse shows that it is highly unlikely that a significant in-service mechanism exists which could prejudice the qualification tests performed by Westinghouse on new equipment within a few years from startup.

The materials used in this component have been compared with the list of components in Appendix C of IE Bulletin 70-01B and, based on this comparision, no significant degradation would occur during this time. Based on the new requirement to address source terms associated with contained accidents in the reactor coolant system and the test program dose of 1×10^8 rads gamma, radiation aging effects have been adequately addressed for 13 effective full power months (1st fuel cycle), and 2 weeks post-DBE. These RTD's will be replaced during the first refueling outage. The qualification program utilized a 6-day test period simulating a 52-day post-DBE environment based on conservative aging procedures documented in WCAP-9157. This provides adequate margin for the time period discussed above.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Electric Hydrogen Recombiner (Upper containment)	W Sturtevant	A	Temp: 180 F Press: 14.8 psig RH: 100% Rad: 8.1×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 309 F Press: 62 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	3 months post LOCA	1 year post LOCA	N/A	N/A	WCAP 7820 and Supplements 1-4 WCAP 7709-L and Supplements 1-4 Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: WCAP 7709-L, Supplement 2 describes chemical spray testing conducted on the H_2 Recombiner. Several types of spray tests were conducted including one using 2500 ppm boron (boric acid) with NaOH added to give a pH of 10.0. To this spray, sodium tetraborate was also injected.

A : The metallic materials used in the H_2 Recombiner are not known to be susceptible to significant degradation due to aging.

All electrical components furnished with the W electric recombiner which may be exposed to post-LOCA environments and which use electrical insulation were tested. The power cable, heater connector wire, heater elements, thermocouples and extension wire were subjected to thermal preaging of 80 heatup and cooldown cycles followed by six LOCA steam pressure and spray cycles. All of the above items plus the terminal blocks were subjected to a radiation exposure of 2×10^8 rads gamma followed by another LOCA test as described in WCAP 7709-L, Supplement 2.

Due to the fact that no significant degradation was observed following the thermal cycling, radiation exposure and LOCA cycle described in WCAP 7709-1 and Supplements 1-4, it is felt that the H_2 recombiner will provide adequate service for 40 years of normal operation plus 1 year post-LOCA.

M : This deficiency was deleted per discussions with M. Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Containment Air Return Fan Motors (Upper containment)	Joy/Reliance	2XF-330081	Temp: 180 F Press: 14.8 psig RH: 100% Rad: $7.6X10^7R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 330 F Press: 85 psig RH: 100% Rad: $1X10^9R$ Chem Spray: Boric acid and sodium hydroxide soln.	2 months post DBE	1 year post DBE	N/A	N/A	Test Report FF-14282 and Supplemental Technical Paper TA-408 Test Report X-604 Test Report NUC-9 and Supplement 4/14/80 Method: Test

SER Item -

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 3000 ppm Boron, 10.5 pH

A.: Safety-related continuous duty motors located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with IEEE 334-1971.

M : This deficiency was deleted per discussions with M. Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Hydrogen Skimmer Fan Motors (Upper containment)	Joy/Reliance	1 YF-882315	Temp: 180 F Press: 14.8 psig RH: 100% Rad: 7.6×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 330 F Press: 85 psig RH: 100% Rad: 1×10^9 R Chem Spray: Boric acid and sodium hydroxide soln.	7 months 1st DBE	1 year post DBE	N/A	N/A	Test Report FF-14282 and Supplemental Technical paper TA-4051 Test Report A-604 Test Report NUC-9 and Supplement 4/14/80 Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 3000 ppm Boron, 10.5 pH

A : Safety-related continuous duty motors located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with 334-1971.

M : This deficiency was deleted per discussions with M. Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERAB REQUI ACCI ENVIRON	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Valve Motor Operators (Lower containment)	Rotork	7 NAI, 11 NAI, 14 NAI, 16 NAI, 30 NAI, 40 NAI, 70 NAI, 90 NAI	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 6.7×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340 F Press: 75 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	5 min (Notes 8 and 9)	30 days post DBE	N/A	N/A	Test Reports: N11/4, December 1970 TR 116, October 1973 TR 222, June 1975 Method: Test

SER Item

QT,M: The actual qualification test duration is 30 days post-DBE which adequately exceeds the required operating time.

A : Safety-related valve operators located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with IEEE 382-1972.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 10,000 ppm Boric Acid, 7-9 pH

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Valve Motor Operators (Upper containment)	Limitorque	SMB	Temp: 180 F Press: 14.8 psig RH: 100% Rad: 1.2×10^8 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340 F Press: 105 psig RH: 100% Rad: 2×10^8 Chem Spray: Boric acid and sodium hydroxide soln.	5 min (Notes 8 and 9)	30 days post DBE	N/A	N/A	Limitorque Test Report: 80058 January 11, 1980 Method: Test

SER Item

QT,M: The actual qualification test duration is 30 days post-DBE which adequately exceeds the required operating time.

A : Safety-related valve operators located inside containment have been mechanically, thermally and radiation aged to an equivalent of 40 years of service in accordance with IEEE 382-1972.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Valve Solenoid Operators (Lower containment)	Valcor	V526 V573	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 7.5×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346 F Press: 113 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	Operate upon receipt of a safety signal	31 days post DBE	N/A	N/A	Test Reports QR-52600-515 and QR-57300-5220-1-1 October 31, 1977 May 15, 1979 Method: Test

SER Item -

QT,M: The actual qualification test duration is 31 days post-DBE which adequately exceeds the required operating time.

A : Safety-related valve operators located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with IEEE 382-1972.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 1720 - 2200 ppm Boric Acid, 9.5 - 10.5 pH

EQUIPMENT IDENTIFICATION (1)	MANUFALTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCUR. REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
ontainment Air eturn Isolation amper Motor Upper containment)	Rotork	1INA21	Temp: 140 F Press: 14.8 psig RH: 100% Rad: $8.1X10^5R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340 F Press: 75 psig RH: 100% Rad: $2x10^8R$ Chem Spray: Boric acid and sodium hydroxide soln.	5 min (max) post DBE	30 days post DBE	N/A	N/A	Test Report NII/4 December 1970 Test Report TR116 October 1973 ethod: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 10,000 ppm Boric Acid, 7-9 pH

A : Safety-related valve operators located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with IEEE 382-1972.

M : This deficiency was deleted per discussions with M Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Valve Solenoid Operators (Lower containment)	Asco	NP8316E34E NP8316E36E	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 7.5×10^7 R Chem Spray: N/A	Temp: 346 F Press: 110 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	Operate upon receipt of safety signal	30 days post DBE	N/A	N/A	Test Report AQS21678/TR Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 3000 ppm Boron, 9.5 - 10.5 pH

QT,M: The actual qualification test duration is 30 days post-DBE which adequately exceeds the required operating time.

A : Safety-related valve operators located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with IEEE 382-1972.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Valve Solenoid Operators (Lower containment)	Target Rock	77CC Model	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 5.7×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385 F Press: 66 psig RH: 100% Rad: 1.3×10^8 R Chem Spray: Boric acid and hydrozine	(Note 10)	14 days post DBE	N/A	N/A	Test Report 2375, 9/26/79 Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 6200 ppm Boric Acid, 8.6 - 10 pH

A : Safety-related valve operators located inside containment have been mechanically, thermally, and radiation aged to an equivalent of 40 years of service in accordance with IEEE 382-1972.

M : The Target Rock solenoid valves are used in the reactor head vent system to provide a path for removal of non-condensable gases. Core events leading to the generation of significant amounts of non-condensable gases occur early in the postulated accident sequences and are of short duration; therefore, these valves are only required to operate within the first few days of the accident. The need for venting non-condensable gases is not anticipated beyond the 14 day qualification of the valves.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Differential Pressure Switch for Damper Control (Upper containment)	Solon	7PS1ADW	Temp: 140 F Press: 14.8 psig RH: 100% Rad: 8.1×10^5 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 150 F Press: 15 psig RH: 100% Rad: 2.1×10^6 R Chem Spray: Boric acid and sodium tetraborate soln.	1 min post DBE	5 min post DBE	± 0.5 psig	± 0.3 psig	Test Report A293-80 Test Report A294-80 Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 2000 - 4000 ppm Boron, 4.0 - 4.7 pH

A : This pressure switch has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion SER text paragraph 3.7, Aging.

M : Within the first sixty (60) seconds following an event requiring this switch to function, the switch will actuate permitting the containment isolation damper to open. At that time the differential pressure switch is electrically isolated from the control circuit and subsequent failure has no impact on safety.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Electrical Penetrations (Lower containment)	D.G. O'Brien	Types A,B,C, D,E,F,G,H,J, K,L,M, and cathodic protection penetration (Note 11)	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 8.5×10^7 R Chem Spray: Boric acid and sodium tetraborate soln. (Note 12)	Temp: 340 F Press: 15 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	4 months post DBE	4 months post DBE	N/A	N/A	Test Reports ER-247, ER-252, and ER-227 Method: Test/Analysis

SER Items

QT,M,CS,A: These items will be resolved pending the completion of the test program outlined below:

These penetrations have been included in the NRC Qualification Verification Program. Recently there has been an interchange of information between Duke and NRC concerning a failure mechanism observed during testing conducted by Sandia Laboratories. In order to investigate the failure mechanism of the EPA (Electrical Penetration Assembly) test at Sandia and to verify the adequacy of the qualification of the connectors on the EPA's, Duke Power Company plans a two part program: First, a material data search will be made to obtain a more definitive understanding of the material characteristics of the connector sealing grommets which relate to the failure mechanism. Second, an environmental qualification test will be performed to repeat the test profile performed in the original qualification program by D. G. O'Brien. The test will include 1) individual components, thermally aged and irradiated, 2) various sizes of connectors, 3) a close simulation of the actual installation, 4) a variety of cable types actually used at the station.

The test sequence will include aging, irradiation and then the steam environment test with electrical tests in between. All circuits will be energized with their appropriate voltages and currents.

This program is expected to be complete by January 1982 with a report available shortly thereafter. A more detailed schedule will be provided as arrangements are made.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Cable - Control, Instrumentation, and 2 KV power (Lower containment)	Okonite	EP Insulation	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 6.7×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 345 F Press: 104 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	30 days post DBE	130 days post DBE	N/A	N/A	Test Reports FN-1, N-1, G-3, 110E, and 141 Method: Test

SER Item -

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH

A : This cable has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

M : This deficiency was deleted per discussion with M. Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Cable - Instrumentation (Lower containment)	Okonite	Tefzel 280 Insulation	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 8.5×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 341 F Press: 112 psig. RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	4 months post DBE	130 days	N/A	N/A	Test Report K-0-8 (September 1979) Method: Test

SER Item

QT,M: Operability required is 120 days. Actual test time is 130 days. Margin is 10 days.

A : This cable has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

CS : Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Cable - Control and 2KV power (Lower containment)	Anaconda	EP Insulation and EP/Hypalon Insulation	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 9×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346 F Press: 113 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	3 months post DBE	4 months post DBE	N/A	N/A	Test Reports F-C4350-2 and F-C4350-3, and Supplement Method: Test

SER Item

CS: Initial Spray: 2000-2100 ppm Boron
4.0 - 4.7 pH

Recirculated Spray: 1800-2200 ppm Boron
6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH

A : This cable has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

M : This deficiency was deleted per discussion with M. Slosson, NRC-EQB, 7-8-81.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Cable - Control (Lower containment)	Brand Rex	XLPE Insulation	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 7.5×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346 F Press: 113 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	30 days post DBE	30 days post DBE	N/A	N/A	Test Report F-C4113 Method: Test

SER Item -

QT,M: The actual qualification test duration of 30 days post-DBE was performed at a higher steady state temperature than expected inside containment. The operability time demonstrated, therefore, did not take credit for the additional qualification time which could be derived from proper Arrhenius Techniques.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

A : This cable has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Cable - Instrumentation (Lower containment)	Samuel Moore	EP/Hypalon Insulation	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 7.5×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340 F Press: 105 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	30 days post DBE	30 days post DBE	N/A	N/A	Test Report F-C3683 Method: Test

SER Item

QT,M: The actual qualification test duration of 30 days post-DBE was performed at a higher steady state temperature than expected. The operability time demonstrated, therefore, did not take credit for the additional qualification time which could be derived from proper Arrhenius Techniques.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 2,000 ppm Boron, pH 9-11

A : This cable has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Cable Termination/ Splice Material (Lower containment)	Raychem	WCSF-N Sleeves and Breakouts	Temp: 327 F Press: 14.8 psig RH: 100% Rad: $\sim.5X10^7$R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 357 F Press: 70 psig RH: 100% Rad: $2x10^8$R Chem Spray: Boric acid and sodium hydroxide soln.	4 months post DBE	4 months post DBE	N/A	N/A	Test Reports F-C4033-3 and 71100 Method: Test/Analysis

SER Item

QT,M: The actual qualification test duration of 113 days post-DBE was performed at a higher steady state temperature than expected inside containment. The operability time demonstrated, therefore, did not take credit for all the additional qualification time which could be derived from proper Arrhenius Techniques. Only 7 days were taken credit and not the full Arrhenius time potential.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH

A : This material has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

McGUIRE NUCLEAR STATION - UNIT 1
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED INSIDE CONTAINMENT

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Stem-Mounted Limit Switches (Lower Containment)	Namco	EA 180 EA 740	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 6.7×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340 F Press: 63 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	5 min (Note 9)	30 days post DBE	N/A	N/A	Namco Test Reports dated March 3, 1978 and February 20, 1978 Method: Test

SER Item

QT,M: The actual qualification test duration is 30 days post-DBE which adequately exceeds the required operating time.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH

A : The aging qualification for this limit switch is under review. Additionally, refer to the generic discussion of the SER Text Paragraph 3.7, Aging.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Seal Material for Cable Entrance Fittings (Lower Containment)	3M	Scotch Cast 9 (XR-5240)	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 6.7×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340 F Press: 15 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid and sodium hydroxide soln.	24 Hours	12 days post DBE	N/A	N/A	Test Report 44390-1, Rev. 4 Method: Test/Analysis

SER Item

QT,M: Operability required is 24 hours. Actual test time is 12 days. Margin is 11 days. The 24 hour operability time is adequate time for mitigation of the containment pressure transient and termination of containment spray.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 4,000 ppm Boron, pH is not available

A : This material has been qualified for the 40 year normal life plus the accident environment. Additionally, refer to the generic discussion of SER Text Paragraph 3.7, Aging.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Containment Radiation Monitors-High Range (Lower Containment)	General Atomic	RD-23 Ionization Chamber	Temp: 240 F Press: 14.8 psig RH: 100% Rad: 8×10^7 R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 315 F Press: 70 psig RH: 100% Rad: Note 17 Chem Spray: Boric acid, sodium thiosulfate and sodium hydroxide	2 weeks post LOCA	18 days post LOCA	NOTE 20	NOTE 20	Test Report E-254-960 dated May 1, 1981 Method: Test/Analysis
Cable for Containment Radiation Monitors-High Range (Lower Containment)	Rockbestos	RSS-6-104	Temp: 240 F Press: 14.8 psig RH: 100% Rad: 8×10^7 R Chem Spray: Note 16	Temp: 315 F Press: 70 psig RH: 100% Rad: 2×10^8 R Chem Spray: Boric acid, sodium thiosulfate and sodium hydroxide	2 weeks post LOCA	395 days post LOCA	N/A	N/A	Test Report: E-254-960 dated May 1, 1981 (Note 18) Method: Test

SER Item

NOTE: This equipment is being installed per NRC requirements stated in NUREG 0737.

QI : The test data for this equipment as noted above was received after the submittal of Duke's NUREG 0588 data.

CS : Initial Spray: 2000-2100 ppm Boron, 4.0 - 4.7 pH
Recirculated Spray: 1800-2200 ppm Boron, 6.0 - 10.0 pH

Test Spray: 3,000 ppm Boron, 10.5 pH (Radiation Monitor)
The Rockbestos cable is installed in conduit and is therefore not exposed to a chemical spray environment.

A : This equipment has been qualified for 40 years normal life plus the accident environment. Additionally, refer to the generic discussion of the SER Text Paragraph 3.7, Aging.

EQUIPMENT IDENTIFICATION (1)	MANUFACTURER	MODEL OR IDENTIFICATION NUMBER	ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT (3)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% of Span)	ACCURACY DEMONSTRATED (% of Span)	QUALIFICATION REPORT AND METHOD (4)
Safety Valve Position Indication-Acoustic Monitors (Lower Containment)	TEC	914	Temp: 327 F Press: 14.8 psig RH: 100% Rad: 8×10^7R Chem Spray: Boric acid and sodium tetraborate soln.	Note 19	2 weeks post DBE	Note 19	N/A	N/A	Note 19

SER Item -

QI: This equipment is being installed per NRC requirements stated in NUREG 0737. Test results are expected by August, 1981.

MCGUIRE NUCLEAR STATION - UNIT 1

ENVIRONMENTAL QUALIFICATION OF CLASS 1E
EQUIPMENT LOCATED INSIDE CONTAINMENT

Note 1

All equipment identified in this table is located inside the containment, specifically in the lower compartment except for the electric hydrogen recombiner, containment air return fan motors; hydrogen skimmer fan motors, containment air return isolation damper motors, differential pressure switches for damper control and cables associated with these devices which are located in the upper compartment.

Note 2

The parameters that compose the overall worst-case containment accident environment are as follows:

Temperature (Upper Compartment): 180F peak; time history as shown in FSAR Figure 6.2.1-24 (Rev 36).

Temperature (Lower Compartment): 327F peak; time history as shown in FSAR Supplement 1, Q042.73, Figure 7 Revision 39.

Pressure (Upper and Lower Compartment): 14.8 psig peak; time history as shown in FSAR Figure 6.2.1-23 (Rev. 36).

Relative Humidity: 100%

Radiation: Total integrated radiation dose for the equipment location includes 40 year normal operating dose plus the appropriate accident dose (except for the narrow-range and wide-range RTD's).

Chemical Spray: Boric acid and sodium tetraborate spray resulting from mixing in the containment sump of borated water from the RWST and sodium tetraborate solution from ice bed melt.

Note 3

Equipment operability requirements in the containment accident environment are as identified in FSAR Table 3.11.1-1 (Rev. 25).

Note 4

Environmental Qualification test reports for the following equipment have previously been submitted to the NRC Staff:

- Transmitters-Barton (by Westinghouse)
- RTD's-Rosemount (by Westinghouse)
- Electric Hydrogen Recombiner (by Westinghouse)
- Containment Air Return Fan Motors (by Duke)
- Hydrogen Skimmer Fan Motors (by Duke)
- Solenoid Operators-Valcor (by Duke)
- Electric Penetrations (by Duke)
- Cable Termination/Splice Material (by Duke)
- Stem-Mounted Limit Switches (by Duke)
- Cable Entrance Seal Material (by Duke)

Note 5

A requirem for McGuire Unit 1 is to limit the positive error for the trip function of narrow-range steam generator level transmitters to +5%. The original Lot 2 report noted an error of +7.3 %[b,c,e] early in the steam test transient. Additional tests were performed on the same unit using water as the process medium instead of nitrogen [b,c,e]. This caused the temperature of the strain gage to track the temperature of the circuit board [b,c,e] more closely during the first minute and limited the positive error to less than 4 %[b,c,e]. In other words, the temperature difference between the strain gage and the circuit board [b,c,e] has been reduced to a level compatible to McGuire Unit 1 functional requirements.

Note 6

Deleted

Note 7

Deleted

Note 8

Five minutes is adequate time to assure containment isolation and the required repositioning of other safety-related valves.

Note 9

During the 30 days following a postulated accident, the containment temperature and pressure will approach normal; therefore, additional service can reasonably be expected from this equipment.

Note 10

The Target Rock solenoid valves are used in the reactor head vent system to provide a path for removal of non-condensable gases. Core events leading to the generation of significant amounts of non-condensable gases occur early in the postulated accident sequences and are of short duration; therefore, these valves are only required to operate within the first few days of the accident. The need for venting non-condensable gases is not anticipated beyond the 14 day qualification of the valves.

Note 11

Electric penetration types B,C,F,G and K are the only penetrations required to function electrically in the containment accident environment. All electric penetrations, however are designed and qualified to maintain their mechanical integrity under normal and postulated accident environmental conditions.

Note 12

The McGuire electric penetrations are protected from direct spray impingement by galvanized steel boxes.

Note 13

Deleted

Note 14

Deleted

Note 15

The radiation environment for this equipment is dependent on operating time in the accident environment. This information will be provided upon receipt and review of formal test reports by Duke Power Company.

Note 16

The cables for the containment radiation monitors (high range) which are located inside the containment are routed in conduit, and, therefore not exposed to chemical spray.

Note 17

The manufacturer's test report states that the detector assembly is constructed of metal and ceramic and is not affected by radiation.

Note 18

Subsequent testing by the manufacturer showed a failure of a sample of cable at a higher temperature.

Note 19

This equipment is being installed per NRC requirements stated in NUREG 0737. Qualification testing for this equipment is scheduled for completion in August, 1981. The results of this testing will be provided upon receipt and review of the formal report by Duke Power Company.

Note 20

This equipment is being installed per NRC requirements stated in NUREG 0737. Overall system accuracy should be within a factor of 2 over the entire range as stated in Regulatory Guide 1.97, rev. 2*. The demonstrated accuracy is under review.