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TECHNICAL EVALUATION REPORT

REVIEW OF LICENSEES' RESOLUTION OF OUTSTANDING ISSUES FROM NRC EQUIPMENT ENVIRONMENTAL QUALIFICATION SAFETY EVALUATION REPORTS (F-11, B-60)

YANKEE ATOMIC ELECTRIC COMPANY
YANKEE ROWE NUCLEAR POWER PLANT

NRC DOCKET NO. 50-029

FRC PROJECT C5257

NRC TAC NO. 42526

FRC ASSIGNMENT 13

NRC CONTRACT NO. NRC-03-79-118

FRC TASK 453

Please Send Copy of XA to PDR

Prepared by

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Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

Lead NRC Engineer: N. B. Le
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May 28, 1982

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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

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T. J. DelGaizo from WESTEC Services, Inc., R. Garrison from ORFI Systems, Inc., and M. A. Fedele from Evaluation Associates, Inc., also contributed to the technical preparation of this report through subcontracts with Franklin Research Center.

IDENTIFICATION OF PROPRIETARY INFORMATION

Some of the information in this technical evaluation report was obtained from manufacturers' proprietary test reports. All proprietary test reports are identified as such in Section 6, References, of this report. Checksheets in Section 4 containing proprietary information have been replaced with a checksheet page stating that the proprietary information has been removed.

1. INTRODUCTION

1.1 PURPOSE OF THE EVALUATION

The purpose of this report is to:

- o evaluate licensees' resolutions of outstanding issues related to safety-related electrical equipment environmental qualification (EEQ) discussed in the Nuclear Regulatory Commission (NRC) Safety Evaluation Reports (SERs) in accordance with NRC criteria. The objective is to identify all cases where a licensee's response has not resolved the significant qualification issues.
- o evaluate licensees' qualification documentation of safety-related electrical equipment located in harsh environments in accordance with criteria established by the NRC and to identify (1) equipment for which qualification documentation is adequate, i.e., substantiates that the equipment is capable of performing its specified design basis safety function when it is exposed to a harsh environment and (2) equipment for which qualification documentation is deficient, i.e., does not give reasonable assurance that the equipment is capable of performing its specified safety function.
- o evaluate licensees' qualification documentation of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2) [35],* in accordance with criteria established by the NRC in a manner identical to the evaluation of all other safety-related electrical equipment.

1.2 SCOPE OF THE EVALUATION

The scope of this report is limited to the evaluation of environmental qualification of electrical equipment that must function to mitigate the consequences of a loss-of-coolant accident (LOCA) or high energy line break (HELB) and whose environment is adversely affected by that event.

*For References, see Section 6. Note that reference numbers are not presented in sequential order.

With respect to TMI Action Plan Implementation, the scope of this report is limited to those sections of NUREG-0737 [38] applicable to equipment having an installation implementation date of January 1, 1981. Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the Licensee.

The NRC has determined that the evaluation of environmental qualification of equipment items (1) located in plant areas whose environment is not adversely affected by the design basis event (DBE) (e.g., equipment located in "mild" environments) or (2) required to achieve and maintain cold shutdown, is not to be included within the scope of this report. However, where the Licensee has identified these equipment items in the EEQ submittals to the NRC, these items have been listed in NRC evaluation Category III.b in this report (see Section 3 of this report for definition of NRC evaluation categories).

Qualification aspects not included within the scope of this evaluation are:

- o seismic and dynamic qualification
- o equipment protection against natural phenomena
- o equipment operational service conditions (e.g., vibration, voltage, and frequency deviations)
- o equipment located where it is subjected to the outdoor environment
- o equipment protection against fire hazards
- o equipment protection against missiles
- o equipment located in plant areas whose environment is not adversely affected by the design basis event
- o equipment required to achieve and maintain cold shutdown.

1.3 GENERIC ISSUE BACKGROUND

Safety-related electrical equipment must be capable of performing design safety functions under all normal, abnormal, and accident conditions. The purpose of equipment qualification is to provide tangible evidence that equipment will operate on demand and to verify design performance, thereby establishing assurance that the potential for common-mode failure is minimized.

Of particular concern is the assurance that equipment will remain operable during and following exposure to the harsh environmental conditions (i.e., temperature, pressure, humidity [steam], chemical sprays, radiation, and submergence) imposed as a result of a design basis accident. These harsh environments are generally defined by the limiting conditions resulting from the complete spectrum of postulated break sizes, break locations, and single failures consequent to a LOCA, main steam line break (MSLB) inside the reactor containment, or a HELB outside the reactor containment (such as a main steam or feedwater line break). In addition, depending on specific plant design features, other postulated HELB locations may be associated with:

- o the chemical and volume control system (CVCS) letdown line
- o the steam supply piping to
 - the auxiliary feedwater (AFW) pump turbine
 - the reactor core isolation cooling (RCIC) pump turbine
 - the high pressure core injection (HPCI) pump turbine
 - the isolation condenser
- o steam generator blowdown.

The NRC criteria for reviewing the safety of nuclear power generating stations include the requirement that the qualification of safety-related electrical equipment be substantiated by auditable documentation of the program that establishes the ability of the equipment to function as specified in the station design. This report is restricted to a technical evaluation of the equipment's ability to function in harsh environments resulting from DBEs.

Qualification criteria applied during the licensing of the older nuclear power plants have been modified over the years, and specific industry standards concerning qualification have been revised as the design of reactor systems has changed and as regulatory and operating experience has accumulated. Examples of such standards are IEEE Standards 279-71, 323-74, 383-74, 317-76, 334-80, 381-77, 382-80, 535-79, 627-80, 649-80, and 650-79. NRC NUREG documents 0413 and 0588 have been developed to address this topic. In particular, NUREG-0588 (published for comment in December 1979 and reissued as Revision 1 in July 1981) formally presented the NRC staff positions regarding selected areas of environmental qualification of safety-related electrical equipment in the resolution of General Technical Activity A-24,

"Qualification of Class IE Safety Related Equipment." The positions documented therein are applicable to plants that are or will be in the construction permit or operating license review process.

Although qualification standards and regulatory requirements have undergone considerable development, all of the currently operating nuclear power plants are required to comply with 10CFR50, Appendix A, General Design Criteria for Nuclear Power Plants, Section I, Criterion 4. This criterion states in part that "structures, systems and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents."

Qualification requirements are also embodied in (1) 10CFR50 Appendix A, General Design Criteria 1, 2, and 23 and (2) 10CFR50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria III, "Design Control," and XI, "Test Control." These requirements are applicable to safety-related equipment located outside as well as inside containment.

The NRC staff has evaluated the licensees' equipment qualification programs by reviewing the qualification documentation of selected safety-related equipment as part of the operating license review for each plant. The NRC staff has also used a variety of methods to assure that these general requirements are met for electrical safety-related equipment. In the oldest plants, qualification was based on the fact that electrical components were of high industrial quality. After 1971, qualification was judged on the basis of IEEE Std 323-71; however, no regulatory guide was issued adopting this standard. For plants whose SERs were issued after July 1, 1974, the Commission issued Regulatory Guide 1.89, which in most respects adopted the most recent standard, IEEE Std 323-74.

In November 1977, the Union of Concerned Scientists petitioned the NRC Commissioners to upgrade current standards for the environmental qualification of safety-related electrical equipment in operating plants. Subsequently, the NRC staff instituted the Systematic Evaluation Program (SEP) to determine the degree to which the older operating nuclear power plants deviated from current

licensing criteria. The subject of electrical equipment environmental qualification (SEP Topic III-12) was selected for accelerated evaluation as part of this program. Seismic qualification of equipment was to be addressed as a separate SEP topic. In December 1977, the NRC issued a generic letter to all SEP plant licensees requesting that they initiate reviews to determine the adequacy of existing equipment qualification documentation.

Preliminary NRC review of licensee responses led to the preparation of NUREG-0458, an interim NRC assessment of the environmental qualification of electrical equipment. This document concluded that "no significant safety deficiencies requiring immediate remedial actions were identified." However, it was recommended that additional effort should be devoted to examining the installation and environmental qualification documentation of specific electrical equipment in all operating reactors.

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees of operating plants (except those included in the SEP) to examine their installed safety-related electrical equipment and ensure appropriate qualification documentation for equipment function under postulated accident conditions. Subsequently, on February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01, which was intended to raise the threshold of IE Circular 78-08 to the level of Bulletin, i.e., action requiring a licensee response. This Bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

The review of the licensees' responses indicated certain deficiencies within the scope of equipment addressed, definition of harsh environments, and adequacy of support documentation. It became apparent that generic criteria were needed for evaluating the electrical equipment environmental qualification for both SEP and non-SEP operating plants. Therefore, during the second half of 1979, the Division of Operating Reactors (DOR) of the NRC issued internally a document entitled "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" [33]. (The document is hereafter

referred to as the "DOR Guidelines.") The document was prepared as a screening standard for reviewing all operating plants, including SEP plants. It was originally intended that the licensees evaluate their qualification documentation in accordance with the DOR Guidelines. However, initial NRC review of this documentation, which was compiled to support licensee submittals, revealed the need for obtaining independent evaluations and for accelerating the qualification review program.

In October 1979, the NRC awarded Franklin Research Center a contract to provide assistance in the "Review and Evaluation of Licensing Actions for Operating Reactors," which included an assignment for review of equipment environmental qualification documentation under SEP Topic III-12. The assignment was to review equipment environmental qualification documentation and to present the results in the form of a Technical Evaluation Report for the 11 oldest plants (included in the SEP review). The plants included within the assignment were the Palisades, Oyster Creek, Ginna, Haddam Neck, Yankee Rowe, LaCrosse, and Big Rock Point plants and Zion Station Units 1 and 2, Indian Point Units 2 and 3, Millstone Unit 1, Dresden Unit 2, and San Onofre Unit 1. (This assignment was completed in April 1981.)

On January 14, 1980, the NRC Office of Inspection and Enforcement issued the DOR Guidelines and IE Bulletin 79-01B, which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities, excluding the 11 facilities undergoing the SEP review. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification. The scope of the review was expanded to include HELBs (inside and outside containment) in addition to equipment aging and submergence. The NRC advised the licensees that the criteria contained in the DOR Guidelines would be used in its review of licensee submittals; NUREG-0588 would be used as a guide in cases where the DOR Guidelines do not provide sufficient detail.

In early February 1980, the NRC decided that Indian Point Units 2 and 3 and Zion Station Units 1 and 2 should be included within SEP Topic III-12 for the purpose of equipment environmental qualification review.

On February 21, 1980, the NRC and representatives of the SEP Plant Owners Group held an open meeting at NRC headquarters to discuss an accelerated review program in accordance with the DOR Guidelines. Representatives of the Indian Point Units and Zion Station also attended this meeting. The NRC formally issued to all licensees represented at the meeting the DOR Guidelines document which included a second document, "Guidelines for Identification of That Safety Equipment of SEP Operating Reactors for Which Environmental Qualification Is To Be Addressed" [33], together with the request that the licensees review their plant systems and provide additional equipment environmental qualification information to the NRC on an accelerated schedule.

For non-SEP plants, the NRC Office of Inspection and Enforcement formed a task force including a principal reviewer in each region and a task leader from headquarters. The regional members were assigned responsibility for the technical review of the licensees' responses to IE Bulletin 79-01B, and the task leader was assigned responsibility for the overall coordination of the review effort with NRC staff to assure overall consistency. The regional reviewers held meetings with the licensees in their respective regions, which resulted in staff positions being issued in a supplement to IE Bulletin 79-01B dated February 29, 1980.

In April 1980, the NRC organizational structure was modified and the Equipment Qualification Branch was formed within the new Division of Engineering. Responsibility for reviewing the status of equipment qualification for all plants was assigned to this branch.

On May 23, 1980, the NRC issued Memorandum and Order CLI-80-21 [36], specifying that licensees and applicants must meet the requirements set forth in the DOR Guidelines and NUREG-0588 regarding environmental qualification of safety-related electrical equipment in order to satisfy 10CFR50, Appendix A, General Design Criteria, Section I, Criterion 4. This Order also established that the SERs on this subject, to be prepared by the NRC staff, must be issued on February 1, 1981 and that all subsequent actions to be taken by licensees to achieve full compliance with the DOR Guidelines or NUREG-0588 must be completed no later than June 30, 1982. The Memorandum and Order established the DOR Guidelines and NUREG-0588 as acceptable interpretations of the General

Design Criteria for an interim period. Rulemaking was proposed for the purpose of establishing a permanent interpretation of the General Design Criteria.

The staff held regional meetings with the licensees and interested parties during the week of July 13, 1980. The staff issued a second supplement to IE Bulletin 79-01B, a response to significant questions raised during the public meetings, and two Orders. The Order dated May 30, 1980 required the licensees to comply with the previously issued Commission Memorandum and Order of May 27, 1980 (CLI-80-21). The above orders required the licensees to complete the tasks identified in IE Bulletin 79-01B no later than November 1, 1980 to allow the staff to comply with the February 1, 1981 date imposed by the Commission Order. The responses to the questions were issued on February 29, 1980; and the second and third supplements to IE Bulletin 79-01B, highlighting the staff positions affecting the licensees' responses, were issued on September 29 and October 24, 1980, respectively.

In October 1980, EG&G Idaho, Inc., awarded Franklin Research Center a contract to provide assistance in the equipment environmental qualification review for 13 of the plants whose licensees responded to IE Bulletin 79-01B. The assignment was to evaluate the licensees' equipment environmental qualification submittals and to present the results in the form of a Technical Evaluation Report for each plant. The objective of this Technical Evaluation Report was to review the licensees' submittals to determine if safety-related electrical equipment was reviewed for environmental qualification in accordance with the DOR Guidelines and NUREG-0588 as required by IE Bulletin 79-01B. The NRC was to perform an audit of the qualification documentation references as part of its Safety Evaluation Program. If discrepancies were found, the audit was to be extended. The plants included within this assignment were Nine Mile Point Unit 1, Millstone Unit 2, Salem Unit 1, Browns Ferry Units 1, 2, and 3, Brunswick Units 1 and 2, Hatch Units 1 and 2, Dresden Unit 3, and Quad Cities Units 1 and 2. (This assignment was completed in June 1981.)

In mid-1981, the NRC issued SERs on environmental qualification of safety-related electrical equipment to licensees of all operating plants.

Where additional qualification information was required, the licensees were directed to respond to the NRC within 90 days of receipt of the SER.

In May 1981, under the licensing action assistance contract, NRC authorized Franklin Research Center to proceed with the review and evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments, required for TMI Lessons Learned Implementation on 71 operating plants.

In July 1981, the NRC conducted extensive meetings with the nuclear industry to address concerns and questions regarding qualification of safety-related equipment. In addition, the NRC provided licensees with detailed information with respect to the format and expected content of the licensees' 90-day responses to the NRC SERs. Draft outlines of the following proposed programs were also presented to the industry: environmental qualification of equipment located in "mild" environments, seismic and dynamic qualification, and environmental qualification of mechanical equipment.

On September 23, 1981, the NRC Commissioners considered a petition (SECY-81-486) to extend the deadline for actions to be taken by licensees to achieve environmental qualification of all safety-related equipment. On September 30, 1981, the NRC Commissioners extended this deadline to the second refueling outage after March 31, 1982.

In October 1981, the NRC authorized Franklin Research Center to include within the scope of the existing EEQ assignment (TMI Lessons Learned Implementation Equipment) the evaluation of licensees' resolutions of outstanding issues related to equipment environmental qualification discussed in the NRC SERs in accordance with NRC criteria. The assignment was to review the qualification documentation and to present the results in the form of a Technical Evaluation Report for 71 operating plants. (This report was developed within the scope of this assignment.)

On January 7, 1982, the NRC Commissioners approved the issuance of the proposed rule, 'Environmental Qualification of Electric Equipment for Nuclear Power Plants,' for public comment. The proposed rule was published in the Federal Register (Volume 47, No. 13) dated January 20, 1982.

In February 1982, Proposed Revision 1 to Regulatory Guide 1.89, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," was issued for public comment. This regulatory guide was issued to (1) reflect current NRC positions on equipment qualification and (2) provide guidelines for meeting the NRC Commissioners proposed rule on equipment qualification.

The final rule, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," was subsequently issued on April 16, 1982 by the NRC (to be published in the Federal Register) to clarify and strengthen the criteria for environmental qualification of electrical equipment. The final rule is to be incorporated into 10CFR50 as Section 50.49, "Environmental Qualification of Electric Equipment for Nuclear Power Plants." The significant features of the rule are:

- o Requalification of electrical equipment in accordance with the rule will not be required for equipment qualified or being qualified in accordance with the DOR Guidelines and IE Bulletin 79-01B or NUREG-0588, provided the qualification program commenced within 90 days after the effective date of the rule.
- o The requirement to qualify equipment needed to complete one path of achieving and maintaining a cold shutdown condition has been deleted.
- o The Commission deadline for actions to be taken by licensees to achieve environmental qualification of all safety-related equipment is extended to the second refueling outage after March 31, 1982.

On April 20, 1982, the NRC staff issued Generic Letter No. 82-09 [60] to all licensees, presenting the NRC's position and clarification of certain aspects of the environmental qualification requirements.

1.4 SPECIFIC ISSUE BACKGROUND

By a letter dated December 23, 1977, Yankee Atomic Electric Company (YAEC) was requested by the NRC to review the status of environmental qualification for the safety-related electrical equipment at the Yankee Rowe Nuclear Power Plant. Information requested from YAEC included identification of electrical equipment required to perform safety functions while subjected to design basis accident environments, definitions of environmental service conditions at

equipment locations, and the status of environmental qualification. In addition, documentation pertaining to qualification was to be compiled and organized for review by NRC. In response to this request, YAEC provided information via a submittal transmitted by letters dated February 28, and November 27, 1978 [31]. Subsequent to the February 21, 1980 meeting, YAEC provided more detailed information, in accordance with the requirements of the DOR Guidelines, by letter dated June 5, 1980 [32]. On July 15 and 16, 1980, NRC and FRC representatives visited the Yankee Rowe plant, inspected safety-related systems and components, and discussed the June 5, 1980 submittal with YAEC representatives. YAEC submitted additional supplemental information by letter dated August 1, 1980, and an undated informal letter was received on August 29, 1980.

FRC issued a Draft Interim Technical Evaluation Report (DITER) to the NRC on October 8, 1980 [54]. Copies of the report were transmitted to YAEC by the NRC.

On August 29 and September 19, 1980, the NRC notified YAEC that all supplemental information on equipment environmental qualification was to be submitted by November 1, 1980. On October 31, 1980, a completely revised submittal of qualification information was provided to the NRC by the Licensee [1].

The final Technical Evaluation Report (TER) [37] on the qualification status of safety-related electrical equipment subject to harsh environments was issued to the NRC for the Yankee Rowe plant on April 20, 1981. The NRC SER [39], which included the technical conclusions of the TER, was issued to YAEC on May 29, 1981.

YAEC provided a response to the SER by letter dated September 8, 1981 [40].

Requests for information [56, 57] were transmitted to the NRC by FRC to obtain TMI Action Plan information, correlations to NUREG-0737 [38], and qualification documentation referenced by YAEC for use in the review of the Licensee's response to the SER.

On February 1, 1982 [41], YAEC transmitted the qualification documentation that was requested in Reference 56.

2. NRC CRITERIA FOR ENVIRONMENTAL QUALIFICATION

2.1 CRITERIA PROVIDED BY THE NRC

The screening guidelines used to evaluate the electrical equipment environmental qualification program were:

- o DOR Guidelines, "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 [33]
- o NUREG-0588, Revision 1, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," July 1981 [55].

Other appropriate references used in the review of the licensees' electrical equipment environmental qualification submittals are:

- o IE Bulletin 79-01B, "Environmental Qualification of Class 1E Equipment," January 14, 1980; Supplement No. 1, February 29, 1980; Supplement No. 2, September 29, 1980; and Supplement No. 3, October 24, 1980 [58, 59, 34, 35]
- o NUREG-0737, "Classification of TMI Action Plan Requirements," November 1980 [38]. This document is applicable for the selection of equipment for the evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The scope of the review is limited to equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981. Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

2.2 STAFF POSITIONS AND SUPPLEMENTAL CRITERIA

The NRC identified the following staff positions and supplemental criteria to be used in conjunction with the referenced screening guidelines.

2.2.1 Requirements and Applicable Criteria

Items 3 and 17 of Supplement 2 to IE Bulletin 79-01B [34] describe the application of the DOR Guidelines and NUREG-0588 to operating reactors (ORs),

near term operating license applicants (NTOLs), and construction permit applicants (CPs). The qualification requirements and applicable criteria are stated as follows:

[Question 3]

"Define the requirements and applicable criteria for ORs, NTOLs, and OLs. Specifically address the NTOLs whose CP SER is prior to July 1974 and after July 1974. Can a CP whose SER is prior to 1974 use the DOR guidelines?"

[NRC Answer to Question 3]

"Table 1 describes the application of each document. All operating reactors as of May 23, 1980, will be evaluated against the DOR guidelines. In cases where the DOR guidelines do not provide sufficient detail, but NUREG-0588 Category II does, NUREG-0588 will be used.

TABLE 1

REQUIREMENTS

ORs	OLs		CPs
	CP SER Before 7/1/74	CP SER After 7/1/74	
DOR GUIDELINES	NUREG-0588 (CAT. II)	NUREG-0588 (CAT. I)	NUREG-0588 (CAT. I) or NEW RULE WHEN IN EFFECT

REPLACEMENT COMPONENTS
USE NUREG-0588 (CAT. I)

All plants licensed after May 23, 1980, shall conform to NUREG-0588. In accordance with Regulatory Guide 1.89, all such operating licenses for facilities whose construction permit SER is dated July 1, 1974 or later, are to be reviewed against IEEE Std. 323-1974. Thus, for these licensees, the operating license applicant is to qualify equipment to the Category I column in NUREG-0588. For operating licenses issued after May 23, 1980, whose construction permit SER is dated before July 1, 1974, the operating license applicant is to qualify equipment to at least Category II column of NUREG-0588, unless the licensee made commitment in the construction permit record to use the 1974 standard, or unless the operating licensee application record indicates that the 1974 standard is to be used, in such cases Column I of NUREG-0588 is to be used.

While there are differences between the Category II column of NUREG-0588 and the DOR guidelines, the differences are in details and in the

optional part of the documents. The minimum requirements set forth by these documents are general and compatible. Thus, the minimum standards set by either of the two documents are equally applicable to ORs and NTOLs."

[Question 17]

"Define the requirements for 'replacement parts.' Are they the same for 'spare' parts? Clearly discuss the alternatives for existing inventories of parts/components. If equipment is ordered to meet IEEE Std. 323-1974 standard but lead time exceeds June 1982, can we use IEEE Std. 323-1971 qualified components in the interim?"

[NRC Answer to Question 17]

"The requirements for 'replacement' and 'spare' parts are the same for the purposes of complying with the Commission order and memorandum. After May 1980, all parts used to replace presently installed parts shall be qualified to Category I of NUREG-0588 'unless there are sound reasons to the contrary.' Nonavailability and/or the fact that the part to be used as a replacement is a spare part purchased prior to May 23, 1980, and is in stock are among the factors to be considered in weighing whether there are 'sound reasons to the contrary.' All replacement parts shall as a minimum conform to the requirements described in the answer to question 3. Justification for deviation from Category I of NUREG-0588 shall be documented by the licensee and records shall be available for audit, upon request by the NRC."

2.2.2 Application of Requirements and Criteria to TMI Lessons Learned Implementation Equipment

The NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation in accordance with criteria established by the NRC in a manner identical to the evaluation of all other safety-related electrical equipment. Additionally, Item 21 of Supplement 2 to IE Bulletin 79-01B [34] states:

"TMI Lessons Learned instrumentation will be considered in the February 1, 1981 SER. This equipment is subject to the same requirements as other safety-related electrical equipment. The guidance and requirements of NUREG-0588 referenced daughter standards, and Reg Guides will be used by the staff in assessing the adequacy of the qualification information."

Item 2 of Supplement 3 to IE Bulletin 79-01B [35] states:

"IEB 79-01B required a 90 day response which was due in mid-April 1980. Supplement 1 (Feb. 1980) informed licensees that equipment which was

'planned' to be installed as a result of lessons learned need not be addressed in that response. Some of this equipment has since been installed. Supplement #2 (Q.5, Q.21) identified that the staff position was that equipment which is installed should be treated in a manner similar to all other safety-related electrical equipment and be addressed in the November 1, 1980 submittal. This position represents no change in staff position regarding the scope of the review. However, since the staff position on this issue was unclear the following will apply:

- a. Qualification information for installed TMI Action Plan equipment must be submitted by February 1, 1981.
- b. Qualification information for future TMI Action Plan equipment (ref. NUREG-0737, when issued), which requires NRC pre-implementation review, must be submitted with the pre-implementation review data.
- c. Qualification information for TMI Action Plan equipment currently under NRC review should be submitted as soon as possible.
- d. Qualification information for TMI Action Plan equipment not yet installed which does not require pre-implementation review should be submitted to NRC for review by the implementation date."

2.2.3 Equipment Not in the Scope of the Qualification Review

Supplement 2 of IE Bulletin 79-01B [34] permits deferment of the review of environmental qualification for all safety-related equipment items located in plant areas where the equipment is not exposed to the direct effects of a high energy line break (HELB) or to nuclear radiation emanating from circulation of fluids containing radioactive substances. Supplement 3 of IE Bulletin 79-01B [35] permits deferment of the review of environmental qualification for all equipment required to achieve and maintain the plant in a cold shutdown condition. Supplements 2 and 3 of 79-01B originally permitted deferment until after February 1, 1981 of the qualification review of equipment located in a mild environment or required to achieve and maintain the plant in a cold shutdown condition. Since the issuance of Supplements 2 and 3, the NRC has determined that the review of environmental qualification for this equipment is not within the scope of the present review program.

2.2.4 Clarification of Qualification Requirements

2.2.4.1 Service Conditions Inside Containment for a Loss-of-Coolant Accident (DOR Guidelines Section 4.1)

For pressurized water reactors (PWRs), the DOR Guidelines state that the containment temperature and pressure conditions as a function of time should be based on the most recent NRC-approved service conditions specified in the Final Safety Analysis Report (FSAR) or other licensee documentation. In the specific case of pressure-suppression type containments, the following minimum high temperature conditions may be used: (1) boiling water reactor (BWR) drywells -- 340°F for 6 hours and (2) PWR ice condenser lower compartments -- 340°F for 3 hours. As stated in Supplement 2 to IE Bulletin 79-01B [34], "these values are a screening device, per the Guidelines, and can be used in lieu of a plant-specific profile, provided that expected pressure and humidity conditions as a function of time are accounted for."

Service conditions should bound those expected for coolant and steam line breaks inside containment with due consideration given to analytical uncertainties. The steam line break condition should include superheated conditions, the peak temperature, and subsequent temperature/pressure profiles as functions of time. If containment spray is to be used, the impact of the spray on required equipment should be assessed.

The adequacy of a plant-specific profile depends on the assumptions and design considerations at the time the profiles were developed. The DOR Guidelines and NUREG-0588 provide guidance and considerations required to determine if the calculated plant-specific temperature/pressure profiles encompass the loss-of-coolant accident (LOCA) and HELB accidents inside containment.

2.2.4.2 Submergence (DOR Guidelines Section 4.1, Subitem 3; and Section 4.3.2, Subitem 3)

Equipment submergence (inside or outside containment) should be addressed where the possibility exists that submergence of equipment may result from HELBs or other postulated occurrences. Supplement 2 to IE Bulletin 79-01B [34] provides the following additional criterion: If the equipment satisfies the

guidance and other requirements of the DOR Guidelines or NUREG-0588 for the LOCA and HELB accidents, and the licensee demonstrates that its failure will not adversely affect any safety-related function or mislead the operator after submergence, the equipment can be considered exempt from the submergence portion of the qualification requirements.

2.2.4.3 Simulated Service Conditions and Test Duration (DOR Guidelines Section 5.2.1)

The Guidelines require that the test chamber environment envelop the required service conditions for a time equal to the period from the initiation of the accident until the service conditions return to normal. Supplement 2 to IE Bulletin 79-01B [34] provides the following additional criterion:

"Equipment designed to perform its safety-related function within a short time into an event must be qualified for a period of at least 1 hour in excess of the time assumed in the accident analysis. The staff has indicated that time is the most significant factor in terms of the margins required to provide an acceptable confidence level that a safety-related function will be completed. The 1-hour qualification requirement is based on the acceptance of a type test for a single unit and the spectrum of accidents (small and large breaks) bounded by the single test."

2.2.4.4 Test Sequence (DOR Guidelines Section 5.2.3)

Supplement 2 to IE Bulletin 79-01B [34] provides the following additional criteria:

"Sequential testing requirements are specified in NUREG-0588 and the DOR Guidelines. Licensees must follow the test requirements of the applicable document.

1. If the test has been completed without aging in sequence, justification for such a deviation must be submitted.
2. If testing of a given component has been scheduled but not initiated, the test sequence/program should be modified to include aging.
3. Test programs in progress should be evaluated regarding the ability to comply by incorporating aging in the proper sequence. These programs would then fall in the first or second category."

2.2.4.5 Radiation

(DOR Guidelines Sections 4.1.2, 4.2.2, and 4.3.2, Subitem 2)

Supplement 2 to IE Bulletin 79-01B [34] provides the following additional criteria:

"Both the DOR Guidelines and NUREG-0588 are similar in that they provide the methods for determining the radiation source term when considering LOCA events inside containment (100% noble gases/50% iodine/1% particulates). These methods consider the radiation source term resulting from an event which completely depressurizes the primary system and releases the source term inventory to the containment.

NUREG-0578 provides the radiation source term to be used for determining the qualification doses for equipment in close proximity to recirculating fluid systems inside and outside of containment as a result of LOCA. This method considers a LOCA event in which the primary system may not depressurize and the source term inventory remains in the coolant.

NUREG-0588 also provides the radiation source term to be used for qualifying equipment following non-LOCA events both inside and outside containment (10% noble gases/10% iodine/0% particulates).

When developing radiation source terms for equipment qualification, the licensee must ensure consideration is given to those events which provide the most bounding conditions. The following table summarizes these considerations:

	<u>LOCA</u>	<u>Non-LOCA HELB</u>
Outside Containment	NUREG-0578 (100/50/1 in RCS) [*]	NUREG-0588 (10/10/0 in RCS)
Inside Containment	<u>Larger of</u> NUREG-0588 (100/50/1 in containment)	NUREG-0588 (10/10/0 in RCS)
	or NUREG-0578 (100/50/1 in RCS)	

*The numbers in parentheses represent % noble gases/% iodine/% particulates.
RCS means reactor coolant system.

Gamma equivalents may be used when consideration of the contributions of beta exposure has been included in accordance with the guidance given in the DOR Guidelines and NUREG-0588. Cobalt 60 is one acceptable gamma radiation source for environmental qualification of safety-related equipment. Cesium 137 may also be used.¹

2.2.5 Additional Clarification of Qualification Requirements

The NRC has worked with a number of licensees, at their requests, to provide further clarification on environmental qualification requirements. On January 20, 1982, the NRC issued Generic Letter No. 82-09 [60] presenting staff positions on certain aspects of the qualification requirements. Generic Letter No. 82-09 states:

"1. Operator Display Instrumentation

- Q. Given the interrelated activities associated with display instrumentation (e.g., NUREG-0700, NUREG-0799, proposed Regulatory Guide 1.97 and Equipment Qualification efforts), what display instrumentation referenced in emergency operating procedures must be identified in licensee submittal to the NRC?
- A. All display instrumentation referenced in the emergency procedures need not be identified. The NRC requires that licensees need only identify and have available qualification documentation on those operator display instruments which are safety-related (see Question 2). If licensees have previously supplied a listing of all display instrumentation referenced in emergency procedures, licensees may identify (such as by the use of an *) which of those instruments are safety-related. The staff will defer review of the basis for this safety-related classification until other NRC activities¹ have been implemented. When these other activities are implemented, additional instruments presently not requiring qualification may require upgrading to a safety-related status and/or may require qualification. Licensees will be required at that time to qualify this instrumentation in accordance with the following criteria:
- o For new or upgraded instrumentation with a required operation date prior to the equipment qualification deadline, qualification must be accomplished by the equipment qualification deadline.

¹Such activities include preparation of new emergency procedures (NUREG-0799), control room design reviews (NUREG-0700), and upgrading of accident monitoring instrumentation (Reg. Guide 1.97 and NUREG-0737).

- o For new or upgraded instrumentation with a required operation date after the equipment qualification deadline, qualification must be accomplished prior to equipment operation and plant acceptance.

2. Safety-Related Equipment

- Q. For Equipment Qualification purposes, what constitutes all safety-related electrical equipment?
- A. The Commission, in CLI-80-21, required the environmental qualification of only safety-related electrical equipment. Identification of the safety-related equipment installed at specific plants can be obtained from FSARs, Technical Specifications and other docketed correspondence setting forth NRC requirements or licensee commitments. Identification of safety-related equipment installed in harsh environments at specific plants must be supplied by the licensee. The necessity for upgrading nonsafety-related system to safety-related status will be the subject of other NRC reviews.

3. Replacement Parts

- Q. Please clarify the NRC requirements on replacement parts.
- A. In CLI-80-21, the Commission stated that unless there were sound reasons to the contrary, replacement equipment should be qualified to the standards set forth in Category I of NUREG-0588. The Commission's position was designed to promote the policy of upgrading the environmental qualification and reliability of installed safety-related electrical equipment. To meet this overall goal, licensees must institute internal policy practices consistent with the Commission's statement.

Situations may arise in which upgrading to NUREG-0588, Category I of replacement equipment qualified to NUREG-0588, Category II or the DOR Guidelines will not be compatible with overall station safety and performance goals. Licensees must review such situations on a case-by-case basis and determine that 'sound reasons to the contrary' do, in fact, exist which warrant the use of replacement equipment (not necessarily in-kind) qualified to the DOR Guidelines or NUREG-0588, Category II. For equipment located in a harsh environment, licensees' procedures must provide for documentation and substantiation of such determinations.

Conditions which reflect sound reasons why qualification standards for replacement of equipment in a harsh environment need not be upgraded to NUREG-0588, Category I include the following:

1. The licensee has replacement equipment in stock that meets the DOR Guidelines or NUREG-0588, Category II, and procurement actions regarding such replacement equipment had commenced prior to May 23, 1980.
2. Replacement equipment qualified to the NUREG-0588, Category I standards does not exist.
3. Replacement equipment qualified to the NUREG-0588, Category I standards is not available to meet installation and operation schedules. Equipment qualified to the DOR Guidelines or NUREG-0588, Category II may be used for an interim period until Category I equipment is obtained and an outage of sufficient duration is available for replacement. Justification for use of the non-Category I qualified replacement equipment beyond this interim period must be submitted to the NRC for approval prior to the end of the interim period and in sufficient time for reasonable NRC review.
4. Replacement equipment qualified to NUREG-0588, Category I standards would require significant plant modifications to accommodate its use.
5. Operating performance and reliability data for the Category I equipment indicates poor overall equipment performance. For example, mean time to failure is significantly shorter for the Category I replacement equipment.
6. The use of replacement equipment qualified to NUREG-0588, Category I standards has a significant probability of creating human factor problems that will negatively affect plant safety and performance, e.g., (1) knowledge, skills and ability of existing plant staff require significant upgrading to operate or maintain the specific Category I replacement equipment; (2) the use of equipment qualified to Category I standards creates a one-of-a-kind application; or (3) maintenance, surveillance or calibration activities are unnecessarily complex.

5. Submergence Outside Containment

- Q. For equipment qualification purposes, what are the staff requirements concerning submergence of equipment outside containment?

- A. The Staff requires that the licensee submit documentation on the qualification of safety-related equipment that could be submerged due to a high energy line break outside containment.

6. Radiation

- Q. Is the staff screening value of 4×10^7 rads applicable to all operating reactors?
- A. No. This screening value is applicable only to PWRs with dry type containments. However, for PWRs with dry type containments, the licensee may choose to use plant specific analysis instead of the screening value. For plants with other containment types, the licensee must use plant specific analysis.

Acceptable to the Staff for equipment qualification purposes are radiation values developed as part of the plant licensing process provided that they are based on the TID14844 source terms and are conservatively performed. In order to assure that the methodologies are appropriate, the Staff requests two component specific sample calculations (one for inside and one for outside containment), and a brief written description of each of the methodologies used, their application and associated conservatisms. Such sample calculations and a statement by the licensee that the values of radiation exposure of components so derived are appropriate for environmental qualification of equipment will satisfy the Staff's concern on the 'Radiation Specification Value' used during the qualification reviews.

7. Containment Service Conditions

- Q. Must the Staff value (identified in the SERs) of T_{SAT} for PWRs and $T_{SAT} + 20^\circ F$ for BWRs be used as the maximum in-containment temperature for the purpose of equipment qualification?
- A. No. The Staff will accept the use of these values. However, an acceptable alternative to the NRC staff's temperature criterion used for the service conditions must base that service condition on the FSAR analysis or other NRC approved analysis, provided that the specific analysis, or a summary of that analysis, together with reference to the previous NRC acceptance of the analysis is submitted by the licensee. In addition, some of the information in the associated safety evaluation may require clarification.

8. One Hour Minimum Operating Time

- Q. The Staff has previously indicated that certain exceptions to the one hour minimum operating time rule are permitted. Can further clarification be provided?

- A. With regard to plants subject to the qualification requirements of the DOR Guidelines or Category II of NUREG-0588, for those pieces of equipment tested prior to May 23, 1980, the test data and analysis may be used to qualify the equipment to the required operating time plus an appropriate margin. The one hour margin requirement need not be applied. However, subsequent failures should be shown not to be detrimental to plant safety.

The one hour time margin rule is not applicable to equipment whose safety function is performed prior to significant changes in the environment at the equipment location.

9. Aging

- Q. Must a qualified life be developed for all safety-related electrical equipment located in harsh environments?
- A. Section 7 of the DOR Guidelines and Section 4.2, Category II of NUREG-0588, do not require a qualified life to be established for all safety-related electrical equipment located in harsh environments. A qualified life, in accordance with the provisions in IEEE 323-1974, is required for equipment, including replacement parts, qualified to Category I of NUREG-0588 that is located in a harsh environment.

An acceptable method for addressing in-service degradation is through a preventive maintenance/surveillance program with equipment and component refurbishment and/or replacement based on known susceptibility to aging degradation, the results of inspections, or manufacturers recommendations. These elements of the program lead to an understanding on a device specific basis of the nature and extent of the increased stress levels encountered during Design Basis Accidents and resultant degradation (if any) which may occur. Arrhenius or other appropriate accelerated aging methodologies may be used to establish replacement and refurbishment schedules if the component's design and materials application are sufficiently simple and the necessary data are available to allow a meaningful application.

In plants subject to the qualification requirements of either the DOR Guidelines or NUREG-0588 Category II, for equipment that has been identified as being susceptible to significant degradation due to thermal and radiation aging, the schedule for inspection of and/or replacement of the susceptible components in that equipment must be incorporated into the preventive maintenance and surveillance programs, and that information should be incorporated into the system component evaluation worksheets (SCEWS). For other equipment, the aging column in the SCEWS should be marked 'No Known Susceptibility'."

3. METHODOLOGY USED FOR THE EVALUATION

3.1 INTRODUCTION

As discussed in Section 1.3 of this report, the NRC issued Safety Evaluation Reports (SERs) on environmental qualification of safety-related equipment to licensees of all operating plants in mid-1981.

The SERs identified various equipment qualification deficiencies as indicated below:

LEGEND: DESIGNATION FOR DEFICIENCY

R - Radiation	M - Margin
T - Temperature	I - HELB Evaluation Outside Containment Not Completed
QT - Qualification Time	QM - Qualification Method
RT - Required Time	RPN - Equipment Relocation or Replacement, Adequate Schedule Not Provided
P - Pressure	EXN - Exempted Equipment Justification Inadequate
H - Humidity	SEN - Separate Effects Qualification Justification Inadequate
CS - Chemical Spray	QI - Qualification Information Being Developed
A - Material Aging Evaluation, Replacement Schedule, Ongoing Equipment Surveillance	RPS - Equipment Relocation or Replacement Schedule Provided
S - Submergence	
(R) - Licensee has committed to replace equipment	

The SERs directed licensees to "either provide documentation of the missing qualification information which demonstrates that safety-related equipment meets the DOR Guidelines or NUREG-0588 requirements or commit to a corrective action (re-qualification, replacement [etc.]) to establish qualification by June 30, 1982." Licensees were required to respond to the NRC within 90 days of receipt of the SER.

As stated in Section 1.1, the purpose of this report is (1) to evaluate licensees' resolutions of outstanding issues related to safety-related electrical equipment environmental qualification (EEQ) discussed in the NRC's SERs in accordance with NRC criteria, and (2) to evaluate licensees' qualification documentation of safety-related electrical equipment, including

TMI Lessons Learned Implementation equipment, located in harsh environments in accordance with criteria established by the NRC (see Section 2 of this report). The methodology used to evaluate (1) the Licensee's response to the NRC SER and (2) the equipment environmental qualification is presented herein.

3.2 METHODOLOGY

The Licensee, Yankee Atomic Electric Company, provided a response to the SER and additional qualification information in its submittals [40, 41] to the NRC for the Yankee Rowe Nuclear Power Plant.

The following bases provided by the NRC were used to determine the relative completeness of the Licensee's submittals:

- o Determine whether the Licensee provided specific responses to the SER concerns.
- o Determine whether the Licensee proposed corrective actions and a schedule for completion of the actions.
- o Determine whether the Licensee addressed the NRC's concern for margin with respect to the containment environmental conditions.
- o Determine whether the Licensee revised the environmental parameters.
- o Determine whether the Licensee's System Component Evaluation Work Sheets (SCEWS) were updated to correct deficiencies and add supplemental information.
- o Determine whether the Licensee provided justifications for interim operation for all unqualified equipment.
- o Determine whether the Licensee addressed aging and incorporated the results into the equipment maintenance program.

The extensive list of safety-related electrical equipment* in various locations of the plant identified by the Licensee was analyzed, and all identical equipment located within plant areas that are exposed to the same environmental service conditions was grouped together and designated an

*In this report, the term "safety-related electrical equipment" refers to the equipment defined by the two NRC Guidelines referenced in Section 2.1.

"equipment item." In this report, the term "equipment item" refers to a specific type of electrical equipment, designated by manufacturer and model, which is representative of all identical equipment in a plant area exposed to the same environmental service conditions (e.g., Flow Transmitter, Fischer & Porter, Model 10B2496, located within containment). This analysis resulted in a reduced listing of equipment (equipment items) that formed the basis for the review.

Appendix A contains the environmental service conditions for each location. Appendix B contains the tabulation of the equipment items, locations, function, plant identification numbers, required operating time, and applicable qualification documentation references. Appendix C lists the plant systems identified by the Licensee and the NRC as being essential to safety.

Each item in the list of safety-related electrical equipment items was reviewed in relation to:

- o the Licensee's response to the SER concerns
- o technical information received from the Licensee as a result of requests for additional information (Appendix E)
- o technical data derived from the Licensee's submittal
- o NRC DOR Guidelines or NUREG-0588 Revision 1 criteria
- o the Licensee's definition of harsh service environments (Appendix A)
- o documentation cited by the Licensee as evidence of qualification
- o applicable and available qualification documentation associated with the overall equipment environmental qualification program
- o the Licensee's analysis and/or justification of qualification
- o Licensee-proposed corrective action for qualification deficiencies
- o the Licensee's equipment/part replacement schedules
- o the Licensee's technical arguments concerning the adequacy of equipment, based on system operational considerations
- o the Licensee's rationale concerning exemption of equipment from qualification.

Topics not within the scope of the evaluation are:

- o completeness of the Licensee's listing of safety-related equipment
- o acceptability of Licensee-provided environmental service conditions.

The NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with those sections of NUREG-0737 which have an equipment installation implementation date of January 1, 1982 (sections are identified below). Where applicable, a review was to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment

II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position

II.E.1.2 (PWR/1-1-81) Auxiliary Feedwater System Automatic Initiation and Flow Indication

II.E.3.1 (PWR/1-1-81) Emergency Power Supply for Pressurizer Heaters (Safety-Grade Interfaces)

II.E.4.1 (ALL/7-1/81) Dedicated Hydrogen Penetrations

II.E.4.2 (ALL/1-1-81) Containment Isolation Dependability

II.F.2 (PWR/1-1-81) Instrumentation for Detection of Inadequate Core Cooling

II.G.1 (PWR/1-1-81) Emergency Power for Pressurizer Equipment (Safety-Grade Interfaces)

II.K.2.10 (PWR/B&W/7-1-81) Safety-Grade Anticipatory Reactor Trip

II.K.3.9 (PWR/W/1-1-81) PID Controller Modification (If Hardware Change Involved)

- II.K.3.12 (PWR/W/1-1-81) Anticipatory Reactor Trip upon Turbine Trip
- II.K.3.13 (PWR/GE/7-1-81) Separation of HPCI and RCIC Initiation Signals
- II.K.3.15 (BWR/GE/7-1-81) Prevention of Spurious Isolation of HPCI and RCIC Systems
- II.K.3.19 (BWR/GE/7-1-81) Interlock on Recirculation Pump Loop
- II.K.3.21 (BWR/GE/7-1-81) Restart of Core Spray and LPCI Systems (If Hardware Changed Out)
- II.K.3.27 (BWR/GE/7-1-81) Provide Common Reference Level for Vessel Level Instrumentation (If Hardware Changed Out)

Licensees whose plants were included within the NRC Systematic Evaluation Program received a Technical Evaluation Report (TER) in addition to the SER. The TER was based on a review of equipment environmental qualification documentation associated with the Licensee's EEQ submittals. The qualification deficiencies identified in the SER were derived from the TER. Plants included within this program were the Palisades, Oyster Creek, Ginna, Waddam Neck, Yankee Rowe, LaCrosse, and Big Rock Point plants and Zion Station Units 1 and 2, Indian Point Units 2 and 3, Millstone Unit 1, Dresden Unit 2, and San Onofre Unit 1. For these plants, the evaluation presented herein is based on (1) the result of the initial TER, (2) the Licensee's response to the NRC SER and the TER, and (3) the Licensee's updated EEQ submittal(s).

TERs were also developed for the following plants: Nine Mile Point Unit 1, Millstone Unit 2, Salem Unit 1, Browns Ferry Units 1, 2, and 3, Brunswick Units 1 and 2, Hatch Units 1 and 2, Dresden Unit 3, and Quad Cities Units 1 and 2. The objective of those TERs was to review the Licensee's submittals to determine if safety-related electrical equipment was reviewed for environmental qualification by the Licensee in accordance with the DOR Guidelines and NUREG-0588 as required by IE Bulletin 79-01B. For these 13 plants and all other plants, excluding the 14 plants associated with the Systematic Evaluation Program, the evaluation presented herein is based solely on (1) the Licensee's response to the NRC SER and (2) the Licensee's revised EEQ submittal(s).

This technical evaluation was conducted to identify (1) whether the Licensee provided an adequate response to the SER concerns (and TER concerns,


where applicable), (2) major deficiencies within the equipment qualification program and (3) whether the Licensee proposed adequate corrective actions to resolve qualification deficiencies and provided a schedule for completion of the corrective actions. The TER was written primarily to address deviations from the NRC criteria and requirements. Technical data or test results that satisfy the qualification criteria are not discussed herein.

The evaluation presented in Section 4 of this report includes completed equipment environmental qualification review checksheeta (partially handwritten) which compile both the technical information necessary to conduct the review and the results of the evaluation. Parameters listed on these checksheeta were derived from the appropriate NRC screening criteria. The evaluation of each equipment item includes several checksheet pages. Only those checksheet pages necessary to complete the evaluation for each equipment item are included in this report. A complete listing of the checksheet pages is shown on the bottom of Checksheet 1a, reproduced here as Figure 3-1.

The checksheeta contain the following information:

- o Equipment item information (see Figure 3-1), for example:
 - Solenoid Valve Located in Turbine Building (Area #7)
 - Automatic Switch Co. (ASCO) Model LB8300B61U
 - Actuates Feedwater Control Valves (V-4269, V-4270)
 - Licensee Reference 839
 - Required Operating Time: Short term (SI signal)
 - TER Checksheet No. 1
 - Reference 59, Section 4.5.2.6
 - Licensee Submittal: Page 9 [62]; Table 3, Page 1 [1]; SCEW 1
- o Qualification deficiencies identified in the SER (see Figure 3-1)
- o Licensee's response to the SER
- o Licensee's statements and rationale for qualification
- o Licensee's corrective action and replacement schedule
- o Evaluation of qualification including identification of all deficiencies
- o Evaluation of system considerations presented by the Licensee as a rationale for excluding equipment from qualification.

The results of the evaluation are summarized on Checksheet 2 (Equipment Environmental Qualification Summary Form) for each equipment item. Checksheet

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<p>EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. _____</p>		

Equipment Item No. 1
Solenoid Valves Located in Turbine Building (Area #7)
Automatic Switch Co. (ASCO) Model LB8300B61U
Actuates Feedwater Control Valves (V-4269, V-4270)
Licensee Reference 1617
Required Operating Time: Short term (SI signal)
TER Checksheet No. 1
Reference 59, Section 4.5.2.6
Licensee Submittal: Page 9 [62]; Table 3, Page 1 [1]; FRC SCEW 1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
(See Section 3 of this TER for Legend)

R, T, Q, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b, 3c, 3d
System Consideration Review	4a, 4b, 4c, 4d, 4e, 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c

Figure 3-1. Sample Checksheet Page 1a
"Equipment Item"

2 specifically identifies any qualification deficiencies determined by the evaluation and identifies the NRC qualification category to which the equipment item was assigned. A sample Checksheet 2 is presented in Figure 3-2.

All information was reviewed for conformance to the NRC criteria referenced in Section 2 of this report. As requested by the NRC, all applicable and available qualification documentation associated with the overall Equipment Environmental Qualification (EEQ) program was used by the reviewers, whether referenced by the Licensee or not.

Upon completion of the review for each equipment item, an overall evaluation of the component and a specific conclusion with respect to its qualification was developed. Based on the evaluation, each equipment item was assigned to one of the generic qualification categories provided by the NRC. The NRC category descriptions are presented in Section 3.3 of this report.


3.3 NRC QUALIFICATION CATEGORIES AND DEFINITIONS

- o NRC Category I.a
EQUIPMENT THAT SATISFIES ALL APPLICABLE REQUIREMENTS OF THE DOR GUIDELINES OR NUREG-0588, OR HAS ACCEPTABLE DEVIATIONS FROM THE DOR/NUREG CRITERIA

This category includes equipment items which are fully acceptable on the basis that all applicable criteria defined in the DOR Guidelines or NUREG-0588 are (1) satisfied and the equipment has been found to be qualified or (2) sufficient information has been presented to determine that deviations from the criteria are acceptable or insignificant.

- o NRC Category I.b
EQUIPMENT FOR WHICH DEVIATIONS FROM THE DOR GUIDELINES OR NUREG-0588 ARE JUDGED CONDITIONALLY ACCEPTABLE PROVIDED THAT SPECIFIC MODIFICATIONS ARE MADE

This category includes equipment items that do not satisfy one or more of the applicable criteria defined in the DOR Guidelines or NUREG-0588; however, the Licensee has stated that specific modifications will be made on or before a designated date. This equipment is considered by NRC to be conditionally acceptable provided that the specific modifications are made by the Licensee. When the modifications are completed as proposed, the Licensee states that the equipment will satisfy all applicable NRC requirements. Examples of specific modifications are (1) replacement of unqualified equipment with qualified equipment, (2) equipment hardware

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. ____		

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

<u>NRC REQUIREMENTS</u>	<u>DESIGNATION:</u> <u>X = DEFICIENCY</u>
Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	_____
Qualified Life or Replacement Schedule Established (If Required)	_____
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	_____
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____
<hr/>	
<u>NPC QUALIFICATION CATEGORY</u>	<u>DESIGNATION:</u> <u>X = CATEGORY</u>
I.a Equipment Qualified	_____
I.b Equipment Qualification Pending Modification	_____
II.a Equipment Qualification Not Established	_____
II.b Equipment Not Qualified	_____
II.c Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	_____
III.a Equipment Exempt From Qualification	_____
III.b Equipment Not in the Scope of the Qualification Review	_____
IV Documentation Not Made Available	_____

Figure 3-2. Sample Checksheet Page 2

"Equipment Environmental Qualification Summary Form"

modification, (3) equipment relocation above submergence level, (4) relocation or shielding of equipment from radiation source, (5) verification of qualification by additional testing, (6) equipment relocation to a mild environment, and (7) qualification testing of equipment in progress.

- o NRC Category II.a
EQUIPMENT FOR WHICH QUALIFICATION DOCUMENTATION IS INSUFFICIENT TO ESTABLISH THAT THE EQUIPMENT IS OR IS NOT QUALIFIED IN ACCORDANCE WITH THE DOR GUIDELINES OR NUREG-0588

The qualification of equipment items in this category, in accordance with the requirements of the DOR Guidelines or NUREG-0588, is significantly deficient or inconclusive based upon review of (1) the documentation provided by the Licensee or (2) applicable and available qualification documentation associated with the overall equipment environmental qualification program. The qualification documentation indicates significant deficiencies, which can be categorized as follows: (1) appropriate documentation reflecting qualification has not been cited and made available for review by the Licensee and there is no knowledge of applicable documentation; (2) the Licensee is awaiting qualification from the equipment vendor; or (3) the qualification documentation indicates significant deficiencies; however, where testing was conducted, no reported failures or severe anomalies were observed which would unquestionably affect the ability of the equipment to perform its design basis safety function(s).

- o NRC Category II.b
EQUIPMENT THAT IS UNQUALIFIED

This category includes equipment items whose qualification documentation has been judged to be seriously deficient based upon review of (1) the documentation provided by the Licensee, or (2) applicable and available qualification documentation associated with the overall equipment environmental qualification program. The qualification documentation indicates serious deficiencies reported during testing; for example, severe anomalies or failure of the test specimen, which could affect the ability of the equipment to perform its safety function. NRC has requested immediate written notification when an equipment item is placed in this category during the course of the review.

- o NRC Category II.c
EQUIPMENT THAT SATISFIES ALL APPLICABLE REQUIREMENTS OF THE DOR GUIDELINES OR NUREG-0588 WITH THE EXCEPTION OF QUALIFIED LIFE

This category includes equipment items that are acceptable on the basis that all applicable criteria defined in the DOR Guidelines or NUREG-0588 are satisfied with the exception of the qualified life criterion. The Licensee (1) has not evaluated qualified life or replacement schedule, (2) has not adequately evaluated qualified life or replacement schedule, or (3) has not adequately interpreted qualified life in terms of calendar time. [Note: The component replacement schedule discussed in Section 7.0 of the

DOR Guidelines is, in effect, a qualified life. It is not essential to use the term "qualified life," but the replacement schedule must be justified.]

o NRC Category III.a
EQUIPMENT THAT IS EXEMPT FROM QUALIFICATION

This category includes equipment items that are exempt from qualification on the basis that (1) the equipment does not provide a safety function (i.e., should not have been included in the equipment list submitted by the Licensee), or (2) the specific safety-related function of the equipment can be accomplished by some other designated equipment that is fully qualified and satisfies the single failure criterion. In addition, any failure of the exempt equipment must not mislead the operator or degrade the ability of qualified equipment to perform its required safety-related function.

o NRC Category III.b
EQUIPMENT NOT IN THE SCOPE OF THE QUALIFICATION REVIEW

This category includes equipment items addressed by the Licensee in the equipment environmental qualification submittals which are (1) required to achieve and maintain the plant in a cold shutdown condition or (2) located in a mild environment. Supplement 2 of IE Bulletin 79-01B permits deferment of the review of environmental qualification for all safety-related equipment items located in plant areas where the equipment is not exposed to the direct effects of a high energy line break (HELB) or to nuclear radiation emanating from circulation of fluids containing radioactive substances. Supplement 3 of IE Bulletin 79-01B permits deferment of the review of environmental qualification for all equipment required to achieve and maintain the plant in a cold shutdown condition. Supplements 2 and 3 of IE Bulletin 79-01B originally permitted deferment until after February 1, 1981 of the qualification review of equipment located in a mild environment or required to achieve and maintain the plant in a cold shutdown condition. Since the issuance of Supplements 2 and 3, the NRC has determined that the review of environmental qualification for this equipment is not within the scope of this report.

o NRC Category IV
EQUIPMENT FOR WHICH QUALIFICATION DOCUMENTATION HAS NOT BEEN MADE AVAILABLE FOR REVIEW

This category includes equipment items for which qualification documentation in accordance with the requirements of the DOR Guidelines or NUREG-0588 has been cited by the Licensee as evidence of qualification; however, this documentation has not been made available for review. Therefore, a conclusion cannot be reached with respect to qualification of this equipment.

3.4 IMPLEMENTATION GUIDE FOR FULFILLING NRC CRITERIA

The NRC has requested that a detailed implementation guide for fulfilling NRC criteria be prepared as part of this assignment. The implementation guide will present a fully detailed discussion of the principal qualification criteria presented in the DOR Guidelines and NUREG-0588. The primary emphasis will be to clarify technical points, eliminate possible misconceptions, and clearly provide definitive guidance to enable licensees to understand and resolve, in an expeditious manner, qualification deficiencies identified as a result of this TER. The implementation guide (TER-C5257-532) has been prepared and issued to the NRC. The implementation guide is either appended to this TER or will be forwarded to the Licensee by the NRC under a separate letter. The Licensee is encouraged to review that document.

4. TECHNICAL EVALUATION

4.1 INTRODUCTION

The technical evaluation presented in this section represents the equipment environmental qualification (EEQ) assessment for each equipment item listed in Appendix B in accordance with the methodology presented in Section 3 of this report. The evaluations were conducted to identify any major deficiencies within the Licensee's equipment qualification program and to determine whether the Licensee (1) provided an adequate response to the SER concerns, (2) proposed adequate corrective actions to resolve qualification deficiencies, and (3) provided a schedule for completion of the corrective actions.

The evaluations are based on the available qualification documentation provided by the Licensee, complemented in several cases by other relevant technical information. The major qualification deficiencies that have been identified and the results of the evaluation are shown in the Equipment Environmental Qualification Summary Forms (Tables 4-1, 4-2, 4-3, and 4-4) presented in Section 4.2.

Observations concerning the Licensee's qualification methodology presented in response to the NRC SER are presented in Section 4.3.

Technical evaluations of the environmental qualification of the equipment items are presented in Section 4.4.

4.2 SUMMARY OF THE EVALUATION

The following tabulations represent a summary of the results of the equipment environmental qualification evaluation conducted in accordance with the methodology presented in Section 3.

Table 4-1 summarizes the number of equipment items assigned to each NRC qualification category as a result of the evaluation.

Table 4-2 summarizes the number of equipment items found to have a specific qualification deficiency.

Table 4-3 summarizes the number of equipment items for which the Licensee has proposed a specific corrective action to resolve a qualification deficiency.

Table 4-4 consists of Equipment Environmental Qualification Summary Forms for the equipment items, identifying (1) compliance with the qualification requirements defined in Section 2, (2) the resultant NRC qualification category and (3) the Licensee-proposed corrective action.

TABLE 4-1
 NUMBER OF EQUIPMENT ITEMS IN EACH QUALIFICATION CATEGORY

NRC CATEGORY	CATEGORY DESCRIPTION	NUMBER OF EQUIPMENT ITEMS
I.A	EQUIPMENT QUALIFIED----- [EQUIPMENT ITEM NO(S): 2, 3, 22, 23, 25, 26, 27, 28, 33, 34, 35, 41, 43]	13
I.B	EQUIPMENT QUALIFICATION PENDING MODIFICATION----- [EQUIPMENT ITEM NO(S): 1, 7, 8, 9, 16, 31, 38, 38]	7
II.A	EQUIPMENT QUALIFICATION NOT ESTABLISHED----- [EQUIPMENT ITEM NO(S): 4, 5, 6, 18, 24, 29, 30, 42]	8
II.B	EQUIPMENT NOT QUALIFIED----- [EQUIPMENT ITEM NO(S): 11]	1
II.C	EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED----- [EQUIPMENT ITEM NO(S): 10, 12, 13, 14, 15, 17, 19, 20, 21, 40]	10
III.A	EQUIPMENT EXEMPT FROM QUALIFICATION-----	0
III.B	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW----- [EQUIPMENT ITEM NO(S): 36, 37, 39]	3
IV	DOCUMENTATION NOT MADE AVAILABLE----- [EQUIPMENT ITEM NO(S): 32]	1
TOTAL		43

TABLE 4-2
 QUALIFICATION DEFICIENCY SUMMARY

NRC REQUIREMENT	NUMBER OF DEFICIENT EQUIPMENT ITEMS
1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE----- [EQUIPMENT ITEM NO(S).: 1, 4, 5, 7, 8, 9, 11, 16, 24, 29, 30, 42]	12
2. ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED----- [EQUIPMENT ITEM NO(S).: 4, 5, 6, 11, 18, 24, 29, 30, 42]	9
3. AGING DEGRADATION EVALUATED ADEQUATELY----- [EQUIPMENT ITEM NO(S).: 4, 5, 10, 11, 12, 13, 14, 15, 17, 19, 20, 21]	12
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)----- [EQUIPMENT ITEM NO(S).: 4, 5, 10, 11, 12, 13, 14, 15, 17, 19, 20, 21, 31, 40]	14
5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION----- [EQUIPMENT ITEM NO(S).: 10, 11, 12, 13, 14, 15]	6
6. CRITERIA REGARDING AGING SIMULATION (IF REQUIRED)-----	0
7. CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE:	
A. - PEAK TEMPERATURE ADEQUATE-----	0
B. - PEAK PRESSURE ADEQUATE-----	0
C. - DURATION ADEQUATE----- [EQUIPMENT ITEM NO(S).: 11]	1
D. - REQUIRED PROFILE ENVELOPED ADEQUATELY----- [EQUIPMENT ITEM NO(S).: 11, 31]	2
E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE----- [EQUIPMENT ITEM NO(S).: 11, 31]	2

Table 4-2 (Cont.)

QUALIFICATION DEFICIENCY SUMMARY

NRC REQUIREMENT	NUMBER OF DEFICIENT EQUIPMENT ITEMS
8. CRITERIA REGARDING SPRAY SATISFIED-----	0
9. CRITERIA REGARDING SUBMERGENCE SATISFIED-----	0
10. CRITERIA REGARDING RADIATION SATISFIED----- [EQUIPMENT ITEM NO(S).: 16, 31]	2
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED----- [EQUIPMENT ITEM NO(S).: 11]	1
12. CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED----- [EQUIPMENT ITEM NO(S).: 11]	1
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED-----	0
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED-----	0
15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED--- [EQUIPMENT ITEM NO(S).: 11, 16]	2
16. CRITERIA REGARDING MARGINS SATISFIED (NUREG-0588, CAT. 1)-	0

TABLE 4-3
 LICENSEE CORRECTIVE ACTION SUMMARY

CORRECTIVE ACTION DESCRIPTION	NUMBER OF EQUIPMENT ITEMS
1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT----- [EQUIPMENT ITEM NO(S).: 1, 16, 31, 39]	4
2. EQUIPMENT MODIFICATION-----	0
3. EQUIPMENT RELOCATION ABOVE SUBMERGENCE LEVEL-----	0
4. RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE-----	0
5. VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS-----	0
6. EQUIPMENT RELOCATION TO A MILD ENVIRONMENT-----	0
7. QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS----- [EQUIPMENT ITEM NO(S).: 7, 8, 9]	3
8. OTHER (FOR DETAILED DESCRIPTION SEE SPECIFIC EQUIPMENT ITEMS)-- [EQUIPMENT ITEM NO(S).: 11, 16, 38]	3
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED (SEE SPECIFIC EQUIPMENT ITEM FOR COMPLETION DATE)----- [EQUIPMENT ITEM NO(S).: 1, 9, 16, 31]	4

Table 4-4

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

		FAC EQUIPMENT ITEM NUMBERS														
		1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015
NRC REQUIREMENTS (DESIGNATION: X = DEFICIENCY)																
1.	DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE-----	X			X	X		X	X	X		X				
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED-----				X	X	X					X				
3.	AGING DEGRADATION EVALUATED ADEQUATELY-----				X	X					X	X	X	X	X	X
4.	QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)-----				X	X					X	X	X	X	X	X
5.	PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION-----										X	X	X	X	X	X
6.	CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)-----										X	X	X	X	X	X
7.	CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE:															
	A. - PEAK TEMPERATURE ADEQUATE-----															
	B. - PEAK PRESSURE ADEQUATE-----															
	C. - DURATION ADEQUATE-----											X				
	D. - REQUIRED PROFILE ENVELOPED ADEQUATELY-----											X				
	E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE-----											X				
8.	CRITERIA REGARDING SPRAY SATISFIED-----															
9.	CRITERIA REGARDING SUBMERGENCE SATISFIED-----															
10.	CRITERIA REGARDING RADIATION SATISFIED-----															
11.	CRITERIA REGARDING TEST SEQUENCE SATISFIED-----											X				
12.	CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED-----											X				
13.	CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED-----															
14.	CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED-----															
15.	TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED-----															
16.	CRITERIA REGARDING MARGINS SATISFIED (NUREG-0588, CAT. 1)-----											X				
NRC QUALIFICATION CATEGORY (DESIGNATION: X = CATEGORY)																
I.A.	EQUIPMENT QUALIFIED-----		X	X												
I.B.	EQUIPMENT QUALIFICATION PENDING MODIFICATION-----	X								X	X	X				
II.A.	EQUIPMENT QUALIFICATION NOT ESTABLISHED-----				X	X	X									
II.B.	EQUIPMENT NOT QUALIFIED-----											X				
II.C.	EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED-----											X	X	X	X	X
III.A.	EQUIPMENT EXEMPT FROM QUALIFICATION-----															
III.B.	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW-----															
IV.	DOCUMENTATION NOT MADE AVAILABLE-----															
CORRECTIVE ACTION SPECIFIED (DESIGNATION: X = ACTION SPECIFIED)																
1.	EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT-----	X														
2.	EQUIPMENT MODIFICATION-----															
3.	EQUIPMENT RELOCATION ABOVE THE SUBMERGENCE LEVEL-----															
4.	RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE-----															
5.	VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS-----															
6.	EQUIPMENT RELOCATION TO A MILD ENVIRONMENT-----															
7.	QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS-----							X	X	X						
8.	OTHER (---SEE SPECIFIC EQUIPMENT ITEM IF CHECKED---)											X				
	SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED-----	X								X						

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Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

		FRC EQUIPMENT ITEM NUMBERS														
		1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030
NRC REQUIREMENTS (DESIGNATION: X = DEFICIENCY)																
1.	DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE-----	X								X					X	X
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED-----			X						X					X	X
3.	AGING DEGRADATION EVALUATED ADEQUATELY-----	X		X	X	X										
4.	QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)-----	X		X	X	X										
5.	PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION-----															
6.	CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)-----															
7.	CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE:															
	A. - PEAK TEMPERATURE ADEQUATE-----															
	B. - PEAK PRESSURE ADEQUATE-----															
	C. - DURATION ADEQUATE-----															
	D. - REQUIRED PROFILE ENVELOPED ADEQUATELY-----															
	E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE-----															
8.	CRITERIA REGARDING SPRAY SATISFIED-----															
9.	CRITERIA REGARDING SUBMERGENCE SATISFIED-----															
10.	CRITERIA REGARDING RADIATION SATISFIED-----	X														
11.	CRITERIA REGARDING TEST SEQUENCE SATISFIED-----															
12.	CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED-----															
13.	CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED-----															
14.	CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED-----															
15.	TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED-----	X														
16.	CRITERIA REGARDING MARGINS SATISFIED (NUREG-0588, CAT. 1)-----															
NRC QUALIFICATION CATEGORY (DESIGNATION: X = CATEGORY)																
I.A	EQUIPMENT QUALIFIED-----							X	X		X	X	X	X		
I.B	EQUIPMENT QUALIFICATION PENDING MODIFICATION-----	X														
II.A	EQUIPMENT QUALIFICATION NOT ESTABLISHED-----			X						X					X	X
II.B	EQUIPMENT NOT QUALIFIED-----															
II.C	EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED-----	X		X	X	X										
III.A	EQUIPMENT EXEMPT FROM QUALIFICATION-----															
III.B	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW-----															
IV	DOCUMENTATION NOT MADE AVAILABLE-----															
CORRECTIVE ACTION SPECIFIED (DESIGNATION: X = ACTION SPECIFIED)																
1.	EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT-----	X														
2.	EQUIPMENT MODIFICATION-----															
3.	EQUIPMENT RELOCATION ABOVE THE SUBMERGENCE LEVEL-----															
4.	RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE-----															
5.	VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS-----															
6.	EQUIPMENT RELOCATION TO A MILD ENVIRONMENT-----															
7.	QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS-----															
8.	OTHER (---SEE SPECIFIC EQUIPMENT ITEM IF CHECKED---)	X														
	SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED-----	X														

Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM
 =====

		FRC EQUIPMENT ITEM NUMBERS												
		1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043
NRC REQUIREMENTS (DESIGNATION: X = DEFICIENCY)														
1.	DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE-----												X	
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED-----												X	
3.	AGING DEGRADATION EVALUATED ADEQUATELY-----													
4.	QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)-----	X								X				
5.	PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION-----													
6.	CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)-----													
7.	CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE:													
	A. - PEAK TEMPERATURE ADEQUATE-----													
	B. - PEAK PRESSURE ADEQUATE-----													
	C. - DURATION ADEQUATE-----													
	D. - REQUIRED PROFILE ENVELOPED ADEQUATELY-----	X												
	E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE-----	X												
8.	CRITERIA REGARDING SPRAY SATISFIED-----													
9.	CRITERIA REGARDING SUBMERGENCE SATISFIED-----													
10.	CRITERIA REGARDING RADIATION SATISFIED-----	X												
11.	CRITERIA REGARDING TEST SEQUENCE SATISFIED-----													
12.	CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED-----													
13.	CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED-----													
14.	CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED-----													
15.	TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED-----													
16.	CRITERIA REGARDING MARGINS SATISFIED (NUREG-0588, CAT. 1)-----													
NRC QUALIFICATION CATEGORY (DESIGNATION: X = CATEGORY)														
I.A.	EQUIPMENT QUALIFIED-----		X	X	X							X		X
I.B.	EQUIPMENT QUALIFICATION PENDING MODIFICATION-----	X						X						
II.A.	EQUIPMENT QUALIFICATION NOT ESTABLISHED-----													
II.B.	EQUIPMENT NOT QUALIFIED-----													
II.C.	EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED-----										X			
III.A.	EQUIPMENT EXEMPT FROM QUALIFICATION-----													
III.B.	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW-----					X	X		X					
IV.	DOCUMENTATION NOT MADE AVAILABLE-----	X												
CORRECTIVE ACTION SPECIFIED (DESIGNATION: X = ACTION SPECIFIED)														
1.	EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT-----	X							X					
2.	EQUIPMENT MODIFICATION-----													
3.	EQUIPMENT RELOCATION ABOVE THE SUBMERGENCE LEVEL-----													
4.	RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE-----													
5.	VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS-----													
6.	EQUIPMENT RELOCATION TO A MILD ENVIRONMENT-----													
7.	QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS-----													
8.	OTHER (---SEE SPECIFIC EQUIPMENT ITEM IF CHECKED---)-----							X						
	SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED-----	X												

4.3 METHODOLOGY USED BY THE LICENSEE

This section includes observations concerning the Licensee's qualification methodology presented in the response [40] to the NRC SER.

4.3.1 Aging and Qualified Life

In response to concerns identified in Section 4.1.3 of TER-C5257-197 [3] and Section 3.7 of the NRC SER [39], the Licensee provided the following information in the 90-day response [40]:

"Aging

The aging aspects of equipment in harsh environments have been addressed by reviewing the documentation references and determining (1) if the thermal aging parameters chosen and used in the tests are supported by adequate documentation or references, (2) if radiation aging was addressed, (3) if humidity aging was addressed, (4) if ambient vibration aging was addressed, (5) if a qualified life is explicitly stated, (6) if the aging tests and/or analysis results support the conclusion as to qualified life and if the conclusion is adequately documented, and (7) if maintenance requirements or component replacement intervals are specified. When all of the aging aspects which are required by the DOR Guidelines and applicable to the specific components have been addressed, the qualified life is entered on the component worksheet and any special requirements for maintenance or replacement are entered on the qualification document review form for use in the equipment maintenance and replacement program.

In cases where any of the above review items have not been addressed in the qualification documentation references, each applicable item (as evaluated on the document reference checklist) is addressed individually by use of materials evaluation using Appendix C of the DOR guidelines, available literature on materials properties, or results of testing on similar materials. If aging test results do not provide adequate justification for qualified life, an Arrhenius evaluation is performed to demonstrate or confirm that the required test time at elevated temperature to achieve qualified life exposure is exceeded by the actual test time. When pre-aging tests have not been performed, a thermal aging analysis is performed using manufacturer's material data and activation energy data from reports and reference library data. When these analyses indicate a qualified life that is less than the required, any special maintenance, surveillance, or replacement requirements are noted on the review form.

As a result of the aging qualification reviews, as described above, it is evident that two situations relative to qualified life will evolve. In the first case, equipment has been tested, including pre-aging, and/or analyzed, and a qualified life of 40 years has been established. For the remaining equipment, testing, analysis, or manufacturers' recommendations have determined that the qualified life is less than 40 years.

To assure timely replacement of those components or materials which have a qualified life of less than 40 years, plant maintenance programs will include provisions for replacement scheduling. When parts are replaced, assurance of maintaining the accepted level of qualification of the affected equipment is provided by use of the procurement policies endorsed by the AIF's position paper on replacement parts and by the plant's approved quality assurance program.

For components which have a relatively long qualified life (greater than 10 years), the accuracy of the predicted life will be verified by including provisions in plant maintenance and surveillance programs to determine the presence of advanced age related degradation. Depending on the equipment involved (complexity, amount of age sensitive materials involved, normal operating environment, etc.), the program will include those features of the following which are considered necessary to track aging conditions of that type of equipment.

- o Periodic visual inspection of materials in the equipment which are subject to aging degradation.
- o Periodic review of maintenance records by engineering personnel to detect trends of failures caused by material degradation.
- o Periodic testing of insulation integrity on representative samples of categories of equipment (motors, solenoid, etc.).
- o Periodic review of operating and maintenance records not related to failures (operating temperatures, calibration records, etc.).

The intervals for the periodic actions will be selected by giving consideration to the predicted qualified life, operating mode of the equipment, accessibility, and existing maintenance and surveillance schedules. It is anticipated that this program will be incorporated by modifications to existing programs, and the program will be in effect before the deadline for equipment qualification."

The Licensee response adequately addresses the concerns identified in the TER [37] and the SER [39]. Because of the uncertainties in predicting "long lifetimes - such as plant life" as noted in EPRI Report NP-1558 [1417], the Licensee should include all safety-related equipment in the surveillance program. Parameters indicative of degradation (whether caused by thermal effects or other environmental parameters) should be monitored.

4.3.2 Completeness of Equipment List

In Attachment A to Reference 40, the Licensee provided a rationale for excluding equipment located outside containment from the list of safety-related equipment to be considered for environmental qualification. An evaluation of this rationale is provided in Appendix C to this report.

In addition, the Licensee made the following statements in Reference 40 regarding the completeness of the equipment list:

"It should be noted that information associated with cold shutdown equipment and TMI lessons-learned modifications (discussed in Section 5 of the SER) was submitted in our report, Reference (c).

With regard to the concern identified by Franklin Research Center (FRC) in Appendix D of the Technical Evaluation Report (TER) relative to exposed cables in containment, it should be noted that there are no exposed cables in the Yankee Rowe containment with the insulation materials of concern. All cables are either mineral insulated cables or are in conduits.

Several items were installed during the recent refueling outage for which qualification documentation is being assembled. These items include the reactor head and pressurizer vent motor operated valves, a new pressurizer wide range level transmitter, and pressure switches on the NRV actuation system. The new worksheets will be submitted upon completion."

It is considered that the Licensee has satisfactorily responded to the concerns of the SER regarding the completeness of the list of safety-related equipment, subject to the comments in Appendix C to this report.

4.3.3 Environmental Service Conditions

4.3.3.1 Containment Spray

In Reference 40, the Licensee stated that no response to Section 3.2 of the SER [39] is required because there is no safety-related containment spray system at the Yankee Rowe Power plant.

4.3.3.2 Temperature, Pressure, and Humidity Conditions Inside Containment

In the SER [39], the NRC stated:

"The staff has concluded that the minimum temperature profile for equipment qualification purposes should include a margin to account for

higher than average temperatures in the upper regions of the containment that can exist due to stratification especially following a postulated MSLB. Use of the steam saturation temperature corresponding to the total building pressure (partial pressure of steam plus partial pressure of air) versus time will provide an acceptable margin for either a postulated LOCA or MSLB, whichever is controlling as to potential adverse environmental effects on equipment."

In Reference 40, the Licensee provided a response to the NRC concern as follows:

"A saturation temperature profile has been plotted corresponding to the containment pressure profile. This profile has been added to Figure III.1-1 and has been labeled T_{sat} . This curve was generated in response to Reference (b) to account for higher than average temperatures in the upper regions of the containment because of potential stratification.

Due to the unique spherical shape of the YR containment, none of the components are located in the upper regions, and most components are outside the shield wall. The components within the shield wall are located at very low elevations or operate very quickly for protective functions. Therefore, we consider the use of T_{sat} for equipment qualification to be inappropriate at YR. However, we have compared T_{sat} profiles to the test profiles of equipment in containment and find that equipment tests generally envelop the T_{sat} profile."

It is considered that the Licensee has resolved the SER [39] concern.

4.3.3.3 Temperature, Pressure, and Humidity Conditions Outside Containment

Section 3.4 of the NRC SER [39] states:

"The Licensee has not provided the temperature, pressure, and humidity values associated with a HELB outside containment. The Licensee has considered the containment to be basically the only 'harsh' area in the plant, with all other areas (such as the Turbine, Primary Auxiliary, and Service Buildings) considered as 'mild' areas. The Licensee has used ambient temperature conditions in some areas outside containment. The staff considers saturation temperature at the peak pressure resulting from a HELB as the minimum level for acceptance."

The Licensee described the temperature, pressure, and humidity conditions in the 90-day response [40] as follows:

"Appendix III.2 of Reference (c) [1] establishes the service conditions for equipment outside of containment. As discussed in Appendix III.2, all areas outside of containment where high energy line breaks (HELB)

could be postulated were evaluated to determine what safety-related equipment in those areas would be subjected to the resulting harsh environment. It was determined that for all HELB outside containment, the safety related electrical or instrumentation equipment subjected to the resulting hostile environment was not required to mitigate the consequences of the pipe break. All of the electrical and instrumentation equipment required to mitigate the consequences of each pipe break is located in areas where the environment is not affected by the pipe break. Therefore, all of the areas outside of containment were considered to be mild areas.

A summary of the various HELB and the equipment in the area from the Master List of Reference (c) [1], Appendix I affected by the resultant harsh environment is compiled as Attachment (A). Based on the information contained in Attachment (A), none of this equipment is required to mitigate the consequences of the various HELB considered."

Evaluation of this Licensee response is contained in Appendix C of this Technical Evaluation Report.

4.3.3.4 Radiation

In the SER [39], the NRC stated:

"The radiation service condition provided by the Licensee is of the order of 2.4×10^6 to 2×10^7 RADS and is lower than provided in the DOR Guidelines for the Gamma and Beta radiation. The Licensee is requested to either provide justification for using lower service conditions or use the service conditions provided in the DOR Guidelines for both Gamma and Beta radiation. If the former option is chosen, then the analysis including the basis and assumptions used in the analysis and a sample calculation should be provided. A required value outside containment of 2.3×10^6 RADS has been used by the Licensee to specify limiting radiation levels within the RHR pump room of the auxiliary building. This value appears to consider the radiation levels influenced by the source term methodology associated with Post-LOCA recirculation fluid lines and is therefore acceptable."

In the 90-day response [40], the Licensee stated:

"Figure 1 in Attachment B [Figure A-4, Appendix A of this TER] shows, by comparison, that the Yankee Gamma Dose Model is more conservative than the DOR Guidelines by 20%.

The Yankee model for both Beta and Gamma dose is a target at the center of a spherical cloud having the volume of the containment. The guidance developed by Yankee for post-LOCA radiation dose specifications (Table 1 of Attachment B) includes a margin of safety. Table 1 (Attachment B) includes credit for shielding and equipment location. The lowest 1 year

dose in the containment is 2.4×10^6 R (against the inside wall of the steam generator cubicle) which assumes the airborne source term in the cubicle is the major contributor."

The Licensee response quoted above resolves the concern contained in the SER [39].

4.4 EQUIPMENT ENVIRONMENTAL QUALIFICATION EVALUATION

The evaluation presented in this section of the report includes, for each equipment item, completed equipment environmental qualification review checksheets (partially handwritten) which present both the technical information necessary to conduct the review and the results of the evaluation.

===== !
! EQUIPMENT ENVIRONMENTAL QUALIFICATION !
! EQUIPMENT ITEM CHECKSHEET INDEX !
=====

FRC ITEM NO.	COMPONENT	MANUFACTURER	MODEL NUMBER	LOCATION
1	SOLENOID VALVE	ATMATIC	3706109	VAPOR CONTAINER, ELEV.1105'
2	SOLENOID VALVE	VALCOR	V5265009	VAPOR CONTAINER, ELEV.1105'
3	MOTORIZED VALVE ACTUATOR	LIMITORQUE	SMB1, SM800, SM900	PAB, VARIOUS ELEVATIONS
4	MOTORIZED VALVE ACTUATOR	LIMITORQUE	SMA2	VAPOR CONTAINER, ELEV.1062'-8"
5	MOTORIZED VALVE ACTUATOR	LIMITORQUE	SMA1	VAPOR CONTAINER, ELEV.1066'-1068"
6	RADIATION DETECTOR	VICTOREEN	B77	VAPOR CONTAINER, VARIOUS ELEVATIONS
7	ACCELEROMETER	BABCOCK & WILCOX	ND	VAPOR CONTAINER, ELEV.1115'
8	ACOUSTIC TRANSMITTER	BABCOCK & WILCOX	ND	VAPOR CONTAINER, ELEV.1115'
9	THERMOCOUPLE	THERMO ELECTRIC	W E SPEC 676511	VAPOR CONTAINER, ELEV.1080'
10	LEVEL TRANSMITTER	ROSEMOUNT	1153A	PAB, LOWER LEVEL
11	LEVEL TRANSMITTER	FISCHER AND PORTER	13D2495JBNS	VAPOR CONTAINER, ELEV.1079'
12	PRESSURE TRANSMITTER	ROSEMOUNT	1152	VAPOR CONTAINER, ELEV.1105'
13	PRESSURE TRANSMITTER	ROSEMOUNT	1153GA9	VAPOR CONTAINER, ELEV.1105'
14	PRESSURE TRANSMITTER	ROSEMOUNT	1153GA9	VAPOR CONTAINER, ELEV.1110'
15	PRESSURE TRANSMITTER	ROSEMOUNT	1153A	PAB, LOWER LEVEL
16	PRESSURE SWITCH	STATIC-O-RING	782R100	VAPOR CONTAINER, ELEV.1105'
17	ELECTRIC MOTOR	ELECTRIC MACHINERY	1C	PAB, ELEV.1022'-8"
18	ELECTRIC MOTOR	GENERAL ELECTRIC	5K404AK174	PAB, ELEV.1022'-8"
19	ELECTRIC MOTOR	WESTINGHOUSE	72Y51238	VAPOR CONTAINER, ELEV.1101'
20	ELECTRIC MOTOR	WESTINGHOUSE	CSP	PAB, LOWER LEVEL
21	ELECTRIC MOTOR	WESTINGHOUSE	CSP	PAB, ELEV.1022'-8"
22	ELECTRICAL CABLE	GENERAL CABLE	XLP	PAB, VARIOUS ELEVATIONS
23	ELECTRICAL CABLE	COLLYER INSULATED WIRE	XLP/NEOPRENE	PAB, VARIOUS ELEVATIONS
24	ELECTRICAL CABLE	ORONITE	STYRENE/BUTADIENE	PAB, VARIOUS ELEVATIONS
25	ELECTRICAL CABLE	CONTINENTAL WIRE	XLP/HYPALON	VAPOR CONTAINER, VARIOUS ELEVATIONS
26	ELECTRICAL CABLE	GENERAL CABLE	MINERAL INSULATED	VAPOR CONTAINER, VARIOUS ELEVATIONS
27	ELECTRICAL CABLE	ROCKBESTOS	FIREBALL III	VAPOR CONTAINER, VARIOUS ELEVATIONS
28	ELECTRICAL CABLE	ROCKBESTOS	SILICONE RUBBER/ASBESTOS	VAPOR CONTAINER, VARIOUS ELEVATIONS
29	ELECTRICAL CABLE	SIMPLEX	BUTYL/PVC	OUTSIDE VAPOR CONTAINER
30	ELECTRICAL CABLE	SIMPLEX	PE/PVC	OUTSIDE VAPOR CONTAINER
31	ELECTRICAL PENETRATION	CHICAGO BRIDGE AND IRON	FIELD FABRICATION	VAPOR CONTAINER, VARIOUS ELEVATIONS
32	ELECTRICAL PENETRATION	WESTINGHOUSE	ND	VAPOR CONTAINER, VARIOUS ELEVATIONS
33	FEEDTHROUGH ASSEMBLY	CONAX	ND	VAPOR CONTAINER
34	TERMINAL BLOCK	MARATHON	6012B	OUTSIDE VAPOR CONTAINER
35	TERMINAL BLOCK	WESTINGHOUSE	542247	VAPOR CONTAINER, VARIOUS ELEVATIONS
36	ELECTRICAL CONTACTOR	GOULD	A103C12 W/CONTROL TRANSFORMER	PAB, ELEV.1022'-8"
37	ELECTRICAL CONTACTOR	GOULD	2032T3 W/CONTROL TRANSFORMER	PAB, ELEV.1022'-8"
38	MOTOR STARTER	WESTINGHOUSE	A210HICAT	PAB, ELEV.1022'-8"
39	MOTOR CONTROL CENTER	WESTINGHOUSE	ND	PAB, ELEV.1022'-8"
40	MOTOR CONTROL CENTER	WESTINGHOUSE	ND	PAB, ELEV.1022'-8"
41	SWITCHGEAR	GENERAL ELECTRIC	AKD5 480 VOLT	PAB, ELEV.1022'-8"
42	BATTERY SWITCHBOARD	WESTINGHOUSE	COP	PAB
43	BATTERY	C AND D	KU15	PAB, ELEV.1022'-8"



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

Equipment Item No. 1 (Installed equipment to be replaced by Equipment Item 2)
 Solenoid Valves Located Within Containment
 Atkomatic Model 32861-CV
 Actuates Hydrogen Vent Valves (HV-SOV-1, -2)
 Licensee References 17 and 1215
 Required Operating Time: Long term
 TER Checksheet No. 1
 Reference 37, Section 4.6.2
 Licensee Submittal: HVI [1]; FRC-designated Page II.7-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, (QI), RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
 - Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
 - Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
 - The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action Next Available outage.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established ---
- Aging Degradation Evaluated Adequately ---
- Qualified Life or Replacement Schedule Established (If Required) ---
- Program Established to Identify Aging Degradation ---
- Criteria Regarding Aging Simulation Satisfied (If Required) ---
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate ---
 - o Peak Pressure Adequate ---
 - o Duration Adequate ---
 - o Required Profile Enveloped Adequately ---
 - o Steam Exposure (If Required) Adequate ---
- Criteria Regarding Spray Satisfied ---
- Criteria Regarding Submergence Satisfied ---
- Criteria Regarding Radiation Satisfied ---
- Criteria Regarding Test Sequence Satisfied ---
- Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied ---
- Criteria Regarding Functional Testing Satisfied ---
- Criteria Regarding Instrument Accuracy Satisfied ---
- Test Duration Margin (1 hour + Function Time) Satisfied ---
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) ---

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified ---
- I.b Equipment Qualification Pending Modification X
- II.a Equipment Qualification Not Established ---
- II.b Equipment Not Qualified ---
- II.c Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified ---
- III.a Equipment Exempt From Qualification ---
- III.b Equipment Not in the Scope of the Qualification Review ---
- IV Documentation Not Made Available ---

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



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FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

LICENSEE RESPONSE TO NRC SER

Yankee Rowe has previously provided documentation references which provide a high degree of confidence that the existing Atkomatic solenoid valves will perform their intended function. However, the documentation does not meet DOR guidelines, so Yankee Rowe will replace these valves with qualified solenoid valves as indicated by the revised worksheet.

Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

Equipment Item No. 2 (Replacement equipment for Equipment Item 1)
 Solenoid Valve Located Within Containment
 Valccr Model V526-5820-9
 Vapor Container Atmosphere Sampling (HV-SOV-1, -2)
 Licensee Reference 1835
 Required Operating Time: Long term
 TER Checksheet No. 2
 Licensee Submittal: HV1 [40]; FRC-designated Page II.7-1R

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	- 2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j ^{5e₁} 5e ₂
Installed Im. Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |

Replacement item for equipment item No. 1



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

Checksheets 5a thru 5f have been removed due to the
proprietary nature of information contained therein.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

Equipment Item No. 3
 Motorized Valve Actuators Located in the Primary Auxiliary Building
 Limatorque Model SMB (Sizes 000, 00, 1)
 Actuators Valves for Recirculation Mode (MOV-SI-48, -49,
 and -514 through -518)
 Licensee References 25, 42, 659, 662, 960, and 2876
 Required Operating Time: 24 hours
 TER Checksheet No. 3
 Reference 37, Section 4.3.3.5
 Licensee Submittal: SI8 [40]; FRC-designated Page II.10-7

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

LICENSEE RESPONSE TO NRC SER

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NOTES:

1. The Licensee has identified 3 different size Limitorque actuators for the same type MVA, but has not identified which size applies to which plant ID# (TAG#).
2. Reference 659, Limitorque Report B0058, describes a generic qualification program which includes the type and size MVA's listed by the Licensee for this equipment item.
3. Limitorque has advised the Licensee that Reference 662, Limitorque Report B0003 is applicable to these equipment items.
4. These values are required to operate for 24 H.
5. These values are located in a relatively "non-harsh" environment.
6. Reference 42, Acton Report 15421-26, states that the type of Limitorque MVA being analyzed is an SMA and it further states that the TAG#s for the equipment located in the Primary Auxiliary Building (PAB) are:
MOV - SI - 48
MOV - SI - 49
MOV - SI - 514
MOV - SI - 516
MOV - SI - 518



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NOTES:

This information is contradictory to the Licensee's System Component Evaluation Worksheet (SCEW) which lists these tag #'s as Limitorque Type SMB (various sizes). Also, Reference 42 does not mention Tag #'s MOV-SI-515 and MOV-SI-517 which were addressed in the SER (TER) and are listed on the Licensee SCEW.

7. In Reference 25, Actor Report 15421-20, a qualified life estimate of 40 yrs has been calculated for the phenolic material used in the switch mechanism. The information on activation energies for phenolics was obtained from Underwater Laboratories. An Arrhenius technique was used in calculating the qualified life estimate for the switch mechanism.

8. The seals were excluded from consideration because, "the Limitorque MVA's are not sealed units, therefore seal integrity is inconsequential." This position is supported by Limitorque.

9. Motor insulation degradation was stated to be addressed in Reference 659, Limitorque



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NOTES:

Report B0058. For Class B insulation failure life data is presented and a qualified life estimate has been calculated with this data by Timitorque at a plant ambient temperature of 50°C which is greater than the licensee specification of 35°C.

10. The Licensee has not identified ~~that~~ ^{the} motor manufacturer.
11. Reference 659 also describes some accelerated aging tests that were performed on insulation systems similar to the one used on this unit. The amount of aging received, however, was not representative of a 40 year qualified life.
12. The Licensee has stated that this equipment item will have its qualified life maintained by the plant maintenance and surveillance program.
13. Based on the information presented above the following is noted:
 - a.) The omission of values MOV-SI-515 and MOV-SI-517 in reference 42 was inadvertent since their function



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NOTES:

and location are the same as MOV-SI-514 and MOV-SI-516, respectively. The Licensee should verify that this equipment is similar to the other identified tag #'s.

- b.) The equipment description in Reference 42 for the equipment in the P.A.B. is incorrect; it should be Timitoque SMB. The Licensee should verify this information.
- c.) enough information is presently available to draw a similarity between the installed equipment and equipment listed previously.
- d.) a further analysis of the Timitoque failure data presented in Reference 659 combined with the plant environmental conditions at the installed location justify the Licensee's claim of a 40 year qualified life estimate for this equipment item.
- e.) the Licensee has not identified the motor manufacturer, however this is deemed acceptable based on the Timitoque generic qualification presented in Reference 659.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

Equipment Item No. 4
 Motorized Valve Actuators Located Within Containment
 Limitorque Model SMA-2
 Safety Injection Valve (CS-MOV-535)
 Licensee References 25, 42, 659, 662, 960, and 2876
 Required Operating Time: 0.5 hours
 TER Checksheet No. 4
 Reference 37, Section 4.5.2.1
 Licensee Submittal: SI9 [40]; FRC-designated Page II.10-9

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, (QI), RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d , 5e , 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (~~has~~/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = EFFICIENCY

Documented Evidence of Qualification Adequate	<u>X</u>
Adequate Similarity Between Equipment and Test Specimen Established	<u>X</u>
Aging Degradation Evaluated Adequately	<u>X</u>
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u>
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	<u>X</u>
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	_____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



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FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	MOTORIZED VALVE ACTUATOR	MOTORIZED VALVE ACTUATOR	
Manufacturer's Name (5.2.2/-/-)	LIMITORQUE	LIMITORQUE	
Model Number (5.2.2/-/-)	SMA-2		SMB-φ X
Serial Number	—		1950φ4 Note 1 P-5f
Features/Mounting (5.2.6/-/-)	—	—	
Connections/Interfaces (5.2.6/-/-)	—	—	
Location/Elevation	CONTAINMENT	AUTOCLAVE	
Equipment ID No.	CS-MOV-535	—	
<u>QUALIFICATION REPORT</u>			
(8.0/5.0/5.0)			
Report ID Number	ACTON 15421-26		Bφφφ3 X
Report Date	4-3-81		6-7-76 Note 1 P-5f
Issued by	ACTON	LIMITORQUE	
Prepared for	YAEC	LIMITORQUE	
Referenced Reports	Bφφ58, ACTON 15421-26, φφφ3	—	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	ANALYSIS	SIMULTANEOUS AND SEQUENTIAL TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	—	—	
Operating Conditions (-/2.2.10/2.2.10)	—	—	
Load/Cycles/Voltage/ Current/Freq.	—	—	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

NOTES:

1. Reference 42, Octrox Report 15421-26, states that pursuant to Reference 30 [Letter from J. B. Deab, Limitorgus, to P. T. Young, ACTON] qualification data is provided for valve actuator MOV-CS-535 by Ref 30 Limitorgus Report B0003. However, examination of Reference 30 shows that Limitorgus has made no such claim. Reference 30 states in part,

"C.2 The below listed actuator motors contain materials similar to or better than the motor used on the actuator qualified in our Report B0003. On this basis, it would be our opinion that Report B0003 could be used to support the capability of the motor only (not including brake) to withstand radiation only to the level stipulated in the report."

- (of which MOV-CS-535 is included ^{is included in} ~~is included in~~ ^{The list})
2. As stated in Reference 42, The motor lead insulation material is unknown and it is also unknown if this MVA incorporates a motor brake.
3. These values are located in The containment.
4. The Licensee has not identified The motor manufacturer or The type of insulation. It is inferred that the insulation is Class B by The reference



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

NOTES:

to Reference 659 in Reference 25. However, this section in Reference 25 refers to the "Outside Containment" section of the Limerique Report.

5. Reference 659 does not include type SMA actuators in their generic qualification program.

6. In Reference 25, a qualified life estimate of 40 years has been calculated for the phenolic material used in the switch mechanism. The information on activation energies for phenolics was obtained from Underwriters Laboratories. An Arrhenius technique was used in calculating the qualified life estimate for the switch mechanism.

7. The seals were excluded from consideration because, "The Limerique MVA's are not sealed units, therefore seal integrity is inconsequential. Though this statement was based on section 3.2.3 of Reference 659, Reference 30 states that generalizations can be made between the seals in the older type SMA and those



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

NOTES:

currently used in The SMB type MVA.

8. Reference 960, which tested type SMA MVA's manufactured by Timitoque, does not envelop the plant specific conditions of this plant for either temperature or pressure.

9. The failure data presented in section 3.2.1.3 of Reference 659 and the statements made by Timitoque about this data were based on outside containment applications. The limited amount of accelerated aging performed on this type of insulation does not approximate the required service life.

10. Summarizing the facts listed above:

a) There is not enough information to provide qualification based on similarity

b) The Report (Reference 42) has incorrectly utilized environmental test data provided in Reference 662, which was stated by Timitoque to be applicable to this equipment item for radiators only.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

NOTES:

- c) The testing performed in Reference 960 does not envelop the plant specific profiles for temperature and pressure.
- d) There is presently not enough information to conclude that these MVA's satisfy the requirements of the DOR Guidelines



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

Equipment Item No. 5
 Motorized Valve Actuator Located Within Containment
 Limatorque Model SMA-1
 Shutdown Cooling System Isolation Valves (SC-MOV-551 through 554)
 Licensee References 25, 42, 659, 662, 960, and 2876
 Required Operating Time: 30 days
 TER Checksheet No. 5
 Reference 37, Section 4.5.2.2
 Licensee Submittal: SCl [40]; FRC-designated Page II.11-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, F, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, (QI) RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d , 5e , 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (~~has~~/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
 - Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
 - Corrective action specified by the Licensee:
 - Replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
 - The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
 - The Licensee (has/nas not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
 - The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u>X</u>
Adequate Similarity Between Equipment and Test Specimen Established	<u>X</u>
Aging Degradation Evaluated Adequately	<u>X</u>
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u>
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	<u>X</u>
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	_____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
--	-----------------------	--------------------------------	----------------------------------

EQUIPMENT DESCRIPTION

Equipment Type	MOTORIZED VALVE ACTUATOR	MOTORIZED VALVE ACTUATOR	
Manufacturer's Name (5.2.2/-/-)	LIMITORQUE	LIMITORQUE	
Model Number (5.2.2/-/-)	SMA-1	SMB-φ	X (see note 1 pg-5f)
Serial Number	—	195φφ4	
Features/Mounting (5.2.6/-/-)	—	—	
Connections/Interfaces (5.2.6/-/-)	—	—	
Location/Elevation	CONTAINMENT	AUTOCLAVE	
Equipment ID No.	SC-MOV-551, -552, -553, -554	—	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	ACTON 15421-26	Bφφφ3	X (see note 1 pg-5f)
Report Date	4-3-81	6-7-76	
Issued by	ACTON	LIMITORQUE	
Prepared for	YAEC	LIMITORQUE	
Referenced Reports	Bφφ5B, ACTON 15421-20, Bφφφ3,	—	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	ANALYSIS	SIMULTANEOUS & SEQUENTIAL	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	—	—	
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.	—	—	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

NOTES:

1. Reference 42, Acton Report 15421-26, states that pursuant to Reference 30 [Letter from J. B. Drake, Limitorque, to P. T. Young, Acton] qualification data is provided for valves actuators SC-MOV-551 through -554 by Limitorque report B0003. However, examination of Reference 30 shows that Limitorque has made no such claim. Reference 30 states in part,

C.2 The below listed actuator motors contain materials similar to or better than the motor used on the actuator qualified in our Report B0003. On this basis, it would be our opinion that Report B0003 could be used to support the capability of the motor only (not including brake) to withstand radiation only to the level stipulated in the report.

(of which SC-MOV-551, -552 and -554 are included in ^{The list} SC-MOV-553 was not included in this list.)

2. As stated in Reference 42, The motor lead insulation material is unknown and it is also unknown if any of these MVA's incorporate a motor brake.

3. These valve actuators are located in the containment.

4. The Licensee has not identified the motor manufacturer or the type of insulation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

NOTES:

It is inferred that the insulation is Class B by the reference to Limitorque Report B0058 in Reference 25. However, this section in Reference 25 refers to the "Outside Containment" section of Reference 659.

5. Reference 659 does not include type SMA actuators in their generic qualification program.

6. In Reference 25, a qualified life estimate of 40 years has been calculated for the phenolic material used in the switch mechanism. The information on activation energies for phenolics was obtained from Underwriters Laboratories. An Arrhenius technique was used in calculating the qualified life estimate for the switch mechanism.

7. The seals were excluded from consideration because, "the Limitorque MVA's are not sealed units, therefore seal integrity is inconsequential. Though this statement was based on section 3.2.3 of Reference 659, Reference 30 states that generalizations



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

NOTES:

can be made between the seals in the older type SMA and those currently used in the SMB type MVA.

8. Reference 960, which tested type SMA MVA's manufactured by Timitorque, does not envelop the plant specific conditions of this plant for either temperature or pressure.

9. The failure data presented in section 3.2.1.3 of Reference 659 and the statements made by Timitorque about this data were based on outside containment applications. The limited amount of accelerated aging performed on this type of insulation does not approximate the required service life.

10. Summarizing the facts listed above:

a) There is not enough information to provide qualification based on similarity.

b) The Report (Reference 42) has incorrectly utilized environmental test data provided in Reference 662, which was stated by Timitorque to be



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

NOTES:

applicable to this equipment item for radiation only.

- c) The testing performed in Reference 960 does not envelop the plant specific profiles for temperature and pressure.
- d) There is presently not enough information to conclude that these MVA's satisfy the requirements of the DOR Guidelines.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 55

Equipment Item No. 6 (TMI Action Plan Item)
 Radiation Detectors and Associated Cables Located Within Containment
 Victoreen Model 877
 High Range Radiation Monitor (RM-130, RM-131)
 Licensee Reference 2883
 Required Operating Time: Long term
 TER Checksheet No. 6
 Reference 37, Section 4.7.2
 Licensee Submittal: AML [40]; FRC-designated Page II.1-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
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System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h , 5i , 5j ^{5e₂}
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established X *see note*
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established X
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

Note: method of connection should be identified



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

LICENSEE RESPONSE TO NRC SER

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u> Equipment Type	RAD MON. & CABLE	CONTAINMENT AREA RAD MONITOR AND ASSOCIATED CABLES	
Manufacturer's Name (5.2.2/-/-)	VICTOREEN	VICTOREEN INST.	
Model Number (5.2.2/-/-)	877	877-1 (DETECTOR) 878-1 (CABLE ASSY)	
Serial Number	NOT STATED	907341 (CABLE ASSY FOR ANO-1 UNIT 2)	
Features/Mounting (5.2.6/-/-)			
Connections/Interfaces (5.2.6/-/-)	NOT STATED	ST-ST HOSE AND PULL BOX PER VICTOREEN DWG. NO. 910077	X NOTE 2
Location/Elevation	CONTAINMENT		
Equipment ID No.	RM-130 RM-131		
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	---	VICTOREEN 950.301	
Report Date	---	JUN-19-81	
Issued by	---	VICTOREEN	
Prepared for	---	VICTOREEN	
Referenced Reports	---	WYLE LABS 45050-1	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	---	TYPE TEST	
<u>QUALIFICATION TEST PROGRAM</u> Functional Test Description (5.2.5/2.2.9/2.2.9)		INITIAL AND FINAL BASELINE TESTS INCLUDE: VOLTAGE W/STAND AND LEAKAGE CURRENT; TRANSFER CAPACITANCE; ACCURACY AND OPERABILITY CHECKS	
Operating Conditions (-/2.2.10/2.2.10) Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

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)	:	±36% INPUT RADIATION VALUE	:
Accuracy (5.2.5/-/-)	:	WITHIN ±36% SPEC.	:
Number of Specimens	:	2 DETECTORS WITH ASSOCIATED CABLES	:
Test Instruments Calibrated	:	CONT. AREA RADIATION MONITOR	:
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	:	30 DAYS	:
Test Duration (5.2.1/-/-)	:	LONG TERM	:
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	:	TA/OPER/RAD/SEIS/ STM+CHSP	:
Required Function Time	:	LONG TERM	:
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	:	Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	:
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	:	240 h @ 151°C for DETECTOR WITH 878-1 CABLES 240 h @ 85°C for DETECTOR WITH 907341 CABLES Arrhenius ANALYSIS PRESENTED IN QUAL. TEST PLAN (907351)	:
Aging (5.2.4, 7.0/4.0/4.0) Thermal Aging/Basis	:	CABLE & SEAL MATERIALS	:
Material Aging Evaluation (7.0/-/-)	:	GAMMA	:
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	:		:
Radiation Aging, Type	:		:



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)		41 Mrd 220 Mrd	NOTE 1
Radiation Aging, Dose Rate		1.0 x 10 ⁶ rd/h	
Radiation Aging, Method		TEST	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)			
Operational Aging (-/4.2/-)		HV POWER SUPPLY 550 VAC, 120 HZ 1.24 x 10 ⁶ CYCLES (2.87 HR.)	
Other Age Conditioning (-/4.2/-)		ND	
Qualified Life Claimed/ Established (5.2.4/4.10/-)		40 yr./40 yr.	
Normal Ambient Temperature	70 - 95 °F	_____	
Normal Ambient Radiation	0.04 - 2 rd/h	_____	
Normal Ambient Humidity	60% NOM.	_____	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	YANKEE ROWE PROGRAM		
On-Going Analysis of Failures and Degradation (7.0/-/-)			
Margin (General) (6.0/3.0/3.0)			
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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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	LOCA	
Radiation Type		GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)		INCLUDED IN AGING DOSE	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)		NA	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)		NA	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)		NA	
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. 6

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>			
Rate of Temp./Press. Increase	6 °F/5/1.6 psig/s		
Peak: °F/psig/RH/Time	275/32/100/3h	357/133/—/3 hr.	
Decrease To: °F/psig/RH/Time	252/20/100/3h	320/75.8/—/3 hr.	
Decrease To: °F/psig/RH/Time	212/20/100/26h	300/53.8/—/4 hr.	
Decrease To: °F/psig/RH/Time		250/15/—/81 hr.	
		200/0/—/26 days	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	NA		
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	—	TEST	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	NA	0.28 m H ₃ BO ₃ NaOH ph= 11.0	
Spray Density (gpm/ft ²)	NA	0.15	
Spray Duration	NA	24 hr. (1440 min.)	
Submergence Duration (4.1.3/2.2.5/2.2.5)	NA	ND	
In-Leakage Considered (5.2.6, 5.3.2/-/-)	NA	NA	
Time to Submergence	—	NA	
Dust Environment (-/2.2.11/2.2.11)	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	MSLB		
Rate of Temp./Press. Increase	3.4°/0.32 Per sec. ^{psig}		NOTE 3
Peak: °F/psig/RH/Time	365/32/100/20s	SEE 5e ₁	
Decrease To: °F/psig/RH/Time	300/24/100/18m		
Decrease To: °F/psig/RH/Time	200/12/100/3h		
Decrease To: °F/psig/RH/Time	120/2/100/27h		
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	NA		
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	NA		
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	NA		
Spray Density (gpm/ft ²)	NA		
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. 6

NOTES:

1. Cable assembly 907341 and detector # 103 were radiation aged to 41 Mrd, cable assembly 878-1 and detector # 104 were aged to 220 Mrd.

2. Testing has identified the method of connection of the detector cables as critical with respect to the ability of this equipment to pass a LOCA test. The Licensee has not identified the installed interface for this equipment. Victoreen drawing no. 91007 outlines the method used to qualify the detector to LOCA conditions.

The Licensee should identify the installed method of connection and justify its integrity through either qualification testing/analysis or document similarity between the installed interface and Victoreen DWG. 91007.

3. The MSLB profile was not enveloped by the test conditions. This discrepancy is judged



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

NOTES:

insignificant due to the short duration
of temperature above 357 °F and the
30 day test duration.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

INSTALLED TMI LESSONS LEARNED IMPLEMENTATION EQUIPMENT SUMMARY

NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of JE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981 (sections are identified below). Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

This plant is a PWR X, BWR ____.
The NSSS Vendor is Westinghouse (W) X, Babcox & Wilcox (B&W) ____,
Combustion Engineering (CE) ____, General Electric (GE) ____.

With respect to this equipment item, it is noted (applicable section checked):

- The Licensee does not provide adequate information with respect to identification of TMI Action Plan equipment installed as of 1/1/81.
- The Licensee has not provided the correlation of this equipment item with the specific sections of NUREG-0737. [The correlation is needed to ensure that all items are included in the review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and the terminal blocks associated with the device also identified?]
- The Licensee has not provided the approximate installation date for the TMI Action Plan equipment items so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEQ evaluation.
- The Licensee has provided a standard Owners' Group position with respect to a NUREG-0737 technical area.
- The Licensee has requested extensions of implementation dates.
- The Licensee has stated that this equipment item is associated with the following section of NUREG-0737. (This list of applicable NUREG-0737 sections has been identified by NRC as sections within the scope of this review):
 - II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment
 - II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

- ___ II.E.1.2 (PWR/1-1-81) Auxiliary Feedwater System Automatic Initiation and Flow Indication
- ___ II.E.3.1 (PWR/1-1-81) Emergency Power Supply for Pressurizer Heaters (Safety-Grade Interfaces)
- ___ II.E.4.1 (ALL/7-1-81) Dedicated Hydrogen Penetrations
- ___ II.E.4.2 (ALL/1-1-81) Containment Isolation Dependability
- ___ II.F.2 (PWR/1-1-81) Instrumentation for Detection of Inadequate Core Cooling
- ___ II.G.1 (PWR/1-1-81) Emergency Power for Pressurizer Equipment (Safety-Grade Interfaces)
- ___ II.K.2.10 (PWR/B&W/7-1-81) Safety-Grade Anticipatory Reactor Trip
- ___ II.K.3.9 (PWR/W/1-1-81) PID Controller Modification (If Hardware Change Involved)
- ___ II.K.3.12 (PWR/W/1-1-81) Anticipatory Reactor Trip upon Turbine Trip
- ___ II.K.3.13 (BWR/GE/7-1-81) Separation of HPCI and RCIC Initiation Signals
- ___ II.K.3.15 (BWR/GE/7-1-81) Prevention of Spurious Isolation of HPCI and RCIC Systems
- ___ II.K.3.19 (BWR/GE/7-1-81) Interlock on Recirculation Pump Loop
- ___ II.K.3.21 (BWR/GE/7-1-81) Restart of Core Spray and LPCI Systems (If Hardware Changed Out)
- ___ II.K.3.27 (BWR/GE/7-1-81) Provide Common Reference Level for Vessel Level Instrumentation (If Hardware Changed Out)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. Z

Equipment Item No. 7 (TMI Action Plan Item)
 Acoustic Accelerometers Located Within Containment
 Babcock & Wilcox
 Valve Position Indication (PR-ZE-1A, B, C)
 Licensee reference not cited
 Required Operating Time: Long term
 TER Checksheet No. 7
 Reference 37, Section 4.7.1
 Licensee Submittal: PRS [40]; FRC-designated Page II.9-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, Q1, RPM, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 7

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
 - Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
 - Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
 - The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
 - The Licensee (~~has~~/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
 - The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 7

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure: _____
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification X
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

Testing in progress - no documentation or schedule available - see page 3a



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

LICENSEE RESPONSE TO NRC SER

This is a TMI related item. The qualification program addressing all environmental parameters is presently in progress. Upon completion of this test program, all necessary qualification information will be reviewed to provide adequate qualification documentation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 7

INSTALLED TMI LESSONS LEARNED IMPLEMENTATION EQUIPMENT SUMMARY

NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981 (sections are identified below). Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

This plant is a PWR X, BWR ____.
 The NSSS Vendor is Westinghouse (W) X, Babcox & Wilcox (B&W) ____,
 Combustion Engineering (CE) ____, General Electric (GE) ____.

With respect to this equipment item, it is noted (applicable section checked):

- The Licensee does not provide adequate information with respect to identification of TMI Action Plan equipment installed as of 1/1/81.
- The Licensee has not provided the correlation of this equipment item with the specific sections of NUREG-0737. [The correlation is needed to ensure that all items are included in the review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and the terminal blocks associated with the device also identified?]
- The Licensee has not provided the approximate installation date for the TMI Action Plan equipment items so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEQ evaluation.
- The Licensee has provided a standard Owners' Group position with respect to a NUREG-0737 technical area.
- The Licensee has requested extensions of implementation dates.
- The Licensee has stated that this equipment item is associated with the following section of NUREG-0737. (This list of applicable NUREG-0737 sections has been identified by NRC as sections within the scope of this review):
 - II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment
 - II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. B

Equipment Item No. 8 (TMI Action Plan Item)
 Acoustic Transmitters Located Within Containment
 Babcock & Wilcox
 Valve Position Indication (PR-ZT-1A, B, C)
 Licensee reference not cited
 Required Operating Time: Long term
 TER Checksheet No. 8
 Reference 27, Section 4.7.4
 Licensee Submittal: PR7 [40]; FRC-designated Page II.9-5

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QI, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (~~has~~/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u>X</u>
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	_____
Qualified Life or Replacement Schedule Established (If Required)	_____
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	<u>X</u>
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	_____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

*Testing in progress - no documentation
or schedule available - see page 3a*



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
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FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

LICENSEE RESPONSE TO NRC SER

This is a TMI related item. The qualification program addressing all environmental parameters is presently in progress. Upon completion of this test program, all necessary qualification information will be reviewed to provide adequate qualification documentation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

INSTALLED TMI LESSONS LEARNED IMPLEMENTATION EQUIPMENT SUMMARY

NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981 (sections are identified below). Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

This plant is a PWR X, BWR ____.
 The NSSS Vendor is Westinghouse (W) X, Babcox & Wilcox (B&W) ____,
 Combustion Engineering (CE) ____, General Electric (GE) ____.

With respect to this equipment item, it is noted (applicable section checked):

- The Licensee does not provide adequate information with respect to identification of TMI Action Plan equipment installed as of 1/1/81.
- The Licensee has not provided the correlation of this equipment item with the specific sections of NUREG-0737. [The correlation is needed to ensure that all items are included in the review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and the terminal blocks associated with the device also identified?]
- The Licensee has not provided the approximate installation date for the TMI Action Plan equipment items so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEQ evaluation.
- The Licensee has provided a standard Owners' Group position with respect to a NUREG-0737 technical area.
- The Licensee has requested extensions of implementation dates.
- The Licensee has stated that this equipment item is associated with the following section of NUREG-0737. (This list of applicable NUREG-0737 sections has been identified by NRC as sections within the scope of this review):
 - II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment
 - II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

Equipment Item No. 9 (TMI Action Plan Item)
 In-Core Thermocouples
 Thermo-Electric Model WESPEC 676511
 Subcooling Margin Monitor Input (MC-TD-D1, 2, 3, 4, 5, 8; MC-TD-E1, 2, 3, 4, 5; MC-TD-C2, 3, 4, 5, 6; MCTD-G3, 10; MCTD-B3, 4, 5, 7; MCTD-A4, 5; MCTD-F7; MCTD-H2, 5, 7; MCTD-K6)
 Provides Continuous Temperature Indication
 Licensee reference not cited
 Required Operating Time: Long term
 TER Checksheet No. 9
 Reference 37, Section 4.6.6
 Licensee Submittal: MC10 [40]; FRC-designated Page II.8-5

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, (QI), RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/~~has not~~) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action 12/81.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification X
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

LICENSEE RESPONSE TO NRC SER

The thermocouples provide information to the saturation meter as a TMI requirement. The connection of the extension wire to the thermocouple is made at the reactor head and is in an enclosure. Since this connection could be exposed to a steam environment, Yankee Rowe will have tests performed to assure the connections are qualified to current requirements. We have a contract with Acton Environmental Testing Corporation (see Reference 028) to test the incore thermocouple connections to the requirements of IEEE 323-1974. These tests will envelope the Yankee Rowe environmental parameters. Upon completion of the test, a report will be available. The expected completion of these tests is 12/81.

Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

INSTALLED TMI LESSONS LEARNED IMPLEMENTATION EQUIPMENT SUMMARY

NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981 (sections are identified below). Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

This plant is a PWR X, BWR ____.
 The NSSS Vendor is Westinghouse (W) X, Babcox & Wilcox (B&W) ____,
 Combustion Engineering (CE) ____, General Electric (GE) ____.

With respect to this equipment item, it is noted (applicable section checked):

- The Licensee does not provide adequate information with respect to identification of TMI Action Plan equipment installed as of 1/1/81.
- The Licensee has not provided the correlation of this equipment item with the specific sections of NUREG-0737. [The correlation is needed to ensure that all items are included in the review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and the terminal blocks associated with the device also identified?]
- The Licensee has not provided the approximate installation date for the TMI Action Plan equipment items so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEQ evaluation.
- The Licensee has provided a standard Owners' Group position with respect to a NUREG-0737 technical area.
- The Licensee has requested extensions of implementation dates.
- The Licensee has stated that this equipment item is associated with the following section of NUREG-0737. (This list of applicable NUREG-0737 sections has been identified by NRC as sections within the scope of this review):
 - II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment
 - II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

- II.E.1.2 (PWR/1-1-81) Auxiliary Feedwater System Automatic Initiation and Flow Indication
- II.E.3.1 (PWR/1-1-81) Emergency Power Supply for Pressurizer Heaters (Safety-Grade Interfaces)
- II.E.4.1 (ALL/7-1-81) Dedicated Hydrogen Penetrations
- II.E.4.2 (ALL/1-1-81) Containment Isolation Dependability
- II.F.2 (PWR/1-1-81) Instrumentation for Detection of Inadequate Core Cooling
- II.G.1 (PWR/1-1-81) Emergency Power for Pressurizer Equipment (Safety-Grade Interfaces)
- II.K.2.10 (PWR/B&W/7-1-81) Safety-Grade Anticipatory Reactor Trip
- II.K.3.9 (PWR/W/1-1-81) PID Controller Modification (If Hardware Change Involved)
- II.K.3.12 (PWR/W/1-1-81) Anticipatory Reactor Trip upon Turbine Trip
- II.K.3.13 (BWR/GE/7-1-81) Separation of HPCI and RCIC Initiation Signals
- II.K.3.15 (BWR/GE/7-1-81) Prevention of Spurious Isolation of HPCI and RCIC Systems
- II.K.3.19 (BWR/GE/7-1-81) Interlock on Recirculation Pump Loop
- II.K.3.21 (BWR/GE/7-1-81) Restart of Core Spray and LPCI Systems (If Hardware Changed Out)
- II.K.3.27 (BWR/GE/7-1-81) Provide Common Reference Level for Vessel Level Instrumentation (If Hardware Changed Out)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

Equipment Item No. 10 (TMI Action Plan Item)
 Level Transmitters Located in the Primary Auxiliary Building
 Rosemount Model 157A
 Containment Water Level (CT-LT-240 and 241)
 Licensee References 24 and 1764
 Required Operating Time: Long term
 TER Checksheet No. 10
 Reference 37, Section 4.3.1.5
 Licensee Submittal: AM2 [40]; FRC-designated Page II.1-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u> _____
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u> _____
Program Established to Identify Aging Degradation	<u>X</u> _____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u> _____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

LICENSEE RESPONSE TO NRC SER

NOTES FOR RESOLUTIONS

- Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)
- Equipment deleted from master list because it already has been replaced.
- Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.
- 4. The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.
- TMI Items
- Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

AM-2

APPENDIX II

NOTES:

- (1) A long-term operating requirement of one year has been assumed.
- (2) This area is ventilated with outside air.
- (3) A 40-year qualified life requirement has been assumed.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

NOTES:

1. This equipment item was previously reviewed and evaluated in Reference 37.

2. We believe that the License Citation [1204] for the 1152 model transmitter is an error and therefore omitted it as an non-applicable reference.

3. The License has cited reference 24 as evidence that the age sensitive materials and components have been addressed. See evaluation of equipment item 14 for full details with respect to aging. We conclude that the contention of a 40 year qualified life is not technically sound and has not been justified on a technical basis.

Experience and good engineering judgement dictate that a reasonable useful life for electronic equipment, such as this, would be on the order of 10 years with periodic replacement of sub-assemblies. It should be noted that although these transmitters are located outside containment, the same concerns apply as discussed in equipment 14.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

INSTALLED TMI LESSONS LEARNED IMPLEMENTATION EQUIPMENT SUMMARY

NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981 (sections are identified below). Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

This plant is a PWR X, BWR .

The NSSS Vendor is Westinghouse (W) X, Babcox & Wilcox (B&W) ,
 Combustion Engineering (CE) , General Electric (GE) .

With respect to this equipment item, it is noted (applicable section checked):

 The Licensee does not provide adequate information with respect to identification of TMI Action Plan equipment installed as of 1/1/81.

X The Licensee has not provided the correlation of this equipment item with the specific sections of NUREG-0737. [The correlation is needed to ensure that all items are included in the review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and the terminal blocks associated with the device also identified?]

 The Licensee has not provided the approximate installation date for the TMI Action Plan equipment items so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEO evaluation.

 The Licensee has provided a standard Owners' Group position with respect to a NUREG-0737 technical area.

 The Licensee has requested extensions of implementation dates.

 The Licensee has stated that this equipment item is associated with the following section of NUREG-0737. (This list of applicable NUREG-0737 sections has been identified by NRC as sections within the scope of this review):

 II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment

 II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

Analysis shows that Viton and Ethylene Propylene O-Rings have a life in excess of 40 years. Rosemount recommends a 5-year service replacement interval due to wear from maintenance adjustments and calibration. [24]



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

Equipment Item No. 11
 Level Transmitters Located Within Containment
 Fischer & Porter Model 13D-2495-JBNS
 Steam Generator Level Transmitters (FW-LT-1003, -1103 -1203, -1303)
 Licensee References 19, 646, and 1407
 Required Operating Time: Short term
 TER Checksheet No. 11
 Reference 37, Section 4.6.1
 Licensee Submittal: FW4 [40]; FRC-designated Page II.6-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j, 5k, 5l, 5m, 5n, 5o, 5p, 5q, 5r
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (Add a fully qualified wide range S/S level transmitter)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| <u>II.b</u> Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u>X</u>
Adequate Similarity Between Equipment and Test Specimen Established	<u>X</u>
Aging Degradation Evaluated Adequately	<u>X</u>
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u>
Program Established to Identify Aging Degradation	<u>X</u>
Criteria Regarding Aging Simulation Satisfied (If Required)	<u> </u>
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	<u> </u>
o Peak Pressure Adequate	<u> </u>
o Duration Adequate	<u>X</u>
o Required Profile Enveloped Adequately	<u>X</u>
o Steam Exposure (If Required) Adequate	<u>X</u>
Criteria Regarding Spray Satisfied	<u> </u>
Criteria Regarding Submergence Satisfied	<u> </u>
Criteria Regarding Radiation Satisfied	<u> </u>
Criteria Regarding Test Sequence Satisfied	<u>X</u>
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	<u>X</u>
Criteria Regarding Functional Testing Satisfied	<u> </u>
Criteria Regarding Instrument Accuracy Satisfied	<u> </u>
Test Duration Margin (1 hour + Function Time) Satisfied	<u>X</u>
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	<u> </u>

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	<u> </u>
I.b	Equipment Qualification Pending Modification	<u> </u>
II.a	Equipment Qualification Not Established	<u> </u>
II.b	Equipment Not Qualified	<u>X</u>
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u> </u>
III.a	Equipment Exempt From Qualification	<u> </u>
III.b	Equipment Not in the Scope of the Qualification Review	<u> </u>
IV	Documentation Not Made Available	<u> </u>

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.

See pages 5g, 5n for conclusions



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

LICENSEE RESPONSE TO NRC SER

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

FW-4

APPENDIX II

NOTES:

- (1) These transmitters are only required for a short-term reactor protection function.
- (2) 100% relative humidity has been assumed for saturated steam conditions.
- (3) A 40-year qualified life requirement has been assumed.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.
- (5) In the TER, FRC concludes that these transmitters are not qualified for long-term operation based on an environmental test (not referenced by Yankee Rowe) where a similar transmitter failed after 6 minutes. However, the TER does establish that in the test on which Yankee Rowe has based its qualification (Documentation Reference 2.8) the time-dependent temperature and pressure profile exceeded the postulated accident profile for 2.75 hours. In addition, FRC concludes that acceptable accuracy is demonstrated for 7 hours. Therefore, the Yankee Rowe units are acceptable for a short-term reactor protection function. Yankee Rowe will add a fully qualified wide range steam generator level transmitter on each steam generator to provide long-term level indication and retain the F&P transmitters only for the reactor protection function.

Yankee Rowe believes the failure of the transmitters in the FRC-referenced test was due to the lack of radiation-hardened electronics, which resulted in failure after heavy radiation and exposure to high temperature steam. The transmitters at Yankee Rowe were specifically quoted and purchased with radiation-resistant components. Similar units were successfully tested, although not sequentially, with a high radiation dose. Therefore, Yankee Rowe concludes that these transmitters are acceptable for long-term use until fully qualified transmitters are installed for the long-term requirement.

- (6) The specified dose is the one-year dose. The actual dose will be much less for the short-term function.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	TRANSMITTER	TRANSMITTER	
Manufacturer's Name (5.2.2/-/-)	FISCHER; PORTER	FISCHER; PORTER 1082496	X-note 2 on 5f
Model Number (5.2.2/-/-)	130-2495- JBNS		
Serial Number	NONE		
Features/Mounting (5.2.6/-/-)			
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation	CNTH/1079'	N/A	
Equipment ID No.	FW-LT-1003, -1103, 1203, 1303		
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	N/A	2204-51-B-006	X-note 1
Report Date	N/A	10-8-68	-note 7
Issued by	N/A	FISCHER; PORTER	-note 6 on 5f and 5g
Prepared for	N/A	FISCHER; PORTER	
Referenced Reports	N/A	-	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	TEST	TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)		OUTPUT MONITORED	
Operating Conditions (-/2.2.10/2.2.10) Load/Cycles/Voltage/ Current/Freq.		4-20 mA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

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)	NONE	NONE	
Accuracy (5.2.5/-/-)	5%	AFTER 1 HR: NO SPAN SHIFT, +3.5% ZERO SHIFT ON SPAN	note 5
Number of Specimens		AFTER 2.76 HR: NO SPAN SHIFT ZERO SHIFT OF +3% OF SPAN	
Test Instruments Calibrated		AFTER 24 HOURS: AT AMBIENT, NO SPAN SHIFT, ZERO SHIFT OF 1.5% OF SPAN.	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	ACTIVE		
Test Duration (5.2.1/-/-)	-	STATED TO BE 24 HRS	X- note 3 note 4
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	27 HRS.		
Required Function Time	short term RPS		
Test Sequence (General) (5.2.3/2.3.1/2.3.1)			X- see note 4 page 5m
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	N/A		
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)	ACTION REPORT 15421-6 [19]	ACTION REPORT 15421-6 [19]	X see note 5 page 5m
Thermal Aging/Basis			
Material Aging Evaluation (7.0/-/-)		"	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)		"	
Radiation Aging, Type			



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 FRC Assignment No. 13
 FRC Task No. 463

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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)			
Radiation Aging, Dose Rate			
Radiation Aging, Method			
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)		<i>not determined</i>	<i>X see note 5 page 5m</i>
Operational Aging (-/4.2/-)			
Other Age Conditioning (-/4.2/-)			
Qualified Life Claimed/ Established (5.2.4/4.10/-)	<i>ASSUMED 40 YEARS</i>		<i>X see note 5 page 5m</i>
Normal Ambient Temperature			
Normal Ambient Radiation			
Normal Ambient Humidity			
On-Going Surveillance and Preventive Maintenance (7.0/-/-)			
On-Going Analysis of Failures and Degradation (7.0/-/-)			
Margin (General) (6.0/3.0/3.0)			
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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)	MSLB		
Radiation Type		Gamma *	
Radiation Dose (rd) (4.1.2/1.4/1.4)			
Radiation Dose Rate (rd/hr)			
Radiation Qual. Method (5.3.1/-/-)			
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)			
Equipment Susceptible to Beta Radiation (4.1.2/-/-)			
Radiation Dose (Normal + Accident) (4.1.2/-/-)	2.4×10^6 Rad	1.5×10^7 Rad *	* FISCHER; PORTER DP # 2224-1 RPT # 002 [1407] see note 4 page 5m
Plateout Dose Considered (-/1.48/1.48)			
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)			

* 1407 - Second test at IRL, Plainboro, NJ:

(a.) Three DP transmitters (complete units) with all teflon replaced and radiation hardened transistors used; and one standard unit (special transistors).

(b.) 1 standard unit failed at 2.2×10^6 rads; with corrected components the unit operated up to 3.6×10^6 rads.

(c.) No failures of high temperature units up to 1.5×10^7 rads.



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NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	LOCA (MSLB)		
Rate of Temp./Press. Increase	6°F/1.6PSIG/SEC (3.4°/0.32PSI/SEC)		
Peak: °F/psig/RH/Time	275/32/100/1h (365/32/100/20S)	320/75/100/0-1hr	note 3, 4
Decrease To: °F/psig/RH/Time	252/20/100/3h (300/24/100/18M)	293/45/100/1-2 3/4 hr	
Decrease To: °F/psig/RH/Time	212/20/100/26h (200/12/100/3h)	228/5/100/2 3/4 - 6 3/4 hr	
Decrease To: °F/psig/RH/Time	(120/2/100/27h)	undetermined/6 3/4 - 24 hr.	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	—		
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	NONE		
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	NONE		
Spray Density (gpm/ft ²)	NONE		
Spray Duration			
Submergence Duration (4.1.3/2.2.5/2.2.5)	NONE		
In-Leakage Considered (5.2.6, 5.3.2/-/-)	NONE		
Time to Submergence	NONE		
Dust Environment (-/2.2.11/2.2.11)	—		



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

NOTES: Evaluation of Licensees' Response (See Page 3a)

(A.) The Licensee stated [40]:

- o These transmitters are only required for a short-term RPS function.
- o The TER concludes, based on a report not cited by Yankee Rowe, that these transmitters are not qualified for long-term operation.
- o The TER establishes, based on reference 646, that the test profile exceeded the required time-dependent temperature/pressure profile for 2.75 hours. In addition, acceptable accuracy is demonstrated for 7 hours. Therefore, Yankee Rowe units are acceptable for short-term RPS function.
- o A fully qualified wide range steam generator level transmitter on each S/G will be added to provide long-term level indication. The existing F/P transmitters will be retained for RPS function.
- o Yankee Rowe believes the failure of the transmitter in the Westinghouse report was due to lack of radiation-hardened electronics. The transmitters at Yankee Rowe were specifically quoted and purchased with radiation-resistant components. Yankee Rowe concludes that these transmitters are acceptable for long-term until fully qualified transmitters are added to accomplish this long-term function.

(B.) Evaluation: The ^{previous} reevaluation of this item stated in reference 37 is presented on page 5g thru 5j.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

NOTES: This equipment item was previously evaluated in Reference 37. (6E+31V)

FRC has reviewed Reference 2.8^A technical data, which accompanies the test report text, and notes the following:

[FIP 2204-S1-B-006]

1. The critical information base within the report is not easily ascertained because the report is brief and lacks substantive test data and technical information pertaining to the actual test which would allow substantiation of the report's conclusions.
2. There is a discrepancy within the report with respect to the single test specimen. The text identifies the item tested as Type 10B2495; however, the actual strip-chart recorder log (Figure 3 of the report) identifies the specimen as Type 10B2496.
3. There are major discrepancies and omissions of data within the report with respect to the temperature, pressure, and dwell time duration during the actual test. Attachments to the test report (Figures 1 and 2) reflect temperature and pressure profiles to be used as criteria for the actual test. However, the resultant test data (Figures 3 through 6) provide an incomprehensible record of test results superimposed on the strip-chart recorder trace. The parameter monitored by the recorder is not identified; however, it appears to be a linear trace of the transmitter output signal. No time axis is provided.

The test engineer's notes as to various temperature or pressure parameter numbers are shown on the chart, including various time chronology notations; however, a definitive test profile and associated time axis cannot be extracted from the information presented. In fact, there is a notation which indicates that the "chamber opened to ambient temperature" approximately 7.5 hours into the test; however, the test text implies that the test duration was continuous for 24 hours. FRC believes that conclusions can be reached from an analysis of the first 7 hours of the test data.

4. The Guidelines require that the test chamber temperature/pressure profile envelop the service conditions for a time equal to the period from the initiation of the accident until the service conditions return to normal. Although the test data are difficult to fully interpret, it appears that the test chamber time-dependent temperature/pressure profile essentially exceeded the LOCA postulated accident profile for 2.75 hours. However, the test chamber time-dependent temperature/pressure profile did not envelop the required MSLE accident profile with respect to temperature for the first few minutes of the test. As stated previously, FRC concludes



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

NOTES:

that this is not significant because the temperature peak lasts only a few minutes, and the temperature of the transmitter is not expected to exceed 320°F.

The test profile did not envelop the required environmental ^(20 psig) service conditions after the third hour. The test chamber pressure (5 psig) was significantly lower than the required pressure (18 psig). This test chamber pressure deviation could be significant. The test time duration, stated to be 24 hours, did not envelop the required accident profile 27-hour interval. In addition, the test chamber appeared to be opened to ambient conditions after 7 hours; and the data appears uninterpretable after the seventh hour. These data are therefore invalid as evidence of qualification without substantial clarification and interpretation.

5. The results of the tests during the maximum steam and temperature cycle (75 psig/320°F) were stated to be a zero shift of +3.5% of span after 1 hour; after 2.75 hours, a zero shift of +3% of span was observed. On return to ambient, a zero shift of 1.5% of span was observed.

FRC concludes that this accuracy is acceptable (for this particular test) for a time interval of approximately 7 hours.

6. The referenced report states that additional temperature testing is conducted on all oscillator-amplifier units. Each transmitter housing is also pressure tested. However, no further details or results of these tests were provided; and therefore, FRC concludes that these statements are not to be construed as being evidence of qualification.
7. The referenced report states that various models of transmitters use identical electronic components as the test specimen and are therefore qualified. FRC notes that no further details are presented to substantiate this statement and to allow verification by an independent reviewer. For example, the part number of a specific oscillator-amplifier is not mentioned, nor are any other special part numbers for the required high-temperature electronic components mentioned. Since special modifications are required, such as additional sealing and special electronic components, FRC concludes that identification of the specific oscillator-amplifier, detector, and force motor should have been presented by the Licensee.

FRC's Evaluation of References Not Provided By the Licensee:

In addition to FRC's previous remarks concerning Licensee comment a, FRC has knowledge of further testing conducted by Westinghouse on Fischer & Porter transmitters. The salient points from that test program are as follows:



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NOTES:

1. Three Fischer & Porter type 10B2496PNBS transmitters were sequentially tested (serial numbers 6906A5350A67 through 69). A radiation exposure test was conducted followed by a high- temperature steam and pressure test.
2. The Guidelines require that the field installation must be identical to the test setup. The test report states that wiring connections were made with specially designed waterproof, high- temperature splices. FRC presumes that this was accomplished by splicing to the pigtail leads which pass through a factory-sealed electrical fitting at the transmitter.
3. 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 test stated that the transmitters' operational characteristics became erratic and the error excessive enough to cancel the testing. Each transmitter exhibited high errors at various times during the environmental tests but remained within the accuracy required for the trip function within the first 30 seconds of the test. The report stated that failure of all test units was attributed to high- temperature steam leaking into the transmitter housing and causing amplifier failure. The transmitter error ranged from +1.5% to 2.1% of span after exposure to 280°F during the first 2.5 seconds of the test. In addition, the report stated that the maximum error after a 15-day exposure is not required (and therefore was not stated). FRC notes that the transmitters failed at 6 to 8 minutes into the test.

Westinghouse concludes that the transmitter models tested were not designed for the test environment (320°F peak temperature, and 220°F/66 psig for a 15-day time duration); however, the transmitters will perform the required trip function in the first 30 seconds of the accident. The report additionally states that the operating characteristics of the transmitters did not change significantly and were within specification after the exposure to high-temperature steam and pressure. FRC concludes that this statement is not consistent with the previous statement and results of the report regarding cancellation of the test and failure after 6 to 8 minutes.

FRC concludes from the foregoing that the Fischer & Porter transmitters failed the environmental test. In addition, this equipment failed to satisfy the NRC supplemental criteria stated in Section 2.2.4 of this report, which states that equipment required for short-term safety functions must be qualified for a period of at least 1 hour in excess of the time assumed in the accident analysis.

4. FRC notes that Westinghouse has responded to NRC questions relative to this test. Westinghouse has stated that Fischer & Porter transmitter type 10B2496 are adequately qualified for short-term



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NOTES:

protective functions; however, the NRC has noted that these transmitters are no longer acceptable for HELB applications. In addition, Westinghouse stated that Fischer & Porter transmitters types 10B2496, 50EP1041, and 50EP1031 are applicable for non-HELB applications.

FRC's Evaluation of Licensee's Comment d:

With respect to Licensee Comment d and the Licensee General Comment, FRC notes that these transmitters can also be used for the small break LOCA in addition to an MSLB event in order to monitor emergency feedwater flowrate to the steam generators. As previously discussed in the DITER, Reference 2.9 established that the transmitter is susceptible to degradation as a result of radiation exposure unless special radiation-resistant high temperature capacitors and radiation-hardened transistors are used. Therefore, the test sequence for this device should have included radiation exposure prior to or concurrent with the steam exposure. The Licensee did not provide evidence that the transmitters installed in the plant will not be degraded by exposure to integrated radiation level of 2.4 Mrd. //

- d. The Guidelines require that radiation exposure should be applied during the test sequence concurrent with, or prior to, the steam environment, if it is known that the device contains materials that can be degraded by irradiation. FRC notes that the irradiated units were different from those subjected to the steam environment tests.

[140] Reference 2.9 established that the transmitter is susceptible to degradation as a result of radiation exposure. Thus, FRC concludes that the test sequence for this device should have included radiation exposure prior to or concurrent with the steam exposure, or else the Licensee should provide other evidence that the transmitter model installed in the plant will not be degraded by exposure to the radiation dose level conservatively predicted for this equipment.



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NOTES:

(C.) Summary of Evaluation:

(1.) The Licensee has incorrectly interpreted the conclusions arrived at in the TER [37]. The TER concluded that these transmitters are not qualified based on (1) review of all documentation, particularly the Westinghouse report which reported failure of all units after 6 minutes, and (2) the lack of evidence to substantiate that the installed transmitters are similar or identical to units which have been successfully tested. The TER concluded:

"This equipment is assigned to NRC Category V. Based on a review of all documentation including test reports as part of the general equipment environmental qualification review program, FRC concludes that these transmitters are not qualified because the transmitter failed the environmental test after 6 minutes. FRC concludes that these transmitters must be qualified for the containment environment which exists during the LOCA and MSLB events. The Licensee has stated that these transmitters are required for long-term operation following an accident."

(2.) Although the Licensee has resolved the concern of long-term monitoring of S/G level, (in order to monitor emergency feedwater flowrate into the steam generator), by adding a fully qualified transmitter to accomplish this function, the short term function of the existing transmitters has not been resolved. The Licensee contends that the reference 646 establishes evidence of operability for 2.75 hours. However, previous evaluation notes 1, 2, 3, 6 and 7 on pages 5g and 5h indicate that reference 646 constitutes poor and inadequate documentation.



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NOTES:

The Licensee has not provided evidence to support the contention that the installed units are designed with radiation-resistant components or high temperature components.

The exact relationship between the installed equipment at Yankee Rowe and the various test specimens has not been fully established and documented.

still

Chief among these concerns are:

Reference 646 states that various types of transmitters use identical electronic components as the test specimen and, therefore, those transmitters are also qualified. However, FRC notes that no part numbers are provided to verify or substantiate this claim (for example, explicit identification of the oscillator-amplifier, detector, and force motor).

Reference 646 states that special modifications are required, such as additional sealing and special high-temperature electronic components, in order to meet the postulated accident conditions. The Licensee has not provided this information for the installed transmitters.

Adequate documentation reflecting full and comprehensive qualification of the transmitters has not been provided by the Licensee. Reference 646 conditions and results were extremely difficult to interpret.

Reference 646 represents inadequate documentation due to discrepancies noted with respect to the model number of the test specimen, and the inconsistencies with respect to the test profile. In addition, the Licensee's installed unit model number is different from the model number of the tested unit. The Licensee has not resolved this issue by providing documented evidence of similarity which can be independently verified. It is concluded that the ability to accomplish short term RPS trip functions has not been resolved.



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NOTES:

(3.) The TER previously concluded:

" More importantly, it is clear from another test report that FRC has reviewed in conjunction with the environmental qualification review program, that the same Fischer & Porter transmitter failed the environmental test after 6 minutes. Clearly this equipment fails to satisfy the NRC criteria which require that short-term safety functions must be qualified for a period of at least 1 hour in excess of required operating time. In addition, Westinghouse states that these Fischer & Porter transmitters are applicable for non-HELB applications. "

Qualification for steam high-temperature and pressure exposure has not been established. The October 8, 1968 testing [646] by Fischer & Porter is inadequate to establish qualification based on documentation discrepancies and the results of the Westinghouse report. Failures were reported to be caused by high-temperature steam leaking into the transmitter housing and causing amplifier failure. In addition Westinghouse concludes that these transmitters are not acceptable for HELB applications. The Licensee's contention that failure was due to lack of radiation hardened electronics is not supported by the documented facts. The Licensee's contention that these transmitters are acceptable for long-term monitoring until fully qualified transmitters are added is not supported by the documented facts.

The DOR Guidelines (section 5.2.5) state that if a component fails at any time during the test, the test should be considered inconclusive. It is concluded that the transmitter failed the environmental testing



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NOTES:

- (4.) The concern expressed in the TER concerning radiation testing and test sequence is provided below.

" FRC concludes that deterioration of the transmitters' Teflon insulation and wiring was caused by radiation testing and that combined testing or adequate analysis has not been provided by the Licensee to demonstrate qualification for a radiation environment.

The Licensee has not provided evidence to support the contention that the installed units are designed with radiation-resistant components and all teflon is removed. Therefore the previous concern has not been resolved.

- (5.) The TER expressed the following concern with respect to aging:

"Aging degradation has not been considered, the qualified life has not been established, nor is there a program to ascertain whether any in-service failures during the installed life of the equipment are the result of aging degradation, as required by the Guidelines."

In response, the licensee submitted reference 19.

Reference 19 has been reviewed; comments follow:

(a.) reference 19 is a thermal aging analysis on a F&P transmitter model NO. 13D2495JBNS. An analysis of Radiation degradation of materials has not been provided by the Licensee.

(b.) Letters dated 6/5/80 and 6/26/80 attached to reference 19 (Bechtel Power Corp. to F&P) indicate that the list of materials are a "best information" readily available on the 50EP, 10B2490 and 13D2490 series units. It is not based on a research of the Bills of materials for the 13D-2495-JBNS unit which



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NOTES:

is installed at Yankee Rowe. The materials list is stated [19] to be 95% confidence level, however we note that the information is based on BPC job 5177-124 for Turkey Point Units 3 and 4 on a best information basis only. The assumption that this materials list is applicable to the Yankee Rowe installed transmitter is not supported by the facts.

(c.) The report states that the useful life of gasket material (DURABLE) is not known and therefore recommends periodic replacement. However, a replacement schedule is not provided. The report states that POLY PHENYLENE OXIDE is used but no data is available, the report "assumed 40 years" for a useful life. This assumption is not technically sound.

(d.) The bases for the "useful life" conclusions have not been provided. Activation energies are stated, however references to source literature are not cited.

(e.) There is no bases for the selection of materials except the limited information based on a telecon with F&P. P.C. Boards and electronic components have been excluded (not accounted for) in the analysis. The report did not account for age-related degradation mechanisms, stresses, and failure modes for components and materials which could affect the ability of the equipment to perform its design basic safety function. "Weak-Link" components or materials have not been assessed or factored into the analysis.

(f.) There is little justification for the methodology of the analysis and selection of materials. The technical information which is missing is more crucial to the conclusion.



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NOTES:

- (g) The report concludes that a FIP transmitter has a useful life (design life) in excess of 40 years. This conclusion is not justified based on the above comments. The facts do not support the conclusion. Experience and good engineering judgement dictate that a reasonable useful life for electronic equipment such as this is on the order of 10 years with periodic replacement of subassemblies. The report's conclusion are not supported by a documented analysis. The analysis is incomplete and unreasonable.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

NOTES: CONCLUSION :

This equipment item is assigned to NRC Qualification Category I-B. Based on a detailed review of the licensee's response and all documentation it is concluded that these transmitters are not qualified. The rationale for this conclusion is (1) the licensee and the manufacturer have not provided evidence which substantiates that the units installed at Yankee Row have special modifications such as additional sealing, high-temperature rated components, and radiation-resistant components, (2) the test report cited by the licensee [646] as evidence of qualification is unclear and contains numerous discrepancies, (3) a test report available as part of the equipment environmental qualification review program indicates that all test specimens failed at 6 to 8 minutes into the test due to high temperature steam leaking into the electronic housing causing amplifier failure, and (4) the NSSS vendor has responded to NRC that these transmitters are applicable for non-HELB applications. It is further concluded that the test failures render the test inconclusive with respect to short-term functionality. The licensee has stated that fully qualified wide range steam generator level transmitters will be installed to perform the long-term monitoring function, and the Fischer & Porter transmitters will be retained for short term protection function only. The fully qualified wide range transmitters will eliminate the original concern that steam



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

NOTES:

generator level is necessary for small break LOCA's as well as MSLB's. The installation of these transmitters will satisfy the requirement of Regulatory Guide 1.97, Rev 2 (effective in June 1983) that fully qualified wide range steam generator level indication be provided for post-accident monitoring. The concern is, however, that the Fischer and Porter transmitters have not been demonstrated to be operable and qualified to perform the MSLB short-term protective function and therefore this equipment has been assigned to NRC qualification Category II.B.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

The Standard model has a gasket material (DUREOLIA) for which useful life data is not available. It is assumed that this gasket is an age susceptible item. Based on this, the transmitters are qualified for 40 yrs. based on replacing gaskets.
periodical

[19]



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

Equipment Item No. 12 (TMI Action Plan Item)
 Pressure Transmitter Located Within Containment
 Rosemount Model 1152
 Subcooling Margin Monitor Input (MC-PT-712)
 Licensee References 24 and 1204
 Required Operating Time: Long term
 TER Checksheet No. 12
 Reference 37, Section 4.3.2.1
 Licensee Submittal: MC4 [40]; FRC-designated Page II.8-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Content:</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u> _____
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u> _____
Program Established to Identify Aging Degradation	<u>X</u> _____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u> _____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

LICENSEE RESPONSE TO NRC SER

NOTES FOR RESOLUTIONS

1. Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)
- ~~X~~. Equipment deleted from master list because it already has been replaced.
- ~~X~~. Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.
- ~~X~~. The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.
- ~~X~~. TMI Items
- ~~X~~. Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

MC-4

APPENDIX II

NOTES:

- (1) Provides continuous pressure indication.
- (2) 100% relative humidity has been assumed for conservatism.
- (3) A 40-year qualified life requirement has been assumed.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.
- (5) This transmitter has been moved to a new location outside the biological shield wall. A Conax seal has been used to protect the internals of the transmitter from any harsh environmental conditions.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	TRANSMITTER	Pressure Transmitter	
Manufacturer's Name (5.2.2/-/-)	ROSEMOUNT	Rosemount	
Model Number (5.2.2/-/-)	1152	1152 DP4A 22	see note 3 page 59
Serial Number		090	
Features/Mounting (5.2.6/-/-)	Conax seal	pressure tight connection	
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation	CONTAINMENT		
Equipment ID No.	MC-PT-712 (MC-4)		
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	[1204]	RMT 117415 REV.B	[1204]
Report Date		9/23/75 (10/26/76)	
Issued by		ROSEMOUNT	
Prepared for		ROSEMOUNT	
Referenced Reports		Rosemount Report 2758	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	TEST	TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)		output monitored before, during, and after the tests	
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

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)			
Accuracy (5.2.5/-/-)		output drift of 12% of span during 350° dry heat test	
Number of Specimens		one	
Test Instruments Calibrated		Yes	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	active		
Test Duration (5.2.1/-/-)			
Accident Duration (Envir. Above Normal) (5.2.1/-/-)			
Required Function Time	Long Term		
Test Sequence (General) (5.2.3/2.3.1/2.3.1)		aging, radiation, seismic, vibration, steam/pressure	
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)			
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)		Two complete thermal cycles from 100-0- 200-100 °F, 16 hours of elevated temperature	thermal cycling only, no aging
Thermal Aging/Basis			
Material Aging Evaluation (7.0/-/-)			
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)			
Radiation Aging, Type			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-10588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)		5.0×10^6 Rads	
Radiation Aging, Dose Rate		1×10^6 Rads/hr	
Radiation Aging, Method		test/gamma	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)			
Operational Aging (-/4.2/-)			
Other Age Conditioning (-/4.2/-)			
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 years	40YRS [24]	X - see note 4 on Page 5g
Normal Ambient Temperature			
Normal Ambient Radiation			
Normal Ambient Humidity			
On-Going Surveillance and Preventive Maintenance (7.0/-/-)			
On-Going Analysis of Failures and Degradation (7.0/-/-)			
Margin (General) (6.0/3.0/3.0)			
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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)	:	:	:
Radiation Type	:	:	:
Radiation Dose (rd) (4.1.2/1.4/1.4)	5×10^6 Rads	(5×10^6 Rads aging)	:
Radiation Dose Rate (rd/hr)	:	:	:
Radiation Qual. Method (5.3.1/-/-)	:	:	:
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	:	:	:
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. 12

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	LOCA (MSLB)		
Rate of Temp./Press. Increase	6 °F/1.6 PSIG/SEC. (3.4°/0.32 PSI/SEC)		
Peak: °F/psig/RH/Time	275/32/100/1h (365/32/100/2h)	350°F/60/DRY HEAT/10MIN.	
Decrease To: °F/psig/RH/Time	252/20/100/3h (300/24/100/12M)	316/70/100/1HR.	see note
Decrease To: °F/psig/RH/Time	212/20/100/26h (200/12/100/3h)	303/55.4/100/7HR	2 page
Decrease To: °F/psig/RH/Time	(120/2/100/27h)	230/16/100/42HR	5f
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)			
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	N/A		
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	N/A		
Spray Density (gpm/ft ²)	N/A		
Spray Duration	N/A		
Submergence Duration (4.1.3/2.2.5/2.2.5)	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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

NOTES:

1. We believe that the License Citation of reference 1764 for the model 1153A transmitter is in error and therefore have omitted this reference as non-applicable.

2. The steam temperature profile and pressure profile in the referenced test [1204] did not fully envelope the plant specific profile, but the deviations are judged acceptable. The test duration was more than adequate. The peak test temperature was greater than the LOCA profile peak, but 15°F lower than the MSLB peak. Also the test temperature peak of 350°F was applied at 60 PSIG dry heat (no steam) for 10 min. Because of the short duration of the MSLB transient peak temperature, the 60 PSIG pressure applied during the 10 min no-steam cycle, with the 1 hr all steam 316°F dwell at 70 PSIG, this discrepancy is not considered significant and the transmitter temperature is not expected to exceed the 350°F test temperature. The test chamber pressure after 8 hours was 6 PSIG (lower than the 20 PSIG required profile pressure). This is not considered to be significant due to the long test time and high initial pressure of 70 PSIG.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

NOTES:

3. A standard model 1152 tested. The report states that the 1152 model is representative of the other models in mechanical and electrical details but give no pertinent details to allow verification.

4. See evaluation of equipment item 14 for full details with respect to review of reference 24 regarding aging. We conclude that the contention of a 40 year qualified life is not technically sound and has not been justified on a technical basis. Experience and good engineering judgement dictate that a reasonable useful life for electronic equipment, such as this, would be on the order of 10 years with periodic replacement of sub-assemblies.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

INSTALLED TMI LESSONS LEARNED IMPLEMENTATION EQUIPMENT SUMMARY

NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981 (sections are identified below). Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

This plant is a PWR X, BWR ____.
 The NSSS Vendor is Westinghouse (W) X, Babcox & Wilcox (B&W) ____,
 Combustion Engineering (CE) ____, General Electric (GE) ____.

With respect to this equipment item, it is noted (applicable section checked):

- The Licensee does not provide adequate information with respect to identification of TMI Action Plan equipment installed as of 1/1/81.
- The Licensee has not provided the correlation of this equipment item with the specific sections of NUREG-0737. [The correlation is needed to ensure that all items are included in the review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and the terminal blocks associated with the device also identified?]
- The Licensee has not provided the approximate installation date for the TMI Action Plan equipment items so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEQ evaluation.
- The Licensee has provided a standard Owners' Group position with respect to a NUREG-0737 technical area.
- The Licensee has requested extensions of implementation dates.
- The Licensee has stated that this equipment item is associated with the following section of NUREG-0737. (This list of applicable NUREG-0737 sections has been identified by NRC as sections within the scope of this review):
 - II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment
 - II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

Analysis shows that Viton and Ethylene Propylene O-Rings have a life in excess of 40 years. Rosemount recommends a 5-year service replacement interval due to wear from maintenance adjustments and calibration. [24]



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

Equipment Item No. 13
 Pressure Transmitter Located Within Containment
 Rosemount Model 1153 GA9
 Initiates Reactor Trip and Safety Injection (MC-PT-100, -200, -300, and -710)
 Licensee References 24 and 1764
 Required Operating Time: 0.1 minute
 TER Checksheet No. 13
 Reference 37, Section 4.3.1.2
 Licensee Submittal: MC3 [40]; FRC-designated Page II.8-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e, 5f, 5g, 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u>
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u>
Program Established to Identify Aging Degradation	<u>X</u>
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u>
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

LICENSEE RESPONSE TO NRC SER

NOTES FOR RESOLUTIONS

1. Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)
2. Equipment deleted from master list because it already has been replaced.
3. Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.
4. The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.
5. TMI Items
6. Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

MC-3

APPENDIX II

NOTES:

- (1) The time specified is based on the condition that these transmitters are used for reactor trip and safety injection actuation.
- (2) 100% relative humidity has been assumed for conservatism.
- (3) A 40-year qualified life requirement has been assumed.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	LOCA		
Rate of Temp./Press. Increase	6°F/16 psig/sec	75-350°/120/3M cycles	see note 2
Peak: °F/psig/RH/Time	275/32/100/1h	350/120/100/10M	
Decrease To: °F/psig/RH/Time	252/20/100/3h	303/55/100/8h	
Decrease To: °F/psig/RH/Time	212/20/100/26h	250/15/100/56 hr	
Decrease To: °F/psig/RH/Time			
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)			
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)			
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)			
Spray Density (gpm/ft ²)			
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. 13

NOTES:

This equipment was previously evaluated in Reference 37.

(1.) We believe that the License Citation [1204] for 1152 model transmitter is an error and therefore omitted it as not applicable.

(2.) The test chamber pressure after 8 hours was 5 PSIG lower (15 PSIG) than the required profile pressure of 20 PSIG. This is not considered to be not significant due to the long test duration and high initial test pressure of 120 PSIG.

(3.) See evaluation of equipment item 14 for full details with respect to review of reference 24 regarding aging. We conclude that the contention of a 40 year qualified life is not technically sound and has not been justified on a technical basis. Experience and good engineering judgement dictate that a reasonable useful life for electronic equipment, such as this, would be on the order of 10 years with periodic replacement of sub-assemblies.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

Analysis shows that Viton and Ethylene Propylene O-Rings have a life in excess of 40 years. Rosemount recommends a 5-year service replacement interval due to wear from maintenance adjustments and calibration. [24].



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

Equipment Items No. 14
 Pressure Transmitter Located Within Containment
 Rosemount Model 1153 GA9
 Pressurizer Pressure and Subcooling Margin Monitor (PR-PT-700)
 Licensee References 24 and 1764
 Required Operating Time: Long term
 TER Checksheet No. 14
 Reference 37, Section 4.3.1.2
 Licensee Submittal: PRL [40]; FRC-designated Page II.9-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e, 5f, 5g, 5h, 5i, 5j, 5k, 5l
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--|
| I.a Qualified | <input checked="" type="checkbox"/> II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u> _____
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u> _____
Program Established to Identify Aging Degradation	<u>X</u> _____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Developed Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u> _____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

LICENSEE RESPONSE TO NRC SER

NOTES FOR RESOLUTIONS

- Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)
- Equipment deleted from master list because it already has been replaced.
- Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.
- 4. The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.
- TMI Items
- Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

PR-1

APPENDIX II

NOTES:

- (1) Operates continuously to provide input to subcooled margin monitor.
- (2) 100% relative humidity has been assumed for saturated steam conditions.
- (3) A 40-year qualified life requirement has been assumed.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	LOCA (MSLB)		
Rate of Temp./Press. Increase	6°F/1.6 PSIG/SEC (3.4°/0.32 PSI/SEC)	75-350°/120/3M cycles	see note 2
Peak: °F/psig/RH/Time	275/32/100/1h (365/32/100/20S)	350/120/100/10M	
Decrease To: °F/psig/RH/Time	252/20/100/3h (300/24/100/18M)	303/55/100/8h	
Decrease To: °F/psig/RH/Time	212/20/100/26h (200/12/100/3h)	250/15/100/56 HR	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)			
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)			
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)			
Spray Density (gpm/ft ²)			
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. 14

NOTES:

This equipment item was previously evaluated in Reference 37.

(1.) We believe that the Science Citation [1204] for 1152 model transmitter is an error and therefore omitted it as not applicable.

(2.) The steam temperature/pressure profile in the referenced test [1764] did not fully envelope the plant-specific profile, but the deviations are judged to be acceptable. The test duration was more than adequate. The peak test temperature was greater than the peak of the LOCA profile but 15°F lower than the MS&B profile. Because of the short duration of the MS&B transient peak temperature the transmitter temperature is not expected to exceed the 350°F peak test temperature (which was applied for 2 cycles). The test chamber pressure after 8 hours was 5 PS1g lower (15 PS1g) than the required profile pressure of 20 PS1g. This is not considered to be significant due to the long test duration and high initial test pressure of 120 PS1g.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NOTES:

(3.) The Licensee has cited reference 24 as evidence that age sensitive materials and components have been addressed. The report concludes that the Rosemount model 1152 and 1153 series pressure transmitters exceed a 40 year design life for thermal aging, subject to replacement of Viton and Ethylene Propylene O-Rings at 5 year intervals. Reference 24 has been reviewed; salient conclusions resulting from the review and evaluation are:

(1.) the report states that a bill of materials was supplied by Rosemount for the 1152 and 1153 series Pressure transmitters. The report addressed certain components which were considered to be age sensitive and dismissed other components with the following justification:

" A significant amount of technical information is available to support the claim that the following components, listed in IEEE STD 650-1979, have no age related failure mechanisms over the qualified life of the equipment:

- | | |
|-------------------------------|----------------------------------|
| - Resistors, Carbon | - Capacitors, Tantalum |
| - Resistors, Wirewound | - Capacitors, Ceramic, Dry Paper |
| - Potentiometers, Composition | - Thermistors and Plastic Film. |
| - Potentiometers, Wirewound | - Silicon Semiconductors |
| - Diodes, Silicon | - Integrated Circuits " |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NOTES:

The referenced standard [IEEE-650(79)] is not an adequate and appropriate basis for this analysis. There is little technical justification and rationale for exclusion of these components. The referenced standard applies to static battery chargers and inverters located "outside containment" in environmentally controlled areas. The transmitters are located "inside" containment, the normal environment is more severe, and the devices potentially exposed to a harsh environmental service condition as a result of the accident.

The position of the standard (sec. 5.1.2.2.1) is not (i) supported by its own list of references, (ii) not technically acceptable to members of both IEEE and the Nuclear Industry, and (iii) used by the Analyses [24] in an appropriate manner. For example, (i) the appendices are not part of the standard and should be used for guidance to the extent practicable; ^{and} (ii) the last paragraph of appendix B.2 (failure rate history) clearly states that extremes of temperature and humidity can alter non-aging characteristics and the appendix applies only to applications "outside" containment. It is clear that the standard is not applied correctly by reference 24 both with respect to environmental conditions and equipment type and application. More fundamentally, the standard's position with respect to exclusion of these electronic components



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NOTES:

(listed above), because aging is not a failure mechanism, is not technically justified on a 40 year basis. The standard excludes components by stating that there is a significant amount of technical evidence which documents that if components are designed and manufactured with the same techniques used for commercial grade equivalent of mil-spec components and applied within design ratings, aging is not significant within a 40 year design life period. However, we note that Military Specifications relate to device performance characteristics or reliability data; none relate to aging or qualified life based on common mode failure concerns caused by increases in stresses (thermal, radiation, humidity, etc.) which may result in failure as cumulative degradation increases to the end-of-life point for the equipment or component. Analysis programs should determine the extent of the susceptibility of all materials to significant aging degradation which would impair the performance of the safety function. Commercial grade components are not generally equivalent to mil-spec, and neither commercial or mil-spec consider materials and susceptibility to degradation. Exclusion of these components, as done by reference 24, could in fact lead to common-mode failure due to poor workmanship or inadequate material in a component. This is particularly a



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NOTES:

Concern unless components are summarily excluded because they are "silicon diodes" for example, and the manufacture and material are not factored into the analysis. This device may be in fact the "weak link" in the circuit due to materials, design data or manufacturing design. It is clear that both a wide range of manufacture components and materials exist; exclusion from analysis based on component type is not technically sound if demonstration of qualification is indeed the goal.

With respect to failure rate data, it is the "future" failure rate which is a concern. The flat portion of the "bathtub" curve may be altered by stresses over a 40 year period which may result in a sharply rising portion of the curve.

Finally, use of data from Mil-Handbook-217B may be at worst in error of about one order of magnitude and most raw data covers installed periods of less than 10 years [1417]. Use of this data is not suitable for computing stress-acceleration factors for aging in equipment [1417].

The standards' conclusion that aging is not a failure



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NOTES:

mechanism for these electronic components within a 40 year period and reference 24 application of the standard to the analysis is not technically justified.

(2.) An analysis of Radiation degradation of materials has not been provided by the Licensee.

(3.) Activation energies are stated in reference 24 with reference to the Action Aging Information Library. This is not a valid technical citation or documentation reference. Qualified lines can be obtained ranging from 157 days to >40 years (for example) depending on the source and the applicability of the information. The citation as a documented source is important.

Conclusion:

The report [24] states: "The Rosemount 1152 and 1153 series pressure transmitters exceed 40 year design life for thermal aging".

We conclude that this contention is not technically sound and has not been justified.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

NOTES:

Experience and good engineering judgement dictate that a reasonable useful life for electronic equipment such as this, would be on the order of 10 years with periodic replacement of sub-assemblies.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

Analysis shows that Viton and Ethylene Propylene O-Rings have a life in excess of 40 years. Rosemount recommends a 5-year service replacement interval due to wear from maintenance adjustments and calibration. [24].



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

Equipment Item No. 15
 Level Transmitters Located in the Primary Auxiliary Building
 Rosemount Model 1153A
 Containment Pressure (CI-PT-240 and 241)
 Licensee References 24 and 1764
 Required Operating Time: Long term
 TER Checksheet No. 15
 Reference 37, Section 4.3.1.5
 Licensee Submittal: AM3 [40]; FRC-designated Page II.1-5

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u> _____
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u> _____
Program Established to Identify Aging Degradation	<u>X</u> _____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u> _____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

LICENSEE RESPONSE TO NRC SER

NOTES FOR RESOLUTIONS

- * Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)
- * Equipment deleted from master list because it already has been replaced.
- * Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.
- 4. The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.
- * TMI Items
- * Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

AM-3

APPENDIX II

NOTES:

- (1) A long-term operating requirement of one year has been assumed.
- (2) This area is ventilated with outside air.
- (3) A 40-year qualified life requirement has been assumed.
- (4) This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

NOTES:

1. This equipment item was previously reviewed and evaluated in Reference 37.
2. We believe that the License Citation [1204] for the 1152 model transmitter is an error and therefore omitted it as an non-applicable reference.
3. The License has cited reference 24 as evidence that the age sensitive materials and components have been addressed. See evaluation of equipment item 14 for full details with respect to aging. We conclude that the contention of a 40 year qualified life is not technically sound and has not been justified on a technical basis. Experience and good engineering judgement dictate that a reasonable useful life for electronic equipment, such as this, would be on the order of 10 years with periodic replacement of sub-assemblies.

It should be noted that although these transmitters are located outside containment, the same concerns apply as discussed in equipment item 14.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

Analysis shows that Viton and Ethylene Propylene O-Rings have a life in excess of 40 years. Rosemount recommends a 5-year service replacement interval due to wear from maintenance adjustments and calibration. [24]



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

Equipment Item No. 16
 Pressure Switch Located Within Containment
 Static O-Ring Model 7828-100
 Safety Injection Initiation (SI-PS-14)
 Licensee References 21 and 1218
 Required Operating Time: 0.1 minute
 TER Checksheet No. 16
 Reference 37, Section 4.6.3
 Licensee Submittal: SI6 [40]; FRC-designated Page II.10-5

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

(R), T, Q1, RT, P, H, CS, A, S, (R), (M), I, QM, RPN, EXN, SEN, (QI), RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b, 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/~~has not~~) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
- Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (or modify circuits by late 1981)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action late 1981.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established
- Aging Degradation Evaluated Adequately
- Qualified Life or Replacement Schedule Established (If Required)
- Program Established to Identify Aging Degradation
- Criteria Regarding Aging Simulation Satisfied (If Required)
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate
 - o Peak Pressure Adequate
 - o Duration Adequate
 - o Required Profile Enveloped Adequately
 - o Steam Exposure (If Required) Adequate
- Criteria Regarding Spray Satisfied
- Criteria Regarding Submergence Satisfied
- Criteria Regarding Radiation Satisfied X
- Criteria Regarding Test Sequence Satisfied
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied
- Criteria Regarding Functional Testing Satisfied
- Criteria Regarding Instrument Accuracy Satisfied
- Test Duration Margin (1 hour + Function Time) Satisfied X
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified
- I.b Equipment Qualification Pending Modification X
- II.a Equipment Qualification Not Established
- II.b Equipment Not Qualified
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified
- III.a Equipment Exempt From Qualification
- III.b Equipment Not in the Scope of the Qualification Review
- IV Documentation Not Made Available

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

LICENSEE RESPONSE TO NRC SER

NOTES FOR RESOLUTIONS

-
- ✓. Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)
 - ✓. Equipment deleted from master list because it already has been replaced.
 - ③. Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.
 - ✓. The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.
 - ✓. TMI Items
 - ✓. Qualification testing is currently being conducted on this piece of equipment. Upon completion of testing, reports will be reviewed to provide adequate qualification documentation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

LICENSEE RESPONSE TO NRC SER (Continued)

FACILITY: YANKEE ROWE
DOCKET NO.: 50-29

SI-6

APPENDIX II

NOTES:

- (1) This switch is used to initiate safety injection; it is not required to function once safety injection has commenced.
- (2) 100% relative humidity has been assumed for conservatism.
- (3) Replacement of this switch is scheduled prior to the end of its 10-year qualified life.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.
- (5) FRC's evaluation of this switch agrees with the Yankee Rowe position that the switch has a short-term function. However, FRC is committed to adhere to the one-hour NRC requirement for minimum operating time. This requirement ignores the Yankee Rowe position that no fuel damage can occur before the switch operates, even in more than one hour, because the pressure is too high to permit fuel failure. Therefore, Yankee Rowe does not believe the switch is deficient for radiation dose tolerance, because the most tolerant material has been evaluated to withstand a one-year dose. Although the steam temperature/pressure test was not run for one hour, the test was specified and performed according to the exact requirements of IEEE-323-1974 at the time the test was performed (before the one-hour requirement). FRC concludes that the switch is not qualified, because the one-hour requirement is not met.

Yankee Rowe believes this switch will adequately perform its intended function. However, since the switch is not tested to the latest requirements, Yankee Rowe will replace this switch when a qualified replacement (if available, possibly by late 1981) or we will redesign the SIAS initiation circuitry to accomplish the switch's function by other methods.

- (6) The specified radiation dose is only the normal operating dose expected prior to any DBE (see Note 5).



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

Equipment Item No. 17
 Electric Motor Located in the Primary Auxiliary Building
 Electric Machinery Model 1C
 Drives Low Pressure Safety Injection Pump (P-48-1, P-48-2, P-48-3)
 Licensee Reference 13
 Required Operating Time: Long term
 TER Checksheet No. 17
 Reference 37, Section 4.7.11
 Licensee Submittal: SI4 [40]; FRC-designated Page II.10-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable deferred

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e , 5f, 5g, 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u> _____
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u> _____
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (N REG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u> _____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

LICENSEE RESPONSE TO NRC SER

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	Motor	Motor	
Manufacturer's Name (5.2.2/-/-)	Electric Machinery	Emmco	
Model Number (5.2.2/-/-)	1C	1C	
Serial Number	not stated	not stated	
Features/Mounting (5.2.6/-/-)	not stated	Dacron Polyester glass type insulation	
Connections/Interfaces (5.2.6/-/-)	not stated	not stated	
Location/Elevation	Primary Aux. Bldg.		
Equipment ID No.	P-48-1,-2,-3	note 1	note 1
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	02-0570- 1066	02-0570-1066	
Report Date	10/30/80	10/30/80	
Issued by	EDS Nuclear	EDS Nuclear	
Prepared for	Yankee Atomic Electric Co.	Yankee Atomic Electric Co.	
Referenced Reports	See Note 2	See Note 2	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	Analysis	Analysis	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	N/A	N/A	
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.	N/A	N/A	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

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	N/A	
Accuracy (5.2.5/-/-)	N/A	N/A	
Number of Specimens	N/A	N/A	
Test Instruments Calibrated	N/A	N/A	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	N/A	N/A	
Test Duration (5.2.1/-/-)	N/A	N/A	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	N/A	N/A	
Required Function Time	N/A	N/A	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	N/A	N/A	
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	N/A	N/A	
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)	not stated	N/A	X
Thermal Aging/Basis			X
Material Aging Evaluation (7.0/-/-)	not stated	N/A	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	not stated	N/A	X
Radiation Aging, Type	Analysis	Analysis	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	see accid.	see accident	
Radiation Aging, Dose Rate	see accident	see accident	
Radiation Aging, Method	Analysis	Analysis	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	not stated	Dacron Polyester/glass	note 4
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/-)	no	no	X
Normal Ambient Temperature Normal Ambient Radiation Normal Ambient Humidity	N/A	N/A	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	Note 3	Note 3	
On-Going Analysis of Failures and Degradation (7.0/-/-)	Note 3	Note 3	
Margin (General) (6.0/3.0/3.0)	N/A	N/A	
Margin (NUREG-0588, Cat. I) (-/3.2/-)	N/A	N/A	
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. 17

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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 recirc.	LOCA recirc.	
Radiation Type	γ	γ	
Radiation Dose (rd) (4.1.2/1.4/1.4)	2.1 mrd γ (Normal acc.)	8 mrd γ (Normal + Acc.)	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	not stated Analysis	not stated Analysis	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	not stated	Not stated	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	not stated	not stated	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	2.1 mrd γ	8 mrd γ	
Plateout Dose Considered (-/1.48/1.48)	N/A	N/A	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	N/A	N/A	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

NOTES:

Note 1: Analysis delineates the LPSI system pumps and describes the motors associated with these. The Yankee Rowe equipment item in question is a pump motor in the LPSI system.

- Note 2:*
1. "ORIGEN: Isotope Generation and Depletion Code - Matrix Exponential Method", written by Oak Ridge National Laboratory and updated May 3, 1976.
 2. "QAD-PSA: A Point-Kernel General Purpose Shielding Program", originally written by Los Alamos Scientific Laboratory and converted to the IBM-360 computer by Oak Ridge National Laboratory, July, 1968.
 3. "Reactor Shielding Design Manual", edited by Theodore Rockwell III, D. Van Nostrand Company, Inc., First Edition, 1956.
 4. "Piping Design and Engineering", ITT Grinnel Industrial Piping, Inc., Fifth Edition, 1976.
 5. "A Handbook of Radiation Shielding Data", edited by J.C. Courtney, ANS/SD-76/14, July, 1976.
 6. "Nuclear Engineering Handbook", edited by Harold Etherington, McGraw Hill, First Edition, 1958.
 7. "The Use of Plastics and Elastomers in Nuclear Radiation" by W.W. Parkinson and O. Sisman, Oak Ridge National Laboratory, October 19, 1970.

Note 3: The licensee's response to the SER states the following with respect to aging:

For components which have a relatively long qualified life (greater than 10 years), the accuracy of the predicted life will be verified by including provisions in plant maintenance and surveillance programs to determine the presence of advanced age related degradation. Depending on the equipment involved (complexity, amount of age sensitive materials involved, normal operating environment, etc.), the program will include those features of the following which are considered necessary to track aging conditions of that type of equipment.

- Periodic visual inspection of materials in the equipment which are subject to aging degradation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

NOTES:

Note 3 cont.:

- . Periodic review of maintenance records by engineering personnel to — detect trends of failures caused by material degradation.
- . Periodic testing of insulation integrity on representative samples — of categories of equipment (motors, solenoid, etc.).
- . Periodic review of operating and maintenance records not related to — failures (operating temperatures, calibration records, etc.)
- The intervals for the periodic actions will be selected by giving — consideration to the predicted qualified life, operating mode of the — equipment, accessibility, and existing maintenance and surveillance — schedules. It is anticipated that this program will be incorporated by — modifications to existing programs, and the program will be in effect — before the deadline for equipment qualification.

This aging program assumes an established qualified life.

No information has been presented with respect to this problem.

Note 4: The EDS Nuclear Analysis states the following with respect to materials susceptible to radiation;

According to EMMCO, the limiting material for radiation degradation is the Dacron Polyester glass type insulation.

Conclusions: The Licensee should provide either an analysis or test data that establishes a qualified life.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

Equipment Item No. 18
 Electric Motor Located in the Primary Auxiliary Building
 General Electric Company Model No. 5K404AK174
 Drives High Pressure Safety Injection Pump (P49-1, P49-2, P49-3)
 Licensee Reference 3642
 Required Operating Time: Long term
 TER Checksheet No. 18
 Reference 37, Section 4.7.3
 Licensee Submittal: SI5 [40]; FRC-designated Page II.10-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable deferred

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <input checked="" type="checkbox"/> I.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____X_____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____X_____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

See note 1 on page 5f



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1B

LICENSEE RESPONSE TO NRC SER

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u> Equipment Type	MOTOR	VERTICAL INDUCTION MOTOR	
Manufacturer's Name (5.2.2/-/-)	GENERAL ELECTRIC	GENERAL ELECTRIC CO.	
Model Number (5.2.2/-/-)	5K404AK17A	SK 6318XC156A	X
Serial Number	ND	JFJ909011	NOTE 1
Features/Mounting (5.2.6/-/-)		3Ø, 460V, 300 HP 60 HZ	
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation	PAB		
Equipment ID No.	P49-1 P49-2 P49-3		
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number		FC2909	
Report Date			
Issued by		FIRL	
Prepared for		VIRGINIA ELECTRIC POWER CO.	
Referenced Reports			
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)		TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)		I, R. TESTS VOLTAGE WITHSTAND TEST	
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.		FULL LOAD FUNCTIONAL LOCA TEST	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (% OR NOTE NO.)
Acceptance Criteria (5.2.5/2.2.1/2.2.1)	:	: DEMONSTRATION OF : OPERABILITY; PASS : FUNCTIONAL TESTS	:
Accuracy (5.2.5/-/-)	: —	: —	:
Number of Specimens	: —	: 1	:
Test Instruments Calibrated	: —	:	:
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	: SAFETY : INJECTION	:	:
Test Duration (5.2.1/-/-)	: —	:	:
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	: NA	:	:
Required Function Time	: LONG TERM	:	:
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	:	:	:
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	:	:	:
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	:	: 100HR. @ 180°C	:
Material Aging Evaluation (7.0/-/-)	:	:	:
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	:	:	:
Radiation Aging, Type	:	: GAMMA	:



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	NA		
Radiation Aging, Dose Rate	NA		
Radiation Aging, Method	NA		
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	INSULATION, LEAD SPLICES; LUBRICATING OIL		
Operational Aging (-/4.2/-)			
Other Age Conditioning (-/4.2/-)			
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 YR, ASSUMED		
Normal Ambient Temperature	65-90°F		
Normal Ambient Radiation	0.1 Mrd		
Normal Ambient Humidity	60% _{NOM.}		
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	SURVEILLANCE MAINT. PROGRAM		
On-Going Analysis of Failures and Degradation (7.0/-/-)			
Margin (General) (6.0/3.0/3.0)			
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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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	
Radiation Type	GAMMA	GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)	0.65 Mrd	30 Mrd	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)		3.0 x 10 ⁵ rd/h TEST	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	RECIRC. FLUIDS	—	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	NA	ND	X
Radiation Dose (Normal + Accident) (4.1.2/-/-)	0.65 Mrd (ACCIDENT)		
Plateout Dose Considered (-/1.48/1.48)	NA	ND	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	NA	ND	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	NA		
Rate of Temp./Press. Increase	ENVIRONMENT MILD EXCEPT FOR RADIATION	RAPID ~ 1.3 SEC.	
Peak: °F/psig/RH/Time		280/60 / - / 2 MIN.	
Decrease To: °F/psig/RH/Time		150/14.8 / - / 336 HR.	
Decrease To: °F/psig/RH/Time			
Decrease To: °F/psig/RH/Time			
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)		MOTOR STATOR TEMPERATURE MONITORED	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)		TEST	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)		BORIC ACID 1.43% PH = 8.5-9.0	
Spray Density (gpm/ft ²)		0.15	
Spray Duration		CONTINUOUS	
Submergence Duration (4.1.3/2.2.5/2.2.5)		NA	
In-Leakage Considered (5.2.6, 5.3.2/-/-)		PROVISIONS MADE TO SAMPLE BEARING OIL FOR CONTAMINANTS	
Time to Submergence		NA	
Dust Environment (-/2.2.11/2.2.11)		NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

NOTES:

1. Adequate similarity between the installed/ tested equipment has not been demonstrated by the Licensee. The Licensee should provide evidence that the motor installed is similar to that tested with respect to the insulation system, the lead splices, and bearing lubrication.

2. The Licensee states that the primary auxiliary building post-accident environment is mild except for radiation (0.65 Mrd). The motor tested was subjected to 30 Mrd gamma, and passed a post-radiation aging megger and dielectric withstand test. The test specimen also demonstrated post thermal and radiation aging operability, it did not however demonstrate long term operability in a harsh environment. This equipment would be considered qualified if the motor concerns above are adequately addressed by the Licensee.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

Equipment Item No. 19
 Electric Motors Located Within Containment
 Westinghouse Model 72Y51238, TBFC, 15 hp
 Recirculation Fan Drive (FN-18-1, FN-18-2, FN-18-3)
 Licensee References 22, 604, and 639
 Required Operating Time: Long term
 TER Checksheet No. 19
 Reference 37, Section 4.5.2.3
 Licensee Submittal: AR1 [40]; FRC-designated Page II.2-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, (QM), RPN, EXN, SEN, (QI), RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	<u>X</u>
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u>
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	<u>X</u>
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

LICENSEE RESPONSE TO NRC SER

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

YAEC has obtained and reviewed the proprietary report referenced in the TER, and has included the report as a Documentation Reference. The FRC concerns relative to qualified life, lubrication, and bearings will be addressed in the plant maintenance and surveillance program. The motor splices were not specifically addressed in the subject report; however, the motors are located in an enclosure, thus providing the splices an additional degree of protection from the environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

Checksheets 5a thru 5f have been removed due to the
proprietary nature of information contained therein.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

Equipment Item No. 20
 Electric Motor Located in the Primary Auxiliary Building
 Westinghouse Electric Corp. Model CSP
 Drives Primary Component Cooling Pump (P-20-1, P-20-2)
 Licensee Reference 13
 Required Operating Time: Long term
 TER Checksheet No. 20
 Reference 37, Section 4.7.5
 Licensee Submittal: CCl [40]; FRC-designated Page II.4-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable deferred

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
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Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e , 5f, 5g, 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure: _____
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

LICENSEE RESPONSE TO NRC SER

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	Motor	Motor	
Manufacturer's Name (5.2.2/-/-)	Westinghouse	Westinghouse	
Model Number (5.2.2/-/-)	CSP	factory no. 19N3369	
Serial Number	not stated	not stated	
Features/Mounting (5.2.6/-/-)	not stated	Thermaleastic Epoxy	Note 1
Connections/Interfaces (5.2.6/-/-)	Not stated	not stated	
Location/Elevation	Primary Aux. Bldg.	not stated	
Equipment ID No.	P-20-1,-2	P-20-1,-2	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	02-0570- 1066	02-0570-1066	
Report Date	Oct. 30, 1980	Oct. 30, 1980	
Issued by	EDS Nuclear	EDS Nuclear	
Prepared for	Westinghouse	Westinghouse	
Referenced Reports	N/A	see Note 2	Note 2
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	Analysis	Analysis	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	N/A	N/A	
Operating Conditions (-/2.2.10/2.2.10)	N/A	N/A	
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

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	N/A	
Accuracy (5.2.5/-/-)	N/A	N/A	
Number of Specimens	N/A	N/A	
Test Instruments Calibrated	N/A	N/A	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	N/A	N/A	
Test Duration (5.2.1/-/-)	N/A	N/A	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	N/A	N/A	
Required Function Time	N/A	N/A	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	N/A	N/A	
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	N/A	N/A	
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	Surveillance and Maintenance	N/A	X Note 3
Material Aging Evaluation (7.0/-/-)	Not stated	N/A	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	Not stated	N/A	
Radiation Aging, Type	Analysis	Analysis	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	see Acc.	see Accident	
Radiation Aging, Dose Rate	↓	↓	
Radiation Aging, Method			
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	not stated	Note 1	
Operational Aging (-/4.2/-)	N/A	N/A	
Other Age Conditioning (-/4.2/-)	↓		
Qualified Life Claimed/ Established (5.2.4/4.10/-)	not stated		X
Normal Ambient Temperature			
Normal Ambient Radiation			
Normal Ambient Humidity			
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	yes	N/A	
On-Going Analysis of Failures and Degradation (7.0/-/-)	yes	N/A	
Margin (General) (6.0/3.0/3.0)	N/A	N/A	
Margin (NUREG-0588, Cat. I) (-/3.2/-)	N/A	N/A	
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. 20

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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 recirc.	LOCA recirc.	
Radiation Type	γ	γ	
Radiation Dose (rd) (4.1.2/1.4/1.4)	2 Mrd (acc. tagging)	2 x 10 ⁸ rd (note 1)	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	not stated Analysis	N/A Analysis	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	Not stated	Not stated	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	not stated	not stated	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	2 Mrd (γ)	2 x 10 ⁸ rd (γ)	
Plateout Dose Considered (-/1.48/1.48)	no	no	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	N/A	N/A	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

NOTES:

Note 1: The EOS Nuclear analysis states the following
with respect to materials identification:

Westinghouse Electric Company indicated that the epoxy impregnant of the thermalastic epoxy insulation system is the most susceptible material capable of withstanding 2×10^5 Rads.

Notes

1. "ORIGEN: Isotope Generation and Depletion Code - Matrix Exponential Method", written by Oak Ridge National Laboratory and updated May 3, 1976.
2. "QAD-PSA: A Point-Kernel General Purpose Shielding Program", originally written by Los Alamos Scientific Laboratory and converted to the IBM-360 computer by Oak Ridge National Laboratory, July, 1968.
3. "Reactor Shielding Design Manual", edited by Theodore Rockwell III, D. Van Nostrand Company, Inc., First Edition, 1956.
4. "Piping Design and Engineering", ITT Grinnel Industrial Piping, Inc., Fifth Edition, 1976.
5. "A Handbook of Radiation Shielding Data", edited by J.C. Courtney, ANS/SD-76/14, July, 1976.
6. "Nuclear Engineering Handbook", edited by Harold Etherington, McGraw Hill, First Edition, 1958.
7. "The Use of Plastics and Elastomers in Nuclear Radiation" by W.W. Parkinson and O. Sisman, Oak Ridge National Laboratory, October 19, 1970.

Note 3: The licensee's response to the SER states the following
with respect to aging:

For components which have a relatively long qualified life (greater than 10 years), the accuracy of the predicted life will be verified by including provisions in plant maintenance and surveillance programs to determine the presence of advanced age related degradation. Depending on the equipment involved (complexity, amount of age sensitive materials involved, normal operating environment, etc.), the program will include those features of the following which are considered necessary to track aging conditions of that type of equipment.

- Periodic visual inspection of materials in the equipment which are subject to aging degradation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

NOTES:

Note 3 cont.:

- Periodic review of maintenance records by engineering personnel to detect trends of failures caused by material degradation.
- Periodic testing of insulation integrity on representative samples of categories of equipment (motors, solenoid, etc.).
- Periodic review of operating and maintenance records not related to failures (operating temperatures, calibration records, etc.)

The intervals for the periodic actions will be selected by giving consideration to the predicted qualified life, operating mode of the equipment, accessibility, and existing maintenance and surveillance schedules. It is anticipated that this program will be incorporated by modifications to existing programs, and the program will be in effect before the deadline for equipment qualification.

This aging program assumes an established qualified life.

No information has been presented with respect to this problem.

Conclusions: The licensee should provide either an analysis or test data that concludes a qualified life.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21

Equipment Item No. 21
 Electric Motor Located in the Primary Auxiliary Building
 Westinghouse Electric Corp. Model CSP
 Drives Shutdown Cooling Pump (P-19)
 Licensee reference not cited
 Required Operating Time: Long term
 TER Checksheet No. 21
 Reference 37, Section 4.7.10
 Licensee Submittal: SC2 [40]; FRC-designated Page II.11-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, Q1, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable deferred

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f, 5g, 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified ~~and~~/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|---------------------------------------|
| I.a Qualified | <u>II.c</u> Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately X
- Qualified Life or Replacement Schedule Established (If Required) X
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified X
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21

LICENSEE RESPONSE TO NRC SER

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21

NOTES:

Although the licensee did not cite any qualification information, reference 49 contains information with respect to the stator insulation. Thermolastic epoxy has a radiation resistance in excess of the stated environmental stresses. In general the splice materials used in the Westinghouse motors (motor to lead splice) have a radiation resistance in excess of 1 Mrd, however the licensee should identify the materials used and verify their acceptability.

The EDS report does not however discuss aging or establish a qualified ^{life}. The licensee states that a maintenance and surveillance program will be implemented to establish qualification with respect to aging. The maintenance and surveillance program however is based on an established qualified life. The licensee should provide either test data or analysis that determines a qualified life so that the maintenance and surveillance program can be implemented. (the analysis or test should consider motor to lead splices, stator insulation bearings and grease, and any other degradable materials)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 22

Equipment Item No. 22
 Electrical Cable Located in the Primary Auxiliary Building
 General Cable Corp. Type XLPE
 Power Distribution
 Licensee References 45 and 2694
 Required Operating Time: Long term
 TER Checksheet No. 22
 Reference 37, Section 4.3.3.4
 Licensee Submittal: J34 [40]; FRC-designated Page II.3-27

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A) S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3a , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 22

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 22

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____ X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

This equipment item was previously evaluated in Reference 37. See page 1A
 Equipment Item description.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 22

LICENSEE RESPONSE TO NRC SER

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.

Provides electrical power to safety-related equipment.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 23

Equipment Item No. 23
 Electrical Cable Located in the Primary Auxiliary Building
 Collyer Type XLPE/Neoprene
 Control Power Distribution
 Licensee Reference 4019
 Required Operating Time: Long term
 TER Checksheet No. 23
 Reference 37, Section 4.3.3.2
 Licensee Submittal: J32 [40]; FRC-designated Page II.3-23

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated. Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
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Licensee Response to NRC SER	3a, 3b, 3c, 3d
System Consideration Review	4a, 4b, 4c, 4d, 4e, 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 23

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/~~has not~~) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 23

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified X _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 23

LICENSEE RESPONSE TO NRC SER

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.

Provides control power for safety-related equipment which is required for long-term operability.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

Equipment Item No. 24
 Electrical Cable Located in the Primary Auxiliary Building
 Okonite Styrene/Butadiene
 Power Distribution
 Licensee References 50 and 2694
 Required Operating Time: Long term
 TER Checksheet No. 24
 Reference 37, Section 4.3.3.3
 Licensee Submittal: J33 [40]; FRC-designated Page II.3-25

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d , 5e , 5f, 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established X
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established X
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

LICENSEE RESPONSE TO NRC SER

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.

Provides electrical power to safety-related equipment.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	styrene butadiene ins cable	SBR-radiation Butyl Rubber/Neoprene	X
Manufacturer's Name (5.2.2/-/-)	OKONITE	Collyer	X see note 1
Model Number (5.2.2/-/-)	NA		
Serial Number			
Features/Mounting (5.2.6/-/-)	NA		
Connections/Interfaces (5.2.6/-/-)	NA		
Location/Elevation	PAB		
Equipment ID No.	NA		
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number			
Report Date			
Issued by			
Prepared for			
Referenced Reports			
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)			
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)			
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

NOTES:

1- In the October 31, 1980 submitted [.]
this cable was identified as
Oponite with Butyl Rubber
Insulation and PVC Jacket. In
the 90 day response [.] the material
has been identified as styrene
Butadiene (SBR) a synthetic
rubber. The licensee does not
provide any basis for using
a Butyl Rubber aging analysis
for SBR. Further the radiation
data from various sources including
reference 2694 shows considerable
variation in radiation resistance
for SBR depending on the specific
insulation formulation. It is
therefore concluded that
qualification of the equipment
has not been established because
there is no direct link between
the installed equipment and the
referenced qualification documents.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

Equipment Item No. 25
 Electrical Cable Located Within Containment
 Continental Wire & Cable Company (XLPE/Hypalon)
 Instrumentation Circuitry
 Licensee References 18 and 1207
 Required Operating Time: Short term
 TER Checksheet No. 25
 Reference 37, Section 4.3.1.4
 Licensee Submittal: J25 [40]; FRC-designated Page II.3-11

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QI, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, ^{5f,} 5g , 5h , 5i , 5j 5e ₂ ,
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (~~has/has not~~) provided a response to the SER concerns.
- The Licensee (~~has/has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (~~has/has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (~~has/has not~~) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (~~has/has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 403

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

LICENSEE RESPONSE TO NRC SER

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.

These cables are only required for a short-term reactor protection function (see FW-4).

100% relative humidity has been assumed for conservatism.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	<i>Instrument Cable</i>	<i>Instrument Cable</i>	
Manufacturer's Name (5.2.2/-/-)	<i>Continental</i>	<i>Continental</i>	
Model Number (5.2.2/-/-)	<i>NA</i>	<i>NA</i>	<i>see note 1</i>
Serial Number	<i>NA</i>	<i>NA</i>	
Features/Mounting (5.2.6/-/-)	<i>NA</i>	<i>NA</i>	
Connections/Interfaces (5.2.6/-/-)	<i>NA</i>	<i>NA</i>	
Location/Elevation	<i>NA</i>	<i>NA</i>	
Equipment ID No.	<i>NA</i>	<i>NA</i>	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	<i>IPS-383</i>	<i>IPS-383</i>	
Report Date	<i>11/27/78</i>	<i>11/27/78</i>	
Issued by	<i>CONAX</i>	<i>CONAX</i>	
Prepared for	<i>VEPCO</i>	<i>VEPCO</i>	
Referenced Reports	<i>-</i>	<i>-</i>	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	<i>Test + analysis</i>	<i>Sequential Test</i>	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	<i>NA</i>	<i>NA</i>	
Operating Conditions (-/2.2.10/2.2.10) Load/Cycles/Voltage/ Current/Freq.	<i>50V DC</i>	<i>50V DC</i>	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

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)	NA	Not stated	
Accuracy (5.2.5/-/-)	NA	Not stated	
Number of Specimens	NA	6	
Test Instruments Calibrated	NA	yes	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	Passive	passive	
Test Duration (5.2.1/-/-)	NA	4 days	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	~30 hrs	NA	
Required Function Time	short	NA	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)		① Thermal age	
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)		② Inspect	
		③ Irradiation	
		④ Inspection	
		⑤ LOCA Test	
		⑥ MSLB Test	
		⑦ Measurement of Electrical & Physical Properties	
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)		60 hours @ 70°C	
Thermal Aging/Basis			
Material Aging Evaluation (7.0/-/-)		action report 15421-5	see note 2
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)			
Radiation Aging, Type	In plant actual	In plant actual (7 yrs)	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	<i>not stated.</i>	<i>see accident dose</i>	
Radiation Aging, Dose Rate	<i>0.04-2 rad/hr</i>	<i>"</i>	
Radiation Aging, Method		<i>"</i>	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	<i>yes</i>	<i>yes</i>	
Operational Aging (-/4.2/-)	<i>NA</i>	<i>7 years in plant</i>	
Other Age Conditioning (-/4.2/-)	<i>NA</i>	<i>not stated</i>	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	<i>40 y</i>	<i>62 years</i>	<i>note 3</i>
Normal Ambient Temperature	<i>70 - 95°F</i>		
Normal Ambient Radiation	<i>0.04 to 2 rad/hr</i>	<i>NA</i>	
Normal Ambient Humidity	<i>60%</i>		
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	<i>Yes</i>	<i>NA</i>	
On-Going Analysis of Failures and Degradation (7.0/-/-)	<i>Yes</i>	<i>NA</i>	
Margin (General) (6.0/3.0/3.0)	<i>NA</i>	<i>NA</i>	
Margin (NUREG-0588, Cat. I) (-/3.2/-)			<i>DOR</i>
1. Temperature (+15°F)			<i>Guide -</i>
2. Pressure (+10%, 10 psig max)			<i>Lines</i>
3. Radiation (not required)			<i>Apply</i>
4. Time (+10%, +1 hour + function time minimum)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)		See LOCA	
Radiation Type	Gamma	Gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	2x10 ⁶	20x10 ⁶	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	N.D.	.91 Mrd/hr.	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	NA	NA	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	NA	Not stated	
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. 25

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	(LOCA)		
Rate of Temp./Press. Increase	6°F/1.6psig/sec	8°F/3psig/sec.	
Peak: °F/psig/RH/Time	275/32/100/1h	300/52/100/90 min	see note 4
Decrease To: °F/psig/RH/Time	252/20/100/3h	150/0/100/46.5h	
Decrease To: °F/psig/RH/Time	212/20/100/26h		
Decrease To: °F/psig/RH/Time			
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	NA	NA	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	NA	Test	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	NA	250 ppm Chem ph 7 to 11	
Spray Density (gpm/ft ²)	NA	.15 gpm/ft ²	
Spray Duration	NA	48 hours	
Submergence Duration (4.1.3/2.2.5/2.2.5)	NA	NA	
In-Leakage Considered (5.2.6, 5.3.2/-/-)	NA	NA	
Time to Submergence	NA	NA	
Dust Environment (-/2.2.11/2.2.11)	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

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

MSLB
3.4°/0.34psia

8°F/sec

Peak: °F/psig/RH/Time

365/32/100/20s

352/120/100/30 min

See

Decrease To: °F/psig/RH/Time

300/24/100/18m

150/0/100/47h

note 4

Decrease To: °F/psig/RH/Time

200/12/100/3h

Decrease To: °F/psig/RH/Time

120/2/100/27h

Equipment Surface Tempera-
ture (MSLB) (-/1.2.5.C,
2.2.6/1.2.5.C, 2.2.6)

NA

NA

Spray Qualification Method
(5.3.2/1.3, 2.2.8/1.3,
2.2.8)

NA

Test

Spray Composition
(4.1.4/1.3, 2.2.8/
1.3, 2.2.8)

NA

2500 ppm Boron
pH 7 to 11

Spray Density (gpm/ft²)

NA

0.15 gpm/ft²

Spray Duration

NA

48 hours

Submergence Duration
(4.1.3/2.2.5/2.2.5)

NA

NA

In-Leakage Considered
(5.2.6, 5.3.2/-/-)

NA

NA

Time to Submergence

NA

NA

Dust Environment
(-/2.2.11/2.2.11)

NA

NA



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

NOTES:

Note 1 - Insulation is cross linked
Polyethylene, Jacket is
Nypsalon.

Note 2 Acton Report used activation
energies from Ref PGN-2694
and performed Arrhenius
calculation to forecast a
lifetime of 62 - 90+ years
for the material - There
is no correlation to the
thermal aging performed on
the cable.

Note 3 - Jacket Life forecast = 762 years
Insulation Life forecast = 715 years
forecast by Acton K5421-5

Note 4 - The test profile is
more conservative than the Yankee Race
profile, as stated in references 54 & 37,
It is considered that the test is
more severe than the accident
profile.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

Equipment Item No. 26
 Electrical Cable Located Within Containment
 General Cable Company (Mineral Insulated)
 Electric Power and Control
 Licensee References 6 and 15
 Required Operating Time: Long term
 TER Checksheet No. 26
 Reference 37, Section 4.3.3.1
 Licensee Submittal: J20 [40]; FRC-designated Page II.3-5

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

The Licensee (has/~~has not~~) provided a response to the SER concerns.

The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.

The Licensee has presented information which shows there are no outstanding qualification deficiencies.

The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.

Justification for interim operation (has/~~has not~~) been provided by the Licensee for this equipment item.

Corrective action specified by the Licensee:

- Equipment replacement with qualified equipment
- Equipment modification
- Equipment relocation above submergence level
- Relocate or shield equipment from radiation source
- Verify qualification by additional (testing/analysis)
- Equipment relocation to a mild environment
- Qualification testing of equipment in progress
- Other (_____)

The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.

The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)

The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

This equipment item was previously evaluated in Reference 37. See page 1A
 Equipment Item description.



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FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

LICENSEE RESPONSE TO NRC SER

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

Equipment Item No. 27
 Electrical Cable Located Within Containment
 Rockbestos Firewall III
 Electrical Power, Instrumentation and Control
 Licensee References 14 and 1391
 Required Operating Time: Long term
 TER Checksheet No. 27
 Reference 37, Section 4.3.1,1
 Licensee Submittal: J24 [40]; FRC-designated Page II.3-9

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h , 5i , 5j ^{5e₂}
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW
 - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified X _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

LICENSEE RESPONSE TO NRC SER

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

- ④ The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	POWER CABLE INSTRUMENT & CONTROL CIRCUITS	POWER/INSTRUMENT/CONTROL	
Manufacturer's Name (5.2.2/-/-)	ROCKBESTOS	ROCKBESTOS CO. FIREWALL III	
Model Number (5.2.2/-/-)	FIREWALL III		
Serial Number		POWER (1/C #6 AWG, FR, XLPE 600V, 45 MIL INS.)	NOTE 1
Features/Mounting (5.2.6/-/-)	NOT STATED		
Connections/Interfaces (5.2.6/-/-)	NOT STATED		
Location/Elevation	CONTAINMENT		
Equipment ID No.	J24		
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	—		
Report Date	—	7-7-77	
Issued by	—	ROCKBESTOS CO.	
Prepared for	—	ROCKBESTOS CO.	
Referenced Reports	—	ND	
Qualification Method (5.1, 5.3/3.1, 2.4/2.1, 2.4)	—	TYPE TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	—	5 MIN. DIELECTRIC W/STAND TEST, TAP WATER IMMERSION 80 VAC/MIL	
Operating Conditions (-/2.2.10/2.2.10)	ND	600 VAC, 70 Amp	
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

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)	---	VOLTAGE WITHSTAND TEST 80 VAC/MIL, 5 MIN.; RM. TEMP. TAP WATER IMMERSION	
Accuracy (5.2.5/-/-)	---	NA	
Number of Specimens	---	18 TEST SAMPLES	NOTE 2
Test Instruments Calibrated	---	yes; (DOSIMETRY ONLY)	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	CLASS 1E CONTROL & INST. CIRCUITS	---	
Test Duration (5.2.1/-/-)	---		
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	---		
Required Function Time	LONG TERM	---	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	---	TA/RAD/STM + CHSP/ Post LOCA SIMULATION	B SAMPLES (NOTE 2)
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	---		
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	---	1300 HR. @ 150°C/ 40yr. @ OPERATING TEMP. OF 90°C	
Material Aging Evaluation (7.0/-/-)	ACTON 15421-1 Rev. 2 11/14/80	Arrhenius DATA	NOTE 3
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	INS. MATERIALS	INS. MATERIALS	
Radiation Aging, Type	---	GAMMA	



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)		50 x 10 ⁶	
Radiation Aging, Dose Rate		0.65 Mrd/hr.	
Radiation Aging, Method		TEST	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)			
Operational Aging (-/4.2/-)		NA	
Other Age Conditioning (-/4.2/-)		ND	
Qualified Life Claimed/ Established (5.2.4/4.10/-)		40 yr. / 40 yr.	
Normal Ambient Temperature	70-95 °F		
Normal Ambient Radiation	0.04-2 rd/h		
Normal Ambient Humidity	60% NOM.		
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	YANKEE ROWE PROGRAM		
On-Going Analysis of Failures and Degradation (7.0/-/-)			
Margin (General) (6.0/3.0/3.0)			
Margin (NUREG-0588, Cat. 1) (-/3.2/-)			
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. 27

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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	LOCA	
Radiation Type		GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)		1.5 x 10 ⁸ rd	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)		0.8 Mrd/hr.	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)		—	
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. 27

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	LOCA		
Rate of Temp./Press. Increase	6 °F/s / 1.6 psig/s	140-346/0-113 IN 45 MIN.	
Peak: °F/psig/RH/Time	275/32/100/1h	346/113/100/3 HR.	
Decrease To: °F/psig/RH/Time	252/20/100/3h	335/93/100/3 HR.	
Decrease To: °F/psig/RH/Time	212/20/100/26h	315/69/100/4 HR	
Decrease To: °F/psig/RH/Time		265/28/100/81HR.	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)		90 °C	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)		SIMULTANEOUS TEST	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	NA	H ₃ BO ₃ 3000 PPM BORON Ph=10.5	
Spray Density (gpm/ft ²)	NA	0.15 GPM/ft. ²	
Spray Duration	NA	24 HR.	
Submergence Duration (4.1.3/2.2.5/2.2.5)		5 MIN. VOLTAGE W/STAND TEST	
In-Leakage Considered (5.2.6, 5.3.2/-/-)		ND	
Time to Submergence		ND	
Dust Environment (-/2.2.11/2.2.11)	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>	MSLB	SEE 5e1	
Rate of Temp./Press. Increase	3.4 °F/s / .32 $\frac{\text{Psi}}{\text{s}}$	SEE 5e1	
Peak: °F/psig/RH/Time	365/32/100/20s	SEE 5e1	
Decrease To: °F/psig/RH/Time	300/24/100/18m	SEE 5e1	
Decrease To: °F/psig/RH/Time	200/12/100/3h	SEE 5e1	
Decrease To: °F/psig/RH/Time	120/2/100/27h	SEE 5e1	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)		SEE 5e1	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)		SEE 5e1	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	NA	SEE 5e1	
Spray Density (gpm/ft ²)	NA	SEE 5e1	
Spray Duration	NA	SEE 5e1	
Submergence Duration (4.1.3/2.2.5/2.2.5)		SEE 5e1	
In-Leakage Considered (5.2.6, 5.3.2/-/-)		SEE 5e1	
Time to Submergence		SEE 5e1	
Dust Environment (-/2.2.11/2.2.11)	NA	SEE 5e1	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

NOTES:

1. The Licensee has not identified the installed cable with respect to; wire size, arrangement of conductors, fillers, binders, etc., and rated characteristics. The samples tested (1/c #6) are representative cable for type testing as outlined by IEEE Std. 383-1974 (TABLE 1), for multiconductor control cable of up to 2000 V.

2. 3 sets of cable samples (A, B and C) were tested. Each set consisted of two 10 ft. lengths of cable. Testing was performed on the A, B and C samples to simulate the following conditions:

A - normal 40 year service life.

B - LOCA late in installed life.

C - LOCA early in installed life.

All samples were subjected to, and passed an 80 VAC/mil voltage withstand test in accordance with IEEE Std. 383-1974 section 2.3.3.4



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

NOTES:

2. (continued)

The LOCA tests were performed with the cable energized at rated voltage and current.

The B samples were exposed to an additional 100 days at 200°F and 100% RH, and passed another voltage withstand test following this exposure.

3. Reference 14 was submitted in addition to the Rochester report.

Ref. 14 (ACTON 15421-1) is an ^{accelerated} analysis performed to demonstrate the cable will perform its safety related function ^{during and} for a thermal degradation period of 40 years service.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

Equipment Item No. 28
 Electrical Cable Located within Containment
 Rockbestos Silicone Rubber/Asbestos
 Power Cable
 Licensee References 16, 1208, and 1327
 Required Operating Time: Long term
 TER Checksheet No. 28
 Reference 37, Section 4.3.1.3
 Licensee Submittal: J23 [40]; FRC-designated Page II.3-7

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, (A), S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h , 5i , 5j ^{5e₂}
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

LICENSEE RESPONSE TO NRC SER

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The aging program described in the body of the cover letter (Section 3.7) responds to the NRC concern.



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

Checksheets 5a thru 5g have been removed due to the
proprietary nature of information contained therein.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

Equipment Item No. 29
 Electric Cable Located Outside Containment (Location not specified)
 Simplex Butyl/PVC
 Power Distribution
 Licensee Reference 1339
 Required Operating Time: Long term
 TER Checksheet No. 29
 Licensee Submittal: J26 [40]; FRC-designated Page II.3-13

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d , 5e , 5f, 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established X
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established X
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

A long-term requirement of one year has been assumed.

These areas are ventilated with outside air.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ; NUREG-0588, Cat. I ___; NUREG-0588, Cat. II ___.

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	<i>Electrical Cable</i>	<i>Electric Cable</i>	
Manufacturer's Name (5.2.2/-/-)	<i>Amplex</i>	<i>Okonite</i>	X
Model Number (5.2.2/-/-)	<i>Butyl/PVC</i>	<i>EPR</i>	X
Serial Number			<i>See note 1 Page 5 f</i>
Features/Mounting (5.2.6/-/-)			
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation			
Equipment ID No.			
<u>QUALIFICATION REPORT</u>			
(8.0/5.0/5.0)			
Report ID Number			
Report Date			
Issued by			
Prepared for			
Referenced Reports			
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)			
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)			
Operating Conditions			
(-/2.2.10/2.2.10)			
Load/Cycles/Voltage/			
Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

NOTES:

Note 1 - The installed cable is from a different manufacturer and is of a different material than the cited test report.

Since the only hard parameter is radiation the licensee should determine if data on the installed materials is available to establish radiation qualification.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

Equipment Item No. 30
 Electrical Cable Located Outside Containment (Location not specified)
 Simplex Type PE/PVC
 Electrical Distribution
 Licensee Reference 1339
 Required Operating Time: Long term
 TER Checksheet No. 30
 Licensee Submittal: J29 [40]; FRC-designated Page II.3-19

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d , 5e , 5f, 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

SUMMARY: LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate X
- Adequate Similarity Between Equipment and Test Specimen Established X
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established X
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

Provides control for safety-related equipment.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ; NUREG-0588, Cat. I ___; NUREG-0588, Cat. II ___.

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	Electric Cable	Electric Cable	
Manufacturer's Name (5.2.2/-/-)	Simplex	Opkonite	X
Model Number (5.2.2/-/-)	PE/PVC	EPOR	X see note p-5f
Serial Number			
Features/Mounting (5.2.6/-/-)			
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation			
Equipment ID No.			
<u>QUALIFICATION REPORT</u>			
(8.0/5.0/5.0)			
Report ID Number			
Report Date			
Issued by			
Prepared for			
Referenced Reports			
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)			
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)			
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

NOTES:

Note - The manufacturer and materials of the installed cable are different from the manufacturer and materials discussed in the referenced report.

Since the only harsh parameter is radiation, the licensee should determine whether there is radiation data on the installed materials which would provide evidence of qualification.



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NRC Contract No. NRC-03-79-118
 FRC Project No. C5257
 FRC Assignment No. 13
 FRC Task No. 463

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 1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

Equipment Item No. 31
 Electrical Penetrations Located Within Containment
 Chicago Bridge & Iron, Field Fabricated
 Electrical Distribution
 Licensee References 3 and 20
 Required Operating Time: Long term
 TER Checksheet No. 31
 Reference 37, Section 4.6.5
 Licensee Submittal: J19 [40]; FRC-designated Page II.3-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

(R), T, (Q1), RT, P, H, CS, (A), S, (R), M, I, (QM), RPN, EXN, SEN, (QI), RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b, 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/~~has not~~) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/~~or~~ will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/~~has not~~) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action not scheduled refueling outage.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	_____
Qualified Life or Replacement Schedule Established (If Required)	<u>X</u>
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	<u>X</u>
o Steam Exposure (If Required) Adequate	<u>X</u>
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	<u>X</u>
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	<u>X</u>
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	_____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

LICENSEE RESPONSE TO NRC SER

Due to advances in equipment design, this equipment is slated to be replaced during the next available outage consistent with equipment delivery time requirements.

A long-term requirement of one year has been assumed.

100% relative humidity has been assumed for conservatism.

A 40-year qualified life requirement has been assumed.

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

Yankee Rowe believes FRC's initial concerns relative to the electrical penetrations were adequately answered by Yankee Rowe's response (TER, pages 4-62 and 4-63). In FRC's evaluation of Yankee Rowe's response, additional concerns are raised relative to the analysis of materials for radiation and aging.

The penetrations at Yankee Rowe are located in sealed enclosures outside the shield wall and are attached to the containment steel shell which is the main heat sink to normal ambient temperature conditions. Therefore, the normal conditions at the penetrations with respect to aging parameters of temperature and radiation are essentially a mild environment. Therefore, no advanced aging of the seal materials should be expected, and leakage testing of the containment and the penetrations through plant life have not demonstrated indications of aging degradation.

In addition, calculations completed on the effect of a LOCA or MSLB on O-Ring seal temperatures indicate that maximum seal ring temperature is within the continuous operating temperature rating of the materials of the O-Ring. Also review of various DBE and aging test data on materials of the same generic family, performed by cable vendors, solenoid valve manufacturers, and motor-operated valve manufacturers for similar applications (O-Ring, or seals) indicate that the materials in question perform very well under the service conditions of temperature, pressure and radiation expected at Yankee Rowe.

With regard to the concerns relative to the coaxial penetration potting compound and seals, we believe these were resolved by filling the entire penetration with the potting compound and performing a successful retest, as reported in TER Reference 2.5.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31LICENSEE RESPONSE TO NRC SER (Continued)

The failure of the Teflon insulator in the cable coupler within the coaxial penetration due to an accident dose greater than 10E5 is not significant because the coaxial signals through these penetrations are only used for neutron monitoring purposes. They are not required for post-accident monitoring or accident mitigation. New penetrations (Worksheet J-31) were installed during the recent refueling shutdown to carry post-accident monitoring signals which require coaxial cable penetrations (Worksheet AM-1).

FRC's concern relative to short circuit heating effects is related more toward auxiliary electrical equipment than to penetration design. As previously indicated, this topic is being addressed in the SEP review and will be resolved in the integrated assessment.

Yankee Rowe believes it has demonstrated the adequacy of the CB&I penetrations for continued operation by addressing each of FRC's concerns. However, FRC concludes that consideration should be given to replacement of the penetrations due to their age. As noted above, no general aging degradation has been found through the life of the penetrations. However, Yankee Rowe replaced several penetrations during the recent refueling shutdown to accommodate newly installed equipment, and in the process was rewired instruments on the following worksheets through the new penetrations: AM-1, FW-4, MC-3, MC-4, PR-1, and PR-7. Yankee Rowe intends to further upgrade the penetrations by rewiring equipment on the following worksheets through new penetrations: AR-1, HV-1, MC-10, SC-1, SI-6, and SI-9. With this change, all equipment in containment which is required to function in LOCA or MSLB environments will be wired through fully qualified penetrations by the next scheduled refueling outage.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

Equipment Item No. 32
 Electrical Penetration Assembly Located Within Containment
 Westinghouse, Model Not Stated
 Electrical Distribution
 Licensee References 51 and 52
 Required Operating Time: Long term
 TER Checksheet No. 32
 Licensee Submittal: J31 [40]; FRC-designated Page II.3-21

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | <input checked="" type="checkbox"/> IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available X

See Page 3a



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-013 worksheet.)

A long-term requirement of one year has been assumed.

100% relative humidity has been assumed due to saturated steam conditions.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

c & d These are W Proprietary and cannot be copied w/o W permission.

[41]



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

Equipment Item No. 33
 Seal Assembly Located Within Containment
 Conax, Model Not Stated
 Electrical Connection
 Licensee References 816 and 1049
 Required Operating Time: Long term
 TER Checksheet No. 33
 Licensee Submittal: J36 [40]; FRC-designated Page II.3-31

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QI, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h , 5i , 5j 5e ₂ ,
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| <u>I.a</u> Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

LICENSEE RESPONSE TO NRC SER

(Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

Checksheets 5a thru 5g have been removed due to the
proprietary nature of information contained therein.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

Equipment Item No. 34
 Terminal Block Located Outside Containment (Location not specified)
 Marathon Special Products Model 6012-B
 Electrical Distribution
 Licensee References 1417 and 3358
 Required Operating Time: Long term
 TER Checksheet No. 34
 Licensee Submittal: J37 [40]; FRC-designated Page II.3-33

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d, 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

- (1) A long-term requirement of one year has been assumed.
- (2) This area is ventilated with outside air.
- (3) A 40-year qualified life requirement has been assumed.
- (4) The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ; NUREG-0588, Cat. I ___; NUREG-0588, Cat. II ___.

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
--	-----------------------	--------------------------------	----------------------------------

EQUIPMENT DESCRIPTION
 Equipment Type

Terminal
 Block

Terminal Block

Manufacturer's Name
 (5.2.2/-/-)

MARATHON

MARATHON

Model Number (5.2.2/-/-)

60 12 B

Series 300

See NME 1
 p-5d

Serial Number

Features/Mounting
 (5.2.6/-/-)

Connections/Interfaces
 (5.2.6/-/-)

Location/Elevation

Equipment ID No.

QUALIFICATION REPORT
 (8.0/5.0/5.0)

Report ID Number

PEN-TR-80-8

Report Date

March 10, 1980

Issued by

Wentworth

Prepared for

Seabrook

Referenced Reports

Qualification Method
 (5.1, 5.3/2.1, 2.4/2.1, 2.4)

QUALIFICATION TEST PROGRAM
 Functional Test Description
 (5.2.5/2.2.9/2.2.9)

Operating Conditions
 (-/2.2.10/2.2.10)

Load/Cycles/Voltage/
 Current/Freq.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)			
Radiation Type	<i>gamma</i>	<i>gamma</i>	
Radiation Dose (rd) (4.1.2/1.4/1.4)	<i>5 x 10⁶</i>	<i>220 x 10⁶</i>	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	<i>NA</i>	<i>1.3 x 10⁶ Rd/h</i>	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	<i>NA</i>	<i>NA</i>	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	<i>NA</i>	<i>NA</i>	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	<i>NA</i>	<i>NA</i>	
Plateout Dose Considered (-/1.48/1.48)	<i>NA</i>	<i>NA</i>	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	<i>NA</i>	<i>NA</i>	

Note 1 - Serial the only harsh parameter is radiation the series 300 phenolic block is an acceptable sample for the 6000 series blocks which are made from the same phenolic according to material.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 35

Equipment Item No. 35
 Terminal Blocks Located Within Containment
 Westinghouse Model 542247
 Electrical Distribution
 Licensee References 23 and 1200
 Required Operating Time: Long term
 TER Checksheet No. 35
 Reference 37, Section 4.6.4
 Licensee Submittal: J18 [40]; FRC-designated Page II.3-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

(R), T, Q1, RT, P, H, CS, (A), S, (R), M, I, (QM), RPN, EXN, SEN, (QI), RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b, 3c, 3d
System Consideration Review	4a, 4b, 4c, 4d, 4e, 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 35

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (~~has~~/~~has not~~) provided a response to the SER concerns.
- The Licensee (~~has~~/~~has not~~) specifically stated that the equipment is qualified and ~~or~~ will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (~~has~~/~~has not~~) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (~~has~~/~~has not~~) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (~~has~~/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|--|--------------------------------|
| <input checked="" type="radio"/> I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 35

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

This equipment item was previously evaluated in Reference 37. See page 1A Equipment Item description.

See page 5 f



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 35

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

A long-term requirement of one year has been assumed.

100% relative humidity has been assumed for saturated steam conditions.

A 40-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

In the TER, FRC notes that YAEC has committed to replace these terminal blocks, and suggests they be replaced with splices. Since YAEC has not committed to replacement, we believe FRC's assumption was drawn from its review of Documentation Reference 2.4, relative to a meeting with YAEC and NRC. At that meeting YAEC and NRC discussed in detail the qualification of the Westinghouse terminal blocks, and YAEC committed to replace the then existing Marathon blocks on safety circuits in containment with the qualified Westinghouse terminal blocks. YAEC has not since committed to replace the Westinghouse blocks as they are still considered by YAEC to be adequately qualified.

FRC's concerns are related to aging degradation during the installed life of the plant and a Sandia test report. Since the blocks are located outside the shield wall and in protective enclosures which are immediately adjacent to the steel vapor containment shell, their normal environmental conditions in relation to temperature and radiation are essentially a mild environment; or normal, ambient, background conditions. The Sandia test report addresses failures of terminal blocks within enclosures, but the Westinghouse blocks were tested in an open, borated steam environment and did not fail. In addition, Yankee Rowe has no spray system.

To reaffirm its position that the Westinghouse terminal blocks are adequately qualified, Yankee Rowe had a consultant perform an independent review. This review confirmed the Yankee Rowe position, so Yankee Rowe believes that these terminal blocks will adequately perform their function under the postulated conditions.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 35

NOTES:

The licensee has presented information which resolves the comments of the T.E.R. However periodic cleaning and inspections of the terminal blocks are necessary to assure continued performance.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

Equipment Item No. 36
 Contactor with Control Transformer Located in the Primary Auxiliary Building
 ITE/Gould Model A103C12
 Electrical Distribution
 Licensee Reference 3353
 Required Operating Time: 30 days
 TER Checksheet No. 36
 Licensee Submittal: J27 [40]; FRC-designated Page II.3-15

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | <u>III.b</u> Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure: _____
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
(If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review X
- IV Documentation Not Made Available _____

The SCEW sheet one year dose of 3.6×10^5 Rad would only be 3×10^4 Rad at 30 days (and even less at 24 hours for the cycling requirement in SCEW sheet Note-1. Since there are no other harsh parameters it is considered that this equipment is only exposed to a mild environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

LICENSEE RESPONSE TO NRC SER

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

The valves served by these contactors will be required to operate within 24 hours.

This area is ventilated with outside air.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 37

Equipment Item No. 37
 Contactor with Control Transformer
 ITE/Gould Model 2032-T3
 Electrical Distribution
 Licensee Reference 3353
 Required Operating Time: 30 days
 TER Checksheet No. 37
 Licensee Submittal: J27 [40]; FRC-designated Page II.3-15-A

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 37

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | <u>III.b</u> Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review X
- IV Documentation Not Made Available _____

The SCEW sheet 1 yr. dose of 3.6×10^5 rd.
 would only be 3.0×10^4 rd at 30 days (and even
 less at 24 hours for the valve cycling
 requirement in SCEW sheet note-1. Since there
 are no other haul parameters it is considered
 that this equipment is only exposed to a mild
 environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

LICENSEE RESPONSE TO NRC SER

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

The valves served by these contactors will be required to operate within 24 hours.

This area is ventilated with outside air.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 38

Equipment Item No. 38
 Motor Starter Located in the Primary Auxiliary Building
 Westinghouse Model A210M1CAT
 Electrical Distribution
 Licensee reference not cited
 Required Operating Time: 30 days
 TER Checksheet No. 38
 Licensee Submittal: J28 [40]; FRC-designated Page II.3-17

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 38

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified ~~and/or~~ will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (A new MCC will be installed during the next refueling outage)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action next refueling outage.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| <u>I.b</u> Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 38

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification X _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

See equipment item 36, 37



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 38

LICENSEE RESPONSE TO NRC SER

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

YAEC proposes to use a new motor control center instead of these contactors. The new MCC will be installed during the next refueling outage.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 39

Equipment Item No. 39
 Motor Control Center Located in the Primary Auxiliary Building
 Westinghouse, Model Not Stated
 480-V ac Distribution
 Licensee Reference 46
 Required Operating Time: 24 hours
 TER Checksheet No. 39
 Licensee Submittal: J35 [40]; FRC-designated Page II.3-29

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable new item

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
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Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a , 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 39

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/~~has not~~) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action next refueling outage.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | <u>III.b</u> Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 39

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review X
- IV Documentation Not Made Available _____

*See note on page 2 of item 36
 and 37*



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 39

LICENSEE RESPONSE TO NRC SER

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.

YAEC proposes to use a new motor control center instead of this unit. The new MCC will be installed during the next refueling.

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

Equipment Item No. 40
 Motor Control Center Located in the Primary Auxiliary Building
 Westinghouse Electric Co., Model Not Stated
 Distribution for 480 Volt Emergency Power (MCC-2)
 Licensee References 13 and 46
 Required Operating Time: Long term
 TER Checksheet No. 40
 Reference 37, Section 4.7.9
 Licensee Submittal: EPS4 [40]; FRC-designated Page II.5-7

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--|
| I.a Qualified | <input checked="" type="checkbox"/> II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) X
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified _____
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified X
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

LICENSEE RESPONSE TO NRC SER/TER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

Provides electrical power for essential components which are required for long-term operation.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assumed.

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	MCC	MCC	ANALYSIS STATES MATERIALS ARE THE SAME
Manufacturer's Name (5.2.2/-/-)	(W)	GE	
Model Number (5.2.2/-/-)	GENERAL	GENERAL	
Serial Number	NA	NA	
Features/Mounting (5.2.6/-/-)	↓	↓	
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation			
Equipment ID No.	↓	↓	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	EDS-02-0570-1066	EDS-02-0570-1066	
Report Date	NOT STATED		
Issued by	EDS	EDS	
Prepared for	YAEC	YAEC	
Referenced Reports	NA	NA	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	ANALYSIS	ANALYSIS	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)			
Operating Conditions (-/2.2.10/2.2.10)			
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

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)	NA	NA	
Accuracy (5.2.5/-/-)	NA	NA	
Number of Specimens	NA	NA	
Test Instruments Calibrated	NA	NA	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	Active	Active	
Test Duration (5.2.1/-/-)	NA	NA	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	1 Year	NA	
Required Function Time	1 year	Not stated	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	NA	NA	
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	NA	NA	
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)	Not stated	Not stated	
Thermal Aging/Basis			
Material Aging Evaluation (7.0/-/-)	Not stated	"	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	Not stated	"	
Radiation Aging, Type	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd,	NA	NA	
Radiation Aging, Dose Rate	NA	NA	
Radiation Aging, Method	NA	analysis	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	NA	various > 10 ⁶ rd	
Operational Aging (-/4.2/-)	NA	NA	
Other Age Conditioning (-/4.2/-)	NA	NA	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 yrs.	NA	
Normal Ambient Temperature Normal Ambient Radiation Normal Ambient Humidity	Not stated	NA	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	Yes	NA	
On-Going Analysis of Failures and Degradation (7.0/-/-)	Yes	NA	
Margin (General) (6.0/3.0/3.0)	NA	NA	
Margin (NUREG-0588, Cat. I) (-/3.2/-)			
1. Temperature (+15°F)	NA	NA	
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. 40

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)	NA	NA	
Radiation Type	gamma	gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	3.6×10^5	> 10 ⁶	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	NA analysis	NA analysis	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	NA	NA	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	NA	NA	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	NA	NA	
Plateout Dose Considered (-/1.48/1.48)	NA	NA	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

Equipment Item No. 41
 Switchgear Located in the Primary Auxiliary Building
 General Electric Model AKD-5
 Distribution for 480-Volt Emergency Power
 Licensee References 13 and 3359
 Required Operating Time: Long term
 TER Checksheet No. 41
 Reference 37, Section 4.7.8
 Licensee Submittal: EPS3 [40]; FRC-designated Page II.5-5

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

The Licensee (has/has not) provided a response to the SER concerns.

The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.

The Licensee has presented information which shows there are no outstanding qualification deficiencies.

The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.

Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.

Corrective action specified by the Licensee:

Equipment replacement with qualified equipment

Equipment modification

Equipment relocation above submergence level

Relocate or shield equipment from radiation source

Verify qualification by additional (testing/analysis)

Equipment relocation to a mild environment

Qualification testing of equipment in progress

Other (_____)

The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.

The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)

The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

I.a Qualified

I.b Modification

II.a Qualification Not Established

II.b Not Qualified

II.c Qualified Life Deficiency

III.a Exempt

III.b Not in Scope

IV Documentation Not Available



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

LICENSEE RESPONSE TO NRC SER/TER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

Provides 480V power to essential equipment which is required for long-term operability.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assured.

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 44

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	Switchgear	Switchgear	
Manufacturer's Name (5.2.2/-/-)	GE	GE	
Model Number (5.2.2/-/-)	AK DS	AK series	
Serial Number	NA	NA	
Features/Mounting (5.2.6/-/-)	NA	NA	
Connections/Interfaces (5.2.6/-/-)	NA	NA	
Location/Elevation	NA	NA	
Equipment ID No.	NA	NA	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	ⓐ Action 15421-23	ⓑ Action 15421-23 (119781)	
Report Date	ⓐ EDS 020570- 1066	ⓑ EDS #02-0570-1066	
Issued by	ⓐ Action ⓑ EDS	ⓐ ACTION ⓑ EDS	
Prepared for	YAFEC	YAFEC	
Referenced Reports	NA	NA	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	analysis	analysis	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	NA	NA	
Operating Conditions (-/2.2.10/2.2.10) Load/Cycles/Voltage/ Current/Freq.	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

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)	NA	NA	
Accuracy (5.2.5/-/-)	NA	NA	
Number of Specimens	NA	NA	
Test Instruments Calibrated	NA	NA	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	Active	Active	
Test Duration (5.2.1/-/-)	NA	NA	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	1 year	NA	
Required Function Time	1 year	NA	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	NA	NA	
Test Sequence (NUREG-0588, Cat. I) (-/2.3.1/-)	NA	NA	
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	Yes	ARRHENIUS	
Material Aging Evaluation (7.0/-/-)	Yes	all preser non metallic	
Materials Susceptible (Therma (5.2.4, 7.0/-/-)	yes	all non metallic	
Radiation Aging, Type	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	NA	NA	
Radiation Aging, Dose Rate	NA	NA	
Radiation Aging, Method	NA	NA	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	yes	all non-metallic	
Operational Aging (-/4.2/-)	NA	NA	
Other Age Conditioning (-/4.2/-)	NA	NA	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 yrs.	> 40y @ 35°C.	
Normal Ambient Temperature	NA	NA	
Normal Ambient Radiation			
Normal Ambient Humidity			
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	Yes	NA	
On-Going Analysis of Failures and Degradation (7.0/-/-)	Yes	NA	
Margin (General) (6.0/3.0/3.0)	NA	NA	
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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)	NA	NA	
Radiation Type	Gamma	Gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	7.5×10^5	8×10^6	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	NA analysis	NA analysis	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	NA	NA	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	NA	NA	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	NA	NA	
Plateout Dose Considered (-/1.48/1.48)	NA	NA	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	NA	NA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 42

Equipment Item No. 42
 Battery Switchboard Located in the Primary Auxiliary Building
 Westinghouse Electric Corporation Model CDP
 Distribution System for 125 V DC Emergency Power
 Licensee Reference 48
 Required Operating Time: Long term
 TER Checksheet No. 42
 Reference 37, Section 4.7.7
 Licensee Submittal: EPS2 [40]; FRC-designated Page II.5-3

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QI, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b , 5c , 5d , 5e , 5f , 5g , 5h , 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 42

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/~~has not~~) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|---|--------------------------------|
| I.a Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a</u> Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 42

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

- Documented Evidence of Qualification Adequate
- Adequate Similarity Between Equipment and Test Specimen Established
- Aging Degradation Evaluated Adequately
- Qualified Life or Replacement Schedule Established (If Required)
- Program Established to Identify Aging Degradation
- Criteria Regarding Aging Simulation Satisfied (If Required)
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate
 - o Peak Pressure Adequate
 - o Duration Adequate
 - o Required Profile Enveloped Adequately
 - o Steam Exposure (If Required) Adequate
- Criteria Regarding Spray Satisfied
- Criteria Regarding Submergence Satisfied
- Criteria Regarding Radiation Satisfied
- Criteria Regarding Test Sequence Satisfied
- Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied
- Criteria Regarding Functional Testing Satisfied
- Criteria Regarding Instrument Accuracy Satisfied
- Test Duration Margin (1 hour + Function Time) Satisfied
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)

NRC QUALIFICATION CATEGORY

DESIGNATION:
X = CATEGORY

- I.a Equipment Qualified
- I.b Equipment Qualification Pending Modification
- II.a Equipment Qualification Not Established
- II.b Equipment Not Qualified
- II.c Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified
- III.a Equipment Exempt From Qualification
- III.b Equipment Not in the Scope of the Qualification Review
- IV Documentation Not Made Available



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 42

LICENSEE RESPONSE TO NRC SER

Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

Provides electrical distribution and protection for 125V dc Battery #3 which is required for long-term operability.

This area is ventilated with outside air.

A 40-year qualified life requirement has been assumed.

This equipment will be included in the plant maintenance and surveillance program for evaluation of aging degradation.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 42

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ; NUREG-0588, Cat. I ___; NUREG-0588, Cat. II ___.

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	<i>Battery</i>	<i>Motor Control</i>	X
Manufacturer's Name (5.2.2/-/-)	<i>Switchboard</i> <i>(W)</i>	<i>Centers</i> <i>GF</i>	X
Model Number (5.2.2/-/-)			
Serial Number			
Features/Mounting (5.2.6/-/-)			
Connections/Interfaces (5.2.6/-/-)			
Location/Elevation			
Equipment ID No.			
<u>QUALIFICATION REPORT</u>			
(8.0/5.0/5.0)			
Report ID Number			
Report Date			
Issued by			
Prepared for			
Referenced Reports			
Qualification Method			
(5.1, 5.3/2.1, 2.4/2.1, 2.4)			
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description			
(5.2.5/2.2.9/2.2.9)			
Operating Conditions			
(-/2.2.10/2.2.10)			
Load/Cycles/Voltage/			
Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

Equipment Item No. 43
 Battery Located in the Primary Auxiliary Building
 C&D Company Model KU-15
 125-V dc Emergency Power
 Licensee References 53, 3361, 3362, and 3363
 Required Operating Time: Long term
 TER Checksheet No. 43
 Reference 37, Section 4.7.6
 Licensee Submittal: EPS1 [40]; FRC-designated Page II.5-1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, Q1, RT, P, H, CS, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
 Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Contents</u>	<u>Checksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, 3b , 3c , 3d
System Consideration Review	4a , 4b , 4c , 4d , 4e , 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e , 5f , 5g, 5h, 5i , 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a , 6b
Maintenance and Replacement Schedule Summary	7a, 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

- The Licensee (has/has not) provided a response to the SER concerns.
- The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.
- The Licensee has presented information which shows there are no outstanding qualification deficiencies.
- The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.
- Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.
- Corrective action specified by the Licensee:
 - Equipment replacement with qualified equipment
 - Equipment modification
 - Equipment relocation above submergence level
 - Relocate or shield equipment from radiation source
 - Verify qualification by additional (testing/analysis)
 - Equipment relocation to a mild environment
 - Qualification testing of equipment in progress
 - Other (_____)
- The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.
- The Licensee (has/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)
- The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

- | | |
|------------------------------------|--------------------------------|
| <u>I.a</u> Qualified | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| II.a Qualification Not Established | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
 X = DEFICIENCY

- Documented Evidence of Qualification Adequate _____
- Adequate Similarity Between Equipment and Test Specimen Established _____
- Aging Degradation Evaluated Adequately _____
- Qualified Life or Replacement Schedule Established (If Required) _____
- Program Established to Identify Aging Degradation _____
- Criteria Regarding Aging Simulation Satisfied (If Required) _____
- Criteria Regarding Temperature/Pressure Exposure:
 - o Peak Temperature Adequate _____
 - o Peak Pressure Adequate _____
 - o Duration Adequate _____
 - o Required Profile Enveloped Adequately _____
 - o Steam Exposure (If Required) Adequate _____
- Criteria Regarding Spray Satisfied _____
- Criteria Regarding Submergence Satisfied _____
- Criteria Regarding Radiation Satisfied _____
- Criteria Regarding Test Sequence Satisfied _____
- Criteria Regarding Test Failures or Severe Anomalies
 (If Any) Satisfied _____
- Criteria Regarding Functional Testing Satisfied _____
- Criteria Regarding Instrument Accuracy Satisfied _____
- Test Duration Margin (1 hour + Function Time) Satisfied _____
- Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I) _____

NRC QUALIFICATION CATEGORY

DESIGNATION:
 X = CATEGORY

- I.a Equipment Qualified X
- I.b Equipment Qualification Pending Modification _____
- II.a Equipment Qualification Not Established _____
- II.b Equipment Not Qualified _____
- II.c Equipment Satisfies All Requirements Except Qualified Life
 or Replacement Schedule Justified _____
- III.a Equipment Exempt From Qualification _____
- III.b Equipment Not in the Scope of the Qualification Review _____
- IV Documentation Not Made Available _____

*Qualified Life of 20 years
 established*



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

LICENSEE RESPONSE TO NRC SER

1. Qualification documents associated with this piece of equipment have been evaluated and have been found to meet the intent of the applicable standards and is therefore qualified. (Refer to latest revision of 79-01B worksheet.)

Provides 125V dc power for diesel starting, breaker control, and dc SOV's which are required for long-term operability.

This area is ventilated with outside air.

A 20-year qualified life requirement has been assumed.

The qualified life of this equipment will be maintained by the plant maintenance and surveillance program.

The maximum postulated DBE level for this environmental parameter is within normal operating limits. Equipment has been specified and designed in accordance with industry standards to operate continuously in this environment.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines X; NUREG-0588, Cat. I ; NUREG-0588, Cat. II .

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	Battery	Battery Cell	
Manufacturer's Name (5.2.2/-/-)	CAD	CAD	
Model Number (5.2.2/-/-)	KU-15	3DCU-9	None! (p-5d)
Serial Number	NA	NA	
Features/Mounting (5.2.6/-/-)	Not stated	NOT STATED	
Connections/Interfaces (5.2.6/-/-)	Not stated	NOT STATED	
Location/Elevation	PAB	NA	
Equipment ID No.	#3	NA	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	N.D.	N.D.	
Report Date	3/20/78	3/20/78	
Issued by	C&D	C&D	
Prepared for	YREC	Data Deleted	
Referenced Reports	Not stated	Wyle 43229-1 Wyle 44138-1 GEL EXANLOG TOR-5	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	Test	Test	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9, 2.2.9)	Not stated	2.0 ± Volts	
Operating Conditions (-/2.2.10/2.2.10)	Not stated	2.0 V/cell	
Load/Cycles/Voltage/ Current/Freq.			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

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)	NA	Not stated	
Accuracy (5.2.5/-/-)	NA	NA	
Number of Specimens	NA	2	
Test Instruments Calibrated	NA	Yes	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	Active	Active	
Test Duration (5.2.1/-/-)	NA	Not stated	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	1 year	NA	
Required Function Time	1 year	NA	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	Not stated	① Thermal aging	
Test Sequence (NUREG-0588, Cat. 1) (-/2.3.1/-)		② Radiation	
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)	Not stated	Arrhenius	
Thermal Aging/Basis			
Material Aging Evaluation (7.0/-/-)	Not stated	200d @ 160°F	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	Not stated	Polycarbonate	
Radiation Aging, Type	Gamma	Gamma	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	NA	NA	
Radiation Aging, Dose Rate	NA	NA	
Radiation Aging, Method	NA	NA	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	Not stated	Polycarbonate	
Operational Aging (-/4.2/-)	Not stated	NA	
Other Age Conditioning (-/4.2/-)	Not stated	NA	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	20 years	20 years @ 70°F	
Normal Ambient Temperature Normal Ambient Radiation Normal Ambient Humidity	Not stated	NA	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	Yes.	NA	
On-Going Analysis of Failures and Degradation (7.0/-/-)	Yes	NA	
Margin (General) (6.0/3.0/3.0)	NA	NA	
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)			



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>ACCIDENT CONDITIONS</u>			
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)	NA	NA	
Radiation Type	GAMMA	GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)	99×10^5	1036×10^7	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	NA	2.23×10^5 rd/hr	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	NA	NA	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	NA	NO	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	NA	NA	
Plateout Dose Considered (-/1.48/1.48)	NA	NA	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	NA	NA	

Note 1 - The manufacturer states

5.2 Both test specimens - the JDCU-9 and the LC-21 - utilized identical jar material, plate grid and active material formulation, plate separator material, vent and cover material as do all C & D stationary batteries manufactured for Class IE applications. Since the JDCU-9 met the capacity requirements, it is safe to predict that the LC-21, or any other type stationary cell, would meet meet post radiation capacity requirements.

It is therefore concluded that test specimen & installed unit are similar.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

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EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 43

MAINTENANCE AND REPLACEMENT SCHEDULE SUMMARY

The following information regarding the maintenance and replacement schedule(s) for components, sub-components, and materials has been provided by the Licensee.

*Battery life is 20 years -
replace at 20 year anniversary*

5. CONCLUSIONS

The tabulations in Section 4.2 represent a summary of the results of the equipment environmental qualification (EEQ) assessment conducted in accordance with the methodology presented in Section 3. The evaluations are based on the available qualification documentation provided by the Licensee, complemented in several cases by other relevant technical information. The major qualification deficiencies that have been identified and the results of the evaluation are shown in the Equipment Environmental Qualification Summary Forms (Tables 4-1, 4-2, 4-3, and 4-4).

Although Sections 4.3, 4.4, and Appendix C of this report present a detailed evaluation of (1) the Licensee's qualification methodology, (2) the equipment environmental qualification of each equipment item, and (3) the Licensee's response to the NRC SER, it is appropriate to highlight for the Licensee and the NRC certain conclusions and concerns reached as a result of the review which require special attention. These concerns are summarized below.

With regard to Equipment Item No. 11, the Licensee has incorrectly interpreted the conclusion in the TER [37]. Although YAEC has resolved the concern of long-term monitoring of steam generator level by adding a fully qualified transmitter, the short-term function of the existing transmitter still has not been resolved. It is therefore concluded that the ability of Equipment Item No. 11 to accomplish short-term RPS trip functions has not been established.

6. REFERENCES

The references listed in this section of the report were used to develop the Equipment Environmental Qualification evaluation for this plant. The references have been separated into two lists: (1) Plant-Specific References and (2) Plant Generic References. All non-generic documents are listed on the "Plant-Specific References" list. All qualification documents that could be applicable to equipment installed in several plants were listed on the "Plant Generic References" list. These documents include topical reports, test reports, component and material analyses, etc. cited by the Licensee as evidence of qualification in accordance with the documentation reference instructions established by IE Bulletin 79-01B. Since these documents were compiled by a computer data base, the citation numbering was computer generated and the same document has the same generic reference number in all Technical Evaluation Reports prepared under this equipment qualification program.

Throughout the text of the report, references are designated by a bracketed number; the reference numbers are not presented in sequential order.

PLANT-SPECIFIC REFERENCES

1. D. E. Vandenburg
Letter to D. G. Eisenhut, NRC. Subject: Response to Order Requiring Information on Environmental Qualification of Electrical Equipment, with Enclosure.
Yankee Atomic Electric Co., 31-Oct-80
WYR-119
2. A. Burger
Memo to Yankee Atomic Electric Co. Subject: Summary of Meeting, February 1, 1978, Concerning Yankee Rowe
USNRC, 03-Feb-78
3. J. J. Byrnes
Thermal Cycling Tests on Leak-Tightness of Seals for the Electrical Penetrations of the Yankee Vapor Container
Assoc. Nucleonics, Inc., 15-May-59
AN-115
4. R. H. Groce
Letter to Office of Nuclear Reactor Regulation, NRC.
Subject: Environmental Qualification of Electrical Penetrations
Yankee Atomic Electric Co., 12-Dec-77
WYR 77-125
5. Report: Reactor Containment Building Integrated Leak Rate Test
Yankee Atomic Electric Co., 01-May-74
1074
6. Catalog: Installation, Use and Servicing of Mineral Insulated Cable
General Cable Corp.
7. Excerpt from Test Report Summary (b.26.4)
8. Catalog Page: URAMIC Series 30000 Solenoid Valves
Atkomatic Valve Co., 06-Jun-72
URAMIC Ser. 3000

9. J. R. Hoffman
Specification for Solenoid Valves for Yankee Rowe
Hydrogen Control System
Yankee Atomic Electric Co., 05-Jun-72
YA-729-Y, Rev. 4
10. Report: Engineering Analysis #YR-ADH-80-6,
Radiation Dose Calculations
YR-ADH-80-6
11. D. E. Vandenburg
Letter to D. M. Crutchfield, NRC. Subject: Data for
Calculation of Containment Pressure and Temperature Decay
(with Attachment A)
Yankee Atomic Electric Co., 01-May-80
WYR 80-48
12. Environmental Qualification of Electrical Equipment;
Table C1: Thermal and Radiation Aging Degradation of
Selected Materials
USNRC/IE, 14-Jan-80
IEB 79-01B
13. Report: No. 02-0570-1066, Environmental Qualification of
Class 1E Electrical Equipment
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02-0570-1066
14. P. T. Young
Report: Thermal Aging Analysis of Rockbestos Firewall III
Cable for Yankee Nuclear Power Station
Acton Environmental Testing, 14-Nov-80
15421-1, Rev. 2
15. P. T. Young
Report: Thermal Aging Evaluation of Mineral Insulated
Cable for Yankee Nuclear Power Station
Acton Environmental Testing, 14-Nov-80
15421-2, Rev. 2
16. P. T. Young
Report: Thermal Aging Analysis of Rockbestos Firewall SR
Cable for Yankee Rowe Nuclear Power Station
Acton Environmental Testing, 14-Nov-80
15421-3, Rev. 1
17. P. T. Young
Report: Thermal Aging Analysis of Atkomatic Solenoid
Operated Valve for Yankee Nuclear Power Station
Acton Environmental Testing, 14-Nov-80
15421-4, Rev. 3

18. P. T. Young
Report: Thermal Aging Analysis of Cross Linked Poly-ethylene/Hypalon Cable, Manufactured by Continental Wire and Cable Company for Yankee Nuclear Power Station
Acton Environmental Testing, 14-Nov-80
15421-5, Rev. 2
19. P. T. Young
Report: Thermal Aging Analysis of Fisher & Porter Model #13D2495 Steam Generator Level Transmitter for Yankee Nuclear Power Station
Acton Environmental Testing, 11-Nov-80
15421-6, Rev. 2
20. P. T. Young
Report on Thermal Aging Analysis of Chicago Bridge and Iron Penetration Assemblies for Yankee Nuclear Power Station
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21. P. T. Young
Report of Thermal Aging Analysis of Static "O" Ring Pressure Switches for Yankee Nuclear Power Station
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22. P. T. Young
Report: Re-Evaluation of Westinghouse Fan Motors for Yankee Nuclear Power Station
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Report: Thermal Aging Analysis of Rosemount Transmitters for Yankee Nuclear Power Station
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25. P. T. Young
Report: Thermal Aging Analysis of Limitorque Valve Actuators for Yankee Nuclear Power Station
Acton Environmental Testing, 14-Nov-80
15421-20, Rev. 3

26. P. T. Young
Report: Thermal Aging Analysis of Station Batteries
for Class 1E Service at Yankee Rowe Nuclear Power Station
Acton Env. Tstg. Corp., 01-Sep-80
15421
27. I. W. Ellsworth
Letter to G. Tsouderos, YREC. Subject: Yankee Rowe
Hydrogen Control System Motors
Westinghouse, 27-Mar-73
28. L. D. White, Jr.
Letter to A. Schwencer, NRC. Subject: Environmental
Qualification of Electrical Equipment, R. E. Ginna Power
Plant
Rochester Gas & Electric, 24-Feb-78
29. Instruction Bulletin for Series 10B, 13D & 14D (2495 & 2496)
Electronic Differential Pressure Transmitters - Design
Level "B"
Fischer & Porter Co., 01-Jul-71
10B2495, Rev. 1
30. J. B. Drab
Letter to P. T. Young, Acton Environmental Testing.
Subject: Qualification Information, Yankee Rowe
Limiter Corp., 29-Sep-80
31. R. H. Groce
Letter to NRC. Subject: Systematic Evaluation Program (SEP)
Yankee Atomic Electric Co., 27-Nov-78
32. D. E. Vandenburg
Letter to D. M. Crutchfield, NRC. Subject: Environmental
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Letter to A. Schwencer, NRC. Subject: Electrical
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TER-C5257-197, Proprietary
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39. Office of Nuclear Reactor Regulation
Safety Evaluation Report for Yankee Rowe Nuclear Power
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USNRC, 29-May-81
40. J. A. Kay
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41. J. A. Kay
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APPENDIX A - ENVIRONMENTAL SERVICE CONDITIONS

This appendix contains a summary of the information concerning expected environmental service conditions in some locations within the plant (see Figure A-1), based upon the information presented in the Licensee's submittals [1, 40]. Based on these considerations, each equipment item was evaluated with respect to the environmental service conditions presented in this appendix.

Only environments resulting from loss-of-coolant accidents (LOCA) or high energy line break (HELB) accidents inside or outside containment are considered in this report. Environmental conditions used in the evaluation of environmental qualification are presented in the following sections.

Environment 1 - Inside Vapor ContainerNormal Operation [31]

Temperature	70°-95°F
Pressure	0 psig
Humidity	60% (nominal)
Radiation	0.04 to 2 rd/h

Accident Conditions

For pressurized water reactor (PWR) plants, the DOR Guidelines (Section 4) state that the environmental service conditions inside containment for a LOCA must be established by the Licensee based on the Final Safety Analysis Report (FSAR). In addition, for plants not equipped with automatic containment spray systems (as is the case for the Yankee Rowe plant), the Guidelines require that the postulated main steam line break (MSLB) accident be considered.

MSLB

Temperature	Figure A-4, Figure A-2(b)*
Pressure	Figure A-3(b)
Humidity	100%
Spray Composition	None
Radiation	Table A-1 (Stated on applicable equipment SCEW sheet)

LOCA

Temperature	Figure A-4, Figure A-2(a)*
Pressure	Figure A-3(a)
Humidity	100% (nominal)
Spray Composition	None
Radiation	Table A-1 (Stated on applicable equipment SCEW sheet)
Flooded Depth	Elev. 1057 ft (11.1 ft depth)

In the 90-day response [40] to the NRC SER [39], the Licensee (YAEC) stated the following:

"Temperature, Pressure, and Humidity Conditions Inside Containment"

A saturation temperature profile has been plotted corresponding to the containment pressure profile. This profile has been added to Figure III.1-1 [A-4 of this report] and has been labeled T_{sat} . This curve was generated in response to Reference (b) to account for higher than average temperatures in the upper regions of the containment because of potential stratification.

Due to the unique spherical shape of the YR containment, none of the components are located in the upper regions, and most components are outside the shield wall. The components within the shield wall are located at very low elevations or operate very quickly for protective functions. Therefore, we consider the use of T_{sat} for equipment qualification to be inappropriate at YR. However, we have compared T_{sat} profiles to the test profiles of equipment in containment and find that equipment tests generally envelope the T_{sat} profile."

The temperature profiles provided in the 90-day response [40] and reproduced as Figure A-4 were used in this technical evaluation report.

*Figure A-2(a) and A-2(b) were used in the evaluation contained in TER-C5257-197.

Environment 2 - Primary Auxiliary BuildingNormal Operation [3]

RHR Pump Room (When reactor is shut down--assumed to be 1% of time; otherwise, conditions are same as for open areas.)

Temperature	65°-90°F
Pressure	0 psig
Humidity	60% (nominal)
Radiation	0.005 Mrd

Other Areas

Temperature	65°-90°F
Pressure	0 psig
Humidity	60% (nominal)
Radiation	0.1 Mrd

With respect to harsh conditions outside containment resulting from a LOCA or a HELB, the Licensee states in Reference 40:

"Radiation (Inside and Outside Containment)

Figure 1 [Figure A-5 of this report] shows, by comparison, that the Yankee Gamma Dose Model is more conservative than the DOR Guidelines by 20%.

The Yankee model for both Beta and Gamma dose is a target at the center of a spherical cloud having the volume of the containment. The guidance developed by Yankee for post-LOCA radiation dose specifications (Table 1 of Attachment B, Table A1 of this report) includes a margin of safety. Table 1 (Attachment B) includes credit for shielding and equipment location. The lowest 1 year dose in the containment is 2.4×10^6 R (against the inside wall of the steam generator cubicle) which assumes the airborne source term in the cubicle is the major contributor.

High Energy Line Breaks Outside Containment

1. Feedwater Line Breaks

a) Feedline break outside the turbine building--

A feedline break in this area will not produce a harsh environment as this piping is outside and not in an enclosed area. Also, none of the equipment on the Master List of Reference (c), Appendix I is located in this area.

This break can be isolated by valves located in the turbine building. All of the normal and emergency feedwater equipment will be available to supply feedwater to the intact feedlines.

b) Feedline break inside the turbine building--

The following equipment from the Master List of Reference (c), Appendix I is located inside the turbine building:

1. containment isolation system solenoid operated valves
2. emergency feedwater flow indication flow elements and transmitters
3. emergency radiation monitors

None of this equipment is required to mitigate the consequences of this feedline break. Containment isolation is not initiated nor required for this transient. If any of the affected solenoid operated valves cause a valve isolation, the plant emergency systems will still function since they are designed to function with a complete containment isolation. Emergency feedwater flow indication is backed-up by steam generator level indication, the equipment for which is not located in the turbine building. Emergency radiation monitors are not required for this line break.

This break can be terminated by securing the normal feed pumps. Emergency feedwater can be supplied by the emergency feed pumps through the alternate feed path, all of which is located in the primary auxiliary building.

2. Steamline Breaks

a) Steamline break outside the turbine building, upstream of the non-return valves--

A steamline break in this area will not produce a harsh environment as this piping is outside and not enclosed. This break will result in the blowdown of one steam generator, leaving the other three available for decay heat removal. Also, all emergency equipment will be available since none of the equipment from the Master List Reference (c), Appendix I is located in this area.

b) Steamline break outside the turbine building, downstream of the Non-return valves--

The same discussion as above in 2(a) applies here. However, the non-return valves will function automatically to isolate all four steam generators, terminating the break, and leaving them all available for decay heat removal.

c) Steamline break inside the turbine building--

The discussion for the feedline break inside the turbine building, 1.(b), also applies here. The break will be isolated automatically by the non-return valves, leaving all four steam generators available for decay heat removal.

3. Steam Generator Blowdown Line Break

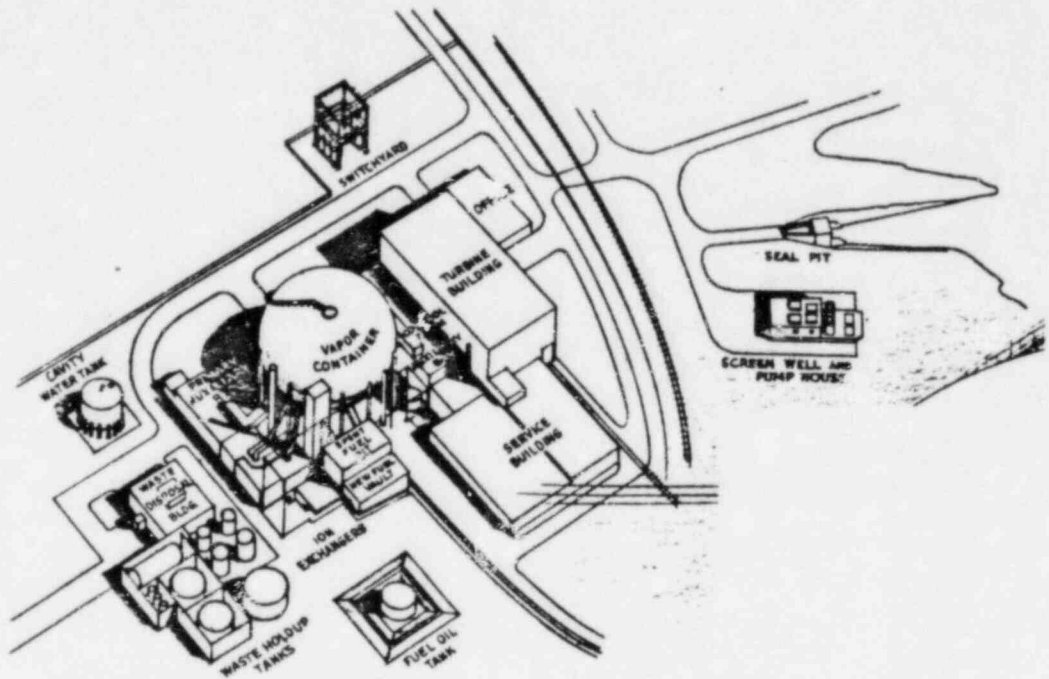
A break in a steam generator blowdown line will result in the slow blowdown of one steam generator into the upper level of the primary auxiliary building; the size of this line is only 2 inches. This break will cause temperature actuated quick acting dampers to open and vent the upper level of the primary auxiliary building, preventing the creation of a harsh environment in any other section of the primary auxiliary building.

The following equipment from the Master List of Reference (c), Appendix I is located in the upper level of the primary auxiliary building:

1. containment isolation system solenoid operated valves
2. pressure switches for containment isolation actuation
3. pressure transmitter for vapor container pressure indication
4. vapor container pressure indicator

None of this equipment is required to mitigate the consequences of a blowdown line break since it is outside containment, and all of the affected equipment is part of the containment isolation system. If the harsh environment resulting from this break causes an inadvertent containment isolation, the plant emergency systems will still function since they are designed to function with a complete containment isolation."

Since the Licensee is responsible for the parameters used in the evaluation of environmental qualification based on NRC-approved analyses, the parameters presented by the Licensee in Reference 40 and reproduced in this appendix have been used in preparing the technical evaluation report.



**FIGURE SUPPLIED
BY THE LICENSEE**

Figure A-1. Identification of Individual Buildings and Specific Areas at the Yankee Rowe Plant

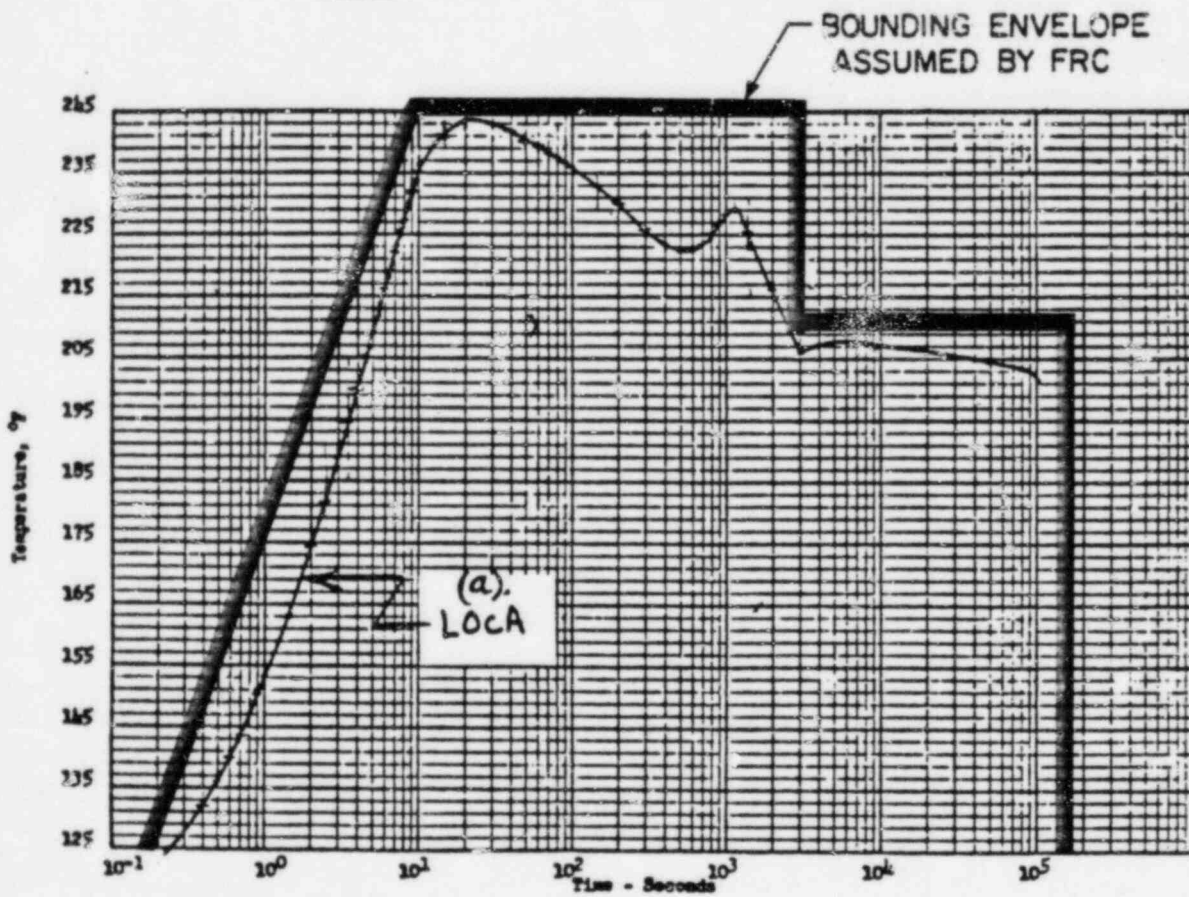
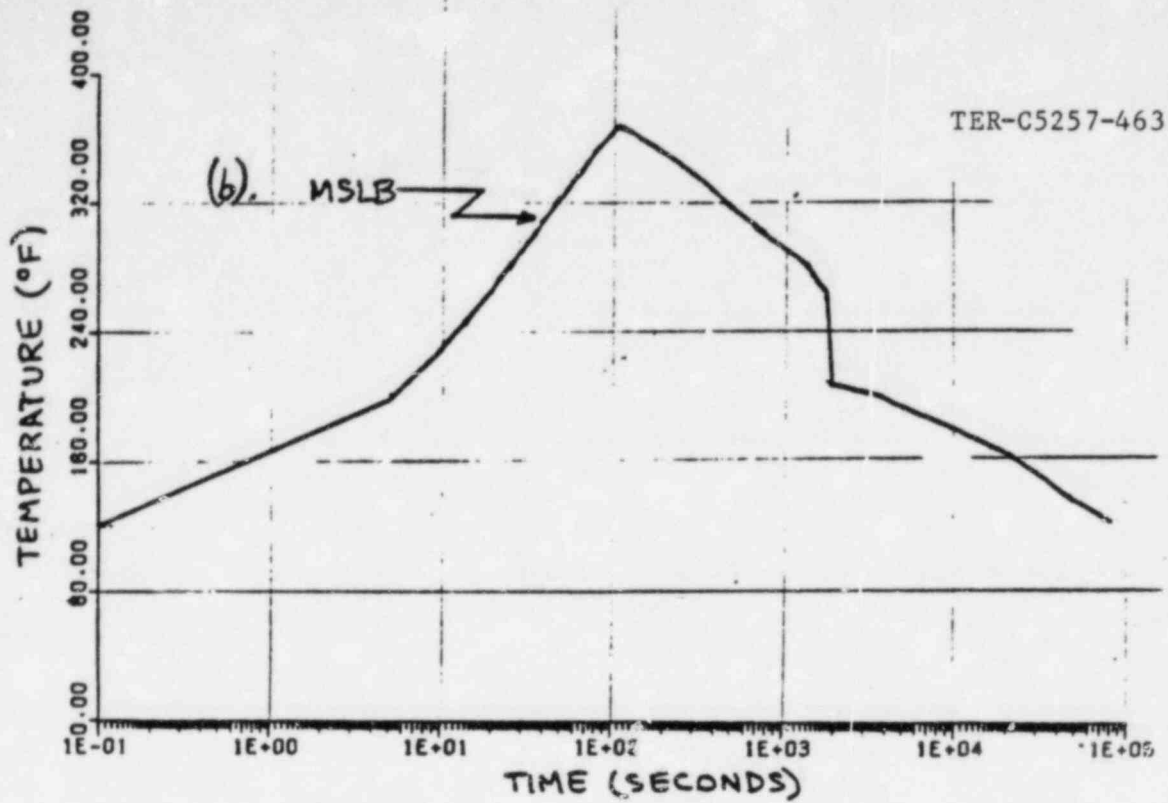


Figure A-2. Accident Condition Temperature Vs. Time Profiles Within Containment [1]

FIGURE SUPPLIED BY THE LICENSEE

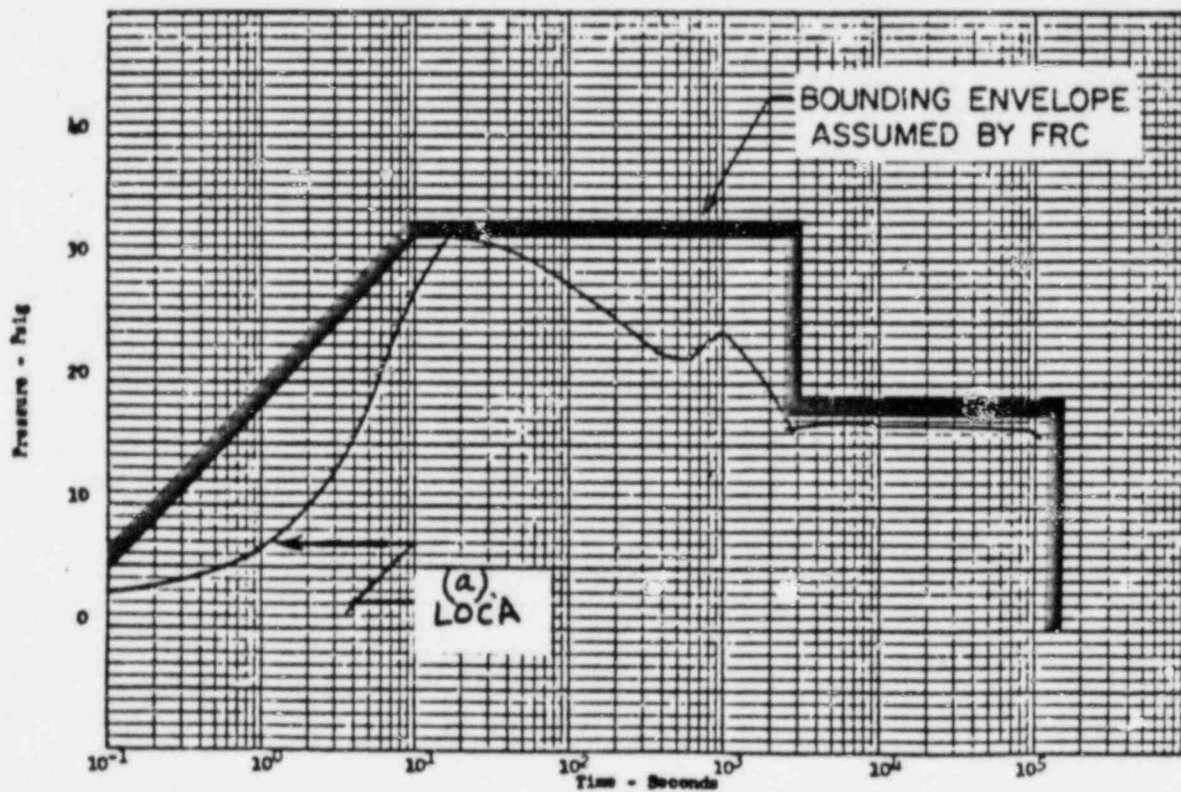
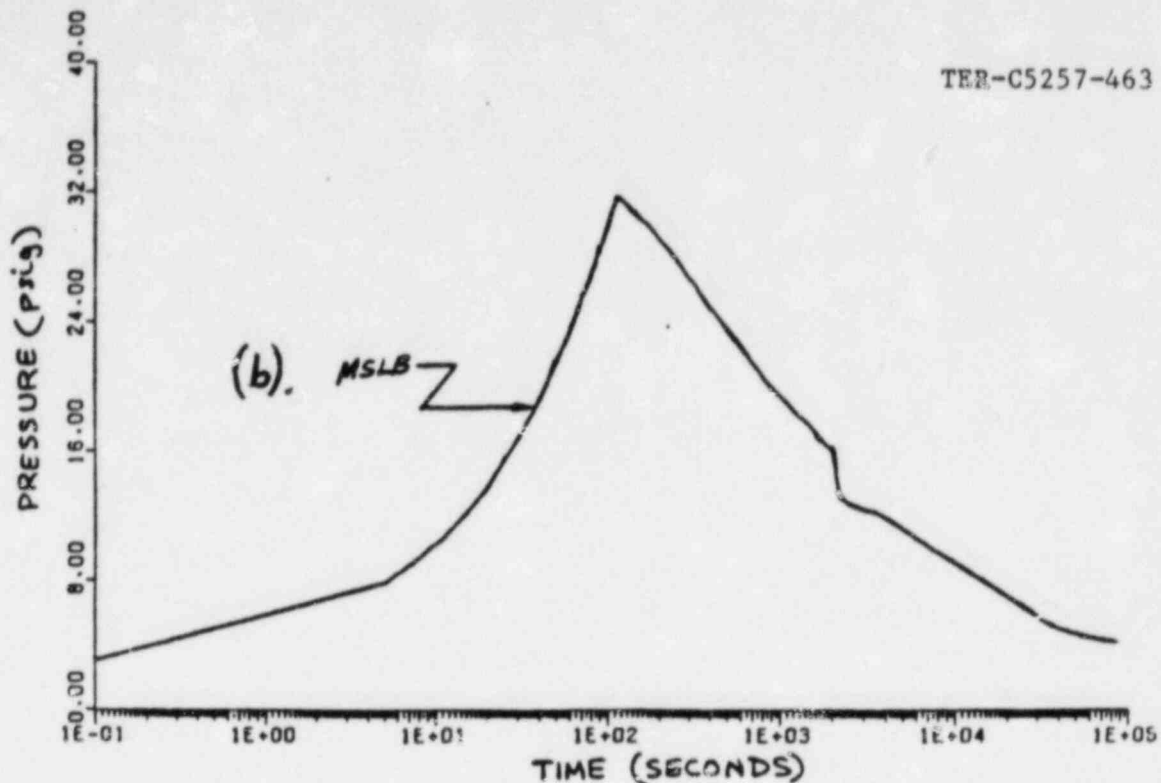


Figure A-3. Accident Condition Pressure Vs. Time Profiles Within Containment [1]

FIGURE SUPPLIED BY THE LICENSEE

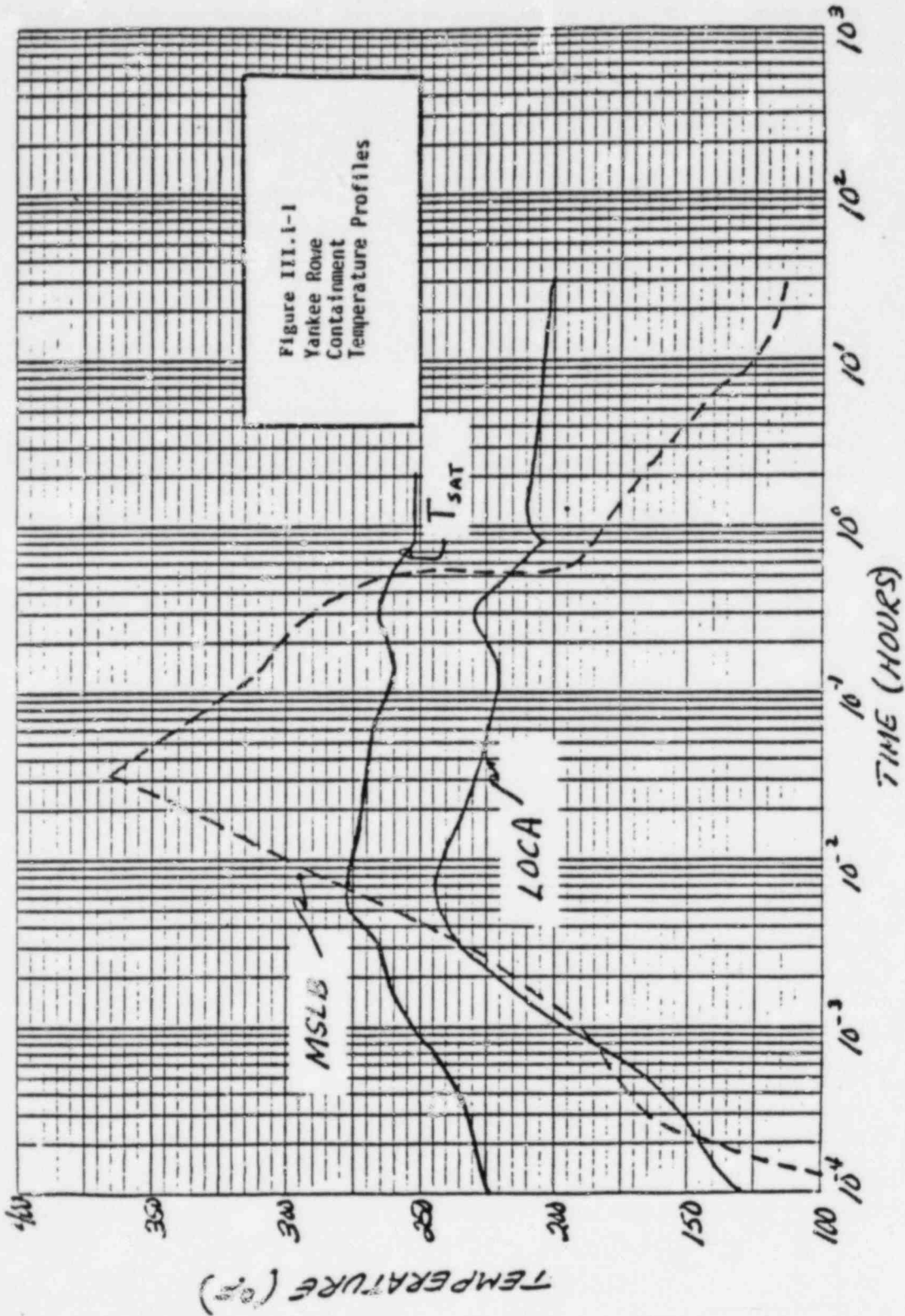
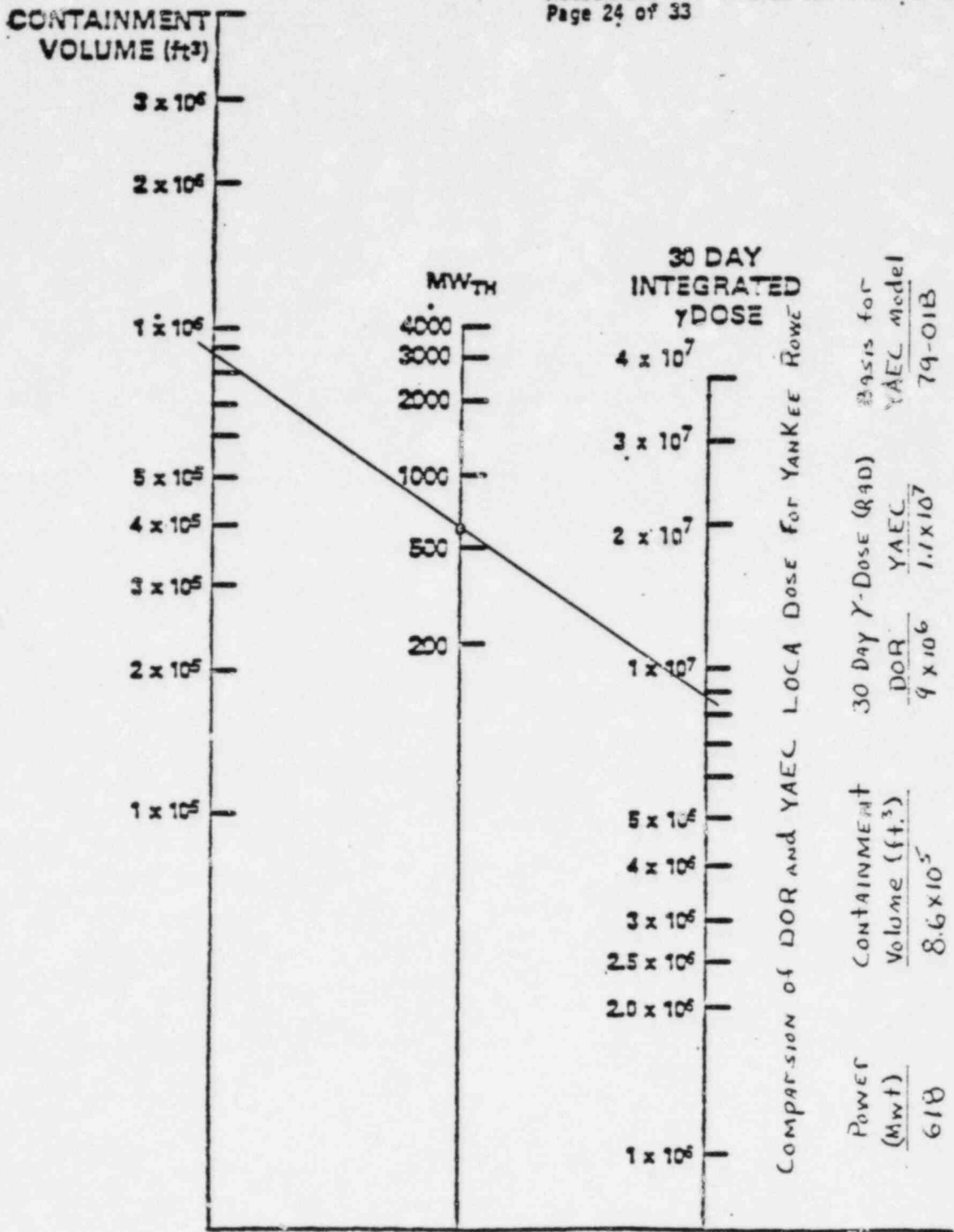


Figure A-4. Yankee Rowe Containment Temperature Profiles

FIGURE SUPPLIED
BY THE LICENSEE



*MSLB ACCIDENT DOSES SHOULD BE READ AS A FACTOR OF 10 LESS

Figure A-5. Nomogram for Containment Volume and Reactor Power LOCA Dose Corrections

Table A-1

One-Year Integrated Dose In and Around
the Primary Containment Due to the Design Basis LOCA

This table of doses is for equipment qualification and may be used to specify the maximum dose at a location provided that:

1. The location will not be immersed in water (i.e. must be above elevation 1058 if in containment)
2. The location is more than 2 feet from the surface of any recirculation fluid pipe
3. The normal operating dose rate is less than 2 R/h
4. The location is more than 1 meter from a pool of water, and the pool is less than 1 centimeter deep.

If any one of these conditions is not met, a special analysis has to be made.

<u>Applicability</u>	<u>One-Year Dose</u>
A. Any area in primary containment	1×10^8 rd
B. Same as A, but shielded by a vapor-tight enclosure of at least 20 gauge steel	2×10^7 rd
C. Same as B, but against a concrete surface which is more than 2 feet thick	1×10^7 rd
D. Same as B, but outside the biological shield	5×10^6 rd
E. Any area in the steam generator cubicles, shielded by 2 feet of concrete from containment	5×10^6 rd
F. Any location from the outside surface of the containment out to 10 meters	5×10^6 rd

APPENDIX B - LISTING OF SAFETY-RELATED ELECTRICAL EQUIPMENT

The following table lists the groupings of safety-related electrical equipment items for the Yankee Rowe Nuclear Power Plant. Equipment items provided in the table are used in the detailed equipment environmental qualification evaluation presented in Section 4.4 and summarized in Section 4.2. This table was generated from the lists of equipment provided by the Licensee [1,40].

The Licensee identified an extensive list of safety-related electrical equipment in various locations of the plant. The equipment listed by the Licensee was analyzed, and all identical equipment located within plant areas that are exposed to the same environmental service conditions was grouped together and designated an "equipment item." In this report, the term "equipment item" refers to a specific type of electrical equipment, designated by manufacturer and model, which is representative of all identical equipment in a plant area exposed to the same environmental service conditions (e.g., Flow Transmitter, Fischer & Porter, Model 10B2496, located within containment). This analysis resulted in a reduced listing of equipment (equipment items) that formed the basis for the review. This appendix contains the tabulation of the equipment items, locations, function, plant identification numbers, required operating time, and applicable qualification documentation references.

Equipment Item No. 1 (Installed equipment to be replaced by Equipment Item 2)
 Solenoid Valves Located Within Containment
 Atkomatic Model 32861-CV
 Actuates Hydrogen Vent Valves (HV-SOV-1, -2)
 Licensee References 17 and 1215
 Required Operating Time: Long term
 TER Checksheet No. 1
 Reference 37, Section 4.6.2
 Licensee Submittal: HV1 [1]; FRC-designated Page II.7-1

Equipment Item No. 2 (Replacement equipment for Equipment Item 1)
 Solenoid Valve Located Within Containment
 Valcor Model V526-5820-9
 Vapor Container Atmosphere Sampling (HV-SOV-1, -2)
 Licensee Reference 1835
 Required Operating Time: Long term
 TER Checksheet No. 2
 Licensee Submittal: HV1 [40]; FRC-designated Page II.7-1R

Equipment Item No. 3
 Motorized Valve Actuators Located in the Primary Auxiliary Building
 Limatorque Model SMB (Sizes 000, 00, and 1)
 Actuates Valves for Recirculation Mode (MOV-SI-48, -49,
 and -514 through -518)
 Licensee References 25, 42, 659, 662, 960, and 2876
 Required Operating Time: 24 hours
 TER Checksheet No. 3
 Reference 37, Section 4.3.3.5
 Licensee Submittal: SI8 [40]; FRC-designated Page II.10-7

Equipment Item No. 4
 Motorized Valve Actuators Located Within Containment
 Limatorque Model SMA-2
 Safety Injection Valve (CS-MOV-535)
 Licensee References 25, 42, 659, 662, 960, and 2876
 Required Operating Time: 0.5 hours
 TER Checksheet No. 4
 Reference 37, Section 4.5.2.1
 Licensee Submittal: SI9 [40]; FRC-designated Page II.10-9

Equipment Item No. 5
Motorized Valve Actuator Located Within Containment
Limatorque Model SMA-1
Shutdown Cooling System Isolation Valves (SC-MOV-551 through 554)
Licensee References 25, 42, 659, 662, 960, and 2876
Required Operating Time: 30 days
TER Checksheet No. 5
Reference 37, Section 4.5.2.2
Licensee Submittal: SC1 [40]; FRC-designated Page II.11-1

Equipment Item No. 6 (TMI Action Plan Item)
Radiation Detectors and Associated Cables Located Within Containment
Victoreen Model 877
High Range Radiation Monitor (RM-130, RM-131)
Licensee Reference 2883
Required Operating Time: Long term
TER Checksheet No. 6
Reference 37, Section 4.7.2
Licensee Submittal: AM1 [40]; FRC-designated Page II.1-1

Equipment Item No. 7 (TMI Action Plan Item)
Acoustic Accelerometers Located Within Containment
Babcock & Wilcox
Valve Position Indication (PR-ZE-1A, B, C)
Licensee reference not cited
Required Operating Time: Long term
TER Checksheet No. 7
Reference 37, Section 4.7.1
Licensee Submittal: PR6 [40]; FRC-designated Page II.9-3

Equipment Item No. 8 (TMI Action Plan Item)
Acoustic Transmitters Located Within Containment
Babcock & Wilcox
Valve Position Indication (PR-ZT-1A, B, C)
Licensee reference not cited
Required Operating Time: Long term
TER Checksheet No. 8
Reference 37, Section 4.7.4
Licensee Submittal: PR7 [40]; FRC-designated Page II.9-5

Equipment Item No. 9 (TMI Action Plan Item)

In-Core Thermocouples

Thermo-Electric Model WESPEC 676511

Subcooling Margin Monitor Input (MC-TD-D1, 2, 3, 4, 5, 8; MC-TD-E1, 2, 3, 4, 5; MC-TD-C2, 3, 4, 5, 6; MCTD-G3, 10; MCTD-B3, 4, 5, 7; MCTD-A4, 5; MCTD-F7; MCTD-H2, 5, 7; MCTD-K6)

Provides Continuous Temperature Indication

Licensee reference not cited

Required Operating Time: Long term

TER Checksheet No. 9

Reference 37, Section 4.6.6

Licensee Submittal: MC10 [40]; FRC-designated Page II.8-5

Equipment Item No. 10 (TMI Action Plan Item)

Level Transmitters Located in the Primary Auxiliary Building

Rosemount Model 1153A

Containment Water Level (CI-LT-240 and 241)

Licensee References 24 and 1764

Required Operating Time: Long term

TER Checksheet No. 10

Reference 37, Section 4.3.1.5

Licensee Submittal: AM2 [40]; FRC-designated Page II.1-3

Equipment Item No. 11

Level Transmitters Located Within Containment

Fischer & Porter Model 13D-2495-JBNS

Steam Generator Level Transmitters (FW-LT-1003, -1103 -1203, -1303)

Licensee References 19, 646, and 1407

Required Operating Time: Short term

TER Checksheet No. 11

Reference 37, Section 4.6.1

Licensee Submittal: FW4 [40]; FRC-designated Page II.6-1

Equipment Item No. 12 (TMI Action Plan Item)

Pressure Transmitter Located Within Containment

Rosemount Model 1152

Subcooling Margin Monitor Input (MC-PT-712)

Licensee References 24 and 1204

Required Operating Time: Long term

TER Checksheet No. 12

Reference 37, Section 4.3.2.1

Licensee Submittal: MC4 [40]; FRC-designated Page II.8-3

Equipment Item No. 13

Pressure Transmitter Located Within Containment

Rosemount Model 1153 GA9

Initiates Reactor Trip and Safety Injection (MC-PT-100, -200, -300, and -710)

Licensee References 24 and 1764

Required Operating Time: 0.1 minute

TER Checksheet No. 13

Reference 37, Section 4.3.1.2

Licensee Submittal: MC3 [40]; FRC-designated Page II.8-1

Equipment Items No. 14

Pressure Transmitter Located Within Containment

Rosemount Model 1153 GA9

Pressurizer Pressure and Subcooling Margin Monitor (PR-PT-700)

Licensee References 24 and 1764

Required Operating Time: Long term

TER Checksheet No. 14

Reference 37, Section 4.3.1.2

Licensee Submittal: PR1 [40]; FRC-designated Page II.9-1

Equipment Item No. 15

Level Transmitters Located in the Primary Auxiliary Building

Rosemount Model 1153A

Containment Pressure (CI-PT-240 and 241)

Licensee References 24 and 1764

Required Operating Time: Long term

TER Checksheet No. 15

Reference 37, Section 4.3.1.5

Licensee Submittal: AM3 [40]; FRC-designated Page II.1-5

Equipment Item No. 16

Pressure Switch Located Within Containment

Static O-Ring Model 7828-100

Safety Injection Initiation (SI-PS-14)

Licensee References 21 and 1218

Required Operating Time: 0.1 minute

TER Checksheet No. 16

Reference 37, Section 4.6.3

Licensee Submittal: SI6 [40]; FRC-designated Page II.10-5

Equipment Item No. 17
 Electric Motor Located in the Primary Auxiliary Building
 Electric Machinery Model 1C
 Drives Low Pressure Safety Injection Pump (P-48-1, P-48-2, P-48-3)
 Licensee Reference 13
 Required Operating Time: Long term
 TER Checksheet No. 17
 Reference 37, Section 4.7.11
 Licensee Submittal: SI4 [40]; FRC-designated Page II.10-1

Equipment Item No. 18
 Electric Motor Located in the Primary Auxiliary Building
 General Electric Company Model No. 5K404AK174
 Drives High Pressure Safety Injection Pump (P49-1, P49-2, P49-3)
 Licensee Reference 3642
 Required Operating Time: Long term
 TER Checksheet No. 18
 Reference 37, Section 4.7.3
 Licensee Submittal: SI5 [40]; FRC-designated Page II.10-3

Equipment Item No. 19
 Electric Motors Located Within Containment
 Westinghouse Model 72Y51238, TBFC, 15 hp
 Recirculation Fan Drive (FN-18-1, FN-18-2, FN-18-3)
 Licensee References 22, 60, 604, and 639
 Required Operating Time: Long term
 TER Checksheet No. 19
 Reference 37, Section 4.5.2.3
 Licensee Submittal: AR1 [40]; FRC-designated Page II.2-1

Equipment Item No. 20
 Electric Motor Located in the Primary Auxiliary Building
 Westinghouse Electric Corp. Model CSP
 Drives Primary Component Cooling Pump (P-20-1, P-20-2)
 Licensee Reference 13
 Required Operating Time: Long term
 TER Checksheet No. 20
 Reference 37, Section 4.7.5
 Licensee Submittal: CCI [40]; FRC-designated Page II.4-1

Equipment Item No. 21
Electric Motor Located in the Primary Auxiliary Building
Westinghouse Electric Corp. Model CSP
Drives Shutdown Cooling Pump (P-19)
Licensee reference not cited
Required Operating Time: Long term
TER Checksheet No. 21
Reference 37, Section 4.7.10
Licensee Submittal: SC2 [40]; FRC-designated Page II.11-3

Equipment Item No. 22
Electrical Cable Located in the Primary Auxiliary Building
General Cable Corp. Type XLPE
Power Distribution
Licensee References 45 and 2694
Required Operating Time: Long term
TER Checksheet No. 22
Reference 37, Section 4.3.3.4
Licensee Submittal: J34 [40]; FRC-designated Page II.3-27

Equipment Item No. 23
Electrical Cable Located in the Primary Auxiliary Building
Collyer Type XLPE/Neoprene
Control Power Distribution
Licensee References 43 and 4019
Required Operating Time: Long term
TER Checksheet No. 23
Reference 37, Section 4.3.3.2
Licensee Submittal: J32 [40]; FRC-designated Page II.3-23

Equipment Item No. 24
Electrical Cable Located in the Primary Auxiliary Building
Okonite Styrene/Butadiene
Power Distribution
Licensee References 50 and 2694
Required Operating Time: Long term
TER Checksheet No. 24
Reference 37, Section 4.3.3.3
Licensee Submittal: J33 [40]; FRC-designated Page II.3-25

Equipment Item No. 25
Electrical Cable Located Within Containment
Continental Wire & Cable Company (XLPE/Hypalon)
Instrumentation Circuitry
Licensee References 18 and 1207
Required Operating Time: Short term
TER Checksheet No. 25
Reference 37, Section 4.3.1.4
Licensee Submittal: J25 [40]; FRC-designated Page II.3-11

Equipment Item No. 26
Electrical Cable Located Within Containment
General Cable Company (Mineral Insulated)
Electric Power and Control
Licensee References 6 and 15
Required Operating Time: Long term
TER Checksheet No. 26
Reference 37, Section 4.3.3.1
Licensee Submittal: J20 [40]; FRC-designated Page II.3-5

Equipment Item No. 27
Electrical Cable Located Within Containment
Rockbestos Firewall III
Electrical Power, Instrumentation and Control
Licensee References 14 and 1391
Required Operating Time: Long term
TER Checksheet No. 27
Reference 37, Section 4.3.1.1
Licensee Submittal: J24 [40]; FRC-designated Page II.3-9

Equipment Item No. 28
Electrical Cable Located Within Containment
Rockbestos Silicone Rubber/Asbestos
Power Cable
Licensee References 16, 1208, and 1327
Required Operating Time: Long term
TER Checksheet No. 28
Reference 37, Section 4.3.1.3
Licensee Submittal: J23 [40]; FRC-designated Page II.3-7

Equipment Item No. 29
Electric Cable Located Outside Containment (Location not specified)
Simplex Butyl/PVC
Power Distribution
Licensee Reference 1339
Required Operating Time: Long term
TER Checksheet No. 29
Licensee Submittal: J26 [40]; FRC-designated Page II.3-13

Equipment Item No. 30
Electrical Cable Located Outside Containment (Location not specified)
Simplex Type PE/PVC
Electrical Distribution
Licensee Reference 1339
Required Operating Time: Long term
TER Checksheet No. 30
Licensee Submittal: J29 [40]; FRC-designated Page II.3-19

Equipment Item No. 31
Electrical Penetrations Located Within Containment
Chicago Bridge & Iron, Field Fabrication
Electrical Distribution
Licensee References 3 and 20
Required Operating Time: Long term
TER Checksheet No. 31
Reference 37, Section 4.6.5
Licensee Submittal: J19 [40]; FRC-designated Page II.3-3

Equipment Item No. 32
Electrical Penetration Assembly Located Within Containment
Westinghouse, Model Not Stated
Electrical Distribution
Licensee References 51 and 52
Required Operating Time: Long term
TER Checksheet No. 32
Licensee Submittal: J31 [40]; FRC-designated Page II.3-21

Equipment Item No. 33
Seal Assembly Located Within Containment
Conax, Model Not Stated
Electrical Connection
Licensee References 816 and 1049
Required Operating Time: Long term
TER Checksheet No. 33
Licensee Submittal: J36 [40]; FRC-designated Page II.3-31

Equipment Item No. 34
Terminal Block Located Outside Containment (Location not specified)
Marathon Special Products Model 6012-B
Electrical Distribution
Licensee References 1417 and 3358
Required Operating Time: Long term
TER Checksheet No. 34
Licensee Submittal: J37 [40]; FRC-designated Page II.3-33

Equipment Item No. 35
Terminal Block Located Within Containment
Westinghouse Model 542247
Electrical Distribution
Licensee References 23 and 1200
Required Operating Time: Long term
TER Checksheet No. 35
Reference 37, Section 4.6.4
Licensee Submittal: J18 [40]; FRC-designated Page II.3-1

Equipment Item No. 36
Contactor with Control Transformer Located in the Primary Auxiliary Building
ITE/Gould Model A103C12
Electrical Distribution
Licensee Reference 3353
Required Operating Time: 30 days
TER Checksheet No. 36
Licensee Submittal: J27 [40]; FRC-designated Page II.3-15

Equipment Item No. 37
Contactor with Control Transformer
ITE/Gould Model 2032-T3
Electrical Distribution
Licensee Reference 3353
Required Operating Time: 30 days
TER Checksheet No. 37
Licensee Submittal: J27 [40]; FRC-designated Page II.3-15-A

Equipment Item No. 38
Motor Starter Located in the Primary Auxiliary Building
Westinghouse Model A210M1CAT
Electrical Distribution
Licensee reference not cited
Required Operating Time: 30 days
TER Checksheet No. 38
Licensee Submittal: J28 [40]; FRC-designated Page II.3-17

Equipment Item No. 39

Motor Control Center Located in the Primary Auxiliary Building

Westinghouse, Model Not Stated

480-V ac Distribution

Licensee Reference 46

Required Operating Time: 24 hours

TER Checksheet No. 39

Licensee Submittal: J35 [40]; FRC-designated Page II.3-29

Equipment Item No. 40

Motor Control Center Located in the Primary Auxiliary Building

Westinghouse Electric Co., Model Not Stated

Distribution for 480 Volt Emergency Power (MCC-2)

Licensee References 13 and 46

Required Operating Time: ong term

TER Checksheet No. 40

Reference 37, Section 4.7.9

Licensee Submittal: EPS4 [40]; FRC-designated Page II.5-7

Equipment Item No. 41

Switchgear Located in the Primary Auxiliary Building

General Electric Model AKD-5

Distribution for 480-Volt Emergency Power

Licensee References 13 and 3359

Required Operating Time: Long term

TER Checksheet No. 41

Reference 37, Section 4.7.8

Licensee Submittal: EPS3 [40]; FRC-designated Page II.5-5

Equipment Item No. 42

Battery Switchboard Located in the Primary Auxiliary Building

Westinghouse Electric Corporation Model CDP

Distribution System for 125 V DC Emergency Power

Licensee Reference 48

Required Operating Time: Long term

TER Checksheet No. 42

Reference 37, Section 4.7.7

Licensee Submittal: EPS2 [40]; FRC-designated Page II.5-3

Equipment Item No. 43
Battery Located in the Primary Auxiliary Building
C&D Company Model KU-15
125-V dc Emergency Power
Licensee References 53, 3361, 3362, and 3363
Required Operating Time: Long term
TER Checksheet No. 43
Reference 37, Section 4.7.6
Licensee Submittal: EPS1 [40]; FRC-designated Page II.5-1

APPENDIX C - PLANT SAFETY-RELATED SYSTEMS AND DISPLAY INSTRUMENTATION

In accordance with the DOR Guidelines, the Licensee was directed to establish a list of systems and display instrumentation needed to mitigate the consequences of a loss-of-coolant accident (LOCA) or high energy line break (HELB) (inside or outside containment) and reach safe shutdown. The lists of safety-related systems and display instrumentation were developed from a review of plant safety analyses and emergency procedures. The display instrumentation selected included equipment needed to monitor overall plant performance as well as to monitor performance of the systems on the list. The systems list was established on the basis of the functions that must be performed in order to mitigate the consequences of a LOCA or HELB without regard to location of equipment relative to a potentially hostile environment. The NRC staff determined and verified that the systems considered by the Licensee are those required to achieve or support: (1) emergency reactor shutdown, (2) containment isolation, (3) reactor core cooling, (4) containment heat removal, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment. The systems and instrumentation list, as provided in the NRC SER [39], is contained in Section C.1 of this appendix.

In response to the NRC SER, the Licensee stated that, for all HELBs outside containment, the safety-related electrical or instrumentation equipment subjected to the resulting hostile environment was not required to mitigate the consequences of the pipe break [40]. Therefore, the Licensee considered all areas outside containment to be mild areas. In support of this contention, the Licensee provided a summary of the various HELBs and the equipment in the areas affected by the resultant environment. Since this information would affect the inclusion or exclusion of equipment to be considered for environmental qualification, the evaluation of the technical content of the Licensee's information is included in Section C.2 of this appendix.

C.1 SYSTEMS AND DISPLAY INSTRUMENTATION LIST

A. Safe Shutdown Systems

Reactor Protection System*
 Reactor Coolant System
 Charging System*
 Shutdown Cooling System+
 Auxiliary Feedwater System*
 Component Cooling System
 Service Water System
 Radiation Monitoring System*
 Sampling System*
 Emergency Diesel AC Power System*
 125 Volt DC System*
 Emergency Power Distribution System*
 Primary Auxiliary Building Ventilation System
 Control Building HVAC System
 Diesel Room Ventilation System

B. Accident Mitigating Systems (LOCA, MSLB, FWLB)

Safeguards Activation System
 Containment Isolation System
 Steam Line Isolation System
 Feedwater Isolation System
 Accumulator System
 High Pressure Safety Injection System
 Low Pressure Safety Injection System
 Recirculating Fan System
 Hydrogen Control System

C. Accident Mitigating and Safe Shutdown Instruments (LOCA, MSLB, FWLB)

RCS Pressure
 RCS Temperature
 Pressurizer Pressure
 Pressurizer Level
 Steam Generator Level
 Auxiliary Feedwater Flow
 Containment Pressure**
 Containment Sump Level**
 DWST Level
 SI Tank Level**

*Systems required for both safe shutdown and accident mitigation (see also Tables C-1 and C-2).

+System required for cold shutdown only.

**Instruments required for accident mitigation only (see also Tables C-1 and C-2).

C.2 HIGH ENERGY LINE BREAKS OUTSIDE CONTAINMENT

C.2.1 Feedwater Line Breaks

Licensee Discussion [40]

a) Feedline break outside the turbine building --

A feedline break in this area will not produce a harsh environment as this piping is outside and not in an enclosed area. Also, none of the equipment on the Master List of Reference (c), Appendix I is located in this area.

This break can be isolated by valves located in the turbine building. All of the normal and emergency feedwater equipment will be available to supply feedwater to the intact feedlines.

b) Feedline break inside the turbine building --

The following equipment from the Master List of Reference (c), Appendix I is located inside the turbine building:

1. containment isolation system solenoid operated valves
2. emergency feedwater flow indication flow elements and transmitters
3. emergency radiation monitors

None of this equipment is required to mitigate the consequences of this feedline break. Containment isolation is not initiated nor required for this transient. If any of the affected solenoid operated valves cause a valve isolation, the plant emergency systems will still function since they are designed to function with a complete containment isolation. Emergency feedwater flow indication is backed-up by steam generator level indication, the equipment for which is not located in the turbine building. Emergency radiation monitors are not required for this line break.

This break can be terminated by securing the normal feed pumps. Emergency feedwater can be supplied by the emergency feed pumps through the alternate feed path, all of which is located in the primary auxiliary building.

Evaluation

Although containment isolation solenoids and emergency radiation monitors are not required to mitigate the consequences of a HELB in the turbine building and emergency feedwater flow indication is backed up by steam

generator level indication, the existence of some backup capability is not a sufficient justification for exempting the emergency feedwater flow elements and transmitters from environmental qualification.

Conclusion

Emergency feedwater flow elements and flow transmitters are required to mitigate the consequences of a feedwater line break in the turbine building. They should be qualified for their post-accident environment.

C.2.2 Steam Line Breaks

Licensee Discussion [40]

- a) Steamline break outside the turbine building, upstream of the non-return valves--

A steamline break in this area will not produce a harsh environment as this piping is outside and not enclosed. This break will result in the blowdown of one steam generator, leaving the other three available for decay heat removal. Also, all emergency equipment will be available since none of the equipment from the Master List Reference (c), Appendix I is located in this area.

- b) Steamline break outside the turbine building, downstream of the Non-return valves--

The same discussion as above in 2(a) applies here. However, the non-return valves will function automatically to isolate all four steam generators, terminating the break, and leaving them all available for decay heat removal.

- c) Steamline break inside the turbine building--

The discussion for the feedline break inside the turbine building, 1.(b), also applies here. The break will be isolated automatically by the non-return valves, leaving all four steam generators available for decay heat removal.

Evaluation

The Licensee's position is justified except for the requirement to qualify emergency feedwater flow indication, as discussed in Section C.2.1 above.

Conclusion

Emergency feedwater flow elements and flow transmitters are required to mitigate the consequences of a steam line break in the turbine building. They should be qualified for their post-accident environment.

C.2.3 Steam Generator Blowdown Line Breaks

Licensee Position [40]

A break in a steam generator blowdown line will result in the slow blowdown of one steam generator into the upper level of the primary auxiliary building; the size of this line is only 2 inches. This break will cause temperature actuated quick acting dampers to open and vent the upper level of the primary auxiliary building, preventing the creation of a harsh environment in any other section of the primary auxiliary building.

The following equipment from the Master List of Reference (c), Appendix I is located in the upper level of the primary auxiliary building:

1. containment isolation system solenoid operated valves
2. pressure switches for containment isolation actuation
3. pressure transmitter for vapor container pressure indication
4. vapor container pressure indicator

None of this equipment is required to mitigate the consequences of a blowdown line break since it is outside containment, and all of the affected equipment is part of the containment isolation system. If the harsh environment resulting from this break causes an inadvertent containment isolation, the plant emergency systems will still function since they are designed to function with a complete containment isolation.

Evaluation

The Licensee states that temperature-actuated quick-acting dampers will prevent the creation of a harsh environment in the primary auxiliary building.

The Licensee has not specifically identified this equipment, and therefore it is not known whether the actuators are mechanical (e.g., fusible links) or electrical. If the actuators are mechanical, the qualification of this equipment is not within the scope of this review. However, if the equipment is electrical, the actuators should be qualified for the post-accident environmental service conditions to which they may be exposed.

Conclusion

The quick-acting dampers must reliably perform the function of preventing the creation of a hostile environment in the primary auxiliary building. The Licensee should identify the actuators as electrical or mechanical devices. If they are electrical, the actuators must be environmentally qualified.

TABLE C-1

ELECTRICAL EQUIPMENT WITHIN CONTAINMENT REQUIRED TO
MITIGATE VARIOUS ACCIDENTS

Equipment Item	LOCA		MSLB
	Injection Phase	Recirculation Phase*	
SC-1 Valve Actuators		X	
SI-9 Valve Actuators		X	
AR-1 Fan Motors		X	
HV-1 Solenoid Valves		X	
MC-10 Thermocouples	X	X	X
MC-4 Pressure Transmitter	X	X	X
PR-1 Pressure Transmitter	X	X	X
MC-3 Pressure Transmitter	X		
PR-6 Acoustic Accelerometers	X	X	X
PR-7 Acoustic Transmitters	X	X	X
FW-4 Level Transmitters			X
SI-6 Pressure Switches	X		
J-18 Terminal Blocks	X	X	X
J-19 Electrical Penetrations	X	X	X
J-20 Instrument Cables		X	
J-23 Power and Control Cables	X	X	
J-24 Instrumentation Cables	X	X	X
J-25 Instrumentation Cables			X
AM-1 Radiation Detector		X	

*Includes hydrogen control.

TABLE C-2

ELECTRICAL EQUIPMENT OUTSIDE CONTAINMENT REQUIRED TO
MITIGATE VARIOUS ACCIDENTS WHILE SUBJECTED TO A HARSH ENVIRONMENT

Equipment Item	LOCA		HELB Outside VC**
	Injection Phase	Recirculation Phase*	
SI-8 Motorized Valve Actuators		X	
CC-1 Electric Motors		X	X
EPS-1 Battery Banks	X	X	X
EPS-2 Battery Switchboard	X	X	X
EPS-3 Switchgear	X	X	X
EPS-4 Motor Control Center	X	X	X
SI-4 Electric Motor		X	
SI-5 Electric Motor		X	
AM-2 Level Transmitters	X	X	X
AM-3 Pressure Transmitters	X	X	X
SC-2 Electric Motors		X	X
J-31 ***		X	X
J-32 Instrumentation Cables		X	X
J-33 Power Cables		X	X
J-34 Power Cables		X	X

* Includes hydrogen control.

** FRC added the "X" in these columns, as discussed in Appendix F of
TER-C5257-197 [37].

*** Not included in Licensee submittal.

APPENDIX D - FRC REVIEW OF LICENSEE'S RESPONSE TO NRC EEQ
SER CONCERNING JUSTIFICATION FOR INTERIM OPERATION

1. BACKGROUND

The NRC Safety Evaluation Report (SER) concerning equipment environmental qualification (EEQ) states [39]:

"Subsection 4.2 identified deficiencies that must be resolved to establish the qualification of the equipment; the staff requires that the information lacking in this category be provided within 90 days of receipt of this SER. Within this period, the licensee should either provide documentation of the missing qualification information which demonstrates that such equipment meets the DOR guidelines or NUREG-0588 or commit to a corrective action (requalification, replacement, relocation, and so forth) consistent with the requirements to establish qualification by June 30, 1982. If the latter option is chosen, the licensee must provide justification for operation until such corrective action is complete."

On January 19, 1982, FRC representatives met with NRC Division of Licensing personnel at NRC offices to discuss the potential for FRC to assist the staff in the technical review of licensees' statements regarding justification for interim plant operation submitted in response to outstanding qualification deficiencies in the NRC EEQ SERs. The results of the meeting were as follows: (1) FRC was requested to proceed immediately with the technical review of licensees' justification for interim operation, (2) the format was established, and (3) the criteria for the review were established. These criteria are presented in Section 2 of this appendix.

On January 21, 1982, the NRC provided the following modification to Final Assignment 13 concerning this subject:

"The FRC review will consist of:

- c Review the licensee's justification of interim operation and provide FRC independent analysis which shows whether or not licensee provided technically sound rationale as a basis for justification for continued plant operation.

- o On January 27, 1982, FRC shall provide a list of those power reactors that have provided technically sound justification for continued operation. FRC shall also provide a list of those power reactors which have not provided technically sound justification for continued operation. In addition to the lists, FRC may provide any additional information which in FRC's judgment is necessary to support the conclusions regarding justification for continued operation."

On January 25, 1982, the completed review of the licensees' statements was presented to the NRC as a basis for justification for interim operation in the response to the NRC EEQ SER.* On February 5, 1982, at the NRC's request, NRC was provided with actual examples of licensees' responses to the NRC EEQ SER that provide adequate rationale as a basis for justification for interim operation.**

2. GENERAL DISCUSSION

In general, licensee-submitted justifications for interim operation are based on systems considerations, equipment operability evaluations, or failure-modes-and-effects analyses.

Systems considerations often involve the availability of backup equipment capable of performing the particular safety function of concern. The backup equipment is either environmentally qualified, unqualified but not exposed to a harsh environment at the same time as the primary equipment, or located so that it is unlikely that both the primary and backup equipment would be simultaneously exposed to a severe environment. In general, these systems discussions should consider (1) the possibility of a single-active failure

* C. J. Crane

Letter to R. A. Clark, NRC. Subject: Transmittal of FRC Review of Licensees' Responses to NRC EEQ SER Concerning Justification for Interim Operation
FRC, 25-Jan-82

** C. J. Crane

Letter to R. A. Clark, NRC. Subject: Transmittal of Actual Examples of Licensees' Responses to NRC EEQ SER Which Provide Adequate Rationale as a Basis for Justification of Interim Operation
FRC, 5-Feb-82

disabling the backup equipment, (2) any major differences in the characteristics of the primary and backup equipment (unless it is obvious that the equipment is essentially identical), (3) the possibility of electrical failure of the primary equipment causing an adverse effect on other safety-related equipment or power supplies, and (4) in the case of display instrumentation, the possibility of an operator being misled by the failed primary equipment. Where equipment has not been demonstrated to be qualified, some justifications discuss administrative procedures or revised operating procedures in effect. Depending upon the specific equipment involved, each of the above considerations need not be discussed in every instance, but, in general, a complete systems discussion would consider the above points.

Where equipment qualification evaluations were used, licensees generally (1) received additional information from manufacturers, (2) applied engineering judgment, (3) performed material analysis, and/or (4) used partial test data in support of the original qualification documentation. Where these evaluations were performed, the licensees determined that, although full qualification was not documented, there was sufficient evidence to suggest that the equipment would perform its intended safety function, thereby justifying interim operation until qualified equipment is installed.

Some licensees provided detailed failure-modes-and-effects analyses of electrical circuitry to demonstrate that, under all identified failure modes, the safety function of the equipment could still be accomplished.

Other justifications involved a combination of qualification information and systems information. For example, if a licensee has qualification information (such as a generic test report or other partial qualification documentation) that tends to confirm the ability of the equipment to remain operable for a specified period of time, justification for interim operation often was based upon a discussion of the required safety function being performed prior to the potential failure. This type of discussion often applies to equipment which performs a short-term trip or isolation function in the early stages of an accident.

3. PLANT-SPECIFIC REVIEW

As a result of the review, this plant was evaluated and the results documented on the "Summary of Review of Licensee's 90-Day Response" form reproduced below:

"EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)
Review of Licensees' Resolution of Outstanding Issues
From NRC Equipment Environmental Qualification
Safety Evaluation Reports

SUMMARY OF REVIEW
OF LICENSEE 90-DAY RESPONSE

Utility: Yankee Atomic Electric Company
Plant Name: Yankee Rowe
NRC Docket No. 50-29
NRC TAC No. 42526
NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 463

References:

- a. J. A. Kay
Letter to D. G. Eisenhut, NRC. Subject: Environmental Qualification
of Electrical Equipment - Response to Safety Evaluation Report for
Yankee Rowe
Yankee Atomic Electric Co., 08-Sep-81
FYR 31-132
- b. Office of Nuclear Reactor Regulation
Safety Evaluation Report for Yankee Rowe
Environmental Qualification of Safety-Related
Electrical Equipment
NRC, 29-May-81

The Licensee has submitted technical information in Reference a in response to the NRC SER [b] on environmental qualification. FRC has reviewed these documents [a,b]. As a result of this review, FRC concludes that the Licensee has stated that the equipment items are environmentally qualified; or has provided a technically sound rationale as a basis for justification for continued plant operation; or has provided a technically sound rationale or other additional information which in FRC's judgment provides a basis for justification for continued operation; with the following exceptions:

<u>Equipment Item</u>	<u>Equipment Description/ Function</u>	<u>SCEW Sheet No.</u>	<u>Status Code</u>	<u>Basis for Deficiency</u>
None				

The Licensee's response to the SER addressed and provided resolution of deficiencies identified in the SER and provided adequate rationale as a basis for justification for interim operation."

APPENDIX E - REQUEST FOR ADDITIONAL INFORMATION

This appendix contains the Request for Additional Information (RAI) that was developed during the course of the review and issued to the NRC for forwarding to the Licensee. The RAI was revised throughout the review to reflect the Licensee's response(s) to the initial RAI.

The reader is cautioned that numbers in brackets refer to citations found in the list of references at the end of this appendix and not to the citations listed in Section 6, References, of the TER.

APPENDIX E

REQUEST FOR ADDITIONAL INFORMATION

EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)
REVIEW OF LICENSEES' RESOLUTION OF OUTSTANDING ISSUES
FROM NRC EQUIPMENT ENVIRONMENTAL QUALIFICATION SAFETY
EVALUATION REPORTS (SER) AND TMI ACTION PLAN INSTALLED EQUIPMENT

Yankee Atomic Electric Company

Yankee Rowe

NRC Docket No. 50-29

November 10, 1981

NRC TAC No. 42526

Rev. 1, February 22, 1982

BACKGROUND

Franklin Research Center (FRC) of Philadelphia, Pa. is providing assistance to the U.S. Nuclear Regulatory Commission (NRC) for the equipment environmental qualification (EEQ) review of operating reactors. FRC will perform an EEQ review of the Licensee's 90-day response to outstanding issues from the NRC Equipment Environmental Qualification Safety Evaluation Report (SER) and the installed TMI Action Plan equipment. The review will be limited to safety-related equipment potentially exposed to a harsh environment. The results will be presented in the form of a technical evaluation report for each plant.

This request for additional information (RAI) is the result of an evaluation of the information provided by a letter dated September 8, 1981 [1].* FRC previously requested TMI Action Plan information by a telephone memorandum dated August 8, 1981 [2]. The Licensee states, in Reference 1, that TMI equipment was included in previous submittals.

In response to the FRC request for information, the Licensee, on February 1, 1982, transmitted the requested qualification documentation [6] with the exception of two proprietary Westinghouse reports (items A.1.c and A.1.d of this RAI). The Licensee stated that permission must be obtained from Westinghouse to copy these documents. The Licensee also stated that the Acton Report (item A.1.b) may be deleted from the list of qualification documents.

In addition to the requested reports, the Licensee submitted two evaluations: (1)**

- a. Generic material evaluation of components used in 480 V Switchgear, QDR-5435-104-0725⁽¹⁾

*Numbers in brackets refer to citations found in the list of references.

**Throughout the text, superscript numbers in parentheses indicate the revision in which the underlined material preceding the superscript was added.

b. Generic material evaluation of components used in Westinghouse battery switchboard for Yankee Rowe Nuclear Power Plant, QDR-5435-104-1951⁽¹⁾

A. FRC REVIEW OF THE LICENSEE'S 90-DAY RESPONSE TO THE NRC EEQ SER

INFORMATION REQUESTED

DATE RECEIVED BY FRC***

1. In reference to the Licensee's 90-day response [1] to the NRC SER [3] a legible single copy of each of the following qualification documents is requested in order that the FRC evaluation may proceed:

a. Report No. 02-0570-1066, "Environmental Qualification of Class 1E Electrical Equipment," EDS Nuclear, Inc.

2/8/82 [6] (1)

b. Report: "Thermal Aging Analysis of Station Batteries for Class 1E Service at Yankee Nuclear Power Station" Acton Env. Tstg. Corp., 01-Sep-80 Report No. 15421-21. (May be deleted by Licensee [6]) (1)

c. "Technical Reports and Qualification Data for Low Voltage, Control, and Instrumentation Electrical Penetrations," PEN-TR-79-07, dated January 25, 1979, Westinghouse Electric Corporation (PROPRIETARY)

d. "Technical Reports for Material Used in Modular Electrical Penetrations," PEN-TR-79-06, dated January 25, 1979 (Revision 1) (PROPRIETARY)

e. "Limitorque Valve Actuator Temperature Related to High Superheat Ambient Temperature," Report No. B0027, Revision A, 10/18/78

2/8/82 [6] (1)

***This column will be completed by FRC as the requested information is received.

DATE RECEIVED BY FRC***

- i. Acton Report No. 15421-26, "Analysis of
1E Qualification of Limitorque Valve
Actuators for Yankee Nuclear Power
Station," Rowe, Massachusetts 2/8/82 [6] (1)
- g. Report: Engineering Analysis
YR-ADH-80⁽¹⁾-5, Radiation Dose Calculations 2/8/82 [6] (1)
- h. Report: Engineering Analysis
YR-ADH-80-5⁽¹⁾, Radiation Dose Calculations 2/8/82 [6] (1)
- i. Qualification Type Test Data Report for
Class 1E Victoreen High Range Containment
Radiation Area Monitor System 2/8/82 [6] (1)
- j. YAEC Report 1253, "Yankee Rowe Post LOCA
Radiation Exposure Due to Fission and
Activation Products in the Vapor
Container," August 1981 2/8/82 [6] (1)
- k. Qualification Test Report for Rosemount
Pressure Transmitter, Model 1152, RMT
Report 117415 (Revision B) 2/8/82 [6] (1)
- l. Qualification Report for Class 1E
Equipment CC-323.74-64 Rev. 0⁽¹⁾ dated
January 31⁽¹⁾, 1980 2/8/82 [6] (1)
- m. Acton Report No. 15421-24, "Thermal Aging
of Generic Cable for Yankee Nuclear Power
Station," dated December 12, 1980 2/8/82 [6] (1)
- n. Generic Material Evaluation of Components
Used in Nuclear Control Centers 2/8/82 [6] (1)
- o. Westinghouse Electric Corp. Test Report
No. PEN-TR-80-18, "Qualification Test
Report for Marathon Series 300 Terminal
Blocks Used on the Seabrook Plant
Electrical Penetrations"
March 10, 1980 2/8/82 [6] (1)
- p. Acton Report No. 15421-23, "Thermal Aging
of AK Series Breakers for Yankee Nuclear
Power Station," dated 11/6/80 2/8/82 [6] (1)

DATE RECEIVED BY FRC***

- q. YAEC Qualification Document Review Package QDR-5435-104-0351. (Report No. 02-0570-1066 EDS Nuclear)⁽¹⁾

2/8/82 [6] (1)

B. FRC REVIEW OF INSTALLED TMI ACTION PLAN ITEMS

INFORMATION REQUESTED

DATE RECEIVED BY FRC***

1. References 1 and 4 do not provide adequate detail with respect to identification of TMI Action Plan equipment installed as of 1/1/81.
- a. Identification of all TMI Action Plan equipment installed as of 1/1/81 is requested.
- b. Identification of TMI Action Plan equipment installed with implementation dates after 1/1/81 is requested.
- c. The correlation of these equipment items with the specific sections of NUREG-0737 [5] presented below (as applicable) is requested.

IIE1.2, IIE4.2, IIE3.1, IIG1, IIF2,
IID3, IIK3.12, IIK3.9,
IIB3, IIE4.1.

[The correlation is needed to ensure review, e.g., if a transmitter is identified as a TMI Action Plan item, are the cable and terminal blocks associated with the device also identified?]

- d. The approximate installation date for the TMI Action Plan equipment items is requested so that the appropriate qualification criteria (NUREG-0588 or DOR Guidelines) can be used in the EEQ evaluation.

DATE RECEIVED BY FRC***

2. Where the Licensee has a standard Owners' Group position with respect to a NUREG-0737 technical area or has requested extensions of implementation dates, this information is requested in order to incorporate it into the review.

C. INSTRUCTIONS FOR TRANSMITTING INFORMATION REQUESTED

1. The schedule for completion of the FRC assignment requires that the Licensee provide the requested information within 3 weeks of the date of the RAI.
2. The Licensee may transmit the requested information as follows:
 - o complete package directly to the NRC project manager
 - or
 - o copy of cover letter to NRC project manager and complete package to FRC.

REFERENCES

1. J. A. Kay
Letter to D. G. Eisenhut, NRC. Subject: Environmental Qualification of Electrical Equipment - Response to Safety Evaluation Report for Yankee Rowe
Yankee Atomic Electric Co., 08-Sep-81
FYR 81-132
2. Telephone Memorandum from FRC to R. Caruso (NRC)
08-Aug-81
3. Office of Nuclear Reactor Regulation
Safety Evaluation Report for Yankee Rowe
Environmental Qualification of Safety-Related
Electrical Equipment
NRC, 29-May-81
4. D. E. Vandenburg (YAEC)
Letter to D. G. Eisenhut, NRC. Subject: Response to Order
Requiring Information on EEQ of Electrical Equipment,
with YAEC Report No. YAEC-1227
Yankee Atomic Electric Co., 31-Oct-80
WYR-119
5. NUREG-0737, "Clarification of TMI Action Plan Requirements"
NRC, November 1980
6. J. A. Kay
Letter to C. J. Crane, FRC. Subject: Transmittal of Requested
Information
Yankee Atomic Electric Co. 01-Feb-82(1)