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TECHNICAL EVALUATION REPORT

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

ALABAMA POWER COMPANY
JOSEPH M. FARLEY NUCLEAR PLANT UNIT 2

NRC DOCKET NO. 50-364

FRC PROJECT C5257

NRC TAG NO. 42534

FRC ASSIGNMENT 13

NRC CONTRACT NO. NRC-03-79-118

FRC TASK 518

Prepared by

Franklin Research Center
20th and Race Streets
Philadelphia, PA 19103

FRC Group Leader: G. J. Toman

Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

Lead NRC Engineer: P. Shemanski

January 17, 1983

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Franklin Research Center

A Division of The Franklin Institute

The Benjamin Franklin Parkway, Phila., Pa. 19103 (215) 448-1000

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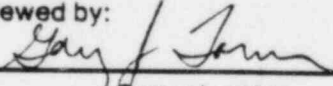
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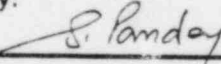
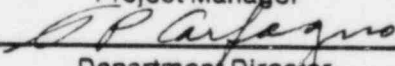
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Reviewed by:


Group Leader

Approved by:


Project Manager

Department Director



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CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1	INTRODUCTION	1-1
1.1	Purpose of the Evaluation	1-1
1.2	Scope of the Evaluation	1-1
1.3	Generic Issue Background.	1-2
1.4	Specific Issue Background	1-10
2	NRC CRITERIA FOR ENVIRONMENTAL QUALIFICATION	2-1
2.1	Criteria Provided by the NRC.	2-1
2.2	Staff Positions and Supplemental Criteria	2-1
2.2.1	Requirements and Applicable Criteria	2-1
2.2.2	Application of Requirements and Criteria to TMI Lessons Learned Implementation Equipment	2-3
2.2.3	Equipment Not in the Scope of the Qualification Review	2-4
2.2.4	Clarification of Qualification Requirements	2-5
2.2.5	Additional Clarification of Qualification Requirements	2-8
3	METHODOLOGY USED FOR THE EVALUATION	3-1
3.1	Introduction.	3-1
3.2	Methodology	3-2
3.3	NRC Qualification Categories and Definitions.	3-8
3.4	Implementation Guide for Fulfilling NRC Criteria.	3-12
4	TECHNICAL EVALUATION	4-1
4.1	Introduction.	4-1
4.2	Summary of the Evaluation	4-2
4.3	Methodology Used by the Licensee.	4-10
4.3.1	Completeness of Safety-Related Equipment List.	4-10
4.3.2	Containment Spray System	4-11
4.3.3	Environmental Service Conditions	4-11
4.3.4	Chemical Spray	4-18
4.3.5	Submergence	4-18
4.3.6	Aging and Qualified Life	4-20
4.4	Equipment Environmental Qualification Evaluation.	4-22

CONTENTS (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
5	CONCLUSIONS	5-1
6	REFERENCES	6-1

APPENDIX A - ENVIRONMENTAL SERVICE CONDITIONS

APPENDIX B - LISTING OF SAFETY-RELATED ELECTRICAL EQUIPMENT

APPENDIX C - PLANT SAFETY-RELATED SYSTEMS AND DISPLAY INSTRUMENTATION

APPENDIX D - REVIEW OF LICENSEE'S RESPONSE TO NRC EEQ
SER CONCERNING JUSTIFICATION FOR INTERIM OPERATION

APPENDIX E - REQUEST FOR ADDITIONAL INFORMATION

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.

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) [11],* 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 [2] 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 response 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 licensee 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" [7]. (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" [7], 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 [12], 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.

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.

1.4 SPECIFIC ISSUE BACKGROUND

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 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.

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. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification.

The NRC 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.

The NRC Office of Inspection and Enforcement performed an onsite verification inspection (December 2-5, 1980) of selected safety-related electrical equipment. Selected components in the reactor coolant, reactor cavity pool -LOCA dilution, containment post-LOCA air mixing, hydrogen recombiner, chemical and volume control, and containment cooling and purge systems were inspected at Unit 2. The inspection verified proper installation of equipment, overall interface integrity, and manufacturers' nameplate data. The manufacturer's name and model number from the nameplate data were compared to information given in the component evaluation work sheets (CES) of the Licensee's report. The site inspection is documented in report IE 50-364/80-49. No deficiencies were noted.

NRR performed audits on August 5 and 6, 1980 and December 17-19, 1980 of environmental qualification documentation and/or test data for 14 items. No significant concerns were identified during the IE inspection or the NRC audits.

On October 30, 1980 [1], Alabama Power Company provided the NRC with an equipment environmental qualification submittal in response to IE Bulletin 79-01B for Farley Nuclear Plant Unit 2.

On February 20, 1981 [3], Alabama Power Company submitted to the NRC further equipment environmental qualification information in response to IE Bulletin 79-01B.

The NRC issued a Safety Evaluation Report (SER) to Alabama Power Company in 1981 [4].

Requests for information [22, 25] were transmitted to the NRC by FRC to obtain qualification documentation referenced by the Licensee in its submittals, TMI Action Plan information, and correlations to NUREG-0737 [2].

By letter dated July 1, 1981 [5], Alabama Power Company transmitted to the NRC a response to the SER.

In Reference 15, 18, and 19, Alabama Power Company responded to the FRC requests for additional information.

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 [7]
- o NUREG-0588, Revision 1, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," July 1981 [14].

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 [8, 9, 10, 11]
- o NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980 [2]. 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 [10] 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			
USE NUREG-0588 AS NECESSARY	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 [10] 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 [11] 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 [10] 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 [11] 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 [10], "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 [10] 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 [10] 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 [10] 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 [10] 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."

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 [13] 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 conservatism. 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, Alabama Power Company, provided a response to the SER and additional qualification information in its submittals [5, 6, 15, 18, 19] to the NRC for Farley Nuclear Plant Unit 2.

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, 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. 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 checksheets (partially handwritten) which compile both the technical information necessary to conduct the review and the results of the evaluation. Parameters listed on these checksheets 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 checksheets 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, 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

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

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	_____

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

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

TABLE 4-
 QUALIFICATION DEFICIENCY SUMMARY

ARC REQUIREMENT	NUMBER OF DEFICIENT EQUIPMENT ITEMS
1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE-----	0
2. ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED----- [EQUIPMENT ITEM NO(S).: 1, 3, 12, 15, 18, 20, 38, 39, 40, 41]	10
3. AGING DEGRADATION EVALUATED ADEQUATELY----- [EQUIPMENT ITEM NO(S).: 1, 3, 13, 14, 18, 20, 24, 24]	7
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)----- [EQUIPMENT ITEM NO(S).: 1, 3, 4, 5, 8, 10, 13, 14, 23, 25, 26, 27]	12
5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION-----	0
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-----	0
D. - REQUIRED PROFILE ENVELOPED ADEQUATELY-----	0
E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE-----	0
8. CRITERIA REGARDING SPRAY SATISFIED----- [EQUIPMENT ITEM NO(S).: 13, 14]	2
9. CRITERIA REGARDING SUBMERGENCE SATISFIED----- [EQUIPMENT ITEM NO(S).: 4, 24, 26]	3

Table 4-2 (Cont.)

TABLE 4-2
 QUALIFICATION DEFICIENCY SUMMARY

NRC REQUIREMENT	NUMBER OF DEFICIENT EQUIPMENT ITEMS
10. CRITERIA REGARDING RADIATION SATISFIED-----	0
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED-----	0
12. CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED----- [EQUIPMENT ITEM NO(S).: 18, 20]	2
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED----- [EQUIPMENT ITEM NO(S).: 13, 14]	2
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED----- [EQUIPMENT ITEM NO(S).: 13, 14]	2
15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED---	0
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).: 7, 9, 13, 14]	4
2. EQUIPMENT MODIFICATION----- [EQUIPMENT ITEM NO(S).: 15]	1
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).: 6, 19]	2
8. OTHER (FOR DETAILED DESCRIPTION SEE SPECIFIC EQUIPMENT ITEMS)-- [EQUIPMENT ITEM NO(S).: 18, 20]	2
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED (SEE SPECIFIC EQUIPMENT ITEM FOR COMPLETION DATE)----- [EQUIPMENT ITEM NO(S).: 7, 9, 19]	3
=====	

Table 4-4

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM
=====

		FRC 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-----																
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED-----																
3.	AGI DEGRADATION EVALUATED ADEQUATELY-----	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-----																
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-----													X	X		
9.	CRITERIA REGARDING SUBMERGENCE SATISFIED-----				X												
10.	CRITERIA REGARDING RADIATION SATISFIED-----																
11.	CRITERIA REGARDING TEST SEQUENCE SATISFIED-----																
12.	CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED-----																
13.	CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED-----													X	X		
14.	CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED-----													X	X		
15.	TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED-----													X	X		
16.	CRITERIA REGARDING MARGINS SATISFIED (NUREG-0588, CAT. 1)-----																
NRC QUALIFICATION CATEGORY (DESIGNATION: X = CATEGORY)																	
I.A.	EQUIPMENT QUALIFIED-----											X					
I.B.	EQUIPMENT QUALIFICATION PENDING MODIFICATION-----						X	X		X				X	X	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-----	X															
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		X				X	X			
2.	EQUIPMENT MODIFICATION-----															X	
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 HILL EQUIPMENT-----																
7.	QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS-----						X										
8.	OTHER (_____) SPECIFIC EQUIPMENT ITEM IF CHECKED (_____)-----																
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED-----							X		X								

TER-05257-518

Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

		FRC EQUIPMENT ITEM NUMBERS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NRC REQUIREMENTS (DESIGNATION: X = DEFICIENCY)																	
1.	DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE																
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIES ESTABLISHED			X		X											
3.	AGING DEGRADATION EVALUATED ADEQUATELY			X		X											
4.	QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)																
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. - STEAK EXPOSURE (IF REQUIRED) ADEQUATE																
8.	CRITERIA REGARDING SPRAY SATISFIED																
9.	CRITERIA REGARDING SUBMERGENCE SATISFIED																
10.	CRITERIA REGARDING RADIATION SATISFIED																
11.	CRITERIA REGARDING TEST SEQUENCE SATISFIED																
12.	CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED			X		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)																
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			X		X											
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 REVIEW																
IV	DOCUMENTATION NOT MADE AVAILABLE	X	X					X	X								
CORRECTIVE ACTION SPECIFIED (DESIGNATION: X = ACTION SPECIFIED)																	
1.	EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT																
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		X											
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED						X											

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM
=====

		FRC EQUIPMENT ITEM NUMBERS										
		1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041
NFC REQUIREMENTS (DESIGNATION: X = DEFICIENCY)												
1.	DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE-----											
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED-----											
3.	AGING DEGRADATION EVALUATED ADEQUATELY-----							X	X	X	X	
4.	QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)-----											
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. - PEQUIFIED PROFILE ENVELOPED ADEQUATELY-----											
	e. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE-----											
8.	CRITERIA REGARDING SPRAY SATISFIED-----											
9.	CRITERIA REGARDING SUBMERGENCE SATISFIED-----											
10.	CRITERIA REGARDING RADIATION SATISFIED-----											
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								
I.B	EQUIPMENT QUALIFICATION PENDING MODIFICATION-----											
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-----											
III.A	EQUIPMENT EXEMPT FROM QUALIFICATION-----											
III.B	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW-----											
IV	DOCUMENTATION NOT MADE AVAILABLE-----			X	X	X	X					
CORRECTIVE ACTION SPECIFIED (DESIGNATION: X = ACTION SPECIFIED)												
1.	EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT-----											
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____)-----											
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED-----												

TER-C5257-518

4.3 METHODOLOGY USED BY THE LICENSEE

This section includes observations concerning the Licensee's qualification methodology presented in the response [5] to the NRC SER.

4.3.1 Completeness of Safety-Related Equipment List

Section 3.1 of the NRC SER [4] identified the following concern:

"Display instrumentation which provides information for the reactor operators to aid them in the safe handling of the plant was not specifically identified by the licensee. A complete list of all display instrumentation mentioned in the LOCA and HELB emergency procedures must be provided. Equipment qualification information in the form of summary sheets should be provided for all components of the display instrumentation exposed to harsh environments. Instrumentation which is not considered to be safety related but which is mentioned in the emergency procedure should appear on the list. For these instruments, (1) justification should be provided for not considering the instrument safety related and (2) assurance should be provided that its subsequent failure will not mislead the operator or adversely affect the mitigation of the consequences of the accident. The environment qualification of post-accident sampling and monitoring and radiation monitoring equipment is closely related to the review of the TMI Lessons-Learned modifications and will be performed in conjunction with that review.

The licensee identified 661 items of equipment which were assessed by the staff."

In response to this concern, the Licensee stated [5]:

"In accordance with the requirements of NUREG-0588, Alabama Power Company has conducted a review of the Emergency Operating Procedures to verify that equipment utilized by the operator for accident mitigation and that could be subjected to the accident environment is adequately qualified to perform its function. This review has determined that the subject instruments are adequately qualified to perform their intended function. Component work sheets have been completed for required instrumentation in the harsh environment.

With reference to instruments which are not fully qualified for the environment resulting from a HELB inside containment, these were included in the EOP's solely as a source of additional information for the operator. These instruments could be deleted from the EOP's if qualification for HELB inside containment was the sole determining factor for incorporation. These instruments, should they fail, would not mislead the operator because operators are trained to take actions based on a combination of plant parameters rather than indication from a single instrument. In addition, as part of the human factors review conducted by the NRC in the

licensing of Farley 2, the EOP's were reviewed and approved by the NRC, taking into account the fact that in some cases non-qualified instrumentation was listed. A listing of these instruments with appropriate justification is provided in the following attachment."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern. Refer to Appendix C of this TER for further details.

4.3.2 Containment Spray System

Section 3.2 of the NRC SER [4] identified the following concern:

"During this review, the staff assumed that for plants designed and equipped with an automatic containment spray system which satisfies the single-failure criterion, the main-steam-line-break (MSLB) environmental conditions are enveloped by the large-break-LOCA environmental conditions. The staff assumed, and requires the licensee to verify, that the containment spray system is not subjected to a disabling single-component failure and therefore satisfies the requirements of Section 4.2.1 of the DOR guidelines."

The Licensee did not respond to the NRC concern.

4.3.3 Environmental Service Conditions

4.3.3.1 Temperature, Pressure, and Humidity Conditions Inside Containment

Section 3.3 of the NRC SER [4] identified the following concern:

"The licensee has provided the results of accident analyses as follows:

	<u>Max Temp (°F)</u>	<u>Max Press (psig)</u>	<u>Humidity (%)</u>
LOCA	300	47.5	100
MSLB	381	44.8	100

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.

The licensee's temperature profile does not appear to fully envelop in all cases the saturation temperature profile recommended by the staff. The peak temperature and peak pressure conditions do not occur at the same time. The saturation temperature of 295°F at the pressure of 47.5 psig should be used instead. The licensee temperature of 272°F at 47.5 psig does not satisfy the above requirement. The licensee should update his equipment summary tables to reflect this change. If there is any equipment that does not meet the staff position, the licensee must either provide justification that the equipment will perform its intended function under the specified conditions or propose corrective action.

The licensee has provided the results of the analysis, which was performed based on the NUREG-0588, to predict the equipment surface temperature during the MSLB event. Furthermore, the licensee has also provided information to show that equipment qualification temperature is higher than expected equipment surface temperature during the MSLB event. However, the licensee has failed to list higher equipment surface temperature as the required temperature in the Component Evaluation Worksheets. The Licensee is requested to update the Component Evaluation Worksheets to reflect the higher equipment surface temperature expected due to the MSLB event as the required temperature."

The Licensee responded to the NRC concern as follows [5]:

"The containment pressure/temperature analysis and calculations of the equipment surface temperature in the harsh environment are performed using the Bechtel COPATTA computer program. COPATTA was derived from the COMTEMPT program written for the Loss-of-Fluid Test (LOFT) program. A detailed description of COPATTA is contained in Bechtel Topical Report BN-TOP-3, Revision 4, 'Performance and Sizing of Dry Pressure Containments.' This report has been reviewed and approved by the NRC.

The following discussion outlines the procedures used to model the temperature response of safety-related electrical equipment following a postulated main steam line break (MSLB). The methodology which is used to calculate the heat transfer rates to the surface of a component is taken from the NRC Interim Evaluation Model for Equipment Qualification, NUREG 0588. An outline of this methodology, which is programmed into the containment analysis code COPATTA, is given in section II.B.1. In section II.B.2 the modeling of a solenoid valve typical of those used in the Farley containment is shown to demonstrate the specific modeling techniques used.

II.B.1 METHODOLOGY FOR SAFETY RELATED COMPONENT THERMAL ANALYSIS IN SUPERHEATED CONTAINMENTS

Component thermal analyses may be performed to justify environmental qualification test conditions less than those calculated during the containment environmental response calculation. The thermal analysis

should be performed for the potential points of component failure such as thin cross-sections and temperature-sensitive parts where thermal stressing, temperature-related degradation, steam or chemical interaction at elevated temperatures, or other thermal effects could result in failure of the components electrically or mechanically. The heat transfer rate to components is calculated as follows:

a. Condensing heat transfer rate

$$q/A = h_{cd} \cdot (T_s - T_w)$$

where q/A = component surface heat flux

h_{cd} = the larger of 4x Tagami Correlation or 4x Uchida Correlation

T_s = saturation temperature (dew point)

T_w = component surface temperature.

Both the Uchida and Tagami Correlations are empirical condensing heat transfer relationships. The Uchida Correlation is based on the ratio of steam to air masses. The Tagami Correlation is based on the free containment volume and the ratio of instantaneous to maximum energy release rates.

b. Convective heat transfer

A convective heat transfer coefficient should be used when the condensing heat flux is calculated to be less than the convective heat flux. During the blowdown period, a forced convection heat transfer correlation is used. For example:

$$Nu = C (Re)^n$$

where Nu = Nusselt No.

Re = Reynolds No.

C, n = empirical constants dependent on geometry and Reynolds No.

The velocity used in the evaluation of Reynolds Number is determined as follows:

$$V = 25 \frac{M_{BD}}{V_{CONT}}$$

where V = velocity in ft/sec

M_{BD} = the blowdown rate in lbm/hr

V_{CONT} = containment volume in ft^3

After the blowdown has ceased or reduced to a negligibly low value, a natural convection heat transfer correlation is acceptable. However, use of a natural convection heat transfer coefficient must be fully justified whenever used ($h_{\text{convection}} = 2.0$).

II.B.2 COMPONENT MODELING

As an example of the modeling techniques used, the model of a three-way direct-acting solenoid valve manufactured by the Automatic Switch Company is presented in this section. This solenoid valve is typical of those in the Farley containment. Figure 1 [Figure 4-1 of this TER] shows several scaled views of the component including its internal construction. The critical region to be analyzed here is the upper housing, a four inch diameter circular cylinder, which contains the core assembly and coil used to energize the valve.

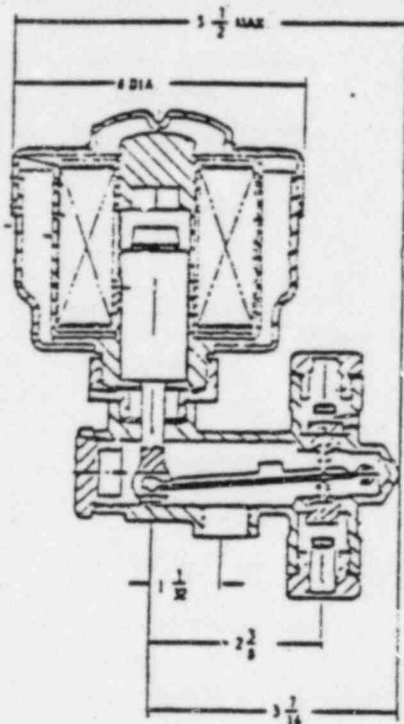
An implicit finite difference solution of the one-dimensional multi-region transient heat conduction equation is employed to determine the component's thermal response.

Mesh points, which define the length of nodes, are placed so that they lie on the external boundaries of the component, at the interface between materials, and at equal intervals between the interfaces and boundaries. The COPATTA computer code used for this analysis allows up to 20 material regions and 101 mesh points per component. A component is modeled, as appropriate, in a rectangular, a cylindrical, or a spherical geometry.

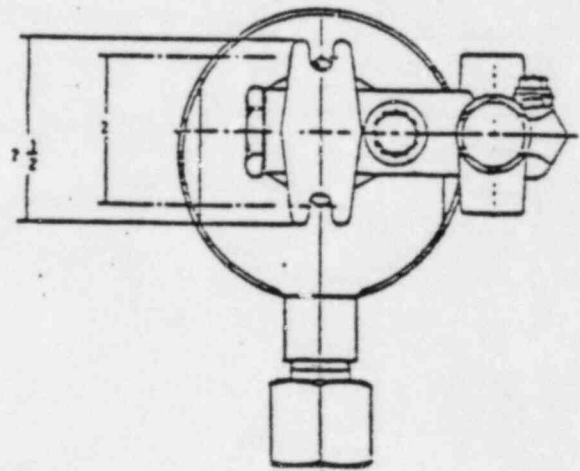
Figure 2 [Figure 4-2 of this TER] is a diagram of the valve, modeled as a cylinder with the center line on the left and the cylinder surface on the right. The material regions from left to right correspond to the steel core assembly with 15 nodes, the copper coil with 10 nodes, the steel coil housing with 10 nodes, the air gap separating the coil and housing with 40 nodes, and the painted steel upper housing with 15 nodes in the steel and 5 nodes in the paint.

Typical thermal conductivities and volumetric heat capacities for each material are also given in Figure 2. The valve's characteristic length of 2.75 inches, the height of the solenoid valve, is used in the calculation of the time dependent convective heat transfer coefficient described in section IIb. As the component is symmetrical, left side centerline boundary condition is insulated (no heat transfer). The right side surface is exposed to the containment MSLB atmosphere.

The component's temperature distribution is hence calculated by the COPATTA computer code for limiting MSLB transients. From this, the maximum surface temperature of the component can be identified and used to determine if a component is qualified for the MSLB environment.



SIDE VIEW
INTERNALS



BOTTOM VIEW

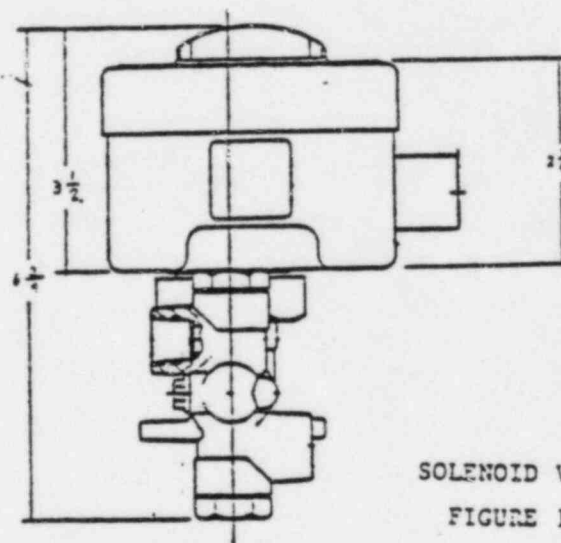


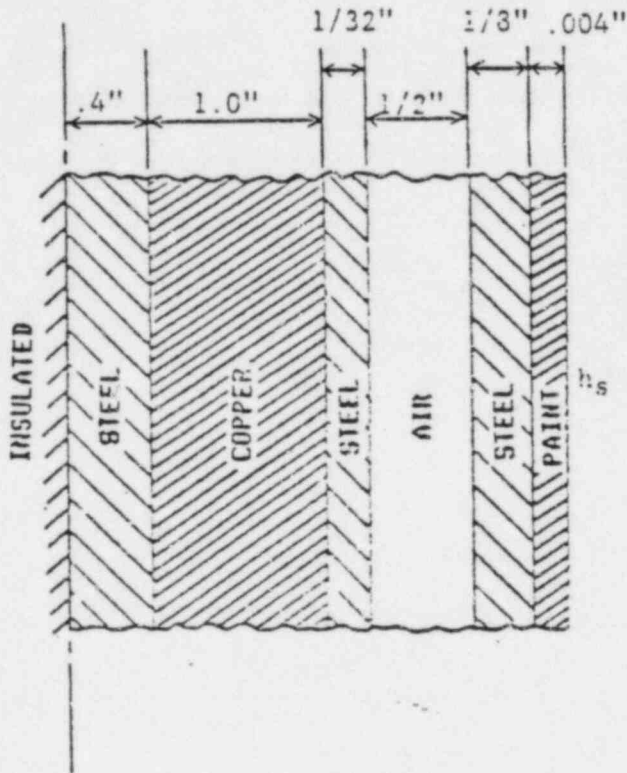
FIGURE SUPPLIED
BY THE LICENSEE

SOLENOID VALVE
FIGURE 1

SIDE VIEW

Figure 4-1. Solenoid Valve (Licensee Figure 1)

MODELED AS CYLINDER



$$K_{\text{PAINT}} = 0.5 \text{ Btu/hr-ft-}^{\circ}\text{F}$$

$$C_{\text{PAINT}} = 31.2 \text{ Btu/ft}^3\text{-}^{\circ}\text{F}$$

$$K_{\text{STEEL}} = 29.6 \text{ Btu/hr-ft-}^{\circ}\text{F}$$

$$C_{\text{STEEL}} = 53.6 \text{ Btu/ft}^3\text{-}^{\circ}\text{F}$$

$$K_{\text{AIR}} = 0.017 \text{ Btu/hr-ft-}^{\circ}\text{F}$$

$$C_{\text{AIR}} = 0.0145 \text{ Btu/ft}^3\text{-}^{\circ}\text{F}$$

$$K_{\text{COPPER}} = 227. \text{ Btu/hr-ft-}^{\circ}\text{F}$$

$$C_{\text{COPPER}} = 51.0 \text{ Btu/ft}^3\text{-}^{\circ}\text{F}$$

FIGURE SUPPLIED
BY THE LICENSEE

CHARACTERISTIC LENGTH = 2.75"

SOLENOID VALVE

FIGURE 2

Figure 4-2. Solenoid Valve (Licensee Figure 2)

Temperatures reported as qualification temperatures were in all cases the measured ambient temperature. However, analysis shows that for the qualification test steam environment, the equipment surface temperature and ambient temperature are essentially identical. Using the calculation methodology previously described the surface temperature was calculated as a function of autoclave temperature and time. For this analysis only 1x Uchida is used to conservatively calculate the heat transport to the modelled components.

The component's surface temperature approaches within 3°F of the ambient temperature in no more than about 200 seconds in a saturated steam environment. This is true of all the components types modelled. Since the qualification test procedure for all components maintained the temperature above the qualification temperature for a period of at least 20 to 240 minutes, we judge the components to be qualified.

Component Evaluation Worksheets will not be updated to reflect the higher equipment surface temperature expected due to the MSLB event. These higher temperatures have been reported in Table B.1-1."

The Licensee has responded to the NRC concern. Since the Licensee is responsible for identifying the environments, the parameters identified by the Licensee have been used in the evaluations contained in this Technical Evaluation Report. These parameters are reproduced in Appendix A.

4.3.3.2 Nuclear Radiation Dose (Inside and Outside Containment)

Section 3.8 of the NRC SER [4] identified the following concern:

"The licensee has provided values for the radiation levels postulated to exist following a LOCA. The application and methodology employed to determine these values were presented to the licensee as part of the NRC staff criteria contained in the DOR guidelines, in NUREG-0588, and in the guidance provided in IEB-79-01B, Supplement 2. Therefore, for this review, the staff has assumed that, unless otherwise noted, the values provided have been determined in accordance with the prescribed criteria. The staff review determined that the values to which equipment was qualified enveloped the requirements identified by the licensee.

The value required by the licensee inside containment is an integrated dose of 5×10^7 rads to 1×10^8 rads. This value envelopes the minimum requirements of NUREG-0588 and is therefore acceptable.

The licensee has not provided the range of required values outside containment used to specify limiting radiation levels within the auxiliary building. These values must be provided, and they should consider the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines. The licensee must

provide this range along with any corrections necessary for the associated summary sheets."

In response to this concern, the Licensee stated [5]:

"The range of required values outside the containment used to specify limiting radiation levels within the auxiliary building has been provided previously in Section C.4 of the NUREG 0588 submittal. The source term methodology associated with post-LOCA recirculation fluid lines was used to establish dose rates and integrated doses for each affected component. The radiation qualification level of each component was then compared to the calculated dose."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.4 Chemical Spray

Section 3.6 of the NRC SER [4] identified the following concern:

"The licensee's FSAR value for the chemical concentration is 2000 ppm boric acid solution; the exact volume percent used by the vendor for qualification testing should be verified by the licensee. Therefore, for the purpose of this review, the effects of chemical spray will be considered unresolved. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report."

In response to this concern, the Licensee stated [5]:

"In all cases the chemical spray portion of the equipment qualification tests utilized a boric acid solution concentration that meets or exceeds the Farley FSAR value of 2000 ppm boric acid. These concentrations are further delineated in Section III of this appendix."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.5 Submergence

Section 3.5 of the NRC SER [4] identified the following concern:

"The maximum submergence levels have been established and assessed by the licensee. Unless otherwise noted, the staff assumed for this review that the methodology employed by the licensee is in accordance with the appropriate criteria as established by Commission Memorandum and Order CLI-80-21.

The licensee's values for maximum submergence are 115 ft 0 in. in the containment and 130 ft 5 in. in the main steam room. Equipment below these levels has been identified by the licensee, along with some justifications. The licensee identified 51 safety-related electrical components for Unit 2 as having the potential for becoming submerged after a postulated event.

In these instances, the licensee stated that the components in question perform their function before becoming submerged and are not required to operate after an HELB. In each of these cases, the licensee should provide an assessment of the failure modes associated with submergence. The licensee should also provide assurance that the subsequent failure of these components will not adversely affect any other safety functions or mislead an operator. Additionally, the licensee should discuss operating time, across the spectrum of events, in relation to the time of submergence. If the results of the licensee's assessment are acceptable, then these components may be exempt from the submergence parameter of qualification."

In response to this concern, the Licensee stated [5]:

"Of the 51 safety related electrical components previously identified as having a potential for becoming submerged after a postulated event, all but 13 have been relocated above the flood level. These thirteen components are located in the containment, and include motor operated valves, solenoid valves and limit switches. In all cases, they will have performed their safety function before becoming submerged. Refer to Table II.C-1 for a comparison of operating time vs. submergence time. A failure mode and effects analysis for the three types of components is also provided.

To assure that those components potentially exposed to submergence will have completed their safety related function prior to being submerged, the rate of containment flooding was calculated. Then, based on the equipment elevation, the time to submergence was determined. The results are presented below:

TABLE II.C-1

<u>Component</u>	<u>El.</u>	<u>Time to Function</u>	<u>Time to Submergence</u>
Q2E21ZS8149A	111'	30 sec.	1260 sec.
Q2E21ZS8149B	111'	30 sec.	1260 sec.
Q2E21ZS8149C	111'	30 sec.	1260 sec.
Q2E21V038A (MOV8808A)	111'-6"	30 sec.	1390 sec.
Q2E21V038B (MOV8808B)	112'-6"	30 sec.	1660 sec.
Q2E21V038C (MOV8808C)	113'-6"	30 sec.	1950 sec.

TABLE II.C-1 (Cont.)

<u>Component</u>	<u>El.</u>	<u>Time to Function</u>	<u>Time to Submergence</u>
N2G21SV1003B	110'	30 sec.	983 sec.
N2G21ZS1003B	110'	30 sec.	983 sec.
N2G21ZS3376	109'	30 sec.	714 sec.
N2G6215V3376	109'	30 sec.	714 sec.
Q2E21SV8149AB	111'	30 sec.	1260 sec.
Q2E21SV8149BB	111'	30 sec.	1260 sec.
Q2E21SV8149CB	111'	30 sec.	1260 sec."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.6 Aging and Qualified Life

Section 3.7 of the NRC SER [4] identified the following concern:

"NUREG-0588 Category II delineates two aging program requirements. Valve operators committed to IEEE Standard 382-1972 and motors committed to IEEE Standard 334-1971 must meet the Category I requirements of the NUREG. This requires the establishment of a qualified life, with maintenance/replacement schedules based on the findings. All other equipment must be subjected to an aging program which identifies aging-susceptible materials within the components. Additionally, the staff requires that the licensee

- (1) establish an ongoing program to review surveillance and maintenance records to identify potential age-related degradations;
- (2) establish component maintenance and replacement schedules which include considerations of aging characteristics of the installed components.

The licensee identified a number of equipment items for which a specified qualified life was established (for example, 5 years, 15 years, or 40 years). In its assessment of these submittals, the staff did not review the adequacy of the methodology nor the basis used to arrive at these values; the staff has assumed that the established values are based on state-of-the-art technology and are acceptable.

For this review, however, the staff requires that the licensee submit supplemental information to verify and identify the degree of conformance to the above requirements. The response should include all the equipment identified as required to maintain functional operability in harsh environments.

The licensee indicated that this phase of the response is outstanding and that the review is in progress. The staff will review the licensee's response when it is submitted and discuss its evaluation in a supplemental report."

In response to this concern, the Licensee stated [5]:

"The safety-related valve operators and motors have been qualified by testing to meet the requirements of IEEE 382-1972 and IEEE-334-1971 respectively. For this equipment, the requirements of NUREG 0588, Category I, Section 4 have been met.

For other equipment covered by the response to NUREG 0588 where artificial (accelerated) aging methods were employed to demonstrate qualified life, the methodology in documented form has been extracted and condensed, and is presented in Section III for each type of equipment.

Where qualified life is demonstrated by methods other than accelerated aging, the methodology, together with appropriate justification for its use has been provided.

For equipment with no aging credentials, a qualified life has been established using analytical methodology based on Arrhenius models, which is acceptable to the staff. 'Weak link' age susceptible materials have been identified, and used as the basis for establishing qualified life of the equipment. Alabama Power Company will evaluate and review current surveillance and maintenance programs for possible modification for monitoring or potential age-related degradation and replacement schedules."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

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 !

! FARLEY 2 !

=====

FRC ITEM NO.	COMPONENT	MANUFACTURER	MODEL NUMBER	LOCATION
1	MOTORIZED VALVE ACTUATOR	LIXITORQUE	SMBJ SIZES 1,4T	MAIN STEAM ROOM, ELEV. 137'5"
2	MOTORIZED VALVE ACTUATOR	LIXITORQUE	SMB4	CONTAINMENT, ELEV. 111'6"
3	MOTORIZED VALVE ACTUATOR	LIXITORQUE	SMBJ SIZES 00,000	CONTAINMENT, ELEV. 126'6"
4	SOLENOID VALVE	ASCO	NP SERIES	CONTAINMENT, ELEV. 110'0"
5	SOLENOID VALVE	ASCO	NP SERIES	MAIN STEAM ROOM, ELEV. 135'0"
6	SOLENOID VALVE	TARGET ROCK	79A8001	CONTAINMENT
7	SOLENOID VALVE	AUTOMATIC VALVE	C5439	CONTAINMENT, ELEV. 89'4"
8	SOLENOID VALVE	ASCO	NP SERIES	CONTAINMENT, ELEV. 129'0"
9	SOLENOID VALVE	ASCO	HTX8320A22V	CONTAINMENT
10	SOLENOID VALVE	ASCO	HV2063814U	AUXILIARY BUILDING, ELEV. 121'0"
11	HYDROGEN RECOMBINER	WESTINGHOUSE	TYPE A	CONTAINMENT, ELEV. 155'0"
12	ELECTRIC MOTOR	JOY MANUFACTURING	TYPE P	CONTAINMENT, ELEV. 155'0"
13	RTD	ROSEMOUNT	176KS	CONTAINMENT, ELEV. 122'0"
14	RTD	ROSEMOUNT	176KF	CONTAINMENT, ELEV. 124'0"
15	RADIATION DETECTOR	VICTOREEN	8771	CONTAINMENT, ELEV. 155'0"
16	PRESSURE TRANSMITTER	BARTON	763 (LOT 2)	CONTAINMENT, ELEV. 116'0"
17	PRESSURE TRANSMITTER	BARTON	764 (LOT 2)	CONTAINMENT, ELEV. 116'0"
18	LEVEL SWITCH	DE LAVAL	LS36497	MAIN STEAM ROOM, ELEV. 133'5"
19	LEVEL SENSOR	DE LAVAL	XMS4854323	CONTAINMENT, ELEV. 80'0"
20	LEVEL TRANSMITTER	DE LAVAL	XMS36495	CONTAINMENT, ELEV. 116'0"
21	LEVEL TRANSMITTER	BARTON	764 (LOT 2)	CONTAINMENT, ELEV. 116'0"
22	FLOW TRANSMITTER	BARTON	764 (LOT 2)	CONTAINMENT, ELEV. 121'0"
23	LIMIT SWITCH	HANCO	EA180	AUXILIARY BUILDING, ELEV. 121'0"
24	LIMIT SWITCH	HANCO	EA180	MAIN STEAM ROOM, ELEV. 131'7"
25	LIMIT SWITCH	HANCO	EA180	CONTAINMENT, ELEV. 118'0" & ABOVE
26	LIMIT SWITCH	HANCO	EA180	CONTAINMENT, ELEV. 109'0"
27	LIMIT SWITCH	HANCO	EA180	CONTAINMENT
28	ELECTRICAL PENETRATION	GENERAL ELECTRIC	100 SERIES	CONTAINMENT
29	ELECTRICAL PENETRATION	GENERAL ELECTRIC	100 SERIES	CONTAINMENT, ELEV. 143'0"
30	TERMINAL BLOCK	STATES	TYPE 2-M	AUXILIARY BUILDING, ELEV. 121'0"
31	TERMINAL BLOCK	STATES	TYPE 2-M	CONTAINMENT
32	TERMINAL BLOCK	STATES	TYPE 2-M	MAIN STEAM ROOM, ELEV. 144'0"
33	TERMINAL BLOCK	STATES	TYPE 2-M	CONTAINMENT, ELEV. 135'9"
34	ELECTRICAL CABLE, INSTRUMENT	BOSTON INSULATED WIRE	LSS1802	MAIN STEAM ROOM, ELEV. 135'0" & ABOVE
35	ELECTRICAL CABLE, INSTRUMENT	BOSTON INSULATED WIRE	LSS1802	MAIN STEAM ROOM, ELEV. 116'0"
36	ELECTRICAL CABLE, INSTRUMENT	BOSTON INSULATED WIRE	LSS1802	CONTAINMENT, ELEV. 121'0"
37	ELECTRICAL CABLE, INSTRUMENT	BOSTON INSULATED WIRE	LSS1802	CONTAINMENT, ELEV. 122'9"
38	ELECTRICAL CABLE, CONTROL	ORONITE	NO	AUXILIARY BUILDING, ELEV. 121'0"
39	ELECTRICAL CABLE, CONTROL	ORONITE	NO	MAIN STEAM ROOM, ELEV. 135'0"
40	ELECTRICAL CABLE, CONTROL	ORONITE	NO	CONTAINMENT
41	ELECTRICAL CABLE, CONTROL	ORONITE	NO	CONTAINMENT, ELEV. 116'0"

TER-C5257-518



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

EQUIPMENT ITEM NO. 1
MOTORIZED VALVE ACTUATOR LOCATED IN THE MAIN STEAM ROOM, ELEV. 137'5"
LIMITORQUE MODEL SMB; SIZES 1, 4T
REQUIRED OPERATING TIME: 1 HOUR
TFR CHECKSHEET NO. 1
LICENSEE REFERENCE(S): 706
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3232A, B, C; (Q2N21V001A-B,
B-B, C-B))
SERVICE: FEEDWATER SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.15.2 [5]
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3350A, B, C; (Q2N23V001A, B,
C))
SERVICE: AUXILIARY FEEDWATER
LICENSEE SUBMITTAL: SCEW(S): C.2.16.3 [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. 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 _____.)
- ☐ 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 Qualification Not Established</u> | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



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FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
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	_____



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

COMPONENT: MOV's - OUTSIDE CONTAINMENT

NRC DEFICIENCY

AGING

APCo RESPONSE

Type test accelerated aging techniques were used to thermally age the motor operated valves to meet the requirements of IEEE 382-72. Arrhenius techniques were used to establish a qualified life. Based on this methodology, qualified life of 40 years was established.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
50

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

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

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	MVA	MOTORIZED VALVE ACTUATOR	
Manufacturer's Name (5.2.2/-/-)	LIMITORQUE	LIMITORQUE	
Model Number (5.2.2/-/-)	SMB, sizes 1, 4T	SMB-0	
Serial Number	NOT STATED	189835 (O/N 600456-A)	NOTE A
Features/Mounting (5.2.6/-/-)	NOT STATED	RELIANCE CLASS RH INSUL. MOTOR, ID# 2Y267074A1EZ, TYPE P	X - NOTE B
Connections/Interfaces (5.2.6/-/-)	NOT STATED	CONTROL & POWER LEADS THRU FLEXIBLE, PRESSURE- TIGHT CONDUIT	NOTE B
Location/Elevation	MAIN STEAM ROOM/2131'-0"	AUTOCLAVE	
Equipment ID No.	See Pg. 1a	---	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	---	600456	
Report Date	---	751201	
Issued by	---	LIMITORQUE	
Prepared for	---	LIMITORQUE	
Referenced Reports	---	LOCKHEED 352J-4811	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	---	SIMULTANEOUS AND SEQUENTIAL TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	---	VALVE ACTUATION AND IR MEASUREMENTS	
Operating Conditions (-/2.2.10/2.2.10)	NOT STATED	40 ft-#/460 Volts/60 Hz	NOTE B
Load/Cycles/Voltage/ Current/Freq.			



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

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)	—	SUCCESSFUL OPERATION OF THE MVA	
Accuracy (5.2.5/-/-)	—	—	
Number of Specimens	—	1 COMPLETE MVA AND 1 ADDITIONAL MOTOR	
Test Instruments Calibrated	—	YES	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	ACTIVE	—	
Test Duration (5.2.1/-/-)	—	30 DAYS	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	Few Seconds	—	} NOTE C
Required Function Time	1 hour (max.)	—	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	—	—	
Test Sequence (NUREG-0538, Cat. I) (-/2.3.1/-)	—	—	
1. Representative Sample	/	—	
2. Baseline Data		—	
3. Performance Extremes		—	
4. Thermal Aging		YES	
5. Radiation Aging		YES	
6. Wear Aging		YES	
7. Vibration/Seismic		YES	
8. DBE Exposure		YES	
9. Post-DBE Exposure		YES	
10. Inspection		YES	
Aging (5.2.4, 7.0/4.0/4.0)	104°F (max.) for 40 years Design	100 HOURS @ 180 C FOR THE MOTOR STATORS ONLY	X - NOTED
Thermal Aging/Basis		NO BASIS	
Material Aging Evaluation (7.0/-/-)	NONE	NO	NOTED
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	—	NOT STATED	
Radiation Aging, Type * ASSUMED	NONE	GAMMA	



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5c

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	—	4 Mrd (COMPLETE UNIT)	
Radiation Aging, Dose Rate	—	1 Mrd/Hr	
Radiation Aging, Method	—	TEST (SEQUENTIAL)	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	—	NOT STATED	
Operational Aging (-/4.2/-)	—	1208 OPEN/CLOSE CYCLES+ 803 (LOCA+POST-LOCA) CYCLES + 2184 CYCLES OF MVA WITH BASE TEST MOTOR INSTALLED	
Other Age Conditioning (-/4.2/-)	—	SEISMIC/VIBRATIONAL	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 years/ NONE	NONE	X-NOTE D
Normal Ambient Temperature *	104°F	—	
Normal Ambient Radiation	—	—	
Normal Ambient Humidity *	20-90%	—	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	yes	—	
On-Going Analysis of Failures and Degradation (7.0/-/-)	yes	—	
Margin (General) (6.0/3.0/3.0)	—	—	
Margin (NUREG-0588, Cat. I) (-/3.2/-)	/	NOT STATED, EXCEPT FOR THE POST-LOCA ADDITIONAL MVA CYCLING	
1. Temperature (+15°F)		—	
2. Pressure (+10%, 10 psig max)		—	
3. Radiation (not required)		—	
4. Time (+10%, +1 hour + function time minimum)		—	

* ASSUMED



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5d

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

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)	HELB	LOCA	
Radiation Type	NONE	GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)		200 Mrd	
Radiation Dose Rate (rd/hr)		1 Mrd/Hr	
Radiation Qual. Method (5.3.1/-/-)		TEST	
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/-/-)		204 Mrd TOTAL DOSE	
Plateout Dose Considered (-/1.48, 1.48)			
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)			



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5e

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

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	1000°F/sec; ≈ 50 psi/sec. for 0.2 sec	10F/SEC., 2.5 psig/SEC.	
Peak: °F/psig/RH/Time	308/5.8/100/ ≈ 2 sec.	310/78/100/30 min.	2 PEAKS, NOTE C
Decrease To: °F/psig/RH/Time	214/0/100/ Greater than	255/30/100/91 hours	
Decrease To: °F/psig/RH/Time	2 sec.	195/10/100/623 hours	
Decrease To: °F/psig/RH/Time		COOL TO AMBIENT	
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	TEST PER IEEE-323-1974	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	↓	3000 PPM BORON(0.28 molar H ₃ BO ₃), 0.064 molar Na ₂ S ₂ O ₃ NaOH to pH of 10.5 @ 77°F	
Spray Density (gpm/ft ²)		1.2 gpm	
Spray Duration	↓	24 hours (ASSUMED)	
Submergence Duration (4.1.3/2.2.5/2.2.5)	NONE	—	
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. 1

NOTES:

"X" DENOTES APPROPRIATE NOTES

- X 1. The Licensee has not provided documentation from the manufacturer which establishes similarity between the installed equipment and the test specimen in the referenced document(s).
- X 2. The Licensee has not identified the class of the insulation system used for the motor in the motorized valve actuator.
- X 3. The Licensee has not identified whether or not this motorized valve actuator incorporates a motor-brake assembly.
- X 4. The Licensee has not identified the class of the insulation system used for the motor-brake assembly (if applicable).
- X 5. The Licensee has not identified the motor manufacturer for this motorized valve actuator.
- X 6. The Licensee has not identified the manufacturer of the motor-brake assembly (if applicable).
- X 7. The Licensee has not identified the type of current used in the motorized valve actuator.
- X 8. The Licensee has not identified the type of current used in the motor-brake assembly (if applicable).
- X 9. The Licensee has not established a qualified life estimate for this motorized valve actuator based on technically justifiable methods and conservative assumptions.
10. The Licensee has stated that the only harsh parameter that this motorized valve actuator is exposed to is radiation.
11. Since radiation is stated to be the only harsh parameter and considering the extensive radiation testing of the motors used in this type of motorized valve actuator, the specified radiation dose of is considered to be of sufficiently low value as to not affect this equipment item. This equipment item is considered qualified for this parameter.
12. The Licensee has committed to replace this equipment item. The Licensee has stated the following:



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

NOTES:

A. The licensee has not provided any serial and/or order number(s) on the System Component Evaluation Worksheets (SCEWs) for this equipment item.

B. The licensee has not fully identified the installed equipment (see page 5f) to the point where similarity to the test specimen can be established, nor has the licensee provided documentation from the manufacturer (Limitorque) which would establish similarity via their records.

C. The test profile and simulated accident conditions envelop the required conditions adequately. The test duration also envelopes the required accident duration.

D. The thermal aging performed in PGR #706 was limited to the thermal aging of the motor stator only. Nowhere in PGR #706 was it stated or implied that the thermal aging that was performed on the motor stator used the Arrhenius technique (or any acceptable method) as the basis for the thermal aging times and temperatures that were chosen. No additional information has been supplied by the licensee which would justify or support the claim of a 40 year qualified life. No additional features (motor-brake assemblies, type of torque or limit switch ...) have been identified, nor have any of the materials of construction been identified (i.e. teflon lead wire insulation...). In order to calculate a conservative qualified life estimate, the installed equipment, including all components and materials of construction, must be identified and analyzed.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5h

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 1

NOTES:

CONCLUSION:

This equipment item is assigned to NRC Qualification Category II.a ---
Qualification Not Established because similarity between the installed
and tested equipment has not been established by the licensee. If
similarity can be established, then thermal aging/qualified life remains
as the only issue to be resolved.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

EQUIPMENT ITEM NO. 2
MOTORIZED VALVE ACTUATOR LOCATED IN THE CONTAINMENT, ELEV. 111'6"
LIMITORQUE MODEL SMB4
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 2
LICENSEE REFERENCE(S): 695, 1590
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV8088A, B, C; (Q2E21V038A, B, C))
SERVICE: CVCS
LICENSEE SUBMITTAL: SCEW(S): C.2.9.4 [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. 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
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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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 _____
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. 578

Page
3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

COMPONENT: MOV's - INSIDE CONTAINMENT

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging techniques were used to thermally age the motor operated valves to meet the requirements of IEEE 382-72. Arrhenius techniques were used to establish a qualified life. Based on this methodology, qualified life of 40 years was established.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm (Reference: Limitorque Report 600456). This sulfuric acid concentration exceeds the Farley FSAR value of 2000 ppm.

SUBMERGENCE

For a discussion of MOV's inside the containment subject to submergence, refer to Appendix 4, Section II.C.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

LICENSEE RESPONSE TO NRC SER (Continued)

SUBMERGENCE OF MOV 8808 A, B, C

LOCATION AND SAFETY FUNCTION

MOV's 8808 A, B, and C are located inside containment in the accumulator injection lines.

MOV's 8808 A, B, and C are required per technical specification to be open whenever the plant is in the power operation, startup, or hot standby (above 1000 psig) mode of operation. Under these modes, power to the valve control circuits is required to be disconnected. If an isolation valve is closed, technical specifications require the valve to be immediately opened or the plant to be in hot standby within 1 hour and hot shutdown within the next 8 hours. These valves receive a confirmatory safety injection signal to automatically open the valves should they be closed within technical specification limits.

The safety function of MOV's 8808 A, B, and C is to be in the open position during the injection phase of post-LOCA operation. The technical specifications, power lockout, and confirmatory safety injection signal features ensure that these valves are not mispositioned during the injection phase of post-LOCA operation. Once open, no further mechanical movement of MOV's 8808 A, B, and C is required to accomplish a post-LOCA safety function.

The motor operators for MOV's 8808 A, B, and C are located approximately 6 feet above floor level inside containment. Therefore, submergence of the motor operators can occur following a design basis accident. The following failure mode analysis and justification have been developed assuming submergence and is a conservative approach.

FAILURE MODE ANALYSIS

The failure modes to be identified are those which could cause the valve to go closed prior to the pressurized injection of the accumulator into the reactor coolant system. This single mode needs to be identified because the valves are normally opened and the control power disconnected.

The circuit to be analyzed is shown on Figure II.C.-1 and operates as follows. The valve motor is operated by the application of 575 Vac power to the motor terminals by standard reversing contactors. The contactors are controlled by a remote switch. Switch closure applies control power to the contactor coil causing the contactors to energize the valve motor and seal itself in until the valve has completed its travel. At this point, limit or torque switches located at the valve, interrupt the seal-in, de-energize the contactor coil and thereby remove power from the valve motor. Control circuits are transformer isolated and ungrounded. Furthermore, when the contactor is de-energized, only one leg of the control circuit is directly exposed to the containment. The other leg is isolated from faults caused by the containment environment, by either



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

LICENSEE RESPONSE TO NRC SER (Continued)

FAILURE MODE ANALYSIS (CONT.)

the control switch or by position indication lights.

Two circuits need to be analyzed for failures: the power circuit and the control circuit. The power feed to the motor is de-energized immediately after valve closure and remains de-energized throughout the submergence period. Therefore, submergence has no direct impact on the power circuit.

The control circuit is shown on Figure II.C-1. The highlighted limit switches LS1-LS5 and the torque switches TS1 and TS2 are the only valve operator components in the control circuit that could be submerged. The condition to be analyzed is whether the open valve can be spuriously moved to the closed position by submergence. LS1, LS2, LS3 and TS1 need not be addressed because they are located in the open circuit, and their status cannot cause closing of the valve. Short circuits need not be addressed for LS4 and LS5 because these switches are already closed when the valve is open.

The effect of a short circuit on limit switches, while the valve is open, would be erroneous valve position indicating only. This is the only result of a short circuit caused by submergence.

Ground path circuits need not be addressed because the closing contactor coil is open-circuited by a control switch contact.

From the foregoing analysis, the only undesired result that needs to be addressed further is the possible erroneous lighting of the indicating lights.

JUSTIFICATION FOR OPERATION

With the failure analysis conclusions indicated above safe and reliable operation can be assured for the following reasons. When in the power operation, startup, and hot standby modes, valves 8808 A, B, and C are open and no mechanical operation is required. Inadvertent closure as a result of submergence is not possible since control power is disconnected.

Should a valve be closed during the power operation, startup or hot standby mode of operation, any closed valve will open upon receipt of a safety injection signal. For a LOCA, the water level in containment will not rise above the operator prior to completion of valve opening.

Once opened, no further mechanical movement of the valves is required following a LOCA. Note that associated limit switches may give an incorrect valve position indication when submerged. This incorrect position indication is acceptable since the operator is trained to utilize a combination of plant parameters rather than indication from a single instrument. With the exception of submergence, the MOV's 8808 A, B, and C are environmentally qualified. The matter of submergence has been addressed here in sufficient depth to demonstrate that the safety related position of the valves will not be compromised.

FIGURE 11.C.-1



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

SYSTEM CONSIDERATION REVIEW

The Licensee has stated that this equipment item does not require environmental qualification and/or should be exempted from qualification. The Licensee's rationale has been evaluated and the reasons for concurrence/~~non-concurrence~~ with the technical basis of the Licensee's position are presented below.

Reason for Concurrence

- Equipment does not provide a safety function or mitigate the consequences of a design basis accident. Equipment Environmental Qualification is not required by the DOR Guidelines. (NRC Qualification Evaluation Category IIIa)
- Equipment is not exposed to a harsh environment by the accident it is intended to mitigate. See note (1) on page 4b. (NRC Qualification Evaluation Category IIIb)
- Backup (equipment/system) is available which completely performs the safety function. The backup (equipment/system) is environmentally qualified and appears to meet single active failure criterion. See note (1) on page 4b. (NRC Qualification Evaluation Category IIIa)

Reason for Non-Concurrence

- Backup (equipment/system) is not fully capable of performing the intended safety function or accident mitigating function.
- Backup (equipment/system) is not environmentally qualified and can be exposed to a hostile environment simultaneously with the primary equipment.
- Backup (equipment/system) is subject to a potentially disabling single active failure.
- Failure of the primary equipment can compromise the ability of other safety-related equipment to perform its specified safety function.
- Failure of the primary equipment can result in erroneous indication which could mislead an operator.
- Requirement for continued functioning throughout the post-accident period necessitates environmental qualification.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
4b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

Reason for Concurrence

— The equipment's accident mitigating function is completed prior to the onset of the hostile environment. No subsequent functions are necessary. See note (1) below. (NRC Qualification Evaluation Category IIIb)

X Other (see page 4b)

X Resultant NRC Qualification Evaluation Category (IIIa/~~IIIb~~)

X Note 1: The Licensee (has/~~has not~~) stated that failure of the primary equipment will not affect other safety-related equipment or cause an operator to be misled. (See page 3c)

Reason for Non-Concurrence

— Although backup equipment is available, it is not technically sound to relinquish defense-in-depth for this function.

— Backup (equipment/system) is not safety-related.

— This equipment is necessary for the operator to ensure an ESF system is performing its intended safety function.

— The rationale presented by the Licensee is not supported by objective technical evidence.

— Other (see page)

LICENSEE STATEMENT

See page 3a of this checksheet.

EVALUATION OF LICENSEE STATEMENT

This equipment is locked open with power removed during power operation. It is locked in its safety position and does not have to operate to perform its safety function.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

EQUIPMENT ITEM NO. 3

MOTORIZED VALVE ACTUATOR LOCATED IN THE CONTAINMENT, ELEV. 126'6"

LIMITORQUE MODEL SMB; SIZES 00, 000

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 3

LICENSEE REFERENCE(S): 706

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3660, MOV3318B; (Q2E14V002, 004))

SERVICE: CONTAINMENT COOLING

LICENSEE SUBMITTAL: SCEW(S): C.2.6.4 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3112 (Q2E21V249A))

SERVICE: CVCS/SAFETY INJECTION

LICENSEE SUBMITTAL: SCEW(S): C.2.9.7 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3872A, B (Q2E22V001A, B))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.10.3 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3536 (Q2E23V021))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.3 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3530 (Q2E23V003))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.4 [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:

Contents

Checksheet Page No.

Equipment Item

1a₁, 1a₂

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

EQUIPMENT ITEM NO. 3 (CONTINUED)

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3528A, B, C, D (Q2E23V022A, B, C, D))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.5 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3835A, B (Q2E23V025A, B))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.5 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3441A, B, C, D (Q2P16V207A, B, C, D))

SERVICE: WATER

LICENSEE SUBMITTAL: SCEW(S): C.2.19.3 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3131 (Q2P16V081))

SERVICE: COOLING WATER

LICENSEE SUBMITTAL: SCEW(S): C.2.19.4 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3046 (Q2P17V097))

SERVICE: COOLING WATER

LICENSEE SUBMITTAL: SCEW(S): C.2.20.2 [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. 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)

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u> </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> </u>
Criteria Regarding Aging Simulation Satisfied (If Required)	<u> </u>
Criteria Regarding Temperature/Pressure Exposure:	<u> </u>
o Peak Temperature Adequate	<u> </u>
o Peak Pressure Adequate	<u> </u>
o Duration Adequate	<u> </u>
o Required Profile Enveloped Adequately	<u> </u>
o Steam Exposure (If Required) Adequate	<u> </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> </u>
Criteria Regarding Test Failures or Severe Anomalies	<u> </u>
(If Any) Satisfied	<u> </u>
Criteria Regarding Functional Testing Satisfied	<u> </u>
Criteria Regarding Instrument Accuracy Satisfied	<u> </u>
Test Duration Margin (1 hour + Function Time) Satisfied	<u> </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> X </u>
II.b	Equipment Not Qualified	<u> </u>
II.c	Equipment Satisfies All Requirements Except Qualified Life	<u> </u>
	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>



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

COMPONENT: MOV's - INSIDE CONTAINMENT

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging techniques were used to thermally age the motor operated valves to meet the requirements of IEEE 382-72. Arrhenius techniques were used to establish a qualified life. Based on this methodology, qualified life of 40 years was established.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm (Reference: Limitorque Report 600456). This loric acid concentration exceeds the Farley FSAR value of 2000 ppm.

SUBMERGENCE

For a discussion of MOV's inside the containment subject to submergence, refer to Appendix 4, Section II.C.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

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

LRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
<u>EQUIPMENT DESCRIPTION</u>			
Equipment Type	MVA	MOTORIZED VALVE ACTUATOR	
Manufacturer's Name (5.2.2/-/-)	LIMITORQUE	LIMITORQUE	
Model Number (5.2.2/-/-)	SMB; SIZES 00, 000	SMB-0	
Serial Number	NOT STATED	189835 (C/N 600456-A)	NOTE A
Features/Mounting (5.2.6/-/-)	NOT STATED	RELIANCE CLASS RH INSUL. MOTOR, ID# 2Y267074A1EZ, TYPE P	X-NOTE B
Connections/Interfaces (5.2.6/-/-)	NOT STATED	CONTROL & POWER LEADS THRU FLEXIBLE, PRESSURE- TIGHT CONDUIT	NOTE B
Location/Elevation	CONTAINMENT Elev. 134'-6" 116'-6"	AUTOClave	
Equipment ID No.	see Pg. 1a	—	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	—	600456	
Report Date	—	751201	
Issued by	—	LIMITORQUE	
Prepared for	—	LIMITORQUE	
Referenced Reports	—	LOCKHEED 352J-4811	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	—	SIMULTANEOUS AND SEQUENTIAL TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	—	VALVE ACTUATION AND IR MEASUREMENTS	
Operating Conditions (-/2.2.10/2.2.10)	NOT STATED	40 ft-#//60 Volts/60 Hz	NOTE B
Load/Cycles/Voltage/ Current/Freq.			



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NRC Contract No. NRC-03-79-118

FRC Project No. 5257

FRC Assignment No. 13

FRC Task No. 518

Page

5b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

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)	—	SUCCESSFUL OPERATION OF THE MVA	
Accuracy (5.2.5/-/-)	—	—	
Number of Specimens	—	1 COMPLETE MVA AND 1 ADDITIONAL MOTOR	
Test Instruments Calibrated	—	YES	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	ACTIVE	—	
Test Duration (5.2.1/-/-)	—	30 DAYS	} NOTE C
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	—	—	
Required Function Time	1 hour (MAX.)	—	
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		YES	
5. Radiation Aging		YES	
6. Wear Aging		YES	
7. Vibration/Seismic		YES	
8. DBE Exposure		YES	
9. Post-DBE Exposure		YES	
10. Inspection		YES	
Aging (5.2.4, 7.0/4.0/4.0)	135°F (MAX.) for 40 YRS. Design	100 HOURS @ 180 C FOR THE MOTOR STATORS ONLY NO BASIS	X-NOTED
Thermal Aging/Basis			
Material Aging Evaluation (7.0/-/-)	NONE	NO	NOTED
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	—	NOT STATED	
Radiation Aging, Type * ASSUMED	IN. ACC. DOSE	GAMMA	



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5c

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	—	4 Mrd (COMPLETE UNIT)	
Radiation Aging, Dose Rate	—	1 Mrd/Hr	
Radiation Aging, Method	—	TEST (SEQUENTIAL)	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	—	NOT STATED	
Operational Aging (-/4.2/-)	—	1208 OPEN/CLOSE CYCLES+ 803 (LOCA+POST-LOCA) CYCLES + 2184 CYCLES OF MVA WITH BASE TEST MOTOR INSTALLED	
Other Age Conditioning (-/4.2/-)	—	SEISMIC/VIBRATIONAL	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	40 years/ NONE	NONE	X - NOTED
Normal Ambient Temperature*	135°F	—	
Normal Ambient Radiation	—	—	
Normal Ambient Humidity*	70-90%	—	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	yes	—	
On-Going Analysis of Failures and Degradation (7.0/-/-)	yes	—	
Margin (General) (6.0/3.0/3.0)	—	—	
Margin (NUREG-0588, Cat. I) (-/3.2/-)	/	NOT STATED, EXCEPT FOR THE POST-LOCA ADDITIONAL MVA CYCLING	
1. Temperature (+15°F)		—	
2. Pressure (+10%, 10 psig max)		—	
3. Radiation (not required)		—	
4. Time (+10%, +1 hour + function time minimum)		—	

* ASSUMED



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5d

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

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	LOCA	
Radiation Type	GAMMA	GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)	5.0E07rd	200 Mrd	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	—	1 Mrd/Hr TEST	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	NOT STATED	—	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	—	—	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	5.0E07rd	204 Mrd TOTAL DOSE	
Plateout Dose Considered (-/1.48/1.48)	—	—	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	—	—	



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20th and Race Streets. Phila. Pa. 19103 (215) 448-1000

NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5e

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

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	36°F/sec.; 1.1 psi/sec.	10F/SEC., 2.5 psig/SEC.	
Peak: °F/psig/RH/Time	300/47.5/100/ 7 minutes	310/78/100/30 min.	2 PEAKS, NOTE C
Decrease To: °F/psig/RH/Time	260/25/100/ 10 min.	255/30/100/91 hours	
Decrease To: °F/psig/RH/Time	180/12/100/ 2 hour	195/10/100/623 hours	
Decrease To: °F/psig/RH/Time	drop to AMB- 1 ENT 1011.57d	COOL TO AMBIENT	
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)	—	TEST PER IEEE-323-1974	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	H ₃ BO ₃ plus NaOH	3000 PPM BORON(0.28 molar H ₃ BO ₃), 0.064 molar Na ₂ S ₂ O ₃ NaOH to pH of 10.5 @ 77°F	NOTE C
Spray Density (gpm/ft ²)	NOT STATED	1.2 gpm	
Spray Duration	NOT STATED	24 hours (ASSUMED)	
Submergence Duration (4.1.3/2.2.5/2.2.5)	NONE	—	
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. 3

NOTES:

"X" DENOTES APPROPRIATE NOTES

- X 1. The Licensee has not provided documentation from the manufacturer which establishes similarity between the installed equipment and the test specimen in the referenced document(s).
- X 2. The Licensee has not identified the class of the insulation system used for the motor in the motorized valve actuator.
- X 3. The Licensee has not identified whether or not this motorized valve actuator incorporates a motor-brake assembly.
- X 4. The Licensee has not identified the class of the insulation system used for the motor-brake assembly (if applicable).
- X 5. The Licensee has not identified the motor manufacturer for this motorized valve actuator.
- X 6. The Licensee has not identified the manufacturer of the motor-brake assembly (if applicable).
- X 7. The Licensee has not identified the type of current used in the motorized valve actuator.
- X 8. The Licensee has not identified the type of current used in the motor-brake assembly (if applicable).
- X 9. The Licensee has not established a qualified life estimate for this motorized valve actuator based on technically justifiable methods and conservative assumptions.
- _____ 10. The Licensee has stated that the only harsh parameter that this motorized valve actuator is exposed to is radiation.
- _____ 11. Since radiation is stated to be the only harsh parameter and considering the extensive radiation testing of the motors used in this type of motorized valve actuator, the specified radiation dose of _____ is considered to be of sufficiently low value as to not affect this equipment item. This equipment item is considered qualified for this parameter.
- _____ 12. The Licensee has committed to replace this equipment item. The Licensee has stated the following:



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NOTES:

A. The licensee has not provided any serial and/or order number(s) on the System Component Evaluation Worksheets (SCEWs) for this equipment item.

B. The licensee has not fully identified the installed equipment (see page 5f) to the point where similarity to the test specimen can be established, nor has the licensee provided documentation from the manufacturer (Limitorque) which would establish similarity via their records.

C. The test profile and simulated accident conditions envelop the required conditions adequately. The test duration also envelopes the required accident duration.

D. The thermal aging performed in PGR #706 was limited to the thermal aging of the motor stator only. Nowhere in PGR #706 was it stated or implied that the thermal aging that was performed on the motor stator used the Arrhenius technique (or any acceptable method) as the basis for the thermal aging times and temperatures that were chosen. No additional information has been supplied by the licensee which would justify or support the claim of a 40 year qualified life. No additional features (motor-brake assemblies, type of torque or limit switch ...) have been identified, nor have any of the materials of construction been identified (i.e. teflon lead wire insulation...). In order to calculate a conservative qualified life estimate, the installed equipment, including all components and materials of construction, must be identified and analyzed.



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5h

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 3

NOTES:

CONCLUSION:

This equipment item is assigned to NRC Qualification Category II.a ---
Qualification Not Established because similarity between the installed
and tested equipment has not been established by the licensee. If
similarity can be established, then thermal aging/qualified life remains
as the only issue to be resolved.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

EQUIPMENT ITEM NO. 4
SOLENOID VALVE LOCATED IN THE CONTAINMENT, ELEV. 110'0"
ASCO MODEL NP SERIES
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 4
LICENSEE REFERENCE(S): 649
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2E21SV8149AB, BB, CE)
LICENSEE SUBMITTAL: SCEW(S): C.2.9.8 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (N2021SV1003B)
LICENSEE SUBMITTAL: SCEW(S): C.2.12.4 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2G21SV3376)
LICENSEE SUBMITTAL: SCEW(S): C.2.12.2 [6]

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	6a, 6b
Equipment Summary	
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 Qualification Not Established</u> | III.b Not in Scope |
| II.b Not Qualified | IV Documentation Not Available |



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

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 Envelopes Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	<u>X</u> _____
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-0586, 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	_____



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

LICENSEE RESPONSE TO NRC SER

COMPONENT: SOLENOID VALVES - INSIDE CONTAINMENT

NRC DEFICIENCY

APCo RESPONSE

AGING

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

SEE PAGE 3C

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm (Reference: ASCO Test Report AQS 21678/TR). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

SUBMERGENCE

For a discussion of the effects of submergence, refer to Appendix 4, Section II.C.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified.

- (a) Temperature - The 346°F qualification test condition exceeds the 300°F required temperature by 46°F thus adequate margin has been demonstrated.
- (b) Pressure - The 110 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 2×10^8 rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 rads. Therefore adequate margin exists.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

LICENSEE RESPONSE TO NRC SER (Continued)

ASCO SOLENOID VALVES

LOCATION AND SAFETY FUNCTION

The ASCO solenoid valves located inside containment are used in the air supply line of several isolation valves. Their safety function is to go to the vent position following the de-energization of the solenoid. This permits the air to be vented from the operator of the air operated isolation valve and the valve to go to its fail safe position (closed) following a LOCA or MELB inside containment. The solenoid is de-energized upon generation of a safety actuation signal.

FAILURE MODE ANALYSIS

A failure mode and effects analysis shows that for each failure mode two initial conditions for the associated coil must be considered: Solenoid initially energized and solenoid initially de-energized. With the solenoid initially energized, coil failures will affect the solenoid and air-operated valves as follows. If the coil fails open circuited the solenoid will be de-energized and cause the associated air-operated valve to go to its fail safe position (closed) and need not be considered further as this is the required safety position. A failure resulting in a single ground would have no effect on the battery supply which is ungrounded. A short circuit would at most result in the trip of the circuit breaker that feeds the solenoid. This failure would de-energize the solenoid resulting in the associated air-operated valve going to its fail safe position (closed). If the solenoid is initially de-energized it will be due to any of three possible conditions, not including the coil failure itself. These three conditions are (1) loss of power, (2) control switch failed open or held continuously in CLOSE position, and (3) containment isolation signal. For the three above mentioned conditions, coil failure has no effect on the solenoid.

JUSTIFICATION FOR OPERATION

The coil de-energizing and the valve going to its fail safe position (closed) is the action that would be accomplished if the solenoid coil does fail since the containment isolation signal de-energizes the coil. Those components identified in the NUREG-0588 response as located below maximum containment flood level all perform their safety related function in

in the first 30 seconds of the DLA. The most conservative analysis for rate of rise in the containment is to assume ACC and Accumulators volumes are instantaneously dumped to the sump followed by immediate maximum ESF flows. The component located lowest in containment which is covered in our response to NUREG-0588 is located at elevation 109'-0". This component will not be submerged for 714 seconds under the most conservative assumptions. (Refer Table II.C.-1).



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

LICENSEE RESPONSE TO NRC SER (Continued)

E. Make: ASCO
Model No. NP-1 Series, 206-Series
Instrument: Solenoid Valve
Location: Containment and Main Steam Room

Results of Evaluation

Type test accelerated thermal and radiation aging techniques and material analysis using a conservative approximation to the Arrhenius model have established a qualified life for these solenoids. The solenoids are used inside and outside the containment and, for both locations, have a qualified life beyond June 30, 1982 and, at least, the next few refueling outages. A new test report has indicated an elastomer component of these solenoids is not recommended for operation under the more limiting radiation aging conditions where the solenoids may be required to shift position following exposure to a total gamma radiation dose in excess of 20 megarads. APCo has completed an evaluation of the operational requirements of the solenoids containing this elastomer component. APCo has determined the solenoids would have completed their position shifts before receiving an exposure to a dose in excess of 20 megarads or would not be required to shift in order to bring the plant to a safe shutdown condition. Therefore, the elastomer component has been determined as acceptable for the harsh environmental conditions at Yankee-Unit 2.

APCo Position:

Surveillance and maintenance procedures are being implemented which reflect the results of the above evaluations, and will verify the continuing qualified status of the instruments throughout the life of the plant. The vendor is completing a material analysis in an attempt to further extend the qualified life of these solenoids. The results of this evaluation will be incorporated in the surveillance and maintenance procedures as necessary.

Appendix 3 I.E-1



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FRC Assignment No. 13

FRC Task No. 5/8

Page

5

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 4

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



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

EQUIPMENT ITEM NO. 5

SOLENOID VALVE LOCATED IN THE MAIN STEAM ROOM, ELEV. 135'0"

ASCO MODEL NP SERIES

REQUIRED OPERATING TIME: 10 MINUTES

TER CHECKSHEET NO. 5

LICENSEE REFERENCE(S): 649

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N25SV3772A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.17.2 [6]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N23SV3228AA, BA, C A; 3227AA, BA, CA)

LICENSEE SUBMITTAL: SCEW(S): C.2.16.5 [6]

FUNCTION (PLANT ID): ACTIVATE AIR OPERATED VALVE FOR ISOLATION (Q2N12SV3235A, B)

LICENSEE SUBMITTAL: SCEW(S): C.3.14.4 [6]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N12SV3234A, B)

LICENSEE SUBMITTAL: SCEW(S): C.2.14.2 [5]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N11SV3369AC, BC, C C; 3370AC, BC, CC)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.8 [6]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N11SV3368AA, BA, C A; 3976A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.7 [6]

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, 3e, 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	6a, 6b
Equipment Summary	
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:
- ☐ 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



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

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 _____

FOR EVALUATION REFER TO ITEM NO. 4 (EXCLUDING SUBMERGENCE)



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

LICENSEE RESPONSE TO NRC SER

COMPONENT: SOLENOID VALVES - OUTSIDE CONTAINMENT

NRC DEFICIENCY

AGING
TEMPERATURE
QUALIFICATION TIME
PRESSURE
HUMIDITY
QUALIFICATION METHOD
MARGIN
RADIATION
REPLACEMENT

APCo RESPONSE

All solenoid valves, outside containment, previously identified as requiring replacement have been replaced with fully qualified ASCO Catalog HP-1 models. System master lists and component evaluation worksheets have been revised to document the qualification of these solenoid valves.

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 5

LICENSEE RESPONSE TO NRC SER (Continued)

E. Make: ASCo
Model No. NF-1 Series, 106-Series
Instrument: Solenoid Valve
Location: Containment and Main Steam Room

Results of Evaluation

Type test accelerated thermal and radiation aging techniques and material analysis using a conservative approximation to the Arrhenius model have established a qualified life for these solenoids. The solenoids are used inside and outside the containment and, for both locations, have a qualified life beyond June 30, 1982 and for at least the next few refueling outages. A new test report has indicated an elastomer component of these solenoids is not recommended for operation under the more limiting radiation aging conditions where the solenoids may be required to shift position following exposure to a total gamma radiation dose in excess of 20 megarads. APCo has completed an evaluation of the operational requirements of the solenoids containing this elastomer component. APCo has determined the solenoids would have completed their position shifts before receiving an exposure to a dose in excess of 20 megarads or would not be required to shift in order to bring the plant to a safe shutdown condition. Therefore, the elastomer component has been determined as acceptable for the harsh environmental conditions at Farley-Unit 2.

APCo Position:

Surveillance and maintenance procedures are being implemented which reflect the results of the above evaluations, and will verify the continuing qualified status of the instruments throughout the life of the plant. The vendor is completing a material analysis in an attempt to further extend the qualified life of these solenoids. The results of this evaluation will be incorporated in the surveillance and maintenance procedures as necessary.

Appendix 5 I.E-1



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

EQUIPMENT ITEM NO. 6
SOLENOID VALVE LOCATED IN THE CONTAINMENT
TARGET ROCK MODEL 79AB001
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 6
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): REACTOR VESSEL HEAD VENTILATION (62B13SV2213A, B; 2214A, B)
LICENSEE SUBMITTAL: SCEW(S): TMI-2.2 [6, 11, 19]

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:

Contents

Checksheet Page No.

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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	_____
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	_____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 6

LICENSEE RESPONSE TO NRC SER

Qualification testing is scheduled to be completed by the fourth quarter of 1982. This equipment is not essential to achieve a safe shutdown condition for any licensed DBE, and, therefore, no operating time is specified.



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NRC Contract No. NRC-03 79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 513

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 7

EQUIPMENT ITEM NO. 7
SOLENOID VALVE LOCATED IN THE CONTAINMENT, ELEV. 89'4"
AUTOMATIC VALVE MODEL C5439
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 7
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2E12SV3999A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.6.7 [6]

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, SFN, 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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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 FIRST 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

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. 7

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 (NULG-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 _____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 7

LICENSEE RESPONSE TO NRC SER

SECTION 8.2

SUMMARY OF OUTSTANDING ITEMS

As a result of the NUREG 0108 Qualification review and the subsequent replacement of two generic types of components which were determined to be deficient in qualification documentation, four solenoid valves located inside containment remain outstanding. These deficiencies, together with corrective action commitments and justification for interim operation, are given below.

1. Solenoid Valves - Inside Containment

A total of 37 solenoid valves inside the containment were determined not to have adequate qualification documentation. Of these 37, all but 4 have been replaced with fully qualified ASCO NP series valves, and the associated component Evaluation Work Sheets have been revised to reflect the qualification parameters. Out of remaining 4 solenoid valves, 2 have been deleted and remaining 2 are used on containment isolation valves and perform their safety function prior to the effects due to the accident environment. Should failure occur, the isolation function of these valves would be maintained and such failure would not adversely affect other safety-related equipment. Furthermore, these solenoid valves have high temperature coils and contain no plastic parts. Although complete qualification testing or analyses have not been performed on the specific assemblies, separate qualification tests have been performed on individual constituent components of the valve assembly. Based on the fact that no materials which have deleterious effects due to the harsh environments are included in these valves, and that previous limited testing has successfully verified qualification, interim use of these valves is acceptable.



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

3b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 2

LICENSEE RESPONSE TO NRC SER (Continued)

Purchase orders have not been issued for two of these solenoid valves because a qualified direct replacement was not available. As a result of an engineering evaluation a suitable qualified replacement solenoid valve has been determined and a purchase order will be issued upon receipt of a quotation from the original air operated valve vendor. The documentation of qualification for the replacement solenoid valve will be equal to that of the other qualified solenoid valves and the replacement will be completed by the end of the first refueling outage. If any problems arise beyond the control of Alabama Power Company which may impact this schedule, the NRC will be notified. Purchase orders were not issued for the remaining two solenoid valves due to the fact that a reevaluation has been performed in regard to the need for qualification of these components. These solenoid valves are utilized on the 48" containment purge AOVs. In a letter from F. L. Clayton, Jr., to A. Schwencer dated September 30, 1980, subject "Containment Purge System", Alabama Power Company committed to operation with these valves maintained in the closed position in all modes except mode 5 and mode 6 (cold shutdown and refueling). With the containment purge valves in the closed position, these subject solenoid valves are in the deenergized position. Subsequent failure of these solenoid valves will not result in opening of the purge valves and containment isolation will be maintained. Based on this evaluation, these solenoid valves have been deleted from our Master List of equipment requiring qualification.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a,

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

EQUIPMENT ITEM NO. 8
SOLENOID VALVE LOCATED IN THE CONTAINMENT, ELEV. 129'0"
ASCO MODEL NP SERIES
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 8
LICENSEE REFERENCE(S): 649
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2B31SV8047)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.2 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2G21SV7126)
LICENSEE SUBMITTAL: SCEW(S): C.2.12.5 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2E21SV8871,
8149AB, BB, CB)
LICENSEE SUBMITTAL: SCEW(S): C.2.9.5 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P13ZS2867B,
2866B)
LICENSEE SUBMITTAL: SCEW(S): C.2.6.6 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P17SV3443)
LICENSEE SUBMITTAL: SCEW(S): C.2.20.5 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P17SV3184)
LICENSEE SUBMITTAL: SCEW(S): C.2.20.3 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P15SV3103,
3766, 3 179A, B, C)
LICENSEE SUBMITTAL: SCEW(S): C.2.18.4 [6]

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

(R, T, CS) 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 ₁ , 1a ₂
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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

EQUIPMENT ITEM NO. 8 (CONTINUED)

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P15SV3180A,
B, C; 3 181A, B, C; 3104; 3765)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.4 [6]

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:

Contents

Checksheet Page No.

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

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	_____
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	_____

FOR EVALUATION REFER TO ITEM NO. 4 (EXCLUDING SUBMERGENCE)



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
37

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8

LICENSEE RESPONSE TO NRC SER

COMPONENT: SOLENOID VALVES - INSIDE CONTAINMENT

NRC DEFICIENCY

APCO RESPONSE

AGING

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm (Reference: ASCO Test Report AQS 21678/TR). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

SUBMERGENCE

For a discussion of the effects of submergence, refer to Appendix 4, Section II.C.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified.

- (a) Temperature - The 346°F qualification test condition exceeds the 300°F required temperature by 46°F thus adequate margin has been demonstrated.
- (b) Pressure - The 110 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 2×10^8 rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 rads. Therefore adequate margin exists.

REQUIRED TIME

Deficiency shown on one solenoid valve Q2P15SV3765 appears to be a clerical error by the NRC. Operating and qualification time both have been shown on component evaluation sheets.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 8LICENSEE RESPONSE TO NRC SER (Continued)

E. Make: ASCO
Model No. NP-1 Series, 206-Series
Instrument: Solenoid Valve
Location: Containment and Main Steam Room

Results of Evaluation

Type test accelerated thermal and radiation aging techniques and material analysis using a conservative approximation to the Arrhenius model have established a qualified life for these solenoids. The solenoids are used inside and outside the containment and, for both locations, have a qualified life beyond June 30, 1982 and for at least the next few refueling outages. A new test report has indicated an elastomer component of these solenoids is not recommended for operation under the more limiting radiation aging conditions where the solenoids may be required to shift position following exposure to a total gamma radiation dose in excess of 20 megarads. APCo has completed an evaluation of the operational requirements of the solenoids containing this elastomer component. APCo has determined the solenoids would have completed their position shifts before receiving an exposure to a dose in excess of 20 megarads or would not be required to shift in order to bring the plant to a safe shutdown condition. Therefore, the elastomer component has been determined as acceptable for the harsh environmental conditions at Farley-Unit 2.

APCo Position:

Surveillance and maintenance procedures are being implemented which reflect the results of the above evaluations, and will verify the continuing qualified status of the instruments throughout the life of the plant. The vendor is completing a material analysis in an attempt to further extend the qualified life of these solenoids. The results of this evaluation will be incorporated in the surveillance and maintenance procedures as necessary.

Appendix 3 I.E-1



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

EQUIPMENT ITEM NO. 9

SOLENOID VALVE LOCATED IN THE CONTAINMENT

ASCO MODEL HTX8320A22V

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 9

LICENSEE REFERENCE(S): NOT CITED

FUNCTION (PLANT ID): PILOT FOR AIR OPERATED VALVE (N2B21SV0444BA, BB; 445AA, AB)

SERVICE: PORV

LICENSEE SUBMITTAL: SCEW(S): TMI-3.2 [6, 11, 19]

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:

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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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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 REPLACE AT 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

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



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NRC Contract No. NRC-03-70-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

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 _____



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 9

LICENSEE RESPONSE TO NRC SER

Qualification for this instrument has not been documented. It will be replaced during the next refueling outage.

This equipment is not essential to achieve a safe shutdown condition under any licensed DBE and, therefore, no operating time is specified.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

EQUIPMENT ITEM NO. 10
SOLENOID VALVE LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
ASCO MODEL HV2063814U
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 10
LICENSEE REFERENCE(S): 649
FUNCTION (PLANT ID): ACTIVATE AIR OPERATED VALVE FOR ISOLATION (N2C22SV0479A,
B; 489A, B; 499A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.6 [6]
FUNCTION (PLANT ID): ACTIVATE AIR OPERATED VALVE FOR ISOLATION (N2C22SV0478A,
B; 488A, B; 498A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.5 [6]

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:

Contents

Checksheet Page No.

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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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 - CIPLED 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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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	_____
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	_____

FOR EVALUATION, REFER TO ITEM NO 4 (EXCLUDING SUBMERGENCE)



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FRC Assignment No. 13

FRC Task No. 518

Page

3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

LICENSEE RESPONSE TO NRC SER

COMPONENT: SOLENOID VALVES - OUTSIDE CONTAINMENT

NRC DEFICIENCY

AGING
TEMPERATURE
QUALIFICATION TIME
PRESSURE
HUMIDITY
QUALIFICATION METHOD
MARGIN
RADIATION
REPLACEMENT

APCo RESPONSE

All solenoid valves, outside containment, previously identified as requiring replacement have been replaced with fully qualified ASCO Catalog NP-1 models. System master lists and component evaluation worksheets have been revised to document the qualification of these solenoid valves.

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 10

LICENSEE RESPONSE TO NRC SER (Continued)

E. Make: ASCo
Model No. NP-1 Series, 206-Series
Instrument: Solenoid Valve
Location: Containment and Main Steam Room

Results of Evaluation

Type test accelerated thermal and radiation aging techniques and material analysis using a conservative approximation to the Arrhenius model have established a qualified life for these solenoids. The solenoids are used inside and outside the containment and, for both locations, have a qualified life beyond June 30, 1982 and for at least the next few refueling outages. A new test report has indicated an elastomer component of these solenoids is not recommended for operation under the more limiting radiation aging conditions where the solenoids may be required to shift position following exposure to a total gamma radiation dose in excess of 20 megarads. APCo has completed an evaluation of the operational requirements of the solenoids containing this elastomer component. APCo has determined the solenoids would have completed their position shifts before receiving an exposure to a dose in excess of 20 megarads or would not be required to shift in order to bring the plant to a safe shutdown condition. Therefore, the elastomer component has been determined as acceptable for the harsh environmental conditions at Farley-Unit 2.

APCo Position:

Surveillance and maintenance procedures are being implemented which reflect the results of the above evaluations, and will verify the continuing qualified status of the instruments throughout the life of the plant. The vendor is completing a material analysis in an attempt to further extend the qualified life of these solenoids. The results of this evaluation will be incorporated in the surveillance and maintenance procedures as necessary.

Appendix 5 I.E-1



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

EQUIPMENT ITEM NO. 11

HYDROGEN RECOMBINER LOCATED IN THE CONTAINMENT, ELEV. 155'0"

WESTINGHOUSE MODEL TYPE A

REQUIRED OPERATING TIME: 30 DAYS

TER CHECKSHEET NO. 11

LICENSEE REFERENCE(S): 1571, 1572, 1573, 1574, 1575

FUNCTION (PLANT ID): HYDROGEN CONCENTRATION REDUCTION (K001A, B (Q2E17G001A, B))

SERVICE: POST LOCA H2 CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.7.2 [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:

Contents

Checksheets Page No.

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. 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 (_____)
- ☐ 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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORMNRC 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	<u>X</u>
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. 11

LICENSEE RESPONSE TO NRC SER

NRC DEFICIENCY

APCo RESPONSE

AGING

The metallic materials used in the H₂ Recombiner Heaters are not known to be susceptible to significant degradation due to aging.

All electrical components furnished with the W electric re-combiner which may be exposed to post LOCA environments and which use electrical insulation were tested. The power cable, heater connector wire, heater elements, thermocouples and extension wire were subjected to thermal preaging of 80 heatup and cooldown cycles to simulate 40 years of operation. All of the above items plus the terminal blocks were subjected to a radiation exposure of 2×10^8 rads gamma followed by a LOCA test as described in WCAP 7709-L Supplement 2.

Due to the fact that no significant degradation was observed following the thermal cycling, radiation exposure, and LOCA cycle described in WCAP 7709-L and Supplements 1-4, the H₂ recombinder will provide adequate service for 40 years of normal operation plus 1 year post LOCA.

QUALIFICATION
TIME

Qualification time for the H₂ recombinder heater was not addressed by 71 program testing. Operability for one year post LOCA was demonstrated by tests described in WCAP 7709-L and Supplements 1-4. The simplistic design and conservative test procedures indicate that the recombinder will provide adequate service during a 40 year service life followed by one year post LOCA environment.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, for most plant specific applications, there will be margin available between the generic test parameters employed by W and the plant specific requirements. In qualifying equipment required to operate in a HELB environment, W did not include any systematic margin on the specified duration of the safety function. Rather, margin is included in qualification testing by selecting conservative qualification parameters and test sequences. Margin is implicit in the test sequence as follows:

- (1) Radiation - Tests are based on conservative calculations for 40 year operation plus 1 year post LOCA operation from the Westinghouse generic program which uses TID-14844 for the source term. This has resulted in a 2×10^8 rads qualification which provides adequate margin above the 5×10^7 rad requirement.
- (2) A conservative estimate of 80 heat up and cooldown cycles were conducted in succession to simulate 40 years of operation prior to conducting HELB tests.
- (3) Six LOCA tests were conducted on the thermally cycled unit.
- (4) Additional post irradiation HELB testing was conducted on the irradiated components.
- (5) Long term testing was conducted as described in Supplements 3 and 4 of WCAP 7709-L. These tests included high temperature heater tests conducted to evaluate heater element performance at temperatures in excess of post LOCA heater temperatures, long term heater element and recombinder tests to evaluate recombinder operation at temperatures well in excess of post LOCA temperatures in a 4% hydrogen concentration environment, and long term steam chamber tests were conducted to demonstrate the recombinder operability long term post LOCA at low containment pressure.
- (6) The H₂ recombinder qualification testing temperature of 309°F exceeds the specified qualification requirement of 300°F as shown on Component Evaluation Sheet C.2.7 Sheet 2.
- (7) The H₂ Recombinder qualification testing pressure of 77 psia exceeds the specified qualification requirement of 62.5 psia as shown on Component Evaluation Work Sheet, Section C.2.7 Sheet 2.

As stated in section 6.3.1.5 of IEEE 323-1974, margin may be demonstrated by increasing levels of testing, number of cycles, and test duration. It is felt that the above mentioned testing described in WCAP 7709-L and Supplements 1-4 demonstrate an acceptable level of margin.

REFERENCES

- (1) WCAP 7709-L and Supplements 1-4
- (2) NRC Letter Vessallo to Eicheldinger of May 1, 1981 provides NRC acceptance of the H₂ recombinder to IEEE 344-1971 and 323-1971 standards.



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 578

Page

5

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 11

Checksheets 5a-5f, 5i & 5j have been removed due to the
proprietary nature of information contained therein.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

EQUIPMENT ITEM NO. 12

ELECTRIC MOTOR LOCATED IN THE CONTAINMENT, ELEV. 155'0"

JOY MANUFACTURING MODEL TYPE P

REQUIRED OPERATING TIME: 4 HOURS

TER CHECKSHEET NO. 12

LICENSEE REFERENCE(S): 1803

FUNCTION (PLANT ID): HYDROGEN CONCENTRATION REDUCTION (Q2E22M001A, B)

SERVICE: POST LOCA H2 CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.10.2 [5]

FUNCTION (PLANT ID): HYDROGEN CONCENTRATION REDUCTION (Q2E19M001A, B, C, D)

SERVICE: POST LOCA H2 CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.8.2 [5]

FUNCTION (PLANT ID): NOT STATED (Q2E12M001, B, C, D)

SERVICE: CONTAINMENT HEAT REMOVAL

LICENSEE SUBMITTAL: SCEW(S): C.2.6.8 [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:Contents

	<u>sheet Page No.</u>
Equipment Item	
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	6a, 6b
Equipment Summary	
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 | II.c Qualified Life Deficiency |
| I.b Modification | III.a Exempt |
| <u>II.a Qualification Not Established</u> | 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	_____ <u>X</u>
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	_____ <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	_____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

LICENSEE RESPONSE TO NRC SAR

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging techniques were used to thermally age these motors to meet the requirements of IEEE 334-1974. Arrhenius models were used to establish a qualified life. The age susceptible materials of the motors were identified and an evaluation was made of their aging characteristics. Based on this methodology, a conservative qualified life of 40 years was established.

CHEMICAL-SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 10,000 ppm (Reference: Joy Report X-604 and F-14782). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

QUALIFICATION
TIME

Joy Manufacturing Co. has tested fan and motor sets through two LOCA cycles of 4 hours each followed by long term tests at slightly reduced temperatures. (Reference: Joy Report X-604). The peak temperature used in the tests exceeded the qualification temperature established for FNP. The qualified time exceeds the specification requirement of 4 hours.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing test parameters. However, the following margins can be identified.

- a) Temperature - The 315°F qualification test temperature exceeds the 300°F required temperature.
- b) Pressure - The 92.7 psia qualification test pressure exceeds the 62.2 psia required pressure.
- c) Qualification Time - The 7 days operating time qualification exceeds 4 hours specification.
- d) Radiation - The total 1×10^9 rads qualification dose exceeds required total dose of 5×10^7 rads.

This demonstrates adequate margin.



EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

The Licensee has cited as evidence of qualification a Joy Report which envelopes all of the required parameters for the Farley 2 plant. However, from the documentation submitted, it is not possible to ascertain that the unit tested and the units installed are in the same family of motors. The SCEW sheet identifies the motor as a type P. The report contains the following description:

INTRODUCTION

JOY Manufacturing Company and Reliance Electric Company have jointly developed a line of motors designed for Class II in-containment service. Design parameters are identical for this entire line of motors, the most important of which are as follows:

1. Normal ambient of 122° F. (50° C.).
2. Temperature rise of 117° F. (55° C.).
3. Design life of forty (40) years.
4. Radiation maximum dosage of 1×10^9 rads over the life of the motor.
5. Insulation is Class H, Type RV.
6. Short term (3 to 4 hours) ambient of 350° F., followed by a gradual reduction to 250° F.
7. One (1) year exposure to 100% relative humidity with vapor droplets and slightly caustic atmosphere.
8. Ambient pressure of 85 psig during the emergency mode.

In addition to all being designed to the above parameters, the materials and methods of construction are identical for the entire line of motors.

The objective of this report is to summarize the results of type testing undertaken at JOY on a representative motor driving a JOY AXIWARD fan for the purpose of qualifying it and thereby this line of motors and fans for Class II in-containment service for both EBR and PWR units as defined in IECR-534-1974.

FAN/MOTOR DESCRIPTION

The fan selected for use in this test was of typical axial flow configuration consisting of an outer casing, vane downstream of the fan rotor, and a means for mounting and supporting the motor in the center of the outer casing, (see typical cross section, Figure 1). The casing used for the vibration testing portion of the program was a typical production casing for nuclear service, while the outer casing for the LOCA simulation was part of the pressure vessel. Power leads were connected in the normal manner for the vibration portion of the testing, i.e., the connection was made in a conduit box mounted on the outside of the fan casing.

For the LOCA simulation, the power leads were connected by means of terminals protruding through an insulating and sealing plate. This was necessary to maintain the pressure boundary of the test chamber.

In both cases the leads were encased in steel pipe from the rotor frame to the connection point and additionally separated by having each lead inside a fiberglass tube.

The fan had a 60 inch diameter rotor of typical fan construction, which is made up of a hub and 16 adjustable pitch blades which are mounted directly on the motor shaft and secured with a ball bearing locknut.

The motor used to drive the fan was a 150/75 horsepower Reliance Electric motor. This was a 1200/600 RPM motor in a D-5005 frame. The motor had Class H, Type RV insulation, which is designed for the following conditions:

1. Radiation - maximum dosage of 1×10^9 rads of gamma radiation during the life of the motor (40 years typical).
2. Short time temperature during emergency mode of 350° F. and ambient (for 3 to 4 hours), then gradual reduction to 250° F.
3. Ambient pressure of 85 psig during the emergency mode.
4. One (1) year exposure to 100% relative humidity with vapor droplets and a slightly caustic atmosphere.
5. Design life of forty (40) years.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5.6

EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 12

-2-

MOTOR IDENTIFICATION:

R-42787
X319739-A1-LT
12DC5005
HP 150/75
RPM 1185/590
Volts 460
Hertz 60
Amps 167/146
Code H
Phase 3
Ambient Spd.
Insulation Class H - Type RM
Duty Continuous
Drive End Bearing 95RU02M3B
Opposite Drive End Bearing 95BC02XPP3H

ATTACHMENT A

APPENDIX E

REPORT X-604

INSULATION SYSTEM:

Reliance Type RM Class H Insulation System was used in this motor and is designed to meet the requirements of the IEEE 323-1974 and IEEE 33-1974 for Class IE Continuous Duty Motors Used in Containment Service Applications for Nuclear Power Generating Plants.

The report indicates that the test motor was the same unit as had been tested in 1970 except that the 1970 motor was rewound. The test report for that motor described the test unit as follows:

a. Manufacturer	Reliance Electric Company
b. Type	P/my
c. Enclosure	TEAO
d. Torque	Constant
e. No. of Windings	One
f. Frame Number	5005
g. Horsepower Rating, bhp	150/75
h. Operating Speed(s), rpm	1200/600
i. Power Supply, v/ph/cy	575/3/60
j. Insulation Class	Class N
k. Temperature Rise	NEMA Class B
l. Air-Over Capacity (Minimum) ft./min.	4000
m. Mounting Configuration	C-face, Footless
n. Bearings	Anti-friction
o. Shaft Configuration	Straight, threaded
p. Shaft Seals	Air Wall Labyrinth
q. Reference Drawings:	

1. Outline Dimension SK-31081-2
2. Shaft Seals SK-690124WB



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5 e

EC JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

The Licensee should either provide a more complete description for the installed motors or obtain certification from the manufacturer that the test report is applicable to the Farley 2 motors.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

EQUIPMENT ITEM NO. 13
RTD LOCATED IN THE CONTAINMENT, ELEV. 122'9"
ROSEMOUNT MODEL 176KS
REQUIRED OPERATING TIME: 14 DAYS
TER CHECKSHEET NO. 13
LICENSEE REFERENCE(S): 687
FUNCTION (PLANT ID): REACTOR TRIP (N2B21TE410, 413, 420, 423, 430, 433)
LICENSEE SUBMITTAL: SCEW(S): C.2.2.3 [6]

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



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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	_____
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 Sprav Satisfied	<u>X</u>
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	<u>X</u>
Criteria Regarding Instrument Accuracy Satisfied	<u>X</u>
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	_____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

LICENSEE RESPONSE TO NRC SER

C. Make: Rosemount
Model: 176 KS
Instrument: Wide Range RTD
Location: Containment

Results of Evaluation

Thermal aging was not a requirement in the qualification program for these instruments, which was developed to meet the requirements of IEEE 308-1971. Radiation aging of these items has been determined to be a limiting factor. Such qualified life has been shown to be at least beyond June 30, 1982 and the next few refueling outages. A previous material analysis has revealed the use of an age-susceptible material as compared to Appendix C of I.E. Bulletin 79-01B, and based on this analysis, no significant thermal or radiological degradation will occur during this extended qualified life. Additionally, a review of the operating experience of the instrument does not indicate an unexpected aging mechanism.

APCo Position

A favorable operating history, the large amount of tests and reviews performed on this instrument, and our NSSS vendor evaluation supports APCo's opinion that the RTD's would be capable of completing their intended function beyond June 30, 1982 and beyond the next few refueling outages. Surveillance and maintenance procedures are being implemented which ensure that radiation and thermal age-related degradation will be identified and the necessary action taken to verify the continuing qualified status of these instruments throughout the life of the plant.



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

LICENSEE RESPONSE TO NRC SER

APCo is presently completing an evaluation of various makes and models of RTD's which would be a suitable replacement for the Farley instruments. The selection will be made in a timely manner to support the scheduled replacement of the installed RTD's in accordance with their qualified life.



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 578

Page

5

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 13

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

EQUIPMENT ITEM NO. 14
RTD LOCATED IN THE CONTAINMENT, ELEV. 124'0"
ROSEMOUNT MODEL 176KF
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 14
LICENSEE REFERENCE(S): 687
FUNCTION (PLANT ID): REACTOR TRIP (N2B13TE412B, D; 422B, D; 432B, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.1.2 [6]

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
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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. 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
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. 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	_____
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	<u>X</u>
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	<u>X</u>
Criteria Regarding Instrument Accuracy Satisfied	<u>X</u>
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	_____

See evaluation for Equipment Item no. 13.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 14

LICENSEE RESPONSE TO NRC SER

F. Make: Rosemount
Model No.: 176 KF
Instrument: Narrow Range RTD
Location: Containment

Results of Evaluation

Thermal aging was not required to be addressed in the qualification program which was developed to meet the requirements of IEEE 323-1971. Radiation aging requirements of FSAR Section 3.11 have been met by the vendor qualification program. The materials and components of this instrument have been previously evaluated and potential thermal age-susceptible material was identified. A re-evaluation of the past environmental exposure of the instrument compared to the qualification testing conducted on this material has demonstrated a qualified life beyond June 30, 1982 and beyond the next few refueling outages. Vendor evaluation of longer term potential thermal aging is underway.

APCo Position

Surveillance and maintenance procedures are being implemented which ensure that the age-related degradation will be identified and the necessary action taken to verify the continuing qualified status of the instruments throughout the life of the plant.

APCo is presently completing an evaluation of various makes and models of RTD's which would be a suitable replacement for the Farley instrument. The selection will be made in a timely manner to support the scheduled replacement of the installed RTD's in accordance with their qualified life.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

EQUIPMENT ITEM NO. 15
RADIATION DETECTOR LOCATED IN THE CONTAINMENT, ELEV. 155'0"
VICTOREEN MODEL 8771
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 15
LICENSEE REFERENCE(S): 2883
FUNCTION (PLANT ID): RADIATION MONITOR (Q2D21REG027A-A, B-B)
SERVICE: POS. ACCIDENT MONITOR
LICENSEE SUBMITTAL: SCEW(S): TMI-5.2 [6, 11, 19]

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
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 | 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. 15

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u> </u>
Adequate Similarity Between Equipment and Test Specimen Established	<u> X </u>
Aging Degradation Evaluated Adequately	<u> </u>
Qualified Life or Replacement Schedule Established (If Required)	<u> </u>
Program Established to Identify Aging Degradation	<u> </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> </u>
o Required Profile Enveloped Adequately	<u> </u>
o Steam Exposure (If Required) Adequate	<u> </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> </u>
Criteria Regarding Test Failures or Severe Anomalies	<u> </u>
(If Any) Satisfied	<u> </u>
Criteria Regarding Functional Testing Satisfied	<u> </u>
Criteria Regarding Instrument Accuracy Satisfied	<u> </u>
Test Duration Margin (1 hour + Function Time) Satisfied	<u> </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> X </u>
II.a	Equipment Qualification Not Established	<u> </u>
II.b	Equipment Not Qualified	<u> </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>



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

LICENSEE RESPONSE TO NRC SER

As discussed in Chapter 2, the following three types of equipment were installed without complete qualification documentation.

<u>Manufacturer</u>	<u>Generic Name</u>	<u>Model</u>	<u>No of Items</u>	<u>Chapter 2 Reference</u>
Target Rock	Solenoid valve	79AB001	4	Section 2
ASCO	Solenoid valve	HTX8320A22V	4	Section 3
Victoreen	Radiation detector	877-1	2	Section 4
GEMS-Delaval	Level sensor	XM-54854	2	Section 7

The Target Rock solenoid valves and GEMS-Delaval level transmitters are presently undergoing qualification testing, which is expected to be completed during the fourth and third quarter of 1982, respectively. The test report for the Victoreen radiation detectors was recently evaluated. As discussed in Chapter 2, the evaluation of the test report indicates a water-tight fitting is necessary to protect the cable connection and to establish similarity with the test specimen. This modification will be completed during the next refueling outage. The ASCO solenoid valves lack adequate qualification documentation and are scheduled to be replaced at the next refueling outage.

Other than the ASCO solenoid valves, all of the above equipment were installed prior to the completion of the qualification test program and the evaluation of the associated test reports. Alabama Power Company installed this equipment in order to provide the state-of-the-art coincident with the implementation dates required by NUREG-0737. Alabama Power Company will continue to monitor the progress of these ongoing qualification test programs. The ASCO solenoid valves will be installed to satisfy NUREG-0588.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 15

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 the integrity of the connection through qualification testing/analysis or document similarity between the installed interface and Victoreen Dwg. 91007.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

EQUIPMENT ITEM NO. 16
PRESSURE TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
BARTON MODEL 763 (LOT 2)
REQUIRED OPERATING TIME: 30 DAYS
TER CHECKSHEET NO. 16
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): POST-ACCIDENT MONITOR (N2B21PT402, 403)
LICENSEE SUBMITTAL: SCEW(S): C.2.2.2[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
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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 (_____)
- ☐ 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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16

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	<u>X</u>

*Licensee did not supply documentation
for review*

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 16LICENSEE RESPONSE TO NRC SERNRC DEFICIENCYAPCo RESPONSEAGING

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment qualification program, modification, replacement).

QUALIFICATION TIME

The test program demonstrates that the transmitter will perform its trip function for 5 minutes and post-accident monitoring function for 4 months following the DBE.

The post accident time used during testing is fifteen (15) days. This time/temperature relationship is a conservative simulation of the four months post-accident operability requirements.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2750 ppm. This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing test parameters. However, the following margins can be identified:

- (a) Temperature - The 380°F qualification test condition exceeds the 300°F required temperature by 80°F, thus adequate margin has been demonstrated.
- (b) Pressure - The 75 psig qualification test condition provides adequate margin above the maximum calculated Farley Unit 2 containment pressure of 47.5 psig.
- (c) Radiation - The Barton transmitter equipment qualification tests were based on a conservative calculation from the Westinghouse generic program which uses HLD-148/4 source terms and a 4100 MW_e plant as a basis. This conservative calculation established 5×10^7 rad as the qualification basis. The maximum calculated dose for Farley - Unit 2 Barton Transmitters would be substantially reduced.

NRC DEFICIENCYAPCo RESPONSEMARGIN

from this amount by a ratio of the Farley power rating (2652 MW_e) over the calculational basis, therefore, adequate margin exists.

- (d) Operating Time - The Barton transmitter qualification test program utilized a 15 day test period simulating a four (4) month post-DBE environment based on conservative aging procedures referenced in W WCAP-9885. This documented conservative basis ensures that adequate margin exists.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 510

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17

EQUIPMENT ITEM NO. 17
PRESSURE TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
BARTON MODEL 764 (LOT 2)
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 17
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): REACTOR TRIP (Q2B31PT455, 456, 457)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.6 [6]

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	6a, 6b
Equipment Summary	
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

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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	_____
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	<u>X</u>

*Licence did not provide documentation
for review*

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 17LICENSEE RESPONSE TO NRC SERNRC DEFICIENCYAPCo RESPONSEAGING

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment qualification program, modification, replacement).

QUALIFICATION TIME

The test program demonstrates that the transmitter will perform its trip function for 5 minutes and post-accident monitoring function for 4 months following the DBE.

The post accident time used during testing is fifteen (15) days. This time/temperature relationship is a conservative simulation of the four months post-accident operability requirements.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2750 ppm. This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing test parameters. However, the following margins can be identified:

- (a) Temperature - The 380°F qualification test condition exceeds the 300°F required temperature by 80°F, thus adequate margin has been demonstrated.
- (b) Pressure - The 75 psig qualification test condition provides adequate margin above the maximum calculated Farley Unit 2 containment pressure of 47.5 psig.
- (c) Radiation - The Barton transmitter equipment qualification tests were based on a conservative calculation from the Westinghouse generic program which uses TLD-1484 source terms and a 4100 MW_e plant as a basis. This conservative calculation established 5×10^7 rad as the qualification basis. The maximum calculated dose for Farley - Unit 2 Barton Transmitters would be substantially reduced.

NRC DEFICIENCYAPCo RESPONSEMARGIN

from this amount by a ratio of the Farley power rating (2652 MW_e) over the calculational basis, therefore, adequate margin exists.

- (d) Operating Time - The Barton transmitter qualification test program utilized a 15 day test period simulating a four (4) month post-DBE environment based on conservative aging procedures referenced in WCAP-9885. This documented conservative basis ensures that adequate margin exists.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

EQUIPMENT ITEM NO. 18
LEVEL SWITCH LOCATED IN THE MAIN STEAM ROOM, ELEV. 133'5"
DE LAVAL MODEL LS36497
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 18
LICENSEE REFERENCE(S): 2587
FUNCTION (PLANT ID): MAIN FEED PUMP TRIP (Q2N21LSH2828A, B, C; 2829A, B, C)
SERVICE: FLOOD LEVEL SENSOR
LICENSEE SUBMITTAL: SCW(S): C.2.15.3 [6]

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
(See Section 2 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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



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NRC Contract No. NRC-03-79-113

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

1b

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 (evaluating replacements if needed)
- ☒ 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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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	_____ <u>X</u>
Aging Degradation Evaluated Adequately	_____ <u>X</u>
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	_____ <u>X</u>
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	_____ <u>X</u>
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. 1B

LICENSEE RESPONSE TO NRC SER

B. Make: GEMS Delaval
Model No.: LS-36497/XM-36495
Instruments: Level Switches/Transmitters
Location: Containment and Main Steam Room

Results of Evaluation

Thermal aging was not a requirement in the qualification program for these instruments, which was developed to address IEEE 323-1971. Radiation aging requirements of FSAR Section 3.11, however, have been adequately met by the vendor qualification program. A material list of the equipment and a complete material list of the manufacturer's analogous equipment has been previously evaluated and found to contain thermal age-susceptible materials. A review of the key aging data of the materials in comparison to the Farley environmental requirements has indicated an expected life beyond June 30, 1982 and beyond the next few refueling outages. Furthermore, the operating history of the instruments does not indicate a short-term deleterious thermal aging mechanism. No new test reports or information is available at this time.

APCo Position

A favorable operating history, a successful radiological-aging test, a review of the thermal aging characteristics of the material, and the A/E evaluation supports APCo's opinion that the instruments would be capable of completing their intended function at least beyond the first refueling outage. Surveillance and maintenance procedures are being implemented which ensure the thermal age-related degradation will



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NRC Contract No. NRC-03-70-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

LICENSEE RESPONSE TO NRC SER

be identified and the necessary action taken to verify the continuing qualified status of the instruments throughout the life of the plant.

APCo is presently completing an evaluation of various makes and models of instruments to determine a suitable replacement if needed. The selection, if required, will be made in a timely manner to support the surveillance and maintenance procedures.



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

3c

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

LICENSEE RESPONSE TO NRC SER

ITEM 2:

The information between the environmental qualification documentation for the Gems level transmitters and the applicability of this documentation to the Gems level switches will be provided.

RESPONSE:

The environmental qualification documentation for the Gems-DeLaval level transmitters (FIRL Test Report F-C3834, March 1974) is also applicable to the Gems-DeLaval level switches. Applicability of the report to the level switches is documented on Gems-DeLaval drawing LS-36457, June 8, 1975, which has been made a part of the central qualification documentation file.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 18

NOTES:

[1888]

[1887]

1. FIRC report S-C3834, [^]supplement to F-C3834, [^]consisted of extended steam exposure in accordance with the first 24 hours of the temperature/pressure profile of IEEE 323-74. During successful execution of the 24 hour steam exposure, the sensor functioned properly for less than 90 minutes, which is considered to be a failure.

2. The test program did not include thermal aging.

3. No qualified life has been established for this equipment.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

EQUIPMENT ITEM NO. 19
LEVEL SENSOR LOCATED IN THE CONTAINMENT, ELEV. 80'0"
DE LAVAL MODEL XM54854323
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 19
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): LEVEL INDICATION (Q2G21LT3282A-A, B-B)
SERVICE: CONTAINMENT SUMP
LICENSEE SUBMITTAL: SCEW(S): TMI-7.2 [6, 11, 19]

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, CG, A, S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,
Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

Contents

Checksheet Page No.

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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 TESTING TO BE COMPLETED BY 3RD QUARTER, 1982.)
- ☐ The Licensee states that the equipment item does not require qualification and/or should be exempt 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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

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	_____
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-0589, 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	_____



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 19

LICENSEE RESPONSE TO NRC SER

As discussed in Chapter 2, the following three types of equipment were installed without complete qualification documentation.

<u>Manufacturer</u>	<u>Generic Name</u>	<u>Model</u>	<u>No of Items</u>	<u>Chapter 2 Reference</u>
Target Rock	Solenoid valve	79AB001	4	Section 2
ASCO	Solenoid valve	HTX8320A22V	4	Section 3
Victoreen	Radiation detector	877-1	2	Section 4
GEMS-Delaval	Level sensor	XM-54854	2	Section 7

The Target Rock solenoid valves and GEMS-Delaval level transmitters are presently undergoing qualification testing, which is expected to be completed during the fourth and third quarter of 1982, respectively. The test report for the Victoreen radiation detectors was recently evaluated. As discussed in Chapter 2, the evaluation of the test report indicates a water-tight fitting is necessary to protect the cable connection and to establish similarity with the test specimen. This modification will be completed during the next refueling outage. The ASCO solenoid valves lack adequate qualification documentation and are scheduled to be replaced at the next refueling outage.

Other than the ASCO solenoid valves, all of the above equipment were installed prior to the completion of the qualification test program and the evaluation of the associated test reports. Alabama Power Company installed this equipment in order to provide the state-of-the-art coincident with the implementation dates required by NUREG-0737. Alabama Power Company will continue to monitor the progress of these ongoing qualification test programs. The ASCO solenoid valves will be installed to satisfy NUREG-0588.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

EQUIPMENT ITEM NO. 20
LEVEL TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
DE LAVAL MODEL XM36495
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 20
LICENSEE REFERENCE(S): 1887, 2587
FUNCTION (PLANT ID): POST-ACCIDENT LEVEL MONITOR (Q2E11LT3594A, B)
LICENSEE SUBMITTAL. SCEW(S): C.2.5.2 [6]

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. 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 (evaluating replacements if needed)
- ☒ 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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u> </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> </u>
Program Established to Identify Aging Degradation	<u> </u>
Criteria Regarding Aging Simulation Satisfied (If Required)	<u> </u>
Criteria Regarding Temperature/Pressure Exposure:	<u> </u>
o Peak Temperature Adequate	<u> </u>
o Peak Pressure Adequate	<u> </u>
o Duration Adequate	<u> </u>
o Required Profile Enveloped Adequately	<u> </u>
o Steam Exposure (If Required) Adequate	<u> </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> </u>
Criteria Regarding Test Failures or Severe Anomalies	<u> </u>
(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> </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>



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	<u> </u>
Adequate Similarity Between Equipment and Test Specimen Established	<u> X </u>
Aging Degradation Evaluated Adequately	<u> Y </u>
Qualified Life or Replacement Schedule Established (If Required)	<u> </u>
Program Established to Identify Aging Degradation	<u> </u>
Criteria Regarding Aging Simulation Satisfied (If Required)	<u> </u>
Criteria Regarding Temperature/Pressure Exposure:	<u> </u>
o Peak Temperature Adequate	<u> </u>
o Peak Pressure Adequate	<u> </u>
o Duration Adequate	<u> </u>
o Required Profile Enveloped Adequately	<u> </u>
o Steam Exposure (If Required) Adequate	<u> </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> </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> </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>



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

LICENSEE RESPONSE TO NRC SER

B. Make: GEMS Delaval
Model No.: LS-36497/XM-36495
Instruments: Level Switches/Transmitters
Location: Containment and Main Steam Room

Results of Evaluation

Thermal aging was not a requirement in the qualification program for these instruments, which was developed to address IEEE 323-1971. Radiation aging requirements of FSAR Section 3.11, however, have been adequately met by the vendor qualification program. A material list of the equipment and a complete material list of the manufacturer's analogous equipment has been previously evaluated and found to contain thermal age-susceptible materials. A review of the key aging data of the materials in comparison to the Farley environmental requirements has indicated an expected life beyond June 30, 1982 and beyond the next few refueling outages. Furthermore, the operating history of the instruments does not indicate a short-term deleterious thermal aging mechanism. No new test reports or information is available at this time.

APCo Position

A favorable operating history, a successful radiological-aging test, a review of the thermal aging characteristics of the material, and the A/E evaluation supports APCo's opinion that the instruments would be capable of completing their intended function at least beyond the first refueling outage. Surveillance and maintenance procedures are being implemented which ensure the thermal age-related degradation will



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

LICENSEE RESPONSE TO NRC SER

be identified and the necessary action taken to verify the continuing qualified status of the instruments throughout the life of the plant.

APCo is presently completing an evaluation of various makes and models of instruments to determine a suitable replacement if needed. The selection, if required, will be made in a timely manner to support the surveillance and maintenance procedures.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 20

NOTES:

[1888]

[1887]

1. FIRC report S-C3834, [^]supplement to F-C3834, [^]consisted of extended steam exposure in accordance with the first 24 hours of the temperature/pressure profile of IEEE 323-74. During successful execution of the 24 hour steam exposure, the sensor functioned properly for less than 90 minutes, which is considered to be a failure.

2. The test program did not include thermal aging.

3. No qualified life has been established for this equipment.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21

EQUIPMENT ITEM NO. 21
LEVEL TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
BARTON MODEL 76A (LOT 2)
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 21
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): PRESSURIZER LEVEL (Q2B31LT459, 460 461)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.5 [6]
FUNCTION (PLANT ID): FEEDWATER CONTROL (Q2C22LT474 TO 476, 484 TO 486, 494 TO 496)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.9 [6]
FUNCTION (PLANT ID): LEVEL INDICATION (Q2N11LT477, 487, 497)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.11 [6]

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	6a, 6b
Equipment Summary	
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
I.b Modification
II.a Qualification Not Established
II.b Not Qualified

II.c Qualified Life Deficiency
III.a Exempt
III.b Not in Score
IV Documentation Not Available



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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 _____
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

*Licencee did not provide documentation
for review*

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 21LICENSEE RESPONSE TO NRC SERNRC DEFICIENCYAPCo RESPONSE

AGING

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment qualification program, modification, replacement).

QUALIFICATION
TIME

The test program demonstrates that the transmitter will perform its trip function for 5 minutes and post-accident monitoring function for 4 months following the DBE.

The post accident time used during testing is fifteen (15) days. This time/temperature relationship is a conservative simulation of the four months post-accident operability requirements.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2750 ppm. This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing test parameters. However, the following margins can be identified:

- (a) Temperature - The 380°F qualification test condition exceeds the 300°F required temperature by 80°F, thus adequate margin has been demonstrated.
- (b) Pressure - The 75 psig qualification test condition provides adequate margin above the maximum calculated Farley Unit 2 containment pressure of 47.5 psig.
- (c) Radiation - The Barton transmitter equipment qualification tests were based on a conservative calculation from the Westinghouse generic program which uses ILD-148/4 source terms and a 4100 MW_e plant as a basis. This conservative calculation established 5×10^7 rad as the qualification basis. The maximum calculated dose for Farley - Unit 2 Barton Transmitters would be substantially reduced.

NRC DEFICIENCYAPCo RESPONSE

MARGIN

from this amount by a ratio of the Farley power rating (2652 MW_e) over the calculational basis, therefore, adequate margin exists.

- (d) Operating Time - The Barton transmitter qualification test program utilized a 15 day test period simulating a four (4) month post-DBE environment based on conservative aging procedures referenced in WCAP-9885. This documented conservative basis ensures that adequate margin exists.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 22

EQUIPMENT ITEM NO. 22
FLOW TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 121'0"
BARTON MODEL 764 (LOT 2)
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 22
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): FEEDWATER CONTROL (Q2C22FT474, 475, 484, 485, 494, 495)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.10 [6]

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	6a, 6b
Equipment Summary	
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)

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 578

Page
2

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: _____
 c 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

*Licensee did not provide documentation
for review*



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 22

LICENSEE RESPONSE TO NRC SERNRC DEFICIENCYAPCo RESPONSE

AGING

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment qualification program, modification, replacement).

QUALIFICATION
TIME

The test program demonstrates that the transmitter will perform its trip function for 5 minutes and post-accident monitoring function for 4 months following the DBE.

The post accident time used during testing is fifteen (15) days. This time/temperature relationship is a conservative simulation of the four months post-accident operability requirements.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2750 ppm. This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing test parameters. However, the following margins can be identified:

- (a) Temperature - The 380°F qualification test condition exceeds the 300°F required temperature by 80°F, thus adequate margin has been demonstrated.
- (b) Pressure - The 75 psig qualification test condition provides adequate margin above the maximum calculated Farley Unit 2 containment pressure of 47.5 psig.
- (c) Radiation - The Barton transmitter equipment qualification tests were based on a conservative calculation from the Westinghouse generic program which uses 11.0-1484 source terms and a 6100 MW_e plant as a basis. This conservative calculation established 5×10^7 rad as the qualification basis. The maximum calculated dose for Farley - Unit 2 Barton Transmitters would be substantially reduced.

NRC DEFICIENCYAPCo RESPONSE

MARGIN

from this amount by a ratio of the Farley power rating (2652 MW_e) over the calculational basis, therefore, adequate margin exists.

- (d) Operating Time - The Barton transmitter qualification test program utilized a 15 day test period simulating a four (4) month post-DBE environment based on conservative aging procedures referenced in WCAP-9885. This documented conservative basis ensures that adequate margin exists.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 23

EQUIPMENT ITEM NO. 23

LIMIT SWITCH LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"

NAMCO MODEL EA180

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 23

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2C22ZS0478, 488, 498, 479,
489, 499)

LICENSEE SUBMITTAL: SCEW(S): C.2.4.4 [6]

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:

Contents

Checksheet Page No.

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. 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)

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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

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)	<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	_____

FOR EVALUATION REFER TO ITEM NO. 26 (EXCLUDING SUBMERGENCE)



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 23

LICENSEE RESPONSE TO NRC SER

APCo RESPONSE

All limit switches outside containment, previously identified as requiring replacement have been replaced with fully qualified NAMCO EA-180 models. System master lists and component evaluation worksheets have been revised to document the qualification of these limit switches. This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

All NAMCO EA-180 Limit Switches outside the containment have been qualified for submerged operation. Refer to Bechtel Change Notice 2BE-1049-3.

Although the NAMCO EA-180 Limit Switches are qualified for 2×10^8 Rads gamma, limit switches in this area will only be exposed to normal background radiation outside the containment. They do not see radiation as a result of recirculated sump fluid.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

EQUIPMENT ITEM NO. 24

LIMIT SWITCH LOCATED IN THE MAIN STEAM ROOM, ELEV. 131'7"

NAMCO MODEL EA180

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 24

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N25ZS3772A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.17.3 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N23ZS3228A, B, C; 3227A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.16.4 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N12ZS3234A, B; 3235A, B)

LICENSEE SUBMITTAL: SCEW(S): C.2.14.3 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N11ZS3369A, B, C; 3370A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.6 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N11ZS3368A, B, C; 3976A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.5 [6]

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

RT, 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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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

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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

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)	_____
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	<u>X</u> _____
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)	_____

DESIGNATION:

X = CATEGORY

NRC QUALIFICATION 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	_____

FOR EVALUATION REFER TO ITEM NO. 26



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 24

LICENSEE RESPONSE TO NRC SER

APCo RESPONSE

All limit switches outside containment, previously identified as requiring replacement have been replaced with fully qualified NAMCO EA-180 models. System master lists and component evaluation worksheets have been revised to document the qualification of these limit switches. This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

All NAMCO EA-180 Limit Switches outside the containment have been qualified for submerged operation. Refer to Bechtel Change Notice 2BE-1049-3.

Although the NAMCO EA-180 Limit Switches are qualified for 2×10^8 Rads gamma, limit switches in this area will only be exposed to normal background radiation outside the containment. They do not see radiation as a result of recirculated sump fluid.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

EQUIPMENT ITEM NO. 25

LIMIT SWITCH LOCATED IN THE CONTAINMENT, ELEV. 118'0" & ABOVE

NAMCO MODEL EA180

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 25

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2B31ZS804;)

LICENSEE SUBMITTAL: SCEW(S): C.2.3.3 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2E21ZS8871)

LICENSEE SUBMITTAL: SCEW(S): C.2.9.6A [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P13ZS3196, 2867B, 3197, 2866B)

LICENSEE SUBMITTAL: SCEW(S): C.2.6.5A [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P17S3184, 3443, N2C22ZS0499)

LICENSEE SUBMITTAL: SCEW(S): C.2.20.4 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P15ZS3104, 3103, 3765, 3766, 3179A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.5 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P15ZS3180A, B, C; 3181A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.5 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2E12ZS3999A, B)

LICENSEE SUBMITTAL: SCEW(S): C.2.4.5 [6]

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:

Contents

Checksheet Page No.

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. 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)

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



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NRC Contract No. NRC-03-78-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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)	<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	_____

FOR EVALUATION REFER TO ITEM NO. 26 (EXCLUDING SUBMERGENCE)



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NRC Contract No. NRC-03-79-11⁶

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 513

Page

3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 25

LICENSEE RESPONSE TO NRC SER

APCo RESPONSE

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm boron (Reference: Qualification Test Report for NAMCO EA-180 Limit Switches). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

For a discussion of the effects of submergence, refer to Appendix 4, Section II.C.



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

EQUIPMENT ITEM NO. 26

LIMIT SWITCH LOCATED IN THE CONTAINMENT, ELEV. 109'0"

NAMCO MODEL EA180

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 26

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2E21ZS8149A, B, C;
Q2E21ZS8808AB, BB, CD)

LICENSEE SUBMITTAL: SCEW(S): C.2.9.6 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2G21ZS3396, 7126;
N2G21ZS1003B)

LICENSEE SUBMITTAL: SCEW(S): C.2.12.3 [6]

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:

Contents

Checksheet Page No.

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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~~



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1b

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)

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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)	<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	<u>X</u> _____
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	_____



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

LICENSEE RESPONSE TO NRC SER

APCo RESPONSE

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm boron (Reference: Qualification Test Report for NAMCO EA-180 Limit Switches). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

For a discussion of the effects of submergence, refer to Appendix 4, Section II.C.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

LICENSEE RESPONSE TO NRC SER (Continued)

NAMCO LIMIT SWITCHES

LOCATION AND SAFETY FUNCTION

NAMCO limit switches located in-containment are used in air-operated valve dc solenoid control circuits. Under normal operating conditions, the valve solenoids are energized and their associated air-operated isolation valves are open. The solenoids are kept in the energized state or "sealed-in" by means of NAMCO limit switches. Figure II.C-1 shows a typical control circuit for an air-operated valve using a limit switch for "seal-in." The NAMCO limit switches provide position indication for the air operated valve. This indication circuit consists of position indicating lights in the control room. No automatic safety functions are associated with this valve position indication circuit.

It should be noted that associated stem mounted limit switches may give an erroneous valve position indication. This is judged acceptable since the operator can verify containment isolation by verifying that the redundant isolation valve is closed and that the operator is not required to reposition these valves post-LOCA or utilize their position indication to establish operating procedures.

FAILURE MODE ANALYSIS

The switches can fail open, grounded, or closed. A failure mode and effects analysis shows that for each failure mode two initial conditions for the associated solenoid must be considered: Solenoid initially energized and solenoid initially de-energized.

With the solenoid initially energized, limit switch failures will affect the solenoid and air-operated valve as follows. If the switch fails open, it will de-energize the solenoid and cause the associated air-operated valve to go to its fail safe position (closed) and need not be considered any further. A failure resulting in a single ground would have no effect on the battery power supply which is ungrounded. Multiple grounds could result in a blown fuse in the circuit that feeds the solenoid. This would cause de-energization of the solenoid resulting in the associated air-operated valve going to its fail safe position (closed) (Refer to Figure II.C.-2).

If the solenoid is initially de-energized it will be due to any of three possible conditions, not including the limit switch failure itself. These



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

LICENSEE RESPONSE TO NRC SER (Continued)

FAILURE MODE ANALYSIS (CONT.)

conditions are (1) loss of power, (2) control switch failed open or held continuously in CLOSE position, and (3) containment isolation signal. For the first two conditions, limit switch failure has no effect on the solenoid. For the third condition (containment isolation signal present), should the limit switch fail open, there would be no immediate effect. Subsequent to the failure, it would not be possible to re-open the air-operated valve unless the control switch was held continuously in the OPEN position. However, this condition has no effect on the ability of the valve to perform its safety function, i.e., to close.

In the event that containment isolation is called for and the limit switch fails closed, the isolation function will be performed as required. However, when the isolation signal is subsequently reset, the failed limit switch could cause its associated solenoid to be re-energized resulting in a re-opening of the air-operated isolation valve (Refer to Figure II.C.-2).

JUSTIFICATION FOR OPERATION

Protection against a loss of containment isolation is provided by redundant air-operated valves located outside of containment. Because these valves and their control elements are located outside containment they are not subject to the adverse environment resulting from the postulated initiating event



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

LICENSEE RESPONSE TO NRC SER (Continued)

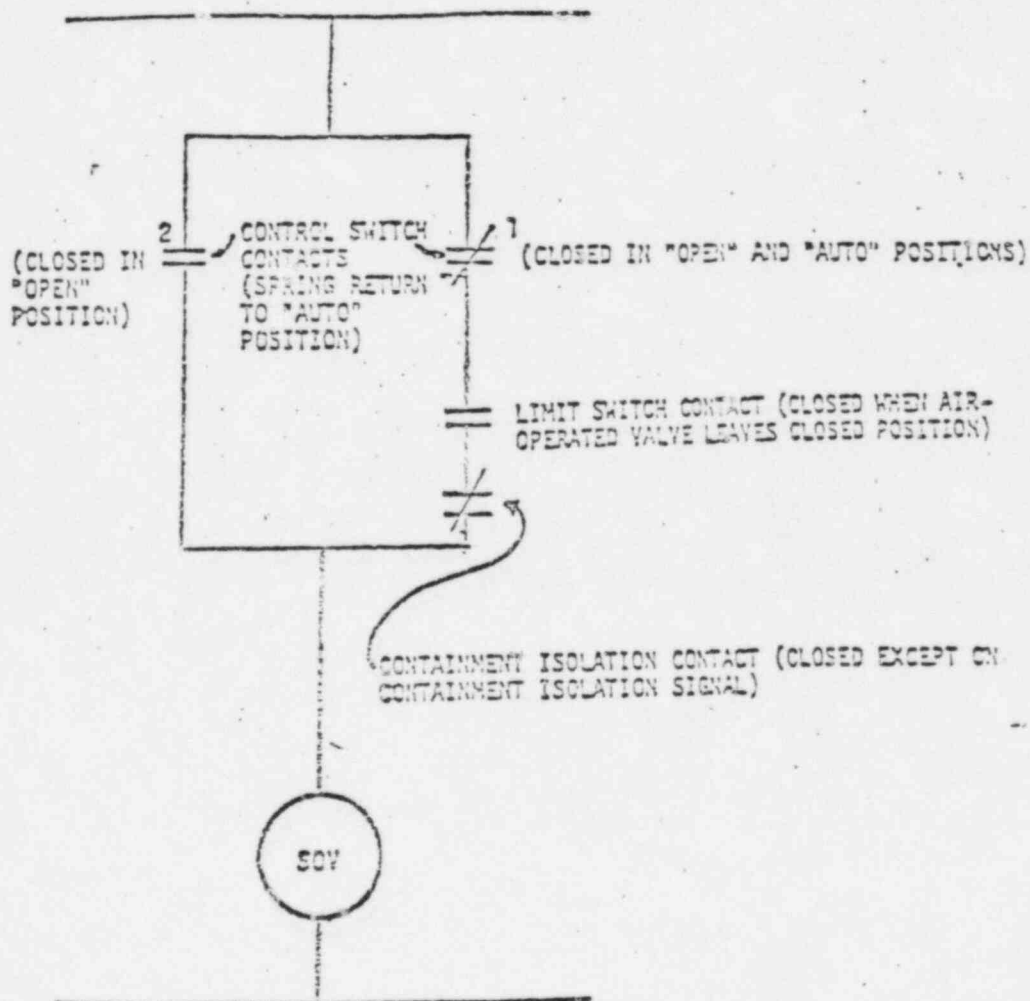


FIGURE II.C.-2
TYPICAL LIMIT SWITCH "SEAL-IN" CIRCUIT
FOR CONTAINMENT ISOLATION VALVE



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

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

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	LIMIT SWITCH	LIMIT SWITCH	
Manufacturer's Name (5.2.2/-/-)	NAMCO CONTROLS	NAMCO CONTROLS	
Model Number (5.2.2/-/-)	EA180	EA180-11302, REV. H	
Serial Number	NOT STATED	3979 H 13658	
Features/Mounting (5.2.6/-/-)	ON VALVE	HORIZONTAL IN AUTOCLAVE	
Connections/Interfaces (5.2.6/-/-)	NOT STATED	TEFLON TAPE USED TO SEAL CONDUIT THREADS	
Location/Elevation	CONTAINMENT ELEV. III'	N/A	
Equipment ID No.		N/A	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	QTR-105	QTR-105	
Report Date	N/A	AUGUST 28, 1980	
Issued by	N/A	ACME CLEVELAND DEVELOPMENT COMPANY	
Prepared for	N/A	NAMCO CONTROLS	
Referenced Reports	N/A	NOT STATED	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	N/A	SEQUENTIAL TEST	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	N/A	MAKE/BREAK CONTACT	
Operating Conditions (-/2.2.10/2.2.10)	NOT STATED	0.5 AMPS @ 100 Vdc	
Load/Cycles/Voltage/ Current/Freq.			



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5b

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

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	NOT STATED	
Accuracy (5.2.5/-/-)	N/A	NOT STATED	
Number of Specimens	N/A	1	
Test Instruments Calibrated	N/A	YES	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	NOT STATED	ACTIVE	
Test Duration (5.2.1/-/-)	N/A	30 days	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	> 1 day	N/A	
Required Function Time	1 HOUR	N/A	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	N/A	INSPECTION/BASE LINE DATA THERMAL AGING/MECHANICAL WEAR AGING/IRRADIATION/ SEISMIC TESTING/LOCA SIMULATION	
Test Sequence (NUREG-0560, 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)			
Thermal Aging/Basis	NOT STATED	400 hrs @ 120°C	X NOTE 1
Material Aging Evaluation (7.0/-/-)	NOT STATED	ANALYSIS TO DETERMINE SUSCEPTIBILITY	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)	NOT STATED	THERMAL	
Radiation Aging, Type	GAMMA	GAMMA	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE NO.)
Radiation Aging, Dose (rd)	N/A	204 MEGA RADS *	
Radiation Aging, Dose Rate	N/A	9.1×10^5 RADS/HR	
Radiation Aging, Method	N/A	TEST	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)	NOT STATED	NOT STATED	
Operational Aging (-/4.2/-)	N/A	100,300 ACTUATION CYCLES WHILE UNDER 0.5 AMP @ 100 Vdc LOAD	
Other Age Conditioning (-/4.2/-)	N/A	NOT STATED	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	NOT STATED	5 YEARS @ 55°C	X NOTE 1
Normal Ambient Temperature	} NOT STATED	} N/A	
Normal Ambient Radiation			
Normal Ambient Humidity			
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	NOT STATED	EA189-90051	
On-Going Analysis of Failures and Degradation (7.0/-/-)	NOT STATED	N/A	
Margin (General) (6.0/3.0/3.0)	N/A	NOT STATED	
Margin (NUREG-0588, Cat. 1) (-/3.2/-)	N/A	NOT STATED	
1. Temperature (+15°F)			
2. Pressure (+10%, 10 psig max)			
3. Radiation (not required)			
4. Time (+10%, +1 hour + function time minimum)			

* NORMAL AND ACCIDENT DOSE COMBINED IN SINGLE EXPOSURE PRIOR
TO LOCA SIMULATION



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5d

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

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	LOCA/MSLB	
Radiation Type	GAMMA	GAMMA	
Radiation Dose (rd) (4.1.2/1.4/1.4)	50 MEGARADS	204 MEGARADS*	
Radiation Dose Rate (rd/hr)	NOT STATED	9.1×10^5 RADS/hr	
Radiation Qual. Method (5.3.1/-/-)	N/A	TEST	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)	NOT STATED	N/A	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)	NOT STATED	NOT STATED	
Radiation Dose (Normal + Accident) (4.1.2/-/-)	NOT STATED	204 MEGARADS*	
Plateout Dose Considered (-/1.48/1.48)	NOT STATED	N/A	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)	NOT STATED	N/A	

* NORMAL AND ACCIDENT DOSES COMBINED IN A SINGLE EXPOSURE PRIOR
TO LOCA SIMULATION



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5e

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

NRC REQUIREMENTS WITH SECTION REFERENCE (DOR/0588-I/0588-II)	LICENSEE SUBMITTAL	QUALIFICATION DOCUMENTATION	DEFICIENCY (X OR NOTE No.)
<u>ENVIRONMENTAL PROFILE *</u> <u>OF ACCIDENT CONDITIONS</u>			
Rate of Temp./Press. Increase	36/41/SEC	11/8/SEC	
Peak: °F/psig/RH/Time	300/47.5/100/7 MIN.	340/70/100/3 hrs	
Decrease To: °F/psig/RH/Time	260/25/100/10 MIN.	140/-/-/10 SEC 340/70/100/3 hrs	
Decrease To: °F/psig/RH/Time	180/12/100/8 HRS	320/40/100/3 hrs	
Decrease To: °F/psig/RH/Time	DROP TO AMBIENT IN 11.57 DAYS	250/25/100/4 days 200/10/100/25 days	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	N/A	N/A	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	N/A	TEST	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	H ₃ BO ₃ /NaOH	Na ₂ S ₂ O ₃ /H ₃ BO ₃ /NaOH/H ₂ O	
Spray Density (gpm/ft ²)	NOT STATED	0.15	
Spray Duration	NOT STATED	30 days	
Submergence Duration (4.1.3/2.2.5/2.2.5)	NOT STATED	N/A	X NOTE 2
In-Leakage Considered (5.2.6, 5.3.2/-/-)	NOT STATED	N/A	
Time to Submergence	77 1/4 SEC	N/A	
Dust Environment (-/2.2.11/2.2.11)	N/A	N/A	

* LICENSEE PROFILE ENVELOPED FOR COMPARISON



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

5f

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 26

NOTES:

1. ALTHOUGH THE REPORT PROVIDES A MEANS OF ESTABLISHING
A QUALIFIED LIFE BASED ON THE AGING SIMULATION, THE
LICENSEE HAS NOT STATED THE QUALIFIED LIFE. THIS IS A
DEFICIENCY

2. THE LICENSEE HAS PROVIDED JUSTIFICATION FOR INTERIM
OPERATION WITH THE FAILURE MODE ANALYSIS (SEE PAGES 36-3d),
BUT HAS NOT PROPOSED ANY CORRECTIVE ACTION OR EVIDENCE
OF QUALIFICATION OF THE LIMIT SWITCHES FOR SUBMERGENCE.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

EQUIPMENT ITEM NO. 27
LIMIT SWITCH LOCATED IN THE CONTAINMENT
NAMCO MODEL EA180
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 27
LICENSEE REFERENCE(S): 3293
FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2B31ZS0445A, 444B)
LICENSEE SUBMITTAL: SCEW(S): TMI-4.5 [6, 11, 19]
FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2B13ZS2034, 2035, 2036)
LICENSEE SUBMITTAL: SCEW(S): TMI-4.5 [6, 11, 19]

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. 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)

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



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NRC Contract No. NRC-03-70-110

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

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)	<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	_____

FOR EVALUATION REFER TO ITEM NO. 26 (EXCLUDING SUBMERGENCE)



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 27

LICENSEE RESPONSE TO NRC SER

APCo RESPONSE

This equipment has been evaluated to have a conservative qualified life beyond June 30, 1982 based on type testing, material analysis using Arrhenius Methodology, and/or operating experience. APCo will complete an evaluation by January 1, 1982 to extend the qualified life of the equipment and take appropriate actions, if necessary (i.e., justification, alternate equipment, qualification program, modification, replacement).

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 3000 ppm boron (Reference: Qualification Test Report for NAMCO EA-180 Limit Switches). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

For a discussion of the effects of submergence, refer to Appendix 4, Section II.C.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

EQUIPMENT ITEM NO. 28
ELECTRICAL PENETRATION LOCATED IN THE CONTAINMENT
GENERAL ELECTRIC MODEL 100 SERIES
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 28
LICENSEE REFERENCE(S): 1789, 1790
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)
SERVICE: ELECTRICAL PENETRATION
LICENSEE SUBMITTAL: SCEW(S): TMI-7.4 [6, 11, 19]
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)
SERVICE: ELECTRICAL PENETRATION
LICENSEE SUBMITTAL: SCEW(S): TMI-5.3 [6, 11, 19]
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)
SERVICE: ELECTRICAL PENETRATION
LICENSEE SUBMITTAL: SCEW(S): TMI-4.4 [6, 11, 19]
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)
SERVICE: ELECTRICAL PENETRATION
LICENSEE SUBMITTAL: SCEW(S): TMI-3.4 [6, 11, 19]
FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)
SERVICE: ELECTRICAL PENETRATION
LICENSEE SUBMITTAL: SCEW(S): TMI-2.3 [6, 11, 19]

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
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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. 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)

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. 28EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORMNRC 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. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 28

LICENSEE RESPONSE TO NRC SER

NRC DEFICIENCY

APCO RESPONSE

AGING

Type test accelerated aging techniques were used to thermally age the most age susceptible material which analyses determined to be epoxy resin. Using Arrhenius techniques, a temperature dependant life line was established based on 50% reduction in ultimate tensile strength. Thermogravimetric analyses also were run on a DuPont Model 950 thermal analyzer to confirm the elevated temperature tests. These data can be extrapolated to indicate a service life in excess of 150,000 hours (40 years) at the average service temperature of 160°F.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 8750 ppm. (Reference: G. C. Test Report for L. V. Penetration). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

QUALIFICATION
TIME

The component qualification time is actually 10 days. The listing of 4 hours on the component worksheet was done to indicate that the specification requirement was met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 340°F qualification test condition exceeds the 300°F required temperature by 40°F thus adequate margin has been demonstrated.
- (b) Pressure - The 118 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 1×10^8 Rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads therefore adequate margin exists.



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FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5

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

ELECTRICAL PENETRATION LOCATED IN THE CONTAINMENT, ELEV. 143'0"

GENERAL ELECTRIC MODEL 100 SERIES

REQUIRED OPERATING TIME: 4 HOURS

TER CHECKSHEET NO. 29

LICENSEE REFERENCE(S): 1789, 1790

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.20.6 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.19.5 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.7 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.12 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.11.6 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.10.4 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.9.9 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.8.3 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.7.3 [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 ₁ , 1a ₂
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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

EQUIPMENT ITEM NO. 29 (CONTINUED)

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
LICENSEE SUBMITTAL: SCEW(S): C.2.6.9 [5]
FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
LICENSEE SUBMITTAL: SCEW(S): C.2.5.3 [5]
FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.11 [5]
FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.4 [5]
FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
LICENSEE SUBMITTAL: SCEW(S): C.2.2.4 [5]
FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
LICENSEE SUBMITTAL: SCEW(S): C.2.1.3 [5]

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

R, T, Q1, RE, 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
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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



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

1b

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

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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

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 _____

For evaluation see item 28



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 29

LICENSEE RESPONSE TO NRC SER

NRC DEFICIENCY

APCO RESPONSE

AGING

Type test accelerated aging techniques were used to thermally age the most age susceptible material which analyses determined to be epoxy resin. Using Arrhenius techniques, a temperature dependant life line was established based on 50% reduction in ultimate tensile strength. Thermogravimetric analyses also were run on a DuPont Model 950 thermal analyzer to confirm the elevated temperature tests. These data can be extrapolated to indicate a service life in excess of 350,000 hours (40 years) at the average service temperature of 160°F.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 8750 ppm (Reference: G. E. Test Report for L. V. Penetration). This boric acid concentration exceeds the Farley FSAR value of 2000 ppm.

QUALIFICATION
TIME

The component qualification time is actually 10 days. The listing of 4 hours on the component worksheet was done to indicate that the specification requirement was met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 340°F qualification test condition exceeds the 300°F required temperature by 40°F thus adequate margin has been demonstrated.
- (b) Pressure - The 118 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 1×10^8 Rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads therefore adequate margin exists.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

EQUIPMENT ITEM NO. 30
TERMINAL BLOCK LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
STATES MODEL TYPE ZWM
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 30
LICENSEE REFERENCE(S): 3950, 4577
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2C22SV0478A-A/JB, 488A-A/JB, 498A-A/JB)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.7 [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. 30

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 Qualified</u> | 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. 30

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	<u>X</u>
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	_____

For evaluation see item 31



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FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30

LICENSEE RESPONSE TO NRC SER

COMPONENT: TERMINAL BLOCKS/JUNCTION BOXES - OUTSIDE CONTAINMENT

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging techniques were used to thermally age the terminal blocks. Arrhenius Methodology was used to establish a qualified life. The age-susceptible materials were identified and activation energies determined. From the analysis, a qualified life of 40 years was established for both inside and outside containment for Plant Farley.

TEMPERATURE

The qualification temperature of the terminal blocks is 302°F. As can be seen from Figure C.3.4, the calculated peak temperature of 308°F is reached in 0.27 seconds, where it remains for approximately 1.1 seconds, at which time the temperature drops to atmospheric saturation temperature of 212°F. Because of the thermal lag, the terminal blocks are never exposed to a temperature greater than 212°F. The terminal blocks are therefore qualified to the accident environment with conservative margin.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - Refer to discussion on temperature above.
- (b) Pressure - The 80 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 Main Steam Room pressure of 20.5 psia.
- (c) Radiation - Although the terminal blocks are qualified for 1×10^8 rads, radiation qualification is not a requirement for the Main Steam Room. Therefore adequate margin exists.

SUBMERGENCE

4 items listed as deficient for submergence are located at an elevation of 135' in Main Steam Room which is above flood level elevation of 130'-5" hence not deficient



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

EQUIPMENT ITEM NO. 31
TERMINAL BLOCK LOCATED IN THE CONTAINMENT
STATES MODEL TYPE ZWM
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 31
LICENSEE REFERENCE(S): 3950
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2B13GG001-B)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-4.3 [6, 11, 19]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2B31SV0444BA-B/JB, 445AA-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-3.3 [6, 11, 19]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (A2TB007; Q2B13SV2213A-A/JB, 4B-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-2.5 [6, 11, 19]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2B13SV2214A/JB, 3B-B/JB; A2TB025)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-2.5 [6, 11, 19]

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
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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. 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 _____.)

☐ 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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORMNRC 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:

Y = 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 _____



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

3a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

LICENSEE RESPONSE TO NRC SER

NRC DEFICIENCY

AGING

Type test accelerated aging techniques were used to thermally age the terminal blocks. Arrhenius Methodology was used to establish a qualified life. The age-susceptible materials were identified and activation energies determined. From the analysis, a qualified life of 40 years was established for both inside and outside containment for Plant Farley.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 10,000 ppm (Reference: Wyle Report 44254-1). This sulfuric acid concentration exceeds the Farley FSAR value of 2000 ppm.

The listing of deficiencies for all parameters for the two boxes N2E31SV8047-B/JB and N2E21SV8871-A/JB appears to be an NRC clerical error, since the same terminal block/terminal boxes are used throughout the inside of the containment.

APCo RESPONSE

EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

The Licensee Stated:

ENVIRONMENTAL QUALIFICATION OF
STATES COMPANY TERMINAL BLOCKS FOR
ALABAMA POWER COMPANY
JOSEPH M. FARLEY NUCLEAR PLANT

I. INTRODUCTION

As a result of a review performed pursuant to NRC Circular 73-08, it was determined that the terminal blocks used in conjunction with certain safety related electrical circuits inside the containment did not have documentation certifying their qualification status.

There is a total of 43 terminal blocks inside the containment which are used to connect electrical solenoid valves to field wiring. These valves are used for the purpose of containment isolation. In addition, there are six wide range cold/hot reactor coolant system temperature sensors, two in each loop, which are interconnected to field wiring through terminal blocks. These are provided to enable the required manual functions to be performed, to proceed to an orderly shutdown following a Condition II or Condition III event as noted in FSAR Sections 15.2 and 15.3. The terminal blocks are Type 2MM, Catalog M-25012, manufactured by States Company, a Division of Multi-Amp Corporation. They are twelve pole, front connected terminal blocks with white marker strips and are mounted on the inside of NEMA 4 enclosures, whose dimensions are 12" x 14" x 5". The welded base of the terminal block is fabricated from general purpose Duxet #791, which is a brand name of Hooker Chemical and Plastics Corporation and is basically a two stage, asbestos free phenolic. The barrier strips are fabricated from Alkath Chemical Grade PP-1082 polypropylene. Both materials are highly resistant to heat and corrosion as well as ionizing radiation.

The enclosures which house the terminal blocks are Hoffman Engineering Company, NEMA Type 4, continuous hinge, clamp cover boxes, Catalog A-1412CNFF. They are fabricated from 14 gauge steel and finished with gray hammerstone enamel inside and out over phosphatized surfaces. To preclude the collapse of the enclosures due to positive pressure, vent holes have been drilled in the boxes, and rupture disks installed over the holes.

Although it was demonstrated that the terminal blocks were environmentally qualified for in-containment applications at Farley, based on an engineering evaluation of published data, and previous test information on constituent parts of the terminal block, it was decided that the blocks should be environmentally qualified by a series of formal, sequential tests at a testing laboratory.

The testing Laboratory selected was Wyle Laboratories located in Eastville, Alabama, and the testing was performed during the period of December 7, 1978 and February 11, 1979.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUPPAGE NO. 5
REPORT NO. 44254-1

3.0 REFERENCES

- 3.1 Alabama Power Company Purchase Order No. FRP-2-1196.
- 3.2 Wyle Laboratories Qualification Plan 545/1025/TS, Revision B, dated October 10, 1978.

6.0 TEST ITEM AND TEST EQUIPMENT DESCRIPTION

6.1 Test Item Description

6.1.1 Test Item No. 1

A 12-pole Terminal Block, Type DVM, manufactured by States Company, a Division of Multi-App Corporation, and a 6-Pole Terminal Block, Type DVM, manufactured by States Company, are mounted in a steel NEMA 4 Enclosure. The 6-pole terminal block is sealed in RTV. The NEMA 4 Enclosure contains a blow-out plug to prevent differential pressure buildup. The NEMA 4 Enclosure is 15" x 12" x 6". The terminal blocks are wired for AC circuits in accordance with Bechtel Schematic for Test Item No. 1 (Box No. 1) and Drawing S-181606, Sheet 83. The wire leads are approximately 10' long for test connections and exit the NEMA 4 Enclosure through conduit.

6.1.2 Test Item No. 2

A 12-Pole Terminal Block, Type DVM, manufactured by States Company, a Division of Multi-App Corporation, and a 6-Pole Terminal Block, Type DVM, manufactured by States Company, are mounted in a steel NEMA 4 Enclosure. The 6-pole terminal block is sealed in RTV. The NEMA 4 Enclosure contains a blow-out plug to prevent differential pressure buildup. The NEMA 4 Enclosure is 15" x 12" x 6". The terminal blocks are wired for DC circuits in accordance with Bechtel Schematic for Test Item No. 2 (Box No. 2) and Drawing S-181607, Sheet 15. The wire leads are approximately 10' long for test connections and exit the NEMA 4 Enclosure through conduit.

6.1.3 Test Item No. 3

Eighteen (18) heat-shrink splices, manufactured by Raychem Corporation, are mounted in a steel NEMA 4 Enclosure. The NEMA 4 Enclosure is 15" x 12" x 6" and contains a blow-out plug to prevent differential pressure buildup. The splices connect AC and DC circuits in accordance with the schematics for Test Item No. 3 (Box No. 3) and Drawings S-181607 and S-181606, Sheet 88. The wire leads are approximately 10' long for test connections and exit the NEMA 4 Enclosure through conduit.

6.1.4 Test Item No. 4

A 12-pole Terminal Block, Type DVM, manufactured by States Company, a Division of Multi-App Corporation, is mounted in a steel NEMA 4 Enclosure. The NEMA 4 Enclosure contains no blow-out plug and all conduit outlets are sealed with RTV. The NEMA 4 Enclosure is 15" x 12" x 6". The terminal block is wired for DC circuits in accordance with Bechtel Schematic for Test Item No. 4 (Box No. 4). The wire leads are approximately 10' long for test connections and exit the NEMA 4 Enclosure through the conduit.



EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

Regarding Aging the Licensee stated:

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP

PAGE NO. 29-1
REPORT NO. 44756-1

SECTION IV

TEMPERATURE AGING TEST

1.0

REQUIREMENTS

The four (4) WMD 4 Enclosures shall be subjected to an accelerated aging test that will put them into a condition which would be equivalent to a 40-year aged condition.

Each component of the subject equipment was reviewed for function and age-related failure mechanisms which could affect its function. This review is contained in the Qualification Plan 545/1025/ES, Revision 2, Section XII (Qualification Program), Paragraph 3.0 (Aging). (This Qualification Plan is included as Section XII of this report.)

As described in Paragraph 3.1, "Aging Evaluation", of the Qualification Plan contained in Section XII, the "weak-link" material is the phenolic in the terminal blocks in Test Items #1, #2, and #4, the heat-shrink splices in Test Item #3.

The aging time and conditions are shown below.

Test Item	Aging Temp.	Aging Time	Aging Atmosphere
Terminal Blocks	82°C ¹	163 hours	Air, 60% R.H. ± 10%
Heat-Shrink Splices	82°C ²	163 hours	Air, 60% R.H. ± 10%
	125°C ³	53 hours	Air, Uncontrolled R.H.

1 - Equivalent to a 40-year life.

2 - Aged with the terminal blocks to produce an equivalent 1.27 year life.

3 - Additional aging to produce aging equivalent to 18.73 years for a total equivalent 40-year life.

2.0

PROCEDURES

The four (4) WMD 4 Enclosures were placed in a temperature chamber. The test items were aged in air at 82 ± 1°C with controlled humidity of 60% ± 10% for 163 hours.

All four test items were removed from the chamber. Test item #3 was placed in another chamber and aged in air at 125°C and uncontrolled ambient humidity for an additional 53 hours and then removed from the chamber.

3.0

RESULTS

The test items were subjected to the temperature aging test as specified above. At the completion of testing, they were visually inspected and no degradation was noted.

Photographs pertaining to this test are contained in Appendix I of this service.

Equipment used for this test is listed in Appendix II of this section.



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NRC Contract No. NRC-03-79-118
FRC Project No. 5257
FRC Assignment No. 13
FRC Task No. 518

Page
5d

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

Regarding radiation the Licensee provided the Following:

Page II-1
A, PORT 44354-1

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF NUCLEAR ENGINEERING
ATLANTA, GEORGIA 30332

FRANK R. KELLY
NUCLEAR RESEARCH CENTER
TELEPHONE: (404) 254-1000

December 21, 1978

Mr. Barry Smith
Wyle Laboratories
7300 Governors Drive West
Enterprise, Alabama 35807

Dear Mr. Smith:

Pursuant to your instructions for NEMA-4 enclosures (Job #44354-02, PO #4-6066, were irradiated in our hot cell facility using Cobalt 60 to a total dose of 1.0×10^6 rads (dose to attached labeling was not determined).

We certify the specific parameters of this irradiation to be:

Irradiation Period:	December 6 thru December 21, 1978 (303.0 hr)
Dose Rate:	3.3×10^3 rad/hr
Total Dose:	1.0×10^6 rads
Dosimetry:	Thermoluminescent dosimeters of lithium borate (Harshaw T _L -300) calibrated with a Fricke Dosimeter model 2502/3.

If you require any further information please contact us.

GEORGIA INSTITUTE OF TECHNOLOGY

Mary Jane
Mary Jane
Assistant Research Scientist
MJK/jm



EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

Regarding LOCA simulation, the Licensee's results are presented on the following pages:

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP

PAGE NO. VIII-1
REPORT NO. 14734-1

SECTION VIII

**ACCIDENT TEST (LOCA)
ENVIRONMENTAL CONDITION - CASE I**

1.0 REQUIREMENTS

The four (4) NEMA 4 Enclosures shall be subjected to the environmental condition (Case I) shown in Figure 8, page 17 of Wyle Laboratories Qualification Plan 545/1025/US, Section III of this report. The following chemical spray solutions will apply:

- o Sodium hydroxide to a pH of 10.5 at room temperature
- o Sulfuric acid, 10,000 ppm
- o Chemical spray rate approximately 0.7 gpm/ft^2 of test item projected horizontal cross-sectional area

Chemical spray starts 55 seconds after initiation of environmental condition, Case I.

The circuits will be energized with 1.1 x 125 VDC, 1 ampere, for the DC requirements, or 1.1 x 115 VAC, 1 ampere, for the AC requirements.

1.2 PROCEDURES

The four (4) NEMA 4 Enclosures were installed in the Wyle 30" Environmental Simulation Chamber, as shown in Photographs No. 1 and No. 2 (located in Appendix II of this section). After running the cables through the chamber, the cables were potted with Southcast Resin at the chamber interface. The circuits were energized for the Accident Test as follows:

1.1 x 125 VDC, 1 ampere, for circuits No. 2 (Test Item #2), 1B (Test Item #3), and 4 (Test Item #4); and 1.1 x 115 VAC, 1 ampere, for circuits No. 1 (Test Item #1) and 3A (Test Item #5). The circuit currents and voltages were recorded during the test.

After the chamber was sealed, the circuits were energized and the test items were subjected to the environmental condition, Case I.

1.3 RESULTS

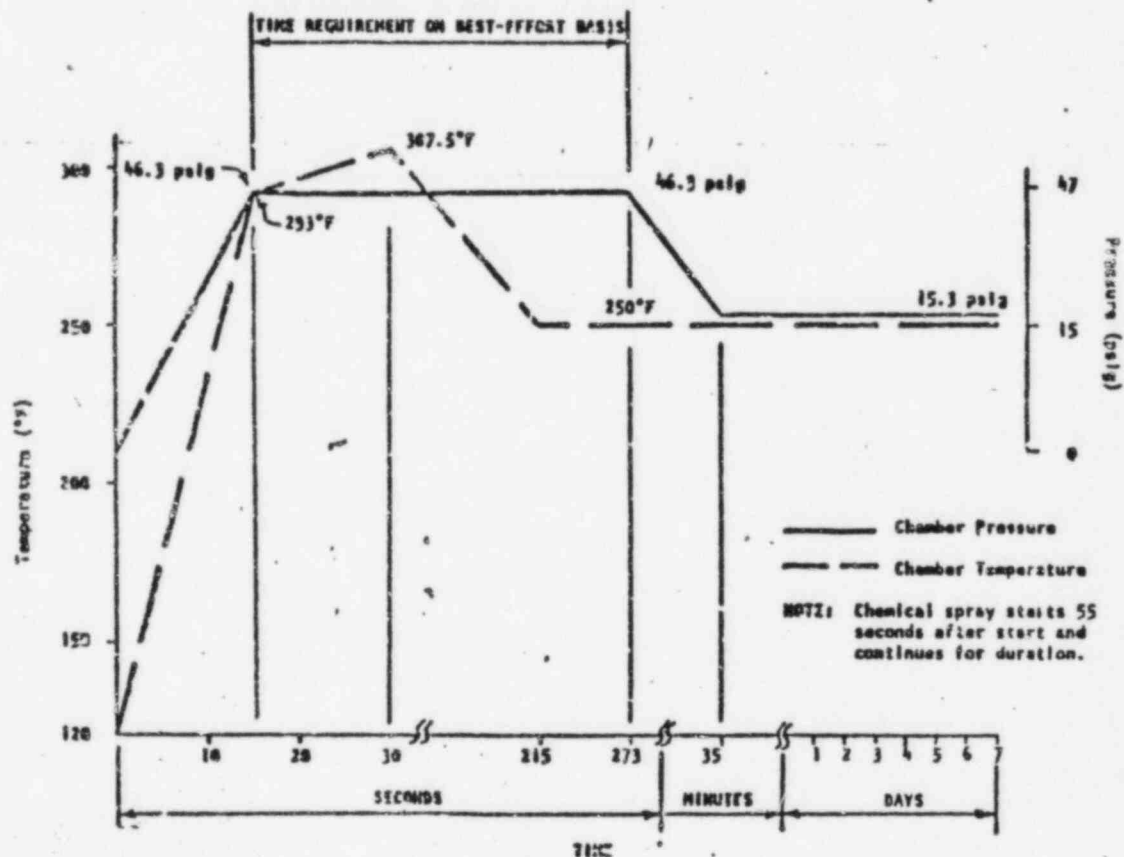
The test items were subjected to the Accident Test as specified above. A typical chart of the test profile is shown in Figure 1, Appendix I, of this section. No significant fluctuations of currents or voltages were observed.

Photographs pertaining to this test are located in Appendix II of this section.

Equipment used during this test is listed in Appendix III.



EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31



Page 22-23
Report 44356-1

545/1025/13
Page 27
REVISION 8

FIGURE 6. ENVIRONMENTAL CONDITION - CASE I

EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP

PAGE NO. X-1
REPORT NO. 44104-1

SECTION I

ACCIDENT TEST (LOCA)
ENVIRONMENTAL CONDITION - CASE II

PRELIMINARY

The four (4) MHA 4 Enclosures shall be subjected to the environmental condition shown in Figure 9, page 28, Wyle Laboratories Qualification Plan 545/1025/25, Section III of this report. The following chemical spray solutions shall apply:

- o Sodium hydroxide to a pH of 10.5 at room temperature
- o Boric acid, 10,000 ppm
- o Chemical spray rate approximately 0.7 gpm/ft^2 of test item projected horizontal cross-sectional area

Chemical spray will be required during the entire Environmental Condition Case II.

The circuits will be energized with $1.1 \times 125 \text{ VDC}$, 1 ampere, for the DC requirements, or $1.1 \times 115 \text{ VAC}$, 1 ampere, for the AC requirements.

EX-10001

The four (4) MHA 4 Enclosures were installed in the Wyle 30" LOCA Simulator Chamber. After running the cables through the chamber, the cables were potted with Scotchcast Resin at the chamber interface.

The circuits were energized for the Accident Test as follows:

$1.1 \times 125 \text{ VDC}$, 1 ampere, for circuits No. 2 (Test Item #2), No. 13 (Test Item #3), and No. 4 (Test Item #4); and $1.1 \times 115 \text{ VAC}$, 1 ampere, for circuits No. 1 (Test Item #1) and No. 12 (Test Item #3). The circuit currents and voltages were recorded during the test.

After the chamber was sealed, the circuits were energized and the test items were subjected to the environmental condition (Case II) as shown in Figure 1. An exception to this is contained in Notice of Anomaly No. 1 (located in Appendix I of this section) which allowed a change to the initial ramp rate for pressure and temperature.



EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

WILE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP

PAGE NO. X-2
REPORT NO. 44754-1

RESULTS

The test items were subjected to the Accident Test as specified above. A chart of the test profile is shown in Appendix II of this section.

During the test, the following voltage and current fluctuations were observed:

Test Item 1 - Voltage and current readings fluctuated as follows:

<u>Time (Elapsed)*</u>	<u>Volts (V)</u>	<u>Current (A)</u>
0 min	129.3 to	1.20 to
10 min	129.3 to	1.12 to
185 min	100.6 to	.006
207 min	100.6	Remained at .006

Test Item 2 - Voltage readings indicated an open circuit by test end and current readings changed as follows:

<u>Time (Elapsed)*</u>	<u>Volts (V)</u>	<u>Current (A)</u>
0 min	137.4 to	1.19 to
30 min	136.3 to	1.19 to
185 min	.00	.63 to
207 min	Remained at .00	.38

Test Item 3, Circuit B - Voltage and current readings fluctuated as follows:

<u>Time (Elapsed)*</u>	<u>Volts (V)</u>	<u>Current (A)</u>
0 min	127.8 to	1.25 to
30 min	137.3 to	1.26 to
140 min	21.4 to	.35 to
185 min	140.6	1.593

Test Item 4 - Voltage readings indicated an open circuit by test end and current readings changed as follows:

<u>Time (Elapsed)*</u>	<u>Volts (V)</u>	<u>Current (A)</u>
0 min	140.3 to	1.22 to
207 min, 20 sec	140.3 to	1.22 to
207 min, 29 sec	.12 to	.15 to
267 min	.00	.033

(* to nearest minute)

Subsequent to the test it was determined that the anomalies were caused by the testing equipment rather than by the test specimens.

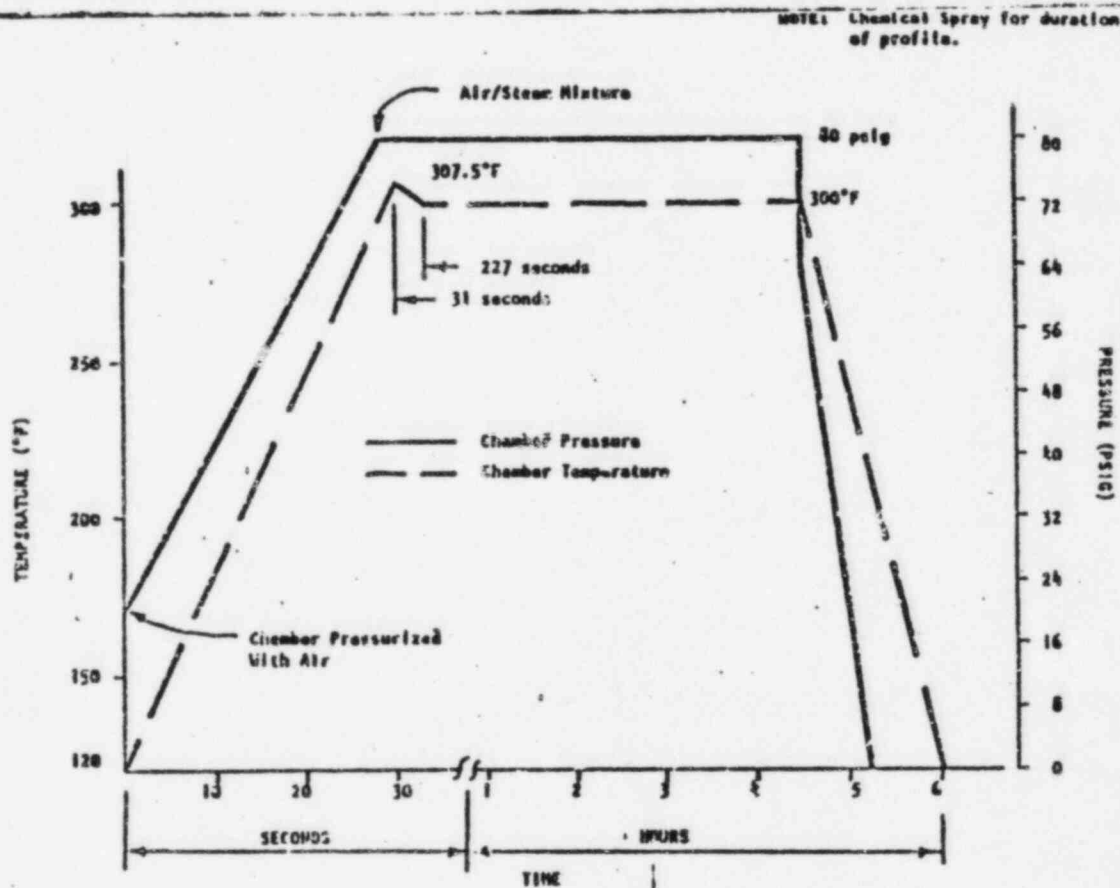
EQ JIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 31

FIGURE 9. ENVIRONMENTAL CONDITION - CASE 11

It is concluded that the test envelopes the required profiles.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32

EQUIPMENT ITEM NO. 32

TERMINAL BLOCK LOCATED IN THE MAIN STEAM ROOM, ELEV. 144'0"

STATES MODEL TYPE ZWM

REQUIRED OPERATING TIME: 4 HOURS

TEP CHECKSHEET NO. 32

LICENSEE REFERENCE(S): 3950

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N25SV3772A-A/JB, B-A/JB, C-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.17.4 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N23SV3228AA-A/JB, BA-A/JB, CA-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.16.6 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N23SV3227AA-A/JB, BA-A/JB, CA-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.16.6 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (A2TB034)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.15.4 [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:

Contents

Checksheet Page No.

Equipment Item

1a₁, 1d₂

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

EQUIPMENT ITEM NO. 32 (CONTINUED)

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N12SV3234A-A/JB, B-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.14.5 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N12SV3235A-A/JB, 3235B-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.14.5 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3976A-B/JB; 3369AA-A/JB, BA-A/JB)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3976CA-A/JB; 3370AA-B/JB, BA-B/JB)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3370CA-B/JB; 3368AA-A/JB, BA-A/JB)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3368CA-A/JB; 3976B-B/JB, C-B/JB)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [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, 2, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

Contents

Checksheet Page No.

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

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 51P

Page
2

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	<u>X</u>
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	_____

For evaluation see item 31

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 32LICENSEE RESPONSE TO NRC SER

COMPONENT: TERMINAL BLOCKS/JUNCTION BOXES - OUTSIDE CONTAINMENT

NRC DEFICIENCYAPCo RESPONSEAGING

Type test accelerated aging techniques were used to thermally age the terminal blocks. Arrhenius Methodology was used to establish a qualified life. The age-susceptible materials were identified and activation energies determined. From the analysis, a qualified life of 40 years was established for both inside and outside containment for Plant Farley.

TEMPERATURE

The qualified temperature of the terminal blocks is 307°F. As can be seen from Figure C.3.4, the calculated peak temperature of 308°F is reached in 0.27 seconds, where it remains for approximately 1.1 seconds, at which time the temperature drops to atmospheric saturation temperature of 212°F. Because of the thermal lag, the terminal blocks are never exposed to a temperature greater than 212°F. The terminal blocks are therefore qualified to the accident environment with conservative margin.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - Refer to discussion on temperature above.
- (b) Pressure - The 80 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 Main Steam Room pressure of 20.5 psia.
- (c) Radiation - Although the terminal blocks are qualified for 1×10^6 rads, radiation qualification is not a requirement for the Main Steam Room. Therefore adequate margin exists.

SUBMERGENCE

4 items listed as deficient for submergence are located at an elevation of 135' in Main Steam Room which is above flood level elevation of 130'-5" hence not deficient



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

EQUIPMENT ITEM NO. 33
TERMINAL BLOCK LOCATED IN THE CONTAINMENT, ELEV. 135'9"
STATES MODEL TYPE ZWM
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 33
LICENSEE REFERENCE(S): 3950
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2B31SV8047-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.3.7 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (12TB001, 003, 004; 22TB001, 002, 005)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.2.5 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (12TB001, 002; 22TB003, 004; 32TB001, 002)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.1.4 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2G21SV3376-B/JB, 1003A-A/JB, 7126-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.12.6 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2E21SV8871-A/JB, 8149AA-A/JB, 8149BA-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.9.10 [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 ₁ , 1a ₂ , 1a ₃
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	6a , 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a , 7b , 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33

EQUIPMENT ITEM NO. 33 (CONTINUED)

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2E21SV8149CAA/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.9.10 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P13SV2867B-B/JB, 3197-B/JB, 2866B-B/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.6.10 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P13SV3196-B/JB; Q2E12SV3999A-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.6.10 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2E12SV3999B-B/JB; Q2T52B025)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.6.10 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P17SV3184-B/JB, 3443-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.20.7 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3103A/JB, 3765-A/JB, 3766-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [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, Q1, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

Contents

Checksheet Page No.

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. 33

EQUIPMENT ITEM NO. 33 (CONTINUED)

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3179A-A/JB, B-A/JB, C-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3180A-A/JB, B-A/JB, C-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3181A-A/JB, B-A/JB, C-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3104-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [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. 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)

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. 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	<u>X</u>
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	_____

For evaluation see item 31

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 33LICENSEE RESPONSE TO NRC SER

COMPONENT: TERMINAL BLOCKS/JUNCTION BOXES - OUTSIDE CONTAINMENT

NRC DEFICIENCYAPCo RESPONSEAGING

Type test accelerated aging techniques were used to thermally age the terminal blocks. Arrhenius Methodology was used to establish a qualified life. The age-susceptible materials were identified and activation energies determined. From the analysis, a qualified life of 40 years was established for both inside and outside containment for Plant Farley.

TEMPERATURE

The qualified temperature of the terminal blocks is 302°F. As can be seen from Figure C.3.4, the calculated peak temperature of 308°F is reached in 0.27 seconds, where it remains for approximately 1.4 seconds, at which time the temperature drops to atmospheric saturation temperature of 212°F. Because of the thermal lag, the terminal blocks are never exposed to a temperature greater than 212°F. The terminal blocks are therefore qualified to the accident environment with conservative margin.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - Refer to discussion on temperature above.
- (b) Pressure - The 30 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 Main Steam Room pressure of 20.5 psia.
- (c) Radiation - Although the terminal blocks are qualified for 1×10^8 rads, radiation qualification is not a requirement for the Main Steam Room. Therefore adequate margin exists.

SUBMERGENCE

4 items listed as deficient for submergence are located at an elevation of 135' in Main Steam Room which is above flood level elevation of 130'-5" hence not deficient



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

EQUIPMENT ITEM NO. 34
ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE MAIN STEAM ROOM, ELEV. 135'0" & ABOVE
BOSTON INSULATED WIRE MODEL LSS1802
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 34
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VAL5007C, 8C, 9C; 2VAL5013D, 4D, 5D)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.16.8 [5]
FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VNR5003A, B)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.14.7 [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:

Contents

Checksheet Page No.

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	6a, 6b
Equipment Summary	
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 _____.)
- ☐ 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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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 _____
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

*The reviewer has referenced a BIW Report
No 73 E-062 as evidence of qualification.
The report was not made available
for review.*



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

30

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 34

LICENSEE RESPONSE TO NRC SER

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging methods were used to thermally age instrumentation cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2000 ppm (Ref. RIU Report 73E062). This hydro acid concentration meets the Farley FAR value of 2000 ppm.

QUALIFICATION TIME

The qualification time for these cables is actually 7 days. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 340° F qualification test condition exceeds the 300° F required temperature by 40° F thus adequate margin has been demonstrated.
- (b) Pressure - The 119.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 1×10^8 Rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.

REQUIRED TIME

Deficiency shown on one cable 2VVR5066B appears to be clerical error by the NRC. Operating time and qualification both have been shown on component evaluation sheet.

SUBMERGENCE

Cables 2VVR5003A and B are listed as deficient for submergence. They are located at an elevation of 135' and above in the Main Steam Room which is above the flood level of 130'9"; hence not deficient.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 35

EQUIPMENT ITEM NO. 35

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE MAIN STEAM, ELEV. 116'0"

BOSTON INSULATED WIRE MODEL LSS1802

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 35

LICENSEE REFERENCE(S): NOT CITED

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VXV5013L, 14H, 14J)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.13 [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:

Contents

Checksheet Page No.

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)

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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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	_____
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	<u>X</u>

*The purchaser has referenced a BIW report
No 73 E 062 as evidence of qualification.
The report was not made available
for review.*

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 30LICENSEE RESPONSE TO NRC SERNRC DEFICIENCYAPCo RESPONSE

AGING

Type test accelerated aging methods were used to thermally age instrumentation cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2000 ppm (Ref. RIW Report 72E062). This hydrochloric acid concentration meets the Farley FAR value of 2000 ppm.

QUALIFICATION TIME

The qualification time for these cables is actually 7 days. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 340° F qualification test condition exceeds the 300°F required temperature by 40°F thus adequate margin has been demonstrated.
- (b) Pressure - The 119.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 1×10^8 Rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.

REQUIRED TIME

Deficiency shown on one cable 2VVR5066B appears to be clerical error by the NRC. Operating time and qualification both have been shown on component evaluation sheet.

SUBMERGENCE

Cables 2VVR5003A and B are listed as deficient for submergence. They are located at an elevation of 135' and above in the Main Steam Room which is above the flood level of 130'9"; hence not deficient.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36

EQUIPMENT ITEM NO. 36

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE CONTAINMENT, ELEV. 121'0"

BOSTON INSULATED WIRE MODEL LSS1802

REQUIRED OPERATING TIME: 4 HOURS

TER CHECKSHEET NO. 36

LICENSEE REFERENCE(S): NOT CITED

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002L, M, N; 2V2V5002L, M, N;)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.4.12 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V3V5002H, J, K, L, M, N;)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.4.12 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V4V5002A, B, C)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.4.12 [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. 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
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



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
2

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 _____
IV Documentation Not Made Available X

*The licensee has referenced a BIW Report
No 73 E 062 as evidence of qualification.
The report was not made available
for review.*

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 36LICENSEE RESPONSE TO NRC SERNRC DEFICIENCYAPCo RESPONSE

AGING

Type test accelerated aging methods were used to thermally age instrumentation cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2000 ppm (Ref. RIU Report 73E062). This basic acid concentration meets the Farley FAR value of 2000 ppm.

QUALIFICATION TIME

The qualification time for these cables is actually 7 days. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 320-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 340° F qualification test condition exceeds the 300° F required temperature by 40° F thus adequate margin has been demonstrated.
- (b) Pressure - The 119.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 1×10^8 Rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.

REQUIRED TIME

Deficiency shown on one cable 2VVR5066B appears to be clerical error by the NRC. Operating time and qualification both have been shown on component evaluation sheet.

SUBMERGENCE

Cables 2VVR5003A and B are listed as deficient for submergence. They are located at an elevation of 135' and above in the Main Steam Room which is above the flood level of 130'9"; hence not deficient.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 37

EQUIPMENT ITEM NO. 37

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE CONTAINMENT, ELEV. 122'9"

BOSTON INSULATED WIRE MODEL LSS1802

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 37

LICENSEE REFERENCE(S): NOT CITED

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VY5031D; 2V25002T, U)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.3.8 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002U; 2V3V5002T, U)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.3.8 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VY5031B; 2VYV5033B;)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.2.6 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002E, F, G; 2V2V5002E, F, G)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.2.6 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002B, D; 2V2V5002B, B)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.1.5 [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:

Contents

Equipment Item

Summary of Licensee Responses to the NRC SER

Equipment Environmental Qualification Summary Forms

Licensee Response to NRC SER

System Consideration Review

Equipment Environmental Qualification Review

Installed TMI Lessons Learned Implementation
Equipment Summary

Maintenance and Replacement Schedule Summary

Checksheet Page No.

1a₁, 1a₂

1b

2

3a, 3b, 3c, 3d

4a, 4b, 4c, 4d, 4e, 4f

5a, 5b, 5c, 5d, 5e, 5f,
5g, 5h, 5i, 5j

6a, 6b

7a, 7b, 7c

**EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 37****EQUIPMENT ITEM NO. 37 (CONTINUED)**

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V3V5002B, D)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.1.5 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VYR5066G)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.12.8 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VXQ5009B, D, F; 2VYQ5017B, D, F)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.7.5 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VYR5066B)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.6.12 [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:ContentsChecksheet Page No.

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, 5jInstalled 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
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



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No.

518

Page

2

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 37EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORMNRC 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

*The licensee has referenced a BIW Report
 No 73 E 062 as evidence of qualification.
 The report was not made available
 for review.*



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 37

LICENSEE RESPONSE TO NRC SER

NRC DEFICIENCY

APCO RESPONSE

AGING

Type test accelerated aging methods were used to thermally age instrumentation cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 2000 ppm (Ref. BID Report 73F062). This basic acid concentration meets the Farley FAR value of 2000 ppm.

QUALIFICATION
TIME

The qualification time for these cables is actually 7 days. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 340° F qualification test condition exceeds the 300° F required temperature by 40° F thus adequate margin has been demonstrated.
- (b) Pressure - The 119.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 1×10^8 Rads qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.

REQUIRED TIME

Deficiency shown on one cable 2VVR5066B appears to be clerical error by the NRC. Operating time and qualification both have been shown on component evaluation sheet.

SUBMERGENCE

Cables 2VVR5003A and B are listed as deficient for submergence. They are located at an elevation of 135' and above in the Main Steam Room which is above the flood level of 130'9"; hence not deficient.



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 38

EQUIPMENT ITEM NO. 38
ELECTRICAL CABLE, CONTROL LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
OKONITE, MODEL NOT STATED
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 38
LICENSEE REFERENCE(S): 2103, 4577
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.4.8 [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:

Contents

Checksheet Page No.

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 (_____)
- ☐ 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. 38

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	<u>X</u> _____
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	<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	_____

For evaluation, refer to item 40



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 38

LICENSEE RESPONSE TO NRC SER

COMPONENT: POWER and CONTROL CABLES

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging methods were used to thermally age cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 10,000 ppm (Ref: Okonite Report 141.) This boric acid concentration exceeds the Farley PSAE value of 2000 ppm.

QUALIFICATION
TIME

The qualification time for these cables is 30 days plus 100 days post DUE. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 324° F qualification test condition exceeds the 300° F required temperature by 24° F thus adequate margin has been demonstrated.
- (b) Pressure - The 94.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 2×10^6 Rads. qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

1a

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 39

EQUIPMENT ITEM NO. 39

ELECTRICAL CABLE, CONTROL LOCATED IN THE MAIN STEAM ROOM, ELEV. 135'0"

OKONITE, MODEL NOT STATED

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 39

LICENSEE REFERENCE(S): 2103, 4577

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.17.5 [5]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.16.7 [5]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.15.5 [5]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.14.6 [5]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.13.10 [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:

Contents

Checksheet Page No.

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. 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 _____.)
- ☐ 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. 39EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORMNRC 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 _____

For evaluation, refer to item 40



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 39

LICENSEE RESPONSE TO NRC SER

COMPONENT: POWER and CONTROL CABLES

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging methods were used to thermally age cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 10,000 ppm (Ref: ORNL Report 141.) This boric acid concentration exceeds the Farley FEAR value of 2000 ppm.

QUALIFICATION TIME

The qualification time for these cables is 30 days plus 100 days post DBE. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 324° F qualification test condition exceeds the 300° F required temperature by 24° F thus adequate margin has been demonstrated.
- (b) Pressure - The 94.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 2×10^{17} Rads. qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^{17} Rads.

Therefore, adequate margin exists.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

EQUIPMENT ITEM NO. 40

ELECTRICAL CABLE, CONTROL LOCATED IN THE CONTAINMENT

OKONITE, MODEL NOT STATED

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 40

LICENSEE REFERENCE(S): 2103, 4577

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): TMI-7.3 [6, 11, 19]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): TMI-4.2 [6, 11, 19]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SAFETY SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): TMI-3.5 [6, 11, 19]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SAFETY SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): TMI-2.4 [6, 11, 19]

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 applicableLISTING OF APPLICABLE CHECKSHEETS:ContentsChecksheet Page No.

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~~, 5jInstalled 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
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. 40

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:
X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	<u>X</u> _____
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	<u>X</u> _____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Quzllified 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. 40LICENSEE RESPONSE TO NRC SER

COMPONENT: POWER and CONTROL CABLES

NRC DEFICIENCYAPCO RESPONSE

AGING

Type test accelerated aging methods were used to thermally age cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 10,000 ppm (Ref: DKOIIC Report 141.) This boric acid concentration exceeds the Farley FRAC value of 2000 ppm.

QUALIFICATION TIME

The qualification time for these cables is 30 days plus 100 days post DUE. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 324° F qualification test condition exceeds the 300° F required temperature by 24° F thus adequate margin has been demonstrated.
- (b) Pressure - The 94.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.7 psia.
- (c) Radiation - The 2×10^7 Rads. qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

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

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>Electric Cable</i>	Electrical Cable	
Manufacturer's Name (5.2.2/-/-)	<i>Okonite</i>	Okonite Company	
Model Number (5.2.2/-/-)	<i>Not listed</i>	See page 5f (Note A)	<u>X</u>
Serial Number	<i>Not stated</i>	Not Applicable	<i>Note 1</i>
Features/Mounting (5.2.6/-/-)	<i>↓</i>	Not Applicable	
Connections/Interfaces (5.2.6/-/-)	<i>↓</i>	Cable Splice (Note A)	
Location/Elevation	<i>Contained</i>	Not Applicable	
Equipment ID No.	<i>N/A</i>	Not Applicable	
<u>QUALIFICATION REPORT</u> (8.0/5.0/5.0)			
Report ID Number	<i>ER141</i>	E.R.141	
Report Date	<i>N-1</i>	February 29, 1972	
Issued by	<i>OKONITE</i>	Okonite	
Prepared for	<i>OKONITE</i>	Okonite	
Referenced Reports	<i>N/A</i>	F-C3094/F-C3171	
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4)	<i>↓</i>	Test	
<u>QUALIFICATION TEST PROGRAM</u>			
Functional Test Description (5.2.5/2.2.9/2.2.9)	<i>↓</i>	Maintain electrical Loading @ rated Voltage, Insulation Resistance & Hypot	
Operating Conditions (-/2.2.10/2.2.10)	<i>↓</i>		
Load/Cycles/Voltage/ Current/Freq.	<i>↓</i>	Not Applicable	



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FRC Assignment No. 13
FRC Task No. 518

Page
56

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 46

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	Not Stated	
Accuracy (5.2.5/-/-)		Not Applicable	
Number of Specimens		6	
Test Instruments Calibrated		Yes	
Safety Function (Active/ Passive) (-/2.1.3/2.1.3)	Not stated	Not Applicable	
Test Duration (5.2.1/-/-)	N/A	100+ days	
Accident Duration (Envir. Above Normal) (5.2.1/-/-)	~24 hrs	Not Applicable	
Required Function Time	10 y. to long term	Not Applicable	
Test Sequence (General) (5.2.3/2.3.1/2.3.1)	N/A	Thermal Aging Irradiation LOCA (PWR Conditions) LOCA (BWR Conditions)	
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		Not Applicable	
Aging (5.2.4, 7.0/4.0/4.0)			
Thermal Aging/Basis	Arrangements	168 hrs @ 121°C Basis	
Material Aging Evaluation (7.0/-/-)		Not Stated	
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-)		Not Stated	
Radiation Aging, Type		Gamma	



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NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 513

Page

5c

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)	<i>Not Stated</i>	See Accident Dose	
Radiation Aging, Dose Rate		See Accident Dose	
Radiation Aging, Method		Test	
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)		Not Stated	
Operational Aging (-/4.2/-)		Not Applicable	
Other Age Conditioning (-/4.2/-)		Not Stated	
Qualified Life Claimed/ Established (5.2.4/4.10/-)	<i>40 years</i>	Not Stated	
Normal Ambient Temperature	<i>Not Stated</i>	Not Applicable	
Normal Ambient Radiation		Not Applicable	
Normal Ambient Humidity		Not Applicable	
On-Going Surveillance and Preventive Maintenance (7.0/-/-)	<i>Farby Program</i>	Not Applicable	
On-Going Analysis of Failures and Degradation (7.0/-/-)		Not Applicable	
Margin (General) (6.0/3.0/3.0)	<i>24°F 32.5 psi 1.5 x 10⁻⁶ rad</i>	Not Applicable	
Margin (NUREG-0588, Cat. I) (-/3.2/-)	<i>N/A</i>	Not Applicable	
1. Temperature (+15°F)			
2. Pressure (+10%, 10 psig max)			
3. Radiation (not required)			
4. Time (+10%, +1 hour + function time minimum)			



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NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

Page
5d

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)	LOCA/HELB	LOCA	
Radiation Type	Gamma	Gamma	
Radiation Dose (rd) (4.1.2/1.4/1.4)	5 x 10 ⁷	2x10 ⁸	
Radiation Dose Rate (rd/hr) Radiation Qual. Method (5.3.1/-/-)	Not Stated	300,000 rd/hr Test	
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6)		Not Applicable	
Equipment Susceptible to Beta Radiation (4.1.2/-/-)		Not Stated	
Radiation Dose (Normal + Accident) (4.1.2/-/-)		Not Applicable	
Plateout Dose Considered (-/1.48/1.48)		Not Applicable	
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7)		Not Applicable	



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>ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS</u>			
Rate of Temp./Press. Increase		25°F, 8Psi/ second	
Peak: °F/psig/RH/Time	<i>See profile</i>	324/80/100/3.3 hrs	
Decrease To: °F/psig/RH/Time	<i>p 52</i>	252/16/100/7 days	
Decrease To: °F/psig/RH/Time		345/104/100/4 hrs	
Decrease To: °F/psig/RH/Time		320/75/100/4.5 hrs	
Decrease To: °F/psig/RH/Time		256/15/100/20 hrs	
Decrease To: °F/psig/RH/Time		272/25/100/3.5 hrs	
Decrease To: °F/psig/RH/Time		212/0/100/100 days	
Equipment Surface Tempera- ture (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6)	<i>N/A</i>	Not Stated	
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8)	<i>N/A</i>	Test	
Spray Composition (4.1.4/1.3, 2.2.8/ 1.3, 2.2.8)	<i>H₃BO₃ & NaOH</i>	10000 ppm Boric Acid buffered with NaOH to a pH of 10.5	
Spray Density (gpm/ft ²)	<i>Not Stated</i>	0.15	
Spray Duration		7 days	
Submergence Duration (4.1.3/2.2.5/2.2.5)		Not Stated	
In-Leakage Considered (5.2.6, 5.3.2/-/-)		Not Applicable	
Time to Submergence		Not Applicable	
Dust Environment (-/2.2.11/2.2.11)		Not Applicable	



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

NOTES: 4.

CABLE SAMPLES TESTED:

One sample of each of the following types of cable and splice was tested. The samples were designated as shown in Table I.

Table I

<u>Sample No.</u>	<u>Cable Designation</u>
A-4	1/C #14 0.030" Okonite, 0.015" Okoprene
D-4	4/C #14 0.030" Okonite, 0.015" Okoprene, 0.045" Okoprene
E-4	7/C #14 0.030" Okonite, 0.015" Okoprene, 0.045" Okoprene
B-4	1/C 4/0 0.055" Okonite, 0.045" Okoprene
F-4	4/C #12 0.047" Okonite, 0.015" Okolon, 0.045" Okolon
C-4	1/C 4/0 0.140" Okoguard, 0.065" Okolon with T-95 splice and T-35 jacketing tape

*Note 1 The cables tested in ER 141
are described above, the cables
tested in N-1 are*

Test Specimens

1/C #12 7x coated copper, .030" Okonite insulation
1/C #6 7x coated copper, .055" Okonite insulation,
.030" Okolon jacket

The licensee has not provided sufficient information to establish that the
Equipment described on the SCEW sheet is the same as the Equipment described
in the referenced report.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

NOTES:

Requirements for establishing similarity between installed and tested cables are contained in the DOR Guidelines and IEEE 383-74 which are reproduced below for convenience.

2. Test Specimen - The test specimen should be the same model as the equipment being qualified. The type test should only be considered valid for equipment identical in design and material construction to the test specimen. Any deviations should be evaluated as part of the qualification documentation (see also Section B.0 below).

[DOR]

IEEE-383

(referred by 0588)

1.3.1 Cable Description. This description or specification should include as a minimum:

1.3.1.1 Conductor — material identification, size, stranding, coating.

1.3.1.2 Insulation — material identification, thickness, method of application.

1.3.1.3 Assembly (multiconductor cables only) — number and arrangement of conductors, fillers, binders.

1.3.1.4 Shielding — tapes, extrusions, braids, or others.

1.3.1.5 Covering — jacket or metallic armor or both, material identification, thickness, method of application.

1.3.1.6 Characteristics — voltage and temperature rating (normal and emergency). For instrumentation cables — capacitance, attenuation, characteristic impedance, microphonics, insulation resistance, as applicable.

1.3.1.7 Identification — manufacturer's trade name, catalog number.

1.3.2 Field Splice or Connection Description or Both. This description or specification should include as a minimum:

1.3.2.1 Whether factory or field assembled to cable.

1.3.2.2 Conductor connection — type, material identification, and method of assembly.

1.3.2.3 Items from Sections 1.3.1.2 through 1.3.1.7.

2.2 Type Test Samples. The samples tested should contain the conductor, insulation, filler, jacket, binder tape, overall jacket, shielding, and field splices which are representative of the cable category being qualified. Table 1 lists sizes which have been considered representative of these categories. The sample lengths should be sufficient to permit reliable test readings and evaluation consistent with good testing practices.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40

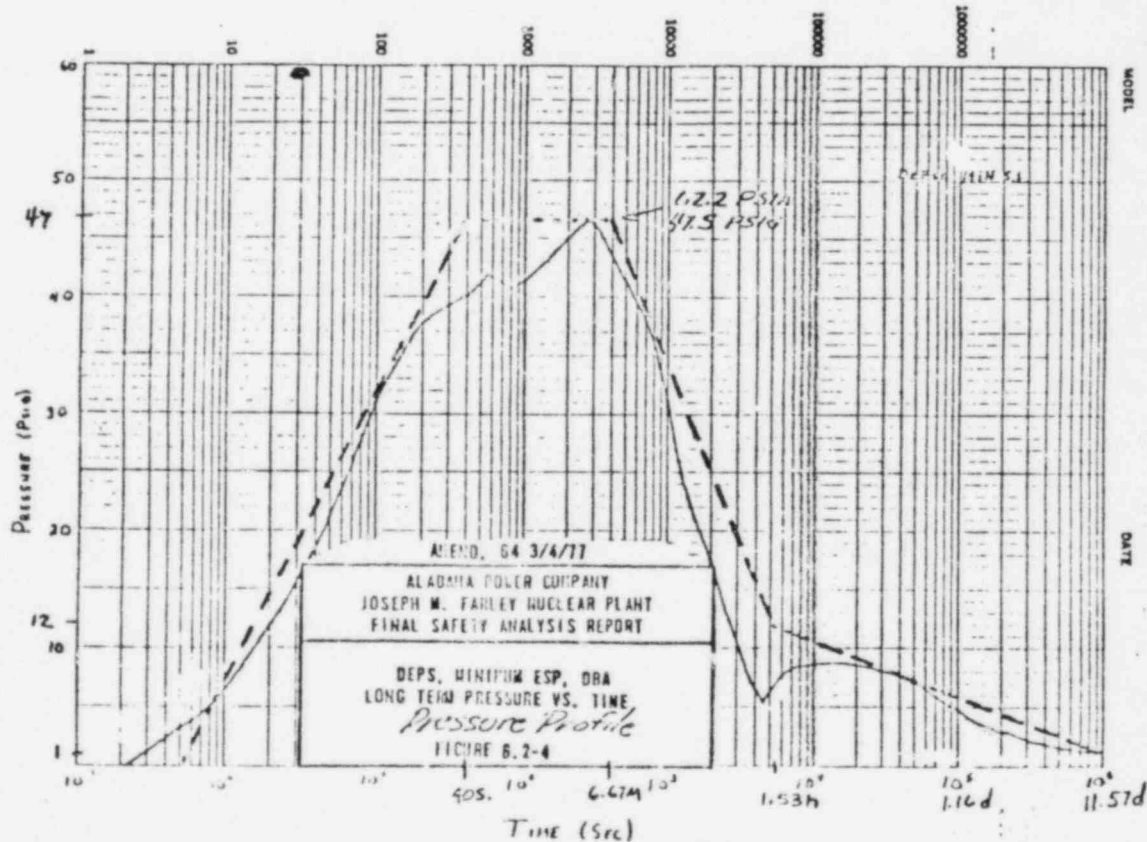
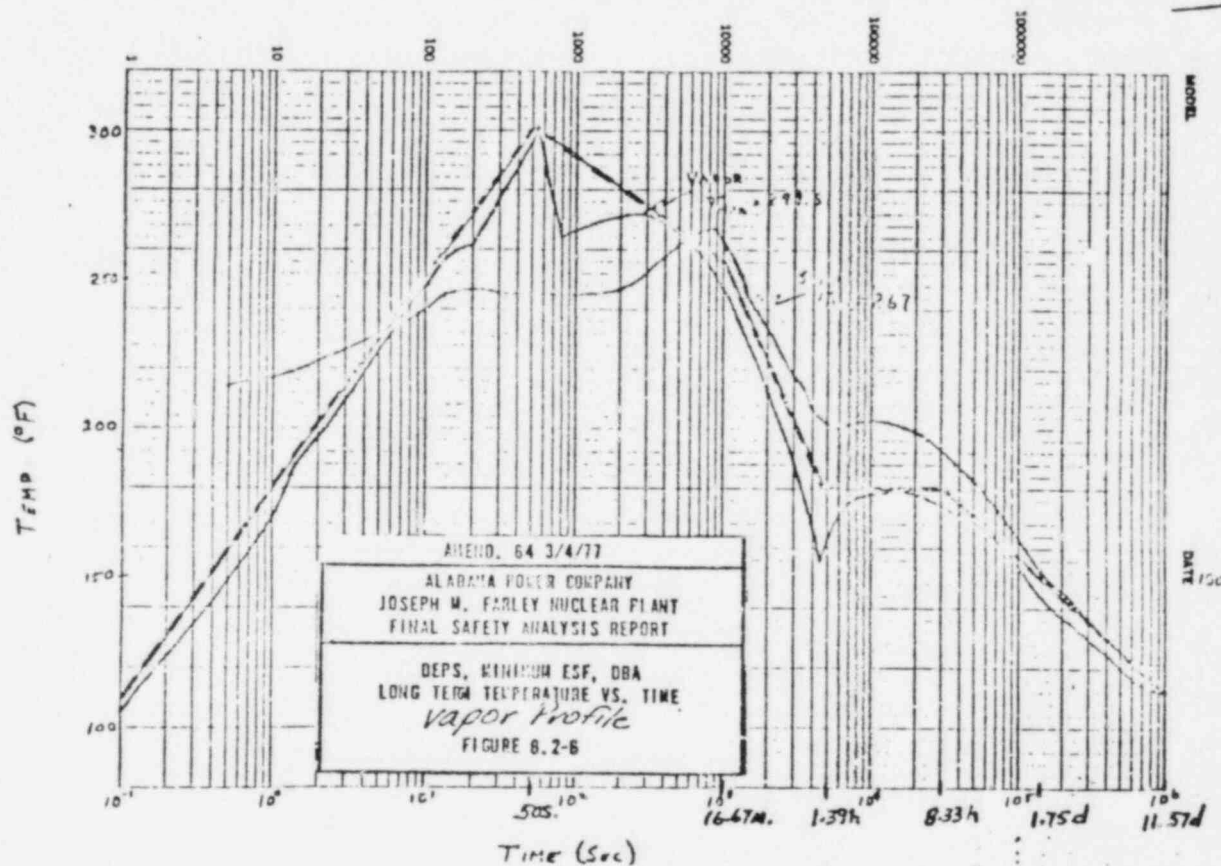
NOTES:

ELECTRIC CABLES, FIELD SPLICES, AND CONNECTIONS

IEEE
Std 383-1974Table 1
Representative Cables for Type Tests

Type	Test	Section	Size
Up to 2000 V multiconductor control cable or Shielded multiconductor signal cable (see note below for individual component) or Single conductor power cable	temperature and moisture resistance	2.3.1	1/C - 14 or 12 AWG
	thermal and radiation exposure	2.3.3	1/C or M/C - 14 or 12 AWG
	design basis event simulation	2.4	1/C or M/C - 14 or 12 AWG
	vertical flame test singles from cable assembly	2.5.6	1/C - 6, 4 or 2 AWG
	vertical tray flame test	2.5.4	1/C - 14 or 12 AWG
Shielded pair, triple or quad (from multiconductor signal cable)	temperature and moisture resistance	2.3.1	1 pair shielded
	thermal and radiation exposure	2.3.3	16 AWG or actual cable
	design basis event simulation	2.4	
	vertical flame test	2.5.6	
	vertical tray flame test	2.5.4	
Coaxial, triaxial or special instrument cable	temperature and moisture resistance	2.3.1	actual size
	thermal and radiation exposure	2.3.3	
	design basis event simulation	2.4	
	vertical flame test singles from cable assembly	2.5.6	
	vertical tray flame test	2.5.4	
Single pair thermocouple extension cable	temperature and moisture resistance	2.3.1	2/C - 20 AWG or actual size if smaller
	thermal and radiation exposure	2.3.3	
	design basis event simulation	2.4	
	vertical tray flame test	2.5.4	
	vertical flame test singles from cable assembly	2.5.6	
2001-15 000 V power cable 1/C triplexed and multiconductor	vertical tray flame test	2.5.4	6 AWG (2-5kV) 2/O or 4/O or 4/O (2-15kV)

In Lieu of the detailed description discussed above it would be acceptable for the licensee to obtain certification from the manufacturer identifying what test report(s) apply to the cables furnished for installation.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 40



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

EQUIPMENT ITEM NO. 41
ELECTRICAL CABLE, CONTROL LOCATED IN THE CONTAINMENT, ELEV. 118'0"
OKONITE, MODEL NOT STATED
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 41
LICENSEE REFERENCE(S): 2103, 4577
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.20.8 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.19.6 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.18.8 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.3.9 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.12.7 [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, 1a ₁
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	6a, 6b
Equipment Summary	
Maintenance and Replacement Schedule Summary	7a, 7b, 7c



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

EQUIPMENT ITEM NO. 41 (CONTINUED)

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.11.7 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.10.5 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.9.11 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.8.4 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.7.4 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.6.11 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.5.4 [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



Franklin Research Center

A Division of The Franklin Institute

20th and Race Streets, Phila. Pa. 19103 (215) 448-1000

NRC Contract No. NRC-03-79-118

FRC Project No. C5257

FRC Assignment No. 13

FRC Task No. 518

Page

2

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 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 _____

For evaluation, refer to item 40



EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 41

LICENSEE RESPONSE TO NRC SER

COMPONENT: POWER and CONTROL CABLES

NRC DEFICIENCY

APCo RESPONSE

AGING

Type test accelerated aging methods were used to thermally age cable. Arrhenius techniques were used to determine a qualified life. The age-susceptible materials were identified and an evaluation was made of their aging characteristics. Based on this methodology a qualified life of 40 years was determined for inside and outside containment.

CHEMICAL SPRAY

The chemical spray concentration utilized in the equipment qualification testing program for this equipment was 20,000 ppm (Ref: Oronite Report 141.) This boric acid concentration exceeds the Farley PSAE value of 2000 ppm.

QUALIFICATION
TIME

The qualification time for these cables is 30 days plus 100 days post DBE. The Component Evaluation Work Sheets indicated 4 hours only to show that the specified operating time of 4 hours had been met.

MARGIN

IEEE 323-1971 did not require that any specific margin be included in establishing the test parameters. However, the following margins can be identified:

- (a) Temperature - The 324° F qualification test condition exceeds the 300° F required temperature by 24° F thus adequate margin has been demonstrated.
- (b) Pressure - The 94.7 psia qualification test condition provides adequate margin above the maximum calculated Farley, Unit 2 containment pressure of 62.2 psia.
- (c) Radiation - The 2×10^7 Rads. qualification test condition provides adequate margin above the specified Farley, Unit 2 containment level of 5×10^7 Rads.

Therefore, adequate margin exists.

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.

Equipment Item Nos. 18 and 20 have been assigned to NRC Category II.b. These Gems flood level detectors exhibited severe anomalies during testing, and failure occurred approximately 90 minutes into the test.

On June 23, 1982, the Licensee provided the following response concerning TMI Action Plan equipment [20]:

"Alabama Power Company has performed a review of the location of all TMI Action Plan equipment and has identified the equipment requiring environmental qualification. The accompanying Master Lists and System Component Evaluation Work Sheets to this chapter identify this equipment and verify its qualified status. Below is a discussion of each of the sections provided in this chapter.

Inadequate Core Cooling; NUREG-0737, II.F.2

Instrumentation and equipment associated with inadequate core cooling is addressed by R.G. 1.97. In accordance with letter dated November 16, 1981, Alabama Power Company committed to respond to the Regulatory Guide upon the promulgation of the associated draft licensing documents that

would affect the design (e.g., NUREG-0801, -0799, -0814, -0835). Following the preparation and implementation of a design for an integrated system to satisfy the various licensing requirements in this regard, Master Lists and SCEWS will be prepared.

Reactor Coolant System (Head Vent); NUREG-0737, II.B.1

Four (4) solenoid valves, Target Rock Model 79AB001, are undergoing qualification testing and, upon completion of the test and subsequent evaluation, the associated SCEWS will be updated. All other equipment located in a possible harsh environment have adequate documentation to demonstrate their capability to function in the most limiting post-accident environment postulated for Farley Nuclear Plant - Unit 2.

Pressurizer Safety and Relief Valve; NUREG-0737, II.D.1

Master lists and SCEWS are provided, herein, to verify the status of qualification of all equipment located in a possible harsh environment. Four (4) solenoid valves, ASCO model HTX8302A22V, lack adequate qualification documentation. The solenoids are scheduled to be replaced at the next outage of sufficient duration to complete the planned modification. All other equipment located in a possible harsh environment have adequate documentation to demonstrate their capability to function in the most limiting post-accident environment postulated for Farley Nuclear Plant - Unit 2.

Pressurizer Safety Valve Position Indication; NUREG-0737, II.D.3

Master lists and SCEWS are provided, herein, to verify the full qualification of all equipment located in a possible harsh environment.

High Range Containment Radiation; NUREG-0737, II.F.1.2

A test report regarding the Victoreen Radiation Detectors was recently completed and evaluated by Alabama Power Company subsequent to their installation. The review of the test report indicates the installation of a water-tight fitting is necessary to protect the cable connection and to establish similarity with the test specimen. The design of the water-tight fitting has been initiated and will be implemented at the next outage of sufficient duration to complete the modifications. All other equipment located in a possible harsh environment have adequate documentation to demonstrate their capability to function in the most limiting post-accident environment postulated for Farley Nuclear Plant - Unit 2.

Hydrogen Recombiner System; NUREG-0737, II.E.4.1

As stated in Alabama Power Company letter dated January 14, 1981, Farley Nuclear Plant does not utilize external hydrogen recombiners. Dedicated hydrogen penetrations are therefore not applicable to Farley Nuclear

Plant. The qualified status of equipment associated with the hydrogen recombiner system located in the containment or Farley Nuclear Plant is verified in a previous NUREG-0588 response, Section C.2.7, dated July 1, 1981.

Containment Water Level; NUREG-0737, II.F.1.5

Master Lists and SCEWS are provided, herein, to verify the status of qualification of all equipment located in a possible harsh environment. Two (2) level transmitters, GEMS-Delaval model XM54854-323, are undergoing qualification testing, and upon completion of the test and subsequent evaluation, the associated SCEWS will be revised. All other equipment located in a possible harsh environment have documentation to demonstrate their capability to function in the most limiting post-accident environment postulated for Farley Nuclear Plant - Unit 2.

Auxiliary Feedwater System; NUREG-0737, II.E.1.2

The status of qualification for equipment associated with the auxiliary feedwater system is verified in a previous NUREG-0588 response, Section C.2.16, dated July 1, 1981.

Containment Isolation Dependability; NUREG-0737, II.E.4.2

The qualified status of equipment associated with containment isolation is verified in previous NUREG-0588 responses, dated July 1 and December 28, 1981, Sections C.2.3, C.2.4, C.2.6, C.2.9, and C.2.11 through C.2.20. Chapter 3 of the December 28, 1981 response identified two (2) solenoids located in the containment that lack adequate qualification documents and are scheduled for replacement during the first refueling outage. The solenoids are utilized to provide isolation of a cooling duct that is wholly enclosed within the containments and does not penetrate the containment boundary. The solenoids are not necessary to provide containment isolation or to satisfy the requirements of NUREG-0737, and are not considered an outstanding item in this regard.

Automatic PORV Isolation System; NUREG-0737, II.K.3.1

As stated in Alabama Power Company letter dated May 26, 1981, Alabama Power Company letter dated May 26, 1981, Alabama Power Company has reviewed the Westinghouse Owners Group report regarding this issue and has determined that an automatic PORV isolation system would not appreciably enhance protection against a PORV LOCA and no modifications are necessary. Consequently, no environmental qualification documentation is necessary.

Automatic Trip of RCP's; NUREG-0737, II.K.3.5

As stated in letter dated January 14, 1981, it is the opinion of Alabama Power Company that resolution of this issue will be achieved without any

design modifications. The Westinghouse Owners Group has provided the NRC Staff the results of model analyses regarding this issue. In the event that an automatic system to trip the reactor coolant pumps is required after the NRC determination of model acceptability, environmental qualification of associated electrical equipment will be prepared upon system installation, as necessary.

The SCEWS provided for TMI Action Plan equipment reflect the most recent peak containment temperature and pressure postulated to result for a LOCA or HELB. The analyses of the pressure/temperature response were performed in association with Technical Specification 3.6.2.3, Containment Cooling System. The Safety Evaluation Report in Alabama Power Company's letter dated August 17, 1982 provides the basis that environmental qualification of Unit 2 containment equipment is not invalidated as a result of this analysis, and this matter is not an unreviewed safety question. The most recent containment temperature and pressure responses are attached as Figures 1 and 2. SCEWS of containment equipment addressed in previous NUREG-0588 submittals will not be revised."

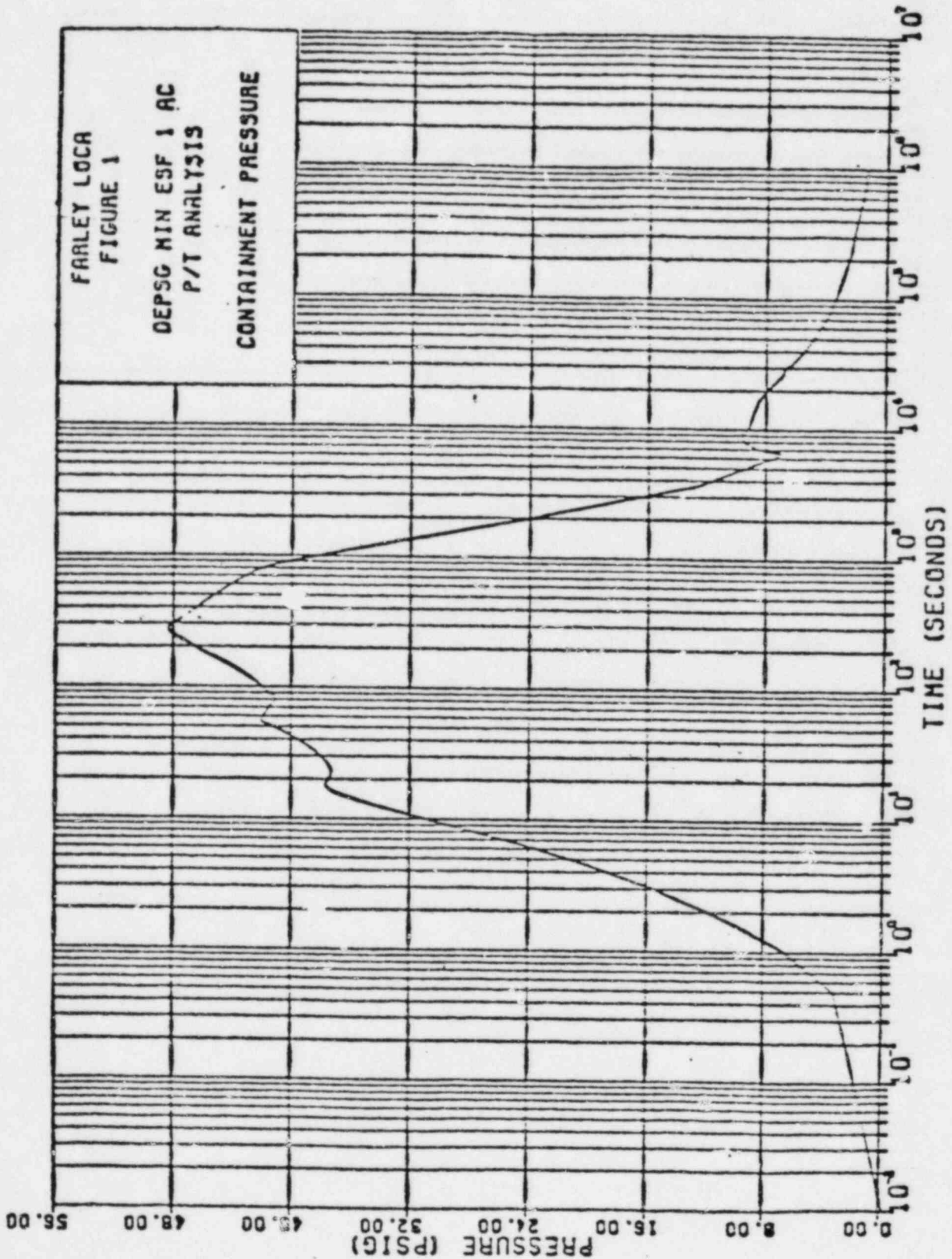


FIGURE SUPPLIED
BY THE LICENSEE

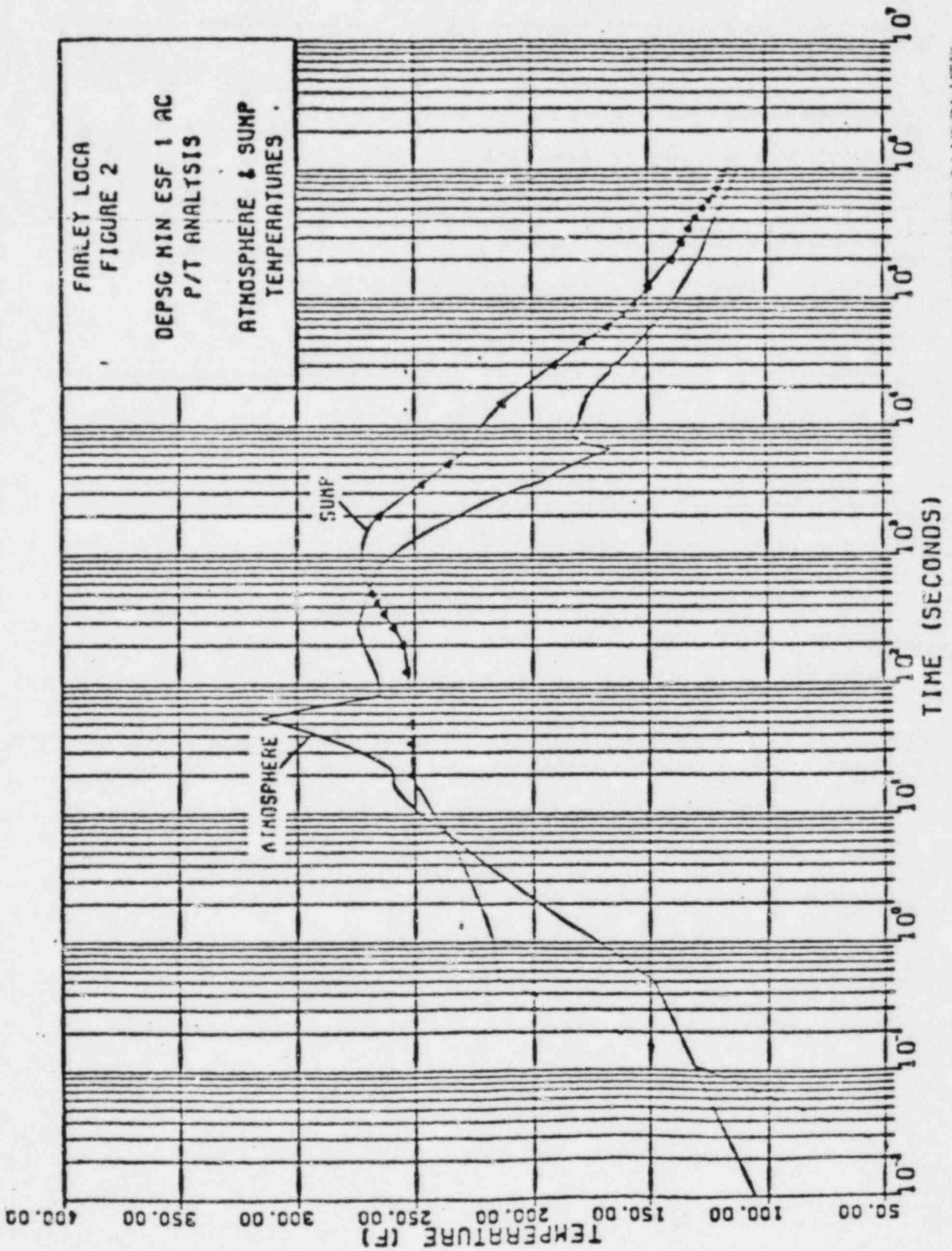


FIGURE SUPPLIED
BY THE LICENSEE

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.

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APPENDIX A - ENVIRONMENTAL SERVICE CONDITIONS

The specific environmental service conditions corresponding to different plant locations that were used in this technical evaluation are stated in this appendix, based upon the information presented in the Licensee's submittal [5].

The temperature and pressure profiles contained herein form the basis for the temperature and pressure noted by the Licensee in the "Environment Required" column on the Licensee's Equipment Qualification Report Evaluation sheets.

This appendix contains the following curves, reproduced from the Final Safety Analysis Report Update for Joseph M. Farley Nuclear Plant Units 1 and 2:

- Figure A-1. DESPG MIN ESF 1 AC, Pressure vs. Time (Licensee Figure 6.2-1)
- Figure A-2. Pressure Versus Time, Steam Line Full D.E. Break, 102% Power (Licensee Figure 6.2-6)
- Figure A-3. Temperature Versus Time, Steam Line Full D.E. Break, 102% Power (Licensee Figure 6.2-7)
- Figure A-4. Pressure Versus Time, Steam Line 0.7 ft² D.E. Break, 102% Power (Licensee Figure 6.2-8)
- Figure A-5. Temperature Versus Time, Steam Line 0.7 ft² D.E. Break, 102% Power (Licensee Figure 6.2-9)
- Figure A-6. Pressure Versus Time, Steam Line 0.6 ft² D.E. Break, 102% Power (Licensee Figure 6.2-10)
- Figure A-7. Temperature Versus Time, Steam Line 0.6 ft² D.E. Break, 102% Power (Licensee Figure 6.2-11)
- Figure A-8. Pressure Versus Time (Steam Line 0.645 ft² Split, 102% Power (Licensee Figure 6.2-12)
- Figure A-9. Temperature Versus Time, Steam Line 0.645 ft² Split, 102% Power (Licensee Figure 6.2-13)

Figure A-10. DEPSG MIN ESF 1 AC P/T Analysis, Long Term Containment Pressure vs. Time (Licensee Figure 6.2-39)

Figure A-11. DEPS MIN ESF DBA, Pressure vs. Time (Licensee Figure 6.2-40)

Figure A-12. DEPSG MIN DBA Short Term Containment Temperature (Licensee Figure 6.2-41).

Accident Conditions Inside Primary Containment

For PWR plants, the DOR Guidelines state that the environmental service conditions inside containment for the loss-of-coolant accident (LOCA) should be established by the Licensee based on the FSAR analysis. In addition, for plants equipped with automatic containment spray systems not subject to single component failure or delayed initiation, the Guidelines state that equipment qualified for the LOCA environment is also considered qualified for the postulated main-steam-line break accident (MSLB). The design of this plant satisfies these criteria. The Licensee has stated that equipment qualified for a LOCA environment can be considered qualified for a MSLB accident environment.

Based on these considerations, each equipment item was evaluated with respect to the environmental service conditions presented in this appendix.

The Licensee's methodology for the development of environmental service conditions was stated in Reference 5 as follows.

The Licensee provided the following response with respect to temperature margins applied to the primary containment accident profile:

"The containment pressure/temperature analysis and calculations of the equipment surface temperature in the harsh environment are performed using the Bechtel COPATTA computer program. COPATTA was derived from the COMTEMPT program written for the Loss-of-Fluid Test (LOFT) program. A detailed description of COPATTA is contained in Bechtel Topical Report BN-TOP-3, Revision 4, 'Performance and Sizing of Dry Pressure Containments.' This report has been reviewed and approved by the NRC.

The following discussion outlines the procedures used to model the temperature response of safety-related electrical equipment following a postulated main steam line break (MSLB). The methodology which is used to calculate the heat transfer rates to the surface of a component is taken from the NRC Interim Evaluation Model for Equipment Qualification,

NUREG 0588. An outline of this methodology, which is programmed into the containment analysis code COPATTA, is given in section II.B.1. In section II.B.2 the modeling of a solenoid valve typical of those used in the Farley containment is shown to demonstrate the specific modeling techniques used.

II.B.1 METHODOLOGY FOR SAFETY RELATED COMPONENT THERMAL ANALYSIS IN SUPERHEATED CONTAINMENTS

Component thermal analyses may be performed to justify environmental qualification test conditions less than those calculated during the containment environmental response calculation. The thermal analysis should be performed for the potential points of component failure such as thin cross-sections and temperature-sensitive parts where thermal stressing, temperature-related degradation, steam or chemical interaction at elevated temperatures, or other thermal effects could result in failure of the components electrically or mechanically. The heat transfer rate to components is calculated as follows:

a. Condensing heat transfer rate

$$q/A = h_{cd} \cdot (T_s - T_w)$$

where q/A = component surface heat flux

h_{cd} = the larger of 4x Tagami Correlation or 4x Uchida Correlation

T_s = saturation temperature (dew point)

T_w = component surface temperature.

Both the Uchida and Tagami Correlations are empirical condensing heat transfer relationships. The Uchida Correlation is based on the ratio of steam to air masses. The Tagami Correlation is based on the free containment volume and the ratio of instantaneous to maximum energy release rates.

b. Convective heat transfer

A convective heat transfer coefficient should be used when the condensing heat flux is calculated to be less than the convective heat flux. During the blowdown period, a forced convection heat transfer correlation is used. For example:

$$Nu = C (Re)^n$$

where Nu = Nusselt No.

Re = Reynolds No.

C, n = empirical constants dependent on geometry and Reynolds No.

The velocity used in the evaluation of Reynolds Number is determined as follows:

$$V = 25 \frac{M_{BD}}{V_{CONT}}$$

where V = velocity in ft/sec
 M_{BD} = the blowdown rate in lbm/hr
 V_{CONT} = containment volume in ft³

After the blowdown has ceased or reduced to a negligibly low value, a natural convection heat transfer correlation is acceptable. However, use of a natural convection heat transfer coefficient must be fully justified whenever used ($h_{convection} = 2.0$).

II.B.2 COMPONENT MODELING

As an example of the modeling techniques used, the model of a three-way direct-acting solenoid valve manufactured by the Automatic Switch Company is presented in this section. This solenoid valve is typical of those in the Farley containment. Figure 1 [Figure 4-1 of this TER] shows several scaled views of the component including its internal construction. The critical region to be analyzed here is the upper housing, a four inch diameter circular cylinder, which contains the core assembly and coil used to energize the valve.

An implicit finite difference solution of the one-dimensional multi-region transient heat conduction equation is employed to determine the component's thermal response.

Mesh points, which define the length of nodes, are placed so that they lie on the external boundaries of the component, at the interface between materials, and at equal intervals between the interfaces and boundaries. The COPATTA computer code used for this analysis allows up to 20 material regions and 101 mesh points per component. A component is modeled, as appropriate, in a rectangular, a cylindrical, or a spherical geometry.

Figure 2 [Figure 4-2 of this TER] is a diagram of the valve, modeled as a cylinder with the center line on the left and the cylinder surface on the right. The material regions from left to right correspond to the steel core assembly with 15 nodes, the copper coil with 10 nodes, the steel coil housing with 10 nodes, the air gap separating the coil and housing with 40 nodes, and the painted steel upper housing with 15 nodes in the steel and 5 nodes in the paint.

Typical thermal conductivities and volumetric heat capacities for each material are also given in Figure 2. The valve's characteristic length of 2.75 inches, the height of the solenoid valve, is used in the calculation of the time dependent convective heat transfer coefficient described in section IIb. As the component is symmetrical, left side centerline

boundary condition is insulated (no heat transfer). The right side surface is exposed to the containment MSLB atmosphere.

The component's temperature distribution is hence calculated by the COPATTA computer code for limiting MSLB transients. From this, the maximum surface temperature of the component can be identified and used to determine if a component is qualified for the MSLB environment.

Temperatures reported as qualification temperatures were in all cases the measured ambient temperature. However, analysis shows that for the qualification test steam environment, the equipment surface temperature and ambient temperature are essentially identical. Using the calculation methodology previously described the surface temperature was calculated as a function of autoclave temperature and time. For this analysis only 1x Uchida is used to conservatively calculate the heat transport to the modelled components.

The component's surface temperature approaches within 3°F of the ambient temperature in no more than about 200 seconds in a saturated steam environment. This is true of all the components types modelled. Since the qualification test procedure for all components maintained the temperature above the qualification temperature for a period of at least 20 to 240 minutes, we judge the components to be qualified.

Component Evaluation Worksheets will not be updated to reflect the higher equipment surface temperature expected due to the MSLB event. These higher temperatures have been reported in Table B.1-1."

With regard to submergence inside containment, the Licensee stated:

"Of the 51 safety related electrical components previously identified as having a potential for becoming submerged after a postulated event, all but 13 have been relocated above the flood level. These thirteen components are located in the containment, and include motor operated valves, solenoid valves and limit switches. In all cases, they will have performed their safety function before becoming submerged. Refer to Table II.C-1 for a comparison of operating time vs. submergence time. A failure mode and effects analysis for the three types of components is also provided.

To assure that those components potentially exposed to submergence will have completed their safety related function prior to being submerged, the rate of containment flooding was calculated. Then, based on the equipment elevation, the time to submergence was determined. The results are presented below:

TABLE II.C-1

<u>Component</u>	<u>El.</u>	<u>Time to Function</u>	<u>Time to Submergence</u>
Q2E21ZS8149A	111'	30 sec.	1260 sec.
Q2E21ZS8149B	111'	30 sec.	1260 sec.
Q2E21ZS8149C	111'	30 sec.	1260 sec.
Q2E21V038A (MOV8808A)	111'-6"	30 sec.	1390 sec.
Q2E21V038B (MOV8808B)	112'-6"	30 sec.	1660 sec.
Q2E21V038C (MOV8808C)	113'-6"	30 sec.	1950 sec.
N2G21SV1003B	110'	30 sec.	983 sec.
N2G21ZS1003B	110'	30 sec.	983 sec.
N2G21ZS3376	109'	30 sec.	714 sec.
N2G6215V3376	109'	30 sec.	714 sec.
Q2E21SV8149AB	111'	30 sec.	1260 sec.
Q2E21SV8149BB	111'	30 sec.	1260 sec.
Q2E21SV8149CB	111'	30 sec.	1260 sec."

With regard to chemical spray, the Licensee stated [5]:

"In all cases the chemical spray portion of the equipment qualification tests utilized a boric acid solution concentration that meets or exceeds the Farley FSAR value of 2000 ppm boric acid. These concentrations are further delineated in Section III of this appendix."

With respect to radiation values inside primary containment, the Licensee stated:

"The range of required values outside the containment used to specify limiting radiation levels within the auxiliary building has been provided previously in Section C.4 of the NUREG 0588 submittal. The source term methodology associated with post-LOCA recirculation fluid lines was used to establish dose rates and integrated doses for each affected component. The radiation qualification level of each component was then compared to the calculated dose."

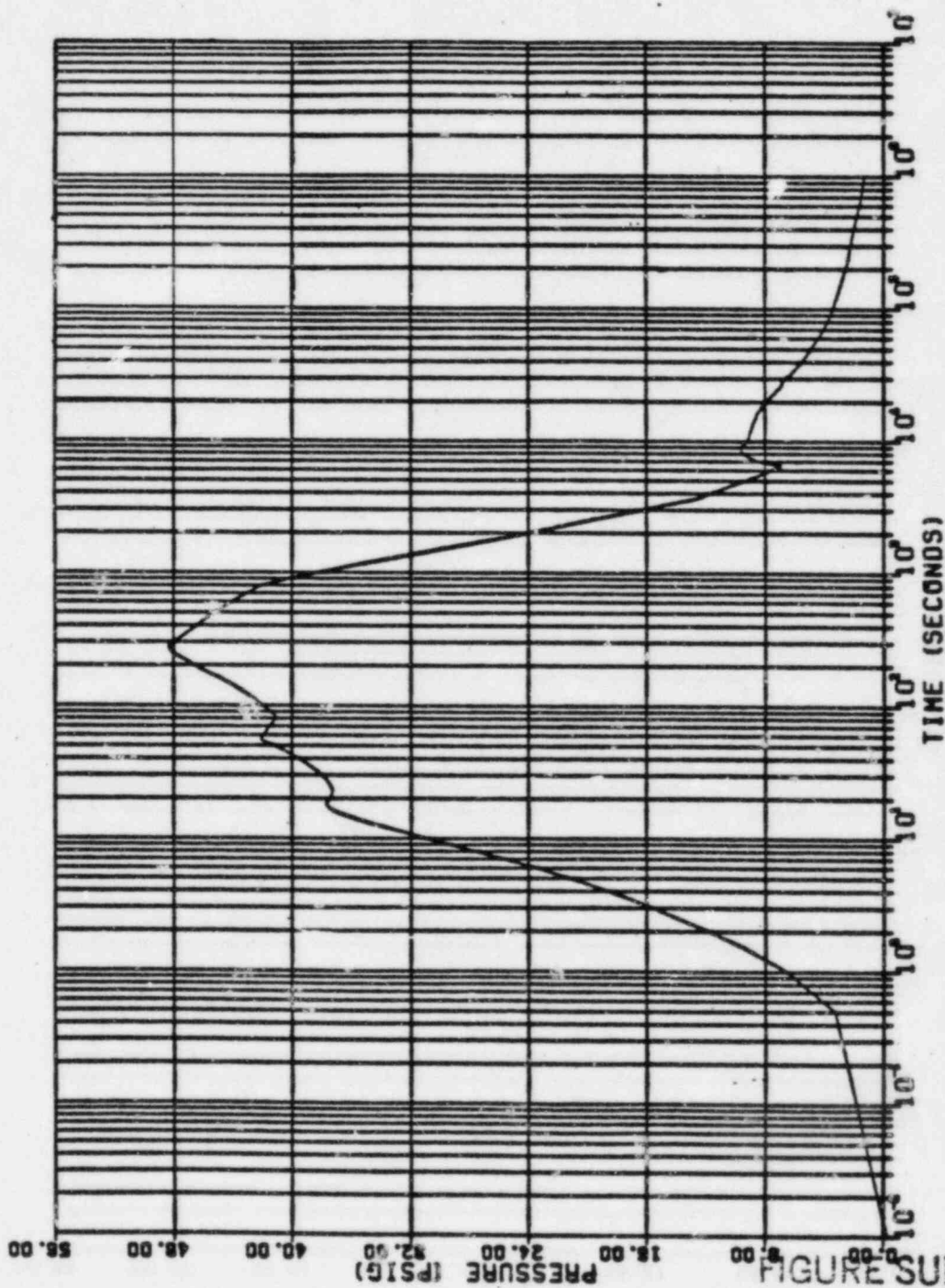


FIGURE SUPPLIED
BY THE LICENSEE

Alabama Power



JOSEPH M. FARLEY
NUCLEAR PLANT
UNIT 1 AND UNIT 2

DESPG MIN ESF 1 AC
PRESSURE VS. TIME

FIGURE 6.2-1

Figure A-1. DESPG MIN ESF 1 AC, Pressure vs. Time (Licensee Figure 6.2-1)



FIGURE SUPPLIED
BY THE LICENSEE

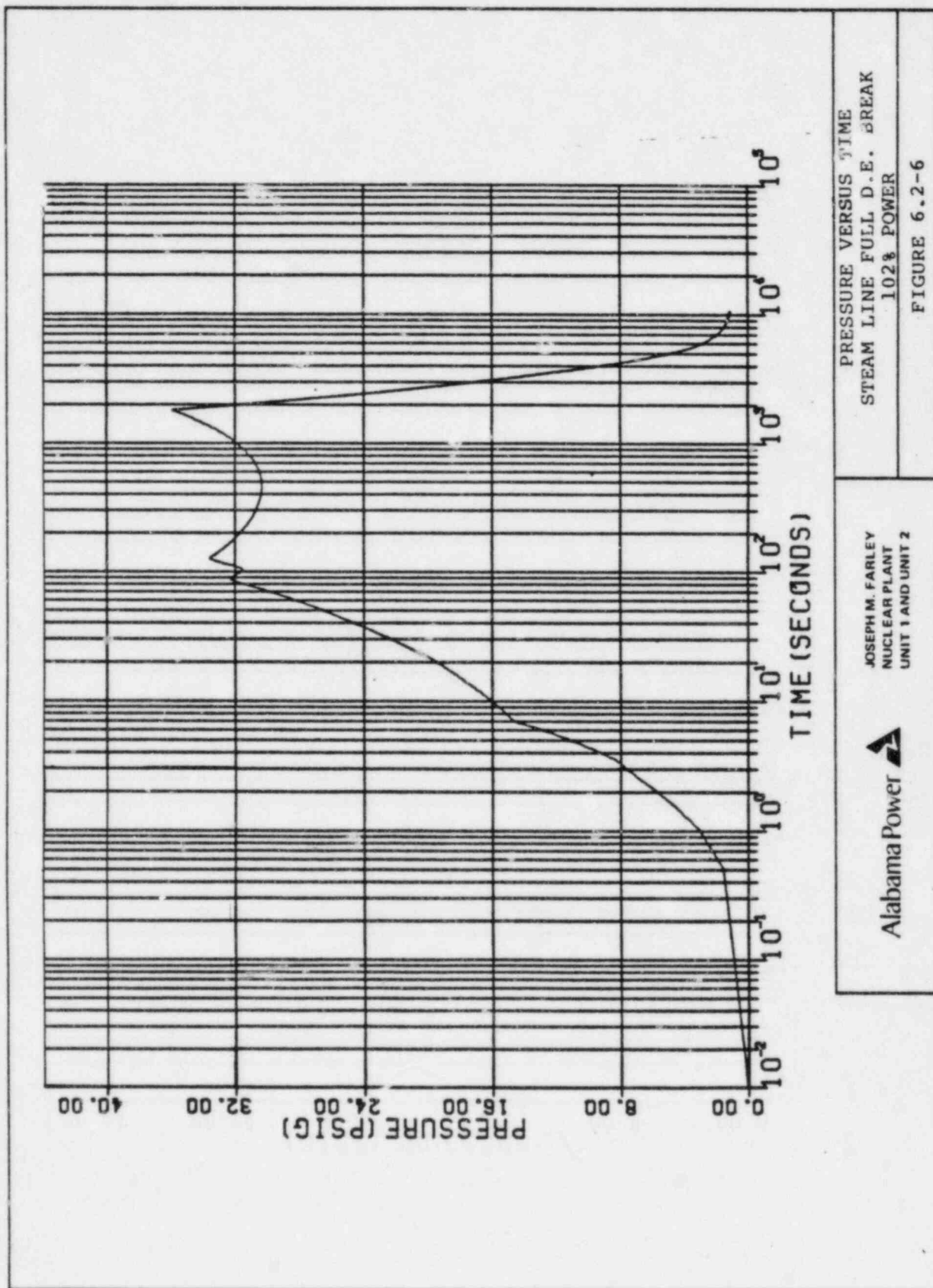
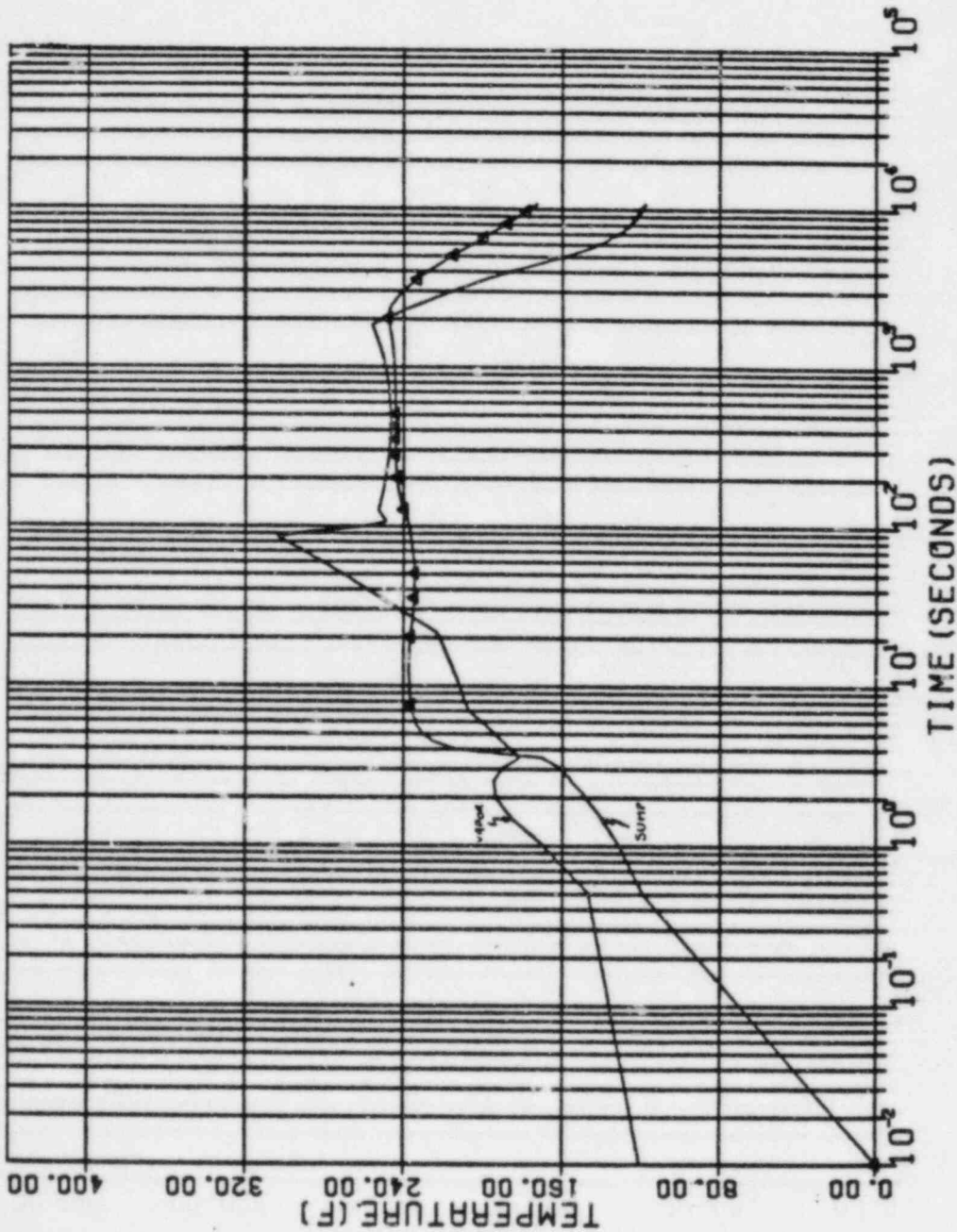


Figure A-2. Pressure Versus Time, Steam Line Full D.E. Break, 102% Power
(Licensee Figure 6.2-6)



TEMPERATURE VERSUS TIME
STEAM LINE FULL D.E. BREAK
102% POWER

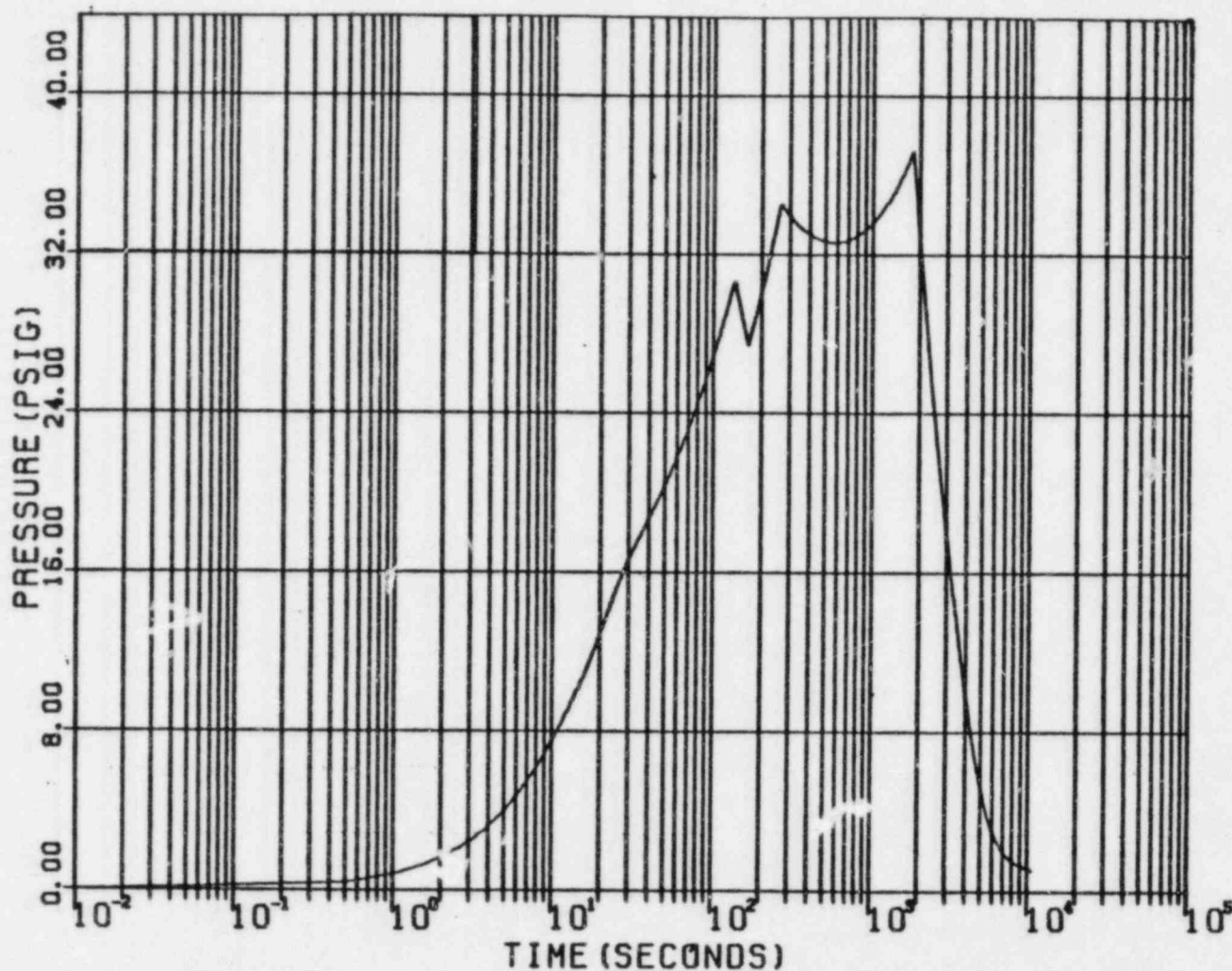
FIGURE 6.2-7

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NUCLEAR PLANT
UNIT 1 AND UNIT 2

AlabamaPower

Figure A-3. Temperature Versus Time, Steam Line Full D.E. Break, 102% Power (Licensee Figure 6.2-7)

FIGURE SUPPLIED
BY THE LICENSEE



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NUCLEAR PLANT
UNIT 1 AND UNIT 2

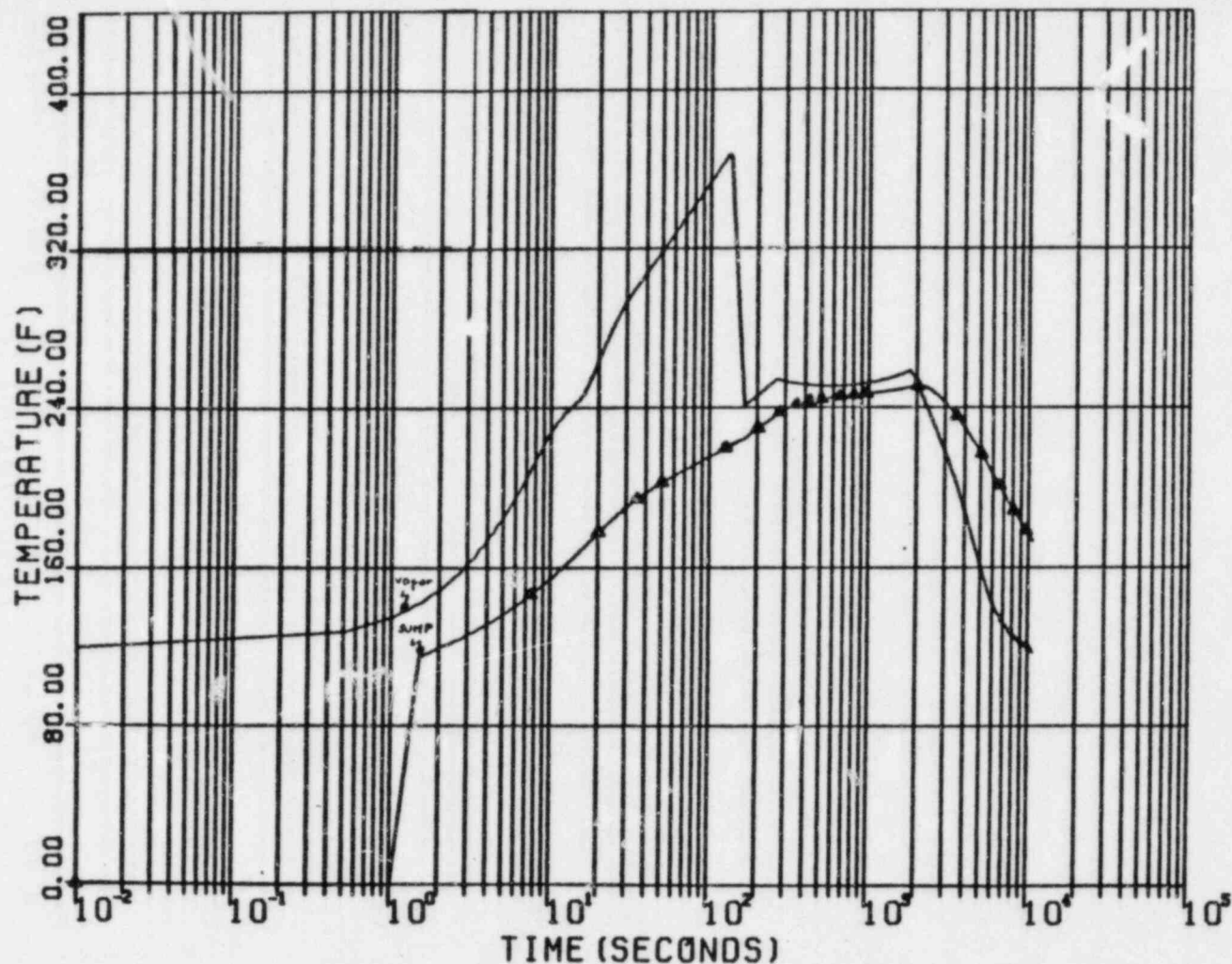
PRESSURE VERSUS TIME
STEAM LINE 0.7 ft² D.E. BREAK
102% POWER

FIGURE 6.2-8

Figure A-4. Pressure Versus Time, Steam Line 0.7 ft² D.E. Break, 102% Power (Licensee Figure 6.2-8)

TER-C5257-518

FIGURE SUPPLIED
BY THE LICENSEE



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NUCLEAR PLANT
UNIT 1 AND UNIT 2

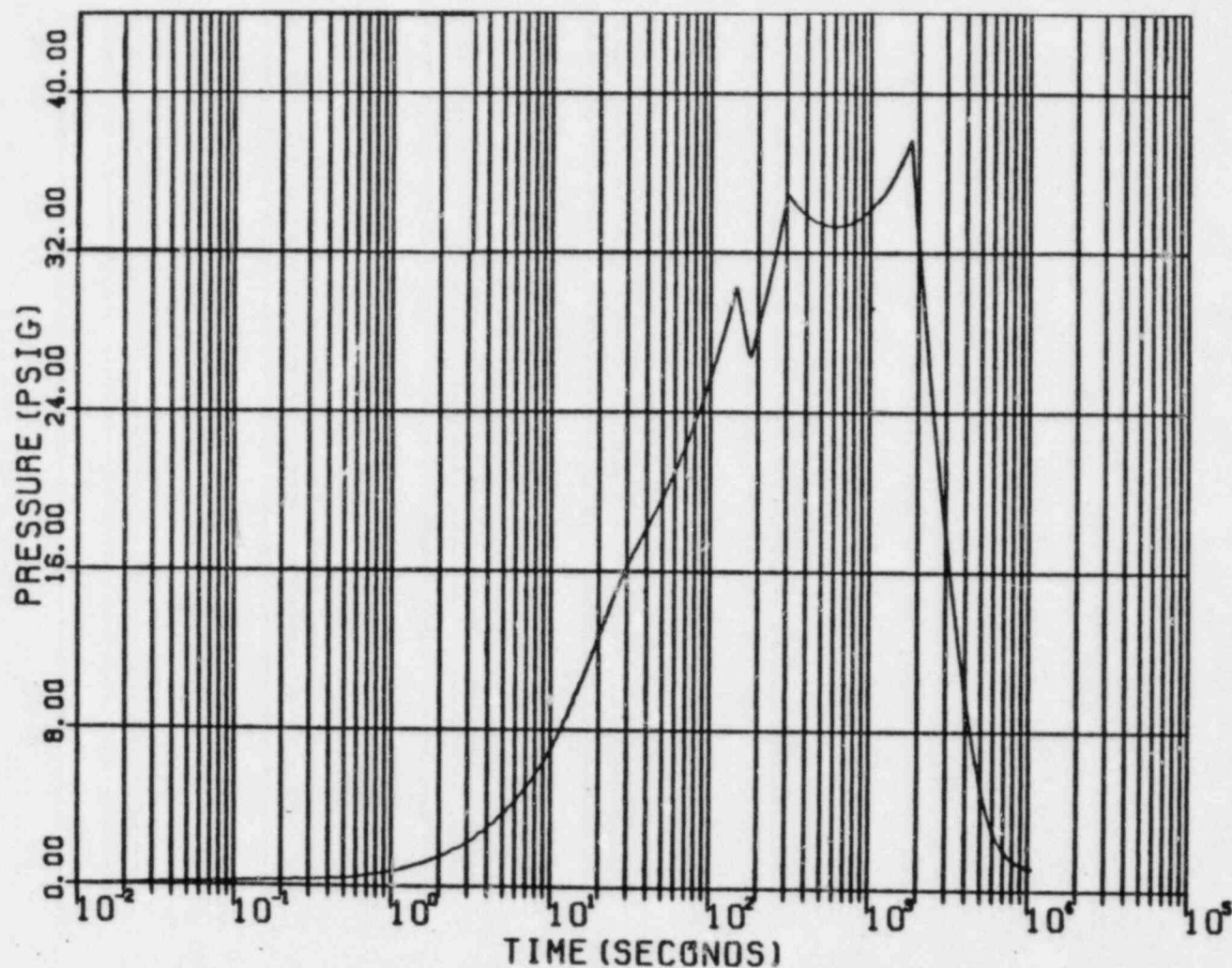
TEMPERATURE VERSUS TIME
STEAM LINE 0.7 ft² D.E. BREAK
102% POWER

FIGURE 6.2-9

Figure A-5. Temperature Versus Time, Steam Line 0.7 ft² D.E. Break, 102% Power (Licensee Figure 6.2-9)

FIGURE SUPPLIED
BY THE LICENSEE

TER-C5257-518



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NUCLEAR PLANT
UNIT 1 AND UNIT 2

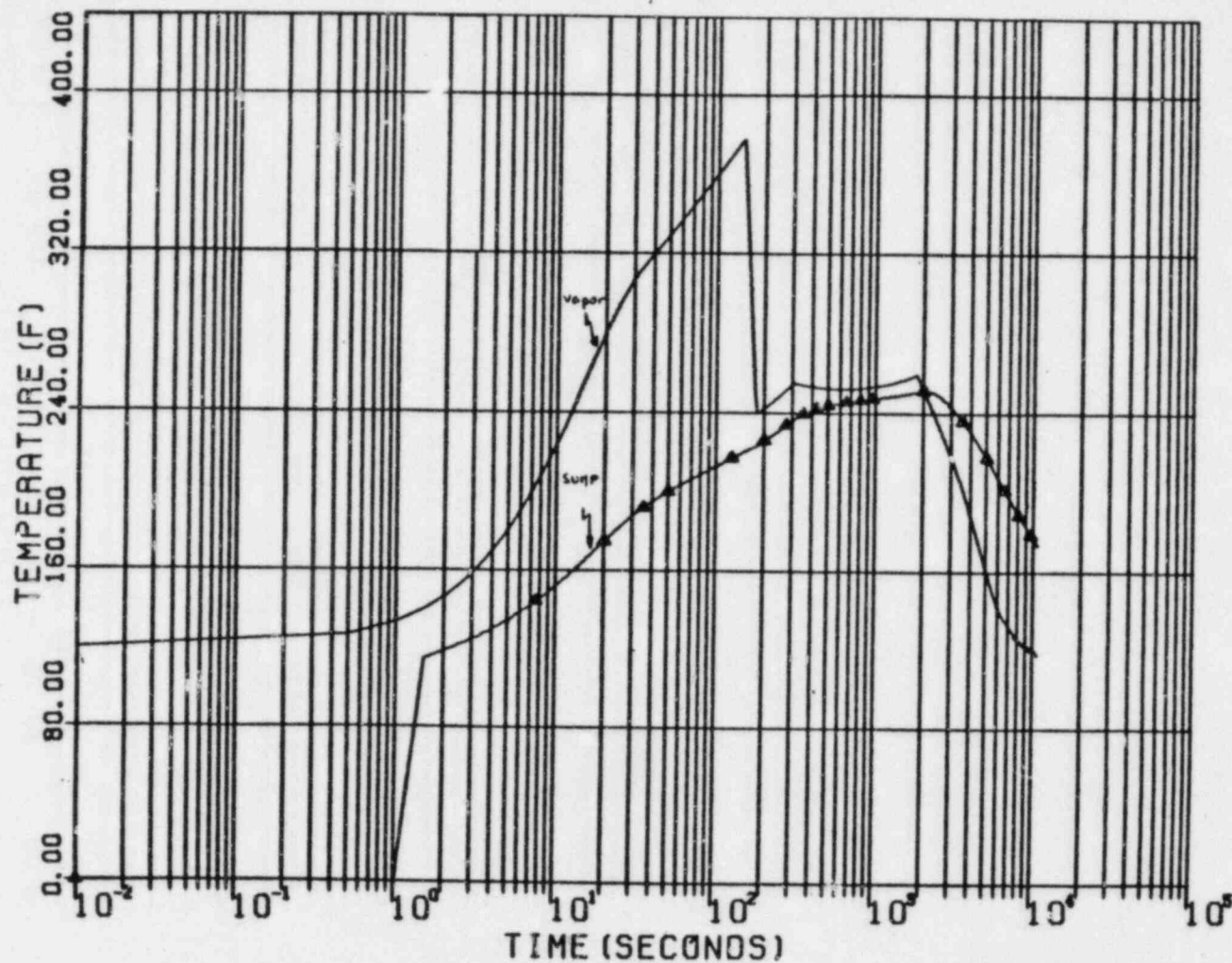
PRESSURE VERSUS TIME
STEAM LINE 0.6 ft² D.E. BREAK
102% POWER

FIGURE 6.2-10

Figure A-6. Pressure Versus Time, Steam Line 0.6 ft² D.E. Break, 102% Power (Licensee Figure 6.2-10)

FIGURE SUPPLIED
BY THE LICENSEE

TER-C5257-518



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UNIT 1 AND UNIT 2

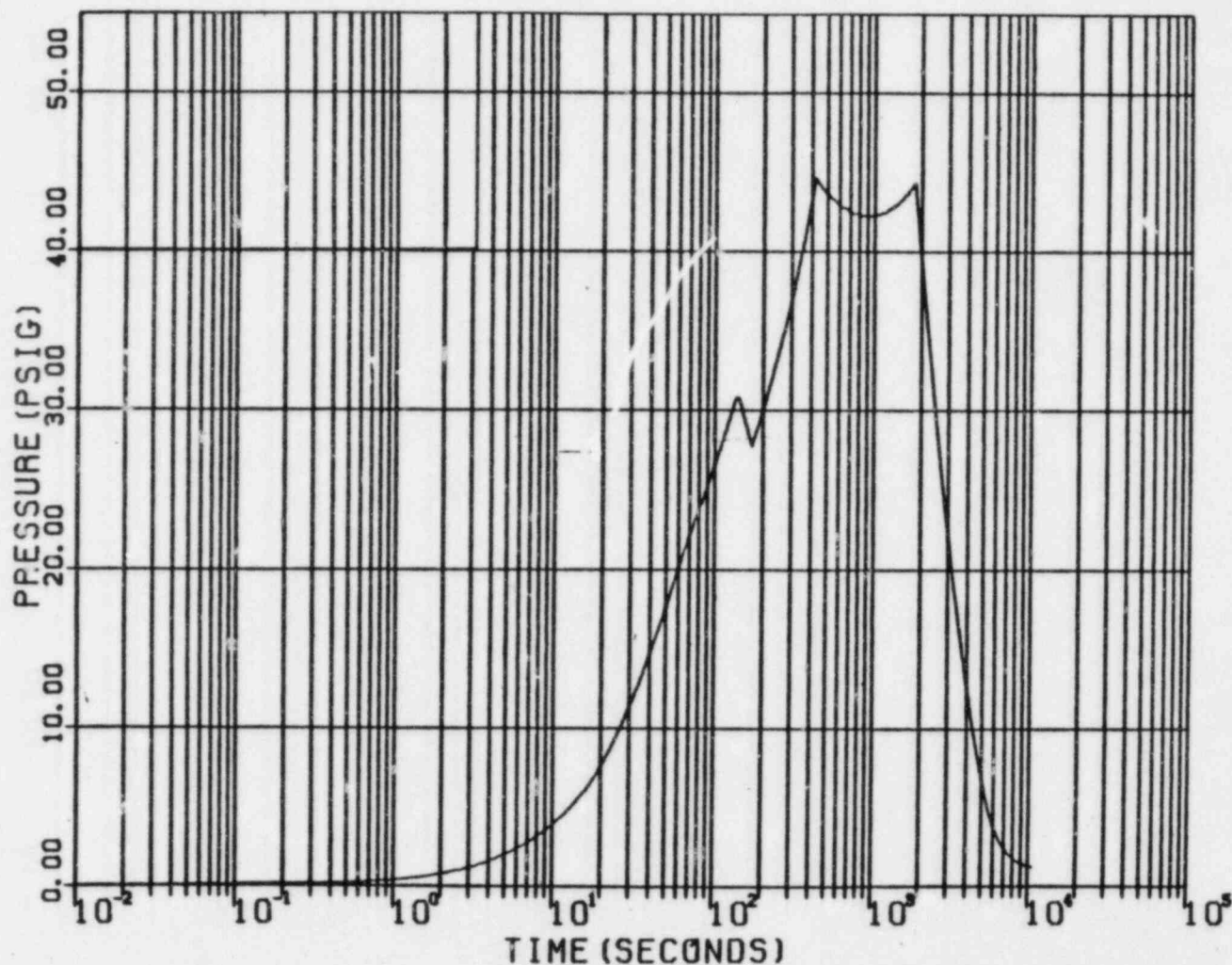
TEMPERATURE VERSUS TIME
STEAM LINE 0.6 ft² D.E. BREAK
102% POWER

FIGURE 6.2-11

Figure A-7. Temperature Versus Time, Steam Line 0.6 ft² D.E. Break, 102% Power (Licensee Figure 6.2-11)

FIGURE SUPPLIED
BY THE LICENSEE

TER-C5257-518



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UNIT 1 AND UNIT 2

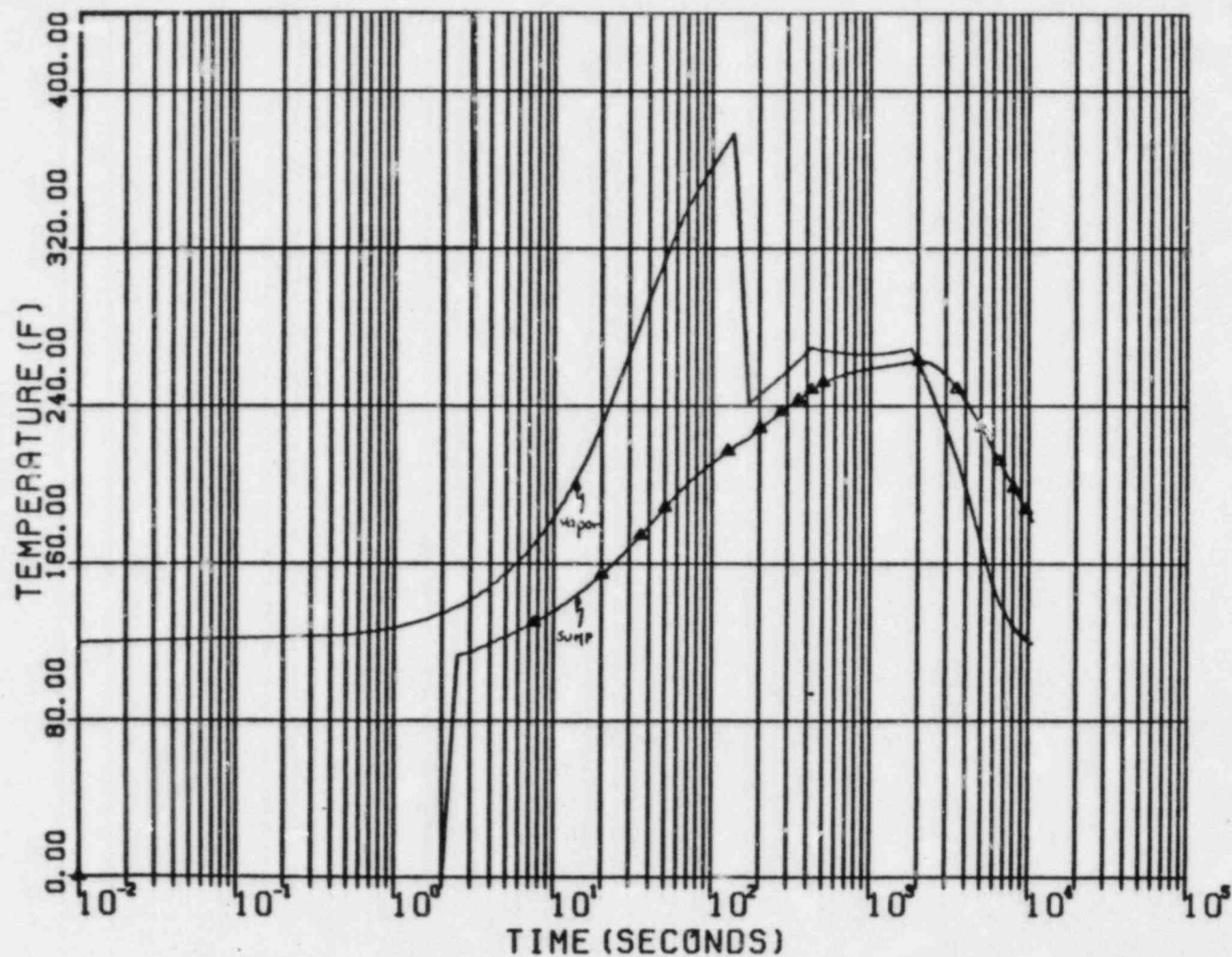
PRESSURE VERSUS TIME
STEAM LINE 0.645 ft² SPLIT
102% POWER

FIGURE 6.2-12

TER-C5257-518

Figure A-3. Pressure Versus Time (Steam Line 0.645 ft² Split, 102% Power (Licensee Figure 6.2-12))

FIGURE SUPPLIED
BY THE LICENSEE



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UNIT 1 AND UNIT 2

TEMPERATURE VERSUS TIME
STEAM LINE 0.645 ft² SPLIT
102% POWER

FIGURE 6.2-13

Figure A-9. Temperature Versus Time, Steam Line 0.645 ft² Split, 102% Power (Licensee Figure 6.2-13)

FIGURE SUPPLIED
BY THE LICENSEE

TER-C5257-518

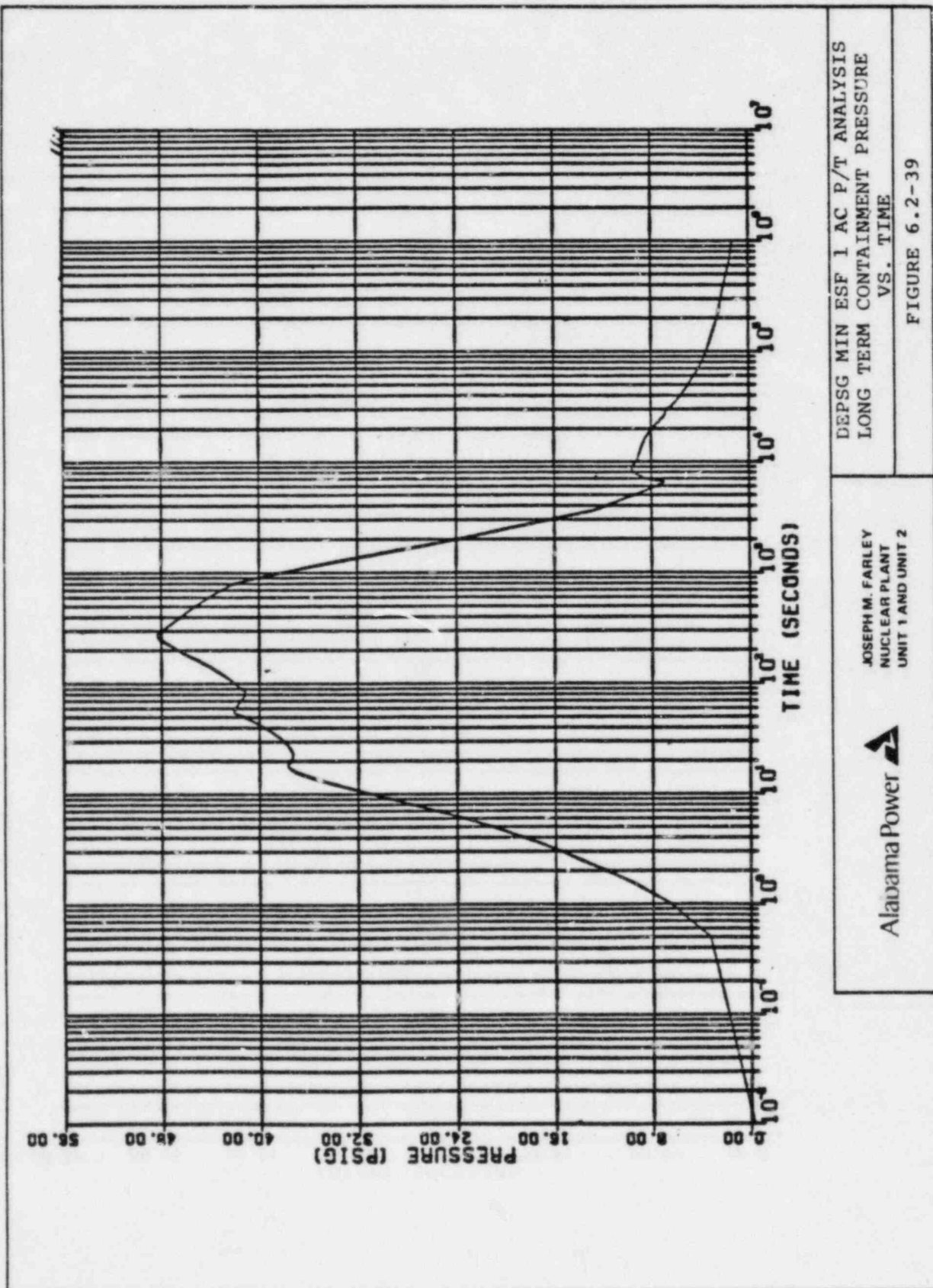
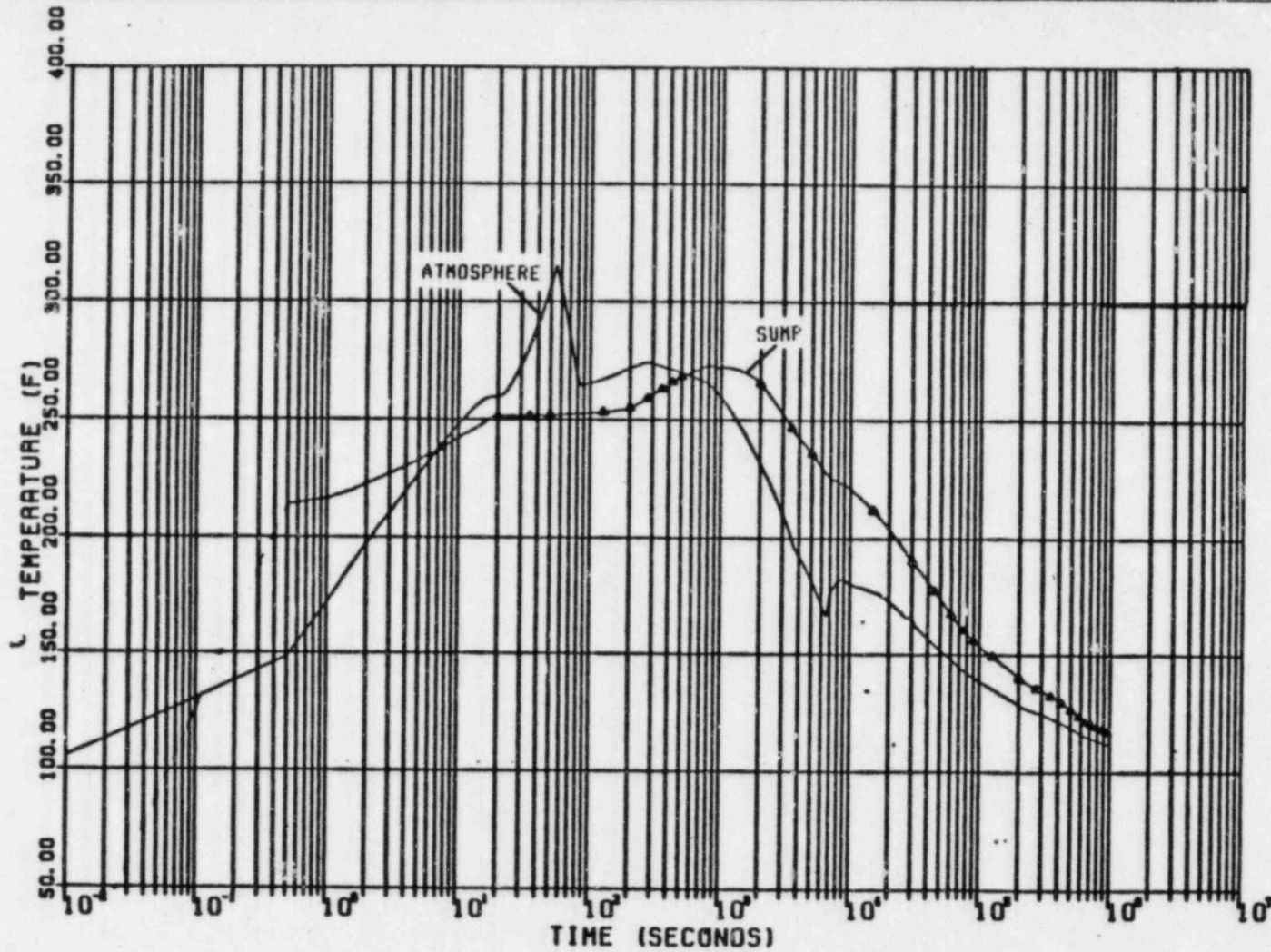


FIGURE SUPPLIED
BY THE LICENSEE

Figure A-10. DEPSG MIN ESF 1 AC P/T Analysis, Long Term Containment Pressure vs. Time (Licensee Figure 6.2-39)



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NUCLEAR PLANT
UNIT 1 AND UNIT 2

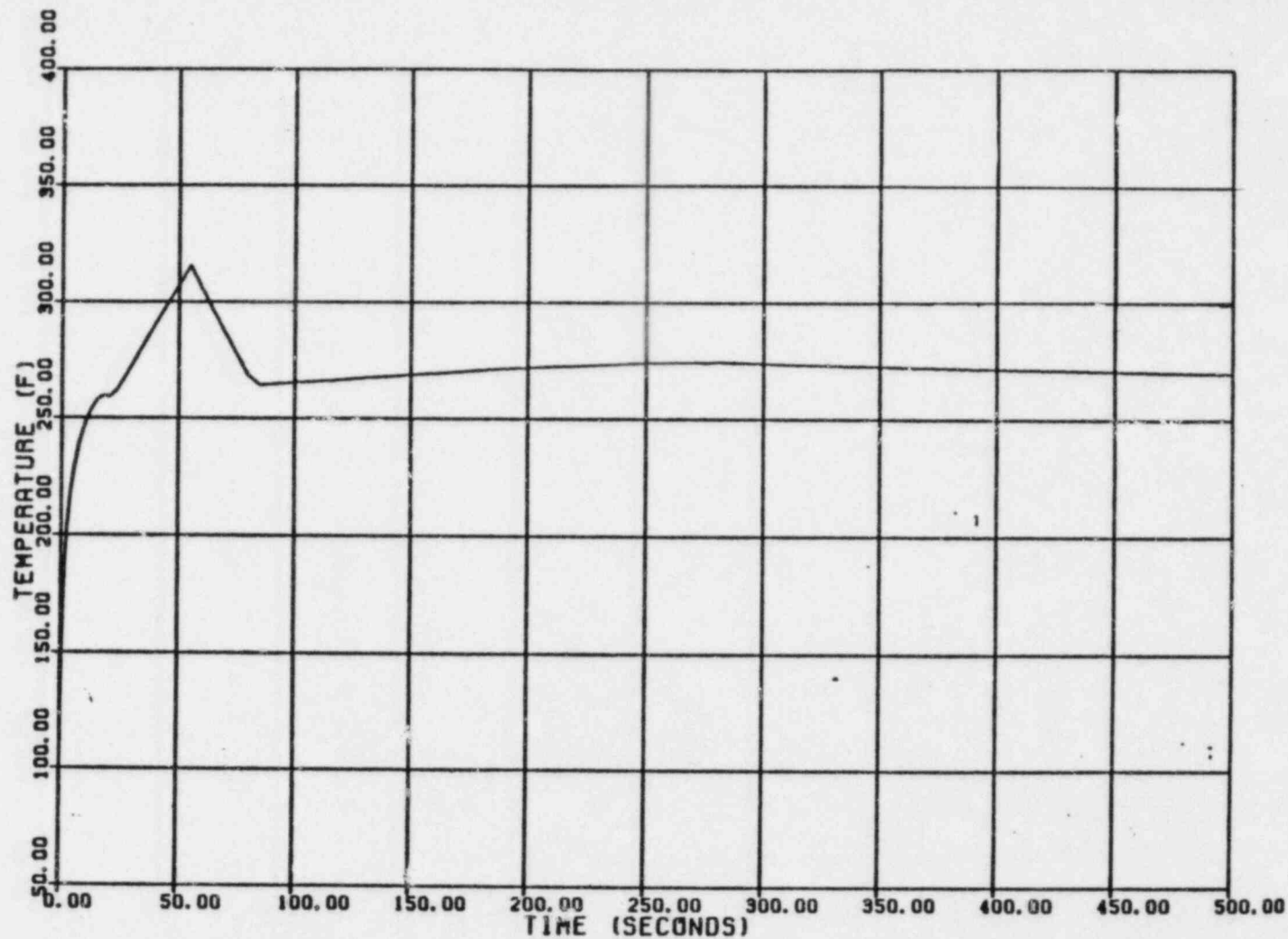
DEPS MIN ESF DBA
PRESSURE VS. TIME

FIGURE 6.2-40

TER-C5257-518

Figure A-11. DEPS MIN ESF DBA, Pressure vs. Time (Licensee Figure 6.2-40)

FIGURE SUPPLIED
BY THE LICENSEE



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NUCLEAR PLANT
UNIT 1 AND UNIT 2

DEPSG MIN DBA SHORT TERM
CONTAINMENT TEMPERATURE

FIGURE 6.2-41

Figure A-12. DEPSG MIN DBA Short Term Containment Temperature (Licensee Figure 6.2-41)

FIGURE SUPPLIED
BY THE LICENSEE

TER-C5257-518

APPENDIX B - LISTING OF SAFETY-RELATED ELECTRICAL EQUIPMENT

The following table lists the groupings of safety-related electrical equipment items for the Farley Nuclear Plant Unit 2. 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 [5, 6].

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

MOTORIZED VALVE ACTUATOR LOCATED IN THE MAIN STEAM ROOM, ELEV. 137'5"

LIMITORQUE MODEL SMB; SIZES 1, 4T

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 1

LICENSEE REFERENCE(S): 706

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3232A, B, C; (Q2N21V001A-B, B-B, C-B))

SERVICE: FEEDWATER SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.15.2 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3350A, B, C; (Q2N23V001A, B, C))

SERVICE: AUXILIARY FEEDWATER

LICENSEE SUBMITTAL: SCEW(S): C.2.16.3 [5]

EQUIPMENT ITEM NO. 2

MOTORIZED VALVE ACTUATOR LOCATED IN THE CONTAINMENT, ELEV. 111'6"

LIMITORQUE MODEL SMB4

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 2

LICENSEE REFERENCE(S): 695, 1590

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV8088A, B, C; (Q2E21V038A, B, C))

SERVICE: CVCS

LICENSEE SUBMITTAL: SCEW(S): C.2.9.4 [5]

EQUIPMENT ITEM NO. 3

MOTORIZED VALVE ACTUATOR LOCATED IN THE CONTAINMENT, ELEV. 126'6"

LIMITORQUE MODEL SMB; SIZES 00, 000

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 3

LICENSEE REFERENCE(S): 706

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3660, MOV3318B; (Q2E14V002, 004))

SERVICE: CONTAINMENT COOLING

LICENSEE SUBMITTAL: SCEW(S): C.2.6.4 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV8112 (Q2E21V249A))

SERVICE: CVCS/SAFETY INJECTION

LICENSEE SUBMITTAL: SCEW(S): C.2.9.7 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3872A, B (Q2E22V001A, B))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.10.3 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3536 (Q2E23V021))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.3 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3530 (Q2E23V003))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.4 [5]

EQUIPMENT ITEM NO. 3 (CONTINUED)

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3528A, B, C, D (Q2E23V022A, B, C, D))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.5 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3835A, B (Q2E23V025A, B))

SERVICE: COMBUSTIBLE GAS CONTROL

LICENSEE SUBMITTAL: SCEW(S): C.2.11.5 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3441A, B, C, D (Q2P16V207A, B, C, D))

SERVICE: WATER

LICENSEE SUBMITTAL: SCEW(S): C.2.19.3 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3131 (Q2P16V081))

SERVICE: COOLING WATER

LICENSEE SUBMITTAL: SCEW(S): C.2.19.4 [5]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (MOV3046 (Q2P17V097))

SERVICE: COOLING WATER

LICENSEE SUBMITTAL: SCEW(S): C.2.20.2 [5]

EQUIPMENT ITEM NO. 4

SOLENOID VALVE LOCATED IN THE CONTAINMENT, ELEV. 110'0"

ASCO MODEL NP SERIES

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 4

LICENSEE REFERENCE(S): 649

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2E21SV8149AB, BB, CB)

LICENSEE SUBMITTAL: SCEW(S): C.2.9.8 [6]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (N2021SV1003B)

LICENSEE SUBMITTAL: SCEW(S): C.2.12.4 [6]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2G21SV3376)

LICENSEE SUBMITTAL: SCEW(S): C.2.12.2 [6]

EQUIPMENT ITEM NO. 5

SOLENOID VALVE LOCATED IN THE MAIN STEAM ROOM, ELEV. 135'0"

ASCO MODEL NP SERIES

REQUIRED OPERATING TIME: 10 MINUTES

TER CHECKSHEET NO. 5

LICENSEE REFERENCE(S): 649

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N25SV3772A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.17.2 [6]

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N23SV3223AA, JA, C A; 3227AA, BA, CA)

LICENSEE SUBMITTAL: SCEW(S): C.2.16.5 [6]

FUNCTION (PLANT ID): ACTIVATE AIR OPERATED VALVE FOR ISOLATION (Q2N12SV3235A, B)

LICENSEE SUBMITTAL: SCEW(S): C.3.14.4 [6]

EQUIPMENT ITEM NO. 5 (CONTINUED)

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N12SV3234A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.14.2 [5]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N11SV3369AC, BC, C C; 3370AC, BC, CC)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.8 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2N11SV3368AA, BA, C A; 3976A, B, C)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.7 [6]

EQUIPMENT ITEM NO. 6

SOLENOID VALVE LOCATED IN THE CONTAINMENT
TARGET ROCK MODEL 79AB001
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 6
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): REACTOR VESSEL HEAD VENTILATION (62B13SV2213A, B; 2214A, B)
LICENSEE SUBMITTAL: SCEW(S): TMI-2.2 [6, 11, 19]

EQUIPMENT ITEM NO. 7

SOLENOID VALVE LOCATED IN THE CONTAINMENT, ELEV. 89'4"
AUTOMATIC VALVE MODEL C5439
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 7
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2E12SV3999A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.6.7 [6]

EQUIPMENT ITEM NO. 8

SOLENOID VALVE LOCATED IN THE CONTAINMENT, ELEV. 129'0"
ASCO MODEL NP SERIES
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 8
LICENSEE REFERENCE(S): 649
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2B31SV8047)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.2 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2G21SV7126)
LICENSEE SUBMITTAL: SCEW(S): C.2.12.5 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2E21SV8871, 8149AB, BB, CB)
LICENSEE SUBMITTAL: SCEW(S): C.2.9.5 [6]
FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P13ZS2867B, 2866B)
LICENSEE SUBMITTAL: SCEW(S): C.2.6.6 [6]

EQUIPMENT ITEM NO. 8 (CONTINUED)

FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P17SV3443)
 LICENSEE SUBMITTAL: SCEW(S): C.2.20.5 [6]
 FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P17SV3184)
 LICENSEE SUBMITTAL: SCEW(S): C.2.20.3 [6]
 FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P15SV3103,
 3766, 3 179A, B, C)
 LICENSEE SUBMITTAL: SCEW(S): C.2.18.4 [6]
 FUNCTION (PLANT ID): ACTUATE AIR OPERATED VALVE FOR ISOLATION (Q2P15SV3180A,
 B, C; 3 181A, B, C; 3104; 3765)
 LICENSEE SUBMITTAL: SCEW(S): C.2.18.4 [6]

EQUIPMENT ITEM NO. 9

SOLENOID VALVE LOCATED IN THE CONTAINMENT
 ASCO MODEL HTX8320A22V
 REQUIRED OPERATING TIME: NOT STATED
 TER CHECKSHEET NO. 9
 LICENSEE REFERENCE(S): NOT CITED
 FUNCTION (PLANT ID): PILOT FOR AIR OPERATED VALVE (N2B21SV0444BA, BB; 445AA,
 AB)
 SERVICE: PORV
 LICENSEE SUBMITTAL: SCEW(S): TMI-3.2 [6, 11, 19]

EQUIPMENT ITEM NO. 10

SOLENOID VALVE LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
 ASCO MODEL HV2063814U
 REQUIRED OPERATING TIME: 1 HOUR
 TER CHECKSHEET NO. 10
 LICENSEE REFERENCE(S): 649
 FUNCTION (PLANT ID): ACTIVATE AIR OPERATED VALVE FOR ISOLATION (N2C22SV0479A,
 B; 489A, B; 499A, B)
 LICENSEE SUBMITTAL: SCEW(S): C.2.4.6 [6]
 FUNCTION (PLANT ID): ACTIVATE AIR OPERATED VALVE FOR ISOLATION (N2C22SV0478A,
 B; 488A, B; 498A, B)
 LICENSEE SUBMITTAL: SCEW(S): C.2.4.5 [6]

EQUIPMENT ITEM NO. 11

HYDROGEN RECOMBINER LOCATED IN THE CONTAINMENT, ELEV. 155'0"
 WESTINGHOUSE MODEL TYPE A
 REQUIRED OPERATING TIME: 30 DAYS
 TER CHECKSHEET NO. 11
 LICENSEE REFERENCE(S): 1571, 1572, 1573, 1574, 1575
 FUNCTION (PLANT ID): HYDROGEN CONCENTRATION REDUCTION (K001A, B (Q2E17G001A,
 B))
 SERVICE: POST LOCA H2 CONTROL
 LICENSEE SUBMITTAL: SCEW(S): C.2.7.2 [5]

EQUIPMENT ITEM NO. 12
ELECTRIC MOTOR LOCATED IN THE CONTAINMENT, ELEV. 155'0"
JOY MANUFACTURING MODEL TYPE P
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 12
LICENSEE REFERENCE(S): 1803
FUNCTION (PLANT ID): HYDROGEN CONCENTRATION REDUCTION (Q2E22M001A, B)
SERVICE: POST LOCA H2 CONTROL
LICENSEE SUBMITTAL: SCEW(S): C.2.10.2 [5]
FUNCTION (PLANT ID): HYDROGEN CONCENTRATION REDUCTION (Q2E19M001A, B, C, D)
SERVICE: POST LOCA H2 CONTROL
LICENSEE SUBMITTAL: SCEW(S): C.2.8.2 [5]
FUNCTION (PLANT ID): NOT STATED (Q2E12M001, B, C, D)
SERVICE: CONTAINMENT HEAT REMOVAL
LICENSEE SUBMITTAL: SCEW(S): C.2.6.8 [5]

EQUIPMENT ITEM NO. 13
RTD LOCATED IN THE CONTAINMENT, ELEV. 122'9"
ROSEMOUNT MODEL 176KS
REQUIRED OPERATING TIME: 14 DAYS
TER CHECKSHEET NO. 13
LICENSEE REFERENCE(S): 687
FUNCTION (PLANT ID): REACTOR TRIP (N2B21TE410, 413, 420, 423, 430, 433)
LICENSEE SUBMITTAL: SCEW(S): C.2.2.3 [6]

EQUIPMENT ITEM NO. 14
RTD LOCATED IN THE CONTAINMENT, ELEV. 124'0"
ROSEMOUNT MODEL 176KF
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 14
LICENSEE REFERENCE(S): 687
FUNCTION (PLANT ID): REACTOR TRIP (N2B13TE412B, D; 422B, D; 432B, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.1.2 [6]

EQUIPMENT ITEM NO. 15
RADIATION DETECTOR LOCATED IN THE CONTAINMENT, ELEV. 155'0"
VICTOREEN MODEL 8771
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 15
LICENSEE REFERENCE(S): 2883
FUNCTION (PLANT ID): RADIATION MONITOR (Q2D21RE0027A-A, B-B)
SERVICE: POST ACCIDENT MONITOR
LICENSEE SUBMITTAL: SCEW(S): TMI-5.2 [6, 11, 19]

EQUIPMENT ITEM NO. 16
PRESSURE TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
BARTON MODEL 763 (LOT 2)
REQUIRED OPERATING TIME: 30 DAYS
TER CHECKSHEET NO. 16
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): POST-ACCIDENT MONITOR (N2B21PT402, 403)
LICENSEE SUBMITTAL: SCEW(S): C.2.2.2[5]

EQUIPMENT ITEM NO. 17
PRESSURE TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
BARTON MODEL 764 (LOT 2)
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 17
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): REACTOR TRIP (Q2B31PT455, 456, 457)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.6 [6]

EQUIPMENT ITEM NO. 18
LEVEL SWITCH LOCATED IN THE MAIN STEAM ROOM, ELEV. 133'5"
DE LAVAL MODEL LS36497
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 18
LICENSEE REFERENCE(S): 2587
FUNCTION (PLANT ID): MAIN FEED PUMP TRIP (Q2N21LSH2828A, B, C; 2829A, B, C)
SERVICE: FLOOD LEVEL SENSOR
LICENSEE SUBMITTAL: SCEW(S): C.2.15.3 [6]

EQUIPMENT ITEM NO. 19
LEVEL SENSOR LOCATED IN THE CONTAINMENT, ELEV. 80'0"
DE LAVAL MODEL XM54854323
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 19
LICENSEE REFERENCE(S): NOT CITED
FUNCTION (PLANT ID): LEVEL INDICATION (Q2G21LT3282A-A, B-B)
SERVICE: CONTAINMENT SUMP
LICENSEE SUBMITTAL: SCEW(S): TMI-7.2 [6, 11, 19]

EQUIPMENT ITEM NO. 20
LEVEL TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
DE LAVAL MODEL XM36495
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 20
LICENSEE REFERENCE(S): 1887, 2587
FUNCTION (PLANT ID): POST-ACCIDENT LEVEL MONITOR (Q2E11LT3594A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.5.2 [6]

EQUIPMENT ITEM NO. 21
LEVEL TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 116'0"
BARTON MODEL 764 (LOT 2)
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 21
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): PRESSURIZER LEVEL (Q2B31LT459, 460, 461)
LICENSEE SUBMITTAL: SCEW(S): C.2.3.5 [6]
FUNCTION (PLANT ID): FEEDWATER CONTROL (Q2C22LT474 TO 476, 484 TO 486, 494 TO 496)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.9 [6]
FUNCTION (PLANT ID): LEVEL INDICATION (Q2N11LT477, 487, 497)
LICENSEE SUBMITTAL: SCEW(S): C.2.13.11 [6]

EQUIPMENT ITEM NO. 22
FLOW TRANSMITTER LOCATED IN THE CONTAINMENT, ELEV. 121'0"
BARTON MODEL 764 (LOT 2)
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 22
LICENSEE REFERENCE(S): 5378
FUNCTION (PLANT ID): FEEDWATER CONTROL (Q2C22FT474, 475, 484, 485, 494, 495)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.10 [6]

EQUIPMENT ITEM NO. 23
LIMIT SWITCH LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
NAMCO MODEL EA180
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 23
LICENSEE REFERENCE(S): 3293
FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2C22ZS0478, 488, 498, 479, 489, 499)
LICENSEE SUBMITTAL: SCEW(S): C.2.4.4 [6]

EQUIPMENT ITEM NO. 24
LIMIT SWITCH LOCATED IN THE MAIN STEAM ROOM, ELEV. 131'7"
NAMCO MODEL EA180
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 24
LICENSEE REFERENCE(S): 3293
FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N25ZS3772A, B, C)
LICENSEE SUBMITTAL: SCEW(S): C.2.17.3 [6]
FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N23ZS3228A, B, C; 3227A, B, C)
LICENSEE SUBMITTAL: SCEW(S): C.2.16.4 [6]
FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N12ZS3234A, B; 3235A, B)
LICENSEE SUBMITTAL: SCEW(S): C.2.14.3 [6]

EQUIPMENT ITEM NO. 24 (CONTINUED)

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N11ZS3369A, B, C; 3370A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.6 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2N11ZS3368A, B, C; 3976A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.5 [6]

EQUIPMENT ITEM NO. 25

LIMIT SWITCH LOCATED IN THE CONTAINMENT, ELEV. 118'0" & ABOVE
NAMCO MODEL EA180

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 25

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2B31ZS8047)

LICENSEE SUBMITTAL: SCEW(S): C.2.3.3 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2E21ZS8871)

LICENSEE SUBMITTAL: SCEW(S): C.2.9.6A [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P13ZS3196, 2867B, 3197, 2866B)

LICENSEE SUBMITTAL: SCEW(S): C.2.6.5A [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P17S3184, 3443, N2C22ZS0499)

LICENSEE SUBMITTAL: SCEW(S): C.2.20.4 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P15ZS3104, 3103, 3765, 3766, 3179A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.5 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2P15ZS3180A, B, C; 3181A, B, C)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.5 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2E12ZS3999A, B)

LICENSEE SUBMITTAL: SCEW(S): C.2.4.5 [6]

EQUIPMENT ITEM NO. 26

LIMIT SWITCH LOCATED IN THE CONTAINMENT, ELEV. 109'0"

NAMCO MODEL EA180

REQUIRED OPERATING TIME: 1 HOUR

TER CHECKSHEET NO. 26

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2E21ZS8149A, B, C; Q2E21ZS8808AB, BB, CD)

LICENSEE SUBMITTAL: SCEW(S): C.2.9.6 [6]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2G21ZS3396, 7126; N2G21ZS1003B)

LICENSEE SUBMITTAL: SCEW(S): C.2.12.3 [6]

EQUIPMENT ITEM NO. 27

LIMIT SWITCH LOCATED IN THE CONTAINMENT

NAMCO MODEL EA180

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 27

LICENSEE REFERENCE(S): 3293

FUNCTION (PLANT ID): VALVE POSITION INDICATION (N2B31ZS0445A, 444B)

LICENSEE SUBMITTAL: SCEW(S): TMI-4.5 [6, 11, 19]

FUNCTION (PLANT ID): VALVE POSITION INDICATION (Q2B13ZS2034, 2035, 2036)

LICENSEE SUBMITTAL: SCEW(S): TMI-4.5 [6, 11, 19]

EQUIPMENT ITEM NO. 28

ELECTRICAL PENETRATION LOCATED IN THE CONTAINMENT

GENERAL ELECTRIC MODEL 100 SERIES

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 28

LICENSEE REFERENCE(S): 1789, 1790

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)

SERVICE: ELECTRICAL PENETRATION

LICENSEE SUBMITTAL: SCEW(S): TMI-7.4 [6, 11, 19]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)

SERVICE: ELECTRICAL PENETRATION

LICENSEE SUBMITTAL: SCEW(S): TMI-5.3 [6, 11, 19]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)

SERVICE: ELECTRICAL PENETRATION

LICENSEE SUBMITTAL: SCEW(S): TMI-4.4 [6, 11, 19]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)

SERVICE: ELECTRICAL PENETRATION

LICENSEE SUBMITTAL: SCEW(S): TMI-3.4 [6, 11, 19]

FUNCTION (PLANT ID): CONTAINMENT ISOLATION (VARIOUS)

SERVICE: ELECTRICAL PENETRATION

LICENSEE SUBMITTAL: SCEW(S): TMI-2.3 [6, 11, 19]

EQUIPMENT ITEM NO. 29

ELECTRICAL PENETRATION LOCATED IN THE CONTAINMENT, ELEV. 143'0"

GENERAL ELECTRIC MODEL 100 SERIES

REQUIRED OPERATING TIME: 4 HOURS

TER CHECKSHEET NO. 29

LICENSEE REFERENCE(S): 1789, 1790

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.20.6 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.19.5 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.18.7 [5]

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.12 [5]

EQUIPMENT ITEM NO. 29 (CONTINUED)

FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.11.6 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.10.4 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.9.9 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.8.3 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.7.3 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.6.9 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.5.3 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.4.11 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.3.4 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.2.4 [5]
 FUNCTION (PLANT ID): CONTAINMENT BOUNDARY ELECTRICAL PENETRATION (VARIOUS)
 LICENSEE SUBMITTAL: SCEW(S): C.2.1.3 [5]

EQUIPMENT ITEM NO. 30

TERMINAL BLOCK LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
 STATES MODEL TYPE ZWM
 REQUIRED OPERATING TIME: 4 HOURS
 TER CHECKSHEET NO. 30
 LICENSEE REFERENCE(S): 3950, 4577
 FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2C22SV0478A-A/JB, 488A-A/JB,
 498A-A/JB)
 LICENSEE SUBMITTAL: SCEW(S): C.2.4.7 [5]

EQUIPMENT ITEM NO. 31

TERMINAL BLOCK LOCATED IN THE CONTAINMENT
 STATES MODEL TYPE ZWM
 REQUIRED OPERATING TIME: NOT STATED
 TER CHECKSHEET NO. 31
 LICENSEE REFERENCE(S): 3950
 FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2B13GG001-B)
 SERVICE: ELECTRICAL SAFETY SYSTEMS
 LICENSEE SUBMITTAL: SCEW(S): TMI-4.3 [6, 11, 19]
 FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2B31SV0444BA-B/JB, 445AA-A/JB)
 SERVICE: ELECTRICAL SAFETY SYSTEMS
 LICENSEE SUBMITTAL: SCEW(S): TMI-3.3 [6, 11, 19]

EQUIPMENT ITEM NO. 31 (CONTINUED)

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (A2TB007; Q2B13SV2213A-A/JB,
4B-B/JB)

SERVICE: ELECTRICAL SAFETY SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): TMI-2.5 [6, 11, 19]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2B13SV2214A/JB, 3B-B/JB; A2TB025)

SERVICE: ELECTRICAL SAFETY SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): TMI-2.5 [6, 11, 19]

EQUIPMENT ITEM NO. 32

TERMINAL BLOCK LOCATED IN THE MAIN STEAM ROOM, ELEV. 144'0"

STATES MODEL TYPE ZWM

REQUIRED OPERATING TIME: 4 HOURS

TER CHECKSHEET NO. 32

LICENSEE REFERENCE(S): 3950

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N25SV3772A-A/JB, B-A/JB, C-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.17.4 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N23SV3228AA-A/JB, BA-A/JB,
CA-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.16.6 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N23SV3227AA-A/JB, BA-A/JB,
CA-A/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.16.6 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (A2TB034)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.15.4 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N12SV3234A-A/JB, B-B/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.14.5 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N12SV3235A-A/JB, 3235B-B/JB)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.14.5 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3976A-B/JB; 3369AA-A/JB,
BA-A/JB)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3976CA-A/JB; 3370AA-B/JB,
BA-B/JB)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3370CA-B/JB; 3368AA-A/JB,
BA-A/JB)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2N11SV3368CA-A/JB; 3976B-B/JB,
C-B/JB)

LICENSEE SUBMITTAL: SCEW(S): C.2.13.9 [5]

EQUIPMENT ITEM NO. 33
TERMINAL BLOCK LOCATED IN THE CONTAINMENT, ELEV. 135'9"
STATES MODEL TYPE ZWM
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 33
LICENSEE REFERENCE(S): 3950
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2B31SV8047-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.3.7 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (12TB001, 003, 004; 22TB001, 002, 005)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.2.5 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (12TB001, 002; 22TB003, 004; 32TB001, 002)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.1.4 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2G21SV3376-B/JB, 1003A-A/JB, 7126-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.12.6 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2E21SV8871-A/JB, 8149AA-A/JB, 8149BA-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.9.10 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (N2E21SV8149CAA/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.9.10 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P13SV2867B-B/JB, 3197-B/JB, 2866B-B/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.6.10 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P13SV3196-B/JB; Q2E12SV3999A-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.6.10 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2E12SV3999B-B/JB; Q2T52B025)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.6.10 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P17SV3184-B/JB, 3443-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.20.7 [5]
FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3103A/JB, 3765-A/JB, 3766-A/JB)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]

EQUIPMENT ITEM NO. 33 (CONTINUED)

FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3179A-A/JB, B-A/JB, C-A/JB)
 SERVICE: ELECTRICAL SAFETY SYSTEM
 LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]
 FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3180A-A/JB, B-A/JB, C-B/JB)
 SERVICE: ELECTRICAL SAFETY SYSTEM
 LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]
 FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3181A-A/JB, B-A/JB, C-A/JB)
 SERVICE: ELECTRICAL SAFETY SYSTEM
 LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]
 FUNCTION (PLANT ID): CONDUCTOR TERMINATION (Q2P15SV3104-A/JB)
 SERVICE: ELECTRICAL SAFETY SYSTEM
 LICENSEE SUBMITTAL: SCEW(S): C.2.18.6 [5]

EQUIPMENT ITEM NO. 34

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE MAIN STEAM ROOM, ELEV. 135'0" &
 ABOVE
 BOSTON INSULATED WIRE MODEL LSS1802
 REQUIRED OPERATING TIME: 4 HOURS
 TER CHECKSHEET NO. 34
 LICENSEE REFERENCE(S): NOT CITED
 FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VAL5007C, 8C, 9C;
 2VAL5013D, 4D, 5D)
 SERVICE: ELECTRICAL SAFETY SYSTEM
 LICENSEE SUBMITTAL: SCEW(S): C.2.16.8 [5]
 FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VNR5003A, B)
 SERVICE: ELECTRICAL SAFETY SYSTEMS
 LICENSEE SUBMITTAL: SCEW(S): C.2.14.7 [5]

EQUIPMENT ITEM NO. 35

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE MAIN STEAM, ELEV. 116'0"
 BOSTON INSULATED WIRE MODEL LSS1802
 REQUIRED OPERATING TIME: NOT STATED
 TER CHECKSHEET NO. 35
 LICENSEE REFERENCE(S): NOT CITED
 FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VXV5013L, 14H, 14J)
 SERVICE: ELECTRICAL SAFETY SYSTEM
 LICENSEE SUBMITTAL: SCEW(S): C.2.13 [5]

EQUIPMENT ITEM NO. 36

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE CONTAINMENT, ELEV. 121'0"

BOSTON INSULATED WIRE MODEL LSS1802

REQUIRED OPERATING TIME: 4 HOURS

TER CHECKSHEET NO. 36

LICENSEE REFERENCE(S): NOT CITED

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002L, M, N; 2V2V5002L, M, N;)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.4.12 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V3V5002H, J, K, L, M, N;)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.4.12 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V4V5002A, B, C)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.4.12 [5]

EQUIPMENT ITEM NO. 37

ELECTRICAL CABLE, INSTRUMENT LOCATED IN THE CONTAINMENT, ELEV. 122'9"

BOSTON INSULATED WIRE MODEL LSS1802

REQUIRED OPERATING TIME: NOT STATED

TER CHECKSHEET NO. 37

LICENSEE REFERENCE(S): NOT CITED

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VY5031D; 2V25002T, U)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.3.8 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002U; 2V3V5002T, U)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.3.8 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VY5031B; 2VYV5033B;)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.2.6 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002E, F, G; 2V2V5002E, F, G)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.2.6 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V1V5002B, D; 2V2V5002B, B)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.1.5 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2V3V5002B, D)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.1.5 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VYR5066G)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.12.8 [5]

FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VXQ5009B, D, F; 2VYQ5017B, D, F)

SERVICE: ELECTRICAL SAFETY SYSTEM

LICENSEE SUBMITTAL: SCEW(S): C.2.7.5 [5]



EQUIPMENT ITEM NO. 37 (CONTINUED)
FUNCTION (PLANT ID): ELECTRICAL INSTRUMENTATION (2VYR5066B)
SERVICE: ELECTRICAL SAFETY SYSTEM
LICENSEE SUBMITTAL: SCEW(S): C.2.6.12 [5]

EQUIPMENT ITEM NO. 38
ELECTRICAL CABLE, CONTROL LOCATED IN THE AUXILIARY BUILDING, ELEV. 121'0"
OKONITE, MODEL NOT STATED
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 38
LICENSEE REFERENCE(S): 2103, 4577
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.4.8 [5]

EQUIPMENT ITEM NO. 39
ELECTRICAL CABLE, CONTROL LOCATED IN THE MAIN STEAM ROOM, ELEV. 135'0"
OKONITE, MODEL NOT STATED
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 39
LICENSEE REFERENCE(S): 2103, 4577
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.17.5 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.16.7 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.15.5 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.14.6 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.13.10 [5]

EQUIPMENT ITEM NO. 40
ELECTRICAL CABLE, CONTROL LOCATED IN THE CONTAINMENT
OKONITE, MODEL NOT STATED
REQUIRED OPERATING TIME: NOT STATED
TER CHECKSHEET NO. 40
LICENSEE REFERENCE(S): 2103, 4577
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-7.3 [6, 11, 19]

EQUIPMENT ITEM NO. 40 (CONTINUED)

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-4.2 [6, 11, 19]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-3.5 [6, 11, 19]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SAFETY SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): TMI-2.4 [6, 11, 19]

EQUIPMENT ITEM NO. 41

ELECTRICAL CABLE, CONTROL LOCATED IN THE CONTAINMENT, ELEV. 118'0"
OKONITE, MODEL NOT STATED
REQUIRED OPERATING TIME: 4 HOURS
TER CHECKSHEET NO. 41
LICENSEE REFERENCE(S): 2103, 4577
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.20.8 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.19.6 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.18.8 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.3.9 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.12.7 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.11.7 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.10.5 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.9.11 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.8.4 [5]
FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)
SERVICE: ELECTRICAL SYSTEMS
LICENSEE SUBMITTAL: SCEW(S): C.2.7.4 [5]

EQUIPMENT ITEM NO. 41 (CONTINUED)

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.6.11 [5]

FUNCTION (PLANT ID): ELECTRICAL POWER AND CONTROL (VARIOUS)

SERVICE: ELECTRICAL SYSTEMS

LICENSEE SUBMITTAL: SCEW(S): C.2.5.4 [5]

APPENDIX C - PLANT SAFETY-RELATED SYSTEMS AND DISPLAY INSTRUMENTATION

C.1 LIST OF SAFETY-RELATED SYSTEMS

In accordance with IE Bulletin 79-01B or NUREG-0588, the Licensee was required to (1) establish a list of systems and equipment required to mitigate the consequences of a loss-of-coolant accident (LOCA) and a high energy line break (HELB) and (2) identify components needed to perform the functions of safety-related display information, post-accident sampling and monitoring, and radiation monitoring.

The list of safety-related systems provided by the Licensee was reviewed by the NRC staff against a staff-developed master list. The NRC staff had developed a generic master list based upon a review of plant safety analyses and emergency procedures. The systems list was established on the basis of the functions that must be performed for accident mitigation (without regard to location of equipment relative to hostile environments). The instrumentation selected included that needed to monitor overall plant performance as well as to monitor the performance of systems on the list.

Based upon information in the Licensee's submittal, the equipment location references, and in some cases conversations with the Licensee, the NRC staff verified that the systems included in the Licensee's submittal were 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 surrounding environment. With the exception of items deferred for later review (cold-shutdown equipment and TMI Lessons-Learned modifications), the staff concluded that the systems identified by the Licensee were acceptable. The list of systems identified by the Licensee and accepted by the NRC staff is as follows:

<u>Function</u>	<u>System¹</u>
Emergency Reactor Shutdown	Reactor Protection
	Engineered Safeguards Actuation
	Reactor Coolant
	Chemical and Volume Control
Containment Isolation	Main Feedwater and Condensate
	Auxiliary Feedwater
	Main and Auxiliary Steam
	Residual Heat Removal
	Chemical Injection
	Chemical and Volume Control
	Liquid Waste Disposal
	Component Cooling Water
	Service Water
	Containment Spray
	Sampling
	Containment Cooling and Purge
Reactor Core Cooling	Chemical and Volume Control/Safety Injection
	Safeguards System, RHR/LHSI

1. The NRC recognized that there are differences in nomenclature of systems because of plant vintage and engineering design, consequently, some systems performing identical or similar functions may have different names. In those instances, it was necessary to verify the function of the system(s) with the responsible IE regional reviewer and/or the licensee.

<u>Function</u>	<u>System</u>
Containment Heat Removal	Containment Spray
	Containment Cooling and Purge
	Residual Heat Removal
Core Residual Heat Removal	Auxiliary Feedwater
	Main Feedwater and Condensate
	Main Steam
	Residual Heat Removal ²
	Component Cooling Water
	Service Water
	Chemical and Volume Control
Prevention of Significant Release of Radioactive Material to Environment	Containment Spray (Iodine Removal)
	Containment Post-LOCA Air Mixing
	Reactor Cavity Post-LOCA Dilution
	Hydrogen Recombiner
	Radiation Monitoring
	Sampling
Supporting Systems	Emergency Power
	Control Room Habitability
	Safety Equipment Area Ventilation

2. Only equipment required to achieve hot shutdown following an accident is included in the master list submitted by the Licensee. Cold shutdown equipment is to be addressed later.

C.2 SAFETY-RELATED INSTRUMENTATION

In Section 3.1 of the NRC SER dated May 21, 1981 [7], the NRC made the following statement:

"Display instrumentation which provides information for the reactor operators to aid them in the safe handling of the plant was not specifically identified by the licensee. A complete list of all display instrumentation mentioned in the LOCA and HELB emergency procedures must be provided. Equipment qualification information in the form of summary sheets should be provided for all components of the display instrumentation exposed to harsh environments. Instrumentation which is not considered to be safety related but which is mentioned in the emergency procedure should appear on the list. For these instruments, (1) justification should be provided for not considering the instrument safety related and (2) assurance should be provided that its subsequent failure will not mislead the operator or adversely affect the mitigation of the consequences of the accident. The environmental qualification of post-accident sampling and monitoring and radiation monitoring equipment is closely related to the review of the TMI Lessons-Learned modifications and will be performed in conjunction with that review."

In Reference 8, the Licensee provided the following response:

"In accordance with the requirements of IEB 79-01B Alabama Power Company has conducted a review of the Emergency Operating Procedures to verify that equipment utilized by the operator for accident mitigation and that could be subjected to the accident environment is adequately qualified to perform its function. This review has determined that the subject instruments are adequately qualified to perform their intended function. Component work sheets have been completed for required instrumentation in the harsh environment.

With reference to instruments which are not fully qualified for the environment resulting from a HELB inside containment, these were included in the EOP's solely as a source of additional information for the operator. These instruments could be deleted from the EOP's if qualification for HELB inside containment was the sole determining factor for incorporation. These instruments, should they fail, would not mislead the operator because operators are trained to take actions based on a combination of plant parameters rather than indication from a single instrument. In addition, as part of the human factors review conducted by the NRC in the licensing of Farley 2, the EOP's were reviewed and approved by the NRC, taking into account the fact that in some cases non-qualified instrumentation was listed. Since the EOP's for Unit 1 are identical to those of Unit 2, this review also applies to Unit 1. A listing of these instruments with appropriate justification is provided in the following attachment [see Table C-1 of this TER]."

Evaluation

The justifications stated by the Licensee in the Table C-1 provide a technical basis for exclusion of the identified instruments. This item is considered resolved.

Table C-1. EOP Instrumentation Not Fully Qualified for Harsh Environment [8]

EOP INSTRUMENTATION NOT FULLY QUALIFIED FOR HARSH ENVIRONMENT			INSTRUMENTATION EXCLUDED FROM ENVIRONMENTAL QUALIFICATION REPORT BECAUSE:	
EQUIPMENT ITEM TPMS #	PRIMARY ELEMENT LOCATION	INSTRUMENT DESCRIPTION		
N1D21R10002A	NE 0002A	CTMT, Area Rad. Monitor	High-range CTMT, rad. monitors have been installed and are environmentally qualified. These monitors provide adequate post-accident indication.	
	CTMT, 155' elev.			
N1D21R10007A	NE 0007A	Seal Table Area Rad. Monitor	Not required for accident monitoring or mitigation. High-range CTMT, rad. monitors have been installed and are environmentally qualified. These monitors provide adequate post-accident indication.	
	CTMT, 129' elev.			
N1C55N10041A 42A 43A 44A NR0045	NE 0041B, 42B, 43B, 44B	Excore Power Instrumentation	IEB 79-01B - Supplement 2 - Item 12 states that nuclear instrumentation and its associated components do not have to be environmentally qualified for a LOCA or a HELB.	
	CTMT.			
N1B13T1472A 421A 431A	TE 411, 421, 431	Narrow Range ECS Temp. Indication	Wide Range ECS Temp. Indication is environmentally qualified. This instrumentation spans the narrow range indication.	
	CTMT, 105' elev.			
N1B31T1463	TE 463	PZR, PORV Downstream Temp. Indication	Qualified limit switches have been installed on the PORV's for reliable valve position indication. Temperature indication is for backup only.	
	CTMT, 129' Elev.			

II.A-2

FIGURE SUPPLIED
BY THE LICENSEE

Table C-1 (Cont.)

EOP INSTRUMENTATION NOT FULLY QUALIFIED FOR HARSH ENVIRONMENT

<u>EQUIPMENT ITEM</u> <u>TPMS #</u>	<u>PRIMARY ELEMENT</u> <u>LOCATION</u>	<u>INSTRUMENT DESCRIPTION</u>	<u>INSTRUMENTATION EXCLUDED FROM</u> <u>ENVIRONMENTAL QUALIFICATION</u> <u>REPORT BECAUSE:</u>
NIB31TI465 467 469	TE 465, 467, 469	PZR. Safety Downstream Temp. Indication	Qualified limit switches have been installed on the Safety Valves for reliable valve position indication. Temperature indication is for backup only.
	CTMT. 129' Elev.		
NIB31LI920 TI471 PI472	LT470, TE471, PT472	PIA. Relief Tank Level, Temp. and Pressure Indication	Instrumentation is backup for PORV and Safety Valve position indication.
	CTMT. 105' Elev.		
NIB21LI920, 922 924, 926 928, 930	LT920, 922, 924, 926, 928, 930	Accum. Tank Level Indication	Instrumentation provided for Tech. Spec. purposes only. Qualified pressure instrumenta- tion gives indication of accum. status.
	CTMT. 839' Elev.		
NIT12TN3183	TE3188	CTMT. Air Temperature	Instrumentation provided for Tech. Spec. purposes only. CTMT. heat removal indication provided by CTMT. cooler instrumentation.
	CTMT. 105' Elev.		
NIB21PI414 415 416	PT414, 415, 416	RCS Flow Indication	For design bases accidents indi- cation would not be available due to lack of forced flow. Natural circulation verified by core differential temperature to ensure decay heat removal.
	CTMT. 105' Elev.		

FIGURE SUPPLIED
BY THE LICENSEE

II.A-3

TER-C5257-518

Table C-1 (Cont.)

EOP INSTRUMENTATION NOT FULLY QUALIFIED FOR HARSH ENVIRONMENT

EQUIPMENT ITEM TPNS #	PRIMARY ELEMENT LOCATION	INSTRUMENT DESCRIPTION	INSTRUMENTATION EXCLUDED FROM ENVIRONMENTAL QUALIFICATION REPORT BECAUSE:
N/C56G001 ↓ G052	G001 - G052	Incore Thermocouples	Instrumentation provided for backup purposes only. Wide Range RTD's, which are qualified serve as primary indication of RCS temperature.
	CTHT, 155' Elev.		

II.A-4

FIGURE SUPPLIED
BY THE LICENSEE

TER-C5257-518

APPENDIX D - 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 [4]:

"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:

- o 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 NRC was provided with the completed review of the licensees' statements presented as a basis for justification for interim operation in response to the NRC EEQ SER.* On February 5, 1982, at the NRC's request, the 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: Alabama Power
Plant Name: Joseph M. Farley Nuclear Plant Unit 2
NRC Docket No. 50-364
NRC TAC No. 42534
NRC Contract No. NRC-03-79-118
FRC Project No. C5257
FRC Assignment No. 13
FRC Task No. 518

References:

- a. F. L. Clayton
Letter to B. J. Youngblood, NRC. Subject: Joseph M. Farley Nuclear
Plant Unit 2, NPF-8 License Condition 2.C.(18)(b)
Alabama Power, 1-July-81
- b. F. L. Clayton
Letter to S. A. Varga, NRC. Subject: Joseph M. Farley
Nuclear Plant - Unit 2, Environmental Qualification
of Safety Related Electrical Equipment
Alabama Power, 28-Dec-81
- c. Office of Nuclear Reactor Regulation
Safety Evaluation Report for Joseph M. Farley Nuclear Plant Unit 2
Environmental Qualification of Safety-Related
Electrical Equipment
NRC, 19-March-81

The Licensee has submitted technical information in References a and b in response to the NRC SER [c] on environmental qualification. FRC has reviewed these documents [a, b, c]. 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>
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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 the 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.

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

Alabama Power Company
Joseph M. Farley Nuclear Plant Unit 2

NRC Docket No. 50-364

December 30, 1981

NRC TAC No. 42534

Rev. 1, January 19, 1982
Rev. 2, April 8, 1982
Rev. 3, May 18, 1982
Rev. 4, July 7, 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 letters from the Licensee dated September 12, 1980 [1] and July 1, 1981 [2].*

In a letter dated December 28, 1981 [5], Alabama Power submitted Revision 5 to their September 12, 1980 [1] submittal. The information submitted contained a Summary of Aging Evaluation and revised SCEW sheets reflecting the results of that evaluation. (1)**

Alabama Power Company (APC) has provided a response to the RAI in a letter dated March 2, 1982 [6]. APC states that: (2)

"Certain vendors have stated that their qualification information is proprietary and expressed concern to the possible unfair trade advantage and conflict of interest regarding the review by Franklin Research Center. Specifically, Westinghouse has requested (Attachment) that Alabama Power Company not submit their proprietary information to Franklin Research Center. Pursuant to an agreement reached between Westinghouse and L. C. Shomaker of the NRC Office of the Executive Legal Director, as discussed this matter with Mr. Z. Rosztoczy of the Equipment Qualification Branch, Westinghouse will ensure that the requested information is, or has been, submitted to the NRC on a timely basis. Therefore, the information other than proprietary Westinghouse qualification documents has been retrieved from our auditable central file and is forwarded directly to your office to ensure the proprietary

*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.

understandings between Alabama Power Company and the vendors have not been disregarded or neglected.

Alabama Power Company requests that the entire submittal be reviewed by your office and only information which is not proprietary, as designated below, be submitted to Franklin Research Center. Additionally, no part of this submittal should be released for public disclosure or reproduced, and the entire submittal must be returned to Alabama Power Company upon completion of the review."⁽²⁾

In addition, APC has stated that item A.1.e has been superseded by a revision dated September 5, 1978, which was submitted to the NRC in a Farley Unit 1 letter dated February 19, 1982 [7]. Documents sent to NRC via the Unit 1 letter were not submitted to NRC with Reference 6. The Licensee also stated that items A.1.h, A.1.i, and A.1.l are not applicable to Farley Unit 2. For items A.1.i and A.1.l, the applicable document, Joy Manufacturing Company Test Report X-604, was submitted to the NRC. Item A.1.h (Wyle Qualification Plan No. 545/0859/ES - DeLeval GEMS Level Sensors dated 10/6/78) has been deleted by the Licensee. APC has also noted that item A.1.p was incorrectly referenced as WCAP-9985. It should have been WCAP-9885, which is item A.1.m.⁽²⁾

By letter dated April 23, 1982 [8], Alabama Power Company has committed to address the qualification of TMI Action Plan equipment by submitting qualification information for all Units 1 and 2 TMI Action Plan equipment requiring environmental qualification. The Licensee has committed to a submittal date of June 23, 1982, by letter [8] and by telecon [9].⁽³⁾

By letter dated June 23, 1982 [10], the Licensee submitted the information regarding TMI-Action Plan equipment [11] committed to by Reference 8.⁽⁴⁾

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 [2] 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. General Electric Company Report, Low Voltage Electrical Containment Penetration Qualification Test Report

Received 1/74 and 3/74 reports for Assignment 13⁽³⁾
 - b. Wyie Labs. NEQ Test Report 44354-1 dated 3-8-79

Received 3/11/82 for Task 505⁽³⁾
 - c. Boston Insulated Wire and Cable Co. Test Report 73E062 dated 9-7-73
 - d. Boston Insulated Wire and Cable Co. Test Report 74A023 dated 1-24-74
 - e. NAMCO Test Report dated September 5, 1978⁽²⁾

Received for Assignment 13⁽³⁾
 - f. The Okonite Co. Engineering Report 143 dated 3-20-72⁽¹⁾
 - g. Bechtel/GEMS Telecon of 4-3-80
 - h. Deleted (Stated by Licensee to be not applicable⁽²⁾)
 - i. Jo- Manufacturing Company Report X-604⁽²⁾

Received for Assignment 13⁽³⁾
 - j. WCAP 7820, Supplements 1-4
 - k. WCAP 7709-L, Supplements 1-4

1-Jan-82⁽³⁾
 - l. Deleted (Incorporated into Item A.1.i)⁽²⁾
 - m. WCAP 9885
 - n. NAMCO Test Report QTR-105 dated August 28, 1980

Received 2/8/82 for Task 502/503⁽²⁾

***This column will be completed by FRC as requested information is received.

DATE RECEIVED BY FRC***

- o. Okonite Co. Engineering Report No. N-1 dated July 3, 1978

Received for
Assignment 13⁽³⁾

- p. Deleted (Same as Item A.1.m)⁽²⁾

B. FRC REVIEW OF INSTALLED TMI ACTION PLAN ITEMS

INFORMATION REQUESTED

DATE RECEIVED BY FRC***

- 1. References 1 and 2⁽²⁾ 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.

6/30/82 [10]⁽⁴⁾

- b. Identification of TMI Action Plan equipment installed with implementation dates after 1/1/81 is requested.

6/30/82 [10]⁽⁴⁾

- c. The correlation of these equipment items with the specific sections of NUREG-0737 [4] presented below (as applicable) is requested.

6/30/82 [10]⁽⁴⁾

II E1.2, IIE4.2, IIE3.1, IIG1, IIF2,
IID3, IIK3.12(Wx), IIK3.9(Wx),
IIK2.10(B&W), IIB3, IIE4.1.

[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 terminal blocks associated with the device also identified?]

- d. For all installed TMI Action Plan equipment identified, a System Component Evaluation Worksheet (SCEW) (in accordance with 79-01B format) is requested.

6/30/82 [10]⁽⁴⁾

- e. 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.

6/30/82 [10]⁽⁴⁾

DATE RECEIVED BY FRC***

2. The qualification documents, e.g., the actual test reports and associated correspondence cited as evidence of qualification listed on the SCEW sheets, for all identified TMI Action Plan equipment are requested. [The identification of those reports considered to be proprietary is requested so that proper control of documents can be maintained.]

3. 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. F. L. Clayton
Letter to A. Schwencer, NRC. Subject: Joseph M. Farley Nuclear Plant Unit 2, Environmental Qualification of Class IE Electrical Equipment-NUREG 0588
Alabama Power, 12-Sept-80
2. F. L. Clayton
Letter to B. J. Youngblood, NRC. Subject: Joseph M. Farley Nuclear Plant Unit 2, NPF-8 License Condition 2.C.(18)(b)
Alabama Power, 1-July-81
3. Office of Nuclear Reactor Regulation
Safety Evaluation Report for Joseph M. Farley Nuclear Plant Unit 2
Environmental Qualification of Safety-Related
Electrical Equipment
NRC, 19-March-81
4. NUREG-0737, "Clarification of TMI Action Plan Requirements"
NRC, November 1980
5. F. L. Clayton
Letter to S. A. Varga, NRC. Subject: Joseph M. Farley
Nuclear Plant - Unit 2, Environmental Qualification
of Safety Related Electrical Equipment
Alabama Power, 28-Dec-81⁽¹⁾
6. F. L. Clayton, Jr.
Letter to S. A. Varga, NRC. Subject: Joseph M. Farley
Nuclear Plant - Unit 2; Environmental Qualification
Alabama Power Co., 02-Mar-82⁽²⁾
7. F. L. Clayton, Jr.
Letter to S. A. Varga, NRC. Subject: Joseph M. Farley
Nuclear Plant - Unit 1; Environmental Qualification
Alabama Power Co., 19-Feb-82⁽²⁾
8. F. L. Clayton, Jr.
Letter to S. A. Varga, NRC. Subject: Joseph M. Farley Nuclear Plant
Units 1 and 2 Environmental Qualification
Alabama Power Company, 23-Apr-82⁽³⁾
9. D. J. Schmitz (FRC)
Telephone Memorandum. Conversation with M. Lawlor (APCo). Subject:
Farley 1 and 2 TMI Action Plan supplement
11-May-82⁽³⁾

10. O. D. Kingsley, Jr.
Letter to C. J. Crane, FRC. Subject: Joseph M. Farley Nuclear Plant
Units 1 and 2; Environmental Qualification of TMI Action Plan
Electrical Equipment
25-Jun-82
NT-82-0775(3)
11. F. L. Clayton, Jr.
Letter to S. A. Varga, NRC. Subject: Joseph M. Farley Nuclear Plant
Unit 2; Environmental Qualification of Safety Related Electrical
Equipment
Alabama Power Co., 23-Jun-82(3)