

SAFETY EVALUATION REPORT BY THE
OFFICE OF NUCLEAR REACTOR REGULATION
EQUIPMENT QUALIFICATION BRANCH
FOR NORTHEAST NUCLEAR ENERGY COMPANY
MILLSTONE NUCLEAR POWER STATION UNIT 2

DOCKET NO. 50-336

8106010775

CONTENTS

	Page
1 Introduction	1
2 Background	1
2.1 Purpose	2
2.2 Scope	2
3 Staff Evaluation	2
3.1 Completeness of Safety-Related Equipment	2
3.2 Service Conditions	3
3.3 Temperature, Pressure, and Humidity Conditions Inside Containment	4
3.4 Temperature, Pressure, and Humidity Conditions Outside Containment	4
3.5 Submergence	4
3.6 Chemical Spray	5
3.7 Aging	5
3.8 Radiation (Inside and Outside Containment).....	6
4 Qualification of Equipment	6
4.1 Equipment Requiring Immediate Corrective Action	7
4.2 Equipment Requiring Additional Information and/or Corrective Action	7
4.3 Equipment Considered Acceptable or Conditionally Acceptable	8
5 Deferred Requirements	9
6 Conclusions	9
APPENDIX A Equipment Requiring Immediate Corrective Action.....	A-1
APPENDIX B Equipment Requiring Additional Information and/or Corrective Action.....	B-1
APPENDIX C Equipment Considered Acceptable or Conditionally Acceptable.....	C-1
APPENDIX D Safety-Related Systems and Safety-Related Display Instrumentation Lists.....	D-1

SAFETY EVALUATION REPORT BY THE
OFFICE OF NUCLEAR REACTOR REGULATION
EQUIPMENT QUALIFICATION BRANCH
FOR NORTHEAST NUCLEAR ENERGY COMPANY
MILLSTONE NUCLEAR POWER STATION UNIT 2
DOCKET NO. 50-336

ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT

1 INTRODUCTION

General Design Criteria 1 and 4 specify that safety-related electrical equipment in nuclear facilities must be capable of performing its safety-related function under environmental conditions associated with all normal, abnormal, and accident plant operation. In order to ensure compliance with the criteria, the NRC staff required all licensees of operating reactors to submit a reevaluation of the qualification of safety-related electrical equipment which may be exposed to a harsh environment.

2 BACKGROUND

On February 8, 1979, the NRC Office of Inspection and Enforcement (IE) issued to all licensees of operating plants (except those included in the systematic evaluation program (SEP)) IE Bulletin IEB 79-01, "Environmental Qualification of Class IE Equipment." This bulletin, together with IE Circular 78-08 (issued on May 31, 1978), required the licensees to perform reviews to assess the adequacy of their environmental qualification programs.

Subsequently, Commission Memorandum and Order CLI-80-21 (issued on May 23, 1980) states that the DOR guidelines and portions of NUREG-0588 (which were issued on January 14, 1980, as enclosures 4 and 5 to IEB-79-01B) form the requirements that licensees must meet regarding environmental qualification of safety-related electrical equipment in order to satisfy those aspects of 10 CFR 50, Appendix A, General Design Criterion (GDC)-4. This order also requires the staff to complete safety evaluation reports (SERs) for all operating plants by February 1, 1981. In addition, this order requires that the licensees have qualified safety-related equipment installed in their plants by June 30, 1982.

Supplements to IEB 79-01B were issued for further clarification and definition of the staff's needs. These supplements were issued on February 29, September 30, and October 24, 1980.

In addition, the staff issued orders dated August 29, 1980 (amended in September 1980) and October 24, 1980 to all licensees. The August order required that the licensees provide a report, by November 1, 1980, documenting the qualification of safety-related electrical equipment. The October order required the establishment of a central file location for the maintenance of all equipment-qualification records. The central file was mandated to be established by December 1, 1980. The order also required that all safety-related electrical equipment be qualified by June 30, 1982. In response, the licensee submitted information through a letter dated October 31, 1980. The staff is aware of the additional information provided by letters dated January 30 and April 30, 1981. This additional information will be evaluated along with the requested 90 day response.

2.1 Purpose

The purpose of this SER is to identify equipment whose qualification program does not provide sufficient assurance that the equipment is capable of performing the design function in hostile environments. The staff position relating to any identified deficiencies is provided in this report.

2.2 Scope

The scope of this report is limited to an evaluation of the equipment which must function in order to mitigate the consequences of a loss-of-coolant accident (LOCA) or a high-energy-line-break (HELB) accident, inside or outside containment, while subjected to the hostile environments associated with these accidents.

3 STAFF EVALUATION

The staff evaluation of the licensee's response included an onsite inspection of selected Class IE equipment and an examination of the licensee's report for completeness and acceptability. The criteria described in the DOR guidelines and in NUREG-0588, in part, were used as a basis for the staff evaluation of the adequacy of the licensee's qualification program.

The Franklin Institute Center under contract to the NRC Office of Inspection and Enforcement (IE) performed a preliminary evaluation of the licensee's response, documented in a technical evaluation report (TER). IE performed an onsite verification inspection (September 23-26, 1980) of selected safety-related electrical equipment. The equipment associated with the chemical volume and control system and the auxiliary building ventilation system was inspected. 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 a report, IE 50-336/80-18, dated October 14, 1980. No deficiencies were noted. For this review, the documents referenced above have been factored into the overall staff evaluation.

3.1 Completeness of Safety-Related Equipment

In accordance with IEB 79-01B, the licensee was directed to (1) establish a list of systems and equipment that are required to mitigate a LOCA and an HELB and (2) identify components needed to perform the function of safety-related display information, post-accident sampling and monitoring, and radiation monitoring.

The staff developed a generic master list based upon a review of plant safety analyses and emergency procedures. The instrumentation selected includes parameters to monitor overall plant performance as well as to monitor the performance of the systems on the list. 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 list of safety-related systems provided by the licensee was reviewed against the staff-developed master list.

Based upon information in the licensee's submittal, the equipment location references, and in some cases subsequent conversations with the licensee, the staff has verified and determined that the systems included in the licensee's submittal are those required to achieve or support: (1) emergency reactor shutdown, (2) containment isolation, (3) reactor core cooling, (4) containment heat removal, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment. The staff therefore concludes that the systems identified by the licensee (listed in Appendix D) are acceptable, with the exception of those items discussed in Section 5 of this report.

Display instrumentation which provides information for the reactor operators to aid them in the safe handling of the plant was identified by the licensee and is also presented in Appendix D. A complete list of all display instrumentation mentioned in the LOCA and HELB emergency procedures appears to have been provided. 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.

The licensee identified 251 items of equipment which were assessed by the staff.

3.2 Service Conditions

Commission Memorandum and Order CLI-80-21 requires that the DOR guidelines and the "For Comment" NUREG-0588 are to be used as the criteria for establishing the adequacy of the safety-related electrical equipment environmental qualification program. These documents provide the option of establishing a bounding pressure and temperature condition based on plant-specific analysis identified in the licensee's Final Safety Analysis Report (FSAR) or based on generic profiles using the methods identified in these documents.

On this basis, the staff has assumed, unless otherwise noted, that the analysis for developing the environmental envelopes for the Millstone Unit 2 plant, relative to the temperature, pressure, and the containment spray caustics, has been performed in accordance with the requirements stated above. The staff has reviewed the qualification documentation to ensure that the qualification specifications envelope the conditions established by the licensee. 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.

Equipment submergence has also been addressed where the possibility exists that flooding of equipment may result from HELBs.

3.3 Temperature, Pressure, and Humidity Conditions Inside Containmentment

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	279	51.7	100
MSLB	not provided	not provided	not provided

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 specified temperature (service condition) of 279°F does not satisfy the above requirement. A saturation temperature corresponding to the peak profile (299°F peak temperature at 51.7 psig) should be used instead. 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 provide either justification that the equipment will perform its intended function under the specified conditions or propose corrective action.

3.4 Temperature, Pressure, and Humidity Conditions Outside Containmentment

The licensee has provided the temperature, pressure, humidity and applicable environment associated with an HELB outside containment. The following areas outside containment have been addressed:

- (1) West main steam isolation valve room
- (2) East main steam isolation valve room
- (3) Turbine building elevation 14 ft 6 in. and elevation 54 ft 6 in.
- (4) Auxiliary building elevation 36 ft 6 in.
- (5) Electrical penetration room (auxiliary building elevation 14 ft 6 in.)

The staff has verified that the parameters identified by the licensee for the MSLB are acceptable.

3.5 Submergence

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 value for maximum submergence is 8.1 ft above the containment floor. Equipment below this level has been identified by the licensee, along with the proposed corrective action. The licensee identified one safety-related electrical component (containment sump level transmitter, item number 16-C) as having the potential for becoming submerged after a postulated event. The licensee stated that the vendor qualification testing is still in progress and that the final test report will be evaluated by October 1981. Although the licensee is committed to provide a fully qualified component by June 30, 1982, the licensee is required to supplement the information presented and justify the adequacy of the design on an interim basis. The staff will review the licensee's response and include the resolution of this item in a supplemental report.

It is not clear from the information submitted that submergence of safety-related electrical equipment outside of containment was addressed. The licensee should address this area more specifically in the 90-day response and upgrade the CES as appropriate.

3.6 Chemical Spray

The licensee's FSAR value for the chemical concentration is less than 2400 ppm boron. Based on the staff review of the licensee's evaluation work sheets, the staff concludes that the qualification testing for containment spray conditions adequately envelopes the above value and is therefore acceptable.

3.7 Aging

Section 7 of the DOR guidelines does not require a qualified life to be established for all safety-related electrical equipment. However, the following actions are required:

- (1) Make a detailed comparison of existing equipment and the materials identified in Appendix C of the DOR guidelines. The first supplement to IEB-79-01B requires licensees to utilize the table in Appendix C and identify any additional materials as the result of their effort.
- (2) Establish an ongoing program to review surveillance and maintenance records to identify potential age-related degradations.
- (3) 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, 4.4 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.

3.8 Radiation (Inside and Outside Containment)

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 ranging between 9.4×10^6 to 1.5×10^8 rads. This value does not envelope the DOR guideline requirements (4×10^7 rads) and therefore is not acceptable. The radiation service condition provided by the licensee is lower than provided in the guidelines for gamma and beta radiation. The licensee is requested to either provide justification for using the lower service condition or use the guidelines for both gamma and beta radiation. If the former option is chosen, then the analysis--including the basis, assumptions, and a sample calculation--should be provided.

A required value outside containment of 3.12×10^6 rads has been used by the licensee to specify limiting radiation levels for the safety injection pump motors. This value appears to consider the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines and is therefore acceptable.

4 QUALIFICATION OF EQUIPMENT

The following subsections present the staff's assessment, based on the licensee's submittal, of the qualification status of safety-related electrical equipment.

The staff has separated the safety-related equipment into three categories: (1) equipment requiring immediate corrective action, (2) equipment requiring additional qualification information and/or corrective action, and (3) equipment considered acceptable if the staff's concern identified in Section 3.7 is satisfactorily resolved.

In its assessment of the licensee's submittal, the NRC staff did not review the methodology employed to determine the values established by the licensee. However, in reviewing the data sheets, the staff made a determination as to the stated conditions presented by the licensee. Additionally, the staff has not completed its review of supporting documentation referenced by the licensee (for example, test reports). It is expected that when the review of test reports is complete, the environmental qualification data bank established by the staff will provide the means to cross reference each supporting document to the referencing licensee.

If supporting documents are found to be unacceptable, the licensee will be required to take additional corrective actions to either establish qualification or replace the item(s) of concern. This effort will begin in early 1981.

An appendix for each subsection of this report provides a list of equipment for which additional information and/or corrective action is required. Where appropriate, a reference is provided in the appendices to identify deficiencies. It should be noted, as in the Commission Memorandum and Order, that the deficiencies identified do not necessarily mean that equipment is unqualified. However, they are cause for concern and may require further case-by-case evaluation.

4.1 Equipment Requiring Immediate Corrective Action

Appendix A identifies equipment (if any) in this category. The licensee was asked to review the facility's safety-related electrical equipment. The licensee's review of this equipment has not identified any equipment requiring immediate corrective action; therefore, no licensee event reports (LERs) were submitted. In addition, in this review, the staff has not identified any safety-related electrical equipment which is not able to perform its intended safety function during the time in which it must operate.

4.2 Equipment Requiring Additional Information and/or Corrective Action

Appendix B identifies equipment in this category, including a tabulation of deficiencies. The deficiencies are noted by a letter relating to the legend (identified below), indicating that the information provided is not sufficient for the qualification parameter or condition.

Legend

- R - radiation
- T - temperature
- QT - qualification time
- RT - required time
- P - pressure
- H - humidity
- CS - chemical spray
- A - material-aging evaluation; replacement schedule; ongoing equipment surveillance
- S - submergence
- M - margin
- I - HELB evaluation outside containment not completed
- QM - qualification method
- RPN - equipment relocation or replacement; adequate schedule not provided
- EXN - exempted equipment justification inadequate
- SEN - separate-effects qualification justification inadequate
- QI - qualification information being developed
- RPS - equipment relocation or replacement schedule provided

As noted in Section 4, these deficiencies do not necessarily mean that the equipment is unqualified. However, the deficiencies are cause for concern and require further case-by-case evaluation. The staff has determined that an acceptable basis to exempt equipment from qualification, in whole or part, can

be established provided the following can be established and verified by the licensee:

- (1) Equipment does not perform essential safety functions in the harsh environment, and equipment failure in the harsh environment will not impact safety-related functions or mislead an operator.
- (2a) Equipment performs its function before its exposure to the harsh environment, and the adequacy for the time margin provided is adequately justified, and
- (2b) Subsequent failure of the equipment as a result of the harsh environment does not degrade other safety functions or mislead the operator.
- (3) The safety-related function can be accomplished by some other designated equipment that has been adequately qualified and satisfies the single-failure criterion.
- (4) Equipment will not be subjected to a harsh environment as a result of the postulated accident.

The licensee is, therefore, required to supplement the information presented by providing resolutions to the deficiencies identified; these resolutions should include a description of the corrective action, schedules for its completion (as applicable), and so forth. The staff will review the licensee's response, when it is submitted, and discuss the resolution in a supplemental report.

It should be noted that in cases where testing is being conducted, a condition may arise which results in a determination by the licensee that the equipment does not satisfy the qualification test requirements. For that equipment, the licensee will be required to provide the proposed corrective action, on a timely basis, to ensure that qualification can be established by June 30, 1982.

4.3 Equipment Considered Acceptable or Conditionally Acceptable

Based on the staff review of the licensee's submittal, the staff identified the equipment in Appendix C as (1) acceptable on the basis that the qualification program adequately enveloped the specific environmental plant parameters, or (2) conditionally acceptable subject to the satisfactory resolution of the staff concern identified in Section 3.7.

For the equipment identified as conditionally acceptable, the staff determined that the licensee did not clearly

- (1) state that an equipment material evaluation was conducted to ensure that no known materials susceptible to degradation because of aging have been used,
- (2) establish an ongoing program to review the plant surveillance and maintenance records in order to identify equipment degradation which may be age related, and/or

- (3) propose a maintenance program and replacement schedule for equipment identified in item 1 or equipment that is qualified for less than the life of the plant.

The licensee is, therefore, required to supplement the information presented for equipment in this category before full acceptance of this equipment can be established. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report.

5 DEFERRED REQUIREMENTS

IEB 79-01B, Supplement 3 has relaxed the time constraints for the submission of the information associated with cold shutdown equipment and TMI lessons-learned modifications. The staff has required that this information be provided by February 1, 1981. The staff will provide a supplemental safety evaluation addressing these concerns.

6 CONCLUSIONS

The staff has determined that the licensee's listing of safety-related systems and associated electrical equipment whose ability to function in a harsh environment following an accident is required to mitigate a LOCA or HELB is complete and acceptable, except as noted in Section 3 of this report. The staff has also determined that the environmental service conditions to be met by the electrical equipment in the harsh accident environment are appropriate, except as noted in Section 3 of this report. Outstanding information identified in Section 3 should be provided within 90 days of receipt of this SER.

The staff has reviewed the qualification of safety-related electrical equipment to the extent defined by this SER and has found no outstanding items which would require immediate corrective action to ensure the safety of plant operation. However, the staff has determined that many items of safety-related electrical equipment identified by the licensee for this review do not have adequate documentation to ensure that they are capable of withstanding the harsh environmental service conditions. This review was based on a comparison of the qualification values with the specified environmental values required by the design, which were provided in the licensee's summary sheets.

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.

Subsection 4.3 identified acceptance and conditional acceptance based on noted deficiencies. Where additional information is required, the licensee should respond within 90 days of receipt of this SER by providing assurance that these concerns will be satisfactorily resolved by June 30, 1982.

The staff issued to the licensee Sections 3 and 4 of this report and requested, under the provisions of 10 CFR 50.54(f), that the licensee review the deficiencies enumerated and the ramifications thereof to determine whether safe operation of the facility would be impacted in consideration of the deficiencies. The licensee has completed a preliminary review of the identified deficiencies and has determined that, after due consideration of the deficiencies and their ramifications, continued safe operation would not be adversely affected.

Based on these considerations, the staff concludes that conformance with the above requirements and satisfactory completion of the corrective actions by June 30, 1982 will ensure compliance with the Commission Memorandum and Order of May 23, 1980. The staff further concludes that there is reasonable assurance of continued safe operation of this facility pending completion of these corrective actions. This conclusion is based on the following:

- (1) that there are no outstanding items which would require immediate corrective action to assure safety of plant operation
- (2) some of the items found deficient have been or are being replaced or relocated, thus improving the facility's capability to function following a LOCA or HELB
- (3) the harsh environmental conditions for which this equipment must be qualified result from low-probability events; events which might reasonably be anticipated during this very limited period would lead to less demanding service conditions for this equipment.

APPENDIX A

Equipment Requiring
Immediate Corrective Action
(Category 4.1)

Item	Equipment	Manufacturer	Model	Deficiency
------	-----------	--------------	-------	------------

No equipment in this category.

APPENDIX B

Equipment Requiring Additional Information
and/or Corrective Action
(Category 4.2)

LEGEND:

Designation for Deficiency

- R - Radiation
- T - Temperature
- QT - Qualification time
- RT - Required time
- P - Pressure
- H - Humidity
- CS - Chemical spray
- A - Material aging evaluation, replacement schedule, ongoing equipment surveillance
- S - Submergence
- M - Margin
- I - HELB evaluation outside containment not completed
- QM - Qualification method
- RPN - Equipment relocation or replacement, adequate schedule not provided
- EXN - Exempted equipment justification inadequate
- SEN - Separate effects qualification justification inadequate
- QI - Qualification information being developed
- RPS - Equipment relocation or replacement schedule provided

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Limit Switch	NAMCO	EA-180	QM,QT,A	10-A
Limit Switch	NAMCO	EA-740	QM,QT,A	11-A
Elec. Seal Assessment	Conax	N-11001-32(33)	QM,QT,A	12-A
Pressure Transmitter	Foxboro	E11GM	RPN,R,CS-SEN,A	27-A
Differential Pressure Transmitter	Foxboro	E-13DH	RPN,QM,T,P,R,CS,QI	30-A
Pressure Transmitter	Foxboro	E-11	R,CS-SEN,RPN,A	31-A
Pressure Transmitter	Foxboro	E-11	R,CS-SEN,RPN,A	32-A
Pump Motor	General Electric	4160V	T,H,QM-EXN	21-B

APPENDIX B (Continued)

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
RBCCW Pump Motor	General Electric	MP-11A	QM,QT,T,H,A	29-B
RBCCW Pump Motor	General Electric	MP-11B	QM,QT,T,H,A	29-B
RBCCW Pump Motor	General Electric	MP-11C	QM,QT,T,H,A	29-B
Differential Pressure Transmitter	Foxboro	E13DH	R,CS-SEN,A	30-A
Motor Control Center	General Electric		H,QI,A	30-B
Motor Control Center	General Electric		H,QI,A	31-B
Pressure Transmitter	GE/MAC	551	RPN,T,R,A,QM	36-B
Pressure Transmitter	GE/MAC	551	RPN,T,R,A,QM	36-Ba
Solenoid Valve	ASCO	WPHTX-8320A184	QI,QM,T,P,H,R,A	66-B
Solenoid Valve	ASCO	WPHTX-8320A184	QI,QM,T,P,H,R,A	66-Ba
Pressure Switch	Custom Component	604-GBR2-352S	QI,T-A	67-B
Limit Switch	NAMCO	SL3CB2	RPN,T,P,H,R,A,QI	69-B
Limit Switch	NAMCO	SL3CB2	RPN,T,P,H,R,A,QI	69-Ba
Solenoid Valve	ASCO	HT-8320A-102	RPN,T,P,H,R,A,QI	70-B
Limit Switch	NAMCO	D-2400X	RPN,T,P,H,R,A,QI	71-B
Solenoid Valve	ASCO	HT-834481	RPN,T,P,H,R,A,QI	72-B
Pump Motor 460V	Westinghouse	TCDP	RPN,A	85-B
Vacuum Switch	Custom Component	604 VBI-351S	QI,QM	86-B
Limit Switch	NAMCO	SL3C	RPN,R,QM,A	112-B
Limit Switch	NAMCO	SL3C	RPN,R,QM,A	113-B
Limit Switch	NAMCO	SL3C	RPN,R,QM,A	116-B
Limit Switch	NAMCO	SL3C	RPN,R,QM,A	119-B
Limit Switch	NAMCO	SL3C	RPN,R,QM,A	120-B
Connector Head	Rosemount	104ADA	RPN,T,P,H,R,QM	5-C

APPENDIX B (Continued)

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Differential Pressure Transmitter	Foxboro	NE13DH	QI,R,QT,A,T,QM	8-C
High Range Radiation Detector	General Atomic	RD-23	QI,A	15-C
Level Transmitter	GEM	XM-548532	QI,A,S	16-C
Accelerometers	Endevco	2273AM20	QI,A	17-C
Cable	Endevco	3075M6	QI,A	18-C
Preamplifier	Unholtz-Dickie	22CA-ZTR	QI,A	19-C
Junction Box	Hoffman	8064-CHNESS	QI,A	20-C
Terminal Blocks	General Electric	CR151	R-EXN,A	1-B
Solenoid Valves	ASCC	HPX8211B54SW	RPS,T,P,R,QM,QI,A	40-B
Solenoid Valves	ASCO	HT-8211D4	RPS,T,P,R,QM,QI,A	40-Ba
Pressure Transmitter	Foxboro	E11GM	CS,R-SEN,RPN	2-C

APPENDIX C

Equipment Considered Acceptable
or Conditionally Acceptable
(Category 4.3)

LEGEND:

- R - Radiation
- T - Temperature
- QT - Qualification time
- RT - Required time
- P - Pressure
- H - Humidity
- CS - Chemical spray
- A - Material aging evaluation, replacement schedule, ongoing equipment surveillance
- S - Submergence
- M - Margin
- I - HELB evaluation outside containment not completed
- QM - Qualification method
- RPN - Equipment relocation or replacement, adequate schedule not provided
- EXN - Exempted equipment justification inadequate
- SEN - Separate effects qualification justification inadequate
- QI - Qualification information being developed
- RPS - Equipment relocation or replacement schedule provided

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Post Incident Fans	Joy		A	9-A
Solenoid Valve	ASCO	NP8320A-185V	A	14-A
Solenoid Valve	ASCO	200-381-6RF	A	15-A
Solenoid Valve	ASCO	NP-8320A-185V	A	16-A
Solenoid Valve	ASCO	206-381-3RVU	A	17-A
Solenoid Valve	ASCO	NP-206-381-6F	A	19-A
Solenoid Valve	ASCO	206-381-3F	A	20-A
Solenoid Valve	ASCO	NP-8344-B58V	A	21-A
Solenoid Valve	ASCO	NP206-381-6RF	A	25-A
Solenoid Valve	ASCO	NP-206-381-6F	A	35-B

APPENDIX C (Continued)

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Solenoid Valve	ASCO	NP-8320A177E	A	43-B
Solenoid Valve	ASCO	NP-8320A183E	A	46-B
Solenoid Valve	ASCO	NP-8320A183E	A	46-Ba
Solenoid Valve	ASCO	NP8320A177E	A	47-B
Limit Switch	NAMCO	EA740-20100	A	49-B
Limit Switch	ASCO	NP-831655E	A	50-B
Limit Switch	NAMCO	EA180-11302	A	51-B
Limit Switch	ASCO	NP8320A185E	A	52-B
Limit Switch	ASCO		A	53-B
Limit Switch	NAMCO	EA740-20100	A	54-B
Limit Switch	NAMCO	EA740-20100	A	55-B
Limit Switch	ASCO	NP-8321A6E	A	56-B
Limit Switch	NAMCO	EA-180-11302	A	57-B
Limit Switch	ASCO	NP8320A185E	A	58-B
Solenoid Valve	ASCO	NP-8321A5E	A	68-B
Solenoid Valve	ASCO	NP-8320A189E	A	68-Ba
Pressure Switch	Custom Component	CCS-F04GR6-356S	A	14-C
Low Voltage Penetration	Conax	7852-1000	A	2-A
Terminal Blocks	General Electric	CR-151	A	3-A
Low Voltage Cable	Anaconda	-	A	4-A
Control Cable	Kerite	-	A	5-A
Instrument Cable	Rockbestos	XLPE Insul.	A	6-A
Instrument Cable	Kerite	-	A	6-Aa
Hydrogen Recombiner	Westinghouse	-		7-A
Containment Fan	Westinghouse	7189007	A	8-A

APPENDIX C (Continued)

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Splice Assemblies	IDEAL	30-210(211)	A	13-A
Motor Operator	Limitorque	157040(1,2,3)	A	23-A
Motor Operator	Limitorque	155532(3)	A	24-A
Differential Pressure Transmitter	Foxboro	E13DM	A	28-A
Differential Pressure Transmitter	Foxboro	E13DM	A	29-A
Solenoid Valve	Valcor	V526-6042(3)-3A	A	34-A
Electrical Connector	Litton	CIR06VI-20	A	35-A
Electrical Connector	Conax	7852-10000	A	36-A
Coaxial Cable	Rockbestos	RSS-6-104	A	37-A
Terminal Block	Weidmuller Inc.	SAKA	A	38-A
Terminal Blocks	General Electric	CR-151	A	1-B
5000V Power Cable	General Cable Corp	-	A	2-B
Control Cable	Kerite	-	A	3-B
Low Voltage Cable	Anaconda	-	A	4-B
Instrument Cable	Rockbestos	XLPE Insul.	A	5-B
Instrument Cable	Kerite	600V	A	5-Ba
Valve Motor	Limitorque	SN-137101(2)	A	7-B
Valve Motor	Limitorque	-	A	8-B
Valve Motor	Limitorque	-	A	9-B
Valve Motor	Limitorque	-	A	10-B
Valve Motor	Limitorque	-	A	11-B
Valve Motor	Limitorque	-	A	12-B
Valve Motor	Limitorque	-	A	13-B

APPENDIX C (Continued)

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Valve Motor	Limitorque	-	A	14-B
Valve Motor	Limitorque	-	A	15-B
Valve Motor	Limitorque	-	A	16-B
Valve Motor	Limitorque	-	A	17-B
Valve Motor	Limitorque	-	A	18-B
Valve Motor	Limitorque	-	A	19-B
Valve Motor	Limitorque	-	A	20-B
Fan Motor	Joy (Reliance)	SN-GF-15747	A	23-B
Pump Motor	Siemens-Allis	-	A	25-B
Pump Motor	Siemens-Allis	-	A	26-B
Motor Operated Valve	Limitorque	-	A	83-B
Motor Operated Valve	Limitorque	-	A	89-B
Pressure Transmitter	Foxboro	E11DM	A	91-B
Solenoid Valve	ASCO	NP8320A177E	A	92-B
Solenoid Valve	ASCO	NP831655E	A	94-B
Solenoid Valve	ASCO	NP8321A5E	A	95-B
Solenoid Valve	ASCO	NP831655E	A	96-B
Solenoid Valve	ASCO	NP831655E	A	97-B
Solenoid Valve	ASCO	NP831655E	A	98-B
Solenoid Valve	ASCO	NP8321A5E	A	99-B
Solenoid Valve	ASCO	NP8321A5E	A	100-B
Solenoid Valve	ASCO	NP8321A5E	A	102-B
Solenoid Valve	ASCO	NP8321A5E	A	103-B
Solenoid Valve	ASCO	NP8321A5E	A	104-B

APPENDIX C (Continued)

Equipment Description	Manufacturer	Model No.	Deficiency	Item No.
Solenoid Valve	ASCO	NP831655	A	106-B
Solenoid Valve	ASCO	NP831655	A	107-B
Solenoid Valve	ASCO	NP8320A189E	A	108-B
Solenoid Valve	ASCO	NP8320A189E	A	109-B
Solenoid Valve	ASCO	NP8321A5E	A	110-B
Pressure Transmitter	Foxboro	NE11GM	A	121-B
Coaxial Cable	Rockbestos	RSS-6-104	A	122-B
Valve Motor	Limitorque	156210(09)	A	1-C
Differential Pressure Transmitter	Foxboro	NE13DM	A	9-C

APPENDIX D
Safety-Related Systems List¹

Function	System
Emergency Reactor Shutdown	Reactor Coolant Reactor Protection Safeguards Actuation ² Chemical and Volume Control Control Element Assemblies
Containment Isolation	Safety Injection and Containment Spray Containment Radiation Monitoring Chemical and Volume Control Clean Liquid Radwaste Gaseous Radwaste Steam Generator Blowdown Waste Gas Containment Sump Primary Makeup Reactor Coolant Pump Bleedoff Instrument Air Main Steam Feedwater Auxiliary Feedwater Reactor Coolant Sample Nitrogen to SI Tanks Gas and Aerated Liquid Radwaste
Reactor Core Cooling	Safety Injection and Containment Spray (HPSI, LPSI, SI Tanks)
Containment Heat Removal	Containment Spray Containment Sump Recirculation Reactor Building Closed Cooling Water Containment and Encl Building Ventilation
Core Residual Heat Removal	Main Steam Steam Dump Auxiliary Feedwater Feedwater Service Water Shutdown Cooling

¹The NRC staff 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 system(s) function with the responsible IE regional reviewer and/or the licensee.

²Components contained in several systems.

APPENDIX D (Continued)

Function	System
Prevention of Significant Release of Radioactive Material to Environment	Containment Radiation Monitoring H ₂ and O ₂ Analyzer H ₂ Recombiners Sampling Post Accident Monitoring
Supporting Systems	Emergency Power (125 VCD, 120 VAC, 480V Load Centers, etc.) Auxiliary HVAC System Diesel Generator Boric Acid Heat Tracing Engineered Safeguards Room Air Recirculation Auxiliary Building Ventilation

Safety-Related Display Instrumentation List

1. Pressurizer Pressure
2. Pressurizer Level
3. Pressurizer Temperature
4. Pressurizer Relief Valve Monitors
5. Pressurizer Relief Valve Temperature
6. Quench Tank Pressure
7. Quench Tank Temperature
8. Quench Tank Level
9. RCP Loop Pressure Differential
10. RCP Loop Temperature
11. Steam Generator Pressure
12. Steam Generator Level
13. Auxiliary Feedwater Flow
14. Condensate Storage Tank Level
15. HPSI Pressure
16. LPSI Pressure
17. Containment Spray Pressure
18. HPSI Flow
19. LPSI Flow
20. Containment Spray Flow
21. SI Tank Pressure
22. SI Tank Level
23. SI Tank Recirculation Flow
24. Volume Control Tank Pressure
25. Volume Control Tank and Letdown Temperature
26. Volume Control Tank Level

APPENDIX D (Continued)

Safety-Related Display Instrumentation List

- 27. Boric Acid Tank Level
- 28. Boric Acid Tank Pressure
- 29. Charging Pressure
- 30. Charging Flow
- 31. Charging Temperature
- 32. Shutdown Cooling Temperature
- 33. RWST Level
- 34. RBCCW Flow
- 35. Containment Pressure
- 36. Containment Temperature
- 37. Containment Humidity
- 38. Containment Sump Level
- 39. Containment High Range Radiation Detectors

TECHNICAL EVALUATION REPORT
FINAL DRAFT
EQUIPMENT ENVIRONMENTAL QUALIFICATION

NORTHEAST NUCLEAR ENERGY COMPANY
MILLSTONE NUCLEAR POWER STATION, UNIT 2

NRC DOCKET NO. 50-336

NRC TAC NO. 42493

EG&G IDAHO, INC. SUBCONTRACT NO. K-7615

FRC PROJECT C5417

FRC TASK 2

Prepared by

Franklin Research Center
The Parkway at Twentieth Street
Philadelphia, PA 19103

FRC Group Leader: C. J. Crane

Prepared for

EG&G Idaho, Inc.
Idaho Falls, Idaho 83401

January 31, 1981

This report was prepared as an account of work performed under a subcontract from EG&G Idaho, Inc., a prime contractor to the United States Department of Energy. Neither EG&G nor the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any third party's use, or the results of such use, or any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights.

NOTE — THIS IS A DRAFT

Because of schedule limitations, this report draft has not gone through the complete review cycle of FRC. While the overall conclusion is expected to remain the same, the reader is cautioned that some details of the report may change as the review is completed.



Franklin Research Center

A Division of The Franklin Institute

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

DUPLICATE

8102030531

dupe 8102030531