Safety Evaluation Report By the Office of Nuclear Reactor Regulation Equipment Qualification Branch

For Consolidated Edison Company of New York, Inc. Indian Point Nuclear Power Station Unit No. 2, Docket No. 50-247

Environmental Qualification of Safety-Related Electrical Equipment

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SAFETY EVALUATION REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION EQUIPMENT QUALIFICATION BRANCH FOR CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. INDIAN POINT NUCLEAR POWER STATION, UNIT NO. 2 DOCKET NO. 50-247 ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT

1.0 INTRODUCTION

General Design Criteria 1 and 4 specify that safety-related electrical equipment in nuclear facilities must be capable of performing their safety-related function under all normal, abnormal and accident conditions. The NRC staff has required that all licensees of operating reactors evaluate the qualification of their safety-related electrical equipment which is located in a harsh environment.

2.0 BACKGROUND

In 1977, the NRC staff instituted the systematic evaluation program (SEP) to determine the extent to which the licensing basis for the older operating nuclear plants complies with current licensing criteria. Topic III-12 of this program relates to the environmental qualification of safety-related equipment. In December 1977, the NRC issued a generic letter to all SEP plant licensees requesting that they review the adequacy of existing equipment qualification documentation. NRC review of licensee responses led to the preparation of NUREG-0458, an interim NRC assessment of the environmental qualification of electrical equipment.

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 79-01, "Environmental Qualification of IE Bulletin 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 program. On November 13, 1979 the DOR (Division of Operating Reactors) "Guidelines for Evaluating Environmental Qualification of class IE Electrical Equipment in Operating Reactors" were prepared to form the basis for reviewing equipment in all operating plants.

In October 1979, the NRC contracted with Franklin Research Center (FRC) for assistance in the detailed review of the SEP equipment environmental qualification and prepare the technical evaluation reports (TERs).

In February 1980, the NRC decided to include Indian Point Units 2 and 3 and Zion Units 1 and 2 in the SEP program for the purpose of equipment environmental qualification review.

Also in February 1980, the NRC staff met with personnel from FRC and representatives of the SEP group in an open session at NRC headquarters to review the program in relation to the DOR guidelines.

On May 23, 1980, the Commissioners issued Memorandum and Order CLI-80-21, which states that the DOR guidelines and NUREG-0588 set the requirements that licensees and applicants must meet regarding the environmental qualification of safety-related electrical equipment to satisfy 10 CFR 50, Appendix A, General Design Criteria (GDC)-4. This order required the staff to complete

safety evaluation reports (SERs) for all operating plants by February 1, 1981. In addition this order requires that all licensees have qualified safety-related electrical 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 safetyrelated electrical be qualified by June 30, 1982.

On March 5, 1980 Consolidated Edison Company of New York, Inc. (CON ED) was formally asked to address the environmental qualification of safetyrelated equipment for the Indian Point 2 Station. In response to this request, CON ED submitted information which was transmitted by a letter dated May 9, 1980.

CON ED submitted additional information on October 31, 1980.

2.1 PURPOSE

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

2.2 SCOPE

The scope of this report includes that equipment which must function to mitigate the consequences of Loss-of-Coolant Accident (LOCA) or a High-Energy-Line Break (HELB) inside or outside containment, and whose environment would be adversely affected by that accident.

3.0 STAFF EVALUATION

The staff's evaluation of the licensee's responses included an on-site inspection of selected Class IE equipment and by examining the licensee's report for completeness and acceptability. The criteria described in the DOR Guidelines and NUREG-0588, in part, were used as a basis for the staff's evaluation of the adequacy of the Licensee qualification program.

During the week of March 24, 1980, NRC and FRC representatives visited the CON ED Engineering Offices to discuss various aspects of the program. On July 24 and 25 NRC and FRC representatives visited the Indian Point 2 plant site, inspected safety-related systems and equipment, identified and tabulated safety-related components through discussions with plant personnel, and conducted a general review of CON ED's submittal of May 9, 1980. The inspection spot checked proper installation of accessible equipment, and manufacturers nameplate data. The manufacturer and model number from nameplate data were compared to information given in the Licensee's submittal.

The following safety evaluation incorporates the CON ED submittal and the Franklin Research Center technical evaluation report (TER).

3.1 COMPLETENESS OF SAFETY-RELATED EQUIPMENT

In accordance with the DOR guidelines, the licensee was directed to establish a list of systems and display instrumentation needed to

mitigate the consequences of a LOCA or HELB, inside or outside containment, and reach safe shutdown. The lists of safety-related systems and display instrumentation were developed from a review of plant safety analyses and emergency procedures. The display instrumentation selected includes parameters to monitor overall plant performance as well as to monitor performance of the systems on the list. The systems list was established on the basis of the functions that must be performed for mitigation of the consequences of a LOCA or HELB without regard to location of equipment relative to a potentially hostile environment. The staff has determined and verified that the systems considered by the licensee are those required to achieve or support: (1) emergency reactor shutdown, (2) containment isolation, (3) reactor core cooling, (4) containment isolation, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment. In addition to the concerns identified below the staff's systems review has not included those equipment items discussed in section 5.0 of this report. The system and instrumentation list is contained in Appendix D.

The licensee submitted an extensive list of safety-related electrical equipment comprising the systems listed in Appendix D. Identical components within a plant area exposed to the same environment were grouped; 69 item types of equipment were identified and assessed by the staff. Several equipment items identified by FRC in the draft interim TER that may be subject to a harsh environment were not addressed by the licensee. (Re: Paragraph 4.1.1 of the TER). The licensee should provide justification for the omission.

3.2 SERVICE CONDITIONS

The Commission Memorandum and Order (CLI-80-21), dated May 23, 1980 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 licensees 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 Indian Point 2 relative to the temperature, pressure, and the containment spray caustics, have been performed in accordance with the above stated requirments. For this review the staff reviewed the qualification documentation to ensure that the qualification specifications envelope the conditions established by the licensee. 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 environmental conditions are enveloped by the large break LOCA environmental conditions. The staff assumed and requires that the licensee verifies that the containment spray system is not subjected to a disabling single component failure and therefore satisfies the DOR Guideline requirements of Section 4.2.1.

Equipment submergence has also been addressed where the possibility exists that flooding of equipment may result from high energy line breaks (HELB).

3.3 TEMPERATURE, PRESSURE, AND HUMIDITY CONDITIONS INSIDE CONTAINMENT The licensee has provided the results of accident analyses as follows:

•	Max. Temp.	(°F)	Max. Press. (psig)	Humidity
MSLB	258		40	100%
LOCA		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 258°F does not satisfy the above requirement. Furthermore the licensee specified pressure is low as compared to the plants of similar design. The licensee is requested to verify that the pressure profile in the FSAR was calculated based on the code requirements defined in the NUREG-0588. If by using these codes the peak containment pressure is still 40 psig, then a saturation temperature corresponding the pressure profile (287°F peak temperature at 40 psig) should be used. If however the calculated peak pressure is higher than 40 psig then the saturation temperature corresponding to the new pressure profile should be used. 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 CONTAINMENT The licensee has provided the temperature pressure, humidity and applicable environmental values associated with a HELB outside containment in the following plant areas:

1. Residual Heat Removal Pump Area in PAB

2. Auxiliary Pump Room

3. Steamline/Feedline Areas

4. Pipe Penetrations Area Adjacent to PAB and Safety Injection Area in PAB

The licensee has used ambient temperature conditions in some areas outside containment. The staff considers saturation temperature at the peak pressure resulting from a HELB as the minimum level for acceptance. The licensee should update his 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 saturated conditions or propose corrective action.

3.5 SUBMERGENCE

The maximum submergence levels have not been established and assessed by the licensee.

Based on the licensee submittal, the staff concludes that insufficient information has been provided to perform an evaluation. The licensee must address this concern and provide assurance that no safety-related equipment identified for this review will be subjected to a submergence condition.

The licensee should provide an assessment of the failure modes associated with the submergence of equipment. Assurance should also be provided that the subsequent failure of this equipment 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 the equipment may be exempt from the submergence parameter of qualification.

3.6 Chemical Spray

The licensee's FSAR value for the chemical concentration is 2000 PPM of boron plus 40% sodium hydroxide solution corresponding to 0.8 volume percent boric acid used by the vendors for qualification testing.

3.7 AGING

The DOR Guidelines, section 7, does not require a qualified life to be established for all safety related electrical equipment, however, the following actions are required:

- Detailed comparison of existing equipment to the materials identifed in Appendix C of the DOR guidelines. The first supplement to IEB-79-01B requires the licensees to utilize the table and identify any additional materials as a result of their effort.
- 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.

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

The staff will review the licensees response, when submitted, and report its evaluation in a supplemental report.

3.8 RADIATION (INSIDE AND OUTSIDE CONTAINMENT)

The licensee has provided values for radiation levels postulated to exist following a LOCA event. The application and methodology employed to determine these values have been presented to the licensee as part of the NRC staff criteria contained in the DOR Guidelines, NUREG-0588 and the guidance provided in IEB-79-01B, Supplement 2.

The staff's review assessed that the values to which equipment was qualified enveloped the requirements identified by the Licensee. The value established 7by the licensee is 2 x LO RADS for the integrated dose inside containment.

The radiation service condition provided by the licensee is lower than provided in the DOR Guidelines for the Gamma and Beta radiation. The licensee is requested to either provide justification for using lower service conditions or use the service condition provided in the DOR Guidelines for both Gamma and Beta radiation. If the former option is chosen then the analysis including the basis and assumptions used in the analysis and a sample calculation should be provided.

A required value outside containment of 3.6 x 10 RADS has been used by the license to specify limiting radiation levels within the RHR pump area of the auxiliary building. This value appears to consider the radiation levels influenced by the source term methodology associated with Post-LOCA recirculation fluid lines and is therefore acceptable.

4.0 QUALIFICATION OF EQUIPMENT

The following subsections are the staff's assessment, based on the licensee's submittal, and the Franklin TER 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 conditioned only on the satisfactory resolution of the staff's concern identified in Section 3.7.

The NRC staff in its assessment of the licensees submittal and the TER did not review the methodology employed to determine the values established by the licensee. However, in reviewing the TER a determination was made by the staff as to the stated conditions presented by the licensee. Additionally, the detailed review of supporting documentation referenced by the licensee (e.g., test reports) has been completed by FRC.

The environmental qualification data bank to be established by the staff will provide the means to cross reference each supporting document to the referencing licensee.

Where supporting documents were 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. An appendix for each subsection is attached which provides a list of equipment which requires additional information and/or corrective section. 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 evaluations.

4.1 EQUIPMENT REQUIRING IMMEDIATE CORRECTIVE ACTION Appendix A identifies equipment in this category. The licensee was requested to perform a review of the facility's safety-related electrical equipment.

On March 26 and 27, 1980 members of the NRC staff visited the Con Ed offices to review environmental qualification data. In the review the staff discovered that the Foxboro transmitter, model 613HM, had failed radiation qualification tests as outlined in WCAP 7410-L, Vol. 1, Dec. 1970. At that time Con Ed was asked to justify continued operation of these transmitters until replacement could be accomplished.

The staff agreed with Con Ed that continued operation of the plant is safe because (1) automatic reactor trip and safety injection will be initiated prior to when the transmitters are exposed to the dose at which they fail, and (2) the parameters measured with these transmitters are either not required, or backup indications exist, in the longer term following an accident.

Con Ed proposed replacement of these transmitters (except those used in accumulator pressure) at the next refueling outage scheduled for December 1980.

The licensees review of this equipment has not identified any other equipment requiring immediate corrective action and therefore no licensee event reports were submitted. The staff, in this review, has not identified any additional safety-related electrical equipment which is known not to be able to perform its intended safety function during the time period in which it is required to operate.

4.2 EQUIPMENT REQUIRING ADDITIONAL INFORMATION AND/OR CORRECTIVE ACTION Appendix B identifies equipment in this category, including the tabulation of their deficiencies. The deficiencies are noted by a letter relating to the legend, identified below, indicating that insufficient information has been provided for the qualification parameter or condition.

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 4.0, these deficiencies do not necessarily mean that the equipment is unqualified. However, they are cause for concern and require further case-by-case evaluations. 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 licensees:

- (1) Equipment does not provide essential safety functions in the harsh environment and failure of it in the harsh environment will not impact safety related functions or mislead an operator.
- (2a) Equipment performs its function prior to 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 thge single failure criteria.
- (4) Equipment not subjected to a harsh environment as a result of the postulated accident.

The licensee is therefore required to supplement the information presented by providing their resolutions to the deficiencies identified which should include a description of the corrective action and schedules for its completion (as applicable), etc. The staff will review the licensees response, when submitted, and report on the resolution in a supplemental report.

It should be noted that where testing is presently 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 their proposed corrective action, on a timely basis, to assure that qualification can be established by June 30, 1982.

4.3 EQUIPMENT CONSIDERED ACCEPTABLE OR CONDITIONALLY ACCEPTABLE Based on the staff's review of the licensee's submittal and the TER 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 a material evaluation on their equipment was conducted to assure that no known materials susceptible to degradation due to aging have been used in their equipment.
- (2) establish an ongoing program to review the surveillance and maintenance records of their plant 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 submitted, and report on the resolution in a supplemental report.

5.0 DEFERRED REQUIREMENTS

IE Bulletin 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. To permit a uniform program schedule the SEP plant reviews have been amended. The staff required that this information be provided by February 1, 1981. The staff will provide a supplemental safety evaluation addressing these concerns.

6.0 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 one outstanding item which required immediate corrective action to assure safety of plant operation, and which has been identified in Section 4.1 and Appendix a of this report. The staff has deterined 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 basd 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 on NUREG-0588 or commit^{*} to a corrective action (re-qualification, 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), the licensee to 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 considation of the deficiencies and their ramification, 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 (CLI-80-21) and with the licensing orders issued by NRR on October 24, 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 facilities capability to function following a LOCA or HELB, and
- (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

List of Equipment in Section 4.1

Equipment Requiring Immediate Corrective Action

NOTE: (R) Licensee has committed to replace equipment

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

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiency	
(R) 10	Transmitter	Foxboro	613HM-H	QI,QM,A,CS,R	
(R) 13	Transmitter	Foxboro	613HM	QI,QM,A,CS,R	

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APPENDIX B

List of Equipment in Section 4.2, Equipment Requiring

Additional Information And/Or Corrective Action

NOTE: (R) Licensee has committed to replace equipment

LEGEND: Designation for Deficiency

R	- Radiation	M - Margin
т	- Temperature	I - HELB Evaluation Outside
от.	- Qualification Time	Containment Not Completed
RT	- Required Time	QM — Qualification Method
P.	- Pressure	RPN - Equipment Relocation or Replacement
Ĥ	- Humidity	Adequate Schedule Not Provided
CS	- Chemical Spray	EXN - Exempted Equipment Justification
A	- Material Aging Evaluation,	Inadequate
	Replacement schedule, Ongoing	SEN – Separate Effects Qualification
	Equipment Surveillance	Justification Inadequate
S	- Submergence	QI – Qualification Information Being
-		Developed
		and Fridework Delegation on Penlacement

RPS - Equipment Relocation or Replacement Schedule Provided

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiency
3	MOV	Limitorque	SMB-00	QI,QM,A
15A -	Transmitter	Foxboro	611-GM	QI,QM,A
1 5 D	Transmitter	Foxboro	611-GM	QI,QM,A
16	Transmitter	Foxboro	613-GM	QI,QM,A
34B	Motor	Westinghouse	509 US Frame	QI,QM,A
34C	Motor	Westinghouse	509 UPZ Frame	QI,QM,A
34D	Motor	Westinghouse	VSWI 5008P20	QI,QM,A
35	Motor	Westinghouse	588-5HP	QI,QM,A,T,CS,R
36	Motor	Westinghouse	69 F97009	QI,QM,A,T,CS,R

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APPENDIX B, Continued

TER Item	No.	Equipment Description	Manufacturer	Model/ Type	Deficiency
	40A Cable/Splice		UNK/Raychem	UNK	QI,A,R
	40B	Cable/Splice	Kerite/Raychem	UNK	QI,A,R
	40D	Cable	Lewis	UNK	QI,A,R
	41	Resistance Temperature Detector	Rosemount	176K F	A,T,R
	42A	Panel	Westinghouse	UNK	QI
(R)	8	Level Switch	GEMS	L\$800	QI
(R)	9	Transmitter	Foxboro	613DM	QI,QM,A,CS,R
(R)	11A	Transmitter	Foxboro	613DM-HSI	QI,QM,A,CS,R
(R)	11B	Transmitter	Foxboro	611DM-C	QI,QM,A,CS,R
(R)	12	Transmitter	Foxboro	611Gн-к	QI,QM,A,CS,R
(R)	14A	Transmitter	Foxboro	611GM	QI,QM,A,CS,R
	14B	Transmitter	Foxboro	611GM-ASI	QI,QM,A,CS,R
	15B	Transmitter	Foxboro	611GM	QI,QM,A,R
	15C	Transmitter	Foxboro	611GM-DSI	QI,QM,A,R
	18	SOV Operator	AS CO	8320	QI
	19	SOV Operator	ASCO	8300	QI
	20A	Solenoid	Lawrence	500	QI
	20B	Solenoid	Lawrence	1200	QI
	21	SOV Operator	AS CO	8314	QI
	22A	SOV Operator	AS CO	8316	QI
	228	SOV Operator	AS CO	8316	QI

APPENDIX B, Continued

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiency
22 C	SOV Operator	ASCO	8316	QI
23	SOV Operator	ASCO	8300	ØI
24 A	SOV Operator	ASCO	8210	ØI
24B	SOV Operator	AS CO	8210	QI
25	SOV Operator	AS CO	8300	QI
26	SOV Operator	AS CO	8320	QI
27	Solenoid	Lawrence	629BC85P5	QI
28A	Switch	NAMCO	EA 180	QI
29A	Switch	Micro Switch	BZE62RN	ØI
29B	Switch	Micro Switch	BZE62RN	QI
30	Switch -	NAMCO	SL3	QI
31 A	Switch	NAMCO	D2400X	QI
318	Switch	NAMCO	D2400X	ØI
310	Switch	NAMCO	D2400X	ØI
324	Switch	Micro Switch	EXD-AR	QI
320	Switch	Micro Switch	EXHAR-3	QI
77	Switch	Micro Switch	0PD-AR6923	QI
3/ 4	Motor	Westinghouse	509 US Fra	me QI
344	Transducer	Foxboro	69TA1	QI
38	Terminal Blocks	Westinghouse	542247 (805432)	Q,A,CS,R
39	Electrical Penetrations	Crouse-Hinds/ Westinghouse	UNK	QI,A,CS,R
400	Cable/Splice	UNK/Raychem	UNK	QI,QM,A,R
42B	Hydrogen Recombiner	Westinghouse	UNK	QI,QM,A,T,CS,R

APPENDIX C

List of Equipment in Section 4.3 Equipment Considered acceptable or Conditionally Acceptable

LEGEND: A - Materials Aging Evaluation

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiency
37в	Transducer	Fisher	546	Α
1	MOV	Limitorque	SMB-00	Α
2	MOV	Limitorque	SMB-2	A
4 A	MOV	Limitorque	SMB-0	Α
48	MOV	Limitorque	SMB-0	Α
5 A	MOV	Limitorque	SMB-00	A
5в	MOV	Limitorque	SMB-00	A
6A	MOV	Limitorque	SMB-000	Α
6В	MOV	Limitorque	SMB-000	Α
7	MOV	Limitorque	SMB-1	A
17	Transmitter	Rosemount	1153A	A
28B	Limit Switch	NAMCO	EA-180	
310	Limit Switch	NAMCO	D2400X	
370	Transducer	Fisher	546	

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APPENDIX D

A. Safe Shutdown Systems		
System	Term	Function
Reactor Protection Trip System*	S	Trips reactor when predetermined setpoints are exceeded
Residual Heat Removal+	L	Long-term heat removal capability
Auxiliary Feedwater*	I/L	Provides steam generator makeup water for decay heat removal and plant cooldown.
Component Cooling	L	Removes heat from the RHR heat exchangers/transfers to the service water system.
Service Water System	L	Transfers heat from the component cool- ing heat exchangers to the river, lake, or other heat sink.
Radiation Monitoring Systems and Sampling*	L	Self-explanatory
Emergency Diesel System*	S/I	Emergency electrical power source for vital equipment
480 V Switchgear System*	L	Self-explanatory.
Motor Control System*	L	Electrical power to various electrical equipment
125-V dc Power Supply Systems*	L	Provides backup power to certain vital equipment and circuits

*Systems Which Function Both for Safe Shutdown & Also for Accident Mitigation. +Systems required for cold shutdown only.

(S)	Short Term	Less than 24 hrs.
(T)	Intermediate Term	Up to 30 days
(L)	Long Term	30 days plus

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**To BE Added As "TMI Lessons Learned" Requirements.
***Review of These Systems Deferred to Feb. 1, 1981.
****Instruments Required Only for Accident Mitigation Purposes.

APPENDIX D, Continued

B. Accident Mitigating Systems

System	Term	Function
Pressurizer Pressure Relief**	I	Power operated relief valves for releas- ing RCS pressure.
Safeguards Actuation System	S	System for signaling the initiation of the ESF systems.
Containment Isolation System	L	Isolates containment penetrations in case of accidents.
Steam Line Isolation System	S	Automatically isolate the main steam lines in case of line break.
Feedwater Isolation System	S	Isolates feedwater lines in case of line break.
High Head/Low Head Safety Injec- tion and Accumulator System	S/I/L	Provides cooling water to the core post-accident
Containment Spray	I	Post-accident containment pressure and iodine control
Fan Cooler System/Hydrogen Recombiner System	I	Post-LOCA containment heat removal and hydrogen control.
Primary Auxiliary Building Vent- ilation system*	I/L	Self-explanatory.
Control Building HVAC Systems***	I/L	Self-explanatory.
Diesel Room Ventilation System***	I	Self-explanatory.

APPENDIX D, Continued

C. Accident Mitigation and Safety Shutdown Instruments (LOCA, MSLB, FWLB)

Pressurizer Level	I
Pressurizer Pressure	L
Containment Pressure****	I
Main Steam Pressure	L
High-Head SI Flow****	I
Steam Generator Level	L
Containment Sump Level****	L
Auxiliary Feedwater Flow	L
RWST Level	I
RHR Recirculation Flow	L
Component Cooling Water Flow	L
Service Water System Flow	L
Diesel Generator Monitoring	I
RCS Pressure	ـ ل ـ
CST Level	I
Recirculation Spray Flow****	L
II Pump Suction and Discharge Pressure****	I

****Instruments required only for accident mitigation purposes.