TECHNICAL EVALUATION REPORT

ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED
ELECTRICAL EQUIPMENT TO HARSH ENVIRONMENTS
IEB 79018

TROJAN

DOCKET NO.: 50-344
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WESTINGHOUSE PWR (3411 MWT/1130 MWE NET)

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1. INTRODUCTION

1.1 General Issue Background

Fundamental to NRC regulation of nuclear power reactors is the principle that safety systems must perform their intended function in spite of the environment which may result from postulated accidents. Conformation that these systems will remain functional under postulated accident conditions constitutes environmental qualification. The current legal requirements for qualification are found on General Design Criteria 1 and 4 of Appendix A, 10 CFR 50; Criterion III and XI of Appendix B, 10 CFR 50; and 10 CFR 50.55a (h). These are general requirements restating the principle that licensees should have environmentally qualified equipment.

The NRC has used a variety of methods to assure that these general legal requirements are met for electrical safety equipment (Class 1E). In the oldest plants, qualification was based on the fact that electrical components were of nigh industrial quality. For the newer plants after 1971, qualification was judged on the basis of IEEE-323-1971. No regulatory guide was ever issued adopting the 1971 IEEE-323 standard, however, many plants referenced IEEE-323-1971 in their licensing submissions to the Commission. IEEE-323-1971 was written as a trial use standard; a document that briefly and broadly described how to qualify any equipment, electrical or otherwise. This standard did not specify the accident conditions which electrical equipment must meet. There were no specific requirements to maintain document files and no specific requirements concerning margin, aging, and other needed equipment specifications. For the newest plants whose Safety Evaluation Reports were issued after July 1, 1974, the Commission issued Regulatory Guide 1.89 which in most respects adopted the most recent standard, IEEE-323-1974.

In 1977, the NRC staff instituted the Systematic Evaluation Program (SEP) to determine the degree to which the older operating nuclear plants deviated from current licensing criteria. The subject of electrical equipment environmental qualification was selected for accelerated evaluation as part of this program. In December, 1977 the NRC issued a general letter to all SEP plants requesting that licensees initiate reviews to determine the adequacy of existing equipment qualification documentation. The review of SEP licensee responses indicated certain deficiencies, within the scope of the equipment addressed, such as inadequate definition of hostile environments, and lack of complete supporting documentation.

On May 21, 1979 the NRC issued IE Circular 79-08 "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants" which required all licensees to examine installed safety-related electrical equipment, and assure appropriate documentation of it's qualification to function under postulated accident conditions.

On February 8, 1979 the NRC issued IE Bulletin 79-01 which was intended to raise the threshold of IE Circular 78-08 to the level of a Bulletin; i.e., action requiring a licensee response. This bulletin required a complete re-review of equipment environmental qualification as described in IE Circular 78-08 within 120 days of receipt of the bulletin for operating facilities. It required that the licensee provide written evidence of the qualification of electrical equipment required to function under accident conditions including (1) Component description, (2) description of the accident environment, (3) the environment to which the component is qualified, (4) the manner of qualification including test methods, and (5) identification of the specific supporting qualification documentation.

As part of the program to reevaluate the environmental qualification of safety-related electrical equipment the NRC staff developed more definitive criteria. The Division of Operating Reactors' "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors" (DOR Guidelines) were completed in November, 1979. The DOR guidelines were intended as a screening device to catch those equipment items which might have qualification problems in operating reactors. In addition, for reactors under licensing review, the NRC staff has issued NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment."

On January 14, 1980, the NRC issued IE Bulletin 79-01B which expanded the scope of IE Bulletin 7901 and requested additional information on environmental qualification of class 1E electrical equipment at operating facilities, excluding the 12 facilities undergoing Systematic Evaluation Program (SEP) review. This bulletin stated that the guidelines and criteria to be used in evaluating the adequacy of class 1E equipment qualification would be the DOR guidelines provided as enclosure 4 to the Bulletin. The intent was to evaluate the qualification of all electrical safety-related equipment subject to harsh environments during postulated accidents in operating plants pursuant to the DOR guidelines. Any problems arising from this review were to be resolved using NUREG 0588 as a guide. The DOR guidelines and NUREG-0588 substantially improve upon the IEEE-323-1971 standard and provide a level of confidence essentially equivalent to that which would be achieved from the application of IEEE-323-1974 and Regulatory Guide 1.89.

The Nuclear Regulatory Commission, by order (CLI-80-21), directed on May 27, 1980 that the DOR Guidelines and NUREG 0588 form the requirements which licensees and applicants must meet in order to satisfy those aspects of 10 CFR 50, Appendix A, General Design Criteria (GDC) 4, which relate to environmental qualification of safety related electrical equipment. Licensees of operating reactors were to comply with these requirements so that the applicable equipment in all operating plants shall meet the DOR guidelines or NUREG-0588. The NRC staff

was directed to complete its review of environmental qualification based on licensee responses to IE Bulletin 79-01B and publish safety evaluation reports on each operating facility by February 1, 1981. By June 30, 1982 all safety-related electrical equipment in all operating plants shall be qualified to the DOR guidelines or NUREG-0588.

In order to comply with this directive, the Nuclear Regulatory Commission, Operating Reactors Branch, Division of Licensing issued to all operating reactors, on August 29, 1980, an order for modification of license to provide that "information which fully and completely responds to the...(IEB-79018)...shall be submitted... not later than November 1, 1980."

1.2. Specific Issue Background

IE Bulletin 79018 of January 14, 1980, "Environmental Qualification of Class 1E Equipment", required submission within 45 days of (1) A "Master List" of all engineered safety feature systems required to function under postulated accident conditions, (2) written evidence of environmental qualification of class 1E electrical equipment to function during LOCA conditions and (3) service condition profiles for Loss of Coolant Accident (LOCA), Main Steam Line Breaks inside containment (MSLB), and High Energy Line Breaks outside containment (HELB). IEB-79018 also required further evaluations to be made and submitted within 90 days of the bulletin issue date. These evaluations included (4) written evidence of environmental qualification of all safety related electrical equipment, both inside and outside containment, to harsh environments per the DOR Guidelines and (5) an evaluation of equipment location with respect to expected accident flood levels.

In response to these requirements, Portland General Electric Company submitted information pertaining to the Trojan facility on March 7, 1980 (45 day response submittal). Further updates of information were made by letters on April 25, 1980 and May 19, 1980. The licensee's final submittal of information required by IEB-79018 was made on September 5, 1980 (90 day response). This submittal was provided in accordance with the reporting requirements of the Order for Modification of License, dated August 29, 1980. The licensees' submittal of September 5, 1980 provides the basis for this technical evaluation report.

1.3 Purpose

This report was submitted in accordance with TI 2515/41 for use as an input to the Safety Evaluation Report (SER) on qualification of Class 1E electrical equipment installed in potentially harsh environments areas of the Trojan facility. The objective was to review the licensee's September 5, 1980 submittal and to verify that the licensee has adequately evaluated safety related electrical equipment at the Trojan facility for environmental qualification per the DOR Guidelines. Components detailed in the licensee's submittal were itemized in five categories; (1) equipment qualified for plant life, (2) equipment qualified with restrictions, (3) equipment exempt from qualification, (4) equipment whose qualification is unresolved, and (5) equipment not qualified. In each case reference is made to the components description and function along with the licensee's plans or schedule for qualification or replacement and justification for continued operation.

1.4 Scope

The scope of this report is limited to that equipment that must function in order to mitigate the consequences of a Loss of Coolant Accident (LOCA) or a Main Steam Line or High Energy Line Break (MSLB/HELB), and whose environment is adversely affected by those accidents or the recirculation of fluid from inside containment to outside containment to accomplish long-term cooling following a LOCA. For this reason, qualification aspects not included within the scope of this evaluation are:

- Seismic qualification.
- Equipment protection against natural phenomena.
- Equipment operation service conditions (for example vibration, voltage, and frequency deviations).
- Equipment exposure to weather.
- Equipment qualification for "mild" environments.

This report included the following service condition criteria as defined in the DOR guidelines:

Inside Containment

- Loss of Coolant Accident (LOCA).
- Main Steam Line Break (MSLB).

Outside Containment

- High Energy Line Break (HELB).
- Areas where fluids are recirculated from inside containment to accomplish long-term emergency core cooling following a LOCA.

The specific parameters reviewed for conformance with DOR guidelines were:

- Temperature.
- Pressure.
- Radiation.
- Chemical Spray.
- Humidity.
- Submergence.
- Aging.
- Operating Time.

The supporting qualification tests reports were not reviewed as part of this report but are listed in Attachment 1 to this report. This listing was prepared from information supplied on the component evaluation worksheets submitted as part of the September 5, 1980 response.

2.0 Evaluation of Harsh Environment Qualification at TROJAN

This section details the environmental qualification program and equipment qualification status of TROJAN Nuclear Generating Station inaccordance with IEB-79018 based on the licensee's information submittal of September 5, 1980, and a site visit by regional inspection personnel on October 27-31, 1980 (Inspection Report 50-344/80-27). Several modifications to the September 5, 1980 submittal were discussed during the site visit and are incorporated in this report.

2.1 Identification of Safety Related Electrical Equipment Required to Function in a Harsh Environment (Master List)

The licensee enclosed revision K of their IEB-79018 "Master List" of systems and components required to function while subjected to the defined harsh environments with the 90 day response submittal of September 5, 1980. The steps the licensee reported as having been taken to ensure a complete and accurate Master List were:

a. Areas of the plant that could be subject to harsh accident environment were defined.

b. The plant circuit schedule was reviewed to identify Class 1E equipment in these areas.

c. The list generated was reviewed to identify the post LOCA/HELB function of each item. Only equipment with a post LOCA/HELB safety function and subject to a harsh environment by the accident it is intended to mitigate was included on the Master List.

d. Plant emergency procedures were reviewed to identify the equipment used by operators in response to a LOCA or HELB. The safety function of equipment identified by this review, and not already on the list, was evaluated to determine the impact of each component's failure. Equipment whose failure could significantly hinder the operators' accident response was added to the Master List.

e. Scheme drawings for all valves on the Master List were checked to identify stem mounted limit switches associated with Master List valves and to determine the safety-related function, if any, for these switches. Any stem mounted limit switch whose failure could seriously impair response to an accident was included on the Master List.

f. Plant status panel inputs subject to accident environments were reviewed. Stem mounted limit switches whose failure would deny operators information critical to their accident response were included on the Master List.

g. The circuit schedule was reviewed to determine the cable types used for representative Master List items.

h. In order to verify equipment model numbers, location, and identify the installed configuration of equipment, an extensive plant walkdown was conducted. Model numbers and serial numbers were recorded from all readily accessible nameplates. In cases where access to equipment was extraordinarily difficult, an attempt to look at the equipment from a distance was made to confirm manufacture and model number by inspection. At least one of each model of equipment in Containment was opened for inspection by the licensee to identify how cables enter the unit, and to determine if the item was vented

or sealed. In cases where the manufacturer supplied a terminal box with his component, at least one of each kind of box was opened to obtained the same sort of information and to determine how the terminations were made. The conduit configuration in each component was noted by the licensee, and any associated pull boxes were opened to check for terminations within the box. Notes were also taken on the construction of the pull box. Most equipment locations were confirmed only in terms of the building or room they are located in and general plant elevation. However, for equipment subject to flooding, measurements were taken by the licensee to determine elevation more exactly.

Specific criteria and procedures applied at each of these steps is presented by the licensee in PGE-1025, "Basis for IE Bulletin Response". In addition to demonstrating consistency with the requirements of IEB-79018, this document also provides justification for those items included in the IEB-7901 response of June 12, 1979 that are not on revision 4 of the Master List. (Since IEB-79018 was restricted to equipment that must operate in the defined harsh environments to mitigate a LOCA or HELB while the response to IEB-7901 included all Class 1E equipment identified by Bechtel, there are differences between the two responses).

The Safety Injected System (SIS) Testing was reviewed by an NRC regional based inspector during a site visit on April 16-18, 1980 (Inspection Report 50-344/80-08). Open items identified were reviewed and closed during an inspection on October 27-31, 1980 (Inspection Report 50-344/80-27). The NRC resident inspector performed further review of the Master List to define obvious omissions. None were noted.

The licensee's Master List was audited to provide a list of component types or models requiring harsh environment qualification at TP0AH. This list is provided in Attachment 2.

2.2 Accident Environment Definition (Service Condition Profiles)

For the purposes of the 79-018 Response, a harsh environment location was defined as an area that would be subject to significantly higher than normal levels of temperature, pressure, chemical spray, humidity, or radiation as a result of a LOCA or HELB. By review of FSAR Chapter 3.11 and PGE-1004 "Trojan Nuclear Plant Analysis of Pipe System Breaks Outside Containment", these areas were determined to be:

1. All areas of Containment following a LOCA or an in-Containment HELB.

2. Main steam support structure following an ex-Containment steam or feedwater line break, except for areas immediately open to the outside.

3. Auxiliary Building below 45 feet elevation following a LOCA.

4. Piping penetration area following a LOCA.

Specifically not considered were line breaks in the auxiliary feedwater pump rooms, as the redundant trains are separated from each other as well as from the effects of a main steam or feedwater line break.

2.2 (a) Inside Containment (LOCA/MSLB)

The accident environment defined in FSAR Section 3.11 is used in the evaluation of equipment inside containment.

The normal environment was defined as:

Temperature	120°F Max
Pressure	15 psia
Humidity	50%
Chemical Spray	None
Radiation	1×10^7 Rad over 40 Years

The LOCA/MSLB Environment was defined as:

Temperature	FSAR figure 3.11-2 (286°F max)
Pressure	FSAR figure 3.11-1 (60 psig max)
Humidity	100%
Chemical Spray	pH 4.9 - 10.0
Radiation	2.1×10^7 R γ
	2×10^9 R β

For the equipment located in the Containment Building with operating times longer than the time period covered by the temperature and pressure curves it was assumed that the containment environment would remain at the final values of these curves indefinitely.

The pressure and temperature conditions are considered to bound main steam line break conditions for containment, as discussed in the licensee's response to the original IE-7901 bulletin on June 12, 1979, and the Bechtel Report "Containment and Safety Related Equipment Transient Temperature Analysis following a Main Steam Line Break", June 1975. This analysis in summary states: "A Main Stream Line Break (MSLB) accident inside Containment results in superheated vapor conditions that could result in a higher Containment temperature than if a LOCA were to take place. However, in general, lower levels of Containment peak pressure will result. A superheat condition (with corresponding high Containment atmosphere temperature) should have no significant effect on electrical equipment temperatures because the equipment surface temperature should closely follow the Containment saturation temperature, which is substantially lower than the peak vapor temperature during the superheat phase of the accident. The reason for this is that energy transfer from the Containment atmosphere to heat sinks is significant only when the sink surface is cooler than the saturation temperature so that condensation can occur. If the equipment surface temperature were to become higher than saturation, then the low energy transfer mechanism of convection would govern heat transfer. Since the Containment peak pressure is at a maximum following the design basis LOCA, the Containment saturation temperature for a MSLB accident is no higher than would be the case for a LOCA. It is on these bases that the worst case environment for Containment mounted equipment was specified to result from the design basis LOCA."

As of September 5, 1980, all components which had been required to function while submerged had been relocated above submergence levels. No items are now required to operate while submerged.

In some cases equipment inside containment has not been tested to the full pH range defined in the chemical spray environment. During the October 27-31, 1980 inspection the licensee made the following statement with respect to qualification of equipment inside containment to chemical spray:

> The worst case chemical spray conditions used for environmental qualification are boric acid, pH 4.2 and sodium hydroxide pH 10.5. These bounds were established to envelope conditions resulting from either a reactor coolant system pipe rupture or containment spray. The acidic component would result only from a broken reactor coolant system pipe during and immediately after boron injection. For this case, some degree of protection against the acidic spray environment is afforded by the physical separation of the RCS loops. Of the equipment under consideration by 79-01B, the following have not been tested under boric acid conditions but could be subjected to a low pH environment.

1. Reactor coolant pump cooling water isolation valves.

2. Terminal blocks for RTDs.

3. Pressurizer safety valve position indication.

4. Pressurizer relief valve solenoids and position indication.

5. Pressurizer block valves and position indication.

Items 1 and 2 are located near their respective reactor coolant pumps. Failure of a component associated with the ruptured RCS loop will not adversely affect the ability of the plant to respond to design basis accident. Equipment associated with the intact loops would be afforded some protection due to the separation distance between loops, therefore, the components are not expected to experience a strong acid environment. Additionally, the equipment in question are housed in metal enclosures that protect the vital parts from direct affects of the acidic spray.

The remaining items are located in the pressurizer enclosure. They all function to relieve the pressurizer to the pressurizer relief tank or to detect that relief is taking place. In these cases, if a break occurs upstream of relief or safety valve, these components cannot act to mitigate the effects of the brake. A break downstream is not a loss of coolant event as the leak can be isolated. Qualification of items 3 through 5 for acid spray, therefore, is not required.

Equipment outside of these areas would only be subjected to the basic containment spray with pH between 8 to 10.5 as outlined in Section 6.4.2.3 of the FSAR. Equipment in this category has either been tested in a basic spray environment or has been analyzed for the spray affects. In some cases, spray testing was not done at pH level as severe of most basic possible containment spray. Nevertheless, this equipment is considered to be qualified for its application since materials known to be reactive with the chemical spray have not been used in Containment and no failures resulted from the exposure of the equipment to the very high pH (usually pH 9 or above) conditions that these items were subjected to in their respective test programs.

2.2 (b) Outside Containment (HELB/Fluid Recirculation)

The areas defined as subject to harsh environments outside the Containment Building were the Main Steam Support Structure and the Auxiliary Building. The Normal Environment for these areas was defined as:

Temperature	50°F - 115°F (104°F Aux. Bldg.)
Pressure	15 psia
Humidity	20% - 100%
Chemical Spray	None
Radiation	4×10^5 R over 40 yrs. (in Auxiliary Building)

For the Auxiliary Building the accident environment was defined as:

Temperature	50°F - 104°F
Pressure	15.5 psia
Humidity	20% - 100%
Chemical Spray	None
Radiation	. 2×10^8 R/hr + 2×10^8 R for equipment in contact with reactor coolant . 2×10^7 R/hr for equipment in areas containing recirculating reactor coolant . 4×10^5 R/hr for hallways below 45' elevation . Background for areas above 45' not containing recirculating reactor coolant or waste gas

Although 79-01B required review against FSAR requirements, much of the Auxiliary Building equipment covered by the Master List was also equipment that was addressed by the shielding analysis required by NUREG 0578. In these cases, decisions to replace or modify equipment was based upon the radiation doses expected as a result of the NUREG 0578 source term rather than the less harsh FSAR requirement.

For the main steam support structure, the HELB Environment was defined as:

Temperature	225°F
Pressure	4.3 psig
Humidity	100%
Chemical Spray	None
Radiation	Background

This was based on an analysis contained in PGE 1004. The conditions defined by this analysis are shown in PGE-1025 figures 3.3 and 3.4. These profiles show transient peaks of 242°F and 10 PSIG pressure, decaying within 1 second to the above conditions.

Since the main steam support structure is largely open to the atmosphere, it was assumed that the steady-state temperatures and pressures arrived by by PGE 1004 would continue for about 1 hour before conditions returned to normal. This was considered to be conservative.

2.3 Equipment/component Evaluation Worksheet Review

The licensee's submittal of September 5, 1980 contained 426 equipment/component environmental qualification worksheets which detailed, in accordance with IEB-79018, qualification requirements and qualification supporting documentation for components subject to harsh environments. This submittal also contained as enclosures an "Open Item Resolution Plan Summary" and a "Technical Evaluation Supporting Continued Operation Pending Qualification". These submittals were reviewed and itemized in five categories:

(a) Equipment Qualified for Plant Life.

(b) Equipment Qualified with Restrictions.

(c) Equipment Exempt from Qualification.

(d) Equipment whose Qualification is Unresolved.

(e) Equipment not Qualified.

The equipment in each category was reviewed with the licensee during a regional based inspection on October 27-31, 1980 (Inspection Report 50-344/80-27). Licensee clarifications and modifications made during that inspection are incorporated in this listing.

2.3(a) Equipment Qualified for Plant Life

Review of the licensee's September 5, 1980 submittal and modifications to that submittal discussed during the October 27-31, 1980 site visit (Inspection Report 50-344/80-27), disclosed the following components whose qualification meets all applicable requirements of the DOR guidelines or NUREG0588. (7 Items)

1. MOTOR OPERATED VALVES, LIMITORQUE, SMB-0, SMB-00, SMB-000 SMB-2, AND SMB-3

Function: Various (see worksheet pages) (containment, MSSS, Aux.)

Test Report: Limitorque Report 80003, Limitorque Report 600198, Limitorque Report 600456, and Limitorque Report 600376A as applicable

Reference: Component worksheet (Rev. K) pages:

SMB-0: 164, 165, 166, 167, 168 and 169.
SMB-00: 38, 39, 40, 42, 43, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 62, 63, 64, 65, 67, 140, 141, 144, 145, 146, 147, 148, 177, 178, 179, 180, 263, 264, 294, 295.
SMB-000: 48, 66, 68, 69, 70, 97, 98, 99, 100, 113, 114, 237, 238, 239, 240, 242, 243, 244, 245, 269, 270, 286, 287, 288, 289, 291, 292, 293, 312, 313, 316 and 318.
SMB-3: 128, 181,
SMB-2: 117, 119

2. SPLICES, RAYCHEM, WCSF-N

Function: Conductor (Containment)

Test Report: Raychem Report #FC-4033-3 (1/75.)

Reference: Component worksheet (Rev. K), page 21

3. FEEDTHROUGH, CONAX, N11001-33

Function: Environmental seal. (Containment)

Test Report: Conax Report IPS409.

Reference: Component worksheet (Rev. K), page 22.

4. CABLE, OKONITE, 350MCM, 5KV, EP

Function: Conductor (Aux).

Test Report: IEEE Paper G8TP651.

Reference: Component Worksheet (Rev. K), page 23.

5. TERMINAL BLOCK, GE, EB-5

Function:	Connections (Aux.)
Test Report:	Connecticut Yankee Report dated 3/16/78.
Reference:	Component worksheet (Rev. K), pages 101, 102, 223, and 260

6. LIMIT SWITCH, NAMCO, EA170 300 SERIES

Function:	Various (see component worksheet) (Aux.)
Test Report:	ACME - Cleveland Report Model EA 170 3/17/78.
Reference:	Component worksheet (Rev. K), pages 139, 161, 212, 213, 214, 217, 219 and 311

7. CABLE ROCKBESTOS, 600V, XLPE

Function:	Conductor (Aux.).
Test Report:	Carro Rockbestous Report "Qualification of Firewall III class 1E Electric Cables" 2/1/77
Reference:	Component worksheet (Rev. K), page 3.

2.3(b) Equipment Qualified with Restrictions

Review of the licensee's September 5, 1980 submittal and modifications to that submittal discussed during the October 27-31, 1980 site visit (Inspection Report 50-344/80-27), disclosed the following components qualified to the DOR guidelines with certain exceptions such as equipment qualification for service life less than plant life (40 years) or equipment requiring modifications to meet qualification requirements such as relocation or shielding. For these components the licensee's schedule for resolution as detailed in the "Open Item Resolution Plans" (submitted with September 5, 1980 response), is summarized. (11 items)

1. PRESSURE AND DIFFERENTIAL PRESSURE TRANSMITTERS BARTON 763 & 764

Function: RCS and pressurizer pressure indication, RHR isolation valve interlock, steam generator level indication and RPS/ESSFAS inputs.

Problem: Thermal age testing incomplete.

Resolution: Qualify per IEEE 323-1974 by July, 1981. Establish periodic replacement intervals based on results of qualification tests by January, 1982.

Basis for Operation: Manual initiation of RPS/ESFAS and/or automatic trips available. Although component has not been tested for design basis accident conditions after accelerated aging for the design life, common mode failure of all components as a result of a harsh environment is unlikely as age-related failures normally occur over a fairly large band of time. It is not expected that the post-accident temperature conditions will compress this failure band sufficiently to cause failure of all redundant components of this type during the course of the accident.

Test Report: Westinghouse letter NS-TMA-2184 12/21/79.

Westinghouse letter POR-80-26 2/29/80.

Reference: Component worksheet (Rev K), pages 273, 274, 275, 277, 278, 279, 280, 281, 283, 284, 354, 355, 356, and 357.
Open Item Resolution, page 10.
Tech. Eval. Sup. Continued Ops., Item 10.

2. RTD, ROSEMOUNT, 176KF

Function: Various (see component worksheet) Containment).

Problem: The RTD's are mounted in wells within RCS piping. The total radiation dose received may be greater than the 1 X 10^{9} rad qualification dose, requiring periodic replacement of the component.

Resolution: Replacement schedule to be determined by April, 1981.

Test Report: WCAP 9157

Reference: Component worksheet (Rev. K) pages 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, and 382.

3. MOTOR ALLIS-CHALMERS GV

Function:	Containment spray pump motors (Aux.)
Problem:	Qualification testing demonstrates a minimum qualified life of 27 years.
Resolution:	Participate in Allis-Chalmers test program.
Test Report:	Siemans-Allis Report Order #8-90200.
Reference:	Component worksheet (Rev. K), pages 271 and 272. Open Item Resolution, page 19. Tech. Eval. Sup. Continued Ops., Item 19.

4. SOLENOID VALVES, ASCO, SERIES NP

Function:	NP8316B4E containment isolation valve solenoids (containment); pressurizer pilot operated relief valve solenoid.
Problem:	Minimum qualified life demonstrated to be 8 years at 120 F. (installed 6/80).
Resolution:	(a) Determine if age qualification can be extended. (b) Develop a replacement schedule by April, 1981. (1st replacement now planned for 1984 refueling outage)
Test Report:	Automatic Switch Company Report AOS21678H12 3/78.
Reference:	Component worksheet (Rev. K), pages 153, 154, 155, 156, 157, 158, 300, 301, 302, 303, and 320. Open Item Resolution, page 21. Tech. Eval. Sup. Continued Ops, Item 21.

6. CABLE, AMERICAN WIRE & CABLE, VARIOUS 300V, EP

Function:	Conductor (containment).
Problem:	Testing demonstrated minimum qualified life of 25 years.
Resolution:	Obtain qualification data from plants committed to IEEE 323-1974, or participate in 40 year life testing.
Test Report:	FIRL Report #F-C3463. FIRL Report #F-C3125 American insulated wire test 6/14/73 QA reel 84 frame 706
Reference:	Component worksheet (Rev. K) pages, 1, 2, 17, 19 and 20. Open Item Resolution, page 31. Tech. Eval. Sup. Continued Ops, Item 31.

7. LIMIT SWITCH, NAMCO, EA180

Function:	Various (see component worksheet) (Containment)
Problem:	Qualified for four year life.
Resolution:	Develope Replacement schedule by April, 1981.
Test Report:	ACME-Cleveland Report on Model EA180 switch 9/3/78. NAMCO Study estimation of EA180 qualified life.
Reference:	Component worksheet (Rev. K), pages 137, 138, 160, 215, 308 and 309.

8. SOLENOID VALVES, ASCO, VARIOUS

Function: Various (See component worksheet) (Containment, Aux)

Problem: Aging can cause failure in a non-safe mode.

Resolution: Periodic replacement scheduled to be determined by April, 1981.

Test Report: Westinghouse letter NS-CE-69.

Reference: Component worksheet (Rev. K), pages:

WPL88300B64F	- 188, 189, 190*, 191*, 192*, 193*, 194*, 195*, 196*, 197*, 198*, 199*, 200*, 201*, 202*, 203*, 204*, 205*, 206*, 208*, 209, 211
FT80033	- 422
FT831J654	- 207
F1831654	- 169
HT80073	- 421
HT8033	- 132
HT8320A36	- 419, 420
8320A90HT	- 131
L8831054	- 210
L0831654	- 310
8316C35HT	- 256, 257, 258, 259
8602826	- 315
FT8320101	- 321
HT8302828RU	- 314
8302C28RU	- 317, 319

*Note: These components are located inside containment. Qualification is by analysis only. The licensee states:

> All ASCO non-NP solenoid valves on the 79-018 master list control air-operated valves that attain their desired safety position upon loss of air. The Westinghouse analysis referenced as the qualification document demonstrates that for design basis accident conditions the only credible failure mode is in a position which vents the air operator thus placing the associated valve in its safe state. Therefore, during a loss-of-coolant accident or high-energy line break, any given ASCO non-NP solenoid valve can only act in one of two ways. It can perform its function by going to the vent position when called upon by the engineered-safety feature actuation system signal, or it can fail prior to receiving the ESFAS signal, thus placing the associated valve in the safe condition prior to receiving safety system actuation. Since premature actuation of the associated valves will not adversely effect the plant's ability to respond to a LOCA or HELB, it is felt that the referenced analysis adequately qualifies the ASCO non-NP solenoid valves for their Class 1E service in Trojan.

9. LEVEL TRANSMITTER, FISCHER PORTER 13D2493

Function:	LT2069A and LT2069B sodium hydroxide tank level transmitters (AUX.).
Problem:	Qualification testing did not address thermal aging.
Resolution:	Perform analysis to determine if materials used are susceptable to thermal degradation by January, 1981. If necessary, replace with transmitters qualified to IEEE 323-1974 by June, 1981.
Test Report:	Fischer Porter Report DP#2224-1, RP#001 10/22/73.
Reference:	Component worksheet (Rev. K), pages 261 and 262. Open Item Resolution, page 3. Tech. Eval. Sup. Continued. Ops., item 3.

10. FLOW TRANSMITTER, FISCHER PORTER 10B2495

Function:	FT3043C and FT3043D Aux. feedwater flow Transmitters (MSSS).
Problem:	Testing did not address thermal aging.
Resolution:	Replace with Rosemount Model 1153 by June 1982. per NUREG 0578. Develope a replacement schedule by April, 1982.
Test Report:	NCAP 7410-L.
Reference:	Component worksheet (Rev. K), pages 95 and 96. Open Item Resolution, page 1. Tech. Eval. Sup. Continued Ops., Item 1.

11. PENETRATIONS, AMPHENOL

Function:	Electrical connection (containment).
Problem:	Testing did not address thermal aging or sufficiently envelope required operating times as defined by the licensee for the 79018 review (see paragraph 2.2(a)), however FSAR requirements met.
Resolution:	Perform further investigation/testing by June, 1981. Repair or replace by June, 1982.
Basis for Operation:	Materials of construction are not expected to be susceptible to thermal degredation. Testing demonstrates FSAR requirements for operating time.
Test Report:	Amphenol Report 123-1236 3/23/72.
Reference:	Component worksheet (Ref. K), pages 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36 and 37. Open Item Resolution, page 28. Tech. Eval. Sup. Continued Ops., Item 28.

2.3(c) Equipment Listed but Exempt From Qualification

In the September 5, 1980 submittal, the licensee did not list any equipment items in this category. It is noted, however, that the licensee did not include equipment subject to line breaks in the auxiliary feedwater pump rooms, as these redundant trains are separated from each other as well as the effects of a main steam or feedwater break.

2.3(c) Equipment with Unresolved Qualification

Review of the licensee's September 5, 1980 submittal and modifications to that submittal discussed during the October 27-31, 1980 site visit (Inspection Report 50-344/80-27), disclosed the following components whose qualification to DOR guidelines was incomplete. For these components the licensee's schedule for qualification as detailed in the "Open Item Resolution Plans" and basis for continued operation as stated in "Technical Evaluation Supporting Continued Operation Pending Qualification..." (both submitted with the September 5, 1980 response), are summarized. (18 items).

1. LEVEL SWITCH, FISCHER PORTER, LS38365

Function:	Containment sump level indication. (Containment)
Problem:	No environmental testing has been performed.
Resolution:	Install qualified level transmitters per NUREG 0578 by April, 1981.
Basis for Operation:	Component function is indication only.
Reference:	Component evaluation worksheet, (Rev. K), pages 109 and 110.

2. I/P CONVERTER, FISCHER, 546

Function:	FV616 and FV607 RHR flow control (I/P converter must not cause flow control valve to close spuriously) (Aux.).
Problem:	Qualification testing for thermal aging and auxiliary building radiation environment has not been performed.
Resolution:	Analysis to determine if component is constructed of materials susceptible to degradation as a result of thermal aging or irradiation, or to determine if all credible failure modes are acceptable by December 1980. Evaluation of acceptability of disabling controller during power operation by February, 1981. Replacement by April 1981.
Basis for Operation:	Vendor states component manufactured of materials appropriate for postulated accident environment. Valve failure is in safe (open) position; manual flow control possible by other valves.
Test Report:	None listed.
Reference:	Component worksheet (Rev. K), pages 107 and 108. Open Item Resolution, page 4. Tech. Eval. Sup. Continued Ops., Item 4.

3. FLOW INDICATING SWITCH, BARTON 288A

Function:	Aux. feedwater flow switches (MSSS).
Problem:	No qualification information.
Resolution:	Obtain qualification data from Barton by January, 1981, or replace with qualified switch by June, 1982.
Basis for Operation:	The equipment is located in a room that does not contain a high energy line or is prone to submersion. However, since the room communicates with the main steam and feedwater line area via a small overhead hatch opening, the temperature and pressure curves for that portion of the main steam line support structure were conservatively applied. In event of an HELB in this area, however, steam is expected to vent through the open top of the main steam line support structure without affecting the lower portion of the building. Also, the effects of an HELB will largely be confined to one compartment of the main steam line support structure and is not likely to affect equipment in the other three compartments (PGE-1004). Therefore, it is expected that these components will not see the harsh environment presently assumed for evaluation purposes. Confirmatory analysis is currently underway to support this conclusion.
Test Report:	None listed.
Reference:	Component worksheet (Rev. K), pages 87, 88, 89, 90, 91, 92, 93 and 94. Open Item Resolution, page 6 Tech. Eval. Sup. Continued. Ops., Item 6.

4. PRESSURE TRANSMITTER FOXBORO E13DH-ISAM2

Function:	Pressurizer level indication and ESFAS input (containment)
Problem:	Instrument contains materials known to be susceptible to thermal age degradation, however qualified life is unknown.
Resolution:	Analysis to determine if replacement of a limited number of component parts can eliminate age degradable material and replace these parts by May, 1981. Industry test program to qualify Foxboro transmitters to IEEE-323-1974 by January, 1982.
Basis for Operation:	Although component has not been tested for design basis accident conditions after accelerated aging for the design life, common mode failure of all components as a result of a harsh environment is unlikely as age-related failures normally occur over a fairly large band of time. It is not expected that the post-accident temperature conditions will compress this failure band sufficiently to cause failure of all redundant components of this type during the course of the accident.
Test Report:	ICAP 841.
Reference:	Component worksheet (Rev. K), pages 350, 351 and 352. Open Item Resolution, page 11. Tech. Eval. Sup. Continued Ops., Item 11

5. SURFACE MNT. RTD, BURNS PDR-820

Function:	PSV and PORV tailpipe temperature (containment).
Problem:	Qualification testing has not been performed.
Resolution:	Analysis of failure modes and effects and material susceptibility to LOCA failure by January 1981. Replacement if necessary by June 1982.
Basis for Operation:	Component function is indication only.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 304, 305, 306 and 307. Open Item Resolution, page 13. Tech. Eval. Sup. Continued Ops., Item 13.

6. ACOUSTIC MONITORS TEC 500

Function:	Pressurizer Safety Valve and PORV position detection (containment).
Problem:	Qualification testing has not yet been performed.
Resolution:	Participate in TEC test program and perform necessary modifications by June, 1982. Establish periodic replacement program by June, 1982.
Basis for Operation:	Component function is indication only.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 296, 297, 298 and 299. Open Item Resolution, page 15. Tech. Eval. Sup. Continued Ops., Item 15

7. RADIATION MONITOR VICTOREEN 847-1

Function:	Auxiliary Building area radiation monitors (emergency procedures refer to use of these detectors to identify ECCS leaks) (Aux.)
Problem:	Qualification testing for thermal aging and radiation has not been performed.
Resolution:	Perform analysis for age degradable or radiosensitive materials by December, 1980. Install shielding as required by Feb, 1981. Replace with IEEE 323-1974 qualified device by June, 1982.
Basis for Operation:	Component function is indication only.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 324 and 325. Open Item Resolution, page 16 Tech. Eval. Sup Continued Ops. Item 16.

8. HYDROGEN RECOMBINERS, WESTINGHOUSE

Function:	Containment Hydrogen Control (containment).
Problem:	(a) Internal cabling not subjected to thermal age test. (b) Qualification of splice to field cable unknown.
Resolution:	Perform analysis of cable material by January, 1981. Replace if necessary by April, 1982.
Basis for Operation:	Hydrogen Vent system performs redundant or commensurate function.
Test Report:	WCAP 77096
Reference:	Component worksheet (Rev. K), pages 226 and 227. Open Item Resolution, page 17. Tech. Eval. Sup. Continued Ops, Item 17.

9. FAN MOTORS WESTINGHOUSE SBDP

Function:	ICCC and containment spray pump room air coolers (Aux.).
Problem:	Qualification for aging and aux building radiation has not been performed.
Resolution:	Analysis of materials to evaluate susceptibility to aging or radiation damage by January 1981, replace if necessary by June, 1982.
Basis for Operation:	Some natural convection room cooling available following motor failure; building ventilation also available if room doors are manually opened.
Test Report:	None.
Reference:	Component Worksheet (Rev. K), pages 71, 72, 73, 74, 75, 76, 77 and 78. Open Item Resolution, page 10. Tech. Eval. Sup. Continued Ops, Item 18.

10. SOLENOID VALVES, R.G. LAURENCE 125434W/110114W

Function:	Steam line isolation valve solenoids (MSSS)
Problem:	Solenoid valves have not been tested to demonstrate operability in the main steam support structure environment during HELB.
Resolution:	Test or replace by June, 1982.
Basis for Operation:	Redundant or commensurate function in non-safety related turbine stop and control valves and safety related check valves. The equipment is located in a room that does not contain a high energy line or is prone to submersion. However, since the room communicates with the main steam and feedwater line area via a small overhead hatch opening, the temperature and pressure curves for that portion of the main steam line support structure were conservatively applied. In event of an HELB in this area, however, steam is expected to vent through the open top of the main steam line support structure without affecting the lower portion of the building. Also, the effects of an HELB will largely be confined to one compartment of the main steam line support structure and is not likely to affect equipment in the other three compartments (PGE-1004). Therefore, it is expected that these components will not see the harsh environment presently assumed for evaluation purposes. Confirmatory analysis is currently underway to support this conclusion.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 403, 404 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, and 418 Open Item Resolution, page 20. Tech. Eval. Sup. Continued Ops., Item 20.

11. TERMINAL BOARDS, SQUARE D, 823

Function:	Reactor coolant system RTD terminations (containment).
Problem:	Environmental qualification testing has not been performed.
Resolution:	Replace with terminal blocks qualified to IEEE 323-1974 by April 1982.
Basis for Operation:	Material and construction appear similar to qualified terminations.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348 and 349. Open Item Resolution, page 33. Tech. Eval. Sup. Continued Ops., Item 33.

12. CONNECTORS, AMPHENOL, 52975-1051 & 52175-1053

Function:	Field wiring to penetration connectors for power range flux monitoring system (containment).
Problem:	Environmental qualification testing was not been performed on these items.
Resolution:	(a) Shrink WCSF-N sleaving around connectors by April, 1981. (b) Participate in qualification test program.
Basis for Operation:	Most likely failure modes will initiate safety function.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 321 and 323. Open Item Resolution, page 29. Tech. Eval. Sup. Continued Ops, Item 29.

13. MOTOR, WESTINGHOUSE, HSDP

Function:	RHR pump (Aux.) centrifugal charging pump (Aux.) SIS pump (Aux.).
Problem:	(1) Qualification of lubrication system in question. (2) Environmental qualification of insulation on motor terminations is in question.
Resolution:	(1) Evaluate applicability of lubricants; replace with qualified lubricants by June, 1982. (2) Replace with qualified insulation by June, 1982.
Basis for Operation:	(1) Vendor indicates lubricants will survive radiation environment (no test reports). (2) Terminations are protected in terminal boxes.
Test Report:	WCAP 8754 WCAP 2829
Reference:	Component Worksheet (Rev. K), pages 129, 130, 131, 132, 134 and 135. Open Item Resolution, pages 26 and 27. Tech. Eval. Sup. Continued Ops, Items 26 and 27.

14. MOTOR RELIANCE, SERIES 2000

Function:	Cont. Cooling Fan (Containment).
Problem:	(1) Qualification of lubrication system in question. (2) Environmental qualification of insulation on motor terminations is in question.
Resolution:	(1) Evaluate applicability of lubricants; replace with qualified lubricants by June, 1982. (2) Replace with qualified insulation by June, 1982.
Basis for Operation:	(1) Vendor indicates lubricants will survive radiation environment (no test reports) (2) Terminations are protected in terminal boxes.
Test Report:	Joy Report on Fan Model #60-30-120.
Reference:	Component Worksheet (Rev. K), pages 224, 225, 229, 230, 231, 232, 233, 234, 235 and 236. Open Item Resolution, pages 26 and 27. Tech. Eval. Sup. Continued Ops, Items 26 and 27.

15. MOTOR OPERATED VALVE, LIMITORQUE, SMB-00, SMB-000, SMB-3

Function:	Component cooling water (isolation valve for spare containment air cooler; ECCS recirculation (sump isolation valve); post accident H_2 analysis (containment)
Problem:	Uncertainty about installed component serial numbers on these four components did not allow identification of applicable test reports.
Resolution:	All other similarly applied operators are appropriately qualified. There is a discrepancy between shop order number and recorded serial number that does not allow an affirmative judgement in these cases until they can be inspected at next shutdown (April, 1981).
Basis for Operation:	There are redundant air coolers; ECCS recirculation would fail in safe (open) position; and there is a redundant H_2 analysis flowpath.
Test Report:	Unknown
Reference: (4)	Component worksheet (Rev. K), pages 61, 111, 112, and 241 Open Item Resolution, page 22. Tech. Eval. Sup. Continued Ops., Item 22.

16. MOTOR OPERATED VALVES, LIMITORQUE SMB-00

Function:	Aux feedwater isolation. (MSSS)
Problem:	Modulatronic position controlled operators. Control circuitry and motors have not been tested for main steam support structure HELB environment.
Resolution:	Replace or modify by June, 1982.
Basis for Operation:	Valves are normally open and would fail as is. The equipment is located in a room that does not contain a high energy line or is prone to submersion. However, since the room communicates with the main steam and feedwater line area via a small overhead hatch opening, the temperature and pressure curves for that portion of the main steam line support structure were conservatively applied. In event of an HELB in this area, however, steam is expected to vent through the open top of the main steam line support structure without affecting the lower portion of the

building. Also, the effects of an HELP will largely be confined to one compartment of the main steam line support structure and is not likely to affect equipment in the other three compartments (PGE-1004). Therefore, it is expected that these components will not see the harsh environment presently assumed for evaluation purposes. Confirmatory analysis is currently underway to support his conclusion.

Test Report: None listed.

Reference: Component worksheet (Rev. K), pages 79, 80, 81, 82,83, 84, 85 and 86.
(8) Open Item Resolution, page 23.
Tech. Eval. Sup. Continued Ops, Item 23.

17. MOTOR OPERATED VALVES, LIMITORQUE SMB-00, SMB-000, SMB-2, SMB-3.

Function: Various (see ref.) (containment).

Problem: Radiation qualification of motors uncertain, operators otherwise qualified.

Resolution: Obtain qualification information or replace by April, 1982.

Basis for Operation: All motor nameplates indicate Class RH or RADCLI insulation. Vendor indicates they are probably qualified.

Test Report: Limitorque Report #600198
Limitorque Report #600376A
Limitorque Report #600456

Reference: Component worksheet (Rev. K), pages 56, 60, 118
Open Item Resolution, page 24.
Tech. Eval. Sup. Continued Ops., Item 24.

16. MOTOR OPERATED VALVES, LIMITORQUE SMB-000

Function:	Containment air cool. flow reg.
Problem:	No documentation to support qualification to containment environment.
Resolution:	(1) Evaluate operators to determine if qualification test reports for containment qualified operators can be applied by June 1981. (2) Replace with operators qualified for containment service by June 1982.
Basis for Operation:	(1) Operators are either normally in safety position or attain safety position ear in accident. (2) Documentation available that demonstrates operability in less harsh steam environments. (3) Operators similar to limitorques qualified for operation in containment accident environment. (4) For operators not normally in safety position, the operators in the redundant train are qualified for accident environment.
Test Report:	Limitorque Report 80003.
Reference:	Component Worksheet (Rev. K) Pages 41, 44, 45, 46, 47, 149 and 290.

2.3(e) Equipment Not Qualified

The following equipment was found to be not qualified for it's required harsh environment service after review of the component evaluation worksheets submitted with the licensee's September 5, 1980 response and discussion with the licensee during the October 27-31, 1980 site visit (Inspection Report 50-344/80-27). The licensee's schedule for replacement as stated in the "Open Item Resolution Plans" and basis for continued operation as stated in the "Technical Evaluation Supporting Continued Operation Pending Qualification...", both submitted with the September 5, 1980 response, are summarize for each component. (8 Items)

1. OKONITE, TRIAX CABLE, 5KV, EP

Function: Power range flux monitoring and reactor trip.

Problem: Internal insulation melts at design basis accident temperatures.

Resolution: (a) Replace with qualified cable by May, 1982.

(b) Analysis to demonstrate that insulation will not be affected during the short time period (60 sec) required for operation.

Basis for Operation: Most probable failure mode of cable (short) will result in initiation of safety function.

Test Report: None.

Reference: Component evaluation worksheet (Rev. K), page 18.
Open Item Resolution, Page 30.
Tech. Eval. Sup. Continued Ops., Item 30
LER: None; nuclear instrumentation not subject to IEB-79018 requirements per supplement 2, answer 12.

2. DIFFERENTIAL PRESSURE TRANSMITTER, BARTON 384

Function: Various (see ref.) (containment, Aux.)

Problem: (a) Testing demonstrates that In-Containment transmitter will not operate for the time required by IEB 79-01B.

(b) Qualification testing has not been performed for aging or Auxiliary Building radiation environment. Barton 384's have survived testing to 2×10^8 R, however, it is not clear that sufficient similarity exists to apply test results here.

Resolution: (a) Replace Containment Transmitters with Barton 764s by April, 1981.

(b) Perform analysis to determine if outside containment transmitters have materials that would be susceptible to thermal aging or radiation degradation in the Aux. Building environment by November, 1980.

Evaluate thermal aging and radiation exposure history of Containment units to determine if qualification can be based upon operating experience.

Replace with transmitters qualified to IEEE 323-74 by June, 1982.

Basis for Operation: (1) For transmitters mounted in the Auxiliary building (flow indication for RHR, SIS, and charging pumps) there is indirect means such as RCS pressure and temperature provide flow indication.

(2) For S/G level transmitters redundant information is provided via Barton 763/764 qualified except for aging.

(3) Steam flow transmitters: For inside containment main steam line breaks (MSLB) alternative trip function is provided by steam line high differential pressure trip and containment high pressure trip both located outside containment.

Reference: Component evaluation worksheet (Rev. K), pages 103, 104, 105, 106, 162, 163, 276*, 282*, 383*, 384*, 385*, 386*, 387*, 388*, 389* and 390*
Open Item Resolution, page 7.
Tech. Eval. Sup. Continued Ops., Item 7.
LER: 80022 (Attachment 4)

*Note: Installed in containment (S/G level and steam flow).

3. PRESSURE TRANSMITTERS, BARTON 345

Function: Steam line pressure indication and ESFAS input (MSSS). SIS pressure indication, and charging pump pressure indication (Aux.).

Problem: Qualification test reports specifically applicable to this model are not available and qualification does not appear possible.

Resolution: Replace with transmitters qualified to IEEE-323-1974 by June, 1982.

Basis for Operation: Manual initiation of ESFAS and/or automatic trips available. Other means available for flow indication on SIS and charging pumps.
For equipment mounted in MSSS structure it is located in a room that does not contain a high energy line or is prone to submersion. However, since the room communicates with the main steam and feedwater line area via a small overhead hatch opening, the temperature and pressure curves for that portion of the main steam line support structure were conservatively applied. In event of an HELB in this area, howeve , steam is expected to vent through the open top of the main steam line support structure without affecting the lower portion of the building. Also, the effects of an HELB

will largely be confined to one compartment of main steam line support structure and is not likely to affect equipment in the other three compartments (PGE-1004). Therefore, it is expected that these components will not see the harsh environment presently assumed for evaluation purposes. Confirmatory analysis is currently underway to support this conclusion.

Test Report: None

Reference: Component worksheet (Rev. K), pages 186, 187, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401 and 402.
Open Item Resolution, page 6.
Tech. Eval. Sup. Continued. Ops, Item 6.
LER: 80-22 (Attachment 4)

4. PRESSURE TRANSMITTER, BARTON 389

Function: PT403 RCS wide range pressure (containment).

Problem: Environmental qualification testing for this specific model has not been performed and qualification does not appear possible.

Resolution: Replace with BARTON Model 763 by April 1981.

Basis for Operation: Component function is indication only. Redundant RCS pressure indication and interlock provided via BARTON 763 pressure transmitters qualified except for aging.

Test Report: None.

Reference: Component worksheet (Rev. K), page 353.
Open Item Resolution, page 8.
Tech. Eval. Sup. Continued Ops., Item 8
LER: 80-22 (Attachment 4)

5. PRESSURE TRANSMITTER, BARTON 393

Function:	PT458 pressurizer pressure (containment) containment pressure (Aux.).
Problem:	Environmental qualification testing for this specific model has not been performed and qualification does not appear possible.
Resolution:	Replace PT458 (containment) with BARTON 763 by April 1981. Replace containment pressure transmitters with rosemount 1153's per NUREG 0578 by April, 1981.
Basis for Operation:	Redundant pressurizer pressure indication and PPS/ESFAS inputs provided by BARTON 763. Manual actuation available for containment spray system.
Test Report:	NCAP 7744 and Westinghouse letter NC-CE-692.
Reference:	Component worksheet (Rev. K), pages 220, 221, 222, 223 and 353. Open Item Resolution, page 9. Tech. Eval. Sup. Continued Ops., Item 9. LER: 80-22 (Attachment 4)

6. RTD BURNS, POR-302

Function:	RHR heat exchanger outlet temperature (Aux.).
Problem:	Contains material known to be susceptible to radiation damage.
Resolution:	Replace by June, 1982.
Basis for Operation:	Component function is indication only. Alternate qualified equipment (RCS and CCWS temperature) performs redundant or commensurate function.
Test Report:	None.
Reference:	Component worksheet (Rev. K), pages 133 and 134. Open Item Resolution, page 12. Tech. Eval. Sup. Continued Ops., Item 12. LER: 80-22 (Attachment 4)

7. LIMIT SWITCHES, NAMCO D2400X (EA 170 - SERIES 100)

Function: Valve seal-in on containment isolation and safety injection signal (Aux.) steamline isolation valve status indication (MSSS).

Problem: Qualification testing has not been performed and qualification does not appear possible.

Resolution: Replace by June, 1982, with NAMCO EA170 series 300's or EA180's (qualified components).

Basis for Operation: Normal and failed valve position is safe position (closed). Steam line isolation valve is status indication only.

Test Report: None.

Reference: Component Worksheet (Rev. K), pages 135, 136, 216, 218, 423, 424, 425, and 426.
Open Item Resolution, page 14
Tech. Eval. Sup. Continued Ops., Item 14
LER: 80-22 (Attachment 4)

8. MOTOR OPERATED VALVES, LIMITORQUE, SMB-0, SMB-00, SMB-000, SMB-1, SMB-2, AND SMB-4

Function: Various (containment, MSSS, Aux.)

Problem: Operator brakes can not be qualified for radiation environments as similarity to tested brakes is not clear.

Resolution: Replace brakes with limitorque SB conversion kit by June, 1982.

Basis for Operation: Some brakes have survived testing to 2×10^3R although it is not clear that sufficient similarity exists to apply test results to these units.

Test Report: Franklin Report F-C 3271
Limitorque Report 80003

Reference: Component Worksheet (Rev. K), pages 115, 116, 120, 121, 122, 123, 124, 125, 126, 127, 142, 143, 150, 170, 171, 172, 173, 174, 175, 176, 182, 183, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 265, 266, 267 and 268.
Open Item Resolution, page 25.
Tech. Eval. Sup. Continued Ops, Item 25.
LER: 80-22 (Attachment 4)

3.0 Summary

Due to the technical evaluation reporting requirements imposed by the Commission Order of May 27, 1980, this evaluation has been based on the licensee's submittal, made in response to IEB-79018 and the order for modification of license of August 29, 1980, dated September 5, 1980, and on interviews with licensee personnel involved with the environmental qualification effort during the week of October 27-31, 1980 (Inspection Report 50-344/80-27). The licensee's September 5, 1980 response did appear to address all items pertinent to the Trojan Plant required by IEB-79018 of January 14, 1980 and supplements 2 and 3 to this bulletin of September 29, 1980 and October 24, 1980 respectively.

The licensee's September 5, 1980 submittal included all safety-related equipment required to mitigate an accident (LOCA, HELB) and bring the plant to a Hot Safe Shutdown condition. The qualification information for additional equipment required to achieve and maintain a Cold Shutdown condition will be provided by the licensee by February 1, 1981 in accordance with IEB-79018, Supplement 3, of October 24, 1980.

The licensee's September 5, 1980 submittal included all installed TMI action plan equipment. Qualification information for TMI action plan equipment not yet installed will be submitted with the pre-implementation review data or by the implementation date in accordance with the requirements of IEB-79018, Supplement 3, of October 24, 1980.

A number of plant modifications have been made as a result of the environmental qualification review. Equipment identified as being required to operate while submerged has been relocated above submergence levels. The licensee stated during the October 27-31, 1980 inspection that no items, other than cables, are required to operate while submerged. New Barton 763 and 764 pressure transmitters and ASCO series NP solenoid valves were installed during the last refueling outage to replace equipment identified as unqualified. Further replacements of these components will be accomplished during the April, 1981 refueling outage. The licensee learned that environmental qualification tests of NAMCO EA180 limit switches were not applicable unless a seal was provided on the electrical cable entry into the switch. Conax seals were obtained and installed during the last refueling outage. In addition a number of electrical terminations for which environmental qualification was in question were repaired.

A number of components with age related failure modes or a qualified life of less than 40 years have been identified. A program for periodic replacement of these components will be instituted, in accordance with the Quality Assurance requirements of 10 CFR 50, Appendix B, by April, 1981. Also the licensee intends to review their procedures for control of replacement parts and implement changes as necessary to assure implementation of environmental qualification requirements.

A consultant, EDS nuclear, had been retained to compile vendor information and evaluate equipment qualification against NRC criteria. EDS nuclear, at the time of the October 27-31, 1980 inspection was tasked with maintaining files and documents supporting the environmental qualification of components as detailed in the September 5, 1980 response.

The inspector reviewed a PGE QA audit performed on May 7 and 8, 1980 to insure that the licensee was monitoring the consultant in the areas of Document Control and Quality Assurance Records. The Audit showed that EDS effectively implemented their responsibilities in these areas. The licensee intends to establish a central file system of environmental qualification records by December 1, 1980 in accordance with the October 24, 1980 order for modification of license.

The review of the licensee's IEB-79018 response disclosed 18 component types with unresolved qualification. The licensee has provided a schedule for resolution of open items and replacement of the components is necessary by June 30, 1982. The licensee also performed a technical evaluation to support continued operations pending qualification of these items. A summary of this evaluation is provided in the September 5, 1980 response.

The review of the licensee's IED-79018 response also disclosed 8 component types not qualified for harsh environment service. All but one of these components were reported in licensee event report 80-22. The missing item is cable used in the power range monitoring and reactor trip system, excluded from this review by IEB-79018, Supplement 2, answer 12. The licensee has provided a schedule for replacement of these components by June 30, 1982, and has performed a technical evaluation to support continued operations pending qualification of these items.

The licensee plans to make an additional submittal of environmental qualification information during December 1980 or January 1981. This submittal will update the September 5, 1980 response and will include information discussed during the October 27-31, 1980 inspection.

4.0 References.

Licensee Submittals:

	TITLE	DATE
IEB 7901	Response	June 12, 1980
IEB 79018	45 day response	March 7, 1980
IEB 79018	90 Day interim response	April 25, 1980
IEB 79018	90 day interim response	May 19, 1980
IEB 79018	Final response (per the order for modification of license of August 27, 1980)	September 5, 1980

Licensee Reports:

PGE-1026	Basis for IEB 79018 Response
PGE-1004	Trojan nuclear plant analysis of pipe system breaks outside containment

NRC Inspection Reports:

Inspection Report (50-344/80-08) April 16-18, 1980

Inspection Report (50-344/80-27) October 27-31, 1980

ATTACHMENT 1

TECHNICAL EVALUATION REPORT

ENVIRONMENTAL QUALIFICATION OF SAFETY

RELATED ELECTRICAL EQUIPMENT TO HARSH ENVIRONMENTS

IEE-79013

TROJAN

QUALIFICATION TEST REPORTS

This table details the qualification test reports referenced Portland General Electric Company's September 5, 1990 submittal in resp. to IEB-79018. These reports were extracted from the component eva. ion worksheets included with that submittal.

Ref. No.	Test Report or Document	Equipment Item
1.	FIRL Report F-C3463	American Wire Power and Instrument Cable
2	FIRL Report F-C3125	American Wire and General Cable Power and Instrument Cable
3.	American Insulated Wire Test 6/14/73 OA Reel 84 Frame 706	American Wire Instrument Cable
4.	Raycram Report #FC-4033-3 1/73	Raychem Splices
5.	Conax Report IPS 409	Conax Feedthroughs
6.	IEEE Paper 68TP651	Okonite Cable
7.	Amphenol Report 123-1206 3/20/73	Amphenol Penetrations
8.	Limitorque Report 50013	Limitorque Motor Operated Valve
9.	Limitorque Report #600193	Limitorque Motor Operated Valve
10.	Limitorque Report #600376A	Limitorque Motor Operated Valve
11.	Limitorque Report #600466	Limitorque Motor Operated Valve
12.	MCAP 7410-L	Fischer-Porter Flow Transmitter
13.	Connecticut Yankee Report Dated 3/16/73	GE Terminal Block

Ref. No.	Test Report or Document	Equipment Item
14.	FIRL Report C-2623 9/79	Barton Flow Transmitter
15.	Westinghouse Letter NC-CE-692	Barton Flow and Pressure Transmitter
16.	WCAP 7744	Barton Flow and Pressure Transmitter
17.	FIRL Report F-C 3271	Limitorque Motor Operated Valve
18.	WCAP 0754	Westinghouse Motor
19.	WCAP 7029	Westinghouse Motor
20.	Westinghouse Letter NS-CE-69	ASCO Solenoid Valve
21.	ACME-Cleveland Report on Model EA-180 Switch - 3/3/73	NAMCO Limit Switch
22.	NAMCO Study Estimation of EA-180 Qualified Life 2/27/80	NAMCO Limit Switch
23.	ACME - Cleveland Report Model EA-170 3/17/73	NAMCO Limit Switch
24.	Automatic Switch Company Report AOS 21678H12 3/78	ASCO Solenoid Valve
25.	Joy Report on Fan Model #60-30-120	Reliance Motor
26.	CAP 7709[illegible]	Westinghouse H_2 Recombiner
27.	Fischer Porter Report DP #2224-1, RP #001 10/22/73	Fischer-Porter Level Transmitter

Ref. No.	Test Report or Document	Equipment Item
28.	Siemens-Allis Report Order #8-90200	Allis Chacmers Motor
29.	Westinghouse letter NS-TMA-2184 12/21/79	Barton Level Transmitter
30.	Westinghouse letter PCR-80-26 2/29/80	Barton Level Transmitter
31.	WCAP 8541	Foxboro Level Transmitter
32.	WCAP 9157	Rosemount RTD
33.	CERRO Rockbestous Report "Qualification of Firewall III Class 1E electrical cables 2/1/71"	Cable

ATTACHMENT 2

TECHNICAL EVALUATION REPORT

ENVIRONMENTAL QUALIFICATION OF SAFETY
RELATED ELECTRICAL EQUIPMENT TO HARSH ENVIRONMENTS

IEB-79018

TROJAN

COMPONENT TYPE/MODEL LISTING

This table details the component types or models requiring harsh environment qualification per Portland General Electric Company's September 5, 1980 submittal to IE8-79018. These component types/models were extracted from the component evaluation worksheets included with that submittal.

Ref. No.	Component	Manufacturer	Type/Model
1.	Cable	AMERICAN WIRE	Various 300V, EP
2.	Cable	ROCKBESTOUS	Various 600V, XLPE
3.	Cable	GENERAL CABLE	Various, 600V, EP
4.	Triax Cable	OKONITE	5KV, EP
5.	Cable	OKONITE	350 MCM, 5KV, EP
6.	Splices	RAYCHEM	WCSF-N
7.	Feedthrough	CONAX	N11001-33
8.	Terminal Block	G. E.	EB-5
9.	Terminal Block	Square D	828
10.	Connector	AMPHENOL	52975-1051/52175-1053
11.	RTD	ROSEMOUNT	176KF
12.	Penetration	AMPHENOL	
13.	Limit Switch	NAMCO	D2400X (EA170 100 SERIES)
14.	Limit Switch	NAMCO	EA180

Ref. No.	Component	Manufacturer	Type/Model
15.	Limit Switch	NAMCO	EA170 300 SERIES
16.	Motor Op. Valve	LIMITORQUE	SMB-0
17.	Motor Op. Valve	LIMITORQUE	SMB-00
18.	Motor Op. Valve	LIMITORQUE	SMB-000
19.	Motor Op. Valve	LIMITORQUE	SMB-1
20.	Motor Op. Valve	LIMITORQUE	SMB-2
21.	Motor Op. Valve	LIMITORQUE	SMB-3
22.	Motor Op. Valve	LIMITORQUE	SMB-4
23.	Motor	WESTINGHOUSE	SBDP
24.	Motor	RELIANCE	Series 2000
25.	Motor	ALLIS CHALMERS	GV
26.	Motor	WESTINGHOUSE	HSDP

Ref. No.	Component	Manufacturer	Type/Model
27.	Solenoid Valve	ASCO	FT831J654/FT831654
28.	Solenoid Valve	ASCO	LB831054
29.	Solenoid Valve	ASCO	8316C35HT
30.	Solenoid Valve	ASCO	LB831654
31.	Solenoid Valve	ASCO	HT8302823RU
32.	Solenoid Valve	ASCO	8602B26
33.	Solenoid Valve	ASCO	8302C26RU
34.	Solenoid Valve	ASCO	FT8320101
35.	Solenoid Valve	ASCO	WPLB8300864RF
36.	Solenoid Valve	ASCO	FT80033
37.	Solenoid Valve	ASCO	NP8316546
38.	Solenoid Valve	ASCO	HT8033/HT80073
39.	Solenoid Valve	ASCO	8320A90HT
40.	Solenoid Valve	ASCO	HT8320A36
41.	Solenoid Valve	R. G. LAURENCE	125434W

Ref. No.	Component	Manufacturer	Type/Model-
42.	Solenoid Valve	P. G. LAURENCE	110114W
43.	Flow Switch	BARTON	288A
44.	Flow Transmitter	BARTON	384
45.	Flow Transmitter	FISCHER PORTER	10B2496
46.	Pressure Transmitter	BARTON	763
47.	Level/Flow Transmitter	BARTON	764
48.	Level Transmitter	FISCHER PORTER	13D2493
49.	PRESSURE TRANSMITTER	BARTON	389
50.	Pressure Transmitter	BARTON	393
51.	Pressure Transmitter	BARTON	345
52.	Level Switch	FISCHER PORTER	LS38365
53.	RTD	BURNS	POF-302
54.	Surface Mnt. RTD	BURNS	POR-320
55.	I/P Converter	FISCHER	546

Ref. No.	Component	Manufacturer	Type/Model
56.	Acoustic Monitor	TEC	500
57.	H_2 Recombiner	WESTINGHOUSE	
58.	Radiation Monitor	VICTOREEN	847-1
59.	Pressure Transmitter	Foxboro	E13DH-ISAM2

ATTACHMENT 3

TECHNICAL EVALUATION REPORT

ENVIRONMENTAL QUALIFICATION OF SAFETY RELATED ELECTRICAL EQUIPMENT TO HARSH ENVIRONMENTS

TER-7901B

TROJAN

HARSH ENVIRONMENT AREAS

These drawings detail areas considered subject to harsh environment conditions as reported in Portland General Electric Company's September 5, 1980 submittal in response to IEB-79018.

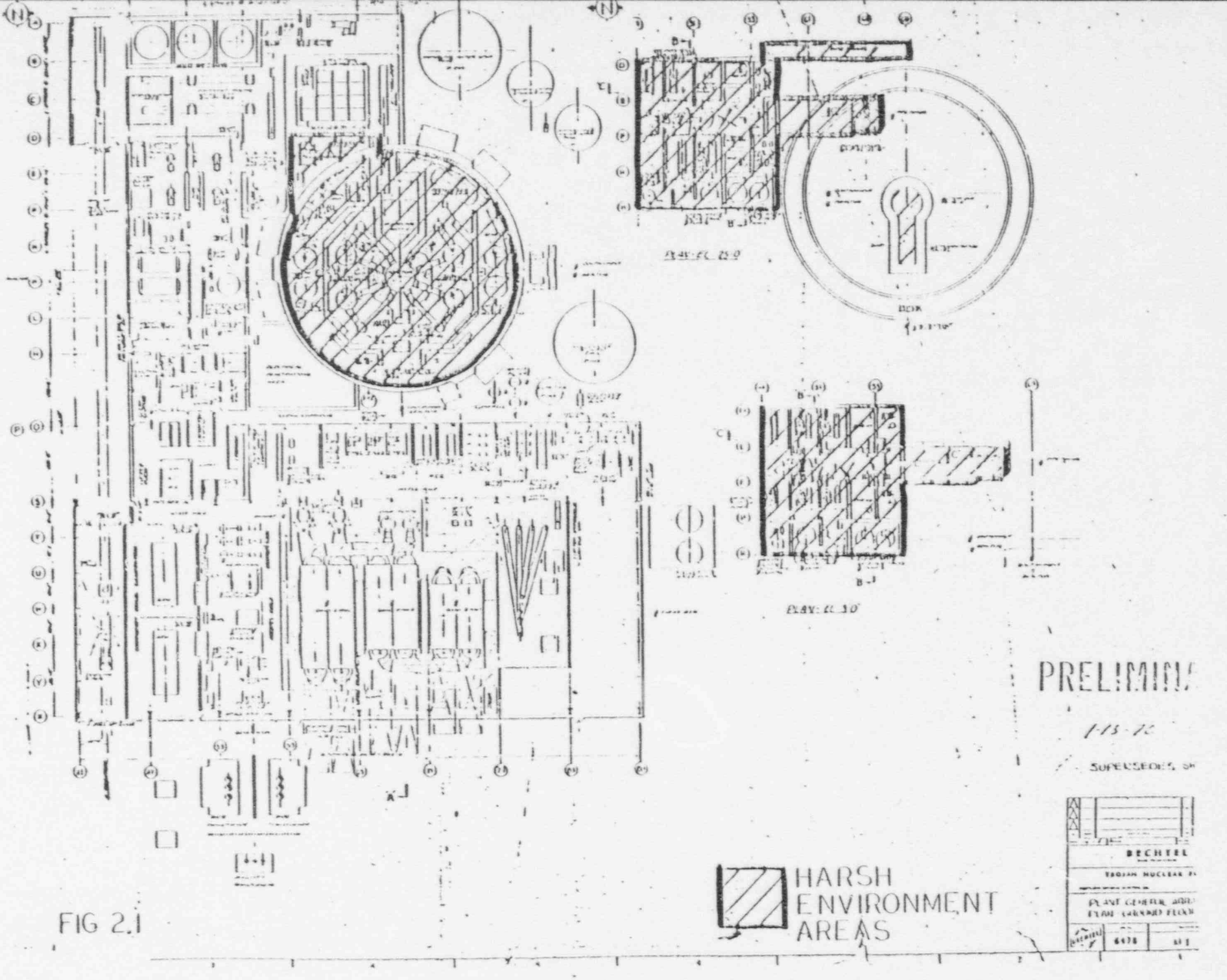


FIG 2.1

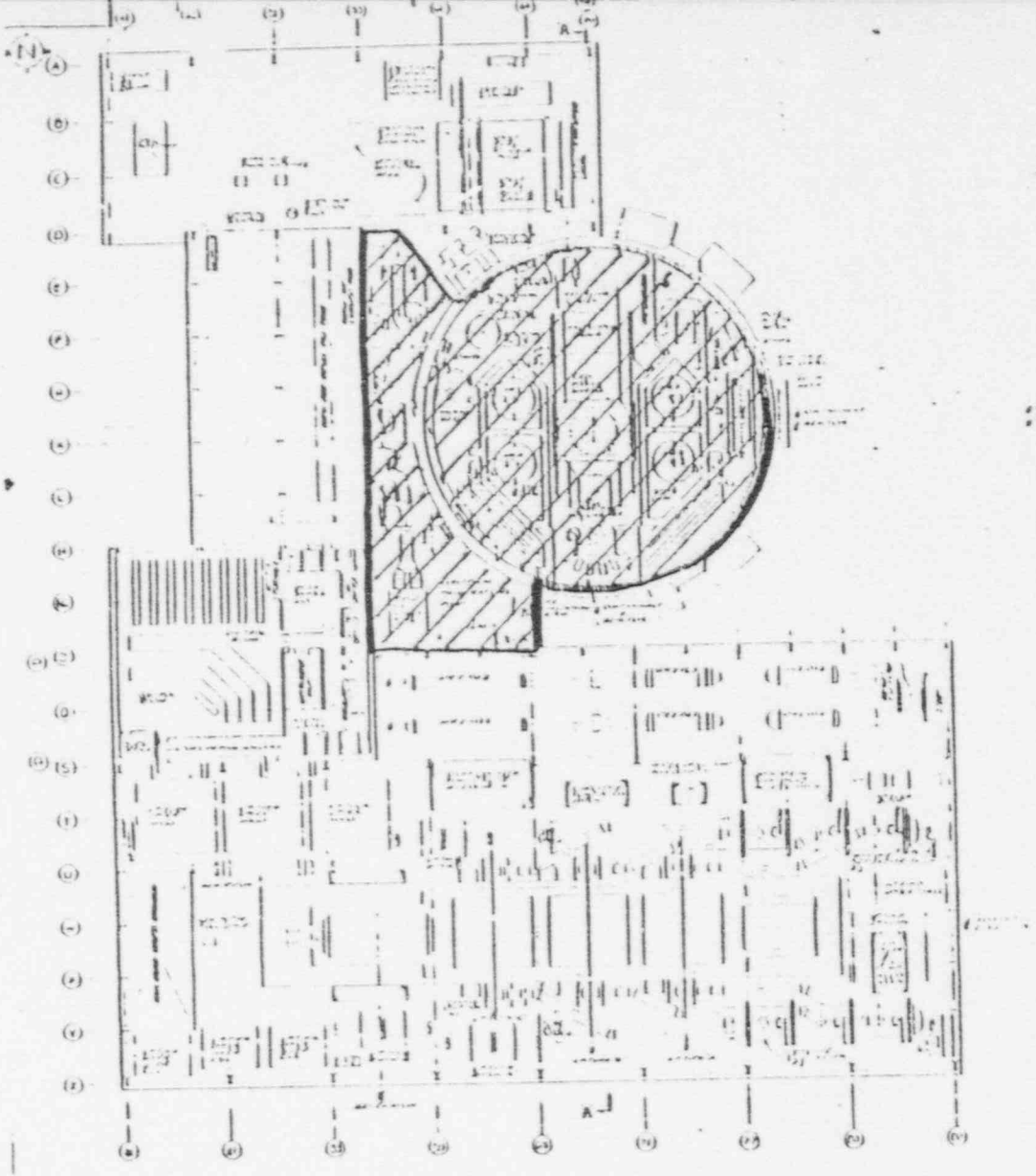
PRELIMINA

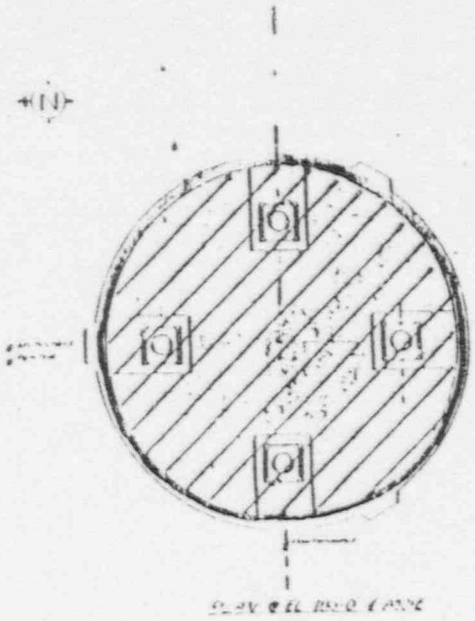
1-15-10

BECHTEL

PLANT CENTER ARRANGE
INTERMEDIATE LEVELS

FIG 2.2





PRELIMINARY

1-15-80

BECHTEL

TROJAN NUCLEAR PLANT

PLANT GENERAL ARRANGEMENT
PLAN OF AUXILIARY FL EL 98'-

6978 M-3

FIG 2.3

ATTACHMENT 4

TECHNICAL EVALUATION REPORT

ENVIRONMENTAL QUALIFICATION OF SAFETY RELATED ELECTRICAL EQUIPMENT TO HARSH ENVIRONMENTS

IEB-79018

TROJAN

LICENSEE EVENT REPORT NO. 80-22

Portland General Electric Company
Trojan Nuclear Plant
P.O. Box 439
Rainier, Oregon 97048
(503) 556-3713

REGION V
NOV 5 1980
INSPECTION & ENFORCEMENT

October 31, 1980
CPY-1074-80

Mr. R. H. Engelken, Director
Nuclear Regulatory Commission, Region V
1990 North California Blvd.
Walnut Creek, California 94596

Dear Sir:

In accordance with IE Bulletin 79-01B, attached ~~is~~ Licensee Event Report No. 80-~~13~~, concerning a situation where several safety-related electrical components were discovered to be possibly unqualified in accordance with the environmental qualification criteria of IE Bulletin 79-01B for intended service conditions.

Sincerely,

W. P. Lauer for

C. P. Yundt
General Manager

CPY/AJC?:na
Attachments

c: LER Distribution List

80-289

REPORTABLE OCCURRENCE

1. Report No.: 80-22

2. a. Report Date: October 31, 1980

   b. Occurrence Date: October 28, 1980

3. Facility: Trojan Nuclear Plant, P.O. Box 439, Rainier, Oregon 97048

4. Identification of Occurrence:

   Several safety-related electrical components were discovered to be unqualified in accordance with the environmental qualification criteria of IE Bulletin 79-01B for intended service conditions.

5. Conditions Prior to Occurrence:

   The Plant was in Mode 1 at 100 percent of rated power.

6. Description of Occurrence:

   As a result of the detailed review of the environmental qualification of safety-related electrial equipment in accordance with the requirements of IE Bulletin 79-01B, the following equipment was determined to be unqualified:

   a. Barton transmitters (Model Nos. 345, 384, 389, and 393) - Qualification testing of 384 transmitter did not demonstrate operability for required time. Qualification testing has not been performed for other models and similarity to qualified types is insufficient to demonstrate qualification conclusively.

   b. Burns NTDs (POR-302) - Material analysis indicates these components are unsuitable for radiation environment.

   c. NAMCO D2400K limit switches - Qualification testing for HELB environment has not been performed. Material analysis indicates these components are unsuitable for radiation environment.

   d. Limitorque motor operator brakes - Radiation qualification testing has not been performed. Although similar brakes are qualified, insufficient information exists to apply test results to these units.

7. Designation of Apparent Cause of Occurrence:

   This occurrence was caused by changes in the criteria for environmental qualification of safety-related electrical equipment required by IE Bulletin 79-01B and Revised Order for Modification of License dated September 25, 1980.

8. Analysis of Occurrence:

This event has no effect on either plant or public safety. Although the equipment is qualified in accordance with the Trojan FSAR, reasonable assurance does not exist that failure of equipment will not occur when exposed to the environmental conditions postulated in IE Bulletin 79-01B. Postulated equipment failures would not preclude the performance of safety-related functions.

9. Corrective Action:

The immediate corrective action taken was to perform a safety evaluation to ensure that equipment failure would not preclude the performance of safety-related functions. (See Enclosure 4 of response to IE Bulletin 79-01b, dated 9-5-80.) The permanent corrective action taken will be replacement or modification of equipment to meet the qualification criteria of IE Bulletin 79-01B prior to June 30, 1982.

NRC FORM 366
(7-77)

U. S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

EXHIBIT A

CONTROL BLOCK: (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1	LICENSEE CODE (2)	O R T N P 1
	LICENSE NUMBER (3)	0 0 - 0 0 0 0 0 - 0 0
	LICENSE TYPE (4)	4 1 1 1 1
	CAT (5)	1
0 1 CONT	REPORT SOURCE (6)	L
	DOCKET NUMBER (7)	0 5 0 - 0 3 4 4
	EVENT DATE (8)	1 0 2 8 8 0
	REPORT DATE (9)	1 0 3 1 8 0

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 NO. 80-22: IE BULLETIN 79-01B REVIEW RESULTED IN DISCOVERY OF FOLLOWING

0 3 SAFETY-RELATED EQUIPMENT NOT MEETING ENVIRONMENTAL QUALIFICATION FOR

0 4 INTENDED SERVICE: BARTON TRANSMITTERS (MODEL NOs. 345, 384, 389, 393).

0 5 BURNS RTDs. NAMCO D2400X LIMIT SWITCHES, AND LIMITORQUE MOTOR OPERATORS.

0 6 BACKUP EQUIPMENT OR ALTERNATIVE MONITORING IS AVAILABLE IF NECESSARY (SEE

0 7 RESPONSE TO IE BULLETIN 79-01B DATED 9-5-80).

0 8

0 9	SYSTEM CODE (11)	Z Z
	CAUSE CODE (12)	X
	CAUSE SUBCODE (13)	Z
	COMPONENT CODE (14)	Z Z Z Z Z Z
	COMP SUBCODE (15)	Z
	VALVE SUBCODE (16)	Z
(17) LER/RO REPORT NUMBER	EVENT YEAR	8 0
	SEQUENTIAL REPORT NO.	0 2 2
	OCCURRENCE CODE	0 1
	REPORT TYPE	T
	REVISION NO.	0
	ACTION TAKEN (18)	X
	FUTURE ACTION (19)	A
	EFFECT ON PLANT (20)	Z
	SHUTDOWN METHOD (21)	Z
	HOURS (22)	0 0 0 0
	ATTACHMENT SUBMITTED (23)	N
	NPRD-4 FORM SUB. (24)	N
	PRIME COMP. SUPPLIER (25)	Z
	COMPONENT MANUFACTURER (26)	Z 9 9 9

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 CHANGE IN CRITERIA FOR ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED

1 1 EQUIPMENT REQUIRED BY IE BULLETIN 79-01B AND REVISED ORDER FOR MODIFICATION

1 2 OF LICENSE (DATED 9-25-80) LED TO REVIEW AND DISCOVERY. EQUIPMENT WILL

1 3 BE QUALIFIED TO MEET NEW CRITERIA OR REPLACED PRIOR TO 6-30-82.

1 4

1 5	FACILITY STATUS (28)	E
	% POWER (29)	1 0 0
	OTHER STATUS (30)	NA
	METHOD OF DISCOVERY (31)	
	DISCOVERY DESCRIPTION (32)	NA
1 6	ACTIVITY RELEASED (33)	Z
	CONTENT OF RELEASE (34)	Z
	AMOUNT OF ACTIVITY (35)	NA
	LOCATION OF RELEASE (36)	NA
1 7	PERSONNEL EXPOSURES NUMBER (37)	0 0 0
	TYPE (38)	Z
	DESCRIPTION (39)	NA
1 8	PERSONNEL INJURIES NUMBER (40)	0 0 0
	DESCRIPTION (41)	NA
1 9	LOSS OF OR DAMAGE TO FACILITY (43) TYPE (42)	Z
	DESCRIPTION	NA
2 0	PUBLICITY ISSUED (44)	N
	DESCRIPTION (45)	NA
	NRC USE ONLY	

NAME OF PREPARER John C. Perry

PHONE 503/556-3713, ext. 228