SAN ONOFRE
NUCLEAR GENERATING STATION
UNIT 2 AND 3

ENVIRONMENTAL QUALIFICATION REPORT PER REQUIREMENTS OF NUREG-0588
REVISION 2

UNIT 2: DOCKET 50-361
UNIT 3: DOCKET 50-362

SOUTHERN CALIFORNIA EDISON COMPANY
SAN DIEGO GAS & ELECTRIC COMPANY

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REVISION 2

UNIT 2: DOCKET 50-361
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SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS & ELECTRIC COMPANY

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 AND 3

DOCKET NO'S. 50-361 AND 50-362

ENVIRONMENTAL QUALIFICATION OF CLASS IE EQUIPMENT

REVISION NO. 2

RESPONSE TO NUREG 0588

CONTENTS

CONTENTS (Cont.)

CONTENTS (Cont.)

TABLES

FIGURES

ACRONYMS

AFWS: Auxiliary Feedwater System

CAECS: Containment Atmosphere Emergency Cooling System

CCAS: Containment Cooling Actuation System

CCW: Component Cooling Water System

CGCS: Combustible Gas Control System

CIAS: Containment Isolation Actuation System

CIS: Containment Isolation System

CPIS: Containment Purge Isolation System

CSAS: Containment Spray Actuation System

CSS: Containment Spray System

CVCS: Chemical and Volume Control System

DBA: Design Basis Accident

DBE: Design Basis Event

DGS: Diesel Generator System

EFAS: Emergency Feedwater Actuation Signal

ESFAS: Engineered Safeguard Features Actuation System

HPSI: High Pressure Safety Injection

HUM.,H.: Humidity

HVAC: Emergency Operation HVAC System

LPSI: Low Pressure Safety Injection

MSIS: Main Steam Isolation System

N/A: Not applicable

PAM: Post-Accident Monitoring

PASS: Post-Accident Sampling System

PHCS: Pressurizer Heater Control System

PLIS: Pressurizer Level Indication System

PPS: Plant Protection System

PRESS,P: Pressure

RAD: Radiation

RAMS:Radiation Monitoring System

RAS: Recirculation Actuation System

RCHV: Reactor Coolant Head Vent

RCPSSS: Reactor Coolant Pump Speed Sensor System

RCS: Reactor Coolant System

ACRONYMS (Cont)

R.H.: Relative Humidity

RPS: Reactor Protection System

RSPT: Reed Switch Position Transmitter

RTD: Resistance Temperature Detector

SIAS: Safety Injection Actuation System

SDCS: Shutdown Cooling System

SGLMS: Steam Generator Level Monitoring System

SI: Safety Injection

SIS: Safety Injection System

SMMS: Subcooled Margin Monitoring System

SONGS: San Onofre Nuclear Generating Station

SWCS: Salt Water Cooling System

TEMP,T,: Temperature

ABSTRACT OF REVISION 2 CHANGES

The SCE written response to the guidelines for Class IE Electrical Equipment in a harsh environment provided in NUREG-0588 is titled "San Onofre Nuclear Generating Station, Units 2 and 3, Environmental Qualification Report per Requirements of NUREG-0588". Revision 2 to this document supercedes Revision 1 in entirety. The basic format and input of Revision 2 is identical to Revision 1 but due to the volume of changes required for response to the NRC open items identified in the NRC Audit Team trip report dated June 1, 1981 and the Safety Evaluation Report dated June 12, 1981, as well as the inclusion of the increased level of qualification achieved for SONGS 2/3 equipment, a reissuance of the document in entirety rather than a page-by-page change (with appropriate change bar indicators) is used.

As an aid to readers of this document who wish to compare Revision 2 to Revision 1 the following general description is provided. It is emphasized that this description does not provide a list of every item that differs between the two revisions but rather an overview of what changes have occurred.

CONTENTS; ABSTRACT OF REVISION 2 CHANGES

This general section was added as a guide to users of the submittal to provide a description of changes between Revision 1 and Revision 2. The Table of Contents was revised to incorporate changes to the body of the report.

1. INTRODUCTION; and

2. SAFETY-RELATED SYSTEMS REQUIRED TO FUNCTION FOR LOCA/HELBA/MSLB SAFE SHUTDOWN

Some areas in these sections received amplification to provide for a clearer, more concise expression of the statements presented. There were no major changes to these sections.

3. ENVIRONMENTAL CONDITIONS

Five areas of concern in this section received a considerable amount of rework.

A. Section 3.1.1.2 discusses the qualification of equipment to the MSLB inside containment profile. Revision 2 provides additional justification for the utilization of the internal temperature profile of certain equipment as a basis for qualification. This method is allowed for Category II plants. Revision 2 presents a component structural analysis to provide a base for acceptability of internal temperature analysis.

3. ENVIRONMENTAL CONDITIONS (continued)

B. Section 3.2.2 discusses operating time margin. Revision 2 specifically addresses what requirements must be met to exempt any piece of equipment from the NUREG-0588 recommended minimum one (1) hour operability time margin.

C. Section 3.3.1.6 in Revision 1 discussed a total integrated radiation dose for a 30 day post accident time period. Revision 2 has revised this section to discuss a 120 day post-accident time period.

D. Section 3.7 discusses submergence. Revision 2 incorporates additions and deletions to this section that were committed to in response to the NRC EQB Audit Team comments.

E. Section 3.8 discusses chemical spray. This is a new section added by Revision 2 to incorporate response to an NRC EQB Audit Team concern.

4. MASTER EQUIPMENT LIST AND QUALIFICATION REVIEW

Section 4.1.3 concerns qualification status assignments for equipment listed in Tables 4-1 and 4-2. Revision 2 restructured the definitions of the various levels of qualification status.

Tables 4-1 and 4-2 have been extensively reworked in Revision 2 to reflect the additional qualification efforts that have occurred since Revision 1. No equipment item that was addressed in Revision 1 is not included in Revision 2. Some items of equipment previously listed in Revision 1 have been determined not to require environmental qualification per NUREG-0588 guidelines. For these items the summary sheets in Tables 4-1 and 4-2 still exist in Revision 2 but no qualification data is provided. Reference to Appendix F for explanation of the deletion is provided. The only equipment that has been added by Revision 2 to Tables 4-1 and 4-2 are some differential pressure transmitters listed on page 4-74. These transmitters were added as a result of the evaluation for required plant trips during an SLB/CEA ejection accident. This evaluation is discussed in Appendix F.

Table 4-3 has been updated by Revision 2 to reflect a 120 day TID radiation level in lieu of the 30 day TID radiation level found in Revision 1.

5. SUMMARY OF OUTSTANDING ITEMS

Tables 5-1 and 5-2 have been extensively reworked in Revision 2 to reflect changes made to Tables 4-1 and 4-2. The function of Tables 5-1 and 5-2 to provide additional information on open items listed in Tables 4-1 and 4-2 is not changed from Revision 1.

6. APPENDICES

Appendices A and B have been reworked in Revision 2 to provide an update on SCE efforts regarding maintenance, surveillance, spare/replacement part procurement and emergency operating instruction review. The basic concepts expressed in Revision 1 have been unchanged, only additional information is provided in Revision 2.

Appendices C and D are unchanged in Revision 2.

Appendix E has been expanded to include SCE response to NRC open items expressed in the Audit Team Trip Report of June 1, 1981 and the Safety Evaluation Report dated June 12, 1981.

Appendix F has been added by Revision 2 to provide explanatory information for all equipment listed in Revision 1 that was deleted from qualification requirements by Revision 2.

Revision 2 is considered by SCE to adequately resolve all NRC EQB concerns expressed in the Audit Team Trip report dated June, 1981 and the Safety Evaluation Report dated June 12, 1981.

The information contained in Revision 2 will be incorporated into the SONGS 2/3 FSAR, Section 3.11.

1. INTRODUCTION

In order to address the question of Environmental Qualification of Electrical Equipment for the San Onofre Nuclear Generating Station, Units 2 and 3, Southern California Edison Company has organized a task force to review the qualification of installed equipment. The equipment covered in this review includes Class IE equipment inside containment and Class IE equipment outside containment which is subjected to a harsh environment; (any area where there is a significant change in one or more of the environmental parameters as the result of an accident) and which is required to mitigate a postulated accident, provide a post accident monitoring function, or place the plant in a safe cold shutdown condition. The harsh environments result from: LOCA/MSLB/HELBA inside the containment, MSLB outside the containment in the MSIV area or the auxiliary feedwater pump room and HELBA outside containment. The review included the effects of radiation on equipment outside the containment building during post-LOCA recirculation of containment sump fluids. This review and supporting documentation assures that the equipment necessary to protect the public health and safety will be capable of performing its function when subjected to the defined harsh environment.

This review of environmental qualification was based on the guidelines outlined for Category II plants as defined in NUREG 0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment" issued to operating license applicants by NRC letter on February 5, 1980. The review was conducted by a task force composed of personnel experienced in reactor systems safety analysis and design, plant operations, emergency operating procedures, nuclear safety and licensing, and environmental qualification. A critical review of all documentation was conducted using criteria derived from NUREG 0588. The review concluded that there exists for the San Onofre Units 2 and 3 an auditable record with appropriate documentation to identify the specific equipment, the criteria used in reviewing the report, the reviewer, the specific report reference, and the level of qualification of the equipment.

The San Onofre Nuclear Generating Station Units 2 and 3 environmental qualification review evaluated specific safety-related equipment for the worst environment that type of equipment would experience and determined its acceptability for use. Safety-related electrical equipment subject to a harsh environment is documented herein on qualification review summary sheets. Appropriate qualification-related requirements and results were recorded for each piece of equipment in accordance with the NRC guidelines. Documentation is also available upon NRC request for a comparison of the environmental qualification data against the requirements set forth in NUREG 0588. These data are on report evaluation sheets for each type of equipment to identify the degree to which the qualification complies with the NRC staff position.

Outstanding items are defined as those items for which discrepancies in meeting the guidelines of NUREG 0588 have been identified. A summary of these discrepancies is provided in Section 5 and includes corrective actions and schedules for implementation together with justification for interim operation or replacement as applicable.

Tables 4-1 and 4-2 provide the summary sheets for all IE equipment considered in this report, including designation of the degree of qualification to NUREG-0588 requirement for Category II plants. Items noted in Tables 4-1 and 4-2 as requiring replacement will be qualified to IEEE 323-1974. Items noted in Tables 4-1 and 4-2 as requiring requalification will be qualified in one of the two following methods: 1.) If any retesting is done, it will be to IEEE 323-1974 requirements; or 2.) Some items require additional analysis and/or vendor information only; therefore if no new testing is to be performed, these will be qualified per Category II of NUREG-0588. All equipment in Tables 4-1 and 4-2 will be fully qualified prior to fuel load unless otherwise indicated in Tables 5-1 and 5-2.

2. SAFETY-RELATED SYSTEMS REQUIRED TO FUNCTION FOR LOCA/HELBA/MSLB SAFE SHUTDOWN

2.1 SAFE SHUTDOWN AND ACCIDENT MITIGATION

As directed, Southern California Edison (SCE) has evaluated the environmental qualification of the safety-related electrical components which experience the harsh environment due to loss-of-coolant accident (LOCA), main steam line break (MSLB), and high energy line break (HELB) accidents. This report includes equipment required for core and reactivity control, reactor coolant system pressure, inventory makeup, and removal of residual heat in order to bring the reactor to a subcritical cold shutdown condition. San Onofre Nuclear Plant Units 2&3 were designed for a safe shutdown condition of Hot Standby. Therefore, certain electrical components required to bring the plant to cold shutdown (i.e., pressurizer heater cable from the heater to IE junction box, charging pump flow sensor, and charging pump discharge pressure transmitters) were not procured to IE specifications. SCE has evaluated the necessity for upgrading this equipment to IE qualified standards and any necessary upgrade is reflected in Tables 4-1 and 4-2.

Safety related equipment is qualified to assure operability in the accident environment for the time required to mitigate a postulated accident. The LOCA accident evaluation also includes areas where equipment will be exposed to high radiation from piping systems containing recirculated containment sump fluids.

2.2 LIST OF SYSTEMS CONTAINING CLASS IE ELECTRICAL EQUIPMENT

Table 2-1 provides a list of all safety related systems. Those systems containing equipment exposed to harsh environments are identified on the table by a superscript (a).

Table 2-1

LIST OF SYSTEMS CONTAINING CLASS IE ELECTRICAL EQUIPMENT

(Sheet 1 of 3)

1. Containment heat removal systems
   a. Containment spray system (a)
   b. Containment atmosphere emergency cooling system (a)
2. Containment isolation system (isolation devices) (a)
3. Combustible gas control system (a)
4. Safety injection system (a)
5. Fission product removal and control systems
   a. Containment spray system (a)
   b. Emergency operation control room ventilation system
   c. Fuel handling building post-accident cleanup system (not required for LOCA/HELBA/MSLB mitigation)
6. Fuel handling building isolation system (not required for LOCA/HELBA/MSLB mitigation)
7. Onsite electrical power systems
   a. AC power system (electrical penetrations and cable) (a)
   b. DC power system (electrical penetrations and cable) (a)
8. Salt water cooling system (a)
9. Component cooling water system (a)
10. Chemical and volume control system
11. Emergency operation containment building ventilation systems
    a. Containment atmosphere emergency cooling system (a)

(a) Denotes exposure to harsh environment

Table 2-1

LIST OF SYSTEMS CONTAINING CLASS IE ELECTRICAL EQUIPMENT

(Sheet 2 of 3)

12. Emergency operation HVAC systems
    a. Control room habitability system
    b. ESF switchgear system
    c. Charging pump room system (a)
    d. Battery room system
    e. Chiller room system
    f. Emergency chilled water system
    g. Fuel handling building post accident cleanup system (not required for LOCA/HELBA/MSLB mitigation)
    h. Safety equipment pump room emergency cooling system (a)
    i. Diesel generator building emergency ventilation system
    j. Intake structure emergency ventilation system
13. Emergency evacuation alarm system (not classified as Class IE equipment)
14. Diesel generator systems
    a. Diesel generator fuel oil storage and transfer system
    b. Diesel generator cooling water system
    c. Diesel generator starting system
    d. Diesel generator lubrication system
    e. Diesel generator combustion air intake and exhaust system

Table 2-1

LIST OF SYSTEMS CONTAINING CLASS IE ELECTRICAL EQUIPMENT

(Sheet 3 of 3)

15. Auxiliary feedwater system[(a)]
16. Fuel pool cooling system (not required for LOCA/HELBA/MSLB mitigation)
17. Reactor protection system[(a)] (electronic equipment in control building not exposed to harsh environment)
18. Engineered safety features actuation system[(a)] (electronic equipment in control building not exposed to harsh environment)
19. Radiation monitors (airborne)[(a)]
20. Shutdown cooling system[(a)]
21. Post accident monitoring[(a)]
22. Reactor coolant gas vent

Table 2-2 provides a list of all safety systems needed to perform the following functions:

- Emergency Reactor Shutdown
- Containment Isolation
- Reactor Core Cooling
- Containment Heat Removal
- Core Residual Heat Removal
- Prevention of Significant Release of Radioactive Material to the Environment

Table 2-2
LIST OF SYSTEMS NEEDED TO PERFORM SAFETY FUNCTIONS

	System Abbreviation		Emergency Reactor Shutdown	Containment Isolation	Reactor Core Cooling	Containment Heat Removal	Core Residual Heat Removal	Prevention of Significant Release of Radioactive Material to Environment	Support Systems
• Containment Spray System	CSS					X		X	
• Containment Atmosphere Emergency Cooling	CAECS					X			
• Containment Isolation System	CIS			X				X	
• Combustible Gas Control System	CGCS							X	
• Safety Injection System	SIS		X		X				
• Salt Water Cooling System	SWCS					X	X		
• Component Cooling Water System	CCW					X	X		
• Chemical and Volume Control System	CVCS		X						
• Emergency Operation HVAC System	HVAC								X(a)
• Diesel Generator System	DGS								X(a)
• Auxiliary Feedwater System	AFWS		X				X		
• Reactor Protection System	RPS		X						
• Engineered Safety Features Actuation System	ESFAS		X	X		X		X	
• Radiation Monitoring System	RAMS							X	X(a)
• Shutdown Cooling System	SDCS						X		
• Post Accident Monitoring System	PAMS								X(b)
• Reactor Coolant Gas Vent	RCGVS								X(c)

(a) Provides support for other safety systems

(b) Indication of selected parameters only

(c) Vent for Reactor Head

2.3 TMI EQUIPMENT REQUIREMENTS

As a result of TMI requirements from NUREG-0737/0660, additional Class IE electrical equipment was added to the plant. NUREG-0737/0660 items which deal with Class IE electrical equipment are listed below with a description of equipment added as a result of TMI. The equipment already added has been qualified to Category II requirements of NUREG-0588. In some cases (i.e., inadequate core cooling) future equipment will be added. All future equipment added and any modification/replacement of existing equipment will conform to NUREG-0588 Category I requirements.

Position

II.B.1 REACTOR COOLANT VENT SYSTEM

A RCS vent system is installed. This vent system utilizes six (6) solenoid-operated valves (HV-0296A, HV-0296B, HV-0297A, HV-0297B, HV-0298, HV-0299) which are IE and are in a harsh environment. These valves are covered in this report on Table 4-1.

II.B.2 PLANT SHIELDING TO PROVIDE ACCESS TO VITAL AREAS AND PROTECT SAFETY EQUIPMENT FOR POST ACCIDENT OPERATION

To provide remote operability of the shutdown cooling system, the two inlet and two outlet isolation valves to the shutdown heat exchanger have been provided with motor operators. The new motor operated valve numbers are HV-8150, HV-8151, HV-8152 and HV-8153 (were valves 12-001, 002, 038, 039). These valves are subjected to a harsh environment and are covered in this report on Table 4-1.

II.B.3 POST-ACCIDENT SAMPLING SYSTEM (PASS)

The PASS is a non-IE system. However, containment isolation valve HV-7816, a solenoid operated IE valve, has been added as a result of addition of the PASS system. This valve has been qualified to IEEE 323-1974 specification and is covered on Table 4-1.

II.D.3 RELIEF AND SAFETY VALVE POSITION INDICATION

A 2 channel TEC acoustic monitor has been added to the downstream safety valve piping. The monitors are designated XE-0201-1, -2 and XE-0200-1, -2. This is Class IE equipment and qualification information is contained in this report on Table 4-1.

II.E.1.1 AUXILIARY FEEDWATER SYSTEM RELIABILITY EVALUATION

AND

II.E.1.2 AUXILIARY FEEDWATER INITIATION AND INDICATION

A second motor operated auxiliary feed pump with associated controls has been added to the system. This second motor driven pump addition to the existing auxiliary feedwater system satisfies the auxiliary feedwater system reliability criteria developed in the evaluation. It meets the same requirements as the existing auxiliary feedwater pump. Qualification documents for the two pumps will be found in Table 4-1.

Wide range steam generator water level indication was added to provide an additional method of determining auxiliary feedwater flow. Two channels of indication per generator were provided. These are LT-1115-1, -2 and LT-1125-1, -2. These instruments are Class IE and are covered in this report on Table 4-2.

II.E.3.1 RELIABILITY OF POWER SUPPLIES FOR NATURAL CIRCULATION

The existing pressurizer heater power supply design satisfies NUREG-0737 requirements therefore no change was made to the plant.

II.F.1 ADDITIONAL ACCIDENT MONITORING INSTRUMENTATION

1. Radiological Noble Gas Effluent Monitors

   Two wide range effluent monitors have been added, one sampling from the steam jet air ejector exhaust and one capable of being switched from sampling the containment purge stack to the plant stack. These are Class IE instruments with the monitor used to switch between the containment purge stack and plant stack being located in a mild environment, therefore it is not included in this report.

Two area radiation monitors have been mounted in close proximity to each steam line in the MSIV rooms. These are Class IE instruments and are located in a benign environment for the accident they are required to function in, a LOCA, therefore they are not covered in this report. These instruments are not necessary to mitigate or monitor a MSLB in the MSIV room.

2. Radioiodine and Particulate Effluent Monitor

The wide range effluent monitor contains provisions for sampling, with onsite analysis for radioiodine and particulate effluents thus satisfying the NUREG-0737 requirements. Refer to Position II.F.1.1 above for a description of the qualification of the wide range effluent monitors.

3. Containment Radiation Monitors

High range in-containment monitors have been added to the existing emergency radiation monitoring system. These are Class IE instruments and are located in a harsh environment. They are included in this report on Table 4-1.

4. Containment Pressure Indication

Additional wide range containment pressure instrumentation has been added. These are Class IE instruments and are in a harsh environment. These new instruments are PT-0353-1 and PT-0354-2. They are included in this report on Table 4-1.

5. Containment Water Level Indication

Additional IE containment water level instrumentation was added to provide a continuous display over the range required by NUREG-0737. These new instruments are LT-9387-1, LT-9388-2, LT-5853-1, and LT-5853-2 and are located in a harsh environment. They are included in this report on Table 4-1.

II.F.1.6 CONTAINMENT HYDROGEN INDICATION

The existing post-LOCA hydrogen monitoring system fulfills the requirements of NUREG-0737. No additional equipment has been added. Components of the existing system are covered in this report.

II.F.2 IDENTIFICATION OF AND RECOVERY FROM CONDITIONS LEADING TO INADEQUATE CORE COOLING

The only item completed at this time has been the addition of the Subcooling Margin Monitoring System (SMMS). Existing RTD's were replaced with dual element RTD's at points in the cold and hot RCS legs. These inputs as well as existing pressurizer pressure inputs are provided to the SMMS. The SMMS processors are located in the control room, a benign environment, so are not included in this report. The existing pressure instrumentation is included in this report. The new RTD's are TE-0111X1/TE-0911X1, TE-0111Y1/TE-0911Y1, TE-0115-2/TE-0915-2, TE-0121X2/TE-0921X2, TE-0121Y2/TE-0921Y2, and TE-0125-1/TE-0925-1 and are IE. They are included in this report on Table 4-2.

II.G.1 POWER SUPPLIES FOR PRESSURIZER RELIEF VALVES, BLOCK VALVES, AND LEVEL INDICATORS

SONGS 2 and 3 does not use power operated relief valves or block valves therefore no changes were made. The existing pressurizer level instrumentation satisfies NUREG-0737. This instrumentation is included in this report.

2.4 FSAR REQUIREMENTS FOR LOCA/HELBA/MSLB

Table 4-3 provides the detailed basis for the environmental qualification of Class IE electrical equipment for San Onofre Nuclear Generating Station Units 2 and 3. The normal, accident and design environmental conditions described by the pressure, temperature, humidity, radiation and chemical environmental envelopes inside and outside containment after a loss-of-coolant accident (LOCA) are presented in Table 4-3. These environmental conditions are consistent with the environmental qualification requirements as presented in IEEE Standard 323-1971 and NUREG-0588, Category II.

Table 2-1 lists and categorizes systems required to mitigate a design basis accident (DBA) or to attain a safe shutdown. The systems listed in this table are designed for operation in the most severe temperature, pressure, humidity, and radiation environment that exists at the equipment location during normal operation, assuming proper routine preventive maintenance is performed. The design basis for equipment is to perform its required safety function with the combination of temperature, pressure, humidity, chemical spray environment, and maximum calculated integrated radiation exposure at the equipment location postulated for its DBA. In addition, steam and feedwater line breaks outside the containment are analytically checked to ensure that no additional qualifications need be applied to components that could be affected by these breaks.

For the purposes of this report, the main steam line break (MSLB) and high energy line break accident (HELBA) profile inside containment are enveloped by the LOCA profile described in Chapter 3.

2.5 SAFETY RELATED DISPLAY INDICATION AND POST-ACCIDENT MONITORING INSTRUMENTATION

Incorporated as table 2-3 is a listing of Class IE instrumentation that is required to be available to place the plant in a cold, safe shutdown condition, and for post-accident monitoring. Instrumentation listed on Table 2-3 that performs an accident mitigation function, i.e., a signal is generated by the instrument that triggers an action to reverse an accident situation, is so noted. Table 2-3 is limited to process indication only; it does not include such items as valve position or pump operability. The display indication of Table 2-3 is located in a benign environment, the control room, and is not included in this report. However, any signal source or transmission equipment that is located in a harsh environment and is necessary to produce the indication is listed in Tables 4-1 and 4-2.

Regulatory Guide 1.75 provides the design basis for Class IE equipment specifically regarding channel redundancy and separation. Responses to NRC questions 032.11, 032.12, 032.13, 032.18 and 032.32 provide assurance that failure of a Class IE instrument channel will not adversely affect the remaining IE channels for the plant protection system. In addition, the failure of a non-IE instrument channel will not adversely affect the function of Class IE instruments for the equipment in the Plant Protection System (PPS). Since all IE isolation is provided in the same manner as the plant protection system, the operator can be confident that the loss of an IE channel or of a non-IE instrument will not affect the remaining Class IE instrumentation.

Table 7.5-2 in the FSAR gives accuracy requirements for PAMI. These accuracies are target values which have been established using:

A. Engineering judgement based on an evaluation of what the operator will use the monitored parameter for and what the expected capability of the instrument is from its specifications.

B. More stringent criteria imposed on the instrument if it is used for accident mitigation or shutdown cooling operation.

The acceptability of qualification test results is determined based on these target values in light of the above two criteria. If a PAMI does not meet its stated accuracy requirement during a test, the instrument may still be considered fully qualified for its intended service based on specific consideration of the use for the information that instrument provides. Acceptable qualification is reinforced when diverse means are available for a cross-check on the same monitored parameter.

The same methodology as described above is applied in the cases of those PAMI that may have response time requirements.

A review of the overall PAMI design basis is presently being conducted using Reg. Guide 1.97. SCE will meet the intent of Reg. Guide 1.97 in two phases: (1) to meet the requirements and schedules NUREG-0737 and the Commission Memorandum and Order (CLI-80-21) and (2) to complete incorporation of the balance of provision in Reg. Guide 1.97 by June, 1983.

Table 2-3

SAFETY RELATED DISPLAY INDICATION/POST ACCIDENT MONITORING INSTRUMENTATION (Sheet 1 of 3)

Bechtel Tag No.	Description	Required For Cold S/D	PAMI	Accident Mitigation
TI-0915-2 TI-0925-1	Cold Leg Temp. (Wide Range)	X	X	
TI-0911X1 TI-0921X2	Hot Leg Temp. (Wide Range)	X	X	
PI-0102A1, A2, A3, A4 PI-0102B1, B2, B3, B4	Pressurizer Pressure	X	X	X
LI-0110A1, A2	Pressurizer Level	X	X	
PI-1023A1, B1, A2, B2, A3, B3, A4, B4 PI-1013A1, B1, A2, B2, A3, B3, A4, B4	Steam Generator Pressure	X	X	X
LI-1113-1, -2, -3, -4 LI-1123-1, -2, -3, -4	Steam Generator Level (Narrow Range)	X		X
LI-1115-1, -2 LI-1125-1, -2	Steam Generator Level (Wide Range)	X	X	
FI-0212	Charging Line Flow	X		
PI-0212	Charging Line Pressure	X		
LI-0206A, B LI-0208A, B	Boric Acid Makeup Tank Level[a]	X		

Table 2-3

SAFETY RELATED DISPLAY INDICATION/POST ACCIDENT MONITORING INSTRUMENTATION (Sheet 2 of 3)

Bechtel Tag No.	Description	Required For Cold S/D	PAMI	Accident Mitigation
LI-0305-1, -2, -3, -4	Refueling Water Storage Tank Level[a]	X	X	X
TI-0303-1, -2	Containment Spray/ Shutdown Cooling Heat Exchanger Outlet Temperature	X	X	
PI-0303-1, -2	Containment Spray/ Shutdown Cooling Heat Exchanger Inlet Pressure	X	X	
TI-0351-1 TI-0352-2	Low Pressure Safety Injection Header Temperature	X	X	
FI-0311-2 FI-0321-1 FI-0331-1 FI-0341-2 FI-9421-1 FI-9435-2	High Pressure Safety Injection Pump Flow	X		X
TI-9178-1, -2, -3, -4 TI-9179-1, -2, -3, -4,	Cold Leg Temperature (Narrow Range)			X
PI-0352-1, -2, -3, -4	Containment Pressure (Narrow Range)			X
PI-0353-1 PI-0354-2	Containment Pressure (Wide Range)		X	
FI-4725-2 FI-4720-1	Auxiliary Feedwater Flow[a]	X	X	
TI-9911-2 TI-9903-1	Containment Temperature		X	

Table 2-3

SAFETY RELATED DISPLAY INDICATION/POST ACCIDENT MONITORING INSTRUMENTATION (Sheet 3 of 3)

Bechtel Tag No.	Description	Required For Cold S/D	PAMI	Accident Mitigation
LI-9386-1 LI-9387-1 LI-9388-2 LI-9389-2 LI-5853-1 LI-5853-2	Containment Sump Level		X	
AI-8108A1, B1	Containment Hydrogen Monitor		X	
TI-0911-1 TI-0921-2	Subcooling Margin Monitor		X	
RI-7820-1, -2	Containment High Range Radiation Monitors		X	
RI-7858-1 RI-7859-2 RI-7860-3	Emergency Radiation Monitoring System[a]		X	
RI-7856 RI-7857	Containment Airborne Radiation Monitors[a]			X
LI-3210B LI-3293B	Condensate Storage Tank Level[a]	X		
RI-7867-1 RI-7872-1	Wide Range Effluent Monitor[a]		X	
RI-7874A1, B1 RI-7875A1, B1	Main Steam Line Monitor[a]		X	

[a] Sensors and all transmission equipment located in a benign environment and are not included in this report.

3. ENVIRONMENTAL CONDITIONS

3.1 ACCIDENT PROFILE

The normal, accident and design environmental conditions for equipment used in the San Onofre Nuclear Generating Station, Units 2 and 3, are described in table 4-3. IEEE Standard 323-1971 and NUREG-0588 Category II have been used to establish requirements for qualification tests and analysis performed on the electrical equipment exposed to these environmental conditions.

3.1.1 ENVIRONMENTAL CONDITIONS INSIDE CONTAINMENT

3.1.1.1 Loss of Coolant Accident (LOCA)

The environmental qualification and design condition envelope is based on an analysis of the containment response to a spectrum of hot and cold leg LOCAs. The analyses were performed using Bechtel's COPATTA containment response analysis program. The COPATTA program predicts pressures and temperatures within the containment building atmosphere and sump regions and the temperature profiles in various modeled structures. A condensed description of the COPATTA code appears in FSAR paragraph 6.2.1.1.3 and a complete description can be found in Bechtel Topical Report BN-TOP-3. The methodology used in the COPATTA program is consistent with that provided in NUREG-0588 as applied to LOCA analyses. The analyses used to define the qualification envelope (Table 4-3) were developed from break mass/energy flow data provided by Combustion Engineering and are presented in FSAR section 6.2. The worst case LOCA is a double-ended suction leg slot break (9.82 ft^2) at 102% power with loss of off-site power and failure of one diesel generator. This postulated LOCA generates a calculated peak containment pressure of 55.1 $lb/in.^2g$ and a peak containment vapor temperature of

287F. The post-accident design envelope for safety-related equipment as shown in Table 4-3 and Figures 3-1 and 3-2 in this report is as follows:

Time Following LOCA	Pressure (lb/in.^{2}g)	Temperature (°F)
0 to 3 hours	60	300
3 to 30 hours	30	220
30 days	0	120

3.1.1.2 Main Steam Line Break (MSLB)

The evaluation of environmental conditions associated with a main steam line break (MSLB) in containment is discussed in the responses to NRC questions 022.18, 022.54, 022.55, 022.56, 022.57, 022.58, and 022.60.

This evaluation was performed utilizing the Bechtel COPATTA code modified to incorporate the modeling set forth in the NRC Containment Systems Branch Interim Evaluation Model and is consistent with the methodology presented in NUREG-0588, Appendix B. The most severe MSLB accident, 102% power with cooling train failure and off-site power available, has been analyzed and the results are shown in Response to NRC Questions figure 22.54-1.

Previously reported MSLB containment response analyses in FSAR table 6.2-9 are conservative compared to the CSB-IEM and remain valid for the purpose of identifying the worst case MSLB to be used for the environmental qualification analysis. Responses to NRC Question 022.54-1 compares the entire spectrum of large and small MSLB accidents analyzed from the standpoint of peak containment temperature and pressure and total time the vapor temperature exceeds 300F. On the basis of peak containment pressure and temperature, the 102% power MSLB with cooling train failure is the most severe. This MSLB exhibits peak containment conditions of 55.7 lb/in.^{2}g and 413.4F. Several cases generate vapor temperatures above 300F for slightly greater lengths of time than the 85-seconds for the reference MSLB. However, they all exhibit lower peak temperatures, and the maximum increase time above 300F is only 5-seconds for the 25% power MSLB with cooling train failure accompanied by a peak temperature

of only 394F. Consequently, the 102% power MSLB with cooling train failure is designated the design basis MSLB for safety-related component thermal analysis and environmental qualification.

Since the design basis MSLB generates a containment vapor temperature which exceeds the design envelope for 85-seconds during the first 90-seconds following the pipe break, the thermal response of a representative member of each type of safety-related component inside containment was determined.

The analysis performed using the Bechtel COPATTA code was modified to conform to NUREG-0588, Appendix B, as embodied in the earlier NRC CSB-IEM document. The response to NRC question 022.58 contained in the San Onofre 2 & 3 FSAR, Section 3.6 of Questions & Responses, identified three safety related components with analytically determined short term post main steam line break surface temperatures in excess of equipment qualification values. Analysis was also provided to show that component internal temperatures remained below the qualification values. The consequences of some safety-related components developing localized skin temperatures above the qualification values for a short period of time following a MSLB is evaluated below:

3.1.1.2.1 Electric Cable

Although modeled with 0.075 inches of monolithic electrical insulation, the cabling is actually covered with 0.020 inches of a polyolefin insulation material, an aluminum-polyester shield and polyester tape wrap estimated to total 0.010 inches, and an outer jacket of 0.045 inch thick cross-linked polyolefin (Raychem Flamtrol^{TM}). The analysis presented in response 022.58 shows only the outer 15 mils (33%) of the jacket material exceeds the qualification temperature of 357F by a maximum of 22F and remains above 357F for less than one minute. The actual conductor insulation never exceeds the qualification temperature and should remain completely functional in the post MSLB environment. The Raychem Flamtrol has additionally been satisfactorily flame tested to the requirements of IEEE 384.

3.1.1.2.2 Target Rock Solenoid Valves

Review of the vendor assembly drawing referenced in the 022.58 response was used as a basis for the thermal response analysis. These drawings show all valve components exposed to the containment atmosphere to be at least as thick-walled as the solenoid magnet casing, except for the valve position switch cover. All valve surfaces except the position switch cover should remain at or below the 270F value calculated for the magnet casing which is well below the valve qualification temperature of 340F. The thin position switch cover was shown in the 022.58 response to reach a maximum surface temperature of 385F and remain above 340F for less than 3 minutes. The analysis further showed internal temperatures in the vicinity of the position switch itself, and terminal strips would not exceed the qualification temperature.

A potential consequence of the elevated position switch cover temperature is failure of the cover-to-solenoid retainer nut O-ring seal allowing moisture to reach the position switches. However, failure of the position indicating switches will not affect valve operation. Two additional O-ring seals are located in areas that remain below the qualification temperature and serve to maintain the hermetic seal on the valve solenoid and associated wiring. All the O-ring seals are used in static seal application; the absence of motion should contribute to maintaining seal integrity.

Most of the Target Rock valves in containment employ ethylene-propylene (EP) rubber O-rings. This material is noted for its thermal stability in a steam/water environment. More recently procured solenoid valves utilize silicone rubber seals and a flanged and gasketed (silicone rubber) seal between the position switch cover and the solenoid housing. Silicone rubber is generally considered useable at temperatures to 500F.

3.1.1.2.3 Limotorque Valve Operators

The valve operators are all fabricated from relatively thick-walled castings and forgings with minimum wall thicknesses of about 0.25 inch. These housings have sufficient thermal capacity to remain within the qualification envelope during the brief containment vapor temperature excursion above the qualification value following a MSLB before the containment spray system quenches the vapor superheat.

The motors used with the Limitorque operators are of various design, depending upon size. The small SMB-000 operator uses a motor having a thin-wall housing which responds more rapidly to the MSLB vapor temperature transient than does the operator housing. As documented in the 022.58 response, the motor casing reaches a maximum calculated surface temperature of 338F and remains above the 300F qualification temperature for two minutes. The analysis further showed that internal motor components would remain within the qualification envelope.

Limitorque operators used inside containment employ Viton seals which have a useable temperature range extending to 500F. In addition, as described in Limitorque Report B0058[1], the Limitorque operators are designed to survive normal and accident conditions without depending on absolute sealing of the internals from the containment atmosphere. As demonstrated in the PWR LOCA environmental qualification test (Limitorque Report 600456), the unsealed design does allow moisture to be forced into the unit and insulating materials without adversely affecting the operability.

More recent Limitorque environmental tests have subjected an operator to superheated vapor temperatures of up to 385F at a pressure of 66 $lb/in.^2g$ over a 6 hour period to model the short term impact of a simulated MSLB environment on the unit. This test has been summarized in Limitorque Report B0058 and is applicable to the operators installed in San Onofre Units 2 and 3. In addition, Limitorque operators identical to those used at San Onofre have also been qualified to the generic BWR accident conditions of up to 340F in an air/steam atmosphere per IEEE 382-73 and documented in Limitorque Report 600376A. Thus, there is ample evidence that the safety-related Limitorque valve operators inside containment are qualified to survive the LOCA and MSLB environments.

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[1]Limitorque Valve Actuator Qualification for Nuclear Power Station Service, Report B0058, Tests Conducted Per IEEE 382-1972, 323-1974, 344-1975; Limitorque Corporation, January 11, 1980

3.1.1.3 High Energy Line Break (HELB)

The evaluation of environmental conditions associated with the high energy line break (HELB) are presented in FSAR section 3.6. A listing of the lines that are considered capable of failure is given in FSAR Tables 3.6-1 and 3.6-2. The effects of each postulated piping failure including pipe whip, jet impingement, and environmental analysis are examined in FSAR Appendix 3-6A. For each line break postulated, a zone of influence was generated and any safety-related equipment in that zone of influence was identified. Specific design features used for protecting the safety-related equipment are identified in Appendix 3.6A. Design features such as physical separation, pipe supports, pipe restraints, and conduit supports are provided where proven that pipe whip or jet impingement effects could damage essential systems to an extent which would impair their design function or affect necessary component operability. Physical barriers are provided to protect essential components where analysis shows that adverse effects could still result. The ability of specific safety-related systems to withstand a single active failure concurrent with the postulated event is discussed in the failure modes and effects analyses provided in FSAR Sections 5.4, 6.2, 6.3, 6.5, 7.2, 7.3, 8.3, 9.2, and 9.3.

For the in-containment environmental analysis, the temperature, pressure, and humidity conditions resulting from a HELB are enveloped by the environmental conditions resulting from the MSLB or LOCA DBA.

3.1.2 ENVIRONMENTAL CONDITIONS OUTSIDE CONTAINMENT

Plant areas containing high energy lines were systematically identified in a review of piping layout and plant arrangement. These areas are separately addressed in FSAR Section 3.6A.3. This systematic review verifies that the effects of postulated auxiliary system piping breaks (HELBA) are isolated, physically remote or restrained by plant design features from safety related systems or components. Where jet impingement due to HELBA on safety-related equipment could occur, it has been demonstrated that insufficient impingement load was generated to damage the equipment. In the cases where this condition was not met, barriers have been erected to protect the equipment.

For each area previously identified, an environmental analysis is performed to verify that the safety-related systems and components exposed are qualified to operate in the maximum temperature, pressure, and humidity envelope generated by the piping break. The following plant areas are addressed:

3.1.2.1 Main Steam and Feedwater Line Valve Rooms

The main steam and feedwater line valve rooms located between the safety equipment building and the containment building have been analyzed for environmental effects of single-area steam and feedwater line breaks. The results of the analysis are contained in the response to NRC Question 010.47. The objective of the analysis was to define short-term peak pressure-temperature conditions in the valve rooms in response to single area pipe breaks. The analysis was performed using the Bechtel computer program, COPDA, a multi-node, thermal-hydraulic code described briefly in FSAR Paragraph 6.2.1.2.3 and in detail in the Bechtel topical report BN-TOP-4. The COPDA code does not take credit for heat transfer to surrounding structures and provides a conservative calculation of short-term subcompartment pressures and temperatures as a function of time following pipe breaks consistent with the intent of NUREG-0588 for pipe breaks outside containment. The analysis showed the single area rupture of a main steam line outboard of the main steam restraint structure to be limiting. The results indicated equipment in the valve rooms will not receive significant exposure to temperatures exceeding the design value of 235F shown in Table 4-3. Exposure of components to the MSLB environment would continue until the MSIV's close or one steam generator boils dry in event of MSIV failure. This condition will exist for a maximum of 16 minutes.

3.1.2.2 Auxiliary Feedwater Pump Room

The post-accident and design conditions originally specified for the auxiliary feedwater pump room did not reflect the consequences of rupture of the 6-inch steam line supplying the turbine-driven auxiliary feedwater pump. An analysis of the room environmental response to rupture of the steam line consistent with NUREG-0588 was subsequently

completed using the Bechtel COPATTA and COPDA programs and the post-accident and design conditions for the room upgraded to a maximum of 300F, 4.14 lb/in.^{2}g and 100% relative humidity (FSAR Amendment 21) as shown in Table 4-3. The duration of exposure to the pipe break environment will not exceed 30-minutes at which time operator action is assumed to terminate steam flow to the pump room. Qualification of the turbine-driven auxiliary feedwater pump and associated controls to the revised pump room post-accident environment is not required since the turbine driven pump will not be operable following the steam line break. As a result of post-TMI requirements, a second motor-driven auxiliary feedwater pump was added to each of the SONGS Units (2&3) auxiliary feedwater pump rooms and is identical to the existing motor-driven pumps. The pumps are qualified to the calculated environment, providing assurance that both motor-driven pumps per unit will remain operable in a post steam-line break environment. The pump room ventilation system has already been qualified to 165C (329F) and will function to return the pump room environment to ambient conditions following termination of steam flow.

3.2 MARGINS

3.2.1 TEMPERATURE-PRESSURE MARGIN

The temperature-pressure margin as defined for environmental qualification includes the differences in temperature and pressure between the post-accident environmental design conditions specified in Table 4-3 and the representative conditions which could conservatively be expected to occur in a DBA as given in paragraph 3.1. The conservatisms used in calculating the expected DBA environmental parameters are discussed in FSAR Paragraph 6.2.1.1.3, Design Evaluation. These conservatisms provide additional separation between design parameters and those environmental parameters which could realistically be expected to occur under DBA conditions.

The margin discussed in NUREG-0588 Section 3(1) and 3(2) strongly imply that margin be quantified and applied across-the-board for all equipment. No such standard existed when the subject equipment was designed and built. However, good engineering practice was followed in each case and practically all levels in the design process contain margin to account for uncertainties (for example, one common practice is equipment derating).

The radiation margin specified for environmental qualification is the inherent differences between the calculated maximum radiation doses for the post-accident design basis accident (DBA) environment and those maximum radiation doses which could realistically be expected to occur under DBA conditions. These conservatisms are defined and outlined in NUREG-0588, Appendices.

3.2.2 OPERATING TIME

The operability requirements (operating time) for each piece of equipment is the length of time the equipment must remain functional post-accident. This does not mean that the equipment will be active during the entire time period, but only that the equipment is capable of actuation during the specified period. Unless otherwise noted, all operability requirements include a time margin of at least one hour or ten percent of the operability requirement, whichever is more conservative. Some devices perform their safety function (e.g., reactor trip) within the first seconds or minutes following an accident. The operating time requirements for these devices have been established based on the full spectrum of design basis accidents which they are required to mitigate. For devices such as these, the one hour margin requirement represents an extremely conservative margin and has not been included as a qualification requirement. For any equipment which is considered as an exception to the one hour margin the following information is provided:

A. Assurance that the specified time is the required functional time (with adequate margin) or the entire spectrum of DBE for which the equipment is required to respond.

B. Assurance that subsequent failure of the equipment will not degrade the safety of the plant or mislead an operator.

C. Verification that the equipment is not required after its primary function has been accomplished.

3.3 HIGH RADIATION

3.3.1 LEVELS INSIDE CONTAINMENT

A review of safety-related equipment which may be unduly degraded by radiation during post-accident operation has been conducted. The guidance provided by NUREG-0588 and NUREG-0737 has been used in determining radiation exposures.

A loss-of-coolant accident results in complete depressurization of the primary system and large release of radioactive material to the containment atmosphere. The following sources of radiation are then available:

3.3.1.1 Core Inventory

Table 3-1 presents the core inventory of radio isotopes. These sources are based on 105% of full power core conditions (3560 MWt).

3.3.1.2 Reactor Coolant

The following fractions of core inventory are diluted in the reactor coolant volume of 82,000 gallons.

A. 100% Noble Gas

B. 50% Halogens (I, Br)

C. 1% Solids

Table 3-2 presents reactor coolant concentrations at start of postulated accident.

3.3.1.3 Containment Airborne

The following fractions of core inventory are diluted in the containment volume of 2.3×10^6 ft^3.

A. 100% Noble Gas

B. 25% Halogens

C. 1% Solids

Table 3-1

CORE INVENTORY (CURIES)

Nuclide	Activity (Ci)	Nuclide	Activity (Ci)	Nuclide	Activity (Ci)
Br-84	2.85E+7	Mo-99	1.89E+8	I-135	1.89E+8
Br-85	3.99E+7	Tc-99m	2.27E+7	Xe-135m	5.51E+7
Kr-85m	3.98E+7	Ru-103	9.18E+7	Xe-135	4.62E+7
Kr-85	8.73E+5	Ru-106	8.23E+6	Cs-135	1.15E+1
Kr-87	7.44E+7	Te-129m	1.07E+7	Cs-136	1.78E+5
Kr-88	1.09E+8	Te-129	3.29E+7	Xe-137	1.80E+8
Rb-88	1.10E+8	I-129	2.08E+0	Cs-137	4.15E+6
Kr-89	1.41E+8	I-131	8.96E+7	Xe-138	1.79E+8
Rb-89	1.46E+8	Xe-131m	6.16E+5	Cs-138	2.04E+8
Sr-89	1.45E+8	Te-132	1.33E+8	Cs-140	1.81E+8
Sr-90	9.27E+6	I-132	1.33E+8	La-140	1.95E+8
Y-90	9.22E+6	Te-133m	1.07E+8	Ba-143	1.60E+8
Sr-91	1.78E+8	Te-133	1.13E+8	La-143	1.81E+8
Y-91m	1.05E+8	I-133	2.06E+8	Ce-143	1.81E+8
Y-91	1.79E+8	Xe-133	1.97E+8	Pr-143	1.81E+8
Y-95	1.87E+8	Cs-134	1.03E+6	Ce-144	1.26E+8
Zr-95	1.87E+8	Te-134	2.12E+8	Pr-144	1.26E+8
Nb-95	1.90E+8	I-134	2.39E+8		

Table 3-2

REACTOR COOLANT CONCENTRATIONS (CURIES/CC)
(AT START OF ACCIDENT)

Nuclide	Concentration (Ci/cc)	Nuclide	Concentration (Ci/cc)	Nuclide	Concentration (Ci/cc)
Br-84	4.60E-02	Ru-106	2.65E-04	Xe-135	1.49E-01
Br-85	6.43E-02	Te-129m	3.44E-04	Cs-135	3.70E-10
Kr-85m	1.28E-01	Te-129	1.06E-03	Cs-136	5.72E-06
Kr-85	2.81E-03	Tc-99M	7.30E-04	Xe-137	5.79E-01
Kr-87	2.39E-01	I-129	3.34E-09	Cs-137	1.33E-04
Kr-88	3.50E-01	I-131	1.44E-01	Xe-138	5.75E-01
Rb-88	3.54E-03	Xe-131m	1.98E-03	Cs-138	6.56E-03
Kr-89	4.54E-01	Te-132	4.28E-03	Cs-140	5.82E-03
Rb-89	4.69E-03	I-132	2.14E-01	La-140	6.27E-03
Sr-89	4.66E-03	Te-133m	3.44E-03	Ba-143	5.14E-03
Sr-90	2.98E-04	Te-133	3.63E-03	La-143	5.82E-03
Y-90	2.96E-04	I-133	3.31E-01	Ce-143	5.82E-03
Sr-91	5.72E-03	Xe-133	6.33E-01	Pr-143	5.82E-03
Y-91m	3.38E-03	Cs-134	3.31E-05	Ce-144	4.05E-03
Y-91	5.75E-03	Te-134	6.82E-03	Pr-144	4.05E-03
Nb-95	6.10E-03	I-134	3.86E-01	Zr-95	6.01E-03
Mo-99	6.08E-03	I-135	3.04E-01		
Ru-103	2.95E-03	Xe-135m	1.77E-01		

As discussed below, 25% of the core inventory of iodines are considered to plateout on containment internal surfaces.

The iodine released to the containment is removed by the containment spray system. The spray removal constants, spray cutoff times, and iodine forms used are shown in Table 3-3.
The model used considers first generation daughters. Table 3-4 shows concentrations of radioisotopes inside containment.

Table 3-3

CONTAINMENT SPRAY PARAMETERS

Iodine Form	Removal Constant (1/hr)	Cutoff Time (hr)	Proportion of Total Iodine
Elemental	4.8	.96	91%
Particulate	.22	38.7	5%
Organic	0.0	0.0	4%

Table 3-4

CONTAINMENT AIRBORNE CONCENTRATION (CURIES/CC)
(AT START OF ACCIDENT)

Nuclide	Concentration (Ci/cc)	Nuclide	Concentration (Ci/cc)	Nuclide	Concentration (Ci/cc)
Br-84	2.19E-04	Ru-106	1.26E-06	Xe-135	7.08E-04
Br-85	3.38E-04	Te-129m	1.64E-06	Cs-135	1.80E-12
Kr-85m	6.09E-04	Te-129	1.19E-05	Cs-136	2.70E-08
Kr-85	1.34E-05	I-129	8.00E-12	Xe-137	2.76E-03
Kr-87	1.14E-03	I-131	3.43E-04	Cs-137	6.40E-07
Kr-88	1.67E-03	Xe-131m	9.43E-06	Xe-138	2.74E-03
Kr-89	2.16E-03	Te-132	3.89E-05	Cs-138	3.12E-05
Rb-88	1.69E-05	I-132	5.09E-04		
Rb-89	2.24E-05	Te-133m	1.64E-05	La-140	2.99E-05
Sr-89	2.22E-05	Te-133	3.34E-05		
Sr-90	6.92E-05	I-133	7.89E-04	La-143	6.00E-05
Y-90	1.41E-06	Xe-133	3.02E-03	Ce-143	2.77E-05
Sr-91	6.91E-05	Cs-134	1.60E-07	Pr-143	2.77E-05
Y-91m	1.61E-05	Te-134	4.75E-05	Ce-144	6.60E-05
Y-91	2.74E-05	I-134	9.15E-04	Pr-144	1.93E-05
Nb-95	2.91E-05	I-135	7.24E-04	Zr-95	2.86E-05
Mo-99	7.87E-05	Xe-135m	8.44E-04		
Ru-103	4.23E-05				

3.3.1.4 Plateout Source Terms

Iodine released from the core will plateout on surfaces within containment. The amount of iodine which is available for plateout is 25% of the core iodine inventory. Conservatively, no time dependency was assumed for the mechanism of plateout. All 25% of the core iodine inventory was assumed to plateout immediately following a postulated accident with the plateout activity the same as the airborne iodine activity throughout the accident.

The total available iodine plateout surface area taken into consideration was the concrete, stainless, galvanized, and carbon steel surfaces within containment. The total surface area available is 3.6×10^5 ft^2.

The concentration of iodine available for plate out immediately following a postulated accident is presented in Table 3-5.

3.3.1.5 Sump Sources

For the purpose of qualifying equipment which is located near the sump, a sump source was determined. The following fractions of core inventory are assumed to be diluted in the sump volume of 400,000 gallons immediately following the postulated accident.

A. No Noble Gases*

B. 50% Halogens

C. 1% Solids

*For sump recirculation 100% of noble gases are also considered in the liquid.

Table 3-5

PLATEOUT CONCENTRATIONS
(AT START OF ACCIDENT)

Isotope	Concentration Micro Ci/CC
I-131	3.43E+2
I-132	5.09E+2
I-133	7.89E+2
I-134	9.15E+2
I-135	7.24E+2

Table 3-6 presents the isotopic concentration in the sump immediately following the postulated accident.

3.3.1.6 Methodology

The following calculation methodology is utilized. Gamma and beta doses are determined for three types of radioactive source distributions: isotopes suspended in the containment atmosphere, plated-out on containment surfaces, or mixed in the containment sump water. A given piece of equipment may receive a dose contribution from any or all of these sources. The amount of dose contributed by each of these sources is determined by the location of the equipment and the effects of shielding.

A. Gamma Radiation:

1. Containment Airborne

   The finite cloud model is used to calculate the gamma dose to equipment from airborne sources. This model uses a sphere with the same volume as that of the containment.

2. Plateout

   The contribution to the gamma dose from iodine plateout is calculated using a cylindrical shell source of the same height and volume as that of the containment. No internal structures are modeled. Air attenuation is not considered.

3. Sump

   The gamma dose from the sump is calculated by modeling the sump as a cylinder with a radius equal to that of the containment and a height equal to that of the sump flood level of 7 ft. The dose is then calculated off the end of this cylinder.

Table 3-6A

CONTAINMENT SUMP ACTIVITIES (CURIES)
(AT START OF ACCIDENT)

Nuclide	Activity (Ci)	Nuclide	Activity (Ci)
Br-84	$1.45X10^{7}$	Te-133m	$1.07X10^{6}$
Br-85	$2.04X10^{7}$	Te-133	$2.18X10^{6}$
Rb-88	$1.1\ X10^{6}$	I-133	$1.03X10^{8}$
Rb-89	$1.46X10^{6}$	Cs-134	$1.03X10^{4}$
Sr-89	$1.45X10^{6}$	Te-134	$3.1\ X10^{6}$
Sr-90	$5.55X10^{7}$	I-134	$1.20X10^{8}$
Y-90	$9.22X10^{4}$	I-135	$9.58X10^{7}$
Sr-91	$1.09X10^{8}$	Cs-135	0.115
Y-91m	$1.05X10^{6}$	Cs-136	$1.78X10^{3}$
Y-91	$1.79X10^{6}$	Cs-137	$4.15X10^{4}$
Zr-95	$4.97X10^{6}$	Ba-137m	$3.86X10^{4}$
Nb-95	$1.90X10^{6}$	Cs-138	$2.04X10^{6}$
Mo-99	$5.14X10^{6}$	Cs-140	$1.19X10^{8}$
Tc-99m	$2.27X10^{5}$	Ba-140	$1.93X10^{6}$
Ru-103	$2.76X10^{6}$	La-140	$1.95X10^{6}$
Ru-106	$8.23X10^{4}$	Ba-143	$3.65X10^{6}$
Te-129m	$1.07X10^{5}$	La-143	$1.81X10^{6}$
Te-129	$7.74X10^{5}$	Ce-143	$1.81X10^{6}$
I-129	1.04	Pr-143	$1.81X10^{6}$
I-131	$4.7\ X10^{7}$	Ce-144	$4.49X10^{6}$
Te-132	$2.54X10^{6}$	Pr-144	$1.26X10^{6}$
I-132	$6.65X10^{7}$		

Table 3-6B

NOBLE GAS CONTAINED IN SUMP FOR RECIRCULATION FLUID (CURIES)
(AT START OF ACCIDENT)

Nuclide	Activity (Ci)	Nuclide	Activity (Ci)
Kr-85m	$3.98X10^{7}$	Xe-135	$4.62X10^{7}$
Kr-85	$8.73X10^{5}$	Xe-137	$1.80X10^{8}$
Kr-87	$7.44X10^{7}$	Xe-138	$1.79X10^{8}$
Kr-88	$1.09X10^{8}$		
Xe-131m	$6.16X10^{5}$		
Xe-133	$1.97X10^{8}$		
Xe-135m	$5.51X10^{7}$		

B. Beta Radiation:

1. Containment Airborne

The beta doses to equipment from airborne sources following a postulated accident are calculated using a semi-infinite cloud model. All the beta energy is assumed to be absorbed by the equipment.

2. Plateout

Beta doses to equipment due to plateout assume that the iodine plates out uniformly on all the plateout surfaces. An infinite plane source model is used to calculate the equipment dose.

3. Sump

The contribution to the beta dose from the sump is calculated by modeling the sump as an infinite cylindrical source of infinite thickness. Three distinct beta energy groups were used and appropriate considerations were given for beta attenuation in air above the sump.

In addition to gamma and beta radiation from accident sources, doses due to normal operation over a 40-year plant life are also considered. Contributions from neutrons and N-16 of reactor coolant with 1% failed fuel were included.

Tables 3-7 and 4-3 present the 0-120 day integrated accident doses. For each specific component, the appropriate normal operational dose is included along with the pertinent accident contributors. Credit for equipment and internal containment shielding is taken for various components. Figure 3-3 presents beta dose reduction factors versus size of component.

Table 3-7

INTEGRATED 0-120 DAY POST-ACCIDENT DOSES INSIDE CONTAINMENT

Source Contributor	Gamma (Rads)	Beta (Rads)
Airborne	1.1 E7	1.0 E8
Plateout	1.5 E5	1.0 E7
Sump	1.7 E7	1.5 E8

3.3.2 LEVELS OUTSIDE CONTAINMENT

The sources of radiation to outside the containment are itemized below.

3.3.2.1 Containment Direct Dose

The direct dose from containment is due to airborne radioactivity within containment. Major radiation streaming paths considered are containment penetrations such as the equipment hatch, personnel lock, and purge penetrations.

3.3.2.2 Containment Leakage

It is assumed that the containment leaks at a rate of 0.1 volume % per day for the first 24-hours and 0.05 volume % per day thereafter. The source term for this leakage is based on the containment airborne sources and spray parameters.

3.3.2.3 Safety Injection System

The low-pressure safety injection pumps are assumed to be operating in the shutdown cooling mode. The source terms for this operation are those given for the reactor coolant system described in paragraph 3.3.1.2.

The high-pressure safety injection pumps are assumed to be operating in the recirculation mode. Prior to start of recirculation, the high-pressure safety injection system will contain non-radioactive water from the refueling water storage tank. At the start of recirculation (30-minutes after start of accident), the source terms are those given for the sump in paragraph 3.3.1.5.

3.3.2.4 Containment Spray System

The containment spray system is assumed to be operating in the recirculation mode. Prior to the start of recirculation, the containment spray system will contain non-radioactive water from the refueling water storage tank. At the start of recirculation (30 minutes after start of accident), the source terms are those given for the sump in paragraph 3.3.1.5.

3.3.2.5 Nuclear Plant Sampling System

The lines to the post-accident sample lab are considered to contain sources discussed for inside containment consistent with the intended service. The portions of the sample lines between the post-accident and normal operation sample labs are not considered to contain highly radioactive material since automatic isolation prevents this condition.

3.3.2.6 Valve Leakage

For purposes of equipment qualification, it is assumed that the shutdown and recirculation cooling non-packless non-diaphragm valves leak at the rate of 10cc/hr per inch of valve stem diameter. This results in a radio-active cloud in the rooms where the valve leakage occurs.

3.3.2.7 Systems Considered Not to be Sources of Radiation Outside the Containment

3.3.2.7.1 Reactor Coolant Chemical and Volume Control System (CVCS)

The CVCS is not considered to contain highly radioactive fluid following a postulated accident, except for piping used in the post-accident sampling system return line. The CVCS is not assumed to become highly radioactive because:

A. The system is automatically isolated.

B. The letdown system is not required for accident mitigation.

C. Post-accident venting capability of the primary system is provided by a remotely operated reactor coolant high point vent system.

3.3.2.7.2 Coolant Radwaste System

The coolant radwaste system is not assumed to contain highly radioactive fluid following a postulated accident, except for the piping used in the sample return line. This assumption is based on:

A. The system is automatically isolated.

B The system is not required for accident mitigation.

The piping used in the sample liquid return line is considered to contain source terms as assumed for reactor coolant.

3.3.2.7.3 Waste Gas System

The waste gas surge and decay tanks are not considered to contain highly radioactive material generated following an accident, since:

A. The waste gas system is automatically isolated.

B. The waste gas system is not required for accident mitigation.

C. Post-accident venting capability of primary system is provided by a remotely operated reactor coolant high point vent system.

D. Waste gas generated in the sample lab is returned to the containment.

The piping used in the sample gas return line is considered to contain highly radioactive material.

3.3.3 CALCULATIONAL METHODOLOGY

The methodology used to calculate the individual dose contributions are listed below.

3.3.3.1 Direct Dose From Containment

In order to calculate the direct dose from containment, the gamma dose is determined by using the QAD, point-kernel, shielding code. The concrete containment shell and interior concrete structures are modeled. The beta dose is attenuated by the containment structure.

3.3.3.2 Airborne Sources

Leakage from containment and valves was considered. For areas outside buildings, the airborne isotopic concentrations are determined by using the control room X/Q's.

The entire containment leakage of paragraph 3.3.2.2 is assumed to be released into the penetration building along with postulated valve leakages. Credit is taken for ventilation systems within the building.

For the safety equipment building not directly connected to the containment only the airborne contribution from postulated valve leakage was considered. The gamma and beta doses from the airborne sources are based on a finite cloud model considering the dimensions of the room where the component is located.

3.3.3.3 Direct Dose From Piping

Piping containing radioactive fluid is modeled as a cylindrical source. Credit is taken for concrete shielding as appropriate. Beta radiation from piping is negligible due to the steel thickness.

3.3.3.4 Normal Operational Dose

Doses due to normal operation over a 40-year plant life are considered. Contributions from piping containing radioactive material are included.

The results of the radiation calculations are shown in Table 4-3 which presents the 0-120 day integrated accident doses as well as normal operating doses.

3.4 VOLTAGE AND FREQUENCY FLUCTUATIONS

3.4.1 VOLTAGE

Sustained voltage variations at rated frequency specified for Class IE equipment operation are as follows:

4160 volts ac ±10%

480 volts ac ±10%

120 volts ac ±10%

120 volt ac vital bus system ±2%

125 volts dc (range 105 - 140V dc)

Voltage qualification is not required because electrical motors are designed in accordance with NEMA Standard MG-1, which allows sustained fluctuations of ±10% in supply voltage. Motors can also function during voltage dips to 75% of normal for 15 seconds.

Control devices are specified to withstand voltage deviations in accordance with NEMA Standard ICS. All control components are within the applicable voltage ranges except for dc relays. During 125V dc battery equalizing, the voltage is 140V dc which exceeds the +10% (137.5V dc) upper limit allowed by ICS. Due to the small 2.5V dc deviation and the fact that equalizing is done infrequently, operation or life of control devices will not be significantly affected.

For equipment powered by the vital buses, voltage variations are not a common mode concern. Each of the four protective channels are electrically isolated (IEEE Std. 279-1971) from each other and are separately powered by a similarly isolated vital bus, with each bus having its own inverter and battery.

These power sources are designed specifically to provide stable, regulated power. The four channel protection system is designed to protect the plant with up to two of these four channels inoperative. In addition, the equipment powered from the vital buses are designed for voltage variations of ±10%, whereas the vital buses are designed to regulate voltage to within ±2%. Therefore, voltage variations will not affect the ability of these systems to perform their required safety functions.

3.4.2 FREQUENCY

Frequency fluctuations which take place on the auxiliary power system are considered minor and will not affect equipment qualification. Stability studies outlined in FSAR paragraph 8.2.2.1.2 indicate that the loss of 1275 MW of generation in the western United States system will result in a frequency droop of only 0.1 Hz, and automatic load shedding to maintain frequency stability will begin at 59.1 Hz.

The diesel generator frequency is limited to 60 Hz ±2% steady state and 55 Hz during transients. Vital bus power supply inverters are designed for 60 Hz ±0.5 Hz output.

The frequency deviations described above will have only extremely limited consequences on the performance of induction motors and control components and have been specified to operate at 60 Hz ±5 Hz.

For equipment powered by the vital buses, frequency variations are not a common mode concern for the same reasons as previously described in the discussion of voltage variations. The equipment is designed for frequency variations of ±5%, whereas the vital buses are designed to regulate frequency to within ±0.5%. Therefore, frequency variations will not affect the ability of these systems to perform their required safety functions.

3.5 DUST

Dust is not considered to be a degrading medium in the areas addressed by this report. This is partially due to the seacoast location of the plant where blowing dust is normally not a major factor. Additionally, ventilating units for the containment and auxiliary feedwater pump area are equipped with air filters. Good housekeeping practices within safety-related areas are also utilized by Southern California Edison to prevent large accumulations of dirt.

3.6 AGING

Accelerated aging was not performed for all equipment covered by this report. For those devices, an aging analysis program was developed to evaluate the stresses imposed on the equipment which degrade performance. The objective of the analysis is to determine a time period for which acceptable equipment performance is highly probable. The aging program consists of the application of one of the following methodologies. One method is to examine the list of components of a piece of equipment, determine the components that are susceptable to aging by either heat (thermal), or radiation (or in some cases by both heat and radiation), and then determine the qualified life for the most susceptable material. This method utilized Arrhenius techniques to determine the thermal aging period. This component would then provide the limiting qualified life of the equipment and will be so noted on the qualification summary sheets of Tables 4-1 and 4-2. The other method is the use of mechanical cycling which is applied to equipment subject to mechanical wear to determine the operating lifetime.

Again, this limiting operating life will be chosen as the qualified life of the equipment and be so noted on the qualification summary sheet of Tables 4-1 and 4-2. If no age susceptable materials are found to limit the age of the equipment to less than the postulated life of the plant, then the equipment is noted as "Qualified for 40 years" in Tables 4-1 and 4-2. This qualified life time period will be the basis for implementing a periodic replacement schedule.

3.7 FLOODING AND SUBMERGENCE

In response to NRC question 032.16 all instrumentation and circuits that may become submerged as a result of a LOCA were evaluated. The water surface elevation inside the containment after a LOCA will be a maximum of 25' - 0".

The result of the evaluation requires that all safety-related devices that must remain functional after a LOCA, will be located above the 25 foot level. The following safety-related devices will be submerged post LOCA, but are not required to function after submergence.

A. The RC loop hot leg large drain (train 2) and reactor coolant to regenerative heat exchanger letdown (trains 1 and 2) valves are located below the post-LOCA flood level (25 ft-0 in.). The safety function of these valves is to close and remain closed in a post-LOCA condition. Short circuits or grounds that may occur at the terminals for the 3-way solenoid valves which control the instrument air to the pneumatic actuators do not reverse the position of the valves after they have closed. Shorts between the limit switches and solenoids do not generate enough current for the solenoids to pick up due to the circuit resistance.

   If the valves are open prior to a LOCA, isolation will occur prior to post-LOCA flood level, submerging the valves operators. Since the valve remains closed in a flooded environment, the valve performs its required safety function.

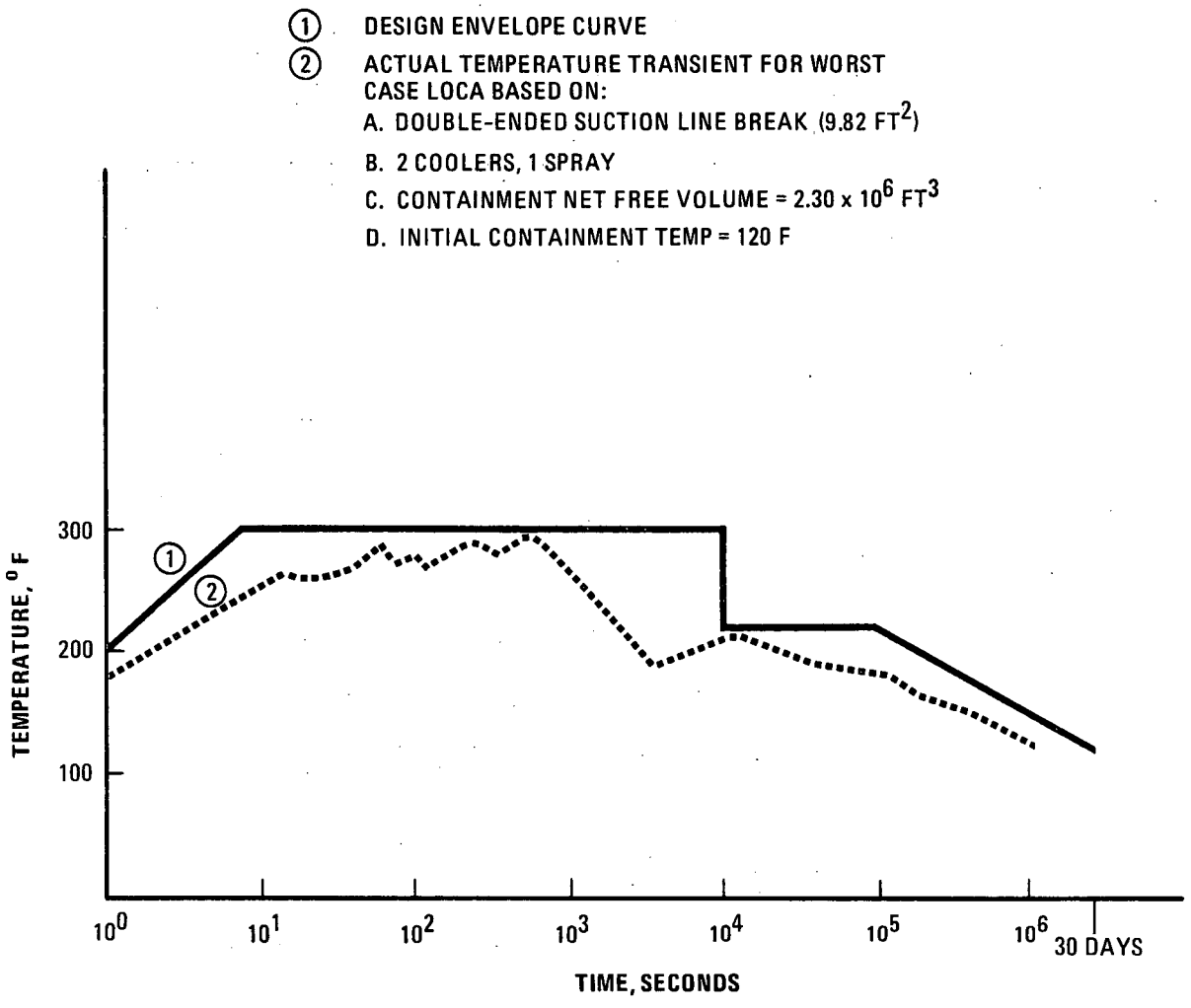
In addition, the circuitry for the three pneumatically operated valves is individually fused. Consequently, a short circuit of either the solenoid operator or the limit switches will be isolated to the particular valve and no other circuitry will be affected.

B. The containment emergency sump level transmitters are submerged in a post-LOCA condition. These transmitters and the respective control room indication are not required by the operator for any of the design basis events. Short circuit of the terminals/wires is equivalent to a "no-signal" condition and accordingly does not degrade the IE instrumentation power supply system.

C. The excore detectors, preamplifiers, and cables are submerged in a post-LOCA condition when the reactor cavity is flooded. However, the location of the excore detectors and cable is several feet above the bottom of the reactor vessel and would, therefore, not be submerged during the first 3- to 4-minutes after a postulated accident. The detectors would have fulfilled their required accident mitigation function within this time.

3.8 CHEMICAL SPRAY

The effects of chemical spray on components within the contaiment, which are required to function during and following containment spray system actuation, has been evaluated in accordance with the guidelines of NUREG-0588. For equipment test reports which reflected use of a test spray of different composition and/or pH other than the chemical spray the equipment would be subjected to at SONGS 2&3, the composition and/or pH of the test spray was determined to envelope the SONGS 2&3 spray. Additionally, for equipment required to operate following containment spray actuation, the potential effects of spray plateout corrosion on the component was evaluated.



SAN ONOFRE NUCLEAR GENERATING STATION Units 2 & 3
CONTAINMENT ATMOSPHERE - TEMPERATURE VS. TIME LOSS-OF-COOLANT ACCIDENT (LOCA)
Figure 3-1

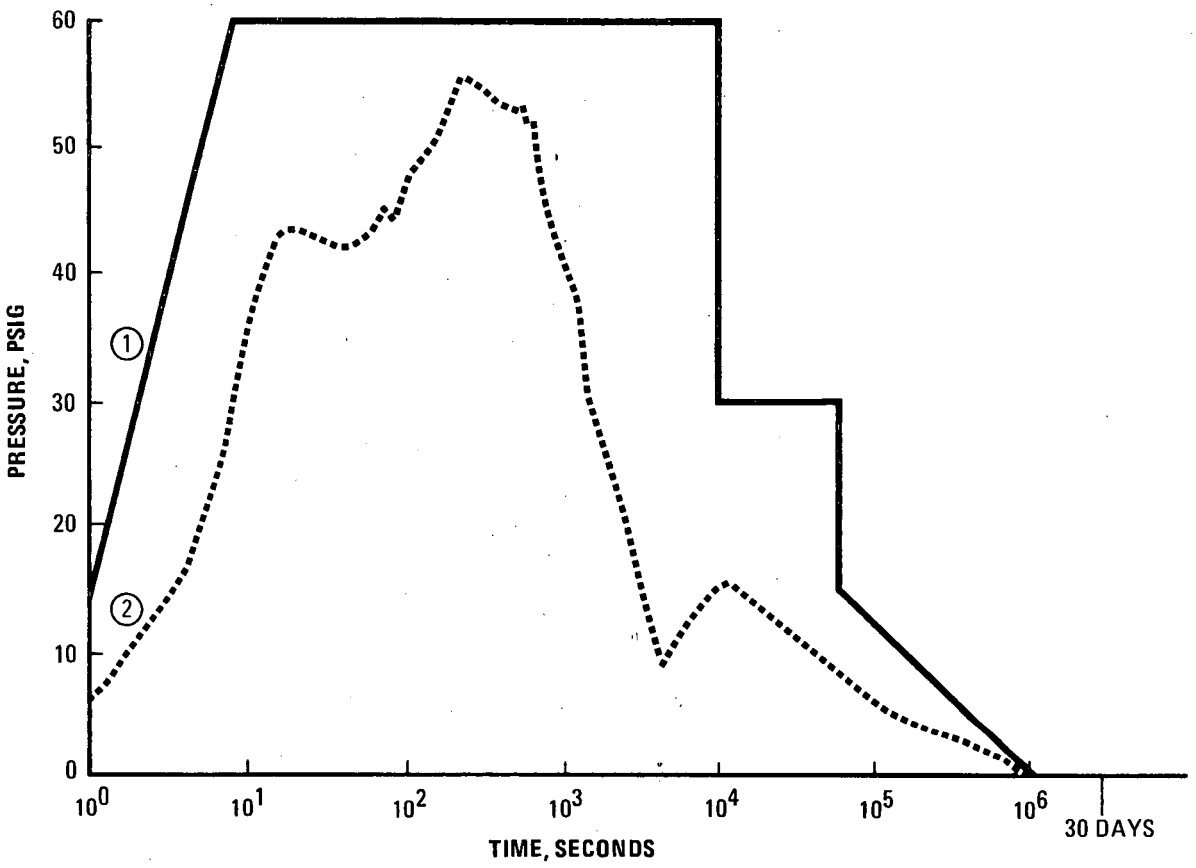
① DESIGN ENVELOPE CURVE

② ACTUAL PRESSURE TRANSIENT FOR WORSE CASE LOCA BASED ON:

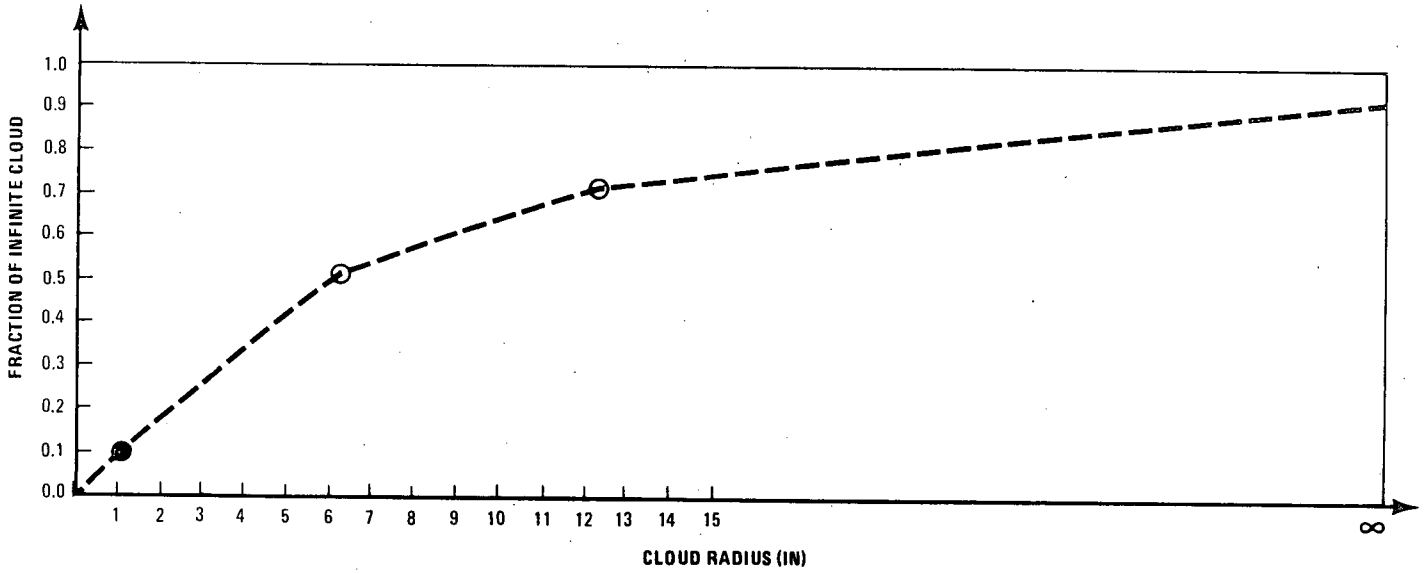
A. DOUBLE-ENDED SUCTION LINE BREAK (9.82 FT^2)

B. 2 COOLERS, 1 SPRAY

C. CONTAINMENT NET FREE VOLUME = 2.30×10^6 FT^3



SAN ONOFRE NUCLEAR GENERATING STATION Units 2 & 3
CONTAINMENT ATMOSPHERE - PRESSURE VS. TIME LOSS-OF-COOLANT ACCIDENT (LOCA)
Figure 3-2



SAN ONOFRE
NUCLEAR GENERATING STATION
Units 2 & 3

BETA DOSE REDUCTION FACTOR

Figure 3-3

4. MASTER EQUIPMENT LIST AND QUALIFICATION REVIEW

4.1 REVIEW TECHNIQUE

4.1.1 BALANCE OF PLANT (BOP)

The first step in conducting the review of the environmental qualification of Class IE equipment located in harsh environmental areas is to identify all the subject equipment. All electrical equipment in the plant is then categorized into either Non-Class IE or Class IE. The Class IE equipment is further sorted as to its location (harsh environment or benign environment). This is accomplished with a high degree of confidence for inclusion of all subject equipment by applying computer sorting techniques. A computer program, which is capable of sorting equipment by area location designation numbers, is used.

The format of the location number is alpha numeric with 13 positions. Each position identifies some feature of the equipment as follows:

(For explanation, the positions are designated as A B C D E F G H I J K L M)

Position	Designates
A.	Unit (2, 3, 0 is common)
B.	Safety Channel Class IE Circuit A, B, C, D (Non-Class IE is X)
C.,D.	Area Code Physical Location, the letter denotes structure, the numeral denotes elevation level for example:
	B1 - B6 Containment
	J1 Refueling Water and Condensate Storage Tank Building. (The Auxiliary Feedwater Pump Room is in this building)
	N1 - N5 Safety Equipment Building (The Main Steam Isolation Valve Room is an adjunct to this building)

Position	Designates
E.	Electrical System or Voltage Level Identifier
F,G,H,I,J,K.	Equipment or System Code Identifier
L,M.	Component Identifier

Class IE equipment, located in a harsh environment, is readily identified by the first four positions of its location number and the specific items can be identified by the last eight positions.

Supplementing the computer sorting techniques to identify the Class IE equipment in harsh environments is a thorough review of other project documents such as the instrument index, specifications, electrical drawings, etc. All identified equipment was then further analyzed, based upon verification with the FSAR and P&ID's to determine if it is actually required to mitigate or monitor the consequences of a postulated accident or place the plant in a cold shutdown condition.

To facilitate a uniform review of the environmental qualification of the above equipment, a review form entitled "Environmental Qualification Summary" was prepared. A copy of this form is included as Appendix C. The review form was prepared based upon the requirements of NUREG 0588 Category II. To be effective and useful, the form emphasizes the requirements of NUREG 0588 which need to be addressed on a case by case basis. Other requirements which can be addressed in a generic manner are included as part of this report. The review form is also designed to guide the reviewer in obtaining information from vendors which is in an auditable form.

The above information has been developed in accordance with the applicable sections of the San Onofre Nuclear Generating Station Units 2 & 3 Project Internal Procedures Manual sections 15 and 38.

4.1.2 NUCLEAR STEAM SUPPLY SYSTEM (NSSS)

The safety-related Class IE equipment for the NSSS scope of supply was identified from a review of Section 3.9, Chapters 6, 7 and 15 of the FSAR, procurement specifications, System Design Requirements, electrical drawings

and P&ID's. The safety related systems listed in section 2.2 have been systematically analyzed to identify and determine if components required to mitigate or monitor the consequences of an accident or place the plant in a cold shutdown condition are located in harsh environmental area per NUREG-0588 Appendix E paragraph 2.a. The individual device locations were defined using the computer listing techniques discussed in paragraph 4.1.1.

Once the safety-related Class IE equipment was identified for the NSSS scope of supply, a systematic review on a component level basis to determine the extent to which the component environmental qualification program complied with the requirements of NUREG-0588. The systematic review was conducted as follows:

A. An evaluation sheet was developed to facilitate a line-by-line evaluation of the requirements of NUREG-0588, Category II, sections 2 through 5. The qualification test reports for each component were evaluated against these requirements and line-by-line notations were made on the evaluation sheets regarding the degree of compliance. A sample evaluation sheet is contained in Appendix D.

B. The areas of non-compliance were summarized on a component basis on resolution sheets to facilitate evaluation of the overall status of the equipment's qualification. A sample resolution sheet is contained in Appendix D.

C. The Equipment Qualification Tabulation Sheet depicts a component level evaluation of the equipment per NUREG-0588 which was compiled with an additional column added indicating qualification status in the last column.

The above information has been developed in accordance with the applicable sections of Combustion Engineering's Quality Assurance Design Manual, Section 5.9.

4.1.3 QUALIFICATION STATUS

Upon completing the review plan discussed in sections 4.1.1 and 4.1.2, the qualification status of each component was determined and designated as one of the five following categories:

4.1.3.1 Qualified

Inclusion in this category was based upon the existing qualification documentation indicating that the equipment will be capable of performing its intended function at any time during its qualified life even though it may be subject to the most harsh environment postulated.

4.1.3.2 Interim Use

This category was selected when tests to qualify equipment to NUREG-0588 have not yet been completed, and are not expected to be completed prior to low power startup tests. Engineering judgement has been used based on such input as previous tests, operating history, and design specifications, to determine that a high degree of confidence exists that the equipment will successfully pass the ongoing tests and will comply with NUREG-0588, thus the equipment is acceptable for operational usage. At the time of test completion, the equipment with this designation will either be qualified per 4.1.3.1 or be replaced with qualified equipment. Equipment designated as Interim Use will have explanatory information provided in either Table 5-1 or 5-2 which indicates:

A. Scope and type of the ongoing test program;
B. Expected completion date of the test program; and
C. Assessment of the acceptability of the equipment for plant operation for the period of time between fuel load and test completion.

4.1.3.3 Relocate

Inclusion in this category indicates that equipment is not qualified to perform its required function because of its location. This recommendation was made only when relocation (i.e., locating the equipment to a less stringent environment) would result in qualification per 4.1.3.1.

Equipment designated as Relocate will be moved prior to fuel load and will no longer be included in the harsh environment report but will be evaluated for compliance with NUREG-0588 with the benign environment equipment.

4.1.3.4 Replace

This category was selected when evaluation of existing test reports showed that the equipment could not be qualified to the harsh environment, or existing equipment required replacement for reasons other than failure to meet environmental qualification specification (i.e., upgrade a component from non-IE to IE status). Equipment designated as Replace will be changed out with equipment meeting the requirements of NUREG-0588 during the first refueling outage of each unit. Based on engineering judgement, the equipment is considered acceptable for plant operational use for the time period between fuel load and first refueling. This assessment is provided in Table 5-1 or 5-2.

4.1.3.5 Qualification in Progress

This category was selected for any equipment that has ongoing qualification analysis that is expected to be completed prior to low power startup testing. The majority of the qualification effort has been successfully completed but there are certain outstanding items which require resolution. Prior to commencement of low power startup testing, all equipment in this category will be redesignated as one of the other categories described in Section 4.1.3. Explanatory information is provided in Tables 5-1 or 5-2 (as applicable) describing what information is lacking and the expected qualification date for all equipment designated in this category.

The environmental qualification evaluation sheets (Appendices C and D) and associated reference documents are not included in this report but are available for audit in a central file.

4.1.4 QUALITY ASSURANCE

All equipment and information listed in this report is controlled by the Quality Assurance (QA) program which Southern California Edison (SCE) has established in Section 17 of the FSAR. This includes such actions as establishment of a QA program by the equipment manufacturers and the testing facilities. Periodic audits have been performed by SCE, Combustion Engineering (for NSSS equipment) and Bechtel (for BOP equipment) of the manufacturers and the testing facilities for compliance to the SCE QA program as well as periodic audits by SCE of the Combustion Engineering and Bechtel QA programs.

Southern California Edison organized the environmental qualification program and has maintained a deep involvement in the program, including review of the environmental qualification testing and the determination of the qualification status of each piece of equipment. As a result of these activities and the application of the C-E and Bechtel QA programs to the data files and summary sheets, Southern California Edison has a high degree of confidence that the qualification status assignments are correct.

4.1.5 EXCEPTIONS

4.1.5.1 Containment Airborne Radiation Monitors

The Class IE Containment Airborne (CA) radiation monitors are located within the harsh environment of the penetration area; but have not been considered in this report because there are two other redundant systems available to measure post accident radiation levels. These systems consist of three Emergency Radiation Monitoring System (ERMS) detectors located on the outside of the containment shell and two High Range monitors inside the containment. Both these systems are safety related.

In a non-accident environment the CA monitors function to alarm on high radiation in the event of a fuel handing accident and to monitor the primary to atmospheric leakage rate inside the containment of 1 gpm for 1 hour in accordance with Regulatory Guide 1.45. Further information on the CA system may be found in FSAR Table 11.5-1 and Section 11.5.2.1.4.5.

4.2 EQUIPMENT QUALIFICATION TABULATION SHEETS

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 1 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electrical Penetration Backup Circuit Brkr. Panel Boards Penetration Areas El. 45'-0" and El. 63'-6"	Comsip Delphi Inc. (Spec. 302-10)	Custom-Built Panelboard with Gould Inc. HE & EE Frames JL Frame Breaker KP Frame Breaker Tag No.: BLP03 BLP04 BLP10 BLP11	Temperature 104F Pressure 0 lb/in^2g Radiation 1.7×10^5 rads Humidity 80% Chemical Spray None Submergence None	Temperature 104F Pressure 0 lb/in^2g Radiation 1×10^7 rads Humidity 95% Chemical Spray None Submergence N/A	Must operate up to 120 days	Mech/Elec. Operations (HE & EE Frames) 6000 at F.L. 4000 No Load (JL Frame) 1000 at F.L. 5000 No Load (KP Frame) 500 at F.L. 2000 No Load	Not Applicable	Not Applicable	Type test Aging 100C for 107 hours Report No. CC-323.74-46 BPC Log No. S023-302-10-80.	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 2 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electrical Penetration Assemblies Containment Wall	Westinghouse Electric-Electronic Tube Div. (Spec 304-1)	Prototype modular low voltag power and control, low level signal and thermocouple	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in2g peak See fig. 3-2 Radiation 2.8×10^7 rads (Note 1) Humidity 100% Chemical Spray $H_3 BO_3$ + NaOH pH > 9 Submergence None	Temperature 342F peak Pressure 105 lb/in.^{2}g peak Radiation 8×10^7 rads Humidity 100% Chemical Spray $H_3 BO_3$ + NaOH pH = 9.5 24 hours Submergence N/A	Must function up to 120 days	0-30 days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type Test aging 302F for 100 hrs. Report No. PEN-TR-75-19 BPC Log No. S023-304-1-48-4	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 3 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electrical Penetration Assemblies Containment Wall	Westinghouse Electric Electronic Tube Div. (Spec 304-1)	Prototype modular low voltage power large conductor	Temperature 300F peak See fig. 3-1 Pressure 60 lb/^{2}g peak see fig. 3-2 Radiation 2.8×10^7 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 342F peak Pressure 105 lb/in.^{2}g peak Radiation 8×10^7 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH = 9.5 24 hours Submergence N/A	Must function up to 120 days	0-30 Days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type test aging 302F for 100 hrs. Report No. PEN-TR-76-29 BPC Log No. SO23-304-1-48-4	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 4 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electrical Penetration Assemblies Containment Wall	Westinghouse Electric-Electronic Tube Div. (Spec. 304-1)	Prototype modular coax and triax	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 2.8×10^7 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 340F peak Pressure 103 lb/in.^{2}g peak Radiation 1×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH with pH = 9.7 Submergence N/A	Must function 30 min and retain integrity up to 120 days	0-53 hrs. by test. 53 hrs-120 days by analysis	Not Applicable	Not Applicable	Type Test aging 150C for 156 hrs. Report No. PEN-TR-76-35 BPC No. S023-304-1-48-4	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 5 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Connector Inside Containment (For connection between field wiring and electrical penetration pigtail)	Amphenol (Spec 304-1(E))	Type "N" plug 34500-1000 82-5585-1000 Jack 18250-1000 82-5586-1000	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 1.3×10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 312F peak Pressure 68 lb/in.^{2}g peak Radiation 2.2×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH = 9.5 27 hours Submergence N/A	30 minutes	Tested 27 hours	N/A	N/A	Type test Aging 134C for 100 hours Report No. PEN-TR-79-29 BPC No. S023-304-1-137	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 10-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 6 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electrical Penetration Assemblies Containment Wall	Westinghouse Electric-Electronic Tube Div. (Spec. 304-1)	Prototype Canister medium voltage	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 2.8×10^7 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 340F peak Pressure 105 lb/in.^{2}g peak Radiation 5×10^7 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH = 9.7 9.8 hours Submergence N/A	Must retain integrity up to 120 days	0-30 days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type test Report No. PEN-ACD4-72-03 BPC No. SO23-304-1-48-4	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 7 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
600 Volt Control & Instrumentation Cable Inside Containment	Raychem (Spec. No. 304-6)	Flamtrol insulated and jacketed cable	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 2.0×10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 357F peak Pressure 70 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + $Na_2S_2O_3$ + NaOH pH = 10.5 30 days Submergence N/A	Continuous up to 120 days	0-30 days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type test 168 hours at 150C Report No. F-C4033-1 BPC No. S023-304-6-7-1	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 8 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
600 Volt Control & Instrumentation Cable Inside Containment	Rockbestos Co. New Haven, CT (Spec. No. 304-6A)	Firewall III Class IE Electric Cable (Chemically cross-linked insulation)	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 2.0×10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 346F peak Pressure 113 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + $Na_2S_2O_3$ + NaOH pH = 9-11 24 hours Submergence N/A	Continuous up to 120 days	0-30 days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging: 1300 hours at 150C Rockbestos Co. qualification of firewall III Class IC Electrical Cable. Report dated July 7, 1977 BPC Log No. S023-304-6A-8-0 Rockbestos Report No. 1803 S023-304-6A-10-1 Rockbestos Report No. 1805 S023-304-6A-11-1	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 9 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
600 Volt Control & Instrumentation Cable Inside Containment	Rockbestos Co. East Grandby, CT (Spec. No. 304-6A)	Firewall III Class IE Electric Cable (Irradiated Cross-Linked Insulation)	Temperature 300F peak see fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 2.0 X 10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + pH >9 Submergence None	Temperature 346F peak Pressure 113 lb/in.^{2}g peak Radiation 2 x 10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH = 9-11 24 hours Submergence N/A	Continuous up to 120 days	0-30 Days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging: 1300 hours at 150C Rockbestos Co. qualification of firewall III Class IE Cables. Report dated June 7, 1978. BPC Log No. SO23-304-6A-7-0 Rockbestos Report No. 1803 SO23-304-6A-10-1 Rockbestos Report No. 1805 SO23-304-6A-11-1	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 10 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
8kV Power Cables Aux. Feedwater Pump Room	Anaconda (Spec. No. 304-8)	EP insulated and hypalon jacketed cable	Temperature 300F peak Pressure 4.14 lb/in.^{2}g peak Radiation <1 x 10^4 rads Humidity 100% Chemical spray None Submergence None	Temperature 346F peak Pressure 113 lb/in.^{2}g peak Radiation 2 x 10^8 rads Humidity 100% Chemical spray N/A Submergence N/A	24 hours	Tested 30 days	Not Applicable	Not Applicable	Type Test Aging 168 hours at 150C Report No. F-C4350-3 BPC Log No. S023-304-8-18-0	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 11 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
GE Vulkene Supreme 600 volt Power Cable w/ Factor Splices Inside Containment	General Electric Co. (Spec. No. 304-11)	N.A.	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 2.0×10^8 rads (Note 1) Humidity 100% Chemical spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 346F peak Pressure 113 lb/in.^{2}g peak Radiation 2.2×10^8 rads Humidity 100% Chemical spray H_3BO_3 + $Na_2S_2O_3$ + NaOH pH = 10.5 24 hours Submergence N/A	Continuous up to 120 days	0-33 days by test 33-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging 248 hours at 150C Report No. F-C5285-1 BPC No. SO23-304-11-115-1	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 12 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
GE EPR Power Cable with Neoprene Jacket Aux. Feedwater Pump Room	General Electric Co. (Spec. No. 304-11)	N.A.	Temperature 300F peak Pressure 4.14 lb/in.^{2}g peak Radiation <1 x 10^4 rads Humidity 100% Chemical spray None Submergence None	Temperature 346F peak Pressure 113 lb/in.^{2}g peak Radiation 2.2 x 10^8 rads Humidity 100% Chemical spray N/A Submergence N/A	24 hours	Tested 30 days	Not Applicable	Not Applicable	Type Test Aging 130 hours at 150C Report No. F-C5285-2 BPC No. SO23-304-11-116-0	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 13 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Special Purpose Cable (RSPT Type II Cable Assembly) Inside Containment	Bendix (Spec. No. 304-13)	Prefabricated cable System: RPS	Temperature 300F peak See figure 3-1 Pressure 60 lb/in.^{2}g peak. See figure 3-2 Humidity 100% Radiation 1.3×10^8 rads (Note 1) Chemical spray NaOH + H_3BO_3 pH >9 Submergence None							This item deleted. See Appendix F, Item 1

Note 1: Radiation conservatively determined for specific equipment for 10-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 14 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Cable and Wire Connector Inside Containment	Amp Inc. (Spec. No. 304-14)	PVF Insulated Terminals	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 1.7×10^8 rads (Note 1) Humidity 100% Chemical spray Boric Acid & Sodium Hydroxide pH > 9 Submergence None	Temperature 370F peak Pressure 60 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical spray Boric Acid & Hydrazine & Trisodium Phosphate pH 9-9.5 16 days Submergence N/A	Continuous up to 120 days	0-16 days by test 16-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging 1500 hours at 150C Report No. 302940016 BPC No. S023-304-14-15-0	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 15 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Heat Shrinkage Connection Kits Inside Containment	Raychem (Spec. No. 304-18)	Type MCK	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 2×10^8 rads (Note 1) Humidity 100% Chemical spray Boric Acid & Sodium Hydroxide pH > 9 Submergence None	Temperature 390F peak Pressure 66 lb/in.^{2}g peak Radiation 2×10^8 to 2.9×10^8 rads Humidity 100% Chemical spray Boron, Hydrazine & Trisodium Phosphate pH = 10.5 30 days Submergence N/A	Continuous up to 120 days	0-30 days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging 1500 hours at 150C Report No. QP-S023 BPC No. S023-304-18-21-1	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 16 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Heat Shrinkable Sleeves Inside Containment	Raychem (Spec. No. 304-18	Type WCSF-N	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 2×10^8 rads (Note 1) Humidity 100% Chemical spray Boric Acid & Sodium Hydroxide pH > 9 Submergence None	Temperature 400F peak Pressure 232 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical spray Boron, Hydrazine, Sodium Thiosulphate, & Sodium Phosphate pH = 10.5 24 hours Submergence N/A	Continous up to 120 days	0-30 days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging 1500 hours at 150C Report No. EDR 5019 BPC No. SO23-304-18-25-0	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 17 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Ident-fication	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demon-strated	Accuracy or Response Time Requirement	Accuracy or Response Time Demon-strated	Qualification Report & Method	Qualification Status
8kV Cable Termination Kit Aux. Feedwater Pump Room	Raychem (Spec. No. 304-18)	Type HVT	Temperature 300F peak Pressure 4.14 lb/in.^{2}g peak Radiation <1 x 10^4 rads Humidity 100% Chemical spray None Submergence None	Temperature 360F peak Pressure 70 lb/in.^{2}g peak Radiation 2 x 10^8 rads Humidity 100% Chemical spray N/A Submergence N/A	24 hours	Tested 100 days	Not Applicable	Not Applicable	Type Test Aging 168 hours at 250F Report No. 71100 BPC No. S023-304-18-17-1	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 18 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Motor Connection Kit (5kV) Aux. Feedwater Pump Room	Raychem (Spec. No. 304-18)	Type HVMC-5	Temperature 300F peak Pressure 4.14 lb/in.^{2}g peak Radiation $< 1 \times 10^4$ rads Humidity 100% Chemical spray None Submergence None	Temperature 360F* 400F** peak Pressure 70 lb/in.^{2}g* 232 lb/in.^{2}g** peak Radiation 2×10^8 rads Humidity 100% Chemical spray N/A Submergence N/A	24 hours	Tested 30 days* & 100 days **	Not Applicable	Not Applicable	Type Test Aging 168 hours at 250F Raychem Report No. 71100 BPC No. S023-304-18-17-1 and EDR - 5019 BPC NO. S023-304-18-28	Qualified for 40 years

*Inner Sleeve
**Outer Sleeve

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 19 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Heat Trace System Wire	Thermon (Spec. No. 308-5)	TEK Heating Cable with Tefzel 200 insulation	Temperature 104F	Temperature 346F Peak	36 hours	Test 30 days	Not Applicable	Not Applicable	Type Test Aging 160 C for 21 days	Qualified for 40 years
Safety Equip. Bldg. Spray Chemical Storage Tank and Pump Room			Pressure 0 lb/in.^{2}g Radiation 1.9×10^6 rads Humidity 80% Chemical Spray None Submergence None	Pressure 113 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A					Isomedix Inc. qualification test of electric cables/conductors under a simulated LOCA/DBE by simultaneous exposure to environments of steam/chemical-spray and radiation report dated May 1978 BPC No. S023-308-5-654-0	

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 20 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Heat Trace System-RTD Safety Equip. Bldg. Spray Chemical Storage Tank and Pump Room	Thermon (Spec. No. 308-5)	RTD with Kapton Insulated Leads	Temperature 104F Pressure 0 $lb/in.^2_g$ Radiation 1.9×10^6 rads Humidity 80% Chemical Spray None Submergence None	Temperature 104F Pressure 0 $lb/in.^2_g$ Radiation 1×10^9 rads Humidity 80% Chemical Spray N/A Submergence N/A	36 hours	Analysis	Not Applicable	Not Applicable	Analysis Thermon to Bechtel letter dated 1/27/81 Bechtel Log XB34405	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 21 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Environmental Seal Assemblies Inside Containment	Conax (Spec. No. 308-18)	Custom-built Electric conductor seal assembly per conax drawing 7825-11000 BPC Log S023-308-18-5	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 2×10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 340F Pressure 180 lb/in.^{2}g Peak Radiation 2.2×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH = 10.5 Submergence N/A	Continuous up to 120-days	0-30 Days by test 30-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging to 169 hours at 249.8F Report No. IPS-409 BPC No. S023-308-18-9-0	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 22 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Containment Emergency Cooling Unit - Air Handling Electric Motor Inside Containment	Reliance Elec. (Spec. No. 410-1)	447T Frame Class H, Type RN insulation, 460V, 100 hp, 1187 r/min TEAO, Induction Motor System: CAECS Tag No. E399 E400 E401 E402	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 3.2×10^8 Rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 350F peak Pressure 78 lb/in.^{2}g Peak Radiation 1×10^9 Rads Humidity 100% Chemical Spray H_3BO_3 + NaOH + $Na_2S_2O_3$ pH = 10.5 7 days Submergence N/A	Continuous up to 120 days	1 year	Not Applicable	Not Applicable	Type Test Aging 108 hours at 415F Report No. X-604 BPC No. S023-410-628-1	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 23 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Dome Circulating Fan Motor Inside Containment	Reliance Electric (Spec. No. 410-2)	444T Frame Class H Type RN insulation, 460V, 60 hp, 1170 r/min TEAO, Induction Motor System: CGCS Tag No. A071 A072 A073 A074	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 3.2×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 350F Peak Pressure 78 lb/in.^{2}g Peak Radiation 1×10^9 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH + $Na_2S_2O_3$ pH = 10.5 7 days Submergence N/A	Continuous up to 120 days	1 Year	Not Applicable	Not Applicable	Type Test Aging 108 hours at 415F Report No. X-604 BPC No. S023-410-1 628-1	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 24 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Aux. Feedwater Pump Motor Aux. Feedwater Pump Room	Siemens Allis (Spec. No. 405-6)	Type AZ, 4160V, 800 hp, 3600 r/min induction motor System: AFWS Tag Nos P141 P504	Temperature 300F Peak Pressure 4.14 lb/in.^{2}g peak Radiation <1 x 10^4 rads Humidity 100% Chemical spray None Submergence None	Temperature 350F Peak Pressure 4 14 lb/in.^{2}g peak Radiation 2 x 10^8 rads 100% Chemical spray N/A Submergence N/A	24 hours	By test and analysis	Not Applicable	Not Applicable	Type Test and Analysis Report No. S023-405-6 -90	Qualification in progress see Table 5-1, Item A1

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 25 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Component Cooling Water Pump Motor Safety Equipment Bldg. Component Cooling Water Pump Rooms	Westinghouse (Spec. No. 405-9)	Frame 5810L 4160V 600 hp 1200 r/min Type LAC Induction Motor System CCWS Tag Nos. P024 P025 P026	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 2.7×10^6 rads Humidity 80% Chemical Spray None Submergence None	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Separate effects testings meet 120 day requirements	Not Applicable	Not Applicable	Type Test Method is based on Similarity of Materials and Design Report No. WCAP-8754, Rev. 1 BPC No. S023-405-9-119-1 Thermal Aging: 4,900 hours at 170C 1,000 hours at 190C 500 hours at 210C Mechanical: 1,000 cycles	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 26 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Safeguard Pump Room 015 A/C Unit Motor Safety Equip. Bldg. Rooms for LPSI, HPSI, and Containment Spray Pumps	Reliance (Spec. No. 410-6)	182T Frame, Class H Type RH Insulation 460V 1800 r/min TEFC, 1-1/2 HP, Squirrel Cage Induction Motor System: HVAC Tag No. E445 E517	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 5.2×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 428F Pressure 0 lb/in.^{2}g Radiation 1×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Analysis and separate effects testing	Not Applicable	Not Applicable	Combination Analysis & Motorette Test to IEEE-117 with temperatures to 220C Report No. NUC-9 BPC No. SO23-410-8-16-2	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 27 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
CCW Pump Rooms 006, 007 008 A/C Unit Motors Safety Equip. Bldg. Component Cooling Water Pump Rooms	Reliance (Spec. No. 410-6)	182T Frame, Class H Type RH Insulation 460V 1800 r/min TEFC, 1 hp, Squirrel Cage Induction Motor System: HVAC Tag No. E455 E518 E454 E453	Temperature 104F Pressure $0\ lb/in.^2g$ Radiation 2.7×10^6 rads Humidity 80% Chemical Spray None Submergence None	Temperature 428F Pressure $0\ lb/in.^2g$ Radiation 1×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Analysis and separate effects testing.	Not Applicable	Not Applicable	Combination Analysis & Motorette Test to IEEE-117 with temperatures to 220C Report No. NUC-9 BPC No. S023-410-8-16-2	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 28 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Safeguard Pump Room 002 A/C Unit Motor Safety Equip. Bldg. Rooms for LPSI, HPSI and Containment Spray Pumps	Reliance (Spec. No. 410-6)	184T Frame, Class H Type RH Insulation 460V 1800 r/min TEFC, 5 hp. Squirrel Cage Induction Motor System: HVAC Tag No. E416	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 5 2 x 10^7 rads Humidity 8: % Chemical Spray None Submergence None	Temperature 428F Pressure 0 lb/in.^{2}g Radiation 1 x 10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Analysis and separate effects testing.	Not Applicable	Not Applicable	Combination Analysis & Motorette Test to IEEE-117 with temperatures to 220C Report No. NUC-9 BPC No. S023-410-8-16-2	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 29 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Charging Pump Room A/C Unit Motor Aux. Bldg. Charging Pump Rooms	Reliance (Spec. No. 410-6)	182T Frame Class H Type RH Insulation 460V 1185 RPM TEFC, 1/2 hp, Squirrel Cage Induction Motor System: HVAC Tag No. E435 E436 E437 E438	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 1×10^6 Humidity 80% Chemical Spray None Submergence None	Temperature 428F Pressure 0 lb/in.^{2}g Radiation 1×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Analysis and separate effects testings	Not Applicable	Not Applicable	Combination Analysis & Motorette Test to IEEE-117 with temperatures to 220C Report No.NUC 9 BPC No.S023-410-8-16-2	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 30 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Safeguard Pump Room 005 A/C Unit Motor Safety Equip. Bldg. Rooms for LPSI, HPSI and Containment Spray Pump	Reliance (Spec. No. 410-6)	213T Frame Class H Type RH Insulation 460V 1800 r/min TEFC, 7-1/2 Squirrel Cage Induction Motor System: HVAC Tag No. E417	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 5.2×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 428F Pressure 0 lb/in.^{2}g Radiation 1×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Analysis and separate effects testing.	Not Applicable	Not Applicable	Combination Analysis & Motorette Test to IEEE-117 with temperatures to 220C Report No. NUC-9 BPC No. S023-410-8-16-2	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 31 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Aux. Feedwater Pump Room Exhaust Fan Motor Aux. Feedwater Pump Room	Reliance Elec. (Spec. No. 410-8)	213T Frame Class H, Type RH Insulation 7.5 hp TEAO 1800 r/min induction motor System: HVAC Tag No. A394 A443	Temperature 300F Peak Pressure 4.14 lb/in.^{2}g Radiation <1 x 10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 428F Pressure 4.14 lb/in.^{2}g Radiation 1 x 10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	24 hours	Analysis and separate effects testing.	Not Applicable	Not Applicable	Combination 40 years. Motorette Test to IEEE-117 with Temperature to 220C Report No. NUC-9 BPC No. S023-410-8-16-2	Qualified for 40 years.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 32 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Pressurizer Relief Valve Position Indication System Inside Containment	Technology for Energy Corporation (Spec. No. 508-18)	Endevco Type 2273 AMI Accelerometer TEC 501 Charge Converter TEC 914 Valve Flow Monitor Tag No: XE-0200-1, -2 XE-0201-1, -2	Temperature 300F peak See fig. 3-1 Pressure 600 lb/in.^{2}g peak See fig. 3-2 Radiation 2.0×10^8 rads Humidity 100% Chemical Spray H_3BO_3+ NaOH pH 9 Submergence None	(Later)						Qualificaton in progress See table 5-1, item A2

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 33 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Containment Radiation Monitor Instrumentation Containment El. 92'	General Atomics (Spec. No. 606-4)	RD-23 System: RAMS Tag Nos. RE7820-1 RE7820-2	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 3.2×10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	(Later)	Continuous for 120 days					Qualification in progress See table 5-1, item A3

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 34 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electric Hydrogen Recombiner Inside Containment	Westinghouse Electric (Spec. No. 607-1)	Custom-built per Westinghouse Electric Hydrogen Recombiner Technical Manual Dated July, 1976 BPC Log S023-607-1-51 System: CGCS Tag No. E145 E146	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 1.5×10^8 rads (Note 1) Humidity 100% Chemical Spray H_3BO_3 + NaOH pH > 9 Submergence None	Temperature 316F Peak Pressure 70 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH pH = 10 10 days Submergence N/A	Continuous for 120 days	0-33 days by test 33-120 days by analysis	Not Applicable	Not Applicable	Type Test Aging 100 hours at 350F Report No. WCAP-7709-L Suppl 1 thru 7 BPC Log No. S023-607-11, -12, -13, -27, -52, -53, -55	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 35 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Electric Hydrogen Recombiner Power Supply Panel	Westinghouse Elec. (Spec. No. 607-1)	Custom-built per Westinghouse Electric Hydrogen Recombiner Technical Manual dated July 1976, BPC Log S023607 151 System: CGCS Tag. No. L180 L181								See Appendix F Item 5.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 36 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Pressure Transmitter Penetration Area	Foxboro (Spec 504-1)	Model No. NE 11GM System: PAMS Tag No. PT0353-1 PT0354-2	Temperature 104F Pressure 0 lb/in.^{2}g Humidity 80% Radiation 7.6×10^5 rads Chemical Spray None Submergence None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chemical Spray N/A Submergence N/A	Must operate up to 120 days	0-24 hours by Test 24 hrs-120 days by analysis	Total Accuracy ±2% Response Time N/A	See Table 5-2, A8	Qualified by separate effects test. Foxboro Test Reports No. T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim use see Table 5-2, A8

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 37 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Level Transmitter Containment Bldg.	GEMS (De Laval) (Spec. No. 504-1)	Model No. XM36498 XM51410 XM62475 System: FAMS Tag No. LT9386-1 LT9389-2 LT9387-2 LT9388-1 LT5853-1 LT5853-2	Temperature 310F peak See fig 3-1 Pressure 60 lb/in.^{2}g peak See fig 3-2 Radiation 2×10^8 rads (Note 1) Humidity 100% Chemical Spray $NaOH + H_2BO_3$ pH > 9 Submergence None	Temperature 300F peak Pressure 59 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity Steam Environment; Chemical Spray 1500 ppm Boric Acid in solution with NaOH. pH = 10.5 4 hours Submergence (Note 1)	Must operate up to 120 days	0-14 days by test. 14-120 days by analysis	Response time: N/A Accuracy ±2%	Response time: N/A Accuracy ±2%	Type Tests Two separate reports submitted. First report prepared by Franklin Institute No. F-C3834, Log 504-1-103, describes radiation exposure and 14 day environmental exposure. Second report prepared by Isomedix Inc., Log 504-1-102, describes a steam and chemical spray exposure for 4 hours. The same device did not undergo both tests.	Interim use See Table 5-1, A4

Note 1: Containment post-LOCA flood level will submerge containment normal sump level transmitters LT5853-1 and LT5853-2, and containment emergency sump level transmitters LT9386-1 and LT9389-2. Therefore, these specific transmitters are required for a 30-day TID. However, containment area water level transmitters LT9387-2 and LT9388-1 are mounted above the flood level and will provide containment water level information. These specific transmitters are required for a 120-day TID. Operation of normal and emergency sump level transmitters is not required for the flooded situation, as water level would exceed their ranges.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 38 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Level Switch Safety Equipment Bldg.	Magnetrol (Spec. No. 506-3)	Model No. FLS-X-MPX SIMD4DC System: Safety Related Display Tag No. LSH9450-2 LSH9451-1 LSH9452-1 LSH9453-2 LSH9454-2 LSH9455-2 LSH9456-2 LSH9457-1 LSH9458-1 LSH9460-2 LSH9471-1 LSH9461-1	Temperature 130F Pressure 0 lb/in.^{2}g Radiation 5.2×10^7 rads Humidity 80% Submergence None Chem Spray None	Temperature 300F Pressure 0 lb/in.^{2}g Radiation 1.25×10^8 rads Humidity 95-100% 480 hours Submergence None. Chem Spray N/A	120 days	Intermittent 10,000 cycles performed in 10 increments of: 600 cycles at 300F for 16 hours followed by 100% humidity at 100F for 480 hours. Additional 4000 cycles at ambient conditions	None	N/A	Type test and analysis Aging Thermal: 160 hrs at 300F Mechanical: 10,000 cycles Magnetrol Report No. 43235-1 Log S023-506-3-61	Qualified for 5 years Installed life of 40 years Replacement of switch mechanism at 5 year intervals and and 12 month periodic examination
Auxiliary Bldg. Radwaste Area		LSH9459-2 LSH9462-1 LSH9463-2 LSH9464-2 LSH9465-1 LSH9466-1 LSH9467-2								

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 39 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Containment Bldg.	Automatic Switch Co. (Spec. No. S023-507-2)	Model No. NP831664E System: CIS Tag No. HY9823 HY9824	Temperature 300F peak. See fig 3-1 Pressure 60 lb/in.^{2}g peak See fig 3-2 Radiation 1.5×10^8 rads (Note 1) Humidity 100% Chemical Spray $NaOH + H_2BO_3$ pH > 9 Submergence None	Temperature 346F peak Pressure 110 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray NaOH +3000 ppm H_2BO_3 pH = 10 30 days Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis.	None	N/A	Type test and analysis Aging Thermal: 288 hrs at 268F Mechanical: 40,000 cycles at max. operating pressure ASCO Test Report AQS21678/TR Log S023-507-2-1-545 AQS21678/TR Rev. A Log S023-507-2-1-611	Qualified for 4 years. Replace coils and elastromeric components at 4 year intervals.

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 40 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Containment Bldg.	Automatic Switch Co. (Spec. No. S023-507-2)	Model No. NP8320A185V System: CVCS Tag No. HY9204	Temperature 300F peak See fig 3-1 Pressure 60 lb/in.^{2}g peak See fig 3-2 Radiation 2×10^8 rads (Note 1) Humidity 100% Chemical Spray $NaOH + H_2BO_3$ pH > 9 Submergence None	Temperature 346F Peak Pressure 110lb/in^{2}g Peak Radiation 2×10^8 rads Humidity 100% Chemical Spray $NaOH + H_2BO_3$ pH = 10 Submergence None	120 days	0-30 days by test 30-120 days by analysis	None	N/A	Type test and analysis Aging Thermal: 288 hrs at 268F Mechanical: 40,000 cycles at max. press. ASCO Test Report AQS21678/TR Log S023-507-2-1-545 AQS 21678/TR Rev. A Log S023-507-2-1-611	Qualified for 4 years Replace Coils and Elastomeric components at 4 year intervals

Note 1: Sump beta dose reduced by 5 feet of air space.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 41 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve MSIV Area	Automatic Switch Co. (Spec No. S023-507-2)	NP8320A187V System: MSIS Tag No. HY8200 HY8201 HY8202 HY8203	Temperature 235F Pressure $7\ lb/in.^2 g$ Radiation less than 1×10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 346F peak Pressure 110 $lb/in.^2 g$ peak Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	36 hrs	In excess of 36 hours by test	None	N/A	Type test and analysis Aging Thermal: 288 hrs at 268F Mechanical: 40,000 cycles at max. operating pressure ASCO Test Report AQS21678/TR Log S023-507-2-1-545 AQS21678/TR Rev. A Log S023-507-2-1-611	Qualified for 4 yrs Replace coils and elastomeric components at 4 yr intervals

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 42 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve MSIV Area	Automatic Switch Co. (Spec No. S023-503-7)	Model No. NP8316D45 System: MSIS Tag No. HY8419B HY8419C HY8421B HY8421C	Temperature 235F Pressure 7 lb/in.^{2}g Radiation < 1 x 10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 346F Pressure 110 lb/in.^{2}g Radiation 2 x 10^8 rads Humidity 100% Chemical spray N/A Submergence N/A	36 hours	In excess of 36 hrs by test	None	N/A	Type Test and analysis Aging Thermal: 288 hrs at 268F Mechanical 40,000 cycles at max. operating pressure. ASCO Test Report AQS21678/TR Log 507-2-1 -545 AQS 21678/TR Rev. A Log 507-2-1-611	Qualified for 4 years Replace coil and elastomeric components at 4 year intervals.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 43 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Penetration Area Safety Equipment Bldg	Automatic Switch Co. (Spec No. S023-507-2)	Model No. NP8320A187V NP8321A5E NP832066E NP8344A77V NP831664E NP8344A70V NP8344A71V System: CIS Tag No. HY0509 HY0511 HY0513 HY5804 HY7513 HY7911 HY7259 HY9920 HY9921 HY9948 HY9951 HY9821 HY9825 HY9218 System: CCW Tag No. HY6212 HY6213 HY6218 HY6219 HY6500 HY6501	Temperature 104F Pressure 0 lb/in.^{2}g Radiation: 8.4×10^7 rads (Note 1) Humidity 80% Chemical Spray None Submergence None	Temperature 346F peak Pressure 110 lb/in.^{2}g peak Radiation: 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis.	None	N/A	Type test and analysis Aging Thermal: 288 hrs at 268F Mechanical: 40,000 cycles at max. operating pressure. ASCO Test Report AQS21678/TR Log S023-507-2-1-545 AQS21678/TR Rev. A Log S023-507-2-1-611	Qualified for 4 years Replace coils and elastomeric components at 4 year intervals

Note 1: Radiation determined for specific equipment for 120 days.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 44 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Penetration Area	Automatic Switch Co. (Spec. No. S023-507-2)	Model No. N/8320A187V System: MSIS Tag No. HY4057 HY4058	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 5.7×10^6 rads Humidity 80% Chemical Spray None Submergence None	Temperature 346F peak Pressure 110 lb/in.^{2}g Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	36 hrs.	In excess of 36 hours by test.	None	N/A	Type test and analysis Aging Thermal: 288 hrs at 268F Mechanical: 40,000 cycles at max operating pressure ASCO Test Report AQS21678/TR Log S023-507-2-1-545 AQS1678/TR Rev. A Log S023-507-2-1-611	Qualified for 4 years. Replace coils and elastomeric components at 4 yr. intervals

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 45 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Penetration Area	Automatic Switch Co. (Spec. No. S023-507-2)	Model No. NP8320A108V NP8320A185V System: CIS Tag No. HY0515 HY5388 HY5437 System: SIS Tag No. HY5434 System: CVC Tag No. HY9200 HY9205	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 7.6×10^5 rads Humidity 80% Chemical Spray None Submergence None	Temperature 346F Peak Pressure 110 lb/in.^{2}g Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-30 days by test 30-120 days by analysis	None	N/A	Type Test and analysis Aging Thermal: 288 hrs at 268F Mechanical 40,000 cycles at Max operating pressure ASCO Test Report AQS21678/TR Log S023 507-2-1-545 AQS21678/TR Rev. A Log S023 507-2-1-611	Qualified 4 years. Replace coil and elastomeric components at at 4 year intervals.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 46 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Limit Switch Containment Bldg.	NAMCO Controls Acme - Cleveland Company (Spec. No. S023-507-2)	Model No. EA-180 System: CVCS Tag No. ZSH9204-2 ZSL9204-2 System: CIS Tag Nos. ZSH9823-1 ZSL9823-1 ZSH9824-2 ZSL9824-2 System: SIS Tag No. ZSH9340-2 ZSL9340-2 ZSH9350-1 ZSL9350-1 ZSH9360-1 ZSL9360-1 ZSH9370-2 ZSL9370-2	Temperature 300F peak See fig 3-1 Pressure 60 lb/in.^{2}g peak See fig 3-2 Radiation 1.3×10^8 rads (Note 1) Humidity 100% Chemical Spray NaHO + H_2BO_3 pH > 9 Submergence None	Temperature 340F peak Pressure 70 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray NaOH + H_2BO_3 pH 10-11 4 days Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis.	None	N/A	Type test and analysis Aging: Thermal 200 hrs at 200F Mechanical 100,000 cycles NAMCO Qualification Report, dated Sept, 1978 Log S023-507-2-1-466	Qualified for 8 years Maintenance schedule: at 1 to 1-1/2 years replace top and bottom gaskets; at 4-1/2 to 5 yrs. replace lever shaft O-ring

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 47 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Limit Switch MSIV Area	NAMCO Controls Acme - Cleveland Company (Spec. No. S023-507-2)	Model No. EA-180 System: MSIS Tag No. ZSH8200-2 ZSL8200-2 ZSH8201-1 ZSL8201-1 ZSH8202-2 ZSL8202-2 ZSH8203-1 ZSL8203-1 ZSL8204-2 ZSL8205-1 ZSH8419-1 ZSL8419-1 ZSH8421-2 ZSL8421-2	Temperature 235F Pressure $7\ lb/in.^2 g$ Radiation less than 1×10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 340F peak Pressure $70\ lb/in.^2 g$ Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	36 hours	In excess of 36 hours by test	None	N/A	Type test and analysis Aging: Thermal 200 hrs at 200F Mechanical 100,000 cycles NAMCO Qualification Report, dated Sept 1978 Log S023-507-2-1-466	Qualified for 8 years Maintenance Schedule: at 1 to 1-1/2 yrs replace top and bottom gaskets at 4-1/2 to 5 yrs replace lever shaft O-ring

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 48 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Limit Switch Cleveland Penetration Area	NAMCO Controls Acme - Company (Spec. No. S023-507-2)	Model No. EA-180 System: CIS Tag No. ZSH0509-1 ZSL0509-1 ZSH0511-1 ZSL0511-1 ZSH0513-1 ZSL0513-1 ZSH0515-2 ZSL0515-2 ZSH5388-1 ZSL5388-1 ZSH5437-2 ZSL5437-2 ZSH5804-2 ZSL5804-2 ZSH7513-2 ZSL7513-2 ZSH7911-2 ZSL7911-2 ZSH7259-1 ZSL7259-1 ZSH9918-1 ZSL9918-1 ZSH9920-1 ZSL9920-1 ZSH9921-1 ZSL9921-1 ZSH9945-1 ZSL9945-1 ZSH9948-2 ZSL9948-2 ZSH9951-1	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 5.2×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 340F peak Pressure 70 lb/in.^{2}g Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis	None	N/A	Type test and analysis Aging: Thermal 200 hrs at 200F Mechanical 100,000 cycles NAMCO Qualification Report, dated Sept 1978 Log S023-507-2-1-466	Qualified for 8 years Maintenance schedule: at 1 to 1-1/2 years replace top and bottom gaskets. At 4 to 4-1/2 years replace lever shaft O-ring

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 49 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Limit Switch Penetration Area (Continued) Safety Equipment Bldg.		ZSL9951-1 ZSH9821-2 ZSL9821-2 ZSH9825-1 ZSL9825-1 ZSH9218-1 ZSL9218-1 System: SIS Tag No. ZSH5434-2 ZSL5434-2 System: CVCS Tag No. ZSH9200-1 ZSL9200-1 ZSH9205-1 ZSL9205-1 System: CCW Tag No. ZSH6212-1 ZSL6212A1 ZSL6212B2 ZSH6213-2 ZSL6213A2 ZSL6213B1 ZSH6218-1 ZSL6218-1 ZSL6218B2 ZSH6219-2 ZSL6219A2 ZSL6219B1 ZSH6500-2 ZSL6500-2 ZSH6501-1 ZSL6501-1								

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 50 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Limit Switch Penetration Area	NAMCO Controls Acme Cleveland Company (Spec. No. S023-507-2)	Model No. EA-180 System: MSIS Tag No. ZSH4057-2 ZSL4057-2 ZSH4058-1 ZSL4058-1	Temperature 104F Pressure $0\ lb/in.^2g$ Radiation 5.2×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 340F peak Pressure $70\ lb/in.^2g$ Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	36 hrs	In excess of 36 hours by test	None	N/A	Type test and analysis Aging Thermal: 200 hrs at 200F Mechanical: 100,000 cycles NAMCO Qualification Report dated Sept 1978 Log S023-507-2-1-466	Qualified for 8 years Maintenance Schedule: at 1-1 1/2 yrs replace top and bottom gaskets. at 4 1/2-5 yrs replace lever shaft O-ring.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 51 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Alternating Current Electric Motor Operators Containment Bldg	Limitorque Corporation (Spec. Nos. S023-507-2 S023-507-5)	Model No. SMB-000 SMB-00 SB-1 SB-4 w/Class RH insulation System: CIS Tag No. HV9900 HV9971 HV5803 HV7258 HV7512 HV9917 HV9946 System: CCW Tag No. HV6223 HV6236 System: SIS Tag No. HV9304 HV9305 HV9334 HV9340 HV9350 HV9360 HV9370 System: CVCS Tag No. HV9201 TV9267	Temperature 300F peak See fig 3-1 Pressure 60 lb/in.^{2}g peak See fig 3-2 Radiation 1.7×10^8 rads (Note 1) Humidity 100% Chemical Spray $NaOH + H_2PO_3$ pH > 9 Submergence None	Temperature 300F peak Pressure 70 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray $H_2BO_3 + Na_2S_2O_3 + NaOH$ pH = 10.8 30 days Submergence N/A	120 days	0-30 days by test. 0-120 days by analysis	None	N/A	Generic type test and analysis Aging Thermal: 100 hrs at 356F Mechanical: 200 cycles during thermal +1800 cycles at ambient Limitorque Report No. 600456 (Appendix C of Report B0058) Log No. 507-2-1-410 507-5-1-212 507-5-4-28 507-5-2-101	Qualified for 40 yrs

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 52 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Ident-fication	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demon-strated	Accuracy or Response Time Requirement	Accuracy or Response Time Demon-strated	Qualification Report & Method	Qualification Status
Alternating Current Electric Motor Operators Containment Bldg (Continued)		System: SDCS Tag No. HV9337 HV9339 HV9377 HV9378 System: CIS Tag No. HV0508 HV0510 HV0512 HV0514 HV0516 HV0517 System: CVCS Tag No. HV9217								

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 53 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Alternating Current Electric Motor Operators Penetration Area Safety Equipment Bldg.	Limitorque Corporation (Spec Nos. S023-507-2 S023-507-5)	Model No's: SB-00S SMB-000 SMB-1 SMB-00 SB-0 W/Class RH insulation System: CIS Tag No. HV5686 System: CCW Tag No. HV6366 HV6367 HV6368 HV6369 HV6370 HV6371 HV6372 HV6373 System: SDCS Tag No. HV9336 HV9353 HV9359 HV9379 System: CSS Tag No. HV9306 HV9307 HV9347 HV9348	Temperature 130F Pressure 0 lb/in.^{2}g Radiation 5.2×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 300F peak Pressure 70 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis.	None	N/A	Generic Type Test and Analysis Aging Thermal: 100 hrs at 356F Mechanical 200 cycles during thermal +1800 cycles at ambient Limitorque Report No. 600456 (Appendix C of Report B0058) Log No's. 507-2-1-410 507-5-1-212 507-5-4-28 507-5-2-101	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 54 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Penetration Bldg.	Valcor Engineering Corporation (Spec. No. 507-4)	Model No. V52600-539 System: CIS Tag No. HV0352A HV0352B HV0352C HV0352D	Temperature 104F Pressure $0\ lb/in.^2g$ Radiation 2.0×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 346F Pressure $113\ lb/in.^2g$ Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis.	None	N/A	Type Test and Analysis Aging Thermal: 318F for 172 hours. Mechanical: 7500 cycles Valcor Qualification Test Report QR52600-515 (Appendix XII of Report No. QR52600-5940-2) MR52600-543-1 Log SO23-507-4-1-50	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 55 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Containment Bldg	Target Rock Corp (Spec. S023-507-4)	Model No. 75G-002 75G-003 75G-015 System: CIS Tag No. HV0500 HV0502 HV7801 HV7802 HV7805 HV7806 System: SIS Tag No. HV9345 HV9355 HV9365 HV9375 System: RC Gas Vent Tag No. HV0296A HV0296B HV0297A HV0297B HV0298 HV0299	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 1.3 x 10^8 rads (Note 1) Humidity 100% Chemical Spray NaOH + H_2BO_3 pH > 9 Submergence None	Temperature 385F peak Pressure 66 lb/in.^{2}g peak Radiation 1.35 x 10^8 rads Humidity 100% Chemical Spray 6200 ppm Boron for 22 min. 55 ppm Hydrazine 14 days pH 8.6-10 Submergence N/A	120 Days	0-14 days by test 14-120 days by analysis	None	N/A	Generic Type Test and Analysis Aging Thermal: 792 hrs at 350F Mechanical: 18,000 cycles Target Rock Report No. 2375	Qualified for 10 years. Installed life of 40 years based on soft seat replacement at 10 year intervals Log 507-4-76

Note 1: Radiation determined for specific equipment for 120 day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 56 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve MSIV Area	Target Rock Corp. (Spec No. S023-507-4)	Model No. 75G-009 System: MSIS Tag No. HV8248 HV8249	Temperature 235F Pressure $7\ lb/in.^2 g$ Radiation less than 1×10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 385F peak Pressure $66\ lb/in.^2 g$ peak Radiation 1.35×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	36 hours	Exceeds 36 hours by test	None	N/A	Generic Type Test and Analysis Aging Thermal: 792 hrs at 350F Mechanical: 18,000 cycles Target Rock Report No. 2375 Log 507-4-76	Qualified for 10 years. Installed life of 40 years based on soft seat replacement at 10 year intervals

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 57 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Solenoid Valve Penetration Area	Target Rock Corp. (Spec. No. S023-507-4	Mode No. 75G-002 75G-003 75G-016 System: CIS Tag No. HV0501 HV0503 HV7800 HV7803 HV7810 HV7811 HV7816	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 2.0×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 385F Pressure 66 lb/in.^{2}g Radiation 1.35×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-14 days by test. 14-120 days by analysis.	None	N/A	Generic type test and analysis Aging Thermal: 792 hrs at 350F Mechanical: 18,000 cycles Target Rock Report No. 2375 Log 507-4-76	Qualified for 10 years Installed life of 40 years based on soft seat replacement at 10 yr intervals

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 58 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Alternating Current Electric Motor Operators	Limitorque Corporation (Philadelphia Gear Corp.) (Spec. 507-2) (507-5)	Model No. SMB-00 SMB-000 w/Class B insulation	Temperature 130F Pressure 0 lb/in.^{2}g Radiation 2.0×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 250F Pressure 25 lb/in.^{2}g Radiation 2×10^7 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-16 days by test. 16-120 days by analysis.	None	N/A	Generic type test and analysis. Aging Thermal: 200 hrs. at 165F Mechanical: 2000 cycles. Limitorque Report No. B0003 (Appendix D of Report B0058) Log No. 507-2-1-410 507-5-4-26	Qualified for 40 years
Penetration Area Tendon Gallery (Containment Emergency Sump Isolation Valve Room Beneath Containment)		System: CCW Tag No. HV6211 HV6216 System. SIS Tag No HV9302 HV9303								

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 59 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Alternating Current Electric Motor Operators (Spec 507-2, 507-5) Safety Equipment Bldg SDHX Rooms	Limitorque Corporation	Model No. SMB-1 With Class B Insulation System: CSS Tag No. HV8150 HV8151 HV8152 HV8153	Temperature 130F Pressure $0\ lb/in.^2g$ Radiation 4.3×10^7 rads (Note 1) Humidity 80% Chemical Spray None Submergence None	Temperature 250F peak Pressure $25\ lb/in.^2g$ peak Radiation 2×10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-16 days by test. 16-120 days by analysis	None	N/A	Type test and analysis Aging Thermal: 200 hrs at 165F Mechanical: 2000 cycles Limitaque Report No. B0003 (Appendix D of Report B0058) Log No. S023-507-2-1 -410 S023-507-5-4-26	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120-day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 60 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Alternating Current Electric Motor Operators Auxiliary Feedwater Pump Room	Limitorque Corporation (Philadelphia Gear Corp) (Spec 507-5)	SMB-000 w/class B insulation System: EFAS Tag No. HV4713	Temperature 300F Pressure 4.14 lb/in.^{2}g Radiation $< 10^4$ rads Humidity 100% Chemical Spray None Submergence None	Temperature 250F peak Pressure 25 lb/in.^{2}g peak Radiation 2×10^7 rads Humidity 100% Chemical Spray N/A Submergence N/A	24 hours	Exceeds 24 hours by test	None	N/A	Generic Type Test and Analysis <u>Aging</u> Thermal: 200 hrs at 165F Mechanical: 2000 cycles Limitorque Report No. B0003 (Appendix D of Report B0058) Log No. 507-2-1-410 507-5-4-26	Qualified for 40 years

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 61 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Limit Switch Assembly Containment Bldg.	Limitorque Corporation (Philadelphia Gear Corp.) (Spec 507-2)	Model No. SMB-0 w/class B insulation System: CIS Tag No. HV9949 HV9950	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation: 3.2×10^8 rads Humidity: 100% Chemical Spray: NaOH + H_2BO_3 pH > 9 Submergence: None							Exempt See Table 5-1, A5

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 62 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Main Steam Isolation Valve (MSIV) Solenoid Actuated Dump Valve Wire MSIV Area	 Marotta Scientific Controls GE Wire and Cable Division (Spec 507-6)	Model No. MV238C Vulkene Type SIS System MSIS Tag No. HV8204 HV8205	Temperature 235F Pressure 7 lb/in.^{2}g Radiation less than 1 x 10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 300F Pressure 50 lb/in.^{2}g Radiation 5 x 10^6 rads Humidity 100% Chemical Spray N/A Submergence N/A	30 seconds	0-16 min by test	None	N/A	Type test and analysis radiation by analysis Aging Thermal: 200 hrs at 200F Mechanical: 200 cycles WKM Qualification Report Report No. 6850 Log S023-507-6-125	Qualified for 40 yrs.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 63 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Thermocouple Containment Bldg	Weed Instrument (Spec 508-5)	Identification Dwg. No. 1000-512-0221 Rev 0 System: PAMS Tag No. TE9903-1 TE9911-2	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 5.5×10^6 rads (Note 1) Humidity 100% Chemical Spray $NaOH + H_2BO_3$ pH >9 Submergence None	Temperature 300F Pressure 60 lb/in.^{2}g Radiation 1.05×10^7 rads Humidity 100% Chemical Spray 2300 ppm Boric Acid and NaOH pH 9-9.5 17 days Submergence N/A	120 days	0-17 days by test 17-120 days by analysis	Accuracy ±2% Response Time N/A	Accuracy ±2% Response Time N/A	Type Test and analysis Aging Thermal: 7 days at 257F Wyle Report No 58547 Log S023-508-5-114	Qualified for 40 years

Note 1: Radiation determined for specific equipment for 120 day TID.

Table 4-1

ENVIRONMENTAL QUALIFICATION OF IE ELECTRICAL EQUIPMENT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3 (Sheet 64 of 64)

Type of Equipment/ Location	Manufacturer	Model No. Or Identification	Abnormal or Accident Environment	Environment To Which Qualified	Operability Requirement	Operability Demonstrated	Accuracy or Response Time Requirement	Accuracy or Response Time Demonstrated	Qualification Report & Method	Qualification Status
Containment Post LOCA Hydrogen Monitor	General Electric (Spec 508-17)	Model No. 47E240609 for complete system	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See Fig. 3-2	Temperature 1) 331F 2) 400F peaks Pressure 1) 55 lb/in.^{2}g See note 2 2) 85 lb/in.^{2}g peaks	120 days	0-90 days by test. 90-120 days analysis	Accuracy ±5% FS	Accuracy ±5% FS	Type tests and Analysis Aging Thermal: 1) and 2) 14 days at 300F GE Report Document No. 80SDS4244 Oct. 1980 Log S023-508-17-18	Qualified for 2 years Replace Hydrogen Sensor every 2 years.
1) Hydrogen Sensor	G.E.	47E240610	Radiation 2.55×10^7 rads (Note 1)	Radiation 1) & 2) 3.2×10^7 rads						
2) Pressure Transducer Containment Bldg	CEC	CEC 1000 System: PAMS Tag No. 1) AET8100-1 AET8101-2 2) PT8112-2 PT8111-1	Humidity 100% Chemical Spray $NaOH + H_2BO_3$ pH >9 Submergence None	Humidity 1) 100% 2) 100% Chemical Spray 1) See note 3 2) See note 3 Submergence 1) N/A 2) N/A						

Note 1: Radiation determined for specific equipment for 120 day TID.
Note 2: Test pressure exceed actual containment pressure transient curve.
Note 3: Devices not susceptible to caustic spray by analysis.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 1 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Resistance Temperature Detector (RTD) Containment Building	Rosemount	Model No.: 104 AFC-1 System: RPS Tag No.: TE-9178 - 1,-2,-3,-4 TE-0112 - 1,-2,-3,-4 TE-9179 - 1,-2,-3,-4 TE-0122 - 1,-2,-3,-4	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2} peak See figure 3-2 R.H.: 100% Radiation 3.8 x 10^7 rads (Note 1) Chem. Spray: None by analysis See table 5-2, A1 Submergence None	0-10 min. Temp: 340F Press: 125 lb/in.^{2} R.H.: 100% 10 min. - 8 hrs: Temp: 303F Press: 70 lb/in^2 R.H.: 100% 8 - 50 hrs: Temp: 228F Press: 20 lbs/in^2 R.H.: 100% Radiation 2.0 x 10^8 rads Chem. Spray: N/A Submergence N/A	Accident Mitigation 30 Minutes	0 - 50 hours by test.	Total Accuracy: ±1.308F Response Time: 6.0 Sec	Total Accuracy: +0.042F -0.054F Response Time: See table 5-2, A2	Qualified by test. Rosemount Test Report No. 1762 Rev A dated June 1976	Qualification in progress See Table 5-2, A3

Note 1: This equipment has been analyzed to be insensitive to beta radiation, therefore the required qualification TID is only the gamma level specified in table 4-3

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 2 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Resistance Temperature Detector (RTD) Containment Building	Rosemount	Model No.: 104 AFV-1 System: PAMS Tag No.: TE-0111-X1 TE-0111-Y1 TE-0911-X1 TE-0911-Y1 TE-0921-X2 TE-0121-X2 TE-0121-Y2 TE-0921-Y2 TE-0915-2 TE-0115-2 TE-0925-1 TE-0125-1	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2} peak See figure 3-2 R.H.: 100% Radiation 3.8 x 10^7 rads (Note 1) Chem. Spray: Boric Acid and NaOH w/pH>9 Submergence None	0-10 min. Temp: 340F Press: 125 lb/in.^{2}g R.H.: 100% 10 min-8 hrs Temp: 303F Press: 70 lb/in.^{2} R.H.: 100% 8 - 50 hrs. Temp: 228F Press: 20 lb/in.^{2} R.H.: 100% Radiation 2 x 10^8 rads Chem. Spray: pH=11 (0.1% of NaOH and 15000 ppm of Boric Acid) for 8 hours Submergence N/A	Post Accident Monitoring: 120 days	0-50 hours by test. 50 hrs. - 120 days by analysis	Post Accident Monitoring: Accuracy: 1.5F Response Time: Not Applicable	Total Accuracy +0.042F -0.054F Response Time: N/A	Qualified by test. Rosemount Report No. 1762 Rev A dated June 1976	Qualification in progress See Table 5-2, A3

Note 1: This equipment has been analyzed to be insensitive to beta radiation, therefore the required qualification TID is only the gamma level specified in table 4-3

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 3 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
RCP Speed Signal Sensor and Transmitter Containment Building	Bentley-Nevada Corporation	Serial No.: 21956-01 (Sens) 21956 (Trans) System: RPS Tag No.: SE-0113 1-4 SE-0123 1-4 SE-0133 1-4 SE-0143 1-4 ST-0113 1-4 ST-0123 1-4 ST-0133 1-4 ST-0143 1-4								See Appendix F, Item 1.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 4 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Transmitter Containment Building	Rosemount	Model No.: 1153 HA6 System: RPS Tag No.: PDT-0978-1, -2,-3,-4 PDT-0979-1, -2,-3,-4	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Pressure 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 3.8×10^7 (See Note 1) Chem.Spray: None by analysis see table 5-2,A1 Submergence None	0-20 min: Temp: 350F Press: 120 lb/in.^{2}g R.H.: Steam 20 min - 8 hrs. & 20 min: Temp: 303F Press: 55 lb/in.^{2}g R.H.: Steam 8 hrs. 20 min - 64 hrs. 20 min: Temp: 250F Press: 15 lb/in.^{2}g R.H.: Steam Radiation 4.4×10^7 rads Chem.Spray: 0-24 hrs. 15000 ppm of Boric Acid and NaOH with pH=10.5 at 77F. Submergence N/A	Accident Mitigation: 30 minutes	0-64 hrs. & 20 min. by test.	Accident Mitigation: Accuracy: ±2.22 lb/in.^{2} Response Time: 0.4 sec.	Total Accuracy: +5.55 -0 lb/in.^{2} Response Time: 0.11 sec.	Qualified by test. Rosemount Test Report No. 3788, dated March 1978.	Replace. See table 5-2, A4.

Note 1: This equipment has been analyzed to be insensitive to beta radiation, therefore the required qualification TID is only the gamma level specified in table 4-3.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 5 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Containment Building	Foxboro	Model No.: E-11 GM System: RPS Tag No.: PT-0101-1, -2,-3,-4	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H. 100% Radiation 2.0×10^8 rads (Note 1) Chem.Spray: None by analysis See Table 5-2, A1 Submergence None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chem.Spray: N/A Submergence N/A	Accident Mitigation: 30 minutes	0-24 hours by test	Total Accuracy: -82 lb/in^{2}a +291b/in^{2}a Response Time: 0.5 sec.	Total Accuracy: -72.1 lb/in^{2}a +0 lb/in^{2}a Response Time: See table 5-2, A5	Qualified by separate effects test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim use See Table 5-2, A6

Note 1: This is a 30 day TID value

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 6 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Containment Building	Rosemount	Model No.: 1153 GA9 System: RPS SIAS CCAS CSAS Tag No.: PT-0102-1, -2,-3,-4 System: PAMS Tag No.: PT-0102-1,-2	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Pressure 60 $lb/in.^2 g$ peak See figure 3-2 R.H.: 100% Radiation 3.8×10^7 (See Note 1) Chem.Spray: Boric Acid and NaOH w/pH >9 Submergence None	0-20 min: Temp: 350F Press: 120 $lb/in.^2 g$ R.H.: Steam 20 min - 4 hrs. & 20 min: Temp: 303F Press: 55 $lb/in.^2 g$ R.H.: Steam 4 hrs. 20 min - 64 hrs. 20 min: Temp: 250F Press: 15 $lb/in.^2 g$ R.H.: Steam Radiation 4.4×10^7 rads Chem.Spray: 0-24 hrs. 15000 ppm of Boric Acid and NaOH of pH=10.5 at 77F. Submergence N/A	Accident Mitigation: 30 minutes Post Accident Monitoring: 120 days	0-64 hrs. & 20 min. by test. 64 hrs and 20 min to 120 days by analysis.	Accident Mitigation: Accuracy: +239.1 lb/in^2 -299.1 lb/in^2 Response Time: 0.5 sec. Post Accident Monitoring Accuracy: ± 100 $lb/in.^2$. Response Time: N/A	Total Accuracy: +236.2 lb/in^2 -0 lb/in^2 Response 0.11 sec.	Qualified by test. Rosemount Test Report No. 3788, dated March 1978.	Replace. See Table 5-2, A4

Note 1: This equipment has been analyzed to be insensitive to beta radiation, therefore the required qualification TID is only the gamma level specified in table 4-3.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 7 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal c: Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Transmitter Containment Building	Foxboro	Model No.: E-13 DH System: PAMS Tag No.: LT-0110-1, -2	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 2.0 x 10^8 rads Note 1 Chem.Spray: Boric Acid and NaOH w/pH >9 Submergence None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2 x 10^8 rads Chem.Spray: NaOH solution with 1.5% of Boric Acid by weight. 0-2 hours: pH of 9.25 to 10.0. 2-24 hours: pH of 8.5 to 9.25. Submergence N/A	Post Accident Monitoring: 36 hours	0-24 hours by test. 24-36 hours by analysis	Post Accident Monitoring: Accuracy: ±5.3 in. Response Time: Not Applicable	Total Accuracy +7.10 in. -6.6 in. Response Time: N/A	Qualified by separate effects test. Foxboro Test Report No. T3-1013 dated May 1975 and T3-1068, dated August 1973.	Interim use. See Table 5-2, A6

Note 1: This is a 30 day TID value

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 8 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Containment Building	Foxboro	Model No.: E-11 GM System: SDCS Tag No.: PT-0103-1 PT-0105-3	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 2.0×10^8 rads (Note 1) Chem.Spray: Boric Acid and NaOH w/pH >9 Submergence None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chem.Spray: NaOH solution with 1.5% off Boric Acid by weight. 0-2 hours: pH of 9.25 to 10.0 2-24 hours: pH of 8.5 to 9.25. Submergence N/A	120 days	0-24 hours by test. 24 hours to 120 days by analysis	Total Accuracy: for 36 hours ±25 lb/in^2 for 120 days ±100 lb/in^2	Total Accuracy: -62.2 lb/in.^{2} +0.0 lb/in^2	Qualified by separate effects test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973.	Interim use See Table 5-2, A6

Note 1: This is a 30 day TID value

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 9 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Containment Building	Rosemount	Model No.: 1153 GA9 System: SDCS Tag No.: PT-0104-2 PT-0106-4	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 3.8×10^7 (See note 1) Chem.Spray: Boric Acid and NaOH w/pH >9 Submergence None	0-20 min: Temp: 350F Press: 120 lb/in.^{2}g R.H.: Steam 20 min - 8 hrs & 20 min: Temp: 303F Press: 55 lb/in.^{2}g R.H.: Steam 8 hrs 20 min - 64 hrs 20 min: Temp 250F Press: 15 lb/in.^{2}g R.H.: Steam Radiation 4.4×10^7 rads Chem.Spray: 0-24 hrs. 15000 ppm of Boric Acid and NaOH of pH=10.5 at 77F. Submergence N/A	36 hours	64 hrs & 20 min. by test.	Total Accuracy: ±50 lb/in.^{2} Response Time: N/A	Total Accuracy: +48.6 lb/in.^{2} -0 lb/in.^{2}	Qualified by test. Rosemount test report No. 3788, dated March 1978.	Replace. See Table 5-2, A4

Note 1: This equipment has been analyzed to be insensitive to beta radiation, therefore the required qualification TID is only the gamma level specified in table 4-3.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 10 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Containment Building	Foxboro	Model No.: E-11 GM System: RPS MSIS EFAS Tag No.: PT-1013-1, -2,-3,-4 PT-1023-1, -2,-3,-4 System: PAMS Tag No.: PT-1013-1,-2 PT-1023-1,-2	Legend A of table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 2.0×10^8 rads (Note 1) Chem.Spray: Boric Acid and NaOH w/pH >9 Submergence None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chem.Spray: NaOH solution with 1.5% of Boric Acid by weight. 0-2 hours: pH of 9.25 to 10.0. 2-24 hours: pH of 8.5 to 9.25. Submergence N/A	Accident Mitigation: 30 minutes Post Accident Monitoring: 36 hours	0-24 hours by Test. 24-36 hours by analysis.	Accident Mitigation: Accuracy: +45 lb/in.^{2} -112 lb/in.^{2} Response Time: 0.5 Sec. Post-Accident Monitoring: Accuracy: ±22 lb/in.^{2} Response Time: Not Applicable	Total Accuracy: +0.0 lb/in.^{2}g -115.0 lb/in.^{2}g Response Time: See Table 5-2, A5	Qualified by separate effects test. Foxboro Test Report No. T3-1013 dated May 1975 and T3-1068, dated August 1973.	Interim use. See Table 5-2, A5,

Note 1: This is a 30 day TID value

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 11 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Transmitter Containment Building	Foxboro	Model No.: E-13 DM System: RPS EFAS Tag No.: LT-1113-1, -2,-3,-4 LT-1123-1, -2,-3,-4	Legend A of table 4-3. Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 2.0×10^8 rads (Note 1) Chem.Spray: None by analysis See Table 5-2, A1 Submergence None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chem.Spray: N/A Submergence N/A	Accident Mitigation: 30 minutes	0-24 hours by test.	Total Accuracy: -10.4 in. +35.4 in. Response Time: 0.5 sec.	Total Accuracy: -9.6 in. +0.0 in. Response Time: See Table 5-2, A5	Qualified by separate effects test. Foxboro test report no. T3-1013 dated May 1975 and T3-1068 dated August 1973	Interim use See Table 5-2, A6

Note 1: This is a 30 day TID value

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 12 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Transmitter Containment Building	Rosemount	Model No.: 1153 DA5 System: PAMS Tag No. LT-1115-1,-2 LT-1125-1,-2	Legend A of Table 4-3 Temp: 300F peak See figure 3-1 Press: 60 lb/in.^{2}g peak See figure 3-2 R.H.: 100% Radiation 3.8 x 10^7 rads (See Note 1) Chem.Spray Boric Acid and NaOH w/pH>9 Submergence None	0-20 min: Temp: 350F Press: 120 lb/in.^{2}g R.H.: Steam 20 min - 8 hrs & 20 min: Temp: 303F Press: 55 lb/in.^{2}g R.H.: Steam 8 hrs 20 min - 64 hrs 20 min: Temp: 250F Press: 15 lb/in.^{2}g R.H.: Steam Radiation 4.4 x 10^7 rads Chem.Spray: 0-24 hrs. 15000 ppm of Boric Acid and NaOH of pH=10.5 at 77F. Submergence N/A	Post-Accident Monitoring: 36 hours	0-64 hrs and 20 min by Test.	Post-Accident Monitoring: Accuracy: ±10.4 in. Response Time: Not applicable	Total Accuracy: +27.2 in. -0 in	Qualified by test. Rosemount test report No. 3788, dated March 1978.	Replace. See Table 5-2, A4

Note 1: This equipment has been analyzed to be insensitive to beta radiation, therefore the required qualification TID is only the gamma level specified in table 4-3.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 13 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
CEDM Reed Switch Position Transmitter Containment Building	Combustion Engineering and Electro-Mechanics	Ident. No.: 150 Inch Type System: RPS Tag No.: Not Applicable								See Appendix F, Item 1

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 14 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
RSPT Cable Containment Building	Anaconda	Ident. No.: Not Applicable System: RPS								See Appendix F Item 1

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 15 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Resistance Temperature Detector (RTD) Safety Equipment Building: SDHX Rooms and Rooms for HPSI, LPSI, and CSS pumps	Rosemount	Model No.: 104 AFC-1 System: SDCS PAMS Tag No.: TE-0303-1,-2 TE-0351-1 TE-0352-2	Legend C1 and C3 of Table 4-3 Temp: 130F Press: 0 lb/in.^{2}g R.H.: 90% Radiation: 4.3×10^7 rads Chem.Spray: None Submergence: None	0-10 min: Temp: 340F Press: 125 lb/in.^{2}g R.H.: 100% 10 min - 8 hrs: Temp: 303F Press: 70 lb/in.^{2}g R.H.: 100% 8-50 hrs: Temp: 228F Press: 20 lb/in.^{2}g R.H.: 100% Radiation: 2.0×10^8 rads Chem.Spray: N/A Submergence: N/A	Post-Accident Monitoring: 120 days	0-50 hrs. by test. 50 hrs - 120 days by analysis	Post-Accident Monitoring: Accuracy: ±12F Response time: Not applicable	Total Accuracy: +0.042F -0.054F Response time: N/A	Qualified by test Rosemount Test Report No. 1762 Rev. A, dated June 1976.	Qualification in progress See Table 5-2, A3

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 16 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Safety Equipment Building SDHX Rooms	Foxboro	Model No.: NE-11 GM System: SDCS PAMS Tag No.: PT-0303-1,-2	Legend C3 of table 4-3 Temp: 130F Press: 0 lb/in.^{2}g R.H.: 80% Radiation: 4.3 x 10^7 rads Chem.Spray: None Submergence: None	0-2 Hours 35 Sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation: 2.2 x 10^8 rads Chem.Spray: N/A Submergence: N/A	Post-Accident Monitoring: 120 days	0-24 hours by Test 24 hours - 120 days by analysis	Post-Accident Monitoring: Accuracy: ±50 lb/in.^{2} Response Time: Not applicable	Total Accuracy: See Table 5-2, A8 Response Time: N/A	Qualified by separate effects test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973.	Interim Use See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 17 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Penetration Area	Foxboro	Model No.: NE-11 GM System: RPS SIAS CCAS CIAS CSAS Tag No.: PT-0351-1, -2,-3,-4	Legend E of table 4-3 Temp: 104F Press: 0 lb/in.^{2}g R.H.: 90% Radiation: 2.0×10^7 rads Chem.Spray: None Submergence: None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation: 2.2×10^8 rads Chem.Spray: N/A Submergence: N/A	30 Minutes	0-24 hours by test.	Total Accuracy: +0.6 lb/in^2 Response Time: 0.9 sec.	Total Accuracy: see Table 5-2, A8 Response Time: See Table 5-2, A5	Qualified by separate effects test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim use. See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 18 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Penetration Area	Foxboro	Model No.: NE-11 GM System: CSAS Tag No.: PT-0352-1, -2,-3,-4	Legend E of Table 4-3 Temp: 104F Press: 0 lb/in.^{2}g R.H.: 100% Radiation: 2.0×10^7 rads Chem.Spray: None Submergence: None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation: 2.2×10^8 rads Chem.Spray: N/A Submergence: N/A	Accident Mitigation: 30 Minutes	0-24 Hours by Test.	Total Accuracy: -3.75 lb/in.^{2} +2.44 lb/in^2 Response Time: 0.9 sec.	Total Accuracy: see Table 5-2, A-8 Response Time: See Table 5-2, A5	Qualified by separate effects test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim use. See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 19 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Flow Transmitter Penetration Area	Foxboro	Model No.: NF-13 DH System: PAMS Tag No.: FT-0311-2 FT-0321-1 FT-0331-1 FT-0341-2 FT-9421-1 FT-9435-2	Legend E of Table 4-3 Temp: 104F Press: 0 lb/in.^{2}g R.H.: 90% Radiation: 2.0×10^7 rads Chem.Spray: None Submergence: None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - To 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation: 2.2×10^8 rads Chem.Spray: N/A Submergence: N/A	Post-Accident Monitoring: 120 days	0-24 hours by Test. 24 hours - 120 days by analysis	Post-Accident Monitoring: Accuracy: For FT-0311-2 FT-0321-1 FT-0331-1 FT-0341-2 ±11.4 gal/min For FT-9421-1 FT-9435-2 ±45.5 gal/min Response Time: Not Applicable	Total Accuracy: see Table 5-2, A8.	Qualified by separate effects test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973.	Interim Use. See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 20 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Flow Transmitter Safety Equipment Building SDHX Rooms	Foxboro	Model No.: NE-13 DM System: CSS Tag No.: FT-0338-1 FT-0348-2	Legend C3 of Table 4-3 Temp: 130F Press: 0 lb/in.^{2}g R.H.: 80% Radiation: 4.3 x 10^7 rads Chem.Spray: None Submergence: None	0-2 hours 35 sec: Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - To 24 hours: Temp: 244F Pres: 20 lb/in.^{2}g R.H.: Steam Radiation: 2.2 x 10^8 rads Chem.Spray: N/A Submergence: N/A	36 hours	0-24 hours by test. 24-36 hours by analysis	Accuracy: ±87.5 gal/min Response Time: 0.9 Sec.	Total Accuracy: see Table 5-2, A8 Response Time: See Table 5-2, A5	Qualified by separate effects test. Foxboro test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim Use. See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 21 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Flow Transmitter Safety Equipment Building Chemical Storage Tank and Pump Room	Foxboro	Model No.: NE-13DH System: CSS Tag No.: FT-0318 FT-0328	Legend C4 of Table 4-3 Temp: 104F Press: Atmospheric Humidity 80% Radiation: 1.9×10^6 rads Chem.Spray: None Submergence: None	0-2 hours 35 sec. Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. - to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chem. Spray: N/A Submergence: N/A	36 hours	0-24 hours by test. 24-36 hours by analysis	±0.7 gal/min Response Time: None	Accuracy: See Table 5-2, A8	Qualified by separate effects test. Foxboro Test Report No. T3-1013 dated May 1975 and T3-1068, dated August 1973.	Interim use See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 22 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Magnetic Flow Transmitter	Foxboro	Model No.: E-96 System: CSS Tag No.: FT-0318 FT-0328	Legend C4 of Table 4-3 Temp: 107F Press: Atmospheric Radiation: 5.4×10^5 rads Humidity: 90% Chem. Spray: None Submergence: None							See Appendix F, Item 4

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 23 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Magnetic Flow Detector	Foxboro	Model No.: 2801 System: CSS Tag No.: FE-0318 FE-0328	Legend C4 of Table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.9×10^6 rads Humidity: 90% Chem.Spray: None Submergence: None							See Appendix F, Item 4

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 24 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Level Transmitter Location: Safety Equipment Building Spray Chemical Storage Tank and Pump Room	Foxboro	Model No.: NE-13DM System: CSS Tab No.: LT-0348-1 LT-0349-2	Legend C4 of Table 4-3 Temp: 104F Press: Atmospheric Humidity: 80% Radiation 1.9×10^6 rads Chem.Spray: None Submergence: None	0-2 hours 35 sec. Temp: 300F Press: 60 lb/in.^{2}g R.H.: Steam 2 hours 35 sec. to 24 hours: Temp: 244F Press: 20 lb/in.^{2}g R.H.: Steam Radiation 2.2×10^8 rads Chem. Spray N/A Submergence N/A	?6 hours	0-24 hours by test 24-36 hours by analysis	Accuracy: +1.5% (full scale) Alarm channel Response Time: Not Applicable	Accuracy: See Table 5-2, A8	Qualified by separate effects test Foxboro Test Report No. T3-1013 dated May 1975 and T3-1068 dated August 1973	Interim Use. See Table 5-2, A8

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 25 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Differential Pressure Flow Transmitter Location: Penetration Area	Foxboro	Model No.: E-13 DH System: CVCS Tag No.: FT-0212	Legend E of Table 4-3 Temp: 104F Press: 0 lb/in.^{2} R.H: 90% Radiation: 5.7×10^6 rads Chemical Spray: None Submergence: None	Not Tested	120 days	Not Demonstrated	Accuracy: +1.5 gal/min Response Time: Not Applicable	Not Tested	Not Tested	Replace See Table 5-2, A7

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 26 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Pressure Transmitter Location: Penetration Area	Foxboro	Model No.: E-11 GH System: CVCS Tag No.: PT-0212	Legend E of Table 4-3 Temp: 104F Press: 0 lb/in.^{2} R.H.: 90% Radiation: 5.7 x 10^6 Rads Chem. Spray: None Submergence: None	Not Tested	120 hours	Not Demonstrated	Accuracy: +30 lb/in.^{2} Response Time: Not Applicable	Not Tested	Not Tested	Replace see Table 5-2, A7

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 27 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Air Solenoid valve for pilot control of piston operated valves Containment Building	Automatic Switch Co.	Model No.: NP 8316 System: SIS Tag No.: HY-9341 HY-9351 HY-9361 HY-9371 HY-9433 HY-9437 System: CVCS Tag No.: TY-0221	Legend A of Table 4-3 Temperature: 300F peak (See figure 3-1) Pressure: 60 lb/in.^{2} peak (See figure 3-2) Radiation: (Note 1) Humidity: 100% RH Chem. Spray: Boric acid and sodium hydroxide w/pH>9 Submergence: None	Temperature: 346F peak Pressure: 110 lb/in.^{2}g Radiation: 2 x 10^8 rads Humidity 100% RH Chem. Spray: Boric acid, thiosulfate, sodium hydroxide w/pH>9.5 Submergence: N/A	Must operate to close main valve immediately after DBE. No further operation is required	Operation demonstrated after aging and radiation by test and analysis	None	N/A	Automatic switch co. qualification report no. AQS21678/TR Rev. A by type test and analysis Aging: Thermal: 12 days at 268F Mechanical 40,000 cycles	Qualified for 4 years Replace coils and elastomeric components at 4 year intervals.

Note 1: Point specific 120 day TID for HY-9341, HY-9351, HY-9361 and HY-9371 is 1.5 x 10^8 rads.
Point specific 120 day TID for HY-9433, HY-9437 and TY-0221 is 2.0 x 10^8 rads.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 28 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Air solenoid valve for pilot control of piston operated valves Containment Building	Automatic Switch Co.	Model No.: NP8316 System: SIS Tag No.: HY9342 HY9352 HY9362 HY9372	Legend A of Table 4-3 Temp: 300F peak (See figure 3-1) Press: 60 lb/in.^{2}g peak (See figure 3-2) Radiation: 1.5×10^8 rads (Note 1) Humidity: 100% R.H. Chem.Spray: Boric Acid and Sodium Hydroxide w/pH>9 Submergence: None	Temp: 346F peak Press: 110 lb/in.^{2}g peak Radiation: 2×10^8 rads Humidity 100% R.H. Chem. Spray: Boric acid, Thiosulphate, Sodium Hydroxide w/pH>9.5 Submergence: N/A	None	Operation demonstrated after aging and radiation by test and analysis	None	N/A	Automatic Switch Co. Qualification Report No. AQS21678/TR Rev. A by type test and analysis Aging: Thermal: 12 days at 268F Mechanical: 40,000 cycles	Qualified for 4 years. Replace coils and elastomeric components at 4 year intervals.

Note 1: Point specific 120 day TID.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 29 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Air solenoid valve for pilot control of diaphragm operated valves	Automatic Switch Co.	Model No.: NP8320			Must operate to open main valve. immediately after DBE. No further operation is required	Operation demonstrated after aging and radiation by test and analysis	None	N/A	Automatic Switch Co. Qualification Report No. AQS21678/TR Rev. A by type test and analysis Aging: Thermal: 12 days at 268 F Mechanical: 40,000 cycles	Qualified for 4 years. Replace coils and elastomeric components at 4 year intervals.
Shutdown heat exch. room		System: SIS Tag No.: FY-0306	Legend C3 of Table 4-3 Temp: 130F Press: Atmospheric Radiation: 4.3×10^7 rads Humidity: 90% R.H. Chem. Spray: None Submergence: None	Temp:346F peak Press: 110 lb/in.^{2}g peak Radiation: 2×10^6 rads Humidity 100% R.H. Chem. Spray: N/A Submergence: N/A						
Safety Equip. Bldg. Rooms for LPSI/HPSI & CSS Pumps		System: SIS Tag No.: HY-9316	Legend C1 of Table 4-3 Temp: 104F Press: Atmospheric Radiation: 5.2×10^7 rads Humidity: 90% R.H. Chem. Spray: None Submergence: None							

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 30 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Limit Switch (2 per valve)- Indicates Open/Closed Position Containment Building	NAMCO Controls	Model No.: EA 180 System: SIS Tag No.: ZSH/ZSL-9341-2 ZSH/ZSL-9351-1 ZSH/ZSL-9361-1 ZSH/ZSL-9371-2 ZSH/ZSL-9433-1 ZSH/ZSL-9437-2 System: CVCS Tag No.: ZSH/ZSL-0221-1	Legend A of Table 4-3 Temperature: 300F Peak (See figure 3-1) Pressure: 60 lb/in.^{2}g Peak (See figure 3-2) Radiation: (Note 1) Humidity: 100% RH Chem. Spray Boric Acid and Sodium Hydroxide w/pH > 9 Submergence: None	Temperature: 346F Peak Pressure: 70 lb/in.^{2}g Peak Radiation: 2 X 10^8 Rads Humidity: 100% R Chem. Spray: Boric Acid, Sodium Thio-Sulfate, Sodium Hydroxide w/pH between 10 and 11 Submergence: N/A	Make and break contact to provide valve indication for 36 hours following DBE and considering 4 hours margin	Operation in excess of 36 hours demonstrated after aging and radiation by test and analysis	None	N/A	NAMCO Controls Qualification Report No. QTR 105 dated 8/28/80 by type test and analysis Aging: Thermal: 400 hours at 248F Mechanical: 100,200 cycles	Qualified for 40 years with scheduled maintenance every 5 years See Appendix F Item 3

Note 1: Point specific 120 day TID for ZSH/ZSL-9341-2, 9351-1, 9361-1, and 9371-2 is 1.5 x 10^8 rads
Point specific 120 day TID for ZSH/ZSL-9433-1, 9437-2, and 0221-1 is 2.0 x 10^8 rads

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 31 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor Operator Penetration Area	Limitorque	Model No.: SMB-1 w/Class B Insulation System: SIS Tag No.: HV-9322 HV-9325 HV-9328 HV-9331	Legend E of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 2×10^7 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 120F Pressure: 25 lb/in.^{2}g Radiation: 2×10^7 rads Humidity: 100% RH Chem. Spray: N/A Submergence: N/A	Operate for 120 days from onset of DBE after normal operation and considering 12 days margin	Operation demonstrated after aging and radiation by test and analysis	None	N/A	Appendix D (Report No. B0003) of Report B0058 by type test and analysis Thermal Aging: 200 hours at 165F Mechanical: 2,000 Cyles	Qualification In Progress See Table 5-2, A9.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 32 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor Operator Penetration Area	Limitorque	Model No: SMB-00 With Class B Insulation System: SIS Tag No.: HV-9323 HV-9326 HV-9329 HV-9332 HV-9324 HV-9327 HV-9330 HV-9333 HV-9367 HV-9368 HV-9420 HV-9434	Legend E of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 2×10^7 Rads Humidity: 90% RH Chem.Spray: None Submergence: None	Temperature: 120F Pressure: 25 $lb/in.^2g$ Radiation: 2×10^7 Rads Humidity: 100% RH Chem.Spray: N/A Submergence: N/A	Operate for 120 days from onset of DBE after normal operation and considering 12 days margin	Operation demonstrated after aging and radiation by test and analysis	None	N/A	Appendix D (Report No. B0003) of Report B0058 by type test and analysis Thermal Aging: 200 Hours at 165F Mechanical: 2,000 Cycles	Qualification In Progress See Table 5-2, A9.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 33 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor Operator Auxiliary Building: Volume Control Tank Valve Gallery	Limitorque	Model No.: SMB-00 with Class B insulation System: CVCS Tag No.: LV-0227B	Legend B-12 of Table 4-3 Temp: 104F Pressure: Atmospheric Radiation: 2×10^5 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temp: 120F Pressure: 25 lb/in.^{2}g Radiation: 2×10^7 rads Humidity 100% RH Chem. Spray: N/A Submergence: N/A	Must operate for 36 hours following DBE. Required to remain closed thereafter. DBE operation after 40 years of normal operation and considering 4 hours margin	Operation in excess of 36 hours demonstrated after aging and radiation by test and analysis	None	N/A	Appendix D (report No. B0003) of report B0058 by type test and analysis Thermal aging: 200 hours at 165F Mechanical: 2,000 cycles	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 34 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Solenoid Operator Safety Equipment Building: Spray Chemical Storage Tank and Pump Room	Valcor Engineering	Model No.: V-52600-573-1 System: CSS Tag No.: HV-9399 HV-9398	Legend C4 of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 1.9×10^6 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 120F Pressure: Atmospheric Radiation: 2×10^8 rads Humidity: 100% RH Chem. Spray: N/A Submergence: N/A	Operate for 36 hours following DBE after 40 years of normal operation and considering 4 hours margin	Operation in excess of 36 hours demonstrated after aging and radiation by test and analysis	None	N/A	Valcor Qualification Report No. QR52600-515 by type test and analysis Thermal aging: 172 hours at 318F Mechanical: 7,500 cycles	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 35 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor For Low Pressure Safety Injection Pump Safety Equipment Building: Rooms For LPSI, HPSI, and Containment Spray Pump	Westinghouse Large AC Motor Division	System: SIS Tag No: P015 P016	Legend C1 of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 5.2×10^7 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 104F Pressure: Atmospheric Radiation: 2×10^8 rads Humidity: 100% RH Chem. Spray: N/A Submergence: N/A	Continuous operation for up to 120 days following DBE (2880 Hours) after 40 years of normal operation and considering 288 hours margin	230,000 hours by test and analysis	None	N/A	Westinghouse Report WCAP-8754, Rev. 1 by test and analysis Thermal Aging: 4,900 hours at 170C 1,000 hours at 190C 500 hours at 210C Mechanical: 1,000 cycles	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)

ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT

(Sheet 36 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor For High Pressure Safety Injection Pump Safety Equipment Building Rooms For HPSI, LPSI, And Containment Spray Pumps	Westinghouse Large AC Motor Division	System: SIS Tag No: P017 P018 P019	Legend C1 Of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 5.2×10^7 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 104F Pressure Atmospheric Radiation 2×10^8 rads Humidity: 100% RH Chem Spray: N/A Submergence: N/A	Continuous operation for up to 120 days following DBE (2880 hours) after 40 years of normal operation and considering 288 hours margin	137,000 Hours by test and analysis	None	N/A	Westinghouse Report WCAP-8754, Rev. 1 by test and analysis Thermal Aging: 4,900 hours at 170C 1,000 hours at 190C 500 hours at 210C Mechanical: 1,000 cycles	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 37 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor For Containment Spray Pump Safety Equipment Building: Rooms For HPSI, LPSI, And Containment Spray Pumps	Westinghouse Large AC Motor Division	System: CSS Tag No: P012 P013	Legend C1 of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 5.2×10^7 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 104F Pressure: Atmospheric Radiation: 2×10^8 rads Humidity: 100% RH Chem. Spray: N/A Submergence: N/A	Continuous operation for up to 120 days following DBE (2880 hours) after 40 years of normal operation and considering 288 hours margin	230,000 hours by test and analysis	None	N/A	Westinghouse Report WCAP-8754, Rev. 1 by test and analysis Thermal Aging: 4,900 hours at 170C 1,000 hours at 190C 500 hours at 210C Mechanical: 1,000 cycles	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 38 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor For Spray Chemical Addition Pump Safety Equipment Building: Spray Chemical Storage Tank And Pump Room	Siemens-Allis	System: IRS Tag No: P020 P021	Legend C4 of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 1.9×10^6 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 104F Pressure: Atmospheric Radiation: 2×10^8 rads Humidity: 100% RH Chem Spray: N/A Submergence: N/A	Continuous operation for up to 36 hours following DBE after 40 years of normal operation and considering 4 hours margin	50,000 hours by test and analysis	None	N/A	Siemens-Allis Report NQ890253-1 by test and analysis Thermal Aging: 4,000 hours at 180C 1,600 hours at 200C 750 hours at 220C	Qualified for 40 years .

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 39 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Solenoid Operator	Target Rock Corp.	Model No.: 80B-001 System: CIS								See Appendix F, Item 2

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 40 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Motor For Charging Pump Auxiliary Building Charging Pump Room	Louis Allis	System: CVCS Tag No: P190 P191 P192	Legend B1 Of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 2×10^6 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 104F Pressure: Atmospheric Radiation: 3.6×10^8 rads Humidity: 100% RH Chem Spray: N/A Submergence: N/A	Operate for 20 days (480 hours) within a period of 120 days following LOCA after 40 years of normal operation and considering 48 hours margin	29,000 hours by test and analysis	None		Louis Allis Report AR#6-202476 by test and analysis Thermal Aging: 3,591 hours at 180C 1,563 hours at 200C	Qualified for 8 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 41 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Hydra-Motor Operator Safety Equipment Building Spray Chemical Storage Tank And Pump Room	ITT General Controls	Model No.: NH93J4002 System: SIS Tag No.: FV-0318 FV-0328	Legend C4 of Table 4-3 Temperature: 104F Pressure: Atmospheric Radiation: 1.9×10^6 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temperature: 122F Pressure: Atmospheric Radiation: 5×10^6 rads Humidity: 100% RH Chem. Spray: N/A Submergence: N/A	36 hours following DBE after 40 years of normal operation and considering 4 hours margin	Operation in excess of 36 hours demonstrated after aging and radistion by test and analysis	None	N/A	ITT General Controls Report 721.77.095 by type test and analysis Thermal Aging: 3 months at 140F Mechanical: 100,000 cycles at 20% stroke 2,000 cycles at 100% stroke	Qualified for 2 years. Requires replacement of electrical equipment at end of 2 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 42 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Nuclear Instrument Detector Assembly and Integral Cable Containment Building	General Atomics/ Reuter Stokes	Serial No.: E1E304-5000-1 System: RPS Tag No.: None	Legend A of table 4-3 Temp: 300F peak See fig.3-1 Press: 60 lb/in.^{2}g peak See fig.3-2 Radiation 3.0×10^8 rads See Note 1. Humidity: 100% Chem.Spray None by analysis See Table 5-2, A1. Submergence: None	0-10 hrs: Temp: 310F Press: 65 lb/in.^{2}g 10-96 hrs. Temp: 250F Press: 65 lb/in.^{2} Radiation: Later Humidity: See table 5-2, A11 Chem.Spray N/A Submergence: N/A	30 seconds for CEA ejection and 55 seconds for 0.5 ft^2 steam line break. See Table 5-2, A10	0-2 min. by test and analysis	See Table 5-2, A13	See Table 5-2, A13	Qualified by test and analysis General Atomics Test Report No. GAE-115-496 dated August 1975.	Qualification In Progress See Table 5-2, A3

Note 1: Since the required operability time is 55 seconds the radiation levels during a CEA ejection or SLB do not significantly increase above the normal TID.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 43 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Nuclear Instrument Preampli-fier/Filter Containment Building	General Atomics/ Reuter Stokes	Ident. No.: PA5Q1 System: RPS Tag No.: None	Legend A table 4-3 Temp: 300F peak See fig.3-1 Press: 60 lb/in.^{2}g peak See fig.3-2 Humidity: 100%	0-1 hr. Temp: 50F Press: 0 R.H.: 50% 1 hr-2 hrs: Temp: 58F Press: 0 R.H.: 50% 2-3 hrs: Temp: 86F Press: 0 R.H.: 50% 3-4 hrs: Temp: 113F Press: 0 R.H.: 50% 4-8 hrs: Temp: 135F Press: 0 R.H.: 50% 8-9 hrs: Temp: 135F Press: 0 R.H.: 90% 9-10 hrs: Temp: 150F Press: 0 R.H.: 95% Humidity: See table 5-2, A12	30 seconds for CEA ejection and 55 seconds for 0.5 ft^2 steam line break See Table 5-2, A10	0-2 min. by test and analysis	See Table 5-2, A13	See Table 5-2, A13	Qualified by test and analysis General Atomics Test Report No. GAE-115-578 dated May 1976. C-E documents S-PSA-399 dated 8/20/81 and S-PSA-414 dated 10/8/81	Qualification In Progress See Table 5-2, A3

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 44 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Nuclear Instrument Preampli-fier/Filter Containment Building (Cont.)			Radiation: 1×10^7 rads (Note 1) Chem.Spray: None by analysis See table 5-2, A1 Submergence: None	Radiation: Later Chem.Spray: N/A Submergence: N/A						

Note 1: Since the required operability time is 55 seconds the radiation levels during a CEA ejection or SLB do not significantly increase above the normal TID.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 45 of 45)

Type of Equipment/ Location	Manufacturer	Model No. or Identification No.	Abnormal or Accident Environment	Environment to Which Qualified	Operability Requirements	Operability Demonstrated	Accuracy or Response Time Requirements	Accuracy or Response Time Demonstrated	Qualification Report and Method	Qualification Status
Excore Detector System Cable Containment Building	ITT	Ident. No.: 3102-65-4123 System: RPS Tag No.: Not Applicable	Legend A of table 4-3 Temp: 300F peak See fig.3-1 Press: 60 lb/in.^{2} peak See fig.3-2 Radiation: 1×10^7 rads (Note 1) Humidity: 100% Chem.Spray None by analysis See Table 5-2, A1 Submergence None	Temp: 150F Press: 70 lt/in.^{2} Radiation: 1.03×10^7 rads Humidity: 95% Chem Spray N/A Submergence N/A	30 seconds for CEA ejection and 55 seconds for 0.5 ft^2 steam line break. See Table 5-2, A10	0-2 min by analysis	See Table 5-2, A13	See Table 5-2, A13	Qualified by analysis ITT Certificate of Compliance No. G0044 C-E document S-PSA-399 dated 8/20/81.	Qualification In Progress See Table 5-2, A3

Note 1: Since the required operability time is 55 seconds the radiation levels during a CEA ejection or SLB do not significantly increase above the normal TID.

Table 4-3
NORMAL, ACCIDENT AND DESIGN ENVIRONMENTAL CONDITIONS FOR LOCA AND MSLB ONLY
(Sheet 1 of 3)

Location		Environmental Conditions															
		Temperature (°F)			Pressure (lb/in.^{2}g)			Humidity (%)			Cumulative Radiation Dose (Rads)				Chemical Spray		
												Post-Accident					
Description	Legend	Normal	Post-Accident	Design	Normal	Post-Accident	Design	Normal	Post-Accident	Design	Normal	γ	β	Design	Normal	Post-Accident	Design
Containment[a]	A	120	300	300[b]	0	60	60[b]	60	100	100	$1x10^7$ $2.9x10^7$ (d)	$2.8x10^7$	$2.6x10^8$	$3.2x10^8$	NA	(c)	(c)
											$3x10^8$ (f)	$2.8x10^7$	$2.6x10^8$	$6x10^8$			
Auxiliary Building	B																
Charging pump rooms	B1	104	104	104	0	0	0	80	80	90	$1x10^6$	(e)	(e)	$1x10^6$	NA	NA	NA
Boric acid makeup pump rooms	B2	104	104	104	0	0	0	80	80	90	(e)	(e)	(e)	(e)	NA	NA	NA
Control room	B4	75	75	75	0	0	0	50	50	50	(e)	(e)	(e)	(e)	NA	NA	NA
ESF switchgear room area	B5	95	95	95	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA
Cabinet area of control room	B6	75	80	85	0	0	0	50	50	50	(e)	(e)	(e)	(e)	NA	NA	NA
Battery system rooms	B7	95	95	95	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA
Cable spreading rooms	B9	98	98	98	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA

a. Post-accident temperatures and pressures listed for the containment are short-term values applicable to the first 3 hours after an accident. Other values are as follows: 3 to 30 hours, pressure 30 lb/in.^{2}g, Temperature 220F
30 days, pressure 0 lb/in.^{2}g, Temperature 120F
In some cases, electrical equipment may be qualified to the more conservative values specified in IEEE 323-1974.

b. Certain selective equipment is qualified to environmental conditions less severe than specified. However, the qualification environmental conditions are consistent with the time requirement for operability and the equipment location.

c. Design maximum and post-accident spray conditions are a mixture of boric acid and sodium hydroxide with a pH greater than 9.

d. These are point-specific doses that apply to NSSS instruments located in close proximity to the reactor coolant piping.

e. Less than 1×10^4.

f. Dose in the reactor cavity.

Table 4-3
NORMAL, ACCIDENT AND DESIGN ENVIRONMENTAL CONDITIONS FOR LOCA AND MSLB ONLY
(Sheet 2 of 3)

Location		Environmental Conditions															
		Temperature (°F)			Pressure (lb/in.^{2}g)			Humidity (%)			Cumulative Radiation Dose (Rads)				Chemical Spray		
												Post-Accident					
Description	Legend	Normal	Post-Accident	Design	Normal	Post-Accident	Design	Normal	Post-Accident	Design	Normal	γ	β	Design	Normal	Post-Accident	Design
Volume control tank rooms	B11	104	104	104	0	0	0	80	80	90	$2x10^8$	(e)	(e)	$2x10^8$	NA	NA	NA
Volume control tank valve gallery	B12	104	104	104	0	0	0	80	80	90	$1.8x10^5$	(e)	(e)	$2x10^5$	NA	NA	NA
Safety Equipment Building	C																
Rooms for LPSI, HPSI, and Containment Spray Pumps	C1	104	104	104	0	0	0	80	80	90	$3.1x10^6$	$4.57x10^7$	$2.65x10^6$	$5.2x10^7$	NA	NA	NA
Main steam isolation valve rooms	C2	100	235	235	0	7	7	100	100	100	(e)	(e)	(e)	(e)	NA	NA	NA
Shutdown heat exchanger rooms	C3	104	130	130	0	0	0	80	80	90	$3.1x10^6$	$3.8x10^7$	$1.9x10^6$	$4.3x10^7$	NA	NA	NA
Spray chemical storage tank and pump room	C4	104	104	104	0	0	0	80	80	90	$5.3x10^3$	$4.44x10^4$	$1.9x10^6$	$1.9x10^6$	NA	NA	NA
Component cooling water pump rooms	C5	104	104	104	0	0	0	80	80	100	$8.8x10^2$	$4.06x10^4$	$2.65x10^6$	$2.7x10^6$	NA	NA	NA
Fuel Handling Building	D	104	150	150	0	0	0	80	80	100	$2x10^5$	(e)	(e)	$2x10^5$	NA	NA	NA
Fuel pool pump rooms	D1	104	104	104	0	0	0	80	80	100	$2x10^5$	(e)	(e)	$2x10^5$	NA	NA	NA

Table 4-3
NORMAL, ACCIDENT AND DESIGN ENVIRONMENTAL CONDITIONS FOR LOCA AND MSLB ONLY
(Sheet 3 of 3)

Location		Environmental Conditions															
		Temperature (°F)			Pressure (lb/in.^{2}g)			Humidity (%)			Cumulative Radiation Dose (Rads)				Chemical Spray		
												Post-Accident					
Description	Legend	Normal	Post-Accident	Design	Normal	Post-Accident	Design	Normal	Post-Accident	Design	Normal	γ	β	Design	Normal	Post-Accident	Design
Penetration Area	E	100	104	104	0	0	0	80	80	90					NA	NA	NA
El. 9' to 45'																	
NW corner near shutdown cooling line											$5.1x10^5$	$2.0x10^7$	$3.3x10^4$	$2.0x10^7$			
North Central in pipe chase area											$2.9x10^6$	$2.8x10^6$	$3.3x10^4$	$5.7x10^6$			
Other Areas											$4x10^4$	$6.9x10^5$	$3.3x10^4$	$7.6x10^5$			
El. 45' to 63'6"											$4x10^4$	$9.6x10^4$	$3.4x10^4$	$1.7x10^5$			
Diesel Generator Rooms	F	95	122	122	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA
Tankage Area	G	104	104	104	0	0	0	100	100	100	(e)	(e)	(e)	(e)	NA	NA	NA
Auxiliary feedwater pump rooms	G1	104	300	300	0	4.14	4.14	80	100	100	(e)	(e)	(e)	(e)	NA	NA	NA
Intake Structure	H	100	100	100	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA
Salt water pump rooms	H1	100	100	100	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA
Electrical Tunnels	J	104	104	104	0	0	0	80	80	100	(e)	(e)	(e)	(e)	NA	NA	NA

5. SUMMARY OF OUTSTANDING ITEMS

A summary of outstanding items - items which preclude full qualification of equipment to the guidelines of NUREG-0588 - is provided. Table 5-1 is a listing of outstanding items - BOP Equipment, and Table 5-2 is a listing of outstanding items - NSSS Equipment.

These tables include corrective or ongoing action, scheduled completion dates, and justification for plant operation using installed equipment until full qualification is achieved for the subject equipment. Also provided in Tables 5-1 and 5-2 are explanatory footnotes to certain equipment qualification statements made in Tables 4-1 and 4-2.

Table 5-1
OUTSTANDING ITEMS - BOP EQUIPMENT
(Sheet 1 of 2)

A1. Auxiliary Feedwater Pump Motor

Based on existing test data, it is concluded that the motors are qualified for 15,000 hours of operation over the 40 year life of the plant. This conclusion was based on an estimated 375 hours of operation per year. Qualification testing reviews will be completed by December, 1981 and files will be updated based on review of test results.

A2. Pressurizer Relief Valve Position Indications System

The qualified charge converters are at the jobsite and are in the process of being installed. These converters have passed the qualification tests and the qualification documents are to be received by December, 1981. Files will be updated based on review of these qualification documents. The rest of the system was previously tested and found acceptable.

Table 5-1

OUTSTANDING ITEMS - BOP EQUIPMENT

(Sheet 2 of 2)

A3. Wide Range Radiation Monitor Instrumentation

The environmental qualification reports for these monitors are being reviewed. In the FSAR the commitment was made to have these monitors installed by Jan. 1, 1982 or operation above 5% power whichever occurs first. The environmental qualification data for these monitors will be provided consistent with the FSAR commitment for installation. Files will be updated based on review of this qualification data.

A4. Level Transmitter (Gems)

Requalification to IEEE 323-1974 is being performed by SNUPPS, test to be conducted by the end of 1981.

SONGS instruments will be qualified based on test results, or replaced with models identical to the test specimen. Based on existing test data, it is concluded that the installed models are qualified for the interim period until the SNUPPS test is complete. The interim period will not exceed the first refueling outage.

Files will be updated based on review of test results.

A5. Limit Switch Assembly

The containment purge valves HV-9949 and HV-9950 are normally closed. They are opened only for refueling, consequently there is no operability requirement for LOCA/HELB/MSLB. Each MOV has an individual circuit breaker and therefore will not degrade the IE power supply. In addition containment isolation is provided by the out-of-containment purge valves which are qualified.

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 1 of 8)

A1. This instrumentation is part of the Reactor Protection System (RPS) and is required for a reactor trip during a Control Element Assembly (CEA) ejection event or certain steam line break (SLB) events. Since a 6 lb/in^2g containment pressure reactor trip will occur as a result of the event prior to containment spray initiation at 12 lb/in^2g, the instrumentation will not experience the chemical spray environment prior to completing its required accident mitigation function.

A2. Rosemount RTD Model No. 104AFC-1 did not have response time demonstrated during environmental qualification testing. An RTD consists only of wire whose response time is not affected by the severe conditions experienced during the DBA. The response of an RTD, including its thermowell housing, for normal environments is documented by test as part of the design and production process by Rosemount. Documentation from Rosemount showing a response time of less than 6.0 seconds is provided in the subject RTD data files in the form of Certificates of Conformance (CofCs). Additionally, demonstration of response time being less than 6.0 seconds will occur during response time testing of the Core Protection Calculator (CPC) inputs required by Technical Specification 3/4.3.1, Table 3.3-2.

A3. The equipment has successfully completed all qualification testing, however an evaluation of age susceptible material is in progress. The purpose of the evaluation is to determine the maximum period of time, under normal service and operating conditions, after which the equipment can withstand the effects of a design basis accident while maintaining its functional requirements. This period of time will be used as the basis for qualified life,and a periodic replacement schedule for age susceptible

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 2 of 8)

components will be defined by the analysis. The analyses will be based on test derived data relevant to the equipment/material under consideration. The evaluation will be completed and a qualified life established prior to startup low power testing.

A4. Rosemount transmitters covered in this report are 1153 Series A models. These transmitters are scheduled to be replaced by the Rosemount Series D models which are currently undergoing qualification testing by Wyle Labs under the sponsorship by a utility users group of which SCE is a participant. There is strong confidence that full qualification of the Rosemount 1153 Series D transmitters will be achieved at the completion of the Wyle testing. The scheduled end date for the test program is July, 1982. The current 1153 Series A transmitters would then be replaced by the qualified 1153 Series D transmitters during the first refueling outage with the subject transmitter files updated accordingly.

The current Rosemount 1153 Series A transmitters are qualified to IEEE Standard 323-1971 and include seismic and sequential testing, but not an aging program. The installed transmitters have been evaluated based on the existing Rosemount Report No. #3788 and are considered acceptable for interim use between fuel load and the first refueling outage.

A5. Response time testing was not performed on the Foxboro transmitters by Foxboro Test Reports T3-1013 and T3-1068. Response time testing is currently being performed during the test program at SONGS 2/3. The data files will be updated on completion of the test program. This will occur prior to fuel load.

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 3 of 8)

A6. These Foxboro transmitters are E-10 Series provided with the LOCA and Radiation Withstand options. These transmitters have been previously qualified using separate effects testing per Foxboro Test Reports T3-1013 and T3-1068. The E-10 Series transmitters provided with LOCA and Radiation Withstand Options are similar to the NE-10 Series transmitters currently being qualified to IEEE Standards 323-1974 and 344-1975 by Wyle Labs under the sponsorship of a utility users group of which SCE is a participant. The Wyle test program is being completed in two phases. Phase I testing utilized inservice aged (three years) E-10 Series models. Phase II testing will include artificial aging. There is strong confidence that full qualification of the NE-10 Series (and thus the E-10 Series with LOCA and Radiation Withstand Options by similarity) will be achieved at the completion of the Wyle testing. The scheduled end date for the test program is July, 1982. The subject data files will be updated accordingly at that time.

Until completion of the Wyle test program the Foxboro E-10 Series transmitters with Radiation and LOCA Withstand Options are considered acceptable for interim use based upon qualification information provided in Foxboro Test Reports T3-1013 and T3-1068. This period of interim use is not to exceed the time of the first refueling outage. If the E-10 Series cannot be qualified, the existing transmitters will be replaced by a qualified type at that time.

A7.

Instrument Channel No.:	Measured Parameter
LT-206 and LT-208	Boric Acid Makeup Tank Levels*
FT-212	Charging Line Flow
PT-212	Charging Line Pressure

*These instruments are located in a mild environment.

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 4 of 8)

The boron addition and charging portions provide the capability to change the reactor coolant boron concentration to the value required for reactor shutdowns at any time. The charging pumps and miscellaneous system valves are required to actuate and inject boric acid into the RCS upon receipt of an SIAS. These CVCS subsystems are designed to accomplish this automatically and they have the capability to perform this function even after sustaining a single active failure. This mode of operation is also necessary following certain small break LOCAs. For these reasons, selective components must remain functional under post-accident conditions. These facts are cited within the SONGS FSAR.

Furthermore, CVCS-related technical specifications for boration cooldown requirements have been provided for all modes of plant operation. The specific requirement maintains a minimum operating level within the BAMTs to achieve the desired boration. Since component reliability is assured and sufficient water exists within the makeup tanks, the charging/boration function can be fulfilled spontaneously without operator intervention.

The boric acid injection/charging flow instrument monitors charging operations and RCS boration water supply. Should the flow channel fail there are numerous indications along the makeup and charging lines which can allow the operator to monitor any given shutdown properly. These other devices include charging pump discharge pressure, BAMT level, charging pump status lights and control valve status lights. If available, operations for charging, makeup and boration may be cross-checked through comparison with these other indicators. Without exception, failure of system instrumentation provides no impact on system operation which is

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 5 of 8)

required to carry out the particular CVCS safety functions associated with post-accident operation, i.e., boration, pressure level control and RCS makeup.
Since the charging and boration functions can be accomplished automatically without operator action, LT-206, LT-208, FT-212 and PT-212 instruments are not required for fulfillment of the CVCS safety functions and therefore do not need IE power.

It is, however, SCE's policy to provide sufficient safety grade instrumentation to keep the operator appraised of the status of all safety-related systems. Therefore these instruments are to be replaced with IE environmentally qualified transmitters during the first refueling outage.

A8. These NE-10 Series Foxboro transmitters are similar to the Foxboro E-10 Series provided with the LOCA and Radiation Withstand options. These E-10 transmitters have been previously qualified using separate effects testing per Foxboro Test Reports T3-1013 and T3-1068. The NE-10 series transmitters are currently being qualified to IEEE Standards 323- 1974 and 344-1975 by Wyle Laboratories under the sponsorship of a utility users group of which SCE is a participant. The Wyle test program is being completed in two phases. Phase I testing utilized inservice aged (three years)E-10 Series models. Phase II testing will include artificial aging. There is strong confidence that full qualification of the NE-10 Series will be achieved at the completion of the Wyle testing. The scheduled end date for the test program is July, 1982. The subject data files will be updated accordingly at that time.

Until completion of the Wyle test program, the Foxboro NE-10 Series transmitters are considered acceptable for interim use based upon qualification information provided in Foxboro Test

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 6 of 8)

Reports T3-1013 and T3-1068. This period of interim use is not to exceed the time of the first refueling outage. If the E-10 Series cannot be qualified, the existing transmitters will be replaced by a qualified type at that time.

Since the E-10 Series transmitters have not yet been tested they do not have a demonstrated accuracy. However these transmitters were required by purchase order specification to have an accuracy to meet SONGS 2&3 requirements and are acceptable for interim use until completion of the test program when the actual demonstrated accuracy will be evaluated.

A9. The motor actuators have been qualified by test for a 40 year life. The qualification test followed a mechanical aging period of 2000 cycles as stipulated by IEEE 382-1974. The subject valves are anticipated to have a plant 40 year lifetime operability in excess of 2000 cycles, therefore additional information has been requested from the vendor to confirm acceptable valve actuator operability in excess of the test report value of 2000 cycles. This information is expected prior to startup low power testing.

A10. The properties of the materials used to construct the excore instrumentation restrict justification for qualification under harsh environmental conditions for lengths of time other than the defined operability time of 55 seconds.

The NRC Staff has defined three criteria that must be met to take exception for the NUREG-0588 required one hour-margin requirement for operability time.

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 7 of 8)

1. Provide assurance that for an instrument the specified operability time is the required functional time for an entire spectrum of DBE's.

2. Subsequent failure of equipment will not degrade the safety of the plant or mislead an operator.

3. Equipment is not required after the primary function is accomplished.

Justification for each of the above criteria is as follows:

1. A specified maximum operating time for the High Power Level Reactor Trip is defined as 52.7 seconds for the entire spectrum of DBEs where this trip function may be required.

2. Failure of the excore instrumentation after performing its trip function will not and cannot have an effect on plant safety, since its only function is to release the CEAs resulting in reactor shutdown. This instrumentation does not provide any required Post Accident Monitoring function. Operators will be directed through emergency operating instructions (EOIs) that an excore signal following a reactor trip during a DBE may not be reliable. This will avoid the misleading of an operator by faulty signals.

3. Excore instrumentation supplies a signal to both the core protection calculators (CPCs) and the High Power Level Reactor Trip. CPCs are not required to operate during Design Basis Events which could result in Harsh Environments. The primary and only other function of the excore instrumentation is a High Power Level Reactor Trip. The excores are not required for their primary function after this trip has occurred.

Table 5-2

OUTSTANDING ITEMS - NSS SUPPLIES EQUIPMENT

(Sheet 8 of 8)

A11. The Nuclear Instrument Detector Assembly and Integral cable (Excore Instrumentation) are hermetically sealed units with welded connections. In addition, the units are also nitrogen charged and are considered gas tight. The excore detectors have been analyzed and are considered not to be susceptible to humidity conditions.

A12. The nuclear instrument preamplifier/filter (Excore Instrumentation) is a hermetically sealed unit with welded connections. Connector junctions have heat shrinkable tubing and/or moisture proof tape used to assure humidity protection. Humidity testing to 95% RH was performed and by analysis it is evident that the instrument is qualified to 100% RH.

A13. Accuracy: A neutron detector is an uncalibrated instrument. Sensitivity is based on things such as: distance from core, neutron attenuation due to intervening materials, etc. The accuracy of the ex-core flux measurement system is established by in-plant calibration by comparison to primary heat balance calculations.

Response Time: The Technical Specification response time requirement is less than 0.4 seconds. The detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from the detector output or input of the first electronic component in the channel. Response time testing has been, and will continue to be, performed per Technical Specification 3/4.3.1 to verify acceptance.

APPENDICES

Appendix A

Program for Maintaining Equipment Qualification

PROGRAM FOR MAINTAINING EQUIPMENT QUALIFICATION

To ensure that the qualification level of equipment identified in the Tables 4-1 and 4-2 of this submittal is maintained throughout the life of the plant and that the corresponding environmental qualification records are maintained up-to-date and retrievable, the Southern California Edison Company provides the following:

1. Maintenance procedures assure that all required maintenance activities associated with an item will be performed in the required manner and at the required time. These maintenance activities include manufacturer's recommendations as well as inclusion of any maintenance required as a result of the thermal and radiation aging studies used in the qualification process. These maintenance activities will be documented, and this documentation will be available on request during an audit.

2. As required by ANSI N18.7, each procurement of a safety related replacement item will meet standards equivalent to or more stringent than those of the item being replaced, including any applicable environmental qualification requirements. Specifically, equipment that requires environmental qualification is identified in a controlled list which is utilized in the procurement process. Documentation verifying compliance with procurement requirements, including environmental qualification, is reviewed by appropriate personnel.

3. Southern California Edison Company design organizations utilize procedures established in accordance with ANSI N45.2.11 to ensure that all equipment requirements, including environmental qualification, are considered for new designs and for changes. In addition, once the plant is operating, a safety evaluation is performed to ensure compliance with 10CFR50.59. Once the design is transmitted to the plant for implementation, it is reviewed by the plant technical staff to verify that the proposed modification meets the design intent and that no plant operating requirements are adversely affected.

4. The Southern California Edison Company procedures assure that when environmentally qualified replacement parts are installed in the plant, the corresponding environmental qualification files are updated to include the environmental qualification evaluation and supporting documentation for the replacement part.

5. The supporting environmental qualification documentation for currently installed items are retrievable by plant tag number, specification number, model, and manufacturer from the Corporate Document Management Center (CDMC) at the jobsite.

6. Quality Assurance procedures require QA surveillance of all plant procedures and activities important to safety to provide additional assurance that installed equipment qualification level is maintained in accordance with procedural requirements.

7. Inservice degradation of equipment will be monitored and analyzed to ensure continued acceptability of equipment to perform its required function. This surveillance program will be used as a tool to verify, or if required, to modify the determined qualified inservice life of components. This program will monitor trends for types of equipment as well as individual items.

Appendix B

Review of Emergency Operating Instructions

Appendix B

Review of Emergency Operating Instructions

SONGS 2&3 does not have a final set of Emergency Operating Instructions (EOIs) formally issued pending resolution of Technical Specification Requirements. Four pilot procedures (Steam Generator Tube Rupture, Loss of Feedwater and Steam Generator Level, Determination of Adequate Core Cooling, and Loss of Coolant Accident) were developed to provide a basis for the methodology and format to be used in all EOIs. These pilot procedures had an initial review by the NRC Procedures and Test Review Branch, and were returned to Southern California Edison with comments for resolution. The remainder of the EOIs were prepared using the pilot procedures and the NRC comments as guidelines.

The format of the EOIs is such that only safety grade instrumentation is used for indication reference when recovering from accident conditions. In addition, the control room panel layout specifically designates by color which indications are IE, and the operators are trained to rely on these indications on which to base their actions.

The EOIs are prepared and have been reviewed to ensure that following an accident resulting in a harsh environment only equipment which is qualified to survive that environment will be utilized for indication leading to operator action. Any non-qualified instrument that is referenced is so noted in the EOI as being non-IE, non-qualified in the environment it is exposed to, and what other qualified indications provide similar information or trends.

Appendix C

BOP Environmental Qualification Summary (Sample Forms)

ENVIRONMENTAL QUALIFICATION SUMMARY

I. EQUIPMENT DESCRIPTION AND REQUIREMENTS

A. Component Identification:

1. Name _____

2. Ref. Spec. No. ____ Rev. ____ Date: _____

3. Most Restrictive location in Plant _____

4. Manufacturer _____

5. Manufacturer's Model No. _____

6. Manufacturer's Cat. No. _____

B. Component used in _____ System

C. System Function:

1. Reactor Cooling _____

2. Emergency Reactor Shutdown _____

3. Containment Isolation _____

4. Containment and Reactor Heat Removal _____

5. Prevention of Significant Release of Radioactive material to the Environment _____

D. Component Operation is:

Continuous _____

Intermittent _____

E. Component must operate at:

(Indicate all "ON", "OFF", times for intermittent operations)

ON _____ _____ _____ _____

OFF _____ _____ _____ _____

(Time measured with T=0 at initiation of DBA)

F. The component's normal environment is:

Pressure _____ psig

Temperature _____ °F

Radiation _____ (integrated dosage)

Humidity _____ %

Other _____

G. Limiting environmental condition following DBA is:

1. LOCA profile _____ Attached _____

2. Other:

	0-15 Min	15-60 Min	1-24 Hrs	1-31 Days
Pressure (psig)				
Temperature (°F)				
Radiation (rad)				
Humidity %				
Caustic Spray (psig/temp/ph)				
Other				

H. In service equipment mounting and orientation requirements:

1. No special Requirements _____

2. Special requirements to be included in installation

spec: _____

Ref: _____

II. EQUIPMENT QUALIFICATION METHOD:

1. Type Test _____ (complete Section III)

2. Analysis or other methods _____ (complete Section IV)

III. EQUIPMENT WAS QUALIFIED BY TYPE TESTS

Yes _____ No _____

(If yes, complete this section)

A. Test Parameters:

1. Test profile attached _____

2. Other

	0-15 Min	15-60 Min	1-24 Hrs	1-31 Days
Pressure (psig)	_____	_____	_____	_____
Temperature (°F)	_____	_____	_____	_____
Radiation (rad)	_____	_____	_____	_____
Humidity (%)	_____	_____	_____	_____
Submergence (yes/no)	_____	_____	_____	_____
Caustic Spray (psig/temp/ph)	_____	_____	_____	_____
Other	_____	_____	_____	_____

B. The specimen tested was a representative of the component delivered:

Yes _____ No _____

Justification _____

_____

C. All tests were performed on same sample

Yes _____ No _____

(If No, is justification adequate)

Yes _____ No _____

Remarks: _____

_____

C. (continued)

Define Test Sequence: _____

_____

_____

Was Test Sequence justified by vendor

Yes _____ No _____

Justification _____

_____

D. Margins applied during tests:

Pressure _____ (% of required)

Temp. _____ (% of required)

Radiation _____ (% of required)

Humidity _____ (% of required)

Caustic Spray:

Pressure _____ (% of required)

Temp. _____ (% of required)

pH _____

Time _____ (% of required)

E. Method of defining temperature of test specimen:

Direct Mounted Thermocouple _____

Heat Transfer Method _____

Other (define) _____

F. Radiation Source _____

G. Heat aging method used

Arrhenius Methodology _____

Operating History _____

Justify _____

_____

H. Radiation aging method used:

Radiation Source _____

Integrated Dosage _____

I. Was review of materials susceptible to aging performed

Yes _____ No _____

(If Yes, identify materials) _____

_____

J. Temp/Press Transient Rate

Time		Temp	Pressure
From	To	°F/Sec	Psi/Sec
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(Describe all positive gradients)

K. Caustic spray was applied at max temp and pressure

Yes _____ No _____

Flow Rate _____

pH _____

L. Expected extremes of power supply voltage and frequency were applied

Yes _____

	HIGHEST	LOWEST
VOLTAGE	_____	_____
FREQUENCY	_____	_____

No _____

Justify _____

_____

M. Performance characteristics were monitored:

Accuracy

Continuously _____ Intermittently _____ Method _____

Repeatability

Continuously _____ Intermittently _____ Method _____

Operability

Continuously _____ Intermittently _____ Method _____

N. Describe qualification test interfaces:

Electrical Connections _____

Piping

Pneumatic _____

Gas _____

Hydraulic _____

Mechanical Supports _____

Other _____

Did these simulate installation condition

Yes _____ No _____

(If no, justify) _____

_____

O. Environmental qualification tests were performed by:

_____
(Name of Organization)

_____
(Address of Organization)

_____ _____
(Report No.) (Date)

_____
(Bechtel Log No)

P. Proprietary documentation was included

Yes _____ No _____ Not Applicable _____

If, "No", proprietary documentation is available for audit at:

_____
(Name of Organization)

_____
(Address of Organization)

IV. EQUIPMENT WAS QUALIFIED BY ANALYSIS OR OTHER METHOD

Yes _____ No _____

(If Yes, complete this section)

A. Method of qualification was:

Analysis _____

Operating Experience _____

Combination _____

On-Going Qualification _____

B. Was completely assembled equipment analyzed:

Yes _____ No _____

C. What components were type tested

_____

_____

D. Parameters of equipment/components analyzed

Temp _____

Radiation _____

Press _____

Stress _____ code applied _____

Cycling _____

E. Methods of Analysis:

1. Temp. Arrhenius Method _____

Time _____ Temp _____

2. Source of information

Lit. Search _____ Source _____

Other _____

3. Radiation _____ Data Source _____

4. Cycling _____

5. Stress _____

6. Chemical _____

F. What margins were applied

Temp _____

Press _____

Radiation _____

Stress _____

Cycling _____

Chemical _____

G. Was expected extremes of power supply voltage and frequency included in the analysis

Yes _____ No _____

(If No, Justify) _____

_____

H. If equipment was qualified by operating experience what parameters were applied

Temp _____

Press _____

Radiation _____

Stress _____

Cycling _____

Chemical _____

Source of Data _____

_____

was environment equal to or more severe than that required for equipment type testing.

Yes _____ No _____

I. Qualified life to be maintained by on-going qualification program:

Yes _____ No _____

1. Is criteria for satisfactory operation defined

Yes _____ No _____

2. Is the periodic evaluation interval defined Yes ___ No ___

3. Are the parameters to be evaluated defined Yes ___ No ____

4. Are the components/modules to be evaluated identified

Yes _____ No _____

Method of evaluation tests _____

Parameter Evaluation _____

5. Is vendor participation required

Yes _____ No _____

Available,

Yes _____ No _____

Describe participation _____

_____

_____

J. Environmental qualification was performed by:

_____
(Name of Organization)

_____
(Address of Organization)

_____ _____
(Report No.) (Date)

_____
(Bechtel Log No)

K. Proprietary documentation was included

Yes _____ No _____ Not Applicable _____

If, "No", proprietary documentation is available for audit at:

_____
(Name of Organization)

_____
(Address of Organization)

V. CONCLUSION

A. Equipment Qualified to NUREG 0588 Guideline _____

B. Equipment Qualified to Other Criteria _____

VI. RECOMMENDED DISPOSITION

A. Use as qualified for plant life _____

B. Relocate to _____

C. Interim use for _____ years

Justification _____

_____

D. Requalification Required _____

VII. SIGN OFF's

Bechtel:

Reviewing Engineer _____

EGS _____

Project Engineer _____

Appendix D

NSSS Sample Evaluation Sheet

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.1(1) Qualification methods should conform to IEEE 323-1971.																											
2.1(2) Analysis without test data is not adequate unless precluded by size or partial type test data is used to support analysis.																											
2.1(3) The bases for the required time interval and the actual operability and failure criteria as well as the safety margin should be defined.																											
2.1(3) (a) "Equipment that must function in order to mitigate any accident should be qualified by test to demonstrate its operability for the time required in the environmental conditions resulting from that accident."																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.1(3) (b) "Any equipment (safety related or non-safety related) that need not function to mitigate any accident, but that must not fail in a manner detrimental to plant safety should be qualified by test to demonstrate its capability to withstand any accident environment for the time during which it must not fail."																											
2.1(3) (c) "Equipment that need not function in order to mitigate any accident and whose failure in any accident environment is not detrimental to plant safety need only be qualified for its non-accident service environment." Although actual type testing is preferred, other methods may be acceptable.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.1(3) (c) Cont'd The bases should be provided for concluding that such equipment is not required to function in order to mitigate any accident and that its failure in any mode in any accident environment is not detrimental to plant safety."																											
2.1(4) For environmental qualification of equipment subject to events other than a DBA, which result in abnormal environmental conditions, actual type testing is preferred. However, analysis or operating history coupled with type test data may be acceptable.																											
2.2(1) Failure criteria should be established prior to testing.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.2(2) Test results should demonstrate that equipment can perform its required function for all service conditions during its installed life.																											
2.2(3) IEEE 323-1971 Section 5.2 provides acceptable guidelines for establishing test procedures, when supplemented by items (4) through (12) following.																											
2.2(4) The preferred simulated environmental profile for qualifying in containment equipment is a single envelope covering all design basis events in all modes of plant operation.																											
2.2(5) Locate equipment above flood level; or protect with watertight enclosures and test.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.2(6) The temperature to which equipment is qualified should be defined by thermocouple readings on or as close as practical to the surface of the component being tested. If no thermocouples are near equipment during test, heat transfer analysis should be done to determine component temperature.																											
2.2(7) Performance characteristics of equipment should be verified before, during, and after testing.																											
2.2(8) Caustic spray should be incorporated during simulated event testing at the maximum pressure and at the temperature conditions that would occur when the spray systems actuate.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.2(9) Operability status should be monitored continuously during testing. For long-term testing, however, monitoring at discrete intervals should be justified if used.																											
2.2(10) Expected extremes in power supply voltage and frequency should be applied during simulated event environmental testing.																											
2.2(11) Dust environments should be addressed when establishing qualification service conditions.																											
2.2(12) Cobalt 60 is an acceptable gamma source for environmental qualification.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.3(1) Justification of the adequacy of the test sequence should be provided.																											
2.3(2) The test should simulate as closely as possible the postulated environment.																											
2.3(3) The test procedures should conform to Section 5, 323-1971.																											
2.3(4) The staff considers that for equipment postulated to be subjected to hostile environments (in or out of containment), separate effects testing, for the most part, is not acceptable. The same piece of equipment should be tested sequentially to radiation and hostile steam environment.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
2.4 Qualification by analysis or operation may be acceptable based on NRC evaluation and some type testing.																											
3(1) Quantified margins should be applied to design parameters in addition to margins applied during the derivation of specified plant parameters.																											
3(2) Margin will be considered on a case basis. Factors to be considered for quantifying margin include (a) induced stress levels on environmental testing, (b) stress duration, (c) number of items tested and number of tests, (d) equipment performance and (e) specified equipment function.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
3(4) Equipment required to function for only seconds or minutes is required to remain functional in the accident environment for a period of at least 1 hour in excess of the time assumed in the accident analysis.																											
4(1) Qualification committed to conform to IEEE Std. 382-72 and 334-71 should include the effects of aging regardless of equipment location in plant.																											
4(2) For equipment other than applicable to 4(1) above, qualification should address aging to the extent of identifying age-susceptible materials and a schedule for replacement of materials/ components.																											

EVALUATION OF ENVIRONMENTAL QUALIFICATION OF C-E SUPPLIED SONGS 2 AND 3 EQUIPMENT LOCATED IN HARSH ENVIRONMENT PER NUREG-0588.

NUREG-0588 REQUIREMENTS CATEGORY II	NSSS EQUIPMENT NUMBER																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
5(1) The staff endorses the requirements for documentation in 323-71 that, "(see quote in 0588)".																											
5(2) The guidelines for documentation in 323-71 when supplemented by Appendix E are acceptable.																											

EQUIPMENT	NON-COMPLIANCE TO NUREG-0588 CATEGORY II	RESOLUTION	APPLICATION

Appendix E

NRC Inspection and Audit Team Items

A. The findings of an NRC inspection concerning docket Nos. 50-361 and 50-362 were reported in a letter from G. S. Spencer, NRC Chief Reactor Construction and Engineering Support Branch, to Dr. L. T. Papay, SCE Vice President Advanced Engineering dated January 9, 1981. The inspection was conducted by Messrs. J. H. Eckhardt and J. O. Elin on December 16-19, 1980 and examined activities authorized by NRC Construction Permit Nos. CPPR-97 and 98. Reports No. 50-361/80-24 and 50-362/80-13 identified action required to close four open items by providing environmental qualification in response to NUREG-0588. The resolution of these open items is as follows:

1. NRC item (50-361/79-10/02), Environmental Qualification of splice connections on containment electrical penetrations was investigated in order to respond to NRC IE Bulletin 77-07 and again during the review for NUREG-0588. It has been verified that the electrical penetrations have been successfully environmentally qualified and documented as shown in Table 4-1.

2. NRC item (50-361/79 - 10/01), Environmental Qualification of amphenol and cannon connectors was investigated in order to respond to NRC IE Bulletin 77-05, 77-05A and again during the review for NUREG-0588. It has been verified that the connectors have been successfully environmentally qualified and documented as shown in Table 4-1.

3. Action on 50.55(e) items concerning factory splices of some cable runs of GE and Rockbestos cable was included in Table 4-1.

4. During a site tour the possible submergence of valves 2HV-9204 and 2TV-0221 was questioned. The entire submergence issue was

resolved in the response to NRC Question 032.16. The response for valves 2HV-9204 and 2TV-0221 was submitted as follows:

The safety function of these valves is to close and remain closed in a post-LOCA condition. Short circuits or grounds that may occur at the terminals for the 3-way solenoid valves which control the instrument air to the pneumatic actuators do not reverse the position of the valves after they have closed.

Shorts between the limit switches and solenoids do not generate enough current for the solenoids to pick up due to the circuit resistance.

If the valves are open prior to a LOCA, isolation will occur prior to post-LOCA flood level, submerging the valves operators. Since the valve remains closed in a flooded environment, the valve performs its required safety function.

B. The SONGS 2&3 Environmental Qualification (EQ) program was the subject of an NRC EQB audit during the period of May 11-15, 1981. The audit team published their findings in a Trip Report dated June 1, 1981 and a Safety Evaluation Report dated June 12, 1981.

The audit team identified three incomplete items in the SONGS 2&3 EQ program:

1. There had not been a Quality Assurance (QA) review of the program.

   Both Bechtel and Combustion Engineering have performed a design QA on their respective data files prior to the turning over of those files to SCE. SCE QA will continue monitoring the EQ program throughout the life of the plant.

2. The EQ files had not been transferred from Bechtel and Combustion Engineering to SCE. All EQ data files are now under SCE control. The files are stored at the Corporate Documentation Management Center at SONGS 2&3 and are available for perusal and audit.

3. Justification for lack of margin had not been provided. All EQ data files have been examined and for any file in which adequate margin is not evident, justification has been provided. This justification is found in the data files and is not provided in Tables 4-1 and 4-2.

The audit team identified nine specific concerns regarding the SONGS 2&3 EQ submittal and central files:

1. The six second response time on the Rosemount RTDs was not demonstrated.

   The files as well as the submittal have been updated to include a discussion of the demonstrated Rosemount RTD response time.

2. Add to EQ files test data on the failure of a capacitor used in the ITT hydramotor operator.

   The ITT hydramotor EQ file has been updated to include the subject test report (Gulf Radiation Technology Report Gulf-RT-C12494).

3. Add to the EQ files a statement on the equivalency of the chemical composition of the test spray versus the plant spray.

   For any piece of equipment which underwent a test that utilized a chemical spray of different composition than the SONGS 2&3 specification, an analysis of the equivalency of the two sprays has been included in the data files.

4. Add specific references for unique radiation analyses to the EQ file.

   For any piece of equipment that required a point specific radiation dose determination, the calculation has been referenced in the file. The calculations are available on request from the SONGS 2&3 A/E which performed the determinations.

5. Address the I^2t heating in the penetration qualification.

   The potential for I^2t heating has been addressed in the penetration assembly data file. Additionally the SONGS 2&3 FSAR has been revised to indicate that the I^2t loading considered LOCA conditions.

6. Review the latest ASCO test report for the NP series solenoids.

   ASCO test report, AQS 21678/TR Revision A has been reviewed and is the basis for qualification of the ASCO NP series solenoid valves used in SONGS 2&3. This test report is referenced in Tables 4-1 and 4-2 of the submittal and is included in the data files.

7. Recategorize the status of Foxboro transmitters outside containment and the Gems level transmitters.

   The Foxboro out-of-containment transmitters and Gems level transmitters have been classified per Section 4.1.3 of the submittal. The requirements defining each classification in Revision 2 have been modified from that of Revision 1, however the intent of the audit team for proper categorization of the subject transmitters has been met.

8. The submergence issue should be addressed. Clarification to the effects of submergence on SONGS 2&3 equipment susceptible to submergence has been provided in Section 3.7 of the submittal.

9. Status of outstanding items identified by the applicant.

   Tables 4-1 and 4-2 as well as the data files have been upgraded to close out a majority of the open items identified by SCE to the audit team. Any remaining open items are identified in Tables 5-1 and 5-2, along with the proposed corrective action and anticipated completion date.

C. Certain other areas were also identified by the audit team as requiring additional information:

1. Exception to the one hour time margin. Any item included in this submittal which has not been qualified to at least one hour has had additional information provided to show that the qualified time is the required functional time for the entire spectrum of DBE; that the subsequent failure of the equipment will not degrade the safety of the plant or mislead an operator; and that the equipment is not required after its primary function is accomplished.

2. Effects of a Main Steam Line Break (MSLB) inside containment.

   It was identified in the submittal that the qualification temperature for some equipment located inside the containment did not meet the MSLB temperature profile. SONGS 2&3 are NUREG-0588 Category II plants, therefore it is allowed to use an equipment internal MSLB temperature qualification profile. Additional information is provided in Section 3.1.1.2 of the submittal to support qualification of the components for a MSLB accident.

SCE believes that the revised EQ program at SONGS 2&3 as delineated in this submittal, and evidenced in the data files, adequately satisfies all the outstanding NRC EQB audit team concerns.

Appendix F

Items Deleted from Revision 1

Items Deleted From Revision 1

As a result of the resolution of open items previously identified by SCE in Revision 1, several pieces of equipment were deleted from the submittal in Revision 2. The summary sheets in Tables 4-1 and 4-2 remain for information only, with this Appendix providing explanatory information for each item deleted from Revision 1.

Item 1. Certain Core Protection Calculator (CPC) inputs required to produce a low DNBR trip could not be environmentally qualified. These CPC equipment items include the RCP speed signal sensor and transmitter and the CEDM reed switch position transmitter and associated cabling (both Anaconda and Bendix supplied). The low DNBR trip was only required to function during certain steam and feedwater line breaks. Combustion Engineering has performed a reanalysis of the spectrum of events requiring the low DNBR trip and has found that by taking credit for the steam generator D/P low flow trip and lowering the high linear power trip the low DNBR trip can be eliminated as a required accident mitigation function. Therefore, the equipment required for the steam generator D/P low flow trip has been added to this submittal and to the data files, and the equipment required for the low DNBR trip has been deleted. The basis for these changes and a more extensive discussion is available. Additionally the SONGS 2&3 FSAR Chapter 15 will be revised to reflect these changes.

Item 2. The original Post-Accident Sampling System (PASS) included this valve as a containment isolation device. Subsequent redesign of the system utilized existing pipe and valves, therefore this valve was not installed and has been deleted from the submittal.

Item 3. Position indication for valves FY-0306, HY-9316, HY-9342, HV-9352, HV-9362, and HV-9372 has been deleted. These valves are spring loaded solenoid actuated valves which will fail in their required post accident position. The solenoids are qualified per Table 4-2 to assure valve operability post-accident, however position indication, while nice to have, is not required.

Item 4. The chemical spray flow detector and transmitter assembly installed in SONGS 2&3 when Revision 1 was issued has been replaced by a conventional orifice and transmitter. The original equipment failed to meet ASME Section III Class 2 and 3 pressure boundary requirements and required replacement. The replacement transmitter and associated Class IE material located in the harsh environment has been included in Revision 2.

Item 5. As indicated in Revision 1, the Electric Hydrogen Recombiner Power Supply Panels could not be environmentally qualified to their original location in the penetration area. These panels have been relocated to the control building which is a benign (mild) environment, therefore their environmental qualification is not covered by this submittal. Environmental qualification of these panels will be included in the SONGS 2&3 benign (mild) environment effort.