SAN ONOFRE
NUCLEAR GENERATING STATION
UNIT 2 AND 3

ENVIRONMENTAL QUALIFICATION REPORT PER REQUIREMENTS OF NUREG-0588
REVISION 1

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

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SOUTHERN CALIFORNIA EDISON COMPANY
SAN DIEGO GAS & ELECTRIC COMPANY

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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. 1

RESPONSE TO NUREG 0588

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TABLES

FIGURES

ACRONYMS

AWFS: 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
DGS: Diesel Generator System
EFAS: Emergency Feedwater Actuation Signal
ESFAS: Engineered Safeguard Features Actuation System
HPSIS: High Pressure Safety Injection System
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

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, i.e., any area where there is a significant change in one or more of the environmental parameters, and required to mitigate a postulated accident 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, and the specific report reference.

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. For any item noted in Tables 4-1 and 4-2 as requiring replacement or requalification the component will be qualified to IEEE 323-1974. 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 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 is continuing to evaluate the necessity for designing and procuring this equipment to IE qualified standards.

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 mitigation)
6. Fuel handling building isolation system (not required for LOCA/HELBA 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 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 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[a]

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 contained 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 4-2.

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 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 IE and are provided in this report on Table 4-2.

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

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 mounted on the steam jet air ejector exhaust and one in the reactor exhaust plenum. These are IE instruments and are located in a harsh environment. They are included in this report on Table 4-1.

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

2. Radioiodine and Particulate Effluent Monitor

The addition of the wide range effluent monitor to the existing radioiodine and particulate effluent monitor satisfies the NUREG-0737 requirements. Radioiodine and particulate monitoring capability is part of the system to measure effluent radiation. 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 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 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

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 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		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. These analyses have been reported in the Response to NRC questions 022.58 and 022.60. The analysis showed the surface temperature of all but three components remain below the qualification value. The three components are: (1) limitorque valve motor operator motor, (2) electrical cable and (3) solenoid valve switch casing. For these three components, with calculated surface temperatures above qualification, all show the internal temperatures in the vicinity of the sensitive constituents well below the qualification value.

Since the time the containment temperature exceeds the LOCA qualification value is extremely short, and calculated component internal temperatures do not exceed qualification parameters, therefore the post MSLB environment is considered to be adequately enveloped by the post-LOCA environment.

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 breaks 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 in table 4-3 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). 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. The second motor-driven auxiliary feedwater pump to be added to the Units 2 (and 3) auxiliary feedwater pump room is identical to the existing motor-driven pump and will be qualified to the calculated environment, providing assurance that both motor-driven pumps will remain operable on 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

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 example, the ex-core neutron detectors are required to mitigate certain CEA ejection events. The longest time between initiation of the event and a reactor trip has been shown in the Safety Analysis to be less than 30 seconds. These detectors are also required to mitigate a limited spectrum of steam line break events. The longest time prior to a Hi Linear Power reactor trip for these events is less than thirty minutes. For devices such as these, the 1 hour margin requirement represents an extremely conservative margin and has not been included as a qualification requirement.

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

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.

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		

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				

The model used considers first generation daughters. Table 3-4 shows concentrations of radioisotopes inside contaiment.

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 are 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 liquid.

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 3-5

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

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.

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	$5.51X10^{7}$		

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 0-30 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.

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.

Table 3-7

INTEGRATED 0-30 DAY POST-ACCIDENT DOSES INSIDE CONTAINMENT

Source Contributor	Gamma (Rads)	Beta (Rads)
Airborne	1.2 E7	9.8 E7
Plateout	1.5 E5	9.6 E6
Sump	1.1 E7	4.1 E7

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 radioactive 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 0-30 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 items of 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 be 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 determination 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 table 4-1 and 4-2. This time period will be the basis for implementing a periodic replacement schedule. This analysis may be performed by an independent consultant who is experienced in this analysis for the nuclear industry.

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

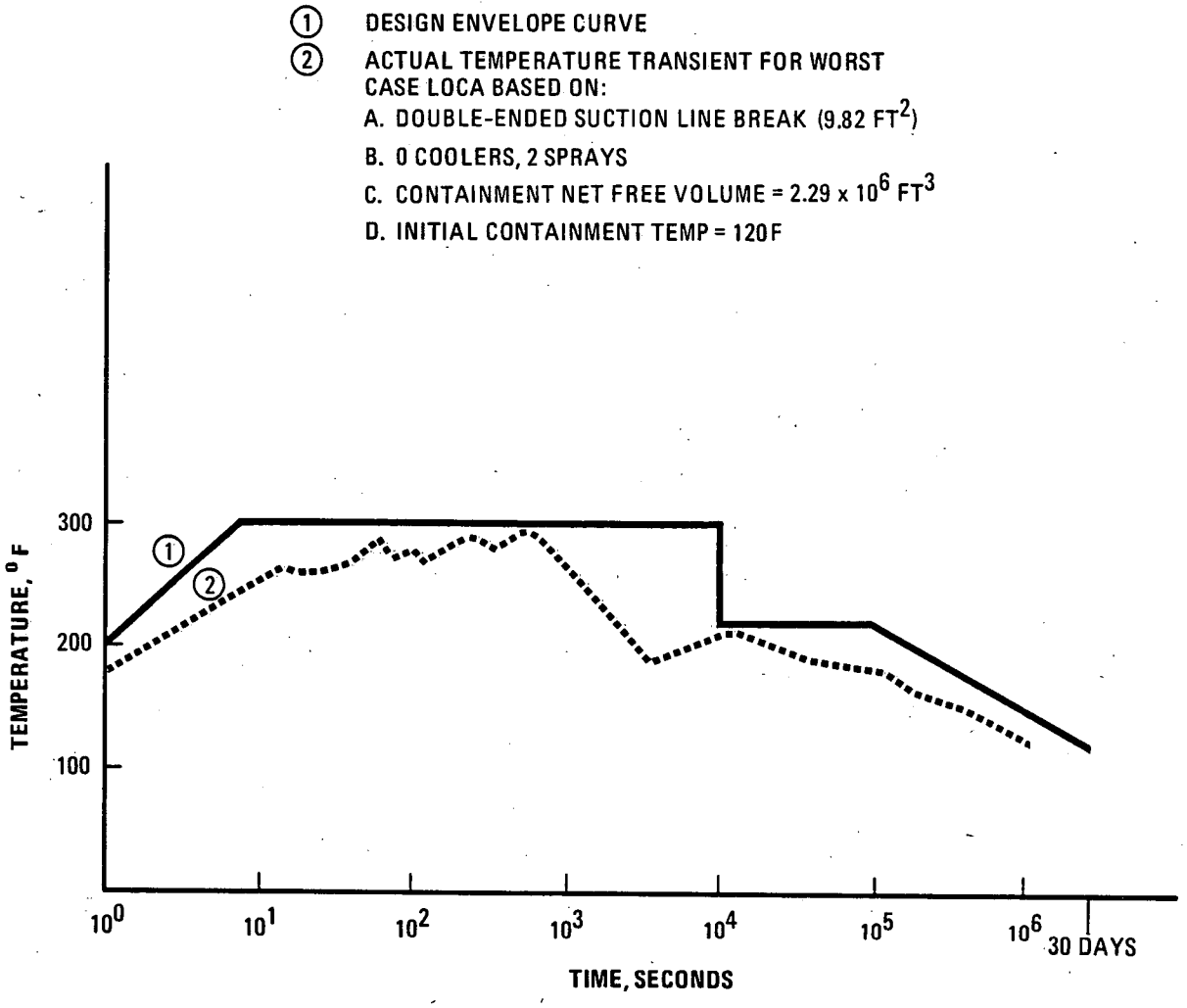
occur at the terminals for the 3-way solenoid valves which control the instrument air to the pneumatic actuators do not reverse the position of the valves after they have closed. Shorts between the limit switches and solenoids do not generate enough current for the solenoids to pick up due to the circuit 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.

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.

In addition, the occurrence of a short circuit is very unlikely since the transmitter terminals are located in a NEMA IV, watertight enclosure, and the device assembly is filled with silicone fluid to prevent water in leakage.

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 action within this time.



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

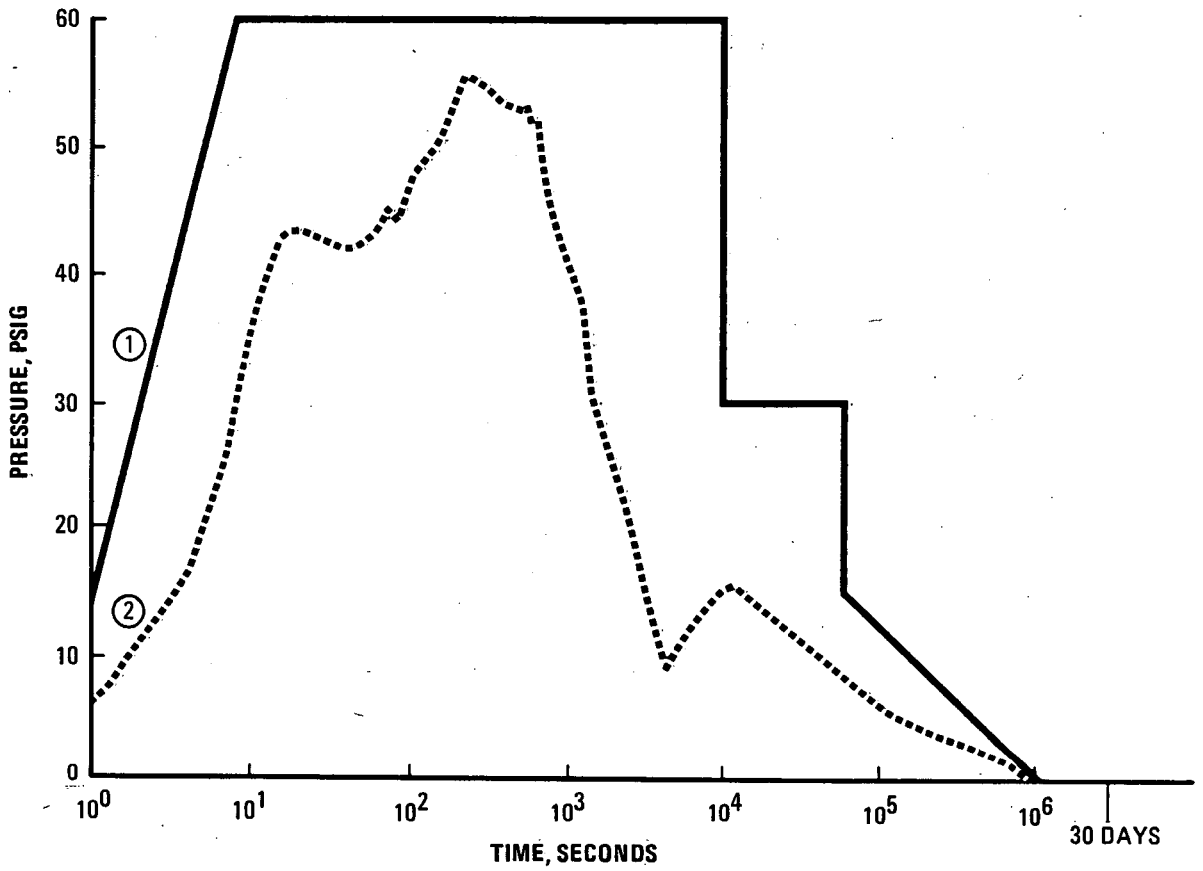
① DESIGN ENVELOPE CURVE

② ACTUAL PRESSURE TRANSIENT FOR WORSE CASE LOCA BASED ON:

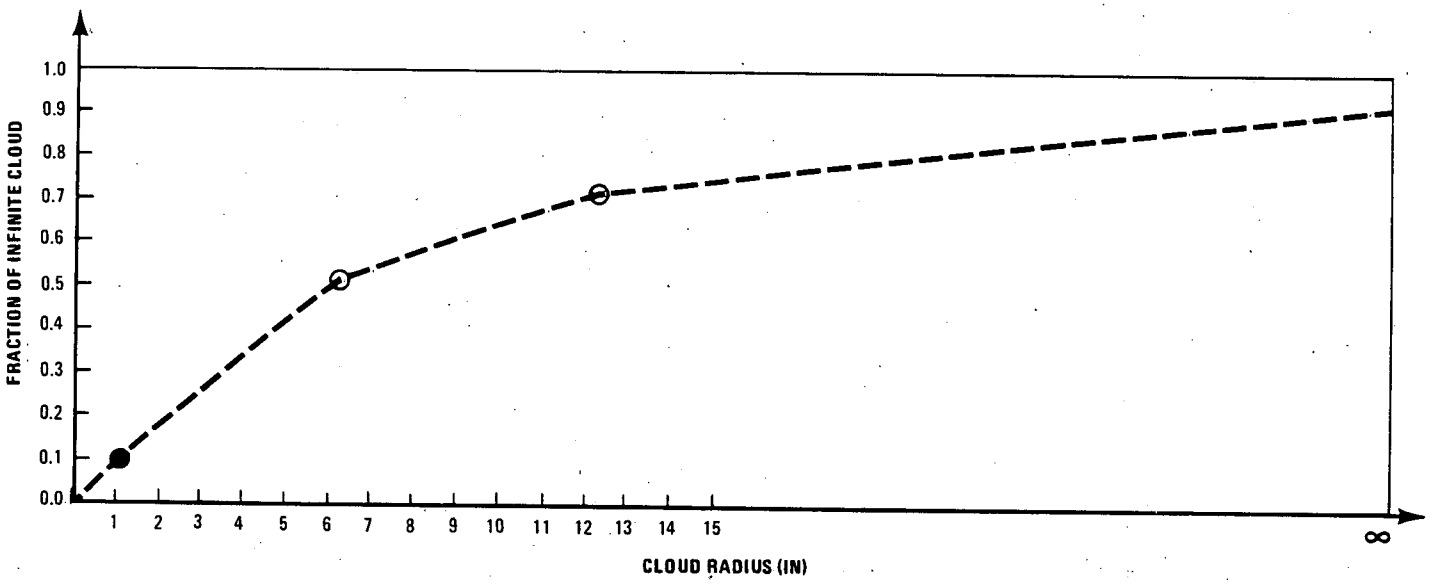
A. DOUBLE-ENDED SUCTION LINE BREAK (9.82 FT^2)

B. 0 COOLERS, 2 SPRAYS

C. CONTAINMENT NET FREE VOLUME = 2.29 x 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 placed into one of the four 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 most of the analysis was completed but total compliance with NUREG-0588 was not yet either demonstrated or documented. Equipment in this category is satisfactory for plant operation based on engineering judgement. Confirmatory analysis is in process to substantiate complete qualification.

4.1.3.3 Relocate To

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 would result in complete qualification, i.e., relocating the equipment to a less stringent environment.

4.1.3.4 Replace or Requalify

Inclusion in this category was based upon a review of the equipment qualification, and an evaluation of the areas of non-compliance, leading to a conclusion that there is not assurance that the equipment will perform its intended safety function during an accident.

Outstanding items which have not been resolved, are indicated in the last column under "Qualification Status" in tables 4-1 and 4-2 and additional information provided in tables 5-1 and 5-2.

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 testing facilities. Periodic audits have been performed by SCE, Combustion Engineering (for NSSS equipment) and Bechtel (for BOP equipment) of the manufacturers and testing facilities for compliance to the QA program as well as periodic audits by SCE of the Combustion Engineering and Bechtel QA programs.

The individual data files for the equipment of Tables 4-1 and 4-2 will have a QA review done by Combustion Engineering for NSSS equipment, and by Bechtel for BOP equipment, prior to fuel load. Prior to NRC review the data files will have been verified as accurate and complete.

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 3 Emergency Radiation Monitoring System (ERMS) detectors located

on the outside of the containment shell and 2 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.: AC3BLP03 BC4BLP04 AC3BLP10 BC4BLP11	Temperature 104F Pressure 0 lb/in^{2}g Radiation 1.5×10^5 rads Humidity 80% Chemical Spray None Submergence None	Temperature 104F Pressure 0 lb/in^{2}g 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 @ F.L. 4000 No Load (JL Frame) 1000 @ F.L. 5000 No Load (KP Frame) 500 @ F.L. 2000 No Load See table 5-1, A15	Not Applicable	Not Applicable	Type Test Aging 100C for 107 hours Report No. CC-323.74-46 BPC Log No. S023-302-10-80.	Interim Use See table 5-1, Item A1 and A15

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 voltage 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 2.4×10^7 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	Tested 30 days, See table 5-1, A15 and A16	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	Interim Use See table 5-1, A15 and A16

Note 1: Radiation determined for specific equipment for 30-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/in.^{2}g see fig. 3-2 Radiation 2.4×10^7 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	Tested 30 days See Table 5-1, A15 and A16	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	Interim Use. See table 5-1, A15 and A16

Note 1: Radiation determined for specific equipment for 30-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 See fig. 3-1 Pressure 60 lb/in.^{2}g See fig. 3-2 Radiation 2.4×10^7 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 1×10^8 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH ph = 9.5 24 hours Submergence N/A	Must function 30 min and retain integrity up to 120 days	Tested 30 days, See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test aging 150C for 156 hrs. Report No. PEN-TR-6-35 BPC No. SO23-304-1-48-4	Interim Use See table 5-1, A15 and A16

Note 1: Radiation determined for specific equipment for 30-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	Type "N" plug 34500-1000 Jack 18250-1000	Temperature 300F See fig. 3-1 Pressure 60 lb/in.^{2}g See fig. 3-2 Radiation 2×10^8 rads 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

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 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
Electrical Penetration Assemblies Containment Wall	Westinghouse Electric-Electronic Tube Div.	Prototype Canister medium voltage	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g See fig. 3-2 Radiation 2.4×10^7 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 8×10^7 rads Humidity 100% Chemical Spray H_3BO_3 + NaOH ph = 9.5 24 hours Submergence N/A	Must retain integrity up to 120 days	Tested 30 days See table 5-1, A15 A16	Not Applicable	Not Applicable	Type Test Report No. PEN-ACD4-72-03 BPC No. SO23-304-1-48-4	Interim Use See table 5-1, A15 and A16

Note 1: Radiation determined for specific equipment for 30-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 See fig. 3-2 Radiation 2×10^8 rads 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	Tested 30 days See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test 168 hours @ 150C Report No. F-C4033-1 BPC No. S023-304-6-7-1	Interim Use See table 5-1, A15 and A16

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 1E 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 2×10^8 rads 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	Tested 30 days See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test Aging: 850 hours @ 150C Rockbestos Co. qualification of firewall III Class IC Electrical Cable. Report dated July 7, 1977 BPC Log No. S023-304-6A-6-0	Interim use, see table 5-1, Item A2, A15, and A16

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 2×10^8 rads 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	Tested 30 days See table 5-1. A15 and A16	Not Applicable	Not Applicable	Type Test Aging: 850 hours @ 150C Rockbestos Co. qualification of firewall III Class IE Cables. Report dated June 7, 1978. BPC Log No. S023-304-6A-7-0	Interim use, see table 5-1, Item A2, A15, and A16

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 Submergente N/A	36 hours	Tested 30 days	Not Applicable	Not Applicable	Type Test Aging 168 hours @ 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 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
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 2×10^8 rads 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	Tested 33 days See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test Aging 248 hours @ 150C Report No. F-C5285-1 BPC No. S023-304-11-115-1	Interim Use See table 5-1, A15 and A16

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	36 hours	Tested 30 days	Not Applicable	Not Applicable	Type Test Aging 130 hours @ 150C Report No. F-C5285-2 BPC No. S023-304-11-116-0	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 See figure 3-1 Pressure 60 lb/in.^{2}g See figure 3-2 Humidity 100% Radiation 2×10^8 rads Chemical spray NaOH + H_3BO_3 ph >9 Submergence None	None	30 min	None	N/A	N/A	None	Requalify

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 2 x 10^8 rads Humidity 100% Chemical spray Boric Acid & Sodium Hydroxide pH > 9 Submergence None	Temperature 370F peak Pressure 60 lb/in.^{2}g peak Radiation 2 x 10^8 rads Humidity 100% Chemical spray Boric Acid & Hydrazine & Trisodium Phosphate ph9-9.5 16 days Submergence N/A	Continuous up to 120 days	Tested 16 days, See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test Aging 1500 hours @ 150C Report No. 302940016 BPC No. S023-304-14-15-0	Interim Use. See table 5-1, A15 and A16

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 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	Tested 30 days See table 5-1, A15 and A16	Not Applicable	Not Applicable Aging	Type Test See table 1500 hours @ 150C Report No. QP-S023 BPC No. S023-304-18-21-1	Interim use. 5-1, A15 and A16

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 x 10^8 rads Humidity 100% Chemical spray Boric Acid & Sodium Hydroxide ph > 9 Submergence None	Temperature 400F peak Pressure 232 lb/in.^{2}g peak Radiation 2 x 10^8 rads Humidity 100% Chemical spray Boron, Hydrazine, Sodium Thiosulphate, & Sodium Phosphate ph = 10.5 24 hours Submergence N/A	Continuous up to 120 days	Tested 30 days See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test Aging to 1500 hours @ 150C Report No. EDR 5019 BPC No. S023-304-18-25-0	Interim use. See table 5-1, A15 and A16

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 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 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	36 hours	Tested 100 days	Not Applicable	Not Applicable	Type Test Aging 168 hours @ 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 x 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 x 10^8 rads Humidity 100% Chemical spray N/A Submergence N/A	36 hours	Tested 30 days* & 100 days**	Not Applicable	Not Applicable	Type Test Aging 168 hours @ 250F Report No. 71100 BPC No. S023-304-18-17-1	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 180C for 7 days	Qualified for 40 years
Safety Equip. Bldg. Spray Chemical Storage 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 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 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	Tested 30 days, table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test Aging to 169 hours @ 249.8F Report No. IPS-409 BPC No. S023-308-18-9-0	Interim use See table 5-1, A15 and A16

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, 1170 r/min TEAO, Induction Motor System: CAECS Tag No. AB5BE399 BB5BE400 AB5BE401 BB5BE402	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 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 See table 5-1, A15	Not Applicable	Not Applicable	Type Test Aging 108 hours @ 415F Report No. X-604 BPC No. S023-410-628-1	Interim use See table 5-1, A15

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. AB6BA071 BB6BA072 BB6BA073 AB6BA074 AB6BA074	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak. See fig. 3-2 Radiation 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 up to 120 days	1 Year See table 5-1, A15	Not Applicable	Not Applicable	Type Test Aging 108 hours @ 415F Report No. X-604 BPC No. S023-410-1 628-1	Interim use. See table 5-1, A15,

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 AJ1AP141 BJ1AP504	Temperature 300F Peak Pressure 4.14 lb/in.^{2}g peak Radiation <1 x 10^4 rads Humidity 100% Chemical spray None Submergence None	(Later) (Later) (Later) (Later) Chemical spray N/A Submergence N/A	36 hours	(Later)	Not Applicable	Not Applicable	Type Test and Analysis Report No. S023-405-6 -90	Requalify table 5-1, Item A3

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. Elev. 2'-3"	Westinghouse (Spec. No. 405-9)	Type 5810L 4160V 600 hp 1200 r/min Induction Motor System: CCWS Tag Nos. AN1AP024 WN1AP025 BN1AP026	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 8.1×10^5 rads Humidity 80% Chemical Spray None Submergence None	Temperature See table 5-1, A4 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 See table 5-1, A4 and A15	Not Applicable	Not Applicable	Type Test Method is based on Similarity of Materials and Design Aging to be determined Report No. WCAP-8754 BPC No. S023-405-9-119-0	Interim use See table 5-1, A4 and A15

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
HPSI Pump Room 015 A/C Unit Motor Safety Equip. Bldg. Elev. (-) 15'6"	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. BN1BE445 AN1BE517	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 3.5×10^7 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. See table 5-1, A15	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	Interim use. See table 5-1, A15.

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. Elev. (-) 5'3"	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. BN1BE455 BN1BE518 AN1BE454 AN1BE453	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 8.1×10^5 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. See table 5-1, A15	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	Interim use. See table 5-1, A15

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
LPSI Pump Room 002 A/C Unit Motor Safety Equip. Bldg. Elev. (-) 15'6"	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. AN1BE416	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 3.5×10^7rads 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. See table 5-1, A15	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	Interim use. See table 5-1, A15

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. Elev. 9'	Reliance (Spec. No. 410-6)	182T Frame Class H Type RH Insulation 460V 1200 RPM TEFC, 1/2 hp, Squirrel Cage Induction Motor System: HVAC Tag No. BP1BE435 BP1BE436 AP1BE437 AP1BE438	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 1×10^8rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	See table 5-1, A15 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	Interim use. See table 5-1, A15

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
LPSI Pump Rm 005 A/C Unit Motor Safety Equip. Bldg. Elev. (-) 15'6"	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. AN1BE417	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 3.5×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 428F Pressure 0 lb/in.^{2}g Radiation 1×10^8rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	Analysis and separate effects testing. See table 5-1, A15	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	Interim use. See table 5-1, A15

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 150 hp TEAO 1800 r/min induction motor System: HVAC Tag No. AJ1BA394 BJ1BA443	Temperature 300F Peak Pressure 4.14 lb/in.^{2}g Radiation $<1 \times 10^4$rads Humidity 100% Chemical Spray None Submergence None	Temperature 428F Pressure 4.14 lb/in.^{2}g Radiation 1×10^8rads Humidity 100% Chemical Spray N/A Submergence N/A	36 hours	Analysis and separate effects testing.	Not Applicable	Not Analysis &	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	(Spec. No. 508-18)			(Later)						Requalify. See table 5-1, item A13

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
Wide Range Radiation Monitor Instrumentation	General Atomics (Spec. No. 606-4)			(Later)						Requalify. See table 5-1, item A14.

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. AB5BE145 BB5BE146	Temperature 300F peak See fig. 3-1 Pressure 60 lb/in.^{2}g peak See fig. 3-2 Radiation 2×10^8 rads 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	Tested 33 days. See table 5-1, A15 and A16	Not Applicable	Not Applicable	Type Test Aging 100 hours @ 350F Report No. WCAP-7709-L Suppl 1 thru 7 BPC Log No. S023-607-11, -12, -13, -27, -52, -53, -55	Interim use. See table 5-1, A15 and A16

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 Penetration Areas: El. 45'-0" 63'-6"	Westinghouse Elec. (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. AC3RL180 BC4RL181	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 1.5×10^5 rads* 6.5×10^4 rads** Humidity 80% Chemical Spray None Submergence None	(Later)	120 days	(Later)	Not Applicable	Not Applicable	Analysis and short-term high temperature testing (10 days at 135F) Report No. WCAP-7709L Supplement 6 & 7 BPC Log S023-601-1 -53, & 55	Requalify or relocate See table 5-1, item A17

*For Tag. No. AC3RL180
**For Tag. No. BC4RL181
System 1 - Combustible Gas Control System

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 Radiation 5.4×10^5 rads Humidity 80% Chemical Spray None Submergence None	Temperature Later Pressure Later Radiation Later Humidity Later Chemical Spray N/A Submergence N/A	Must operate up to 120 days	Later	Total Accuracy ±2% Response Time N/A	Later	See table 5-2 A10	Requalify see table 5-2, A10

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 XM59870 System: PAMS Tag No. LT9386-1 LT9389-2 LT9387-2 LT9388-1 LT5853-1 LT5853-2	Temperature 300F See fig 3-1 Pressure 60 lb/in.^{2}g See fig 3-2 Radiation 2×10^8 rads 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; % not stated Chemical Spray 1500 ppm Boric Acid in solution with NaOH. ph = 10.5 4 hours Submergence No. See table 5-1, A5	Must operate up to 120 days	0-14 days by test. 14-120 days by analysis. See table 5-1, A15 and A16	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 per table 5-1, A5, A15 and A16

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. Auxiliary Bldg. Radwaste Area	Magnetrol (Spec. No. 506-3)	Model No. FLS-X-MPX SIM4DC 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 LSH9459-2 LSH9462-1 LSH9463-2 LSH9464-2 LSH9465-1 LSH9466-1 LSH9467-2	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 3.5×10^7 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. See table 5-1, A6 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 48 hours. Additional 4000 cycles at ambient conditions See table 5-1, A15	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	Interim use per table 5-1, A6, and A15

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. See fig 3-1 Pressure 60 lb/in.^{2}g See fig 3-2 Radiation 2 x 10^8 rads Humidity 100% Chemical Spray NaOH + H_2 BO_3 ph > 9 Submergence None	Temperature 346F peak Pressure 110 lb/in.^{2}g peak Radiation 2 x 10^8 rads Humidity > 90% Chemical Spray NaOH +3000 ppm H_2 BO_3 ph = 10 30 days Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis. See table 5-1, A15 and A16	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	Interim use per table 5-1, A15 and A16

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. HTX8320A185V System: CVCS Tag No. HY9204	Temperature 300F. See fig 3-1 Pressure 60 lb/in.^{2}g See fig 3-2 Radiation 2×10^8 rads Humidity 100% Chemical Spray NaOH + H_2BO_3 ph > 9 Submergence None	None	120 days	None	None	N/A	None	Replace

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 x 10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 346F peak Pressure 110 peak lb/in.^{2}g Radiation 2 x 10^8 rads Humidity > 90% 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	Qualified for 4 yrs Maintenance Schedule: 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. S023-507-2)	Model No. HT8316D45 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	None	36 hours	None	None	N/A	None	Replace

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 x 10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 346F peak Pressure 110 lb/in.^{2}g peak Radiation: 2 x 10^8 rads Humidity >90% Chemical Spray N/A Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis. See table 5-1, A15	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	Interim use. See table 5-1, A15

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. NP8320A187V System: MSIS Tag No. HY4057 HY4058	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 8.4×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 346F peak Pressure 110 lb/in.^{2}g Radiation 2×10^8 rads Humidity >90% Chemical Spray N/A Submergence N/A	36 hrs.	In excess of 36 hours by test.	None	N/A	Type test and analysis <u>Aging</u> Thermal: 288 hrs at 268F Mechanical: 40,000 cycles at max operating pressure ASCO Test Report AQS1678/TR Log S023-507-2-1-545	Qualified for 4 years. Maintenance schedule: 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. HTX8320A108V HTX8320A105V 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 5.4×10^5 rads Humidity 80% Chemical Spray None Submergence None	None	120 days	None	None	N/A	None	Replace

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 ZSH9971-2 ZSL9971-2 System: SIS Tag No. ZSH9340-2 ZSL9340-2 ZSH9350-1 ZSL9350-1 ZSH9360-1 ZSL9360-1 ZSH9370-2 ZSL9370-2	Temperature 300F See fig 3-1 Pressure 60 lb/in.^{2}g See fig 3-2 Radiation 2×10^8 rads Humidity 100% Chemical Spray NaOH + H_2 BO_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_2 BO_3 ph 10-11 4 days Submergence N/A	120 days	0-30 days by test. 30-120 days by analysis. See table 5-1, A15 and A16	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	Interim use per table 5-1, A15 and A16

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 ZSH8419-1 ZSL8421-2	Temperature 235F Pressure 7 lb/in.^{2}g Radiation less than 1 x 10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 340F peak Pressure 70 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 hours	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 1 year See table 5-1, A8 Maintenance Schedule: @ 1-1 1/2 yrs replace top and bottom gaskets @ 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 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 Penetration Area	NAMCO Controls Acme - Cleveland Company (Spec. No. S023-507-2)	Mode 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 3.5×10^7 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. See table 5-1, A15	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	Interim use per table 5-1, A15

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)		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								
Safety Equipment Bldg.		System: CCW Tag No. ZSH6212-1 ZSL6212-1 ZSL6212A1 ZSL6212B2 ZSH6213-2 ZSL6213-2 ZSL6213A2 ZSL6213B1 ZSH6218-1 ZSL6218-1 ZSL6218A1 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	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.^{2}g Radiation 3.5×10^7 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	36 hrs	In excess of 36 hours by test	None	N/A	Type test and analysis <u>Aging</u> Thermal: 200 hrs at 200F Mechanical: 100,000 cycles NAMCO Qualification Report dated Sept 1978 Log S023-507-2-1-466	Qualified for 1 year See table 5-1, A8 Maintenance Schedule: @ 1-1 1/2 yrs replace top and bottom gaskets. @ 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 HV9917 HV9946 System: CCW Tag No. HV6223 HV6236 HV7512 System: SIS Tag No. HV9304 HV9305 HV9334 HV9340 HV9350 HV9360 HV9370 System: CVCS Tag No. HV9201 TV9267	Temperature 300F. See fig 3-1 Pressure 60 lb/in.^{2}g See fig 3-2 Radiation 2×10^8 rads Humidity 100% Chemical Spray NaOH + H_2 BO_3 ph > 9 Submergence None	Temperature 300F peak Pressure 70 lb/in.^{2}g peak Radiation 2×10^8 rads Humidity 100% Chemical Spray ph = 10.8 30 days Submergence N/A	120 days	Operation demonstrated 30 days. See table 5-1, A15 and A16	None	N/A	Generic type test and analysis Aging Thermal: 100 hrs at 356F Mechanical: 200 cycles during thermal +1800 cycles at ambient Limitoruqe 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	Interim Use see table 5-1, A15 and A16

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 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 (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: SMB-005 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 HV9359 HV9379 System: CSS Tag No. HV9306 HV9307 HV9347 HV9348	Temperature 104F Pressure 0 lb/in.^{2}g Radiation 3.5×10^7 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. See table 5-1, A15	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	Interim Use See table 5-1, A15

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.^{2}g Radiation 1.5×10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 346F Pressure 113 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. See table 5-1, A15	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)	Interim use per table 5-1, A9 and A15

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 See fig. 3-1 Pressure 60 lb/in.^{2}g See fig. 3-2 Radiation 1.25 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 Log 507-4-76	Qualified for 10 years. Installed life of 40 years based on soft seat replacement at 10 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 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 x 10^4 rads Humidity 100% Chemical Spray None Submergence None	Temperature 385F peak Pressure 66 lb/in.^{2}g peak Radiation 1.35 x 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 1.5 x 10^7 rads Humidity 80% Chemical Spray None Submergence None	Temperature 385F Pressure 66 lb/in.^{2}g Radiation 1.35 x 10^8 rads Humidity 100% Chemical Spray N/A Submergence N/A	120 days	0-14 days by test. 14-120 days by analysis. See table 5-1, A15	None	N/A	Generic type test and analysis Aging Thermal: 792 hrs at 350F Mechanical: 18,000 cycles	Interim use. See table 5-1, A15

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-00-5 SMB-00-10 SMB-000-5 w/Class B insulation	Temperature 130F Pressure 0 lb/in.^{2}g Radiation 1.5×10^7 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. See table 5-1, A15	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	Interim use. See table 5-1, A15.
Penetration Area		System: CCW Tag No. HV6211 HV6216 System: SDCS Tag No. HV9353								
Tendon Gallery (Containment Emergency Sump Isolation Valve Room Beneath Containment)		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	Limitorque Corporation	Model No. SMB-1-40 With Class B Insulation System: CSS Tag No. HV8150 HV8151 HV8152 HV8153	Temperature 130F Pressure 0 lb/in.^{2}g Radiation 3.1×10^7 rads Humidity 80% 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	120 days	Later	None	N/A	Later	Replace. See table 5-1, A10

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-000-2 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 x 10^7 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 <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-0-40 w/class B insulation System: CIS Tag No. HV9949 HV9950	Temperature 300F See fig. 3-1 Pressure 60 lb/in.^{2}g See fig. 3-2 Radiation: 2 x 10^8 rads Humidity: 100% Chemical Spray: NaOH + H_2BO_3 ph > 9 Submergence: None	Later	120 days	Later	None	N/A	Later	Replace

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 Relay Wire MSIV Area	 Marotta Scientific Controls Potter-Brumfield GE Wire and Cable Division (Spec 507-6)	Model No. MV238C MDR 5060 MDR 137-8 Vulkene Type SIS System MSIS Tag No. HV8204 HV8205	Temperature 271F Pressure 28 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 >95% Chemical Spray N/A Submergence N/A	30 seconds	See table 5-1, All	None	N/A	Type test and analysis radiation by analysis Aging Thermal: 200 hrs at 200F Mechanical: 200 cycles	Requalify

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. 1000-512-0021 Rev 0 System: PAMS Tag No. TE9903-1 TE9911-2	Temperature 300F See fig. 3-1 Pressure 60 lb/in.^{2}g See fig. 3-2 Radiation 6.4×10^6 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 See table 5-1, A15 and A16	Accuracy ±2% Response Time N/A	Accuracy ±2% Response Time N/A	Type Test and analysis Aging Thermal: 7 days at 257F Report No. 58547 Log S023-508-5-114	Interim use See table 5-1, A15 and A16

Note 1: Radiation determined for specific equipment for 30 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 See fig. 3-1 Pressure 60 lb/in.^{2}g See Fig. 3-2	Temperature 1) 331F 2) 400F peaks Pressure 1) 55 lb/in.^{2}g 2) 85 lb/in.^{2}g peaks	120 days	Later	Accuracy ±5% FS	Accuracy ±5% FS	Type tests and Analysis Aging Thermal: 1) See table 5-1, A12 2) 14 days at 300F	Requalify
1) Hydrogen Sensor	G.E.	47E240610	Radiation 1.55 x 10^7 rads (Note 1)	Radiation 1) & 2) 3.2 x 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) 80% Chemical Spray 1) None 2) None Submergence 1) N/A 2) N/A						

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

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 1 of 43)

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)	Rosemount	Model No.: 104 AFC-1			Accident Mitigation 30 Minutes	0 - 50 hours by test.	Total Accuracy: ±1.308F Response Time: 6.0 Sec	Total Accuracy: +0.058F -0.037F Response Time: See table 5-2, A7	Qualified by test. Rosemount Test Report No. 1762 Rev A dated June 1976	Interim Use See table 5-2. All
Containment Building		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	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%						
			Temp: 300F See figure 3-1 Press: 60 lb/in.^{2} See Figure 3-2 R.H.: 100%							
			Radiation 2.0×10^8 rads	Radiation 2.0×10^8 rads						
			Chem. Spray: None See table 5-2, A16	Chem. Spray: N/A						
			Submergence None	Submergence N/A						

Table 4-2

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

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)	Rosemount	Model No.: 104 AFV-1			Post Accident Monitoring: 120 days	0-50 hours by test. 50 hrs. - 120 days by analysis See table 5-2, A14 and A19	Post Accident Monitoring: Accuracy: ±12F	Total Accuracy +0.058F -0.037F	Qualified by test. Rosemount Report No. 1762 Rev A dated June 1976	Interim Use See table 5-2, A11, A14, and A19
Containment Building		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 See figure 3-1 Press: 60 lb/in^2 See figure 3-2 R.H.: 100% R.H.: 100%	0-10 min. Temp: 340F Press: lb/in.^{2}g R.H.: 100% 10 min-8 hrs Temp: 303F Press: 70 lb/in.^{2} 8 - 50 hrs. Temp: 228F Press: 20 lb/in.^{2} R.H.: 100%			Response Time: Not Applicable	Response Time: N/A		
			Radiation 2×10^8	Radiation 2×10^8						
			Chem. Spray: B.H. and NaoH w/ph>9	Chem. Spray: ph=11 (0.1% of NaOH and 1000 ppm of Boric Acid)						
			Submergence None	Submergence N/A						

Table 4-2

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

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	Bentley-Nevada Corporation	Serial No.: 21956-01 (Sens) 21956 (Trans)			Accident Mitigation: 30 Minutes	0-93 hrs. by test.	Total Accuracy: ±1.456 RPM for 28" disc ±3.326 RPM for 16.969" disc	Total Accuracy: No degradation in accuracy occurred.	Qualified by test. Wyle Lab Test Report No. 54602, dated March 1977	Requalify See table 5-2, A9
Containment Building		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	Legend A of table 4-3	0-4 hrs 10 min. Temp: 40F Press: 0 lb/in.^{2}g R.H.: 100%			Response Time: None	Response Time: Not Measured		
			Temp: 300F See figure 3-1 Press: 60 lb/in.^{2}g See figure 3-2 R.H.: 100%	4 hrs. 10 min. - 17 hrs. 10 min: Temp: 180F Press: 0 lb/in.^{2}g R.H.: 100%						
				17 hrs. 10 min. - 93 hrs. 30 min: Temp: 212F Press: 0 lb/in.^{2}g R.H.: 100%						
			Radiation: 2.0×10^8 rads See table 5-2, A9	Radiation: 6.8×10^5 (Trans) 1.5×10^7 (Sensor)						
			Chem. Spray: None See table 5-2, A16	Chem. Spray: N/A						
			Submergence None	Submergence N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 4 of 43)

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	Foxboro	Model No.: E-11 GM			Accident Mitigation:		Total Accuracy: -82 lb/in^{2}a	Total Accuracy: -63.8$_2$ lb/in^{2}a	Qualified by test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973	Requalify See table 5-2, A10 and A5
Containment Building		System: RPS Tag No.: PT0101 1-4	Legend A of table 4-3 Temp: 300F See figure 3-1 Press: 60 lb/in^{2}g See figure 3-2 R.H. 100% Radiation 2.0 x 10^8 rads Chem.Spray: None See table 5-2, A16 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	30 minutes	0-24 hours by test	Response Time: 0.5 sec.	Response Time: See table 5-2, A5		

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 5 of 43)

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	Rosemount	Model No.: 1153 GA9			Accident Mitigation:	0-64 hrs. & 20 min. by test.	Accident Mitigation:	Total Accuracy:	Qualified by test. Rosemount Test Report No. 3788, dated March 1978.	Interim Use See table 5-2, A10, A14, and A19.
Containment Building		System: RPS SIAS CCAS CSAS Tag No.: PT-102 1-4 System: PAMS Tag No.: PT-0102 1,2	Legend A of table 4-3 Temp: 300F See figure 3-1 Pressure 60 lb/in.^{2}g See figure 3-2 R.H.: 100%	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	30 minutes Post Accident Monitoring: See table 120 days	64 hrs - 120 days by analysis. Time: 5-2, A14 and A19	Accuracy: 239.1 lb/in^2 Response Time: 0.5 sec.	236.2 lb/in^2 Response 0.11 sec.		
			Radiation 3.5 x 10^7 (See Note 1)	Radiation 4.4 x 10^7 Rads						
			Chem.Spray: BA and NaOH w/ph >9	Chem.Spray: 0-24 hrs. 1500 ppm of Boric Acid and NaOH of ph=10.5 at 77F.						
			Submergence None	Submergence N/A						

Note 1: This equipment has been analyzed to be insensitive to beta radiation. Required qualification is gamma radiation only, as specified in Table 4-3, legend A.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 6 of 43)

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 DH System: PAMS Tag No.: LT-110 1,2	Legend A of table 4-3 Temp: 300F See figure 3-1 Press: 60 lb/in^{2}g See figure 3-2 R.H.: 100% Radiation 2.0×10^8 rads Chem.Spray: B.A. 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: 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 See Table 5-2, A14	Post Accident Monitoring: Accuracy: ±5.3 in. Response Time: Not Applicable	Total Accuracy 9.6 in. Response Time: N/A	Qualified by test. Foxboro Test Report No. T3-1013 dated May 1975 and T3-1068, dated August 1973.	Requalify See Table 5-2, A10 and A14.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 7 of 43)

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	Foxboro	Model No.: E-11 GM			12 hours	24 hours by by test.	Total Accuracy: ±25 lb/in.^{2}	Total Accuracy: 62.0 lb/in.^{2}	Qualified by test. Foxboro Test Report No. T3-1013, dated May 1975 and T3-1068, dated August 1973.	Requalify See table 5-2, A10
Containment Building		System: SDCS Tag No.: PT-0103-1 PT-0105-3	Legend A of table 4-3 Temp: 300F See figure 3-1 Press: 60 lb/in.^{2}g See figure 3-2 R.H.: 100% Radiation 2.0 x 10^8 Rads Chem.Spray: B.A. 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: 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					

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 8 of 43)

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	Rosemount	Model No.: 1153 GA9			12 hours	64 hrs & 20 min. by test.	Total Accuracy: ±25 lb/in^2	Total Accuracy: 27.8 lb/in^2	Qualified by test. Rosemount test report No. 3788, dated March 1978.	Interium Use See table 5-2, A10
Containment Building		System: SDCS Tag No.: PT-0104-2 PT-0106-4	Legend A of table 4-3	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						
			Temp: 300F See figure 3-1 Press: 60 lb/in^{2}g See figure 3-2 R.H.: 100%							
			Radiation 3.5 x 10^7 (See note 1)	Radiation 4.4 x 10^7 rads						
			Chem.Spray: B.A. and NaOH w/ph >9	Chem.Spray: 0-24 hrs. 1500 ppm of Boric Acid and NaOH of ph=10.5 at 77F.						
			Submergence None	Submergence N/A						

Note 1: This equipment has been analyzed to be insensitive to beta radiation. Required qualification is gamma radiation only, as specified in Table 4-3, legend A.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 9 of 43)

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 1-4 PT-1023 1-4 System: PAMS Tag No.: PT-1013 1,2 PT-1023 1,2	Legend A of table 4-3 Temp: 300F See figure 3-1 Press: 60 lb/in^{2}g See figure 3-2 R.H.: 100% Radiation 2.0 x 10^8 rads Chem.Spray: B.A. 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: 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. See table 5-2, A14	Accident Mitigation: Accuracy: 26.95 lb/in.^{2} Response Time: 0.5 Sec. Post-Accident Monitoring: Accuracy: 26.95 lb/in^2 Response Time: Not Applicable	Total Accuracy: +0.0 lb/in.^{2}g -115.0_2 lb/in.^{2}g Response Time: See table 5-2, A5 Post-Accident Monitoring: Accuracy: 26.95 lb/in^2 Response Time: N/A	Qualified by test. Foxboro Test Report No. T3-1013 dated May 1975 and T3-1068, dated August 1973.	Requalify See table 5-2, A5, A10, and A14

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 10 of 43)

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	Foxboro	Model No.: E-13 DM			Accident Mitigation: 30 minutes	0-24 hours by test.	Total Accuracy: 13.2 in.	Total Accuracy: 9.6 in.	Qualified by test. Foxboro test report no. T3-1013 dated May 1975 and T3-1068 dated August 1973	Requalify See table 5-2, A10 and A5
Containment Building		System: RPS EFAS Tag No.: LT-1113 1-4 LT-1123 1-4	Legend A of table 4-3.	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			Response Time: 0.5 sec.	Response Time: See table 5-2, A5		
			Temp: 300F See figure 3-1 Press: 60 lb/in^{2}g See figure 3-2 R.H.: 100%							
			Radiation 2.0×10^8 rads	Radiation 2.2×10^8 rads						
			Chem.Spray: None See table 5-2, A16	Chem.Spray: N/A						
			Submergence None	Submergence N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 11 of 43)

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 See figure 3-1 Press: 60 lb/in^{2}g See figure 3-2 R.H.: 100% Radiation 3.5 x 10^7 rads (See Note 1) Chem.Spray B.A. 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 x 10^7 Chem.Spray: 0-24 hrs. 1500 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.	Qualified by test. Rosemount test report No. 3788, dated March 1978.	Interim Use See table 5-2, A10

Note 1: This equipment has been analyzed to be insensitive to beta radiation. Required qualification is gamma radiation only, as specified in Table 4-3, legend A.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 12 of 43)

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 See fig.3-1 Press: 60 lb/in.^{2}g See fig.3-2 Radiation 5.0×10^8 rads Humidity: 100% Chem.Spray: None. See table 5-2, A16 Submergence: None	0-10 hrs: Temp: 310F Press: 65 lb/in.^{2}g 10-96 hrs: Temp: 250F Press: 65 lb/in.^{2}g Radiation: See table 5-2, A17 Humidity: See table 5-2, A18(a) Chem.Spray: N/A Submergence: N/A	30 seconds for CEA ejection and 55 seconds for 0.5 ft^2 steam line break.	0-96 hrs. by test.	N/A See table 5-2, A1	Response Time: 10^{-10} sec. See table 5-2, A1	Qualified by test General Atomics Test Report No. GAE-115-496 dated August 1975.	Requalify. See table 5-2 A9

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 13 of 43)

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	Legend A of table 4-3 Temp: 300F See fig.3-1 Press: 60 lb/in.^{2}g See fig.3-2 Radiation: 2.0×10^8 rads See table 5-2, A9 Humidity: 100% Chem.Spray: None. See table 5-2, A16 Submergence: None	0-120 hrs: Temp: 375F Press: .6 lb/in.^{2}g Radiation: 8.4×10^6 rads (by analysis) Humidity: See table 5-2, A18(c) Chem.Spray: N/A Submergence: N/A	30 Minutes	0-120 hrs by test.	Total Accuracy: +4.993 in. -3.998 in. Response Time: None	Total Accuracy: 1.4 in. Response Time: Not measured	Qualified by test. C-E Nuclear Test Labs. Test Report No. TR-ESE-174 dated March 1977	Requalify. See table 5-2, A9

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 14 of 43)

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 See fig.3-1 Press: 60 lb/in.^{2}g 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, A18(b)	30 seconds for CEA ejection and 55 seconds for 0.5 ft^2 steam line break	0-10 hrs. by test.	See table 5-2, A1	See table 5-2, A1	Qualified by test. General Atomics Test Report No. GAE-115-578 dated May 1976.	Requalify. See table 5-2, A9,

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 15 of 43)

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: 2.0×10^8 rads Chem.Spray. None. See table 5-2, A16 Submergence: None	Radiation: See table 5-2, A17 Chem.Spray: N/A Submergence: N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 16 of 43)

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 See fig.3-1 Press: 60 lb/in.^{2} See fig.3-2 Radiation: 5.0 x 10^8 rads Humidity: 100% Chem.Spray: None See table 5-2, A16 Submergence: None	See table 5-2, A4 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, A4	Not applicable	Not measured	See table 5-2, A4	Requalify. See table 5-2 A4, and A9.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 17 of 43)

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	Anaconda	Ident. No.: Not Applicable			30 Minutes	See table 5-2, A3	Not applicable	Not measured	See table 5-2, A3	Requalify. See table 5-2, A3, A9,
Containment Building		System: RPS Tag No.: Not Applicable	Legend A of table 4-3	See table 5-2, A3						
			Temp: 300F See fig.3-1							
			Press: 60 lb/in.^{2} See fig.3-2							
			Radiation: 2 x 10^8 rads							
			Humidity: 100%							
			Chem.Spray: None. See table 5-2, A16	Chem.Spray: N/A						
			Submergence: None	Submergence: N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 18 of 43)

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
Temperature Sensors (RTD) Safety Equipment Building Elevation: 8'-0" to 30'-6"	Rosemount	Model No.: 104 AFC-1 System: SDCS PAMS Tag No.: TE-0303 1, 2 TE-0351 1 TE-0352-2	Legend C3 of Table 4-3 Temp: 130F Press: 0 lb/in.^{2}g R.H.: 90% Radiation: 3.1×10^7 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	Temperature: 0-50 hrs. by test. Radiation: See table 5-2, A19	Post-Accident Monitoring: Accuracy: ±12F Response time: Not applicable	Total Accuracy: +0.022F -0.005F Response time: N/A	Qualified by test Rosemount Test Report No. 1762 Rev. A, dated June 1976.	Interim Use See table 5-2, A11 and A19

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 19 of 43)

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 Sensors Safety Equipment Building Elevation: 8'-0" to 15'-0"	Foxboro	Model No.: E-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.: 90% Radiation: 3.1×10^7 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	Temperature: 0-24 hours by Test See table 5-2, A14 Radiation: See table 5-2, A19	Post-Accident Monitoring: Accuracy: ±50 lb/in.^{2} Response Time: Not applicable	Total Accuracy: -25.2 +0 lb/in.^{2} Response Time: N/A	Qualified by Test. Foxboro Test Report No.(s) T3-1013, dated May 1975 and T3-1068, dated August 1973.	Interim Use See table 5-2, A11, A14, and A19

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 20 of 43)

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 Sensor	Foxboro	Model No.: E11 GM			30 Minutes	0-24 hours by test.	Total Accuracy: -1.01 lb/in.^{2}	Total Accuracy: -.86 lb/in.^{2}	Qualified by test. Foxboro Test Report No.(s) T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim use. See table 5-2, A5 and A11.
Penetration Area Elevation: 33'-0" to 45'-0"		System: RPS SIAS CCAS CIAS CSAS Tag No.: PT-0351 1-4	Legend E of table 4-3 Temp: 104F Press: 0 lb/in.^{2}g R.H.: 90% Radiation: 1.5 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			Response Time: 0.6 sec.	Response Time: See table 5-2, A5		

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 21 of 43)

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 Sensor	Foxboro	Model No.: E11 GM			Accident Mitigation: 30 Minutes	0-24 Hours by Test.	Total Accuracy: -3.75 $lb/in.^2$	Total Accuracy: -3.2 $lb/in.^2$	Qualified by test. Foxboro Test Report No.(s)	Interim use. See table 5-2, A11 and A5
Penetration Area Elevation: 33'-0" to 45'-0"		System: CSAS Tag No.: PT-0352 1-4	Legend E of table 4-3	0-2 hours 35 sec:			Response Time: 0.6 sec.	Response Time: See table 5-2, A5	T3-1013, dated May 1975 and T3-1068, dated August 1973	
			Temp: 104F Press: 0 $lb/in.^2 g$ R.H.: 90%	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: 1.5×10^7 rads	Radiation: 2.2×10^8 rads						
			Chem.Spray: None	Chem.Spray: N/A						
			Submergence: None	Submergence: N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 22 of 43)

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 Sensors Penetration Area Elevation: 33'-0" to 45'-0"	Foxboro	Model No.: E13 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: 1.5 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	Temperature: 0-24 hours by Test. Radiation: See table 5-2, A19	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: 10.3 gal/min	Qualified by Test. Foxboro Test Report No.(s) T3-1013, dated May 1975 and T3-1068, dated August 1973.	Interim Use. See table 5-2, A11 and A19

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 23 of 43)

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 Sensors Safety Equipment Building Elevation: 15'-0" to 8'-0"	Foxboro	Model No.: E13 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.: 90% Radiation: 3.1 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	Temperature: 0-24 hours by Test. 24-36 hours See Table 5-2, A14	Accuracy: ±87.5 gal/min Response Time: 0.60 Sec.	Total Accuracy: -135.8 gal/min +0 gal/min Response Time: See table 5-2, A5	Qualified by Test. Foxboro test Report No.(s) T3-1013, dated May 1975 and T3-1068, dated August 1973	Interim Use. See table 5-2, A5, A11 and A14

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 24 of 43)

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 Safety Equipment Building Elevation: 8'-0" to 30'-0"	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	Later	36 hours	Later	Later	Later	Later	Replace

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 25 of 43)

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 Safety Equipment Building Elevation: 8'-0" to 30'-0"	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	Not Qualified	36 hours	Later	Later	Later	Later	Replace

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 26 of 43)

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 Chemical Storage Tank Room	Foxboro	Model No.: E 13 DMP System: CSS Tab No.: LT-0348-1 LT-0349-2	Legend C4 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.9×10^6 rads Humidity: 90% Chem.Spray: None Submergence: None	Not Qualified	36 hours	Not Tested	Accuracy: +2.5% (full scale) Alarm channel Response Time: Not Applicable	Not Tested	None	Replace

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 27 of 43)

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 Sensor Location: Penetration Area	Foxboro	Model No.: E-13 DH System: CVCS Tag No.: FT-0212	(Later)	Not Tested	120 days	Not Demonstrated	Accuracy: +1.5 gal/min Response Time: Not Applicable	Not Tested	Not Tested	Replace

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 28 of 43)

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	Being Determined	Not Tested	120 hours	Not Demonstrated	Accuracy: +30 lb/in.^{2} Response Time: Not Applicable	Not Tested	Not Tested	Replace

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 29 of 43)

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.: HT831665 System: SIS Tag No.: HY-9341 HY-9351 HY-9361 HY-9371 HY-9342 HY-9352 HY-9362 HY-9372 HY-9433 HY-9437 System: CVCS Tag No.: TV-0221	Legend A of table 4-3 Temp: 300F (See figure 3-1) Press: 60 lb/in.^{2}g (See figure 3-2) Radiation: 2×10^8 rads Humidity: 100% R.H. Chem.Spray: B.A. and Sodium Hydroxide w/ph>9 Submergence: None	None	Must operate to close main valve.	None	None	N/A	None	Not qualified. Being replaced by ASCO NP series solenoids prior to fuel load.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 30 of 43)

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.: HT8320A108		None	Must operate to close main valve.	None	None	N/A	None	Not qualified. Being replaced by ASCO NP series solenoids prior to fuel load.
Shutdown heat exch. room		System: SIS Tag No.: FY-0306	Legend C3 of table 4-3 Temp: 130F Press: Atmospheric Radiation: 3.1×10^7 rads Humidity: 90% R.H. Chem.Spray: None Submergence: None							
Safety equip. bldg. LPSI/HPSI & CSS Area		System: SIS Tag No.: HY-9316	Legend C1 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 3.5×10^7 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 31 of 43)

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.: EA170 System: CVCS Tag No. ZSH & ZSL for TV-0221 System: SIS Tag No. ZSH & ZSL for HV-9341 HV-9351 HV-9361 HV-9371 HV-9342 HV-9352 HV-9362 HV-9372 HV-9433 HV-9437	Legend A of table 4-3 Temp: 300F (See figure 3-1) Press: 60 lb/in.^{2}g (See figure 3-2) Radiation: 2×10^8 rads Humidity: 100% R.H. Chem Spray: B.A. and sodium hydroxide w/ph > 9 Submergence: None	None	Make and break contact to provide valve position indication for 30 days	None	None	N/A	None	Not Qualified. Being replaced by by NAMCO EA180 prior to fuel load.

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)

ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT

(Sheet 32 of 43)

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	Namco Controls	Model No.: EA 170		None	Make and break contact to provide valve position indication for 30 days	None	None	N/A	None	Not qualified Being replaced by Namco EA180 prior to fuel load.
Shutdown Heat Exch. Room		System: SIS Tag No. ZSH & ZSL for FV-0306	Legend C3 of table 4-3 Temp: 130F Press: Atmospheric Radiation: 3.1×10^7 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 33 of 43)

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	Namco Controls	Model No.: EA 170		None	Make and break contact to provide valve position indication for 30 days.	None	None	N/A	None	Not qualified. Being replaced by Namco EA180 prior to fuel load.
Safety Equip. Bldg. LPSI/HPSI & CSS Area		System: SIS Tag No. ZSH & ZSL for HV-9316	Legend C1 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 3.5×10^7 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 34 of 43)

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	Limitorque	Model No. SMB-1-40			Must operate for 120 days	Operation demonstrated exceeds 30 days. See table 5-2, A19	None	N/A	Appendix D (Report I B 0003) of Report B0058 Type test and analysis Aging conditions Thermal: 200 hours @ 165F Mechanical: 2000 cycles	Interim Use. See table 5-2, A19
Penetration area		System SIS Tag No.: HV-9322 HV-9325 HV-9328 HV-9331	Legend E of table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.5×10^7 rads Humidity: 90% Chem. Spray: None Submergence: None	Temp: 120F Press: Atmospheric Radiation 2×10^7 rads Humidity: 100% Chem. Spray: N/A Submergence: N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 35 of 43)

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-00-10 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 Temp: 104F Press: Atmospheric Radiation: 1.5×10^7 rads Humidity: 90% Chem. Spray None Submergence None	Temp: 120F Press: Atmospheric Radiation: 2×10^7 rads Humidity: 100% Chem. Spray N/A Submergence None	Must operate for 120 days	Operation demonstrated exceeds 30 days See table 5-2, A19	None	N/A	Appendix D (Report # B0003) of Report B0058 Type test and analysis Aging Conditions Thermal: 200 hours @ 165F Mechanical: 2000 cycles	Interim Use See table 5-2, A19
Volume Control Tank Valve Gallery		System: CVCS Tag No.: LV-0227B	Legend B12 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 2×10^3 rads Humidity: 90% Chem. Spray None Submergence None	Temp: 120F Press: Atmospheric Radiation: 2×10^7 rads Humidity: 100% Chem. Spray N/A Submergence N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)

ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT

(Sheet 36 of 43)

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 Chemical Storage Equipment Building	Valcor Engineering	V-52600-573-1 System: SIS Tag No.: HV-9399 HV-9398	Legend C4 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.9×10^6 rads Humdiity: 90% Chem. Spray: None Sub-mergence: None	Temp: 120F Press: Atmospheric Radiation: 2×10^8 rads Humidity: 100% Chem. Spray: N/A Sub-mergence: N/A	Must operate for 36 hours	Operation demonstrated after aging and radiation	None	N/A	Valcor Qualification Test Report No. QR52600-515 Type test and analysis Aging conditions: Thermal: 172 hours at 318F Mechanical: 7500 cycles	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)

ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT

(Sheet 37 of 43)

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 LPSI Pump Room	Westinghouse	5808 P39; frame NA68690-17 System: SIS Tag No.: P-015 P-016	Legend C1 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 3.5×10^7 rads Humidity: 90% RH Chem. Spray: None Sub-mergence: None	Temp: 104F Press: Atmospheric Radiation: 2×10^8 rads Humidity: 100% RH Chem. Spray: N/A Sub-mergence: N/A	Continuous operation for up to 120 days (2,880 hours)	40,000 hours based on test and analysis See table 5-2, A19	None	N/A	Westinghouse Report W Cap 8754 Rev. 1 Analysis and testing of age-sensitive components	Interim Use. See table 5-2, A19

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 38 of 43)

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 HPSI Pump Room	Westinghouse	5809 H Type Lac. TEWC System: SIS Tag No.: P-017 P-018 P-019	Legend C1 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 3.5×10^7 rads Humidity: 90% RH Chem. Spray: None Submergence: None	Temp: 104F Press: Atmospheric Radiation: 2×10^8 rads Humidity: 100% RH Chem. Spray: N/A Submergence: N/A	Continuous Operation for up to 120 days (2,880 hours)	40,000 hours based on test and analysis See table 5-2, A19	None	N/A	Westinghouse Report W Cap - 8754 Rev. 1 Analysis and testing of age-sensitive components	Interim Use See table 5-2, A19

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 39 of 43)

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	Westinghouse	5808 P39; Frame NA 68690-L7			Continuous Operation for up to 120 days (2,880 hours)	40,000 hours based on test and analysis See table 5-2, A19	None	N/A	Westinghouse Report W Cap 8754 Rev. 1 Analysis and testing of age-sensitive components	Interim Use. See table 5-2, A19
Safety Equipment Building Containment Spray Pump Room		System: CSS Tag No.: P-012 P-013	Legend C1 of table 4-3							
			Temp: 104F	Temp: 104F						
			Press: Atmospheric	Press: Atmospheric						
			Radiation: 3.5×10^7 rads	Radiaiton: 2×10^8 rads						
			Humidity: 90% RH	Humidity: 100% RH						
			Chem. Spray: None	Chem. Spray: N/A						
			Sub-mergence: None	Sub-mergence: N/A						

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 40 of 43)

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 Spray Chemical Storage Tank and Pump Room	Seismens-Allis	EL8-90253-1 System: CSS Tag No.: P-020 P-021	Legend C4 of Table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.9×10^8 rads Humdiity: 90% RH Chem. Spray: None Sub-mergence: None	Temp: 104F Press: Atmospheric Radiation: 2×10^8 rads Humidity: 90% RH Chem. Spray: N/A Sub-mergence: N/A	36 hours	50,000 hours at 104F and 90% RH by analysis and test	None	N/A	Test and Analysis Seismens-Allis Report No. NQ 890253-1	Qualified for 40 years

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 41 of 43)

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 Penetration area	Target Rock Corp.	Model No.: 80B-001 System: CIS Tag No.: HV-7816	Legend E of table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.5×10^7 Humidity: 90% RH Chem. Spray: None Sub-mergence: None	Temp: 120F Press: Atmospheric Radiation: 1.0×10^8 Humidity: 90% Chem. Spray: N/A Sub-mergence: N/A	Must operate for 120 days	Operation demonstrated exceeds 30 days See table 5-2, A19	None	N/A	Target Rock Report No.: 2375 Type test and analysis Aging Conditions Thermal: 33 days at 350F Mechanical: 18,000 cycles	Interim Use See table 5-2, A19

Table 4-2

EQUIPMENT QUALIFICATION TABULATION (NSSS)
ENVIRONMENTAL QUALIFICATION OF SONGS 2 & 3 ELECTRICAL EQUIPMENT
(Sheet 42 of 43)

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	L-A Type CG5C System: CVCS Tag No.: P-190 P-191 P-192	Legend B1 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 1×10^6 rads Humidity: 90% RH Chem. Spray: None Sub-mergence: None	Temp: 104F Press: Atmospheric Radiation: 3.6×10^8 rads Humidity: 100% RH Chem. Spray: N/A Sub-mergence: N/A	20 days (480 hrs) operating time within a period of 120 days	25,000 hours based on test and analysis See table 5-2, A19	None	N/A	Louis Allis Test Report dated 2/9/77 titled "Gaulin Encapsulated Nuclear Motors"	Interim Use. See table 5-2, A19

Table 4-2

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

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 Chemical Storage Tank Room	ITT General Controls	NH93J4002 System: SIS Tag No.: FV-0318 FV-0328	Legend C4 of table 4-3 Temp: 104F Press: Atmospheric Radiation: 1.9×10^6 rads Humidity: 90% Chem. Spray: None Sub-mergence: None	Temp: 122F Press: Atmospheric Radiation: 5×10^6 rads Humidity: 100% Chem. Spray: N/A Sub-mergence: N/A	36 hours	Operation demonstrated after aging and radiation exposure	None	N/A	ITT General Controls Report No. 721.77.095 Type test and analysis Aging conditions Thermal: 3 months at 104F Mechanical: 100,000 cycles at 10% stroke 2000 cycles at 100% stroke	Qualified for 4 years

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

Environmental Conditions																	
Location		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)	$2.3x10^7$	$1.5x10^8$	$2x10^8$ (b)	NA	(c)	(c)
											$3x10^8$ (f)	$2.3x10^7$	$1.5x10^8$	$5x10^8$ (b)			
Auxiliary Building	B																
Charging pump rooms	B1	104	300	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 ($lb/in.^2g$)			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	$3.1x10^6$	$3.2x10^7$	$3.1x10^4$	$3.5x10^7$	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	$3.1x10^6$	$2.6x10^7$	$1.9x10^6$	$3.1x10^7$	NA	NA	NA
Spray chemical storage tank and pump room	C4	104	104	104	0	0	0	80	80	90	$5.3x10^3$	$3.6x10^4$	$1.9x10^6$	$1.9x10^6$	NA	NA	NA
Component cooling water pump rooms	C5	104	104	104	0	0	0	80	80	100	$8.8x10^2$	$8.1x10^5$	$3.1x10^4$	$8.1x10^5$	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											5.1×10^5	1.4×10^7	2.5×10^4	1.5×10^7			
North Central in pipe chase area											2.9×10^6	1.9×10^6	2.5×10^4	4.8×10^6			
Other Areas											4×10^4	4.7×10^5	2.5×10^4	5.4×10^5			
El. 45' to 63'6"											4×10^4	7.9×10^4	2.6×10^4	1.5×10^5			
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, those items for which discrepancies in meeting the guidelines have been identified, is provided in table 5-1 Outstanding Items - BOP Equipment and table 5-2 Outstanding Items - NSSS Equipment which follow. These tables include corrective actions, schedules for implementation, and justification for interim operation or replacement as applicable.

Table 5-1
OUTSTANDING ITEMS - BOP EQUIPMENT
(Sheet 1 of 4)

A1. Electrical Penetration Circuit Breaker Panels

The only Class IE components to be qualified in the backup penetration circuit breaker panels are the circuit breakers themselves. Only a summary of qualification test results is now available. The breakers are considered qualified for interim use based upon a summary of the qualification test results. Analysis of the qualification test report will be confirmatory to full qualification of the circuit breakers. This confirmatory analysis will be complete prior to fuel load.

A2. 600V Control and Instrumentation Cable

Material used for factory splices and repairs is compatible with original cable material. Qualification testing of cable with splices and repairs will be completed by May 1981.

A3. Aux Feedwater Pump Motor

Qualification is in process. Equipment will be qualified prior to fuel load.

A4. CCW Pump Motor

The deficiency in accelerated aging analysis does not impact interim operation of the plant. The aging study will determine the qualified life of the motor and indicate the ambient temperature. This will be resolved prior to fuel load.

Table 5-1

OUTSTANDING ITEMS - NSSS EQUIPMENT

(Sheet 2 of 4)

A5. Level Transmitter (Gems)

Requalification to IEEE 323-1974 is being performed by SNUPPS. Test plan is in review. Tests to be conducted end of 1981. SONGS instrument will be requalified based on test results or replaced with model identical to test specimen.

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. However, containment area water level transmitters LT9387-2 and LT9388-1 are mounted above the flood level and will provide containment water level information. Operation of normal and emergency pump level transmitters is not required for this situation, as water level would exceed their ranges. Additional information or submergence will be requested from vendor, nevertheless.

A6. Level Switch (Magnetrol)

Vendor recommends replacement of switch mechanism after 5-years and periodic (12 month) examination.

Flooding level switch is only required to indicate a flooding condition. If flood level rises above switch, it will be submerged but will have already indicated a flooded condition. Additional information has been requested from vendor to address submergence.

A7. (Deleted)

A8. Limit Switch (NAMCO)

The vendor indicates a qualified life of eight years. Present documentation is under review to substantiate this claim based on aging information supplied. Replacement schedule is identified based on conservative evaluation of aging accomplished.

Table 5-1

OUTSTANDING ITEMS - NSSS EQUIPMENT

(Sheet 3 of 4)

A9. Solenoid Valve (VALCOR)

Qualification Report submitted March 1981. It identifies qualification testing exceeding SONGS 2&3 requirements. Harsh environment is radiation only, and radiation environment to which qualified exceeds accident environment.

The report provides a substantial amount of information on aging and identification of age sensitive materials. Report is in review and determination of qualified life will be made following completion of review and evaluation of data presented with respect to aging. (This evaluation will be complete and qualified life determined prior to fuel load.)

A10. Alternating Current Electric Motor Operators with Class B Insulation

Regarding tag No. HV8150, 8151, 8152, 8153, 9949, and 9950:

Limitorque motor actuators with class B insulation are qualified for 2 x 10^7 rads radiation. This value is that to which the entire actuator was irradiated. Motors with class B insulation were irradiated to 2.04 x 10^8 rads. The phenolic insulating material for switches in the outside containment actuator is different from that of the inside containment actuator. Consequently, for the subject valves, the supplied switches will be replaced prior to feul load with the type used for in-containment service resulting in an actuator that can withstand the higher radiation value of 2 x 10^8 rads.

A11. Main Steam Isolation Valve

Potter-Brumfield relays failed to operate during post-thermal aging functional test. This anamoly occurred after 200 hours of 200F and 95% relative humidity. Qualification of the Potter-Brumfield relays is being reviewed by the Vendor. The relay will be requalified by test prior to fuel load.

Table 5-1

OUTSTANDING ITEMS - NSSS EQUIPMENT

(Sheet 4 of 4)

A12. Containment Post LOCA Hydrogen Monitor (GE)

Analysis required from vendor to satisfy aging of hydrogen sensor. No accelerated thermal aging was performed. Vendor to identify materials and justify qualified life based prior to fuel load on activation energies of materials used based on published information.

A13. Pressurizer Relief Valve Position Indication System

Generic qualification test performed is unacceptable. Requalification to be completed by September 1981.

A14. Wide Range Radiation Monitor Instrumentation

Qualification Testing to be completed by June 1981.

A15. The abnormal environment dose is that for 30 days. Analysis is in progress to determine the 120 day dose level. The qualified environment is greater than the 30 day dose. Therefore, there is a high degree of confidence that the equipment will be qualified for 120 days. Analysis will be completed prior to fuel load.

A16. An analysis will be performed to evaluate the amount of overtesting that can be credited towards an extension of "Operability Demonstrated." Thermal aging effect will be considered for the times and temperatures tested which exceed the required accident conditions. Analysis to be completed prior to fuel load.

A17. Electric Hydrogen Recombiner Power Supply Panel

Power supply panels for the hydrogen recombiners are located within the penetration area. These panels contain solid state devices (e.g., SCR's), transformers and wiring which may be affected by the harsh environment. There is no adequate qualification data available for this equipment to substantiate its performance in the normal or post-accident modes. The power supply panels will either be qualified or moved out of the harsh environment prior to fuel load.

Table 5-2

OUTSTANDING ITEMS - NSSS EQUIPMENT

(Sheet 1 of 6)

A1. The NSSS summary sheets for the Nuclear Instrument Detector and Preamplifier do not show demonstrated nor required accuracies. A neutron detector is an uncalibrated instrument. Sensitivity is based on many things; such as distance from the 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. The response time of the Ex-core Neutron Detector is basically the detector collection time which is in the order of 10^{-10} seconds.

A2. (Deleted.)

A3. Similar cables (i.e., same insulation, jacket, and type of construction) have been qualified by test to an environment of 110C and 120 megarads for a design life of 40 years. Test reports are to be provided by vendor no later than June 1981. No qualification data is to be provided for the 30-minutes accident environment qualification. Thirty minute operation of cable insulation into a high temperature steam/air environment can be shown by analysis. Accuracy and response time are not applicable.

A4. Similar cable (i.e., same insulation, jacket, and type of construction) has been qualified by test to an environment of 150F and 1.03×10^{7} rads gamma. Test reports are to be provided by vendor no later than June 1981. No qualification data is to be provided for the 30-minute accident environment qualification. Thirty minutes operation of cable insulation into a high temperature steam/air environment can be shown by analysis. Accuracy and response time are not applicable.

A5. Evaluation of response time is in progress; the data will be available and submitted prior to the fuel load.

A6. (Deleted.)

Table 5-2
OUTSTANDING ITEMS - NSSS EQUIPMENT
(Sheet 2 of 6)

A7. The Rosemount RTD, Model 104 AFC-1, did not have response time demonstrated during environmental testing. However, this RTD consists of only wire whose response time is not affected by the severe conditions experienced during the DBA. The response of RTD for normal environments, including its thermowell housing, is documented by test as part of the design and production process, and is the basis for the 6-second requirement. This precludes the need to demonstrate response time during extreme environments.

A8. (Deleted.)

A9. Several NSSS Items provide inputs to the Core Protection Calculator (CPC) and are not qualified for DBA environmental conditions which they are presently credited to mitigate. These components are:

RCPSSS Probe and Transmitter
Reedswitch Position Transmitter (RSPT)
RSPT Cable
Ex-Core Detector Assembly
Ex-Core Preamplifier
Ex-Core Detector System Cable

Preliminary analyses indicate that credit could be taken for a combination of Loss of Load Reactor trip, High Containment Pressure Reactor trip, and Ex-Core Overpower (Hi Linear Power) Reactor trip in lieu of the present Lo DNBR CPC trip for protection in the event of inside containment MSLB events. Further analyses are underway to provide a basis for this change to the plant safety analyses.

Additionally, a transient thermal analysis will be performed to demonstrate that the ex-core detectors can provide a Hi Linear Power trip to mitigate selected MSLB events and a CEA ejection prior to exceeding the environmental conditions to which qualified.

Table 5-2
OUTSTANDING ITEMS - NSSS EQUIPMENT
(Sheet 3 of 6)

As a result of the preliminary analyses in progress, the following equipment will most likely be removed from exposures to the "harsh" in-containment (DBA) environment:

RCPSSS Probe and Transmitter

Reedswitch Position Transmitter (RSPT)

RSPT Cable

Additionally, the following components of the ex-core detector system will most likely be shown qualified for their accident mitigation function:

Ex-Core Detector and Cable
Ex-Core Preamplifier
Ex-Core Detector System Cable

A final determination of the adequacy of the aforementioned equipment will be made prior to fuel loading based upon results of the analyses described above.

A10. Foxboro and Rosemount Pressure, Level, and Flow Transmitters

The IE pressure, level, and flow transmitters in San Onofre Nuclear Generating Station 2&3 harsh environment applications consist of both Foxboro and Rosemount units (to meet diversity).

Foxboro transmitters in such SONGS 2&3 applications are E11 and E13 models with LOCA and Radiation Withstand options. These transmitters are equivalent to the N-E11 and N-E13 units currently being type-qualified to IEEE 323-1974/344-1975 by the Utility Transmitter Qualification Program at Wyle Laboratories (in which SCE is a participant).

The Utility Program for Rosemount and Foxboro transmitters is being completed in two phases, with vendor support should design modifications be required. Phase I testing of Foxboro transmitters utilized

Table 5-2
OUTSTANDING ITEMS - NSSS EQUIPMENT
(Sheet 4 of 6)

inservice aged (three years) N-E11 and N-E13 models. Phase II testing of Foxboro transmitters will utilize artificial aging and is expected to result in full IEEE 323-1974/344-1975 qualification of these transmitters by January 1982.

The present transmitter qualifications will be supplemented with the results of the tests described above.

Rosemount pressure, level, and flow transmitters in SONGS 2&3 i.e., harsh environment applications are 1153 Series A models. These transmitters are currently qualified to IEEE 323-1971 including SONGS 2&3 seismic criteria and sequential testing, but aging was not considered. The presently installed Rosemount 1153 Series A transmitters are considered acceptable for interim use until they can be replaced with fully qualified transmitters. Phase II of the Utility Program described above is expected to result in full qualification of replacement design Rosemount 1153 Series D transmitters by January 1982. Replacement of the Rosemount transmitters will be made as soon as practical, but not later than first refueling.

A11. Interim use as per Section 3.6, installed life to be determined during Aging Evaluation. An Aging Evaluation is being performed. 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 components to be defined by the analysis. The analyses will be based on test derived data, relevant to the equipment/material under consideration. This analysis will be completed prior to fuel load.

Table 5-2

OUTSTANDING ITEMS - NSSS EQUIPMENT

(Sheet 5 of 6)

A12. (Deleted)

A13. (Deleted)

A14. An analysis will be performed to evaluate the amount of overtesting that can be credited towards an extension of "Operability Demonstrated." Thermal aging effects will be considered for the times and temperatures tested which exceed the required accident conditions. Analysis to be done prior to fuel load.

A15. (Deleted.)

A16. This Instrumentation is part of the RPS and is only required for a reactor trip during a CEA ejection or certain SLB events. Because a 4 lb/in^2g containment pressure reactor trip will occur before the containment spray initiation at 12 lb/in^2g, this Instrumentation will never experience a chemical spray environment prior to a reactor trip.

A17. The radiation levels experienced by the Excore Instrumentation during a CEA ejection or SLB do not significantly increase above the normal expected doses. Radiation qualification to higher doses is not required.

A18 (a).

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. Humidity qualification is not required.

Table 5-2

OUTSTANDING ITEMS - NSSS EQUIPMENT

(Sheet 6 of 6)

A18 (b).

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 done but additional qualification to 100% RH is not required.

A18 (c).

The CEDM Reedswitch Position Transmitter (RSPT) is a fully sealed unit with a moisture proof covering. This same covering has been tested under steam conditions for a similar RSPT unit and that verification of adequate moisture proof electrical connectors will be made prior to fuel load.

A19. The abmormal environment dose is that for 30 days. Analysis is in progress to determine the 120-day dose level. The qualified environment is greater than the 30-day dose. Therefore, there is a high degree of confidence that the equipment will be qualified for 120 days. Analysis will be completed prior to full load.

APPENDICES

Appendix A

Procedure for Maintaining Equipment Qualification

PROCEDURES FOR MAINTAINING EQUIPMENT QUALIFICATION

To ensure that the qualification level of equipment identified in the master list 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 environmentally qualified parts subject to thermal and radiation aging are replaced or serviced at the intervals stipulated in the corresponding environmental qualification packages.

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 part qualification requirements. Specifically, equipment that requires environmental qualification is identified in a controlled list which is utilized in the process of procuring identical or replacement items. 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 issued from stock and installed in the plant, the corresponding environmental qualification records are updated to reflect the as-built condition.

5. The supporting environmental qualification records for currently installed items are retrievable by plant tag number, or other positive identifier, from the Engineering Data Management Center (EDMC) at the plant.

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.

Appendix B

Emergency Operating Instructions Review

Appendix B

Emergency Operating Procedures Review and Results

To date SONGS 2&3 does not have a complete set of Emergency Operating Instructions (EOI's) formally issued. Four pilot procedures (Steam generator tube rupture, loss of feedwater and steam generator level, determination of adequate core cooling, and loss of coolant accident) are being developed to provide a basis for the methodology and format to be used on all EOI's. These pilot procedures have had an initial review by the NRC Procedures and Test Review Branch, and have been returned to Southern California Edison with comments for resolution and future resubmittal.

The format of the EOI's 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 to base an action on.

As the EOI's are reviewed, prior to issue, they will be checked to ensure that following an accident resulting in harsh environment, for equipment that is located in that environment, only equipment which is qualified to survive that environment will be relied on for indication leading to operator action. Should any non-qualified instrument be referenced it will be so noted in the EOI as being non-IE, non-qualified in the environment exposed to, and which other qualified indications can provide similar backup 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 _____

p^H _____

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 Items

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. Report Nos. 50-361/80-24 and 50-362/80-13 identified action will be taken to close four open items by providing environmental qualification in the response to NUREG-0588. The resolution of these 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 on Equipment Qualification Tabulation 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 on Equipment Qualification Tabulation 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 NUREG-0588 Equipment Qualification Tabulation 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.

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