Applicants' Exhibit 8
Eddleman Contention 9
Docket No. 50-400 OL

A-8
10/19/84
50-400-OL

Final Safety Analysis Report
Section 3.11 and Appendix 3.11A
Environmental Qualification of Electrical Equipment

NUCLEAR REGULATORY COMMISSION

Docket No. 50-400 Official Exh. No. 8
In the matter of Sheron Harris
Staff ______ IDENTIFIED ✓
Applicant ______ RECEIVED ✓
Intervenor ______ REJECTED ______
Cont'g Off'r ______ DATE 10-19-84
Contractor ______ Witness ______
Other ______
Reporter WRB

8412130133 841019
PDR ADOCK 05000400
G PDR

3.11 ENVIRONMENTAL DESIGN OF ELECTRIC AND MECHANICAL EQUIPMENT

3.11.0 GENERAL

Equipment that is relied on to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions postulated to occur during its installed life for the time it is required to operate. This requirement, which is embodied in General Design Criteria 1, 2, 4, and 23 of Appendix "A" and Sections III and XI of Appendix "B" to 10CFR50, is applicable to equipment located inside and outside containment. More detailed requirements and guidance relating to the methods and procedures for demonstrating this capability have been set forth in 10CFR50.49. 16

The purpose of this section is to provide information on the environmental conditions and design bases for which safety related electrical and mechanical equipment is designed to ensure compliance with the above. In addition, this section describes the applicants' environmental qualification program and methodology for compliance with NUREG-0588 Category II guidelines and therefore 10CFR50.49.

This section consists of a written description, tables, figures, appendices, and data references describing the equipment qualification for safety-related Class IE components used in the plant. Descriptions of these tables, figures, appendices, and references are as follows:

Table 3.11.0-1 - This table lists the NSSS supplied safety-related equipment with the applicable qualification reference indicated.

Table 3.11.0-2 - This table lists the Ebasco supplied safety-related equipment.

Table 3.11.0-3 - This table lists the design criteria used in safety-related equipment for non-seismic vibrations.

Table 3.11.1-1 - This table defines the location codes used in the Master List.

Figure 3.11.1-1 - This figure provides the format and legend for the SHNPP "Master List."

Figure 3.11.1-2 - This figure provides a legend for the SHNPP Component Evaluation Sheet.

Appendix 3.11A - This appendix contains the NUREG-0588 Comparison. 16

Apendix 3.11B - This appendix contains the Containment and Reactor Auxiliary Building Zone Maps for temperature and radiation. Figures 3.11B-1 through 3.11B-19 are the Post Accident Temperature in Spaces Cooled by ESF HVAC 16 Systems. Figures 3.11B-20 through 3.11B-29 are the zone maps for the Integrated Radiation Doses to Equipment During Normal and Post Accident Environments.

Appendix 3.11C - This appendix contains supplemental analyses and their results used to demonstrate the thermal response of safety-related equipment located inside Containment, and the subsequent ability to survive and operate during and after the design basis accident

16

WCAP 8587, Supplement No. 1 - This qualification reference indicates the individual qualification details for each particular type of equipment, meeting IEEE 323-1974, supplied by the NSSS Vendor, Westinghouse. This WCAP and supplement are not contained in the FSAR and are generic reference documents for all NSSS supplied IE equipments meeting IEEE 323-1974.

WCAP-7410-L, WCAP-7744 and the Westinghouse Environmental Supplemental Qualification Testing Program (see Westinghouse Letter NS-CE-692, C. Eicheldinger to D. B. Vassallo, July 10, 1985, and NRC Letter from D. B. Vassalo to C. Eicheldinger, November 19, 1975) - This qualification reference indicates the qualification details for equipment suppied by the NSSS Vendor, Westinghouse which meets IEEE 323-1971.

These WCAPs and the Supplemental Program are not contained in the FSAR and are generic reference documents for all NSSS supplied IE equipment meeting IEEE 323-1971.

16 The design environmental criteria for safety-related electrical and mechanical equipment are based on equipment location. Radiation Environment for qualification of electrical and mechanical equipment is based on radiation doses calculated using source terms and methodology discussed in NUREG-0588, NUREG-0588 Rev. 1, and Section II-B.2 of NUREG-0737. As far as practical, equipment for these systems is located outside the Containment Building or other areas where high radioactivity levels or adverse environmental conditions could exist under normal, test, or accident conditions.

16 Safety-related equipment are capable of performing their intended functions under the following specified environmental conditions:

a) All safety-related components are capable of meeting their rated performance specifications under the environmental service conditions expected as a result of normal operating requirements, including the range of expected minimum and maximum environmental conditions.

16 b) All safety-related equipment are capable of completing their functions under the environmental service conditions related to the design basis accident. The environmental service conditions related to a design basis accident are specified to include: normal operating conditions existing before the event, conditions generated by the event, and conditions which exist subsequent to the event for such time as is required for the protective actions to be carried to completion.

TABLE 3.11.0-1

NSSS SUPPLIED
SAFETY-RELATED EQUIPMENT

Equipment	Manufacturer	Model or Drawing Number	Qualification Reference[c]	Qualification PER/IEEE-323 (1971-1974)	
Wide-Range Reactor Coolant Pressure Transmitter	W ITT Barton	763 (Group A)	ESE-1A	1974	16
Wide-Range Reactor Coolant Pressure Transmitter	W Veritrak	76PH2	ESE-1B	1974	16
Pressurizer Pressure Transmitter	W ITT Barton	763	ESE-1A	1974	
Pressurizer Level Transmitter	W ITT Barton	764 (Group A)	ESE-3A	1974	16
Steam Generator Level WR&NR Transmitter	W ITT Barton Veritrak	764 76DP2 (Group A)	ESE-3A ESE-3B	1974 1974	
Reactor Coolant Flow Transmitter	W ITT Barton	752 (Group B)	ESE-4A	1974	16
Steam Flow Transmitter	W ITT Barton	764 (Group A)	ESE-3A	1974	
Narrow-Range Reactor-Coolant Temperature Detectors	RdF	21204	ESE-5	1974	
Wide-Range Reactor-Coolant Temperature Detectors	RdF	21205	ESE-6	1974	16

TABLE 3.11.0-1 (Cont'd)

NSSS SUPPLIED
SAFETY-RELATED EQUIPMENT

Equipment	Manufacturer	Model or Drawing Number	Qualification[c] Reference	Qualification PER/IEEE-323 (1971-1974)	
					16
Containment Pressure Sensor	W ITT Barton	351	ESE-21	1974	16
Electric Hydrogen Recombiners and Equipment	W Sturtevant	Model A 02D0448 Rev. 0 (HAL.)			16
	Halamar Shaffer Eng.	CP-6070-1 Rev. 2 (SHAF.) CP-4070-1 Rev. 1 (SHAF.)	SP-1	1974	16
Excore Detectors	W - IGTD	24154	ESE-8A	1974	
Stem Mounted Limit Switches Inside Containment	NAMCO	EA-180	NAMCO Test Report 11/21/77	1971	
Valve Motor Operators Inside Containment	Limitorque	SMB Class H	WCAP-7410-L WCAP-7744 NS-CE-692	1971	
Valve Solenoid Operators Inside Containment	ASCO	Various	NS-CE-755	1971	
Steam Pressure Transmitter	W ITT Barton	763 (Group A)	ESE-1A	1974	16
Turbine Pressure Transmitter	W ITT Barton	753 (Group B)	ESE-2	1974	
Containment Pressure Transmitter	W ITT Barton	752 (Group B)	ESE-4	1974	
PAM Indicators	W - RID	VX252	ESE-14	1974	

TABLE 3.11.0-1 (Cont'd)

NSSS SUPPLIED
SAFETY-RELATED EQUIPMENT

Equipment	Manufacturer	Model or Drawing Number	Qualification[(c)] Reference	Qualification PER/IEEE-323 (1971-1974)	
PAM Recorders	W - CID	Optimal 100	ESE-15	1974	16
Refueling Water Storage Tank Level Transmitter	W ITT Barton	752 (Group B)	ESE-4	1974	16
Feedwater Flow Transmitter	W ITT Barton	752 (Group B)	ESE-4	1974	16
Component Cooling Heat Exchanger Discharge Pressure	W ITT Barton	753 (Group B)	ESE-2	1974	16
Process Protection System	WISD	7300	ESE-13	1974	16
Nuclear Instrumentation System	W NICD	1054E26 Rev. D	ESE-10	1974	16
Solid State Protection System	W NICD	2-Train	ESE-16	1974	16
Main Control Board Main Termination Cabinets	W	1139E34 1139E35 1139E36	WCAP-10469 WCAP-10369	1974	16
Safeguards Test Cabinets	W NICD	2-Train	ESE-16	1974	16

TABLE 3.11.0-1 (Cont'd)

NSSS SUPPLIED
SAFETY-RELATED EQUIPMENT

Equipment	Manufacturer	Model or Drawing Number	Qualification(c) Reference	Qualification PER/IEEE-323 (1971-1974)	
					16
RVLIS (Reactor Vessel Level Instrumentation System)	W - ID	MULT 1	ESE-50C(d)	1974	16
Instrument Static Inverter	W PEDS	7-1/2 KVA, 1 Phase 60 Cycle Inst. Bus Inverter	ESE-18	1974	
Reactor Trip Switchgear	W LVSD	Type DS416 RTS	ESE-20	1974	16
Stem Mounted Limit Switches (Outside Containment)	NAMCO	EA170 D-2400X	Fisher Control Test #72AR7B and 1529	1971	16
Valve Motor Operators (Outside Containment)	Limitorque	Various	Limitorque Report #800 6/7/76 Limitorque Report # 600456 11/22/74	1971	16
Valve Solenoid Operators (Outside Containment)	ASCO	FT831654 HT8300B54-RF	NS-CE-755	1971	
Component Cooling Water Pump Motor	W LMD	8249D36	AE-2	1974	16

TABLE 3.11.0-1 (Cont'd)

NSSS SUPPLIED
SAFETY-RELATED EQUIPMENT

Equipment	Manufacturer	Model or Drawing Number	Qualification[c] Reference	Qualification PER/IEEE-323 (1971-1974)	
					16
Residual Heat Removal Pump Motor	W LMD	8246D34	AE-2	1974	16
Centrifugal Charging Pump Motor	W LMD	8241D38	AE-2	1974	16
Boric Acid Transfer Pump Motor	Chempump	B62239	Chempump Report A18187	1974	16

NOTES:

(A) This note has been deleted. 16

(B) This equipment is not required to perform its function under severe post-accident environmental condition. Qualification type testing for this equipment is described in WCAP-7410-L, WCAP-7744 and the Westinghouse Environmental Supplement Qualification Testing Program.

(C) EQDP's from WCAP-8587 Supplement 1.

(D) This umbrella report references EQDPs ESE-4, 15, 42, 48, 49, and 53 as identified in WCAP 8587. 16

TABLE 3.11.0-2

EBASCO PURCHASED
SAFETY RELATED EQUIPMENT

EQUIPMENT	SUPPLIER	MODEL NUMBER	QUALIFICATION PER IEEE-323 (1971 OR 1974)
6.9 kV Metal Clad Switchgear	Siemens-Allis	F3-500 Al (15 kV Class)	1974
480 V Metal Enclosed Switchgear	Gould-Brown Boveri	Type LK	1974
Motor Control Centers	Gould-Brown Boveri	Series 5600	1974
Emergency Diesel Engine and Generator	Transamerica DeLaval	DSRV-16-4	1974
Emergency Diesel Generator Control Panel	Transamerica DeLaval	N/A	1974
15 kV Power Cable	Anaconda	N/A	1974
600 V Power & Control Cable	Kerite	N/A	1974
300 V Instrumentation, Communication, and Computer Input Cable	American Insulated Wire	N/A	1974
Thermocouple Cable	Samuel Moore & Company	N/A	1974
Power, Control and Instrumentation Cable	Anaconda	N/A	1974

3

TABLE 3.11.0-2 (Continued)

EQUIPMENT	SUPPLIER	MODEL NUMBER	QUALIFICATION PER IEEE-323 (1971 OR 1974)
Emergency Diesel Generator - Engine Control Panel	Transamerica DeLaval	N/A	1974
Emergency Diesel-Motor Controller	Transamerica DeLaval	N/A	1974
Control and Instrumentation Cable	American Insulated Wire Corp.	N/A	1974
Triaxial Cable	Boston Insulated Wire & Cable Co.	N/A	1974
125 V DC Distribution Panels	Gould-Brown Boveri	FC-1	1974
125 V Batteries	C & D Batteries	LC-19	1971
125 V DC Battery Chargers	C & D Batteries	ARR 130 HK 150F	1971
Containment Electrical Penetrations: Low-Voltage Power, Control and Instrumentation	Westinghouse	WX-33527 WX-33528 WX-33881 WX-33453 through WX-33487	1974
Containment Electrical Penetrations Medium Voltage	Westinghouse	WX-33452	1974
Electronic Instrumentation	Rosemount	1153 Series B	1974
Thermocouple Assemblies and Test Thermowells	WEED Instrument	N/A	1974
Auxiliary Control Panel	Reliance Electric	N/A	1974
Local Instrument Cabinets & Racks	Mercury Company of Norwood, Inc.	N/A	1974
Auxiliary Relay Cabinets & Racks	Systems Control Corp.	N/A	1974

3

TABLE 3.11.0-2 (Continued)

EQUIPMENT	SUPPLIER	MODEL NUMBER	QUALIFICATION PER IEEE-323 (1971 OR 1974)
Isolation Panels	Consolidated Control Corp.	N/A	1974
Transfer Panels	Systems Control Corp.	N/A	1974
Sequencer Panels	Systems Control Corp.	N/A	1974
Level Switches	Magnetrol International	A-153F 17-7-75	1974
Level Transmitters	Transamerica DeLaval	RE-36562 XM-36495	1974
Low Range Differential Pressure Transmitters	FLO-TEK	NS-10RA-2A2	1974
Low Range Flow Switches	Fluid Components	FR-72-4 FR-72-4R	1974
Containment Fan Coolers	American Air Filter	N/A	1974
Water Chillers	York		1974
Chilled Water Circulating Pumps	Goulds Pumps		1974
Air Handling Units	Bahnson		1974
Centrifugal Fans	Barry Blower		1974
Axial Flow Fans	Joy Manufacturing		1974
In-Line Fans	Joy Manufacturing		1974
Electric Heating Coils	Brasch Manufacturing		1974
Dampers	Ruskin Manufacturing		1974
Air Cleaning Units	CTI - Nuclear		1974
Tornado Protection Dampers	Quality Air Design		N/A

3

TABLE 3.11.0-2 (Continued)

EQUIPMENT	SUPPLIER	MODEL NUMBER	QUALIFICATION PER IEEE-323 (1971 OR 1974)
Butterfly Valves	BIF - Unit of General Signal		1974
Auxiliary Steam Generator Feed Pumps & Motor	Ingersoll-Rand	3HMTA-9-Pump 5008P39-Motor Frame	1974
Auxiliary Steam Generator Feed Pumps & Turbine	Ingersoll-Rand	4x9-NH-7-Pump GS-2N Turbine	1974
Service Water Booster Pumps & Motor	Goulds Pumps	3405L-Pump 447TS-Motor Frame	1974
Spent Fuel Pool Cooling Pump & Motor	Goulds Pumps	3405L-Pump 445TS-Motor Frame	1974
Diesel Oil Transfer Pump & Motor	Goulds Pumps	3196ST-Pump 213T-Motor Frame	1974
Containment Spray Pump & Motor	Ingersoll-Rand	8x23WDF-Pump 5008P39-Motor Frame	1974
Feedwater Isolation Gate and Check Valves	Borg-Warner	16"x16" Flexiwedge	1974
2 1/2" & Larger C.S. Valves	Pacific Valves	180-7-WE-X 150-7-WE-X 160-7-WE-X	1974
2 1/2" & Larger C.S. Valves 900#	Rockwell International	4" & 6" 1911 HHJTY	N/A
Diaphragm Valves	ITT Grinnell Valve		1974
Motor & Manual Operated Butterfly Valves	Jamesbury Corp.	8229, 8226	1974

3

TABLE 3.11.0-2 (Continued)

EQUIPMENT	SUPPLIER	MODEL NUMBER	QUALIFICATION PER IEEE-323 (1971 OR 1974)
Main Steam Power Operated Relief Valves	Control Components	OX69-X8-X8BW-10BW	1971*
Self Cleaning Strainers	R. P. Adams Co.	HDWS-80	1974
Miscellaneous Control Valves and Accessories	ITT/Hammel Dahl	Valves: HD/C-830, 672, 502 Operators: ITT G/C; E/H-NH-90, 92	1974
Misc. Control Valves and Accessories	Masoneilan Int.	48-40411	1974
Emergency Service Water Pumps & Motors	Hayward Tyler Pump Co.		1974
Solenoid Operated Globe Valves	Target Rock Corp.	1021010 1032110	1974
ESW Intake Structure Butterfly Valves	Allis-Chalmers	10'x8' Rectangular Streamseal	1974
Emergency Service Water Screen Wash Pumps and Motors	Crane-Deming Reliance	3065-AIO-Pump 254T-Motor Frame	1974
2 1/2-Inch & Larger Motor Operated Valves	Anchor/Darling	-	1974
2-Inch & Smaller Motor Operated Valves	Rockwell	-	1974
Plug Valves	Tufline	-	1974
Packless Globe Valves	Kerotest	-	1974
Traveling Water Screens	Envirex	-	1974

(*)Under Negotiation To Up-Date To IEEE 323-74

TABLE 3.11.0-3 3

SAFETY RELATED EQUIPMENT DESIGN FOR NONSEISMIC VIBRATION

	Equipment	Standard or Requirement
A.	Containment Spray Pump Component Cooling Water Pumps RHR Pumps Charging Pumps Chilled Water Pumps	Pump bearing housing and pump shaft vibration double amplitude is limited to .003 inches
	Emergency Service Water Pumps	Bearing housing and shaft vibration limited to .005 inches double amplitude
B.	Auxiliary Feedwater Pumps	Pump bearing housing and pump shaft vibration peak to peak is limited to 0.0021 inches at speeds up to 110 percent rated speed
C.	All other Safety Related Pumps	API 610 or better
D.	All Electrical Motors	NEMA Standard MGI-12-05
E.	Containment Fan Coolers	Fan bearing housing vibration limited to .002 inches double amplitude
F.	All other HVAC Equipment	ASHRAE Systems handbook

3.11.1 EQUIPMENT IDENTIFICATION AND ENVIRONMENTAL CONDITIONS

3.11.1.1 Equipment Identification

The methodology to determine which equipment important to safety is to be environmentally qualified is based on the IE Bulletin 79-01B approach of reviewing plant systems which perform safety functions. The equipment within such systems, which are necessary for the performance of the safety function, are identified and qualified environmentally to demonstrate acceptable performance throughout its installed life.

Plant safety related systems are identified in FSAR Table 3.2.1-1. The specific equipment, within safety related systems, which is environmentally qualified, is identified on separate master lists submitted to the NRC. Figure 3.11.1-1 and applicable notes provide the format and legend for the Shearon Harris Nuclear Power Plant master list for electrical safety related equipment. All equipment defined in the scope of 10CFR50.49 is included in the Shearon Harris EQ Program. 16

3.11.1.2 Environmental Conditions

Normal and accident environmental conditions are explicitly identified in various FSAR sections. The figures contained in FSAR Section 3.11B show general plant areas. Superimposed on these figures, in tabular form, are the environmental conditions used for qualification purposes. The individual Component Evaluation Sheets (CES) for qualified safety related equipment summarize the environmental conditions to which a specific item is qualified. Figure 3.11.1-2 and applicable notes provide the format and legend for the Shearon Harris Nuclear Power Plant CES for electrical safety related equipment.

CES are included, for each piece of equipment, in the appropriate environmental qualification documentation package, which substantiates qualification in detail.

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TABLE 3.11.1-1
SHEARON HARRIS NUCLEAR POWER PLANT
SAFETY RELATED EQUIPMENT LOCATION CODES

IDEN	PC	AREA	EXCL	XMIN	XMAX	YMIN	YMAX	ZMIN	ZMAX	RCYL
WP11	1	WASTE PROC EL 211		1192.00	1382.90	1655.00	1945.00	211.00	234.00	0.00
WP21	2	WASTE PROC EL 236		1192.00	1382.90	1655.00	1945.00	235.00	259.00	0.00
WP21	2	WASTE PROC EL 236	EXCL	1288.00	1382.90	1766.00	1834.00	234.00	260.90	0.00
WP22	3	WP CTL RM & VAULT		1288.00	1382.90	1766.00	1834.00	235.00	259.90	0.00
AB52	4	RAB EL 305-CONT RM		1537.00	1764.00	1513.00	1699.90	304.00	323.00	0.00
AB52	4	RAB EL 305-CONT RM	EXCL	1737.00	1764.00	1572.00	1699.90	304.00	330.00	0.00
AB52	4	RAB EL 305-CONT RM	EXCL	1537.00	1565.00	1570.00	1699.90	303.00	324.00	0.00
AB52	4	RAB EL 305-CONT RM	EXCL	1537.00	1592.00	1640.00	1699.90	303.00	324.00	0.00
AB01	5	RAB EL 190		1383.00	1650.00	1513.00	1699.90	190.00	215.00	0.00
AB01	5	RAB EL 190	EXCL	1500.00	0.00	1700.00	0.00	189.00	450.00	65.00
AB21	6	RAB EL 236		1383.00	1740.00	1513.00	1699.90	235.00	259.90	0.00
AB21	6	RAB EL 236	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
AB31	7	RAB EL 261		1383.00	1710.00	1513.00	1699.90	260.00	284.90	0.00
AB31	7	RAB EL 261	EXCL	1476.00	1525.00	1570.00	1647.00	259.00	310.00	0.00
AB31	7	RAB EL 261	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
AB31	7	RAB EL 261	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
AB32	8	RAB EL 261-305		1476.00	1525.00	1570.00	1647.00	260.00	303.00	0.00
AB32	8	RAB EL 261-305	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
TA11	9	TANK AREA UNIT 1		1319.00	1382.90	1513.00	1654.90	230.00	340.00	0.00
SW11	10	SEC WASTE EL 216		1383.00	1453.00	1700.00	1900.00	216.00	234.90	0.00
SW11	10	SEC WASTE EL 216	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
SW21	11	SEC WASTE EL 236		1383.00	1453.00	1700.00	1900.00	235.00	259.90	0.00
SW21	11	SEC WASTE EL 236	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
TB31	12	TURB ELS 240-261		1278.00	1710.00	1345.00	1513.00	240.00	284.90	0.00
TB41	13	TURB ELS 266-314		1278.00	1710.00	1345.00	1513.00	285.00	340.00	0.00
FH11	14	FUEL HDLG EL 216		1435.00	1917.00	1700.00	1900.00	216.00	234.90	0.00
FH11	14	FUEL HDLG EL 216	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
AB43	15	RAB EL 286-SWGR RM		1383.00	1589.90	1513.00	1602.00	285.00	303.90	0.00
AB43	15	RAB EL 286-SWGR RM	EXCL	1565.00	1589.90	1513.00	1570.00	284.00	310.00	0.00
AB43	15	RAB EL 286-SWGR RM	EXCL	1476.00	1525.00	1570.00	1602.00	284.00	310.00	0.00
AB41	16	RAB EL 286		1383.00	1650.00	1513.00	1699.90	285.00	303.90	0.00
AB41	16	RAB EL 286	EXCL	1476.00	1525.00	1570.00	1647.00	259.00	310.00	0.00

TABLE 3.11.1-1 (Cont'd)
SHEARON HARRIS NUCLEAR POWER PLANT
SAFETY RELATED EQUIPMENT LOCATION CODES

15

IDEN	PC	AREA	EXCL	XMIN	XMAX	YMIN	YMAX	ZMIN	ZMAX	RCYL
AB41	16	RAB EL 286	EXCL	1383.00	1565.00	1513.00	1602.00	284.00	310.00	0.00
AB41	16	RAB EL 286	EXCL	1565.00	1589.90	1570.00	1602.00	284.00	310.00	0.00
AB41	16	RAB EL 286	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
FH21	17	FUEL HDLG EL 236		1453.00	1917.00	1700.00	1900.00	235.00	259.90	0.00
FH21	17	FUEL HDLG EL 236	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
AB11	18	RAB EL 216		1383.00	1749.00	1513.00	1699.90	215.00	234.90	0.00
AB11	18	RAB EL 216	EXCL	1590.00	1710.00	1610.00	1699.90	214.00	236.90	0.00
AB11	18	RAB EL 216	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
WP31	19	WASTE PROC EL 261		1192.00	1382.90	1655.00	1945.00	260.00	289.90	0.00
WP31	19	WASTE PROC EL 261	EXCL	1192.00	1382.90	1766.00	1905.00	274.00	290.90	0.00
SW31	20	SEC WASTE EL 261		1383.00	1453.00	1700.00	1900.00	260.00	284.90	0.00
SW31	20	SEC WASTE EL 261	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
FH31	21	FUEL HDLG EL 261		1453.00	2016.00	1700.00	1900.00	260.00	284.90	0.00
FH31	21	FUEL HDLG EL 261	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
XY31	22	XFMR YARD		1380.00	1620.00	1145.00	1346.90	250.00	300.00	0.00
WT31	23	WATER TREAT BLDG		750.00	1042.00	2060.00	2310.00	250.00	350.00	0.00
WT31	23	WATER TREAT BLDG	EXCL	935.00	1026.00	2060.00	2106.90	249.00	351.00	0.00
DF31	24	DEISEL FO STR BLDG		2140.00	2240.00	1852.00	1948.00	240.00	300.00	0.00
BA31	25	AUX BLR AREA		724.00	1025.90	2032.00	2475.00	250.00	300.00	0.00
BA31	25	AUX BLR AREA	EXCL	823.90	1025.90	2400.00	2475.00	249.00	301.00	0.00
BA31	25	AUX BLR AREA	EXCL	724.00	1025.90	2106.90	2399.90	249.00	301.00	0.00
BA31	25	AUX BLR AREA	EXCL	724.00	949.90	2032.00	2106.90	249.00	301.00	0.00
IE31	26	INTAKE STR-EMER SW		44.00	173.00	1475.00	1685.00	230.00	300.00	0.00
SS31	27	EM SCREEN STRUCT		160.00	300.00	2130.00	2200.00	230.00	300.00	0.00
IS31	28	INTAKE STRUCT-SW		1560.00	1750.00	415.00	525.00	250.00	300.00	0.00
AB51	29	RAB EL 305		1458.00	1545.00	1513.00	1654.00	304.00	325.00	0.00
AB51	29	RAB EL 305	EXCL	1537.00	1545.00	1513.00	1570.00	303.00	321.00	0.00
WP41	30	WASTE PROC EL 276		1192.00	1382.90	1766.00	1905.00	275.00	289.90	0.00
WP51	31	WASTE PROC EL 291		1192.00	1382.90	1658.00	1945.00	290.00	340.00	0.00
FH41	32	FUEL HDLG EL 286		1411.00	2016.00	1700.00	1900.00	285.00	303.90	0.00
FH41	32	FUEL HDLG EL 286	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
CB11	33	RCB EL 221		1500.00	0.00	1700.00	0.00	190.00	235.00	65.00

TABLE 3.11.1-1 (Cont'd)
SHEARON HARRIS NUCLEAR POWER PLANT
SAFETY RELATED EQUIPMENT LOCATION CODES

IDEN	PC	AREA	EXCL	XMIN	XMAX	YMIN	YMAX	ZMIN	ZMAX	RCYL
CB21	34	RCB EL 236		1500.00	0.00	1700.00	0.00	236.00	260.00	65.00
CB31	35	RCB EL 261		1500.00	0.00	1700.00	0.00	261.00	285.00	65.00
CB41	36	RCB EL 286		1500.00	0.00	1700.00	0.00	286.00	450.00	65.00
IC31	37	INTAKE STRUCT-CW		1220.00	1335.00	620.00	780.00	250.00	300.00	0.00
CT31	38	COOL'G TOWER		1210.00	1500.00	420.00	150.00	250.00	650.00	0.00
DG31	39	DIESEL GEN BLDG		1573.00	1727.00	1057.00	1180.00	240.00	350.00	0.00
2S31	40	230KV SWYD		330.00	790.00	525.00	1180.00	250.00	280.00	0.00
FH51	41	FUEL HDLG EL 305		1411.00	2016.00	1700.00	1900.00	304.00	322.90	0.00
FH51	41	FUEL HDLG EL 305	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
FH61	42	FUEL HDLG EL 324		1411.00	2016.00	1700.00	1900.00	323.00	340.00	0.00
FH61	42	FUEL HDLG EL 324	EXCL	1500.00	0.00	1700.00	0.00	190.00	450.00	65.00
CF01	43	INT STR-CPE FR RIV		7425.00	7575.00	7725.00	7875.00	137.00	230.00	0.00
MD01	44	MAIN DAM SPILLWAY		5425.00	5575.00	5725.00	5875.00	195.00	270.00	0.00
SB31	45	SERVICE BLDG		950.00	1055.00	1700.00	1955.00	250.00	350.00	0.00
GS31	46	GAS STORAGE BLDG		965.00	1040.00	2400.00	2575.00	250.00	305.00	0.00
YD31	49	Y D R AREA #1		390.00	1650.00	60.00	1800.00	240.00	275.00	0.00
YD32	50	Y D R AREA #2		1650.00	2600.00	60.00	1800.00	240.00	275.00	0.00
YD33	51	Y D R AREA #3		1650.00	2600.00	1800.00	3400.00	240.00	275.00	0.00
YD34	52	Y D R AREA #4		390.00	1650.00	1800.00	3400.00	240.00	275.00	0.00

3.11.2 QUALIFICATION TESTS AND ANALYSIS

Environmental qualification testing and/or analysis based on tests are performed on safety related equipment located in a harsh environment. The results are evaluated for compliance with the Category II NUREG-0588 guidelines.

Nuclear Steam Supply System (NSSS) Class 1E equipment is qualified under the Westinghouse environmental qualification program as stated in Westinghouse Topical Report WCAP 8587. This report describes the basic methodology on which the Westinghouse qualification program is based and includes qualification methods used for harsh environment Class 1E equipment.

The NRC has reviewed and accepted the generic qualification methodology described in Westinghouse Topical Report 8587. The applicants review the report to verify applicability to Shearon Harris.

Specifically, all reviews consider but are not limited to the following:

a) Assurance that the test report is applicable to SHNPP. This is accomplished by assuring that the project name, purchase order and equipment specification as a minimum are identified on or traceable to the report.

b) A comparison of the test sample is made to assure that the equipment tested is identical to or representative of the purchased equipment.

c) The aging (radiation, humidity, temperature, electro-mechanical cycling, etc., as required) simulation is evaluated to determine if the test equipment has been placed in a condition which simulates its expected end of qualified life condition prior to design basis accident testing. Process temperatures, when applicable, are addressed. 16

d) The design basis accident environmental test conditions (temperature, pressure, chemical spray, etc.) are evaluated to determine if they envelop the Shearon Harris expected environmental conditions in the unlikely event of a design basis accident.

e) Anomalies observed during qualification testing are evaluated.

In addition, other items such as test sequence, margin, interfaces are also addressed during the environmental qualification report review process.

Compliance with the various NRC Regulatory Guides and General Design Criteria is described in FSAR Sections 1.8 and 3.1, respectively.

3.11.3 QUALIFICATION TEST RESULTS

A summary of the harsh environment qualification test results for each type of qualified safety related equipment is provided in the individual Component Evaluation Sheet (CES) for each equipment. Refer to FSAR Section 3.11.1.2 for a discussion of CES. The CES identifies the applicable environmental qualification documentation package which substantiates qualification in detail. Documentation packages are prepared for equipment groups by type (e.g., all Target Rock Solenoid Operator harsh environment qualification documents are contained in a single documentation package).

Typical documents which are included in the environmental qualification documentation packages are:

a) Equipment Functional Description and Summary,

b) Component Evaluation Sheets,

c) Equipment Specifications,

d) Environmental Qualification Report(s), 16

e) Supplementary Review/Analysis Sheets which provide analysis/ calculations performed to demonstrate qualification to each applicable environmental parameter,

f) Review Guidelines and Checklist which discuss environmental conditions, testing, aging and replacement, interfaces and maintenance considerations,

g) Drawing(s) showing equipment details, and

h) Open Items.

The various documentation packages are permanently stored and maintained at the Shearon Harris Nuclear Power Plant.

3.11.4 LOSS OF VENTILATION

3.11.4.1 Equipment Qualification

Plant areas containing safety related equipment and their support systems are temperature controlled to provide a controlled environment during normal and most severe DBA conditions. During normal plant operating conditions, plant area environments are less than or equal to those shown in Appendix 3.11B. Safety related temperature controlling equipment located in a harsh environment is environmentally qualified in the same manner as other safety related equipment in the same plant areas. 16

3.11.4.2 Air Conditioning Systems

The Seismic Category I and Safety Classes 2 and 3 Air Conditioning Systems, are powered from Class 1E electrical power supplies and are provided for the locations described in Section 9.4. They are designed such that the single failure of an active component, after a design basis accident, cannot impair the ability of the systems served by the air-conditioning equipment to fulfill their safety functions. Should the air-conditioning unit in one of the rooms in a Seismic Category I, Safety Class 2 or 3 system become inoperative during normal operation, sufficient equipment is still available to mitigate the consequences of a design basis accident.

3.11.4.3 Ventilation Systems

Two redundant Safety Class 3, Seismic Category I air handling units are provided in the Reactor Auxiliary Building for the Control Room envelope. The system design assures that proper ambient temperature is maintained at all times. It is not considered credible that simultaneous loss of the two units could occur.

Humidity is not controlled during accident conditions in most areas, except in the Control Room, and 100 percent humidity is assumed unless otherwise indicated.

3.11.4.4 Design Basis Temperatures

The maximum temperatures considered in the sizing of ventilation and cooling systems serving safety-related systems were determined by quantitative analysis of the following factors:

a) Maximum outdoor design temperatures for the geographical area of the plant (both wet-bulb and dry-bulb readings) per ASHRAE standards.

b) Maximum internal piping thermal loads, if applicable, for the particular area or room, using maximum operating temperatures for the pipe contents and maximum footage of active pipe for each mode of operation.

c) Maximum internal electrical load, assuming full lighting for the room and using, if applicable, the maximum control and equipment resistance losses for each mode of operation.

d) Maximum heat transfer for miscellaneous equipment surfaces.

e) Maximum heat transfer from the surfaces of open pools and tanks, using the maximum operating temperature of the contents.

f) Maximum heat transfer from the surfaces of the room, including walls, floor and ceiling or roof.

3.11.4.5 Temperature Conditions Inside Containment and Main Steam Tunnel During/After a Design Basis Accident

The temperature conditions inside the Containment or Main Steam Tunnel resulting from a design basis accident are a function of time. The following FSAR figures show these conditions for the various postulated line breaks considered:

Figure 3.11.4-1 DBA Temperature Profile Inside Containment
16 (combined LOCA/MSLB)

Figure 3.11.4-2 DBA Temperature Profile Inside Containment (LOCA)

Figure 3.11.4-3 DBA Temperature Profile Inside Containment (MSLB)

Figure 3.11.4-4 DBA Temperature Profile Inside Main Steam Tunnel (MSLB)

3.11.5 ESTIMATED CHEMICAL AND RADIATION ENVIRONMENT

3.11.5.1 Chemical Environment

Safety Related Systems are designed to perform their safety-related 16
functions in the temperature, pressure, and humidity conditions discussed in Section 3.11.1 and in Section 6.2. In addition, components of ESF systems inside the Containment are designed to perform their safety-related functions in a long-term contact with boric acid and sodium hydroxide solutions, recirculated through the Safety Injection System (SIS) and Containment Spray System (CSS).

The pH time history of the water both in the containment spray and in the containment sump, as well as the boron concentration in the Reactor Coolant System, is discussed in Section 6.5.2.

The containment atmosphere is maintained below 4 volume percent hydrogen consistent with the recommendations of Regulatory Guide 1.7. The extent to which this and other recommendations of Regulatory Guide 1.7 are followed are discussed in FSAR Section 6.2.5.

The boron injection portion of the Safety Injection System (SIS) is designed for 12 weight percent boric acid. The CVCS, SIS, and CSS are designed for
both the maximum and long-term boric acid concentration of 2000-2100 ppm at a 16
pH of 8.5 to 11.0.

3.11.5.2 Radiation Environment

Safety related systems and components are designed to perform their safety 16
related functions after the normal 40-year operational exposure plus one
accident exposure. The normal operational exposure is based on the design
source terms presented in Section 11.1 and Section 12.2.1. Post accident 16
system and component radiation exposures are dependent on equipment
location. Source terms and other accident parameters are presented in
Section 12.2.1 and in Chapter 15. For safety related systems, normal
operational exposure and post accident radiation exposures are listed in 16
Appendix 3.11B.

The degree to which the recommendations of Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors," has been used in determining the source terms used in evaluating radiation exposure is detailed in Section 1.8.

The design radiation exposures are based on gamma and beta radiation. The 16
effects of beta radiation are effectively attenuated by small amounts of shielding, such as conduits for cable and casings for equipment. Organic materials which are located inside the Containment are identified in Section 6.1.2.

3.11.6 PRESSURE ENVIRONMENT

Normal operating pressure inside containment is 14.7 psia as indicated in FSAR Section 6.2.1.5.2, as well as in all other plant areas.

Design basis accident pressure conditions inside containment and the main steam tunnel are a function of time as shown in the following FSAR figures:

FSAR Figure 3.11.6-1	Pressure Profile Inside Containment (Combines LOCA/MSLB)
FSAR Figure 3.11.6-2	Pressure Profile Inside Containment (MSLB)
FSAR Figure 3.11.6-3	Pressure Profile Inside Main Steam Tunnel (MSLB)

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In all other plant areas, during a design basis accident inside containment or the main steam tunnel, the pressure remains at 14.7 psia.

SHEARON HARRIS - MASTER LIST

PAGE NO- 1

SYSTEM # & NAME:SP0054-SAMPLING SYSTEM

TAG NO	COMPONENT NAME	FUNCTION & SERVICE	MANUFACTUR.	MODEL/SER	PLANT LOCATION	LOCATION X,Y,Z	ENVIRONM. H/M	FUNCT. CATEG.	SAFETY FUNCTION	REG 1.97	CES #	REV #

SAMPLE

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SHEARON HARRIS NUCLEAR POWER PL.
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

MASTER LIST

FIGURE 3.11.1-1

NOTES TO FIGURE 3.11.1-1
SHNPP QUALIFICATION PROGRAM MASTER LIST

LEGEND

The interpretation of each entry in the Master List is as follows:

1.	TAG NO.	Specific device alpha-numeric designation which identifies plant equipment.
2.	COMPONENT NAME	A brief title or description of the item being qualified (Note: components are the smallest breakdown of equipment types or categories for qualification purposes).
3.	FUNCTION & SERVICE	This is a description of the service which the component performs.
4.	MANUFACTURER	Specific vendor who manufactured the component, but not necessarily supplier of the component. For example, limitorque manufactures valve operators for a valve vendor who in turn supplies the entire valve-operator assembly to the utility.
5.	MODEL/SERIAL NO.	Specific vendor designation for a family or group of like components.
6.	PLANT LOCATION	The general plant area location where the component is located. (See Table 3.11.1-1)
7.	LOCATION "X", "Y", "Z"	The coordinates locate the equipment within the "plant location" and more importantly within the environmental zones. (See Table 3.11.1-1)
8.	ENVIRONMENTAL CATEGORY: H/M	Classification of each component's environment as "harsh" or "mild".
9.	FUNCTION CATEGORY	A single entry is made herein for the applicable category listed in NUREG-0588, Appendix E, paragraph 2. The categories are "A", "B", "C", or "D".
10.	SAFETY FUNCTION	Major plant safety functions indicative of safety function performed by the system in which the equipment is a part of. Examples of safety functions are: Containment Isolation (CI), Emergency Reactor Shutdown (ERS), Reactor Core Cooling (RCC), Containment Heat Removal (CHR), Core Residual Heat Removal (CRHR), Prevention of Significant Release of Radioactive Material to the Environment (PRRM), Supporting Systems (SS).

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NOTES TO FIGURE 3.11.1-1 (cont'd)

11.	REG 1.97	An asterisk (*) is inserted whenever the component is a Category 1 or 2 post-accident monitoring instrument in accordance with Regulatory Guide 1.97.
12.	CES NO.	The unique identification number identifying the Component Evaluation Sheet which summarizes the required environmental conditions and provides other qualification summary information for the given component.
13.	REV. #	The revision number applicable to a Component Evaluation Sheet.

16

A/E: EBASCO SERVICES INC. | FACILITY: SHEARON HARRIS NPP | NSSS: WESTINGHOUSE - PWR | REV#-
UTILITY: CAROLINA POWER & LIGHT | COMPONENT EVALUATION SHEET | CAPACITY:900 MWE) | CESO-

EQUIPMENT DESCRIPTION	ENVIRONMENT PARAMETER	ACTUAL -1-	REQ. QUALIF. -2-	DOCUMENTATION ACTUAL -3-	REQ. QUALIF. -4-	QUALIF. METHOD -5-	O/M -6-	OUIS ITEMS -7-	
TAG NO : SAMPLE EQUIPMENT: PRIMARY ELEMENT TYPE	OPERABIL-ITY NORM/TEST DBA								
COMPONENT: MANUFACTURER:	TEMPERAT-URE								REPLACEMENT: MAINTAIN.:
MAJOR : SUPPLIER	PRESSURE								SUBCOMPONENTS:
MODEL AND: SERIAL # FUNCT.DES: & SERVICE	RELATIVE HUMIDITY								NO UNIQUE TAGGED SUBCOMPONENTS ARE ENVELOPED BY THIS EQUIPMENT
ACCUR. SPEC:	CHEMICAL SPRAY								
ACCUR. DEP.:	R GAMMA A BETA D N SHIELD S T.I.D.								
SPECIFICATIONS: P.O #: PLANT LOC.:	AGE- INST LIFE (PER 323- 1974 DEF.)								SAFETY FUNCTION:
COORDINATES X- Y- Z-	SUBMERGED LEVEL								

INSTALLED (Y/N):
INSTAL. REF:
QUALIF EXEMPT#:

PARA-METER	SUPPL. REVIEW
OPERABILITY	O
TEMPERATURE	T
PRESSURE	P
REL. HUMDTY	H
CHEM. SPRAY	C
RADIATION	R
AGING	A
SUBMERGENCE	S

*QUALIF:
*STATUS
*
*

EQ. PCK # :

0588 CATEG.:
APPENDIX E

FOR PUNCHLIST ITEMS SEE SH EQ PACKAGE:

REFERENCES:

QUALIFICATION SIGN-OFF FOUND IN DOCUMENTATION PACKAGE:

CESO-

REVISION # :
DATE :

SYSTEM :

TAG :SAMPLE

SAMPLE

AMENDMENT NO. 15

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

COMPONENT EVALUATION SHEET

FIGURE 3.11.1-2

NOTES TO FIGURE 3.11.1-2
EXPLANATION AND LEGEND FOR COMPONENT EVALUATION SHEETS

1. Terms found below "Equipment Description" designation are explained as follows:

TAG NO.	Specific device alpha-numeric designation which identifies plant equipment.
EQUIPMENT TYPE	Designation of equipment into categories (e.g., sensors, motors) which correspond to NUREG-0588 Appendix E, Section 1.d categories.
COMPONENT	A brief title or description of the item being qualified (Note: components are the smallest breakdown of equipment types or categories for qualification purposes).
MANUFACTURER	Specific vendor who manufactured the component, but not necessarily the supplier of the component. For example, limitorque manufactures valve operators for a valve vendor who in turn supplies the entire valve-operator assembly to the utility.
MAJOR SUPPLIER	The vendor supplying the equipment of the utility if other than the manufacturer of the equipment.
MODEL AND SERIAL NO.	Specific vendor designation for a family or group of like components. 16
FUNCTIONAL DESCRIPTION & SERVICE	This is a description of the service which the component performs.
ACCUR SPEC	This is either the requirement for accuracy used in Station Safety Analysis or the standard manufacturer's limits used in generic testing or instruments, whichever requires greater accuracy.
ACCUR DEMON	This is a value which is equal to or better than the accur. spec entry. Value is for the long-term stable operation of instruments.
SPECIFICATIONS	This entry is the equipment specification the equipment is designed to meet.
PURCHASE ORDER NO.	This is the purchase order used during equipment procurement.
PLANT LOCATION	The general plant area location where the component is located.

NOTES TO FIGURE 3.11.1-2 (cont'd)

16

COORDINATES "X", "Y", "Z"	The coordinates locate the equipment within the "Plant Location" and more importantly within the environmental parameter zones.
INSTALLED YES/NO	An indication of installation status to minimize an attempt to audit an installation when equipment is not installed.
INSTAL. REF.	The source of data for installation status.
QUALIFICATION EXEMPTION	Entry (rarely made) to indicate equipment need not be qualified by use of CES. For example, a mechanical only device may be on the Master List and is not to be qualified. If this is so, entry of notes in the reference section of CES is expected.
QUALIFICATION STATUS	An indication of the environmental qualification status of the equipment.

a. Qualified - Without Exception - This category is based upon the existing qualification documentation demonstrating that the equipment will be capable of performing its intended safety function at any time during its qualified life, plus post-accident duration as required. Total compliance with the requirements has been fully documented.

b. Qualified - Awaiting Confirmatory Data - This category is used when most of the qualification report review and analysis, to demonstrate qualification, has been completed; but some open items, which are identified, must be resolved. In all cases, there is a high degree of confidence that the open items will be resolved satisfactorily, thus enabling this status to be upgraded to Qualified - Without Exception.

c. Qualified - For Interim Operation - This category is used primarily when qualification testing has not been completed, but there is a high degree of confidence that the equipment can be qualified, thus permitting interim operation. In addition, the criteria in Enclosure 1 of Policy Issue SECY-82-51 issued 2/4/82 for justification for interim operation is used and documented.

NOTES TO FIGURE 3.11.1-2 (cont'd)

d. Relocate Equipment - This category is selected when the equipment is not demonstrated to be qualified for its initial installation location. This equipment must be relocated to a new location where qualification can be demonstrated for the new conditions. (See e, f, g, h, below.)

e. Shield Equipment - This category is used when equipment is not demonstrated to be qualified for its installed location and simple shielding (e.g., from beta radiation) can assure adequacy of qualification.

f. Retest Equipment - This category is used when equipment is undergoing retesting to demonstrate qualification as required.

g. Replace Equipment - This category is used when qualification cannot be demonstrated and it is prudent to replace the equipment with a suitable, qualified replacement.

h. Qualified - Awaiting Minor Analysis. (See b above.)

i. Demon. NUREG-0588C - This category is used for equipment in the scope of the definition of Category "C" as stated in NUREG 0588, Appendix E. 16

j. Requires Major Analysis - This category is used when there are significant concerns related to the qualification status of the equipment and a major effort is required to qualify the equipment.

2. Terms found below Environment Parameter Actual (Column 1) are described below:

OPERABILITY Norm/Test DBA	Requirements for operation which may be in time (hours, days, months, years), cycles, or both.
TEMPERATURE	Normal and DBA temperature conditions at the equipment location.
PRESSURE	Normal (generally atmospheric) and DBA press.re conditions at the equipment location.

NOTES TO FIGURE 3.11.1-2 (cont'd)

RELATIVE HUMIDITY	Ambient normal and DBA relative humidity conditions at the equipment location.
CHEMICALSPRAY	Values for the chemical composition of the chemical spray (containment spray) utilized in a post-DBA event in containment.
R GAMMA A BETA D B SHIELD S T.I.D.	GAMMA is the sum total of the 40 year normal plus applicable (1 yr, 1 mo, 1 day) DBA gamma dose. Beta is the applicable (1 yr, 1 mo, 1 day) DBA Beta Dose. B. Shield is the credit (10-100%) permitted, to reduce the Beta dose, due to enclosures, material coverings, and thicknesses. TID (Total Integrated Dose) is the sum total of GAMMA plus Beta (after sheilding) applicable to the equipment.
AGE-INST LIFE (per 323 1974 DEF)	The goal or requirement for equipment life, usually 40 years.
SUBMERGED LEVEL	Maximum plant elevation (Ft.) reached during flood conditions. Generally, equipment should be located above this level.

3. Data below Environment Parameter DEM. QUALIF. (column 2) are the actual values the equipment is qualified to which corresponds on a "one-to-one" basis with the actual parameter (column 1).

16 4. Data below Documentation Actual (column 3) is the reference source (generally FSAR, Environmental Zone Maps, etc.) which identifies the requirements in column 1.

5. Data below Documentation DEM. QUALIF (column 4) is the reference source (environmental qualification test reports, engineering analysis, etc.) which substantiates the information in column 2.

6. Data below Qualification Method (column 5) is the actual methodology used to demonstrate qualification. The most likely entry is "Combined Test and Supplementary Review" to indicate that the qualification method is a type test supplemented by analysis/review.

7. Data entered below the H/M (column 6) is the indication if a zone's environmental parameter values are harsh or mild.

8. Data entry below Outstanding Items (column 7) would be for significant items of concern which do not allow an item to be classified as qualified. Minor items just requiring confirmation will not be considered outstanding items.

NOTES TO FIGURE 3.11.1-2 (cont'd)

9. Data below the rightmost columns is as follows:

REPLACEMENT	Special requirements to replace items not normally replaced during normal maintenance as a condition of qualification, if the equipment or component therein is not qualified to 40 years.
MAINTENANCE	As for replacement, only conditions related to qualification are entered.
SUBCOMPONENTS	This is an entry that may be used by the utility to help locate components enveloped within a larger qualification package. For example, relays may be included here.
SAFETY FUNCTION	Major plant safety functions indicative of the safety function performed by the system in which the equipment is a part of. Examples of safety functions are: Containment Isolation (CI), Emergency Reactor Shutdown (ERS), Reactor Core Cooling (RCC), Containment Heat Removal (CHR), Core Residual Heat Removal (CRHR), Prevention of Significant Release of Radioactive Material to the Environment to the Environment (PRRM), Supporting Systems (SS).

10. Data Entered in the Parameter - Suppl. Review Box (lower mid-left side) 16

PARAMETER	A list of all parameters (operability through submergence) being reviewed.
SUPPL. REVIEW	Identifies the Supplementary Review sheets, included in the documentation packages, for each parameter (operability, temperature, pressure, relative humidity, chemical spray, radiation, aging, submergence) which justifies qualification to each parameter.
NUREG-0588 APPENDIX E CATEGORY	A single entry is made herein of the applicable NUREG-0588, Appendix E category listed in paragraph 2. The categories are "A", "B", "C", or "D".

11. Data entered in the lower middle box is as follows:

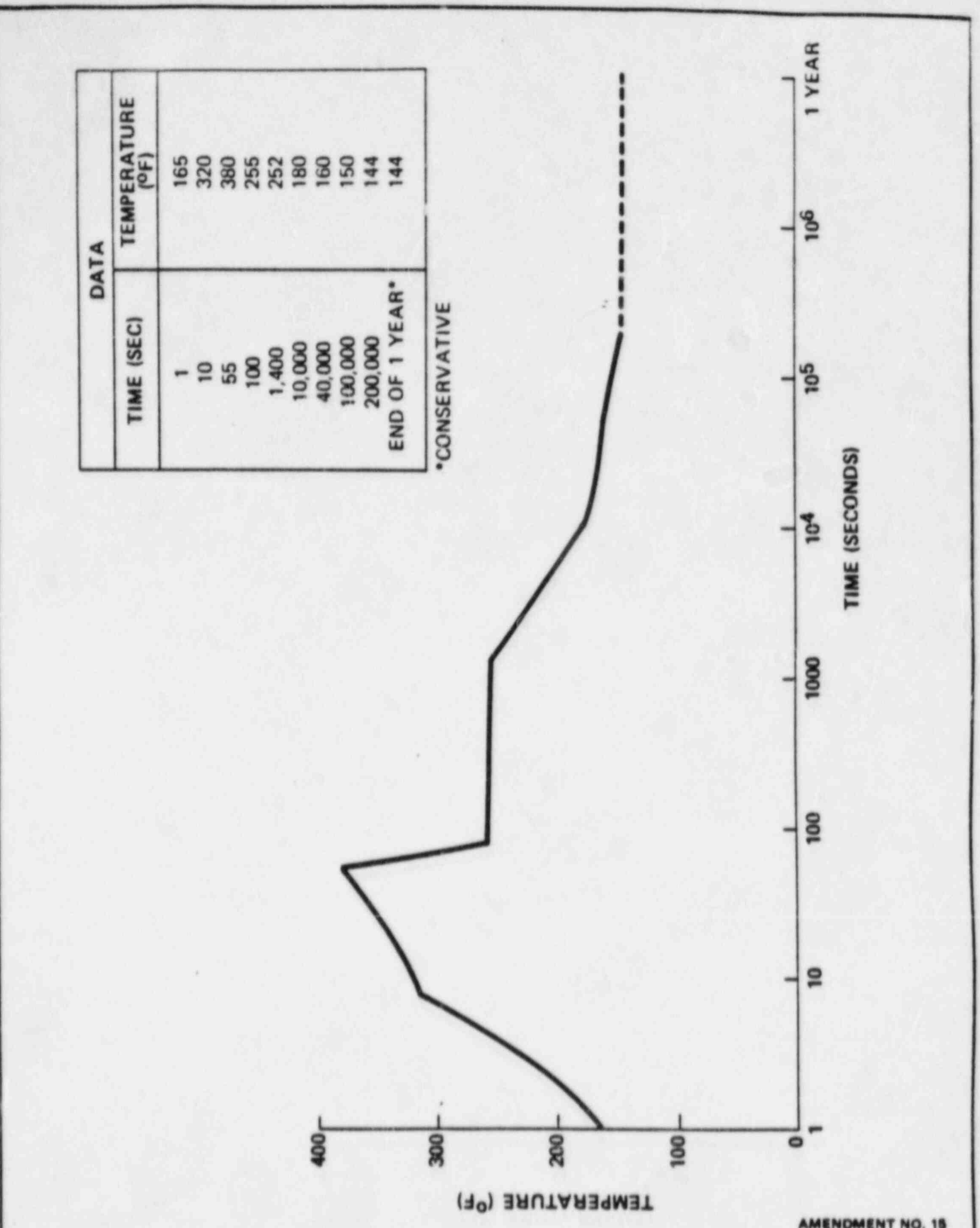
FOR PUNCHLIST ITEMS	References the documentation package number (usually same) where Punchlist (EQ outstanding) items may be found.
REFERENCES	References Qualification Information sources applicable to the equipment being qualified.

NOTES TO FIGURE 3.11.1-2 (cont'd)

12. Data entered in the lower right hand box is as follows:

QUALIFICATION SIGN OFF	References the documentation package number (usually the same) where the names and signatures of individuals preparing/checking the documentation package may be found.
CES #	The unique four-digit number which identifies the individual Component Evaluation Sheets.
REVISION #	The revision number applicable to a component Evaluation Sheet.
DATE	The date the applicable revision to the Component Evaluation Sheet was made.

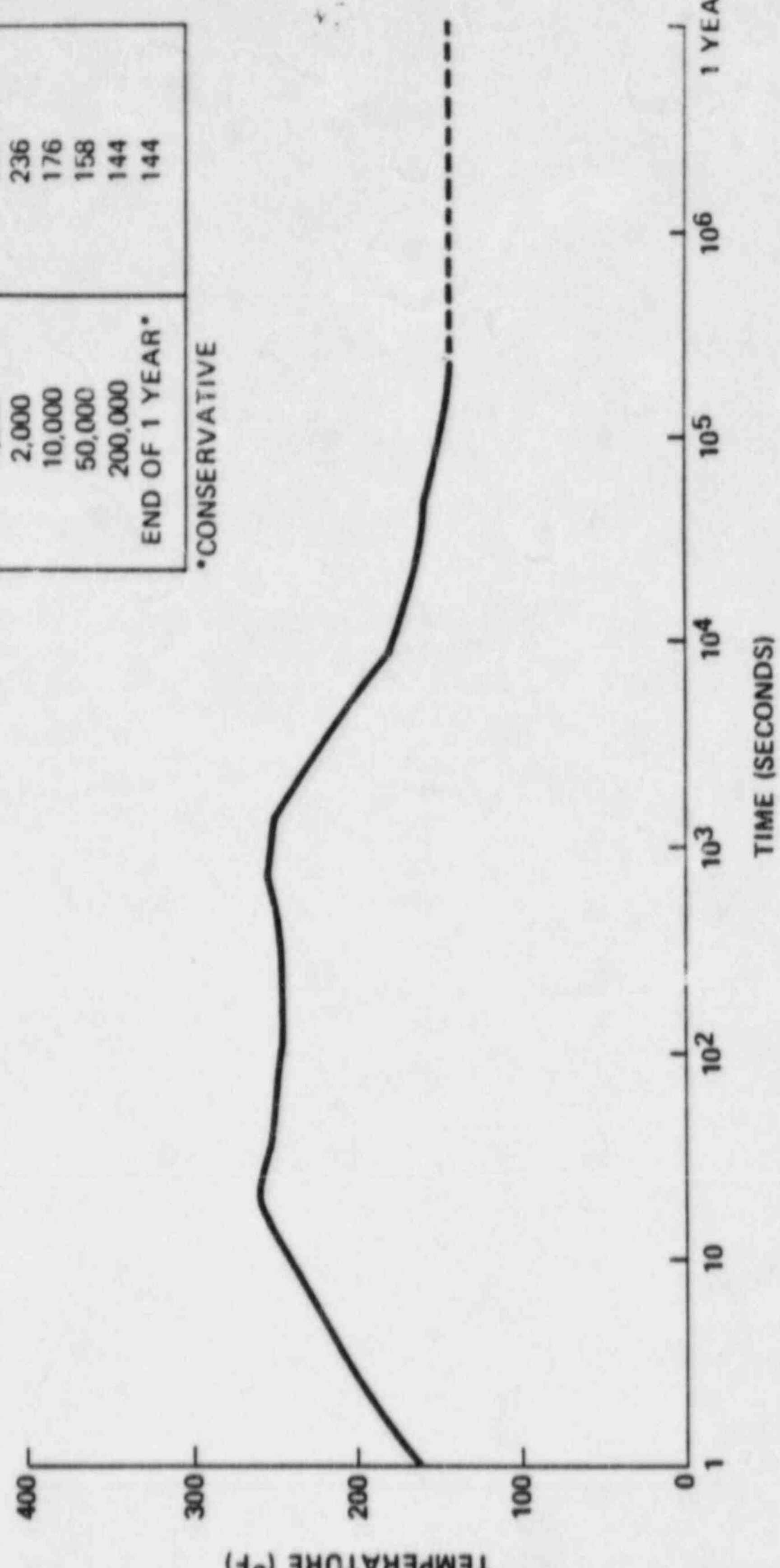
16



DATA	
TIME (SEC)	TEMPERATURE (°F)
1	165
10	320
55	380
100	255
1,400	252
10,000	180
40,000	160
100,000	150
200,000	144
END OF 1 YEAR*	144

*CONSERVATIVE

SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	DBA TEMPERATURE PROFILE INSIDE CONTAINMENT (COMBINED LOCA/MSLB) FOR ENVIRONMENTAL QUALIFICATION	FIGURE 3.11.4-1



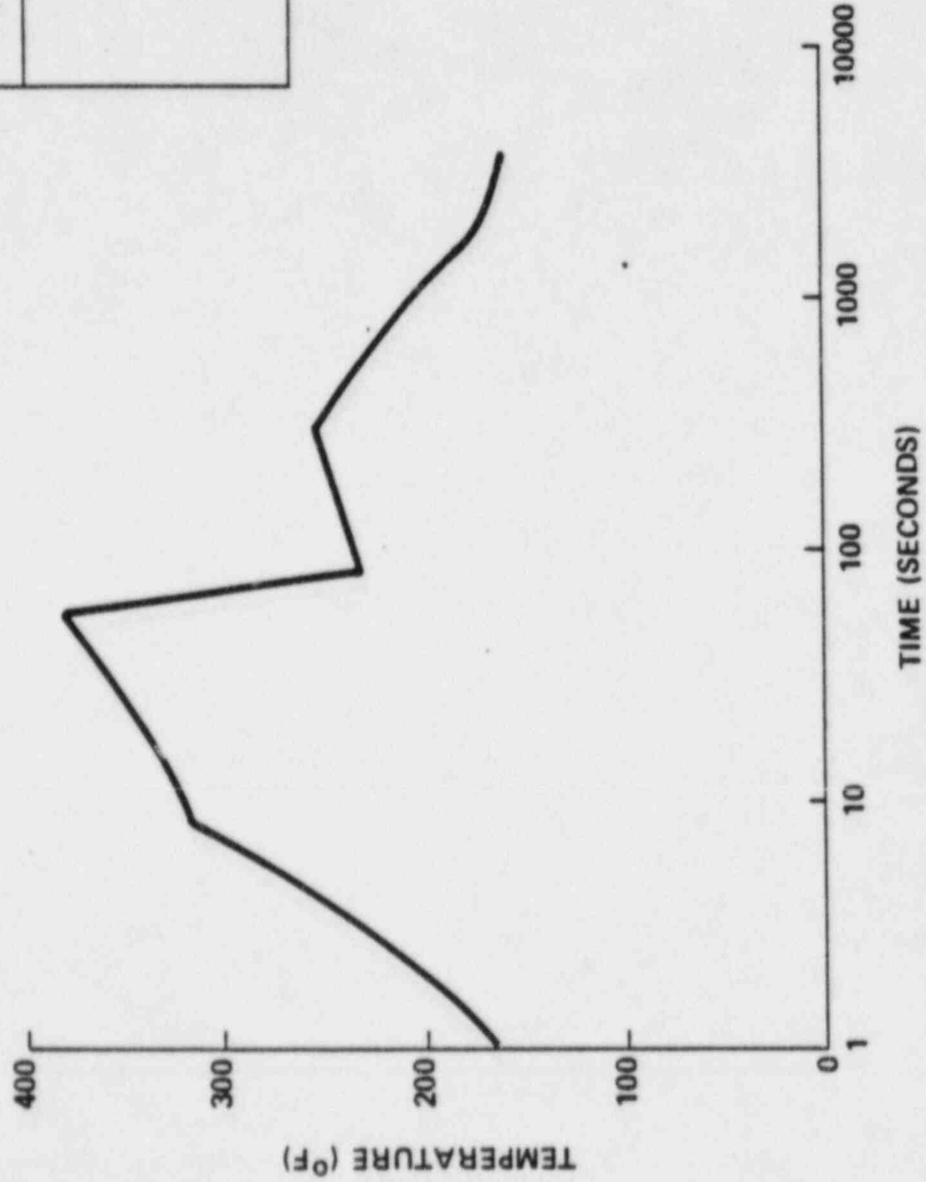
DATA	
TIME (SEC)	TEMPERATURE (°F)
1	162
10	242
20	260
100	247
750	252
1,000	250
2,000	236
10,000	176
50,000	158
200,000	144
END OF 1 YEAR*	144

*CONSERVATIVE

AMENDMENT NO. 15

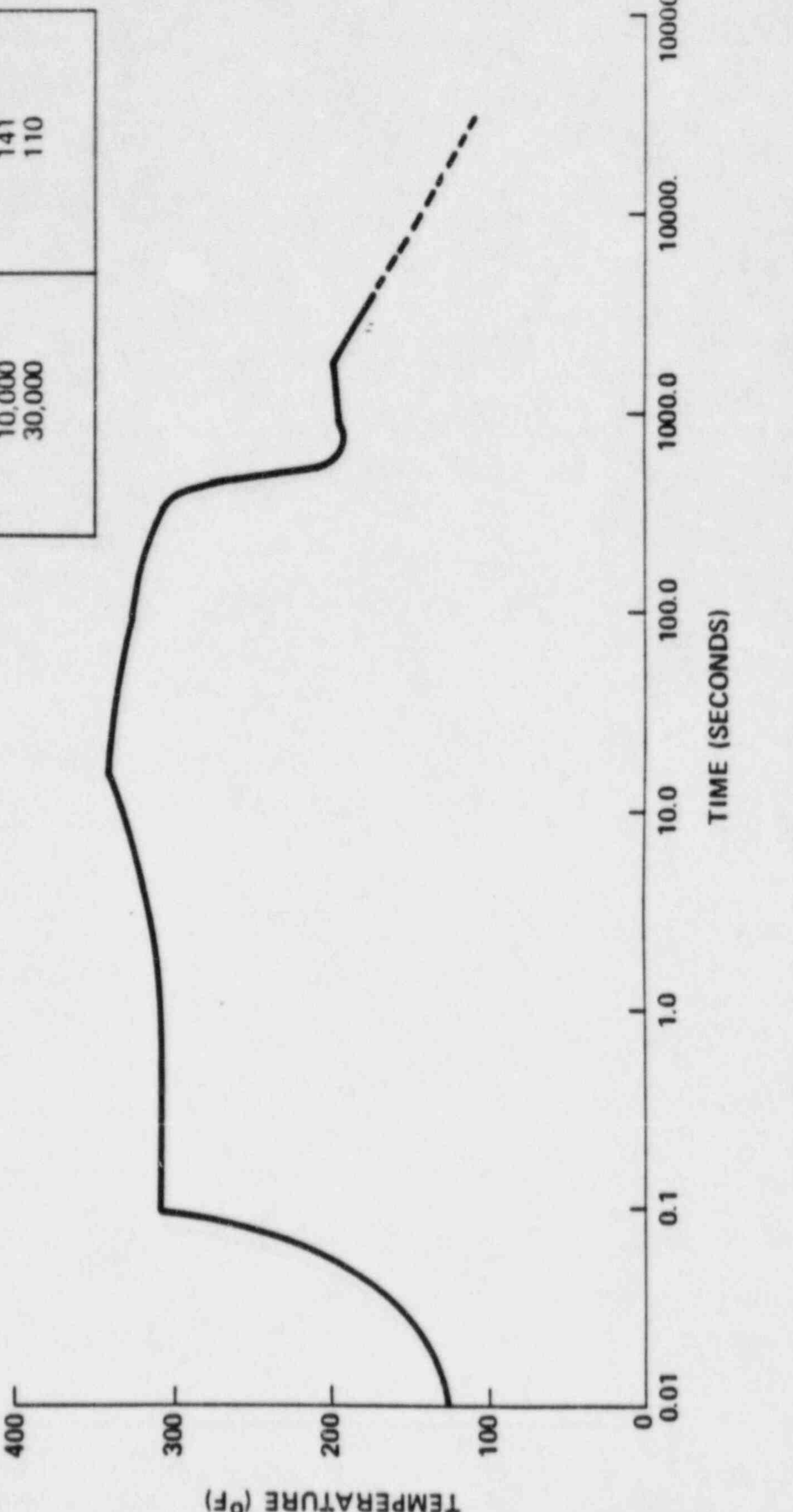
SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	DBA TEMPERATURE PROFILE INSIDE CONTAINMENT (LOCA) FOR ENVIRONMENTAL QUALIFICATION	FIGURE 3.11.4-2

DATA	
TIME (SEC)	TEMPERATURE (^oF)
1	165
10	320
55	380
80	230
300	252
1000	205
2000	170
3600	160



AMENDMENT NO. 15

SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	DBA TEMPERATURE PROFILE INSIDE CONTAINMENT (MSLB) FOR ENVIRONMENTAL QUALIFICATION	FIGURE 3.11.4-3



DATA	
TIME (SEC)	TEMPERATURE (°F)
0.01	125
0.1	309
1	307
10	332
20	340
100	325
300	310
1,000	192
3,000	180
10,000	141
30,000	110

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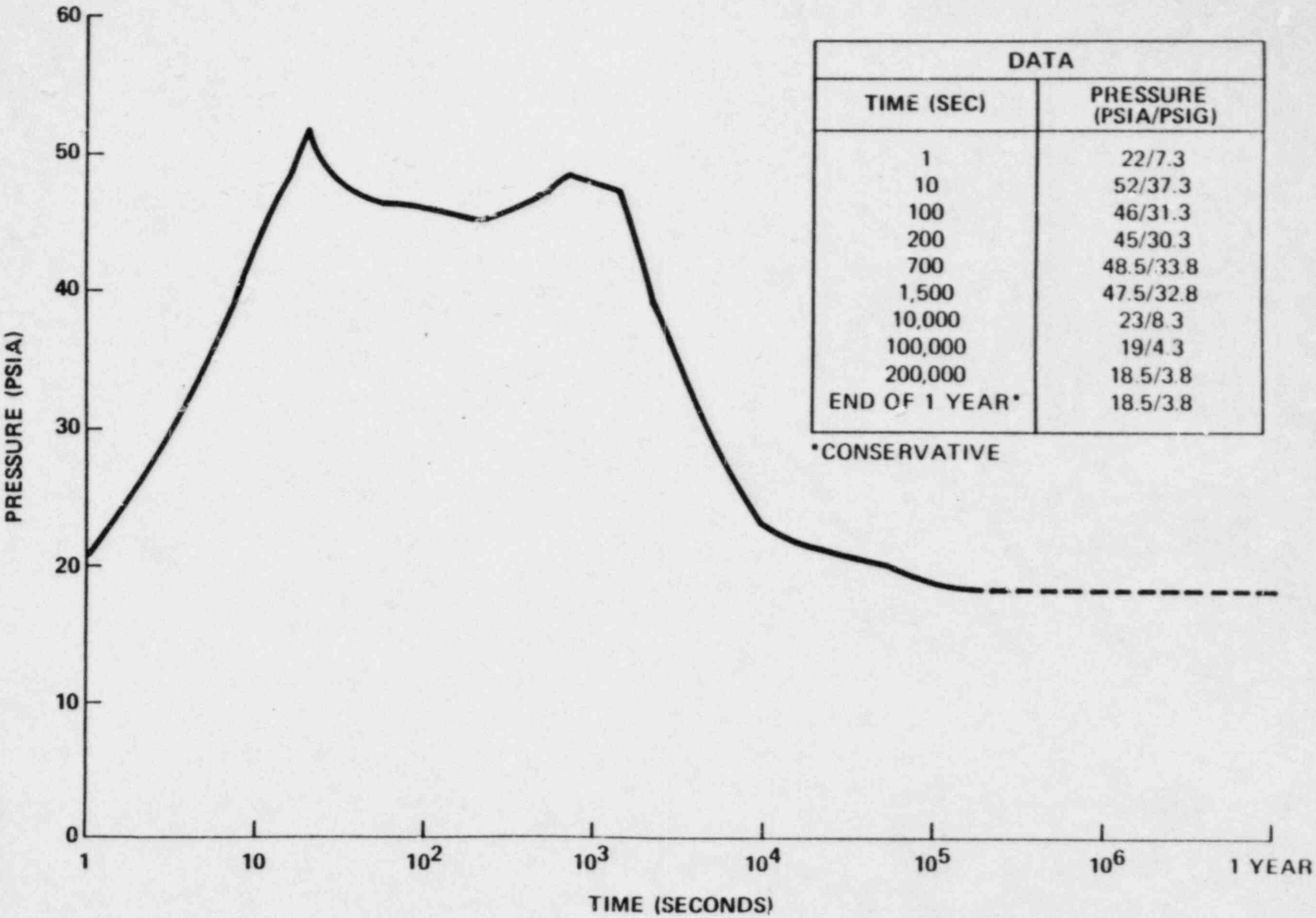
SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	DBA TEMPERATURE PROFILE INSIDE MAIN STEAM TUNNEL (MSLB) FOR ENVIRONMENTAL QUALIFICATION	FIGURE 3.11.4-4



DATA	
TIME (SEC)	PRESSURE (PSIA/PSIG)
1	22/7.3
10	52/37.3
100	46/31.3
200	45/30.3
700	48.5/33.8
1,500	47.5/32.8
10,000	23/8.3
100,000	19/4.3
200,000	18.5/3.8
END OF 1 YEAR*	18.5/3.8

*CONSERVATIVE

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

PRESSURE PROFILE INSIDE CONTAINMENT (LOCA/MSLB) FOR ENVIRONMENTAL QUALIFICATION

FIGURE 3.11.6-1

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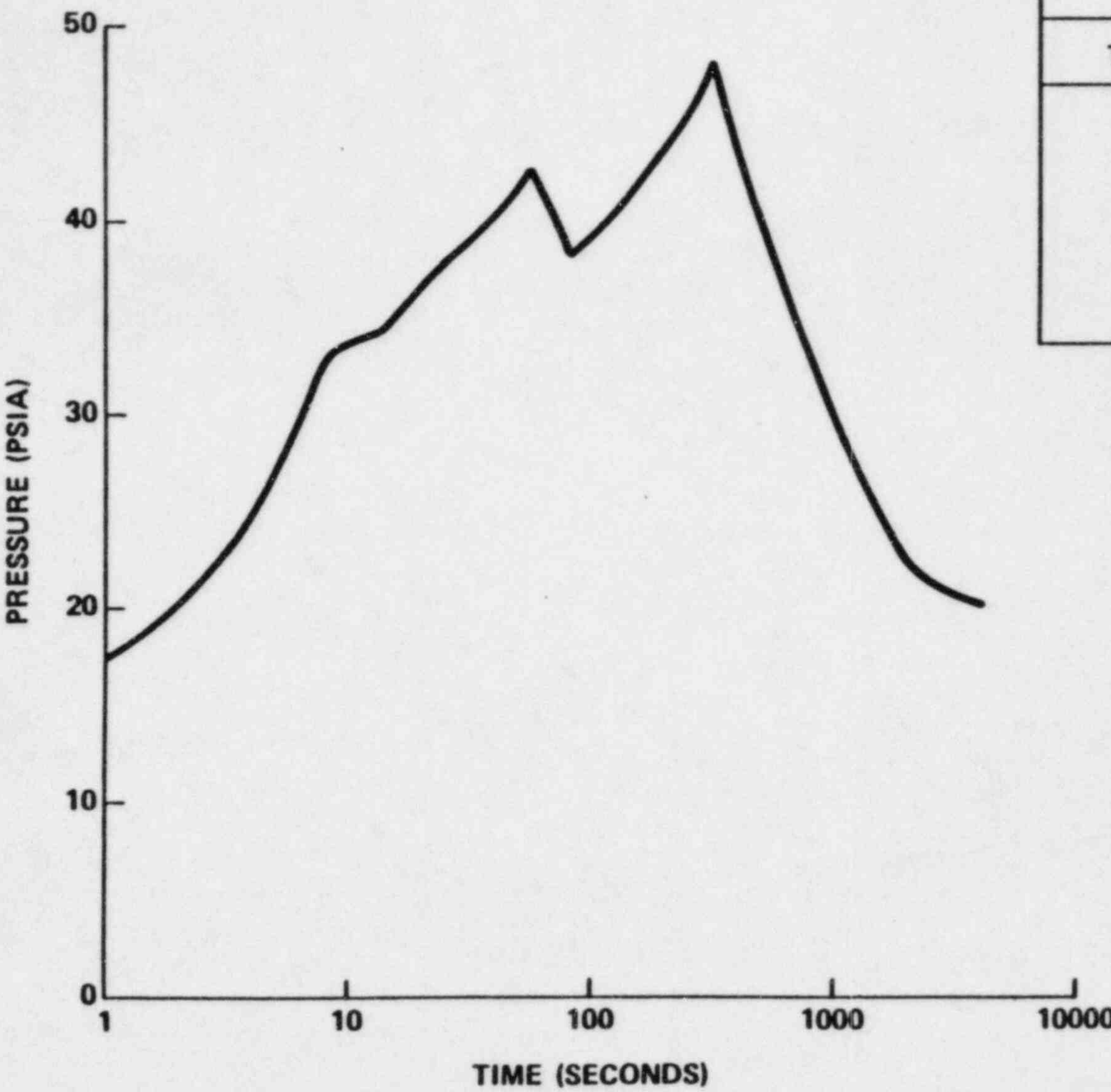

DATA	
TIME (SEC)	PRESSURE (PSIA/PSIG)
1	17.5/2.8
10	33.7/19.0
55	42.5/27.8
80	38/23.3
300	48/33.3
2000	22/7.3
4000	20/5.3

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PRESSURE PROFILE INSIDE CONTAINMENT (MSLB) FOR ENVIRONMENTAL QUALIFICATION

FIGURE 3.11.6-2

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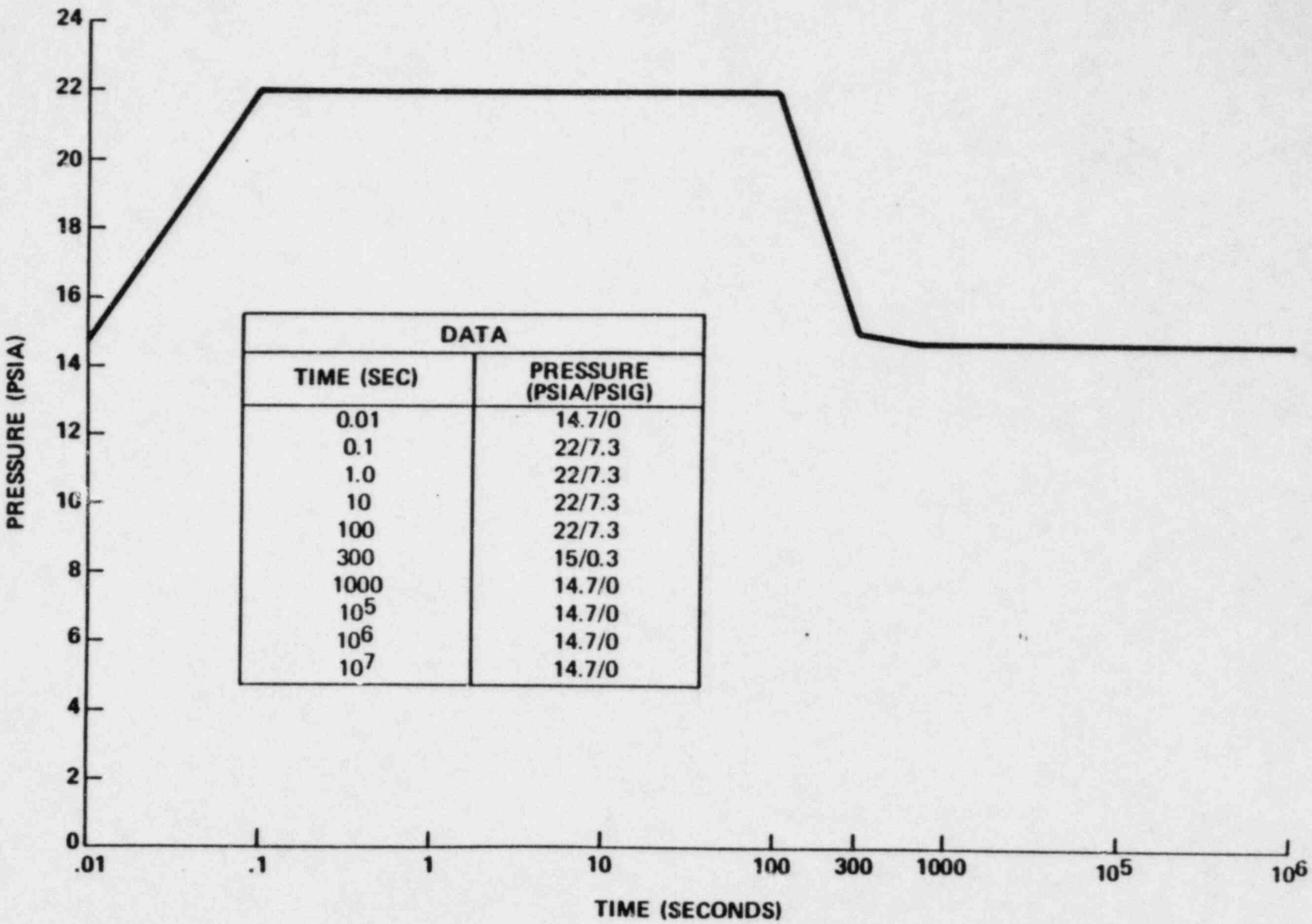

DATA	
TIME (SEC)	PRESSURE (PSIA/PSIG)
0.01	14.7/0
0.1	22/7.3
1.0	22/7.3
10	22/7.3
100	22/7.3
300	15/0.3
1000	14.7/0
10^5	14.7/0
10^6	14.7/0
10^7	14.7/0

PRESSURE PROFILE INSIDE MAIN STEAM TUNNEL (MSLB) FOR ENVIRONMENTAL QUALIFICATION

FIGURE 3.11.6-3

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CATEGORY II Applicable to Equipment Qualified in Accordance with IEEE Std. 323-1971	Shearon Harris Nuclear Power Plant Program
1. ESTABLISHMENT OF THE QUALIFICATION PARAMETERS FOR DESIGN BASIS EVENTS	
1.1 Temperature and Pressure Conditions Inside Containment - Loss-of-Coolant Accident (LOCA	
(1) The time-dependent temperature and pressure, established for the design of the containment structure and found acceptable by the staff, may be used for environmental qualification of equipment.	1.1 (1) Time dependent temperature and pressure LOCA profiles are used. Refer to figures in FSAR Sections 3.11.4 and 3.11.6 and Appendix 3.11B.
(2) Acceptable methods for calculating and establishing the containment pressure and temperature envelopes to which equipment should be qualified are summarized below. Acceptable methods for calculating mass and energy release rates are summarized in Appendix A.	(2) Mass and energy release rates are consistent with those summarized in NUREG-0588 Appendix A. Refer to FSAR Section 6.2.1.3 for details. 16
Pressurized Water Reactors (PWRs)	
Dry Containment - Calculate LOCA containment environment using CONTEMPT-LT or equivalent industry codes. Additional guidance is provided in Standard Review Plan (SRP) Section 6.2.1.1.A, NUREG-75/087. The assumption of partial revaporization will be allowed. Other assumptions that reduce the temperature response of the containment will be evaluated on a case-by-case basis.	CONTEMPT-LT26 is used in calculating the post-LOCA containment environment. Refer to FSAR Section 6.2.1.1.3.2
Ice Condenser Containment - Calculate LOCA containment environment using LOTIC or equivalent industry codes. Additional guidance is provided in SRP Section 6.2.1.1.B, NUREG-75/087.	SHNPP does not have an ice condenser containment; therefore, this is not applicable.

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Boiling Water Reactors (BWRs)	
Mark I, II, and III Containment - Calculate LOCA environment using methods of GESSAR Appendix 3B or equivalent industry codes. Additional guidance is provided in SRP Section 6.2.1.1.C, NUREG-75/087.	SHNPP is a PWR; therefore, this is not applicable.
(3) In lieu of using the plant-specific containment temperature and pressure design profiles for BWR and ice condenser types of plants, the generic envelope shown in Appendix C may be used for qualification testing.	(3) SHNPP is a dry containment PWR; therefore, this is not applicable.
16 (4) The test profiles included in Appendix A to IEEE Std. 323-1974 should not be considered an acceptable alternative in lieu of using plant-specific containment temperature and pressure design profiles unless plant-specific analysis is provided to verify the adequacy of those profiles.	(4) Plant-specific containment temperature and pressure profiles are used. Refer to figures in FSAR Sections 3.11.4 and 3.11.6 and Appendix 3.11B.
1.2 Temperature and Pressure Conditions Inside Containment - Main Steam Line Break (MSLB)	
(1) Where qualification has not been completed, the environmental parameters used for equipment qualification should be calculated using a plant-specific model based on the staff-approved assumptions discussed in Item 1 of Appendix B.	1.2 (1) A plant-specific analysis consistent with the requirements of NUREG-0588, utilizing CONTEMPT-LT as described in FSAR Section 6.2.1.3.3, has been used to determine the temperature and pressure conditions inside containment for a MSLB.
(2) Other models that are acceptable for calculating containment parameters are listed in Section 1.1(2).	(2) See 1.2 (1) above.

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(3) In lieu of using the plant-specific containment temperature and pressure design profiles for BWR and ice condenser plants, the generic envelope shown in Appendix C may be used.	(3) SHNPP is a dry containment PWR; therefore, this is not applicable. See 1.1 (1) above.
(4) The test profiles included in Appendix A to IEEE Std. 323-1974 should not be considered an acceptable alternative in lieu of using plant-specific containment temperature and pressure design profiles unless plant-specific analysis is provided to verify the adequacy of those profiles.	(4) Plant-specific containment temperature and pressure design profiles are used. Refer to 1.1 (1) above.
(5) Where qualification has been completed but only LOCA conditions were considered, then it must be demonstrated that the LOCA qualification conditions exceed or are equivalent to the maximum calculated MSLB conditions. The following technique is acceptable: (a) Calculate the peak temperature from an MSLB using a model based on the staff's approved assumptions discussed in item 1 of Appendix B. (b) Show that the peak surface temperature of the component to be qualified does not exceed the LOCA qualification temperature by the method discussed in item 2 of Appendix B. (c) If the calculated surface temperature exceeds the qualification temperature, the staff requires that (1) additional justification be provided to demonstrate that the equipment	(5) In general, combined MSLB/LOCA profiles are utilized for time-dependent temperatures and pressures (Refer to FSAR Figures 3.11.4-1 and 3.11.6-1, respectively) regardless of less stringent qualification requirements; however, in those cases where the test condition profile does not envelope the applicable Shearon Harris profile, the following technique is used: 16 - Additional justification (e.g., component thermal lag analysis) is provided to demonstrate that the equipment can maintain its required functional operability or - requalification testing is performed with appropriate margins, or - qualified physical protection may be provided to assure that the equipment experiences only the conditions for which it is qualified.

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can maintain its required functional operability if its surface temperature reaches the calculated value or (ii) requalification testing be performed with appropriate margins, or (iii) qualified physical protection be provided to assure that the surface temperature will not exceed the actual qualification temperature.	
1.3 Effects of Chemical Spray The effects of caustic spray should be addressed for the equipment qualification. The concentration of caustics used for qualification should be equivalent to or more severe than those used in the plant containment spray system. If the chemical composition of the caustic spray can be affected by equipment malfunctions, the most severe caustic spray environment that results from a single failure in the spray system should be assumed. See SRP Section 6.5.2 (NUREG-75/087), paragraph II, item (e) for caustic spray solution guidelines	1.3 The most severe containment spray environment (boron concentration and pH level) is used for environmental qualification. The actual (calculated) spray environment bounds any postulated single failure.
1.4 Radiation Conditions Inside and Outside Containment The radiation environment for qualification of equipment should be based on the normally expected radiation environment over the equipment qualified life, plus that associated with the most severe design basis accident (DBA) during or following which that equipment must remain functional. It should be assumed that the DBA related environmental conditions occur at the end of the equipment qualified life.	1.4 For qualification purposes, reductions in air dose due to spray washout and plateout are not used in calculating the post-accident radiation environments. Therefore, radiation doses used in qualification are maximum total integrated dose calculated over the equipment qualified life, plus that associated with the most severe design basis accident.

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The sample calculations in Appendix D and the following positions provide an acceptable approach for establishing radiation limits for qualification. Additional radiation margins identified in Section 6.3.1.5 of IEEE Std. 323-1974 for qualification type testing are not required if these methods are used.	
(1) The source term to be used in determining the radiation environment associated with the design basis LOCA should be taken as an instantaneous release from the fuel to the atmosphere of 100 percent of the noble gases, 50 percent of the iodines, and 1 percent of the remaining fission products. For all other non-LOCA design basis accident conditions, a source term involving an instantaneous release from the fuel to the atmosphere of 10 percent of the noble gases (except Kr-85 for which a release of 30 percent should be assumed) and 10 percent of the iodines is acceptable.	(1) The source term used in all cases in determining the radiation environment is that 100 percent of the noble gases, 50 percent of the iodines, and 1 percent of the remaining fission products are released instantaneously from the fuel to the containment atmosphere. 16
(2) The calculation of the radiation environment associated with design basis accidents should take into account the time-dependent transport of released fission products within various regions of containment and auxiliary structures.	(2) Time-dependent transport of released fission products within various regions of containment and auxiliary structures is assumed in the calculation of the radiation environment associated with design basis accidents.
(3) The initial distribution of activity within the containment should be based on a mechanistically rational assumption. Hence, for compartmented containments, such as in a BWR, a large portion of the source should be assumed to be initially contained in	(3) The initial distribution of activity within the containment is based on a mechanistically rational assumption as described in FSAR Section 12.2. Since the internal structures of the containment were designed to provide vertical compartments around each of

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the drywell. The assumption of uniform distribution of activity throughout the containment at time zero is not appropriate.	the steam generators and the reactor vessel and since the Containment Spray and/or the containment ventilation and filtration systems provide mixing for the containment atmosphere, a determination was made to assume a uniform distribution of activity throughout the containment.
(4) Effects of ESF systems, such as containment sprays and containment ventilation and filtration systems, which act to remove airborne activity and redistribute activity within containment, should be calculated using the same assumptions used in the calculation of offsite dose. See SRP Section 15.6.5 (NUREG-75/087) and the related sections referenced in the Appendices to that section.	(4) Credit for the removal of airborne activity by ESF systems has been taken. In addition, the distribution of activity is taken into account as described in (3) above and by (5) below.
16 (5) Natural deposition (i.e., plate-out) of airborne activity should be determined using a mechanistic model and best estimates for the model parameters. The assumption of 50 percent instantaneous plate-out of the iodine released from the core should not be made. Removal of iodine from surfaces by steam condensate flow of washoff by the containment spray may be assumed if such effects can be justified and quantified by analysis or experiment.	(5) The SHNPP model assumes zero removal for plate-out; however, the containment sump source terms are developed by assuming dilution of 50 percent of the core inventory of halogens and 1 percent of other nuclides with the combined volumes of the Reactor Coolant, Accumulators, Boron Injection Surge Tanks and the Refueling Water Storage Tank. The resulting initial sump (diluted coolant) activity is given on FSAR Table 12.2.1-26.
(6) For unshielded equipment located in the containment, the gamma dose and dose rate should be equal to the dose and dose rate at the centerpoint of the containment plus the contribution from location dependent sources such as the sump water and plate-out, unless it can be shown by analyses that location and shielding of the equipment reduces the dose and dose rate.	(6) The gamma dose and dose rate used in qualification for equipment located inside containment is calculated for various zones utilizing distance and shielding credits. Refer to FSAR Appendix 3.11B for applicable doses in various zones.

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(7) For unshielded equipment, the beta doses at the surface of the equipment should be the sum of the airborne and plate-out sources. The airborne beta dose should be taken as the beta dose calculated for a point at the containment center.	(7) For unshielded equipment, the beta dose is calculated at the most conservative location for all appropriate contributors of beta doses including airborne, and suspended sources.
(8) Shielded components need be qualified only to the gamma radiation levels required, provided an analysis or test shows that the sensitive portions of the component or equipment are not exposed to beta radiation or that the effects of beta radiation heating and ionization have no deleterious effects on component performance.	(8) Components are qualified, by exposure to gamma radiation only, to the total (numerical) integrated dose required. The total dose includes gamma and beta radiation and appropriate shielding credits with adequate justification.
(9) Cables arranged in cable trays in the containment should be assumed to be exposed to half the beta radiation dose calculated for a point at the center of the containment plus the gamma ray dose calculated in accordance with Section 1.4(6). This reduction in beta dose is allowed because of the localized shielding by other cables plus the cable tray itself.	(9) See 1.4 (8) above. In addition, the beta dose at the equipment may be reduced by equipment covering material (i.e., cable jackets, boxes, etc.) and thickness as permitted by Section 4.1.2 of I&E Bulletin 79-01B. In these cases, justification is provided. 16
(10) Paints and coatings should be assumed to be exposed to both beta and gamma rays in assessing their resistance to radiation. Plate-out activity should be assumed to remain on the equipment surface unless the effects of the removal mechanisms, such as spray wash-off or steam condensate flow, can be justified and quantified by analysis or experiment.	(10) Paints and coatings are assumed to be exposed to both beta and gamma rays in assessing their resistance to radiation. Plate-out activity is assumed to remain on the equipment.
(11) Components of the emergency core cooling system (ECCS) located outside containment (e.g., pumps, valves, seals and electrical equipment) should be qualified to withstand the radiation	(11) Components of the Residual Heat Removal System and the Containment Spray System located outside containment are qualified to withstand the radiation equivalent to that

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equivalent to that penetrating the containment , plus the exposure from the sump fluid using assumptions consistent with the requirements stated in Appendix K to 10 CFR Part 50.	penetrating the containment plus the exposure from the sump fluid. See 1.4 (5) above.
(12) Equipment that may be exposed to radiation doses below 10^4 rads should not be considered to be exempt from radiation qualification, unless analysis supported by test data is provided to verify that these levels will not degrade the operability of the equipment below acceptable values.	(12) Equipment exposed to radiation doses at any level are not considered to be exempt from radiation qualification, unless analysis supported by test data and/or operating experience is provided to verify that these levels will not degrade the operability of the equipment below acceptable values. Otherwise equipment is qualified to their required doses. See 1.4 (8) and (9) above.
16 (13) The staff will accept a given component to be qualified provided it can be shown that the component has been qualified to integrated beta and gamma doses which are equal to or higher than those levels resulting from an analysis similiar in nature and scope to that included in Appendix D (which uses the source term given in item (1) above), and that the component incorporates appropriate factors pertinent to the plant design and operating characteristics, as given in these general guidelines.	(13) The applicants' environmental qualification program complies with the guidelines previously described in item 1.1 (1) through (12).
(14) When a conservative analysis has not been provided by the applicant for staff review, the staff will use the radiation environment guidelines contained in Appendix D, suitably corrected for the differences in reactor power level, type, containment size, and other appropriate factors.	(14) A conservative analysis has been provided by the applicant in the FSAR sections referenced above.

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1.5 Environmental Conditions for Outside Containment	
(1) Equipment located outside containment that could be subjected to high-energy pipe breaks should be qualified to the conditions resulting from the accident for the duration required. The techniques to calculate the environmental parameters described in Sections 1.1 through 1.4 (Category II) above should be applied.	1.5 (1) Equipment located outside containment is qualified to operate following a high-energy pipe break as described in FSAR Section 3.6 and Appendix 3.6A. Only that equipment necessary to mitigate or monitor the consequences of the postulated HELB accident is qualified to the respective HELB conditions.
(2) Equipment located in general plant areas outside containment where equipment is not subjected to a design basis accident environment should be qualified to the normal and abnormal range of environmental conditions postulated to occur at the equipment location.	(2) Equipment located in general plant areas outside Containment are qualified for the maximum normal and abnormal range of environmental conditions postulated in the equipment area. Refer to the figures in FSAR Appendix 3.11B for applicable environmental parameters in these general plant areas. 16
(3) Equipment not served by Class 1E environmental support systems, or served by Class 1E support systems that may be secured during plant operation or shutdown, should be qualified to the limiting environmental conditions that are postulated for the location, assuming a loss of the environmental support system; or, there may be designs where a loss of the environmental support system may expose some equipment to environments that exceed the qualified limits. For these designs, appropriate monitoring devices should be provided to alert the operator that abnormal conditions exist and to permit an assessment of the conditions that occurred in order to determine if corrective action, such as replacing any affected equipment, is warranted.	(3) Equipment served by Class 1E environmental support systems that may be secured during plant operation or shutdown will be qualified for the limiting Anticipated Operation Occurrence (AOO) environmental conditions assuming loss of the environmental support system, but such conditions are considered to be within the AOO temperature envelope of mild environment.

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2. QUALIFICATION METHODS	
2.1 Selection of Methods	
(1) Qualification methods should conform to the requirements defined in IEEE Std. 323-1971.	2.1 (1) Qualification methods conform to the guidelines of IEEE Std. 323-1971; however, much of the equipment has been upgraded to meet NRC Regulatory Guide 1.89 Revision 0 and its adopted standard IEEE Std. 323-1974 as described in FSAR Section 1.8. Refer to FSAR Tables 3.11.0-1 and 3.11.0-2 for qualified equipment which has been upgraded.
(2) The choice of the methods selected is largely a matter of technical judgment and availability of information that 16 supports the conclusions reached. Experience has shown that qualification of equipment subjected to an accident environment without test data is not adequate to demonstrate functional operability. In general, the staff will not accept analysis in lieu of test data unless (a) testing of the component is impractical due to size limitations, and (b) partial type test data is provided to support the analytical assumptions and conclusions reached.	(2) In general equipment located in a harsh environment is qualified for the time required by type test in an accident test environment. Supplementary review and analysis is necessary to demonstrate that the test environmental conditions exceed or are equivalent to the applicable Shearon Harris conditions. Functional operability is required during qualification testing.
(3) The environmental qualification of equipment exposed to DBA environments should conform to the following positions. The bases should be provided for the time interval required for operability of this equipment. The operability and failure criteria should be specified and the safety margins defined.	(3) The environment qualification of equipment located in a harsh environment conforms to the following:
(a) Equipment that must function in order to mitigate any accident should be qualified by test to	(a) Equipment that must function in order to mitigate or monitor any accident is qualified as stated

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demonstrate its operability for the time required in the environmental conditions resulting from that accident.	in 2.1 (2) above, to demonstrate operability for the time required.
(b) Any equipment (safety-related or non-safety-related) that need not function in order 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.	(b) Non-safety related equipment in this category has been upgraded to Class IE status. Safety-related equipment is qualified as described in 2.1 (2) above.
(c) Equipment that need not function in order to mitigate any accident and whose failure in any mode 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 when justified may be found acceptable. 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.	(c) This equipment is qualified for a mild environment as described in 10CFR50.49. The applicant complies with this requirement with respect to safety-related equipment. (NUREG-0588 is only applicable to safety-related equipment.) 16
(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, or any applicable combination thereof,	(4) When the environment from such an event (e.g., loss of offsite power) is enveloped by the environment from anticipated operational occurrences rather than significant design basis event changes, the area is defined as a mild environment area; therefore,

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coupled with partial type test data may be found acceptable, subject to the applicability and detail of information provided.	the equipment is qualified under mild environmental conditions.
2.2 Qualification by Test	
(1) The failure criteria should be established prior to testing.	2.2 (1) In lieu of failure criteria, the Applicant has insured that the qualifications by test include an acceptance criteria. Completed testing which did not include a specific acceptance criteria are analyzed or verified acceptable for their application.
(2) Test results should demonstrate that the equipment can perform its required function for all service conditions postulated (with margin) during its 16 installed life.	(2) Refer to Section 3 for details on margin.
(3) The items described in Section 5.2 of IEEE Std. 323-1971 supplemented by items (4) through (12) below constitute acceptable guidelines for establishing test procedures.	(3) SHNPP utilizes these guidelines for establishing test procedures. In addition, equipment upgraded to the 1974 standard utilizes the guidelines of Section 6.3 of IEEE Std. 323-1974 as applicable supplemented by items (4) through (12) below.
(4) When establishing the simulated environmental profile for qualifying equipment located inside containment, it is preferred that a single profile be used that envelops the environmental conditions resulting from any design basis event during any mode of plant operation (e.g., a profile that envelops the conditions produced by the main steamline break and loss-of-coolant accidents).	(4) SHNPP utilizes a simulated combined MSLB/LOCA environmental profile for equipment inside containment as shown on FSAR Figures 3.11.4-1 and 3.11.6-1. The preferred method of qualification is to assure that this profile is enveloped by the environmental test profile to which the equipment is qualified.
(5) Equipment should be located above flood level or protected against submergence by locating the equip-	(5) In general, equipment is located above the maximum flood level. Equipment required to be located below the max-

CATEGORY II Applicable to Equipment Qualified in Accordance with IEEE Std. 323-1971	Shearon Harris Nuclear Power Plant Program
ment in qualified watertight enclosures. Where equipment is located in watertight enclosures, qualification by test or analysis should be used to demonstrate the adequacy of such protection. Where equipment could be submerged, it should be identified and demonstrated to be qualified by test for the duration required.	imum flood level is qualified to operate in a submerged condition or justification is provided to demonstrate that the equipment can perform its safety function for the duration required before being submerged and subsequent failure will not affect the accomplishment of safety function.
(6) The temperature to which equipment is qualified, when exposed to the simulated accident evironment, should be defined by thermocouple reading on or as close as practical to the surface of the component being qualified. If there were no thermocouples located near the equipment during the tests, heat transfer analysis should be used to determine the temperature at the component. (Acceptable heat transfer analysis methods are provided in Appendix B.)	(6) The temperature to which equipment is qualified is monitored throughout the test to assure that it was exposed to the bulk temperature equivalent to or more severe than that temperature assumed in the bounding envelope derived from the accident analysis. In some cases, this monitoring is based on using the steam tables and the measured steam pressure to obtain the saturated steam temperature. 16
(7) Performance characteristics of equipment should be verified before, after, and periodically during testing throughout its range of required operability.	(7) Equipment performance characteristics are monitored before, during, and after testing. The degree of equipment monitoring (i.e., periodic or continuous) is based on equipment function, failure modes, and practicality of testing.
(8) Caustic spray should be incorporated during simulated event testing at the maximum pressure and at the temperature conditions that would occur when the onsite spray systems actuate.	(8) During simulated event testing, a caustic spray is used. Spray system actuation is delayed so as to simulate the required conditions as closely as possible.
(9) The operability status of equipment should be monitored continuously during testing. For long-term testing, however, monitoring at discrete intervals should be justified if used.	(9) See 2.2 (7) above.

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(10) Expected extremes in power supply voltage range and frequency should be applied during simulated event environmental testing.	(10) During simulated event environmental test application of voltage/frequency extremes may not be feasible. Post test is the point at which extremes of voltage/frequency are considered. Voltage/frequency tolerance is typically enveloped by industry standards which is the design constraint for the design of the power distribution system as described in FSAR Section 8. Design optimization is verified for voltage, frequency, etc. This ensures the adequacy of equipment and distribution system.
16 (11) Dust environments should be addressed when establishing qualification service conditions.	(11) Equipment susceptability to dust is considered in the plant maintenance procedures or by the use of protective covers.
(12) Cobalt-60 is an acceptable gamma radiation source for environmental qualification.	(12) Cobalt-60 or an equivalent source is used.
2.3 Test Sequence	
(1) Justification of the adequacy of the test sequence selected should be provided.	2.3 (1) Justification for the test sequence is provided. In addition, the test environmental conditions are reviewed to assure that they simulate as close as practicable the postulated environment.
(2) The test should simulate as closely as practicable the postulated environment.	(2) Environmental service conditions expected to occur are enveloped by the test simulation environment and/or by supplementing analysis and review.
(3) The test procedures should conform to the guidelines described in Section 5 of IEEE Std. 323-1971.	(3) See 2.2 (3) above.

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(4) The staff considers that, for vital electrical equipment such as penetrations, connectors, cables, valves and motors, and transmitters located inside containment or exposed to hostile steam environments outside containment, separate effects testing for the most part is not an acceptable qualification method. The testing of such equipment should be conducted in a manner that subjects the same piece of equipment to radiation and the hostile steam environment sequentially.	(4) In general, equipment which must perform a safety function in a harsh environment is qualified by subjecting "sample" equipment to the test conditions. Where this is impractical (e.g., due to size limitations) justification is provided for separate effects testing. Sequential testing is the standard method of test with exceptions documented and justified.
2.4 Other Qualification Methods Qualification by analysis or operating experience implemented, as described in IEEE Std. 323-1971 and other ancillary standards, may be found acceptable. The adequacy of these methods will be evaluated on the basis of the quality and detail of the information submitted in support of the assumptions made and the specific function and location of the equipment. These methods are most suitable for equipment where testing is precluded by physical size of the equipment being qualified. It is required that when these methods are employed some partial type tests on vital components of the equipment be provided in support of these methods.	2.4 In general, supplementary review and analysis is used to evaluate test data to demonstrate qualification. Testing is generally employed to qualify the equipment. 16
3. MARGINS (1) Quantified margins should be applied to the design parmeters discussed in Section 1 to assure that the postulated accident conditions have been enveloped during testing. These	3. (1) The applicant has utilized the NRC staff acceptable approach of demonstrating that the temperature, pressure, and radiation conditions are derived using the NUREG-0588

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margins should be applied in addition to any margins (conservatism) applied during the derivation of the specified plant parameters.	methodolog, which is sufficiently conservative such that margin need account only for inaccuracies in the test equipment. See Resolution of Comment 70 in NUREG-0588, Rev. 1
(2) The margins provided in the design will be evaluated on a case-by-case basis. Factors that should be considered in quantifying margins are (a) the environmental stress levels induced during testing, (b) the duration of the stress, (c) the number of items tested and the number of tests performed in the hostile environment, (d) the performance characteristics of the equipment while subjected to the environmental stresses, and (e) the specified function of the equipment.	(2) See 3 (1) above.
(3) When the qualification envelope in Appendix C is used, the only required margins are those accounting for the inaccuracies in the test equipment. Sufficient conservatism has already been included to account for uncertainties such as production errors and errors associated with defining satisfactory performance (e.g., when only a small number of units are tested).	(3) Appendix C is appliable to BWR and ice condenser containments. SHNPP is a dry containment PWR; therefore, qualification to Appendix C is not applicable.
(4) Some equipment may be required by the design to only perform its safety function within a short time period into the event (i.e., within seconds or minutes), and, once its function is complete, subsequent failures are shown not to be detrimental to plant safety. Other equipment may not be required to perform a safety function but must not fail within a short time period into the	(4) Equipment procured for short-term operation has been reviewed to assure that it is qualified for the time required to operate with additional margin.

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event, and subsequent failures are also shown not to be detrimental to plant safety. Equipment in these categories is required to remain functional in the accident environment for a period of at least one hour in excess of the time assumed in the accident analysis. For all other equipment (e.g., post-accident monitoring, recombiners, etc.), the 10 percent time margin identified in Section 6.3.1.5 of IEEE Std. 323-1974 may be used.	
4. AGING	
(1) Qualification programs that are committed to conform to the requirements of IEEE Std. 382-1972 (for valve operators) and IEEE Std. 334-1971 (for motors) should consider the effects of aging. For this equipment, aging effects, regardless of its location in the plant, should be considered and included in the qualification program.	4. (1) The effects of aging are considered for the qualification programs that are committed to conform to the requirements of IEEE Std. 382-1972 (for valve operators) and IEEE Std. 334-1971 (for motors). 16
(2) For other equipment, the qualification programs should address aging only to the extent that equipment that is composed, in part, of materials susceptible to aging effects should be identified, and a schedule for periodically replacing the equipment and/or materials should be established. During individual case reviews, the staff will require that the effects of aging be accounted for on selected equipment if operating experience or testing indicates that the equipment may exhibit deleterious aging mechanisms.	(2) Aging effects on all Class 1E equipment located in a harsh environment are considered. Specific maintenance/surveillance requirements are referenced in the Equipment Qualification Documentation Package. Where it has been determined that qualified equipment or sub-components must be replaced/maintained, due to aging effects, it will be so noted on the Component Evaluation sheet for the affected equipment. This information will be incorporated into the applicant's maintenance/surveillance program.

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THE FOLLOWING CATEGORY I PORTIONS OF SECTION 4 ARE APPLICABLE FOR THE QUALIFICATION PROGRAMS THAT ARE COMMITTED TO CONFORM TO THE REQUIREMENTS OF IEEE STD. 382-1972 (FOR VALVE OPERATORS) AND IEEE STD. 334-1971 (FOR MOTORS).

4.1 Aging effects on all equipment, regardless of its location in the plant, should be considered and included in the qualification program.	4.1 The effects of aging are considered for all safety related equipment located in a harsh environment.
4.2 The degrading influences discussed in Sections 6.3.3, 6.3.4, and 6.3.5 of IEEE Std. 323-1974 and the electrical and mechanical stresses associated with cyclic operation of equipment should be considered and included as part of the aging programs.	4.2 The degrading influences discussed in Sections 6.3.3, 6.3.4, and 6.3.5 of IEE Std. 323-1974 and the electrical and mechanical stresses associated with cyclic operation of equipment are considered and included as part of the Equipment Qualification Program.
16 4.3 Synergistic effects should be considered in the accelerated aging programs. Investigation should be performed to assure that no known synergistic effects have been identified on materials that are included in the equipment being qualified. Where synergistic effects have been identified, they should be accounted for in the qualification programs. Refer to NUREG/CR-0276 (SAND 78-0799) and NUREG/CR-0401 (SAND 78-1452), "Qualification Testing Evaluation Quarterly Reports," for additional information.	4.3 Synergistic effects are considered and are a part of SHNPP's ongoing Environmental Qualification Program.
4.4 The Arrhenius methodology is considered an acceptable method of addressing accelerated aging. Other aging methods that can be supported by type tests will be evaluated on a case-by-case basis.	4.4 In general, Arrhenius methodology and other aging methods (when used) are supported by type tests and supplementary analysis.

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4.5 Known material phase changes and reactions should be defined to insure that no known changes occur within the extrapolation limits.	4.5 Known material phase changes are evaluated if necessary, during qualification to insure that no known changes occur within the limits of qualification.
4.6 The aging acceleration rate used during qualification testing and the basis upon which the rate was established should be described and justified.	4.6 The aging acceleration rate used during qualification testing and the basis for the rate is described and identified in the Equipment Qualification Documentation Package.
4.7 Periodic surveillance testing under normal service conditions is not considered an acceptable method for ongoing qualification, unless the plant design includes provisions for subjecting the equipment to the limiting service environment conditions (specified in Section 3(7) of IEEE Std. 279-1971) during such testing.	4.7 In general, Class 1E equipment located in a harsh environment is qualified by testing. Periodic surveillance testing is not used as a method of qualification. 16
4.8 Effects of relative humidity need not be considered in the aging of electrical cable insulation.	4.8 SHNPP complies with this recommendation
4.9 The qualified life of the equipment (and/or component as applicable) and the basis for its selection should be defined.	4.9 The qualified life of the equipment and the basis for its selection is included in the specific Equipment Qualification Documentation Package.
4.10 Qualified life should be established on the basis of the severity of the testing performed, the conservatisms employed in the extrapolation of data, the operating history, and in other methods that may be reasonably assumed, coupled with good engineering judgment.	4.10 Qualified life is established as described.

END OF APPLICABLE CATEGORY I PORTIONS OF SECTION 4

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5. QUALIFICATION DOCUMENTATION	
(1) The staff endorses the requirements stated in IEEE Std. 323-1974 that, "The qualification documentation shall verify that each type of electrical equipment is qualified for its application and meets its specified performance requirements. The basis of qualification shall be 16 explained to show the relationship of all facets of proof needed to support adequacy of the complete equipment. Data used to demonstrate the qualification of the equipment shall be pertinent to the application and organized in an auditable form."	5. (1) The main purpose of the qualification documentation is to provide auditable evidence that each type of equipment is qualified for its application and meets its specified performance requirements. Section 3.11 of the SHNPP FSAR provides information on the type of documentation generated as evidence of qualification.
(2) The guidelines for documentation in IEEE Std. 323-1971 when fully implemented are acceptable. The documentation should include sufficient information to address the required information identified in Appendix E. A certificate of conformance by itself is not acceptable unless it is accompanied by test data and information on the qualification program.	(2) Refer to Section 3.11 of the SHNPP FSAR for a description of the documentation generated to demonstrate qualification.