EQDP-ESE-55
Rev. 0, 6/83

EQUIPMENT QUALIFICATION DATA PACKAGE

This document contains information, relative to the qualification of the equipment identified below in accordance with the methodology of WCAP-8587. The Specification Section (Part 1) defines the assumed limits for the equipment qualification and constitute interface requirements to the user.

Auxiliary Safeguards Cabinet (ASC)

APPROVED: _____
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PART 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFCATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 120 VAC ± 10 percent Single Phase, 105 - 140 VDC

1.1.2 Frequency: 60 or 50 Hz ± 5 percent

1.1.3 Load: Steady state - 4.2 amp; In Rush - 30 amp

1.1.4 Electromagnetic Interference: None

1.2 Installation Requirements: Westinghouse Drawing 7244096 Revision 2.

1.3 Auxiliary Devices: None

1.4 Preventative Maintenance Schedule: No maintenance is required to support the qualified life defined in Section 1.9.

1.5 Design Life: 40 years

1.6 Operating Cycles (expected number of cycles during design life, include test): Continuous duty. Refer to Appendix A1, Reference 1, for mechanical cycling of relays.

1.7 Performance Requirements for Function[b]:

Parameter	Normal Conditions	Abnormal Conditions	Containment Test Conditions	DBE Conditions(a) FLB/SLB	DBE Conditions(a) LOCA	DBE Conditions(a) Seismic	Post DBE Conditions (a) FLB/SLB	Post DBE Conditions (a) LOCA	Post DBE Conditions (a) Seismic
1.7.1 Time requirement	Continuous	12 hours	N/A	N/A	N/A	Event Duration	N/A	N/A	Continuous
1.7.2 Performance requirement	Note d	As normal				As normal			As normal

1.8 Environmental conditions for Same Function[b]

1.8.1 Temperature (°F)	60 - 80	Note c				Ambient			Ambient
1.8.2 Pressure (psig)	0	0				0			0
1.8.3 Humidity (RH)	30 - 50	Note c				Ambient			Ambient
1.8.4 Radiation (R)	< 400	None				None			None
1.8.5 Chemicals	None	None				None			None
1.8.6 Vibration	None	None				None			None
1.8.7 Acceleration(g)	None	None				See Sec. 2.10.3.2			

Note: a. DBE is the Design Basis Event.

b. Margin is not included in the parameters of this section.

c. Figure 1, envelope 3,. However, since operation at low humidity, based on Westinghouse experience, is not an operating concern, the abnormal extreme for humidity shall be 95 percent RH. Also, for plants having a Class 1E HVAC for the area in which the ASC is located, the abnormal extremes are the same as the normal specified above.

d. Initiate safeguards actuation on demand.

1.9 Qualified Life: The currently demonstrated qualified life (Phase 1 Short-Term Aging), 5 years based on the actual test conditions identified in Table 1. Westinghouse is planning an extension (Phase II Long-Term Aging) of Subprogram C of the Aging Evaluation Program (Appendix B to WCAP-8587) to increase the demonstrated qualified life.

1.10 Remarks: None

PART 2 - QUALIFICATION BY COMBINED ANALYSIS AND TESTING

2.0 TEST PLAN

The environmental qualification of the Auxiliary Safeguards Cabinet was performed at Westinghouse NICD Hunt Valley, Maryland

The seismic qualification of the equipment's Class 1E components was performed at Westinghouse Advanced Energy Systems Division (WAESD) in Large, Pennsylvania.

2.1 Equipment Description: Auxiliary Safeguards Cabinet (see Section 2.10.2). The Auxiliary Safeguards Cabinet performs a safeguards actuation function.

2.2 Number Tested: Type test on twelve (12) representative relays

2.3 Mounting: Westinghouse Drawing 7244D96 Revision 2

2.4 Connections: Terminal blocks (Power Input and Output)

2.5 Aging Simulation Procedure:

As described in Subprogram C of Appendix B to WCAP-8587 and reported in Reference 2.

		Normal	Abnormal	Cont. Test	Seismic	HELB	Post-HELB
2.6.1	Temp. (˚F)	Ambient	Figure 2	N/A	Ambient	N/A	N/A
2.6.2	Pressure (psig)	0	0		0		
2.6.3	Humidity (RH)	Ambient	Figure 2		Ambient		
2.6.4	Radiation (R)	None	None		None		
2.6.5	Chemicals	None	None		None		
2.6.6	Vibration	None	None		None		
2.6.7	Acceleration (g)	None	None		See 2.10.3		

2.7 Measured Variables

This section identifies the parameters required to be measured during the test sequences(s).

		Required	Not Required
2.7.1	**Category I - Environment**		
2.7.1.1	Temperature	B	A
2.7.1.2	Pressure		A,B
2.7.1.3	Moisture	B	A
2.7.1.4	Gas Composition		A,B
2.7.1.5	Seismic Acceleration	A	B
2.7.1.6	Time	A,B	
2.7.2	**Category II - Input Electrical Characteristics**		
2.7.2.1	Voltage	A,B	
2.7.2.2	Current	B	A
2.7.2.3	Frequency	A,B	
2.7.2.4	Power		A,B
2.7.2.5	Other		A,B
2.7.3	**Category III - Fluid Characteristics**		
2.7.3.1	Chemical Composition		A,B
2.7.3.2	Flow Rate		A,B
2.7.3.3	Spray		A,B
2.7.3.4	Temperature		A,B
2.7.4	**Category IV - Radiological Features**		
2.7.4.1	Energy Type		A,B
2.7.4.2	Energy Level		A,B
2.7.4.3	Dose Rate		A,B
2.7.4.4	Integrated Dose		A,B

		Required	Not Required
2.7.5	Category V - Electrical Characteristics		
2.7.5.1	Insulation Resistance		A,B
2.7.5.2	Output Voltage		A,B
2.7.5.3	Output Current		A,B
2.7.5.4	Output Power		A,B
2.7.5.5	Response Time		A,B
2.7.5.6	Frequency Characteristics		A,B
2.7.5.7	Simulated Load		A,B
2.7.6	Category VI - Mechanical Characteristics		
2.7.6.1	Thrust		A,B
2.7.6.2	Torque		A,B
2.7.6.3	Time		A,B
2.7.6.4	Load Profile		A,B
2.7.7	Category VII - Auxiliary Equipment		
	None		

A: Seismic Test

B: Operation Test, Abnormal Conditions

2.8 Test Sequence Preferred

This section identifies the preferred test sequences as specified in IEEE-323-74.

2.8.1 Inspection of Test Item
2.8.2 Operation (Normal Condition)
2.8.3 Operation (Performance Specifications Extremes, Section 1)
2.8.4 Simulated Aging
2.8.5 Vibration
2.8.6 Operation (Simulated High Energy Line break Conditions)
2.8.7 Operation (Simulated Post HELB Conditions)
2.8.8 Disassembly and Inspection

2.9 Test Sequence Actual

This section identifies the actual test sequence(s) which, in total, constitutes the overall qualification program for this equipment. The separate subsections indicate the separate test sequences completed on differing, but essentially identical, equipment and/or components. The justification for employing anything other than the preferred sequence is as follows;

2.9.1 Auxiliary Safeguards Cabinet Actual Test Sequence

The DBE is simulated by the Environmental and Seismic Test Sequence of Sections 2.9.2.2 and 2.9.2.3. The HELB Tests (Sections 2.8.6 and 2.8.7) have been excluded since the Auxiliary Safeguards Cabinet is not exposed to the HELB environment due to its location. The aging test employes the preferred sequence test (Section 2.8 excluding HELB and Abnormal Extremes Sections 2.8.6, 2.8.7, and 2.8.3) on a representative sample of components from the Auxiliary Safeguards Cabinet. The aging tests demonstrate that during the qualified life there are no in-service aging mechanisms capable of reducing the capabiliy of the Auxiliary Safeguards Cabinet to perform during or

after a seismic event. As a consequence, the seismic testing on the unaged Auxiliary Safeguards Cabinet is not prejudiced by any in-service aging mechanisms.

2.9.2.1 Production Test Sequence

2.8.1
2.8.2 System test performed on
2.8.8 all production units

2.9.2.2 Environmental Test Sequence

2.8.1
2.8.2 Abnormal environment
2.8.3

2.9.2.3 Seismic Test Sequence

2.8.1
2.8.5 Seismic simulation
2.8.8

2.9.2.4 Aging Test Sequence

2.8.1
2.8.2 Aging is addressed by separate
2.8.4 testing as described in Subprogram C
2.8.5 of Appendix B to WCAP-8587 and reported
2.8.8 in References 2 and 3

2.10 Qualification Data

2.10.1 Objective

The objective of this qualification program is to determine, employing the recommended practices of Regulatory Guide 1.89

(IEEE-323-1974) and Regulatory Guide 1.100 (IEEE-344-1975), the capability of the Auxiliary Safeguards Cabinet to complete the safety-related functions described in EQDP Section 1.7 while exposed to the applicable environment defined in EQDP Section 1.8.

2.10.2. Equipment Qualified

2.10.2.1 Auxiliary Safeguards Cabinet

2.10.2.1.1 Auxiliary Safeguards Cabinet Seismic qualification using combined analysis and testing approach is reported in Reference 4.

2.10.2.1.2 Environmental Test reported in Reference 4.

2.10.2.1.3 Aging Evaluation Program

A representative sample of critical components from the ASC is included in Subprobram C of the Aging Evaluation Program described in Appendix B to WCAP-8587 and reported in Reference 2.

2.10.3 Component Test Summary

Component operability tests were performed before, during and after the seismic and environment testing to confirm that the equipment had not degraded substantially as the result of the tests. These tests confirmed satisfactory operation.

2.10.3.1 Seismic Test

The single design basis event capable of producing an adverse environment at the equipment location is a seismic event. The seismic qualification was conducted by combined analysis and testing approach as reported in Reference 4. The methodology employed for the qualification of the Auxiliary Safeguards Cabinet was in accordance with Regulatory Guide 1.100 (IEEE-344-1975). The generic required response spectra for the ASC (Figure 3) contain significant margin with respect to any single plant application referencing this program.(1)

2.10.3.2 Environmental Test

Westinghouse requires that the Auxiliary Safeguards Cabinet be located such that it does not experience a consequent adverse environment when required to operate following a high energy line break either inside or outside containment. Therefore, the only testing required, is to demonstrate equipment capability under normal and abnormal environmental service conditions (temperature, humidity, AC power voltage and frequency, and DC power voltage).

Reference 5 summarizes the results of available radiation testing of organic and inorganic materials and justifies that, for radiation doses less than 10^4 rads, no deterioration in material structural properties is detectable. As a consequence, a radiation simulation is not required on this equipment, since estimated in-service radiation doses will not prejudice the capability of the equipment to perform under design basis event (i.e., seismic event) conditions.

The environmental testing reported in Reference 4 is designed to demonstrate the capability of the equipment to meet the safety-related performance requirements specified in EQDP Section 1.7 when exposed to the variations in temperature, humidity, voltage and frequency specified by Figure 2. The testing successfully demonsrated the specified safety-related requirements. Additional margin, was, furthermore, included in this test by submitting the equipment to a triple cycle of electrical and environmental extremes as described by Figure 2. This test is considered to satisfactorily demonstrate the Auxiliary Safeguards Cabinets capability to meet its safety-related functional requirements when exposed to the specified abnormal environments (EQDP Section 1.7) and the permitted range of frequency and voltage variations (EQDP Section 1.1) in accordance with IEEE 323-1974 Section 6.3.2(2) and (3).

2.10.3.3 Aging Evaluation

Subprogram C of the Westinghouse Aging Evaluation Program (Appendix B, WCAP-8587) has incorporated a representative sample of components from the Auxiliary Safeguards Cabinet. This program is completed and reported in WCAP-8687, Supplement 2, Appendix A1 (Proprietary). The objective of Subprogram C is to demonstrate that during the qualified life there are no in-service aging mechanisms capable of reducing the capability of the Auxiliary Safeguards Cabinet to perform during or after a seismic event. As a consequence, the seismic qualification on the full Auxiliary Safeguards Cabinet described above, is not prejudiced by an in-service aging mechanism.

2.10.4 Conclusion

The Auxiliary Safeguards Cabinet components were actuated and monitored both during and following the seismic testing. The seismic test demonstrated that the Auxiliary Safeguards Cabinet is capable of initiating safeguards actuation on demand during or following a seismic event.

The currently demonstrated qualified life of the Auxiliary Safeguards Cabinet is 5 years. Westinghouse is planning an extension of Subprogram C of the Aging Evaluation Program to increase the qualified life. The results of the aging program, the seismic and environmental testing described herein, together with the seismic analysis of Section 4, demonstrate: the qualification of the Auxiliary Safeguards Cabinet employing the practices recommended by Regulatory Guide 1.89 and 1.100.

2.11 Section 2 Notes

(1) The generic tests proposed by Westinghouse employ parameters designed to envelope a number of plant applications. Margin is a plant specific parameter and will be established by the applicant.

2.12 References

1. Jab, R., Parello, J., Huang, J., Yalich, M., "Equipment Qualification Test Report Short-Term Component Aging Test Program," WCAP-8687, Supplement 2, Appendix A1 (Proprietary).

2. "Equipment Qualification Test Report Materials Aging Analysis," WCAP-8687, Supplement 2, Appendix A2 (Proprietary).

3. Capone, J., Chang, S. M., Vogeding, E. L., "Equipment Qualification Test Report for the Auxiliary Safeguard Cabinet", WCAP-8687, Supplement 2, E-55A.

4. Chang, S.M., "Finite Element Seismic Analysis of the Auxiliary Safeguards Cabinet, Loop Stop Valve Cabinet, and Modified Auxiliary Safeguards Cabinet," WCAP-9858.

5. Damerow, F. W., "Effects of Gamma Radiation Doses Below 10^4 Rads on the Mechanical Properties of Materials," WCAP-8587, Appendix C (Non-Proprietary).

PART 3 - QUALIFICATION BY EXPERIENCE

Westinghouse does not employ operating experience in support of the Qualification Program for the Auxiliary Safeguards Cabinet.

PART 4 - QUALIFICATION BY ANALYSIS

4.0 COMBINED ANALYSIS AND TEST FOR QUALIFICATION OF THE AUXILIARY SAFEGUARDS CABINET (ASC)

4.1 Seismic Qualification

A test verified finite element model for the Auxiliary Safeguards Cabinet was developed. Seismic analysis was performed on the model using the Westinghouse WECAN computer code. The analysis demonstrated structural integrity of the cabinet and yielded in-equipment (device) response spectra which served as the basis for establishing the inputs during the device testing. This analysis documented in Reference 4 along with the testing of the ASC components discussed in Reference 3 constitute the total documentation of the qualification for the Auxiliary Safeguards Cabinet.

TABLE 1

ACTUAL QUALIFICATION TEST CONDITIONS

EQUIPMENT (1) SYSTEM/CATEGORY	LOCATION STRUCTURE/AREA	MANUFACTURER TYPE/MODEL	ABNORMAL/ACCIDENT ENVIRONMENTAL EXTREMES PARAMETER	SPECIFIED (2)	QUALIFIED	OPERABILITY ACCURACY ( ) REQ	DEM	REQ	DEM	QUAL LIFE	QUAL METHOD	QUAL REF	QUAL PROGRAM STATUS
Auxiliary	Control	W-NICD	Temperature		120°F	12 hr.	Three	-	-	5	Seq.	ESE	Completed
Safeguards	Building/	Two	Pressure		Atmos.	cycles	12			yrs.	Test	16	
Cabinet/ESF/	MCR	Train	Rel. Humidity		95		hr.			(3)			
Category d			Radiation		10^4R(γ)		cycles						
			Chemistry		None								

Notes:

1. For definition of the category letters, refer to NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," Appendix E, Section 2.

2. Plant specific environmental parameters are to be inserted by the applicant.

3. Phase I of the Westinghouse Aging Evaluation Program as described in WCAP-8587, Appendix B, has established a qualified life of at least 5 years for this equipment, Phase II of this program will extend the qualification life to a maximum of 20 years or as far as is achievable.

4. Temperature was 78°F at maximum humidity of 95 percent.

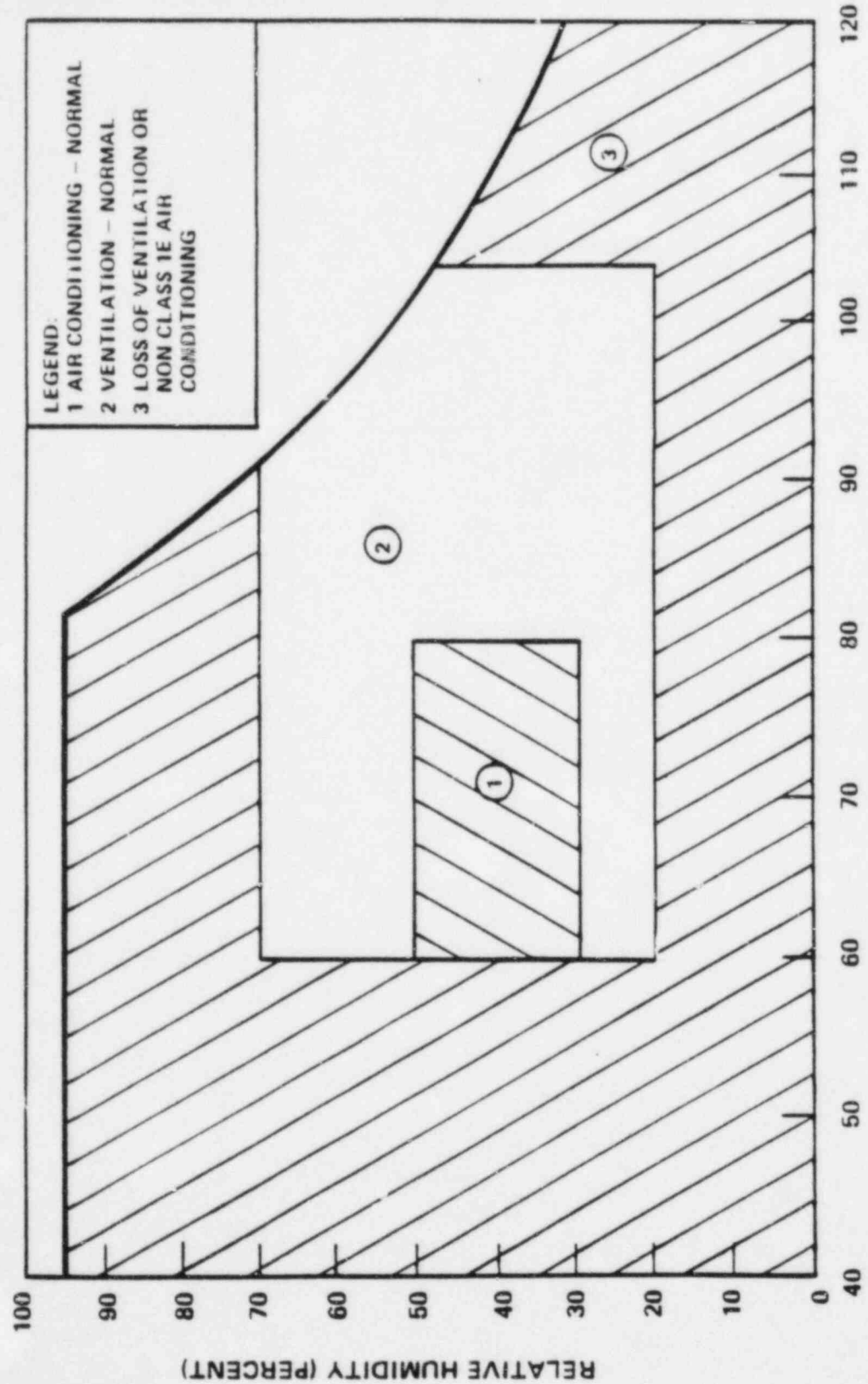

Figure 1 Temperature Versus Humidity - Enclosed Environments Outside Containment

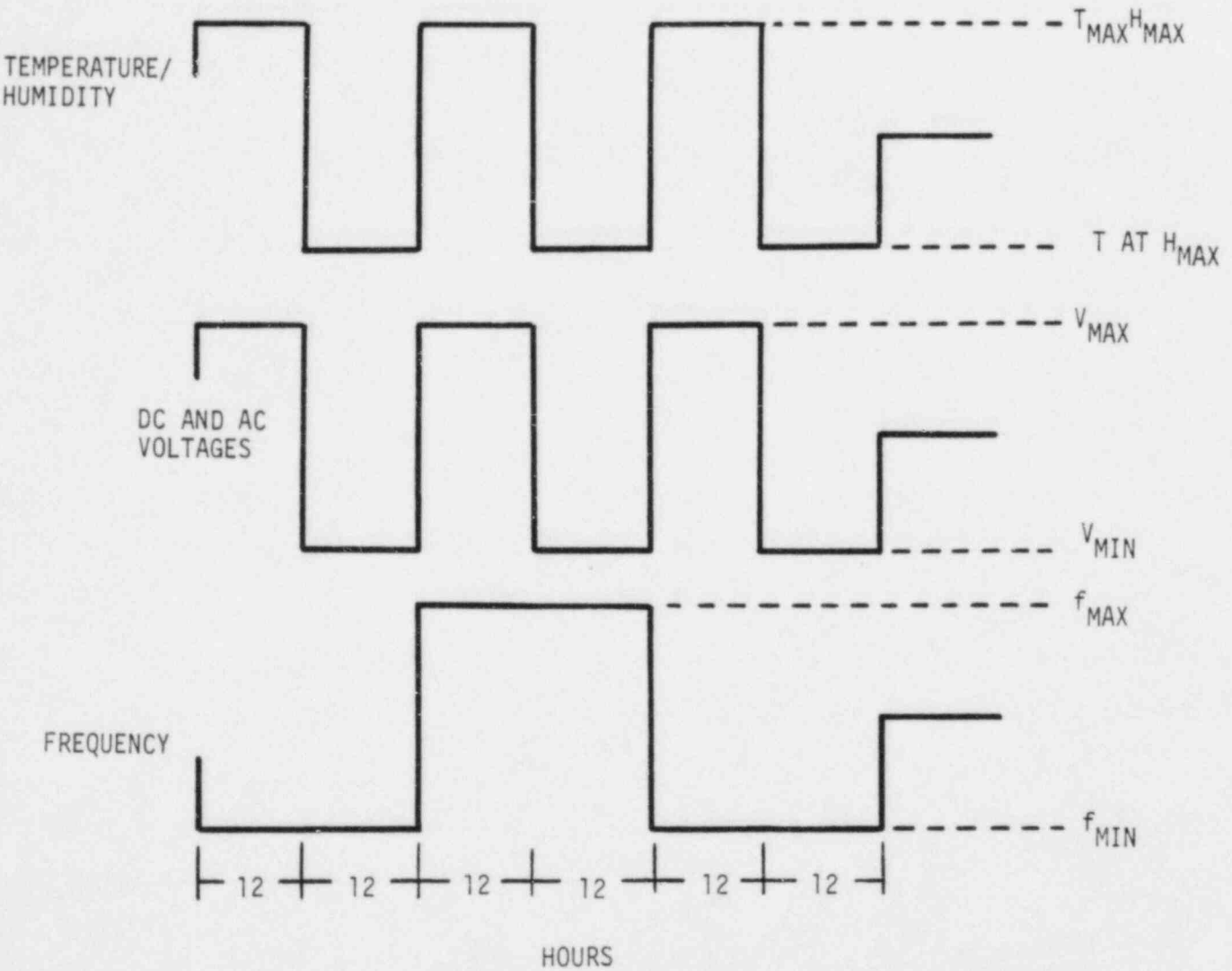

Figure 2 Verification Test Profile

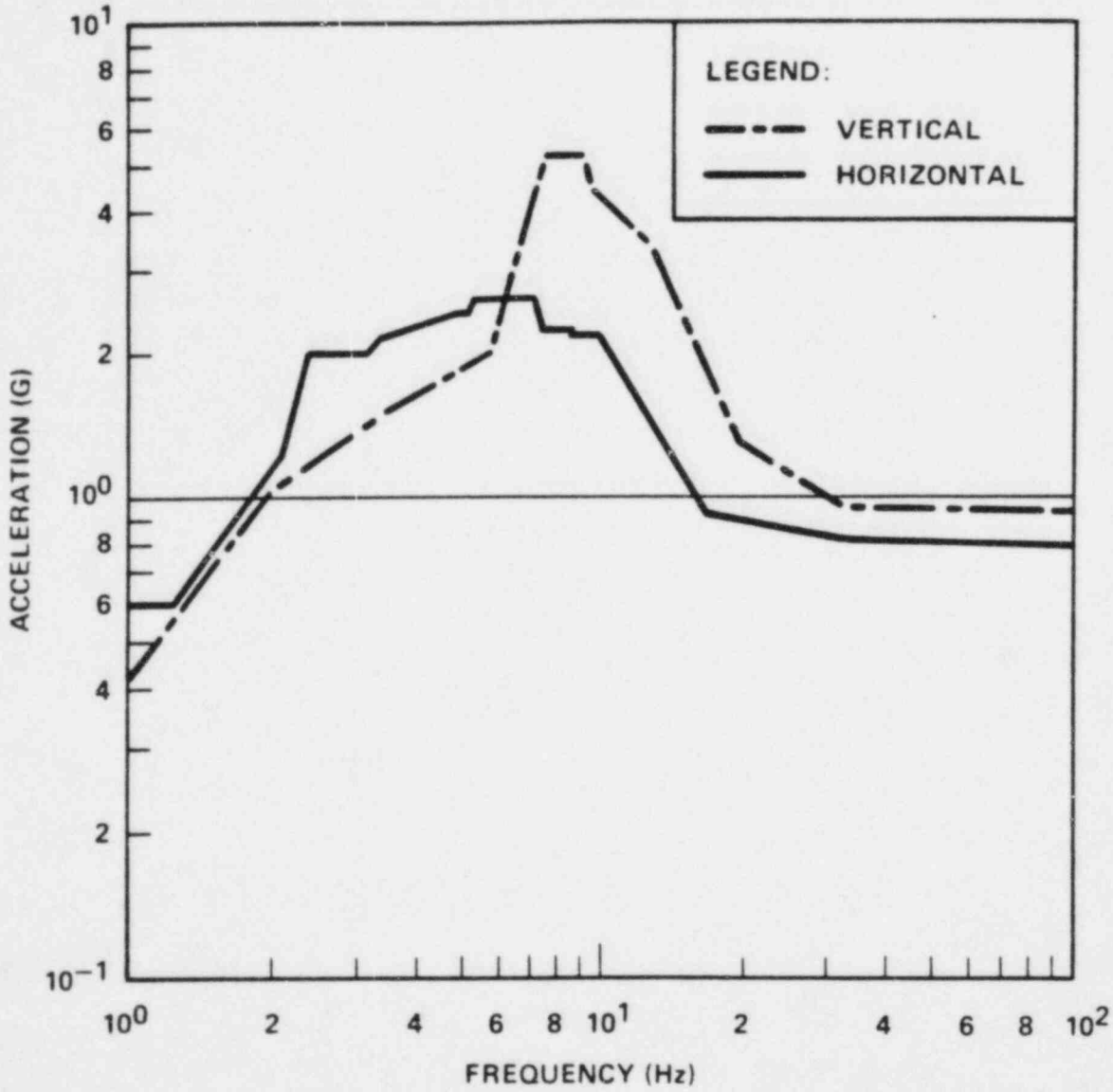

Figure 3 SSE Required Response Spectra for the Generic Auxiliary Safeguards Cabinet