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 (Section 1) defines the assumed limits for the equipment qualification and constitute interface requirements to tne user.

SAFETY RELATED LIMITORQUE MOTOR OPERATORS

(Qualification Group A)

APPROVED: _____
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SECTION 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFICATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 460 VAC 3 Phase
1.1.2 Frequency: 60 Hz
1.1.3 Load: As specified for each model by the manufacturer
1.1.4 Electromagnetic Interference: N/A
1.1.5 Other: Integral Limit Switches & Torque Switch
Voltage - 120 VAC Nominal
Load - < 5 amps
Frequency - 60 Hz Nominal

1.2 Installation Requirements: The Generic Design Family of Limitorque Motor Operators identified in Table 1 of Reference 1 is qualified by this testing for any mounting position as noted in the applicable valve drawings. The orientation used during seismic testing is with the motor and handwheel shafts in the horizontal position and the limit switch cover either horizontal or vertically up. The applicable valve assembly drawings which includes the motor operator, describes the orientation and specifies any mounting restrictions that apply to that valve and motor operator assembly. In all cases, the qualification testing described herein is applicable for all these valve and motor operator assemblies. Applicability on a per plant basis will be established with an auditable link document.

Deviations from the above described test position may necessitate an evaluation on a case by case basis by Westinghouse. Bolt sizes and mounting bolt torques are to be in accordance with the applicable valve maintenance manual/drawing.

1.3 Auxiliary Devices: None

1.4 Preventive Maintenance Schedule: Per the Westinghouse Equipment Qualification test program, no preventive maintenance is required to support the equipment qualified life. This does not preclude development of a preventive maintenance program designed to enhance equipment performance and identify unanticipated equipment degradation as long as this program does not compromise the qualification status of the equipment. Surveillance activities may also be considered to support the basis for and a possible extension of the qualified life.

The Limitorque recommended Lubrication and Inspection Procedure & Data (LC-8) is included an Attachment III of Reference 1. Supplementary information is included in the Limitorque Standard Maintenance and Instruction Manual for each model type of the generic families qualified.

1.5 Design Life: 40 years

1.6 Operating Cycles (Expected number of cycles during design life, including test): 2000 cycles

1.7 Performance Requirements for[b]:

	Parameter	Normal Conditions	Abnormal Conditions	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	Included under normal	Test Duration	<24 hrs.	<24 hrs.	Event Duration	1 year	1 year	Continuous
1.7.2	Performance requirement	Note c		No Damage	Note c	Note c	Note c	Note c	Note c	Note c

1.8 Environmental Conditions for Same Function[b]

1.8.1	Temperature(°F)	50-120	Included under normal	Ambient	Fig. 2	Fig. 3	Ambient	Fig. 2	Fig. 3	Ambient
1.8.2	Pressure (psig)	-6.7/+2.3		70	Fig. 2	Fig. 3	Ambient	Fig. 2	Fig. 3	Ambient
1.8.3	Humidity (% RH)	10-100		Ambient	100	100	Ambient	100	100	Ambient
1.8.4	Radiation (R)	1.75×10^7 γ		None	3.5×10^4 γ 1.8×10^5 β Fig. 4 & 5	2.3×10^7 γ 1.7×10^8 β Fig. 5 & 7	None	1.2×10^5 γ 7.8×10^5 β Fig. 4 & 6	1.3×10^8 γ 1.3×10^9 β Fig. 5 & 7	None
1.8.5	Chemicals	None		None	Note d	Note d	None	Note d	Note d	None
1.8.6	Vibration	Fig. 1		None	None	None	None	None	None	None
1.8.7	Acceleration (g)	None		None	None	None	Fig. 9	None	None	None

Notes: a: DBE is the Design Basis Event.
b: Margin is not included in the parameters of this section.
c: Actuator to stroke with prespecified torque, thrust and speed of operation established by manufacturer.
d: The spray solution contains 2500 ppm boron buffered with 0.88% dissolved sodium hydroxide to maintain a pH of 10.5.

1.9 Qualified Life: An assumed ambient temperature of 120°F was utilized to demonstrate qualified life of five (5) years based on the actual test conditions identified in Table 1.

1.10 Remarks: None

SECTION 2 - QUALIFICATION BY TEST

2.0 TEST PLAN

The complete sequence of type testing for the Generic Design Group of the Limitorque Motor Operators was conducted at several different test facilities. The Baseline Performance Test, Thermal and Wear Aging Tests, DBE Environment Test and all Performance Testing was performed at the Limitorque Research and Development Testing facility in Lynchburg, Virginia. All normal/abnormal/accident environmental radiation testing was performed at Isomedex Inc., Parsippany, New Jersey. Vibration/seismic testing was performed at Acton Environmental Corp., Acton Massachusetts.

2.1 Equipment Description: Limitorque Motor Operator

2.2 Number Tested: One

Model Number SMB-00 with Reliance type LR 15 FT-LB Motor

2.3 Mounting: As defined in Section 1.2

2.4 Connections: The qualification of the connecting power or control cabling is not a part of this test. During this test, unsupported cable of twenty pounds provided power. However, the qualification of the electrical connection is the responsibility of the utility.

2.5 Aging Simulation Procedure: By a sequential component test program as described by Subprogram A of Appendix B to WCAP-8587 and reported in Reference 1.

2.6 Service Conditions to be Simulated by Test(1)

		Normal	Abnormal	Containment Test	Seismic	HELB/LOCA	Post-HELB/LOCA
2.6.1	Temp. (°F)	50-120	Included Under Normal	Ambient	Ambient	Fig. 8	Fig. 8
2.6.2	Pressure (psig)	-6.7/+2.3		78	Ambient	Fig. 8	Fig. 8
2.6.3	Humidity (% RH)	10-100		Ambient	Ambient	100%	100%
2.6.4	Radiation (R)	1.85×10^8	Included under Normal	None	None	Included under Normal	Included under Normal
2.6.5	Chemicals	None		None	None	Note (a)	Note (a)
2.6.6	Vibration	See Fig. 1		None	None	None	None
2.6.7	Acceleration (g)	None		None	Figure 2	None	None

Note: (a) The spray solution contains 2500 ppm boron buffered with 0.88% dissolved sodium hydroxide to maintain a pH of 10.50.

2.7 Measured Variables

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

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

			Required	Not Required
2.7.5	Category V - Electrical Characteristics			
	2.7.5.1	Insulation Resistance	A,C,E	B,D
	2.7.5.2	Output Voltage		A,B,C,D,E
	2.7.5.3	Output Current		A,B,C,D,E
	2.7.5.4	Output Power		A,B,C,D,E
	2.7.5.5	Response Time		A,B,C,D,E
	2.7.5.6	Frequency Characteristics		A,B,C,D,E
	2.7.5.7	Simulated Load	A,B,C,E	D
2.7.6	Category VI - Mechanical Characteristics			
	2.7.6.1	Thrust	A,B,C,E	D
	2.7.6.2	Torque	A,B,C,E	D
	2.7.6.3	Time	A,B,C,E	D
	2.7.6.4	Load Profile	A,B,C,E	D
2.7.7	Category VII - Auxiliary Equipment			

A. Performance Test
B. Environmental Aging Test
C. Vibration - Seismic Test
D. Radiation Test
E. DBE Environment Test

2.8 Test Sequence Preferred

This section identifies the preferred test sequences as specified in IEEE-323-1974

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 Post HELB/LOCA Conditions)
2.8.7 Operation (Simulated Post HELB/LOCA Conditions)
2.8.8 Disassembly and Inspection

2.9 Test Sequence Actual

The sample Motor Operator Assembly was type tested in accordance with the sequence identified in Section 2.8.

2.10 Type Test Data

2.10.1 Objective

The objective of this test program is to demonstrate, employing the recommended practices of Reg. Guide 1.89 (IEEE-323-1974), Reg. Guide 1.100 (IEEE 344-1975) and Reg. Guide 1.73 (IEEE 382-1972), the capability of the Limitorque Motor Operators to complete their safety-related function(s) described in EQDP Section 1.7 while exposed to the applicable environments defined in EQDP Section 1.8.

2.10.2 Equipment Tested

The sample component from the Generic Group was identified and type tested. Manufacturing processes, production tests and materials of construction for the Generic Design Group are monitored and controlled and a quality release provided. The sample component selected from the Generic Design Group completed the entire test sequence of Section 2.8.

2.10.3 Test Summary

2.10.3.1 The generic component was performance tested to establish the base-line that each unit is to meet.

2.10.3.2 A generic component was selected and type tested for the entire sequence of tests identified in Section 2.8

2.10.3.3 The generic component was thermally aged in an oven for a time period and at an elevated temperature equivalent to a qualified life of five (5) years. The Limitorque Motor Operator was cycled at least ten percent of its mechanical life during thermal aging.

2.10.3.4 The generic component was mechanically aged to a total of 250 cycles.

2.10.3.5 The generic component was then radiation aged to a gamma radiation dose of 1.85×10^8 rads.

2.10.3.6 The generic component was vibration and seismic tested in accordance with the requirements of IEEE-344-1975 employing single frequency testing.

2.10.3.7 Subsequent to the test performance in Sections 2.10.3.4, 2.10.3.5 and 2.10.3.6 the generic component was performance tested to demonstrate the Limitorque Motor Operator operational integrity. The component successfully completed these tests.

2.10.4 Conclusion

The demonstrated qualified life of the Limitorque Motor Operator has been established in accordance with Subprogram A of the Westinghouse Aging Evaluation Program. The results of the aging program, together with the seismic and environmental type testing described herein, demonstrates as detailed in Reference 1 a five (5) year qualified life of the generic design group of the Limitorque Motor Operators employing the practices recommended by Reg. Guides 1.73, 1.89, and 1.100

2.11 Section 2 Notes

(1) The generic tests completed 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. Zegar, M. J., "Equipment Qualification Test Report Limitorque Valve Motor Operators (Environmental and Seismic Testing)," WCAP 8687 Supp 2-H01A (Proprietary).

SECTIONS 3 & 4 QUALIFICATION BY EXPERIENCE AND/OR ANALYSIS

Westinghouse does not employ operating experience or analysis in support of the qualification program for Limitorque Valve Electric Motor Operators.

TABLE 1

ACTUAL QUALIFICATION TEST CONDITIONS

EQUIPMENT (1) SYSTEM/CATEGORY	LOCATION STRUCTURAL/AREA	MANUFACTURER TYPE/MODEL	ABNORMAL/ACCIDENT ENVIRONMENTAL EXTREMES PARAMETER	SPECIFIED (2)	QUALIFIED	OPERABILITY REQ	OPERABILITY DEM	ACCURACY(%) REQ	ACCURACY(%) DEM	QUAL LIFE	QUAL METHOD	QUAL REF	QUAL PROGRAM STATUS
Valve motor operators/ CVCS, SIS, CCS/ Category a	Containment Building/ Outside Missle Shield	Limitorque SMB-000 through SMB-5. SB-000 through SB-4 and SBD-000 through SBD-4	Temperature Pressure Rel. humidity Radiation Chemistry		420°F 57 psig 100 % 1.85×10^8 Rγ 2500 ppm NaOH to 10.7pH	1 yr. Post DBE	1 yr Post DBE	N/A	N/A	5 yrs.	Seq. Test	HE-1	Completed

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.

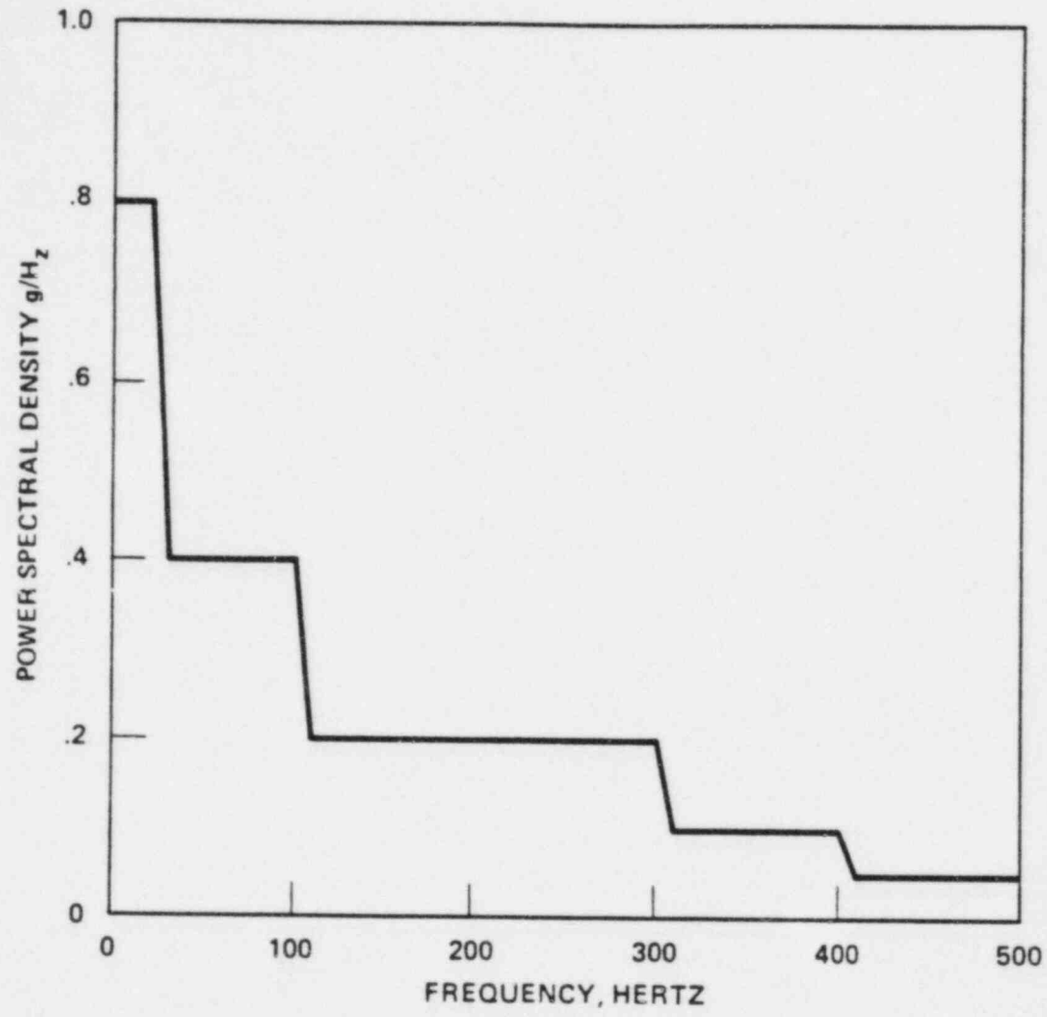

Figure 1 Plant Induced Vibration Linear Spectra Density

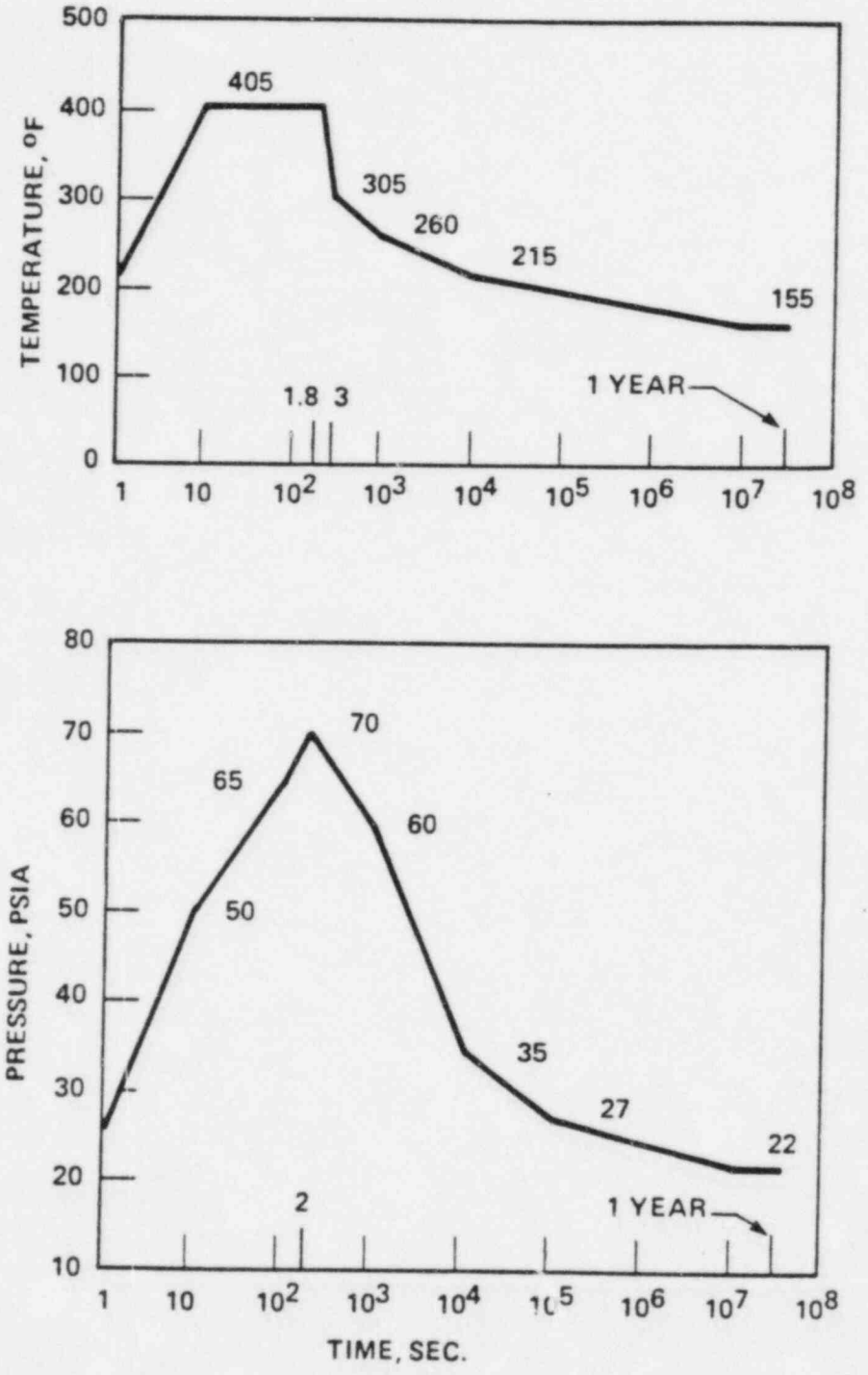

Figure 2 High Energy Line Break

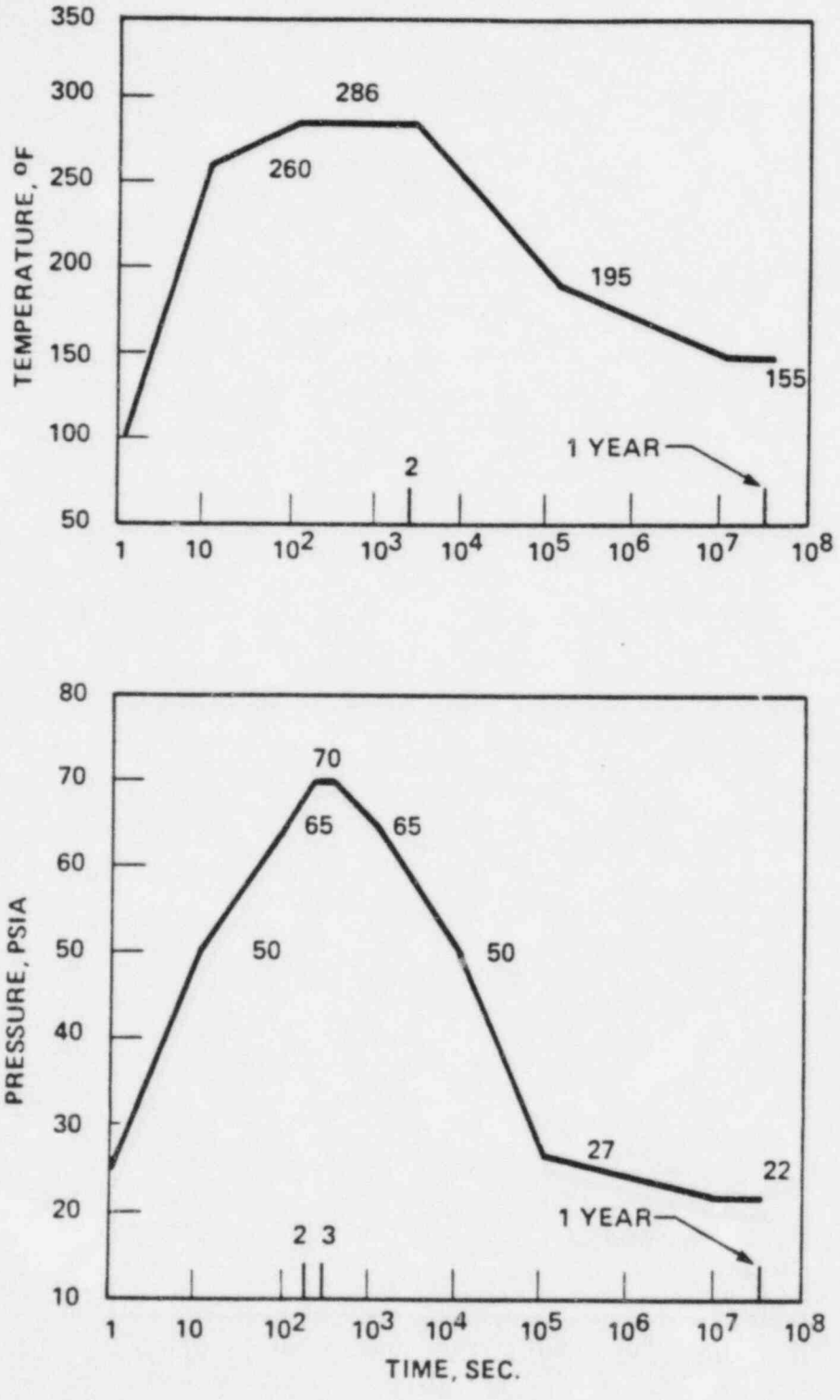

Figure 3 Loss of Coolant Accident Environment

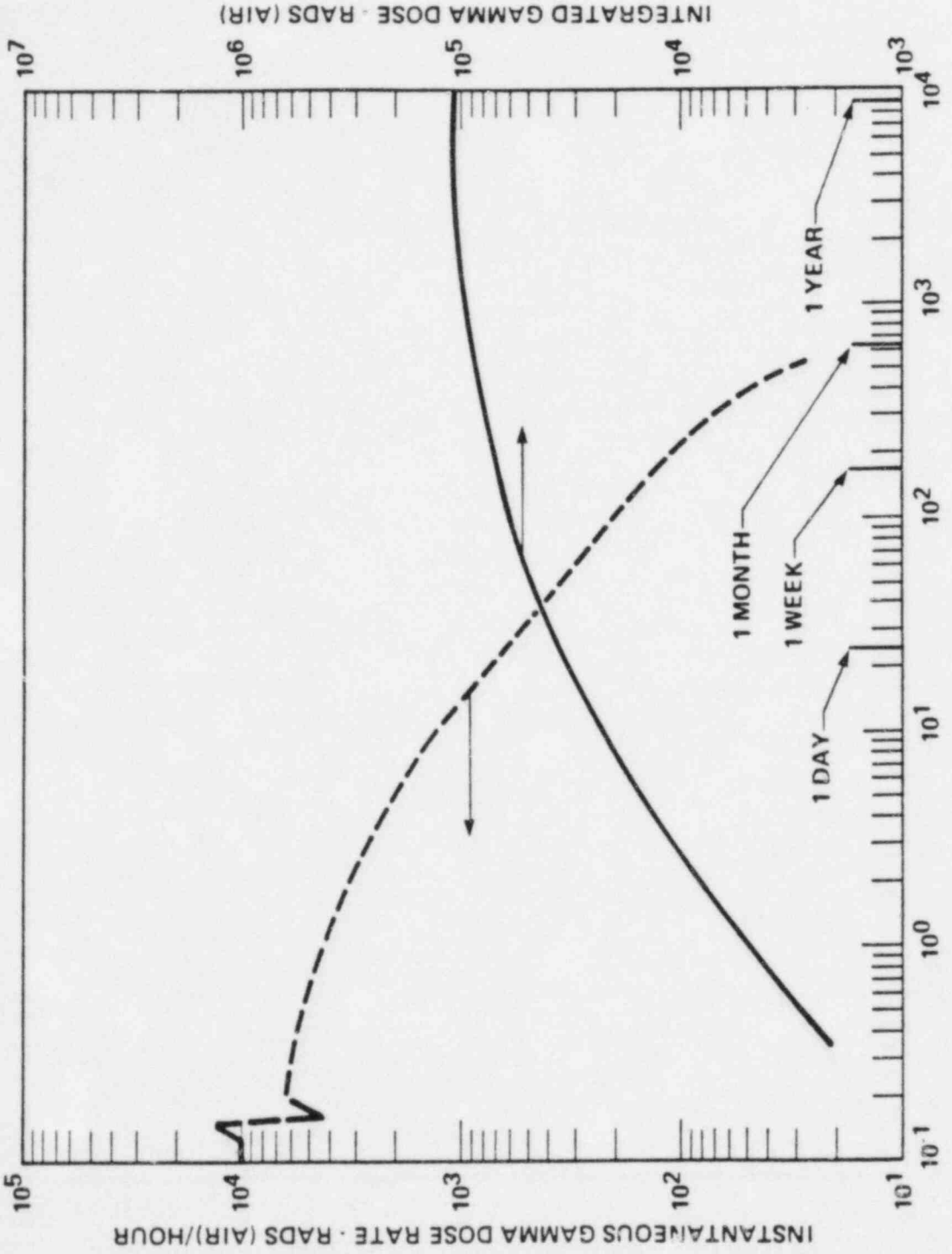

Figure 4 Gamma Dose and Dose Rate Inside the Containment as a Function of Time After a Steam Line Break Accident

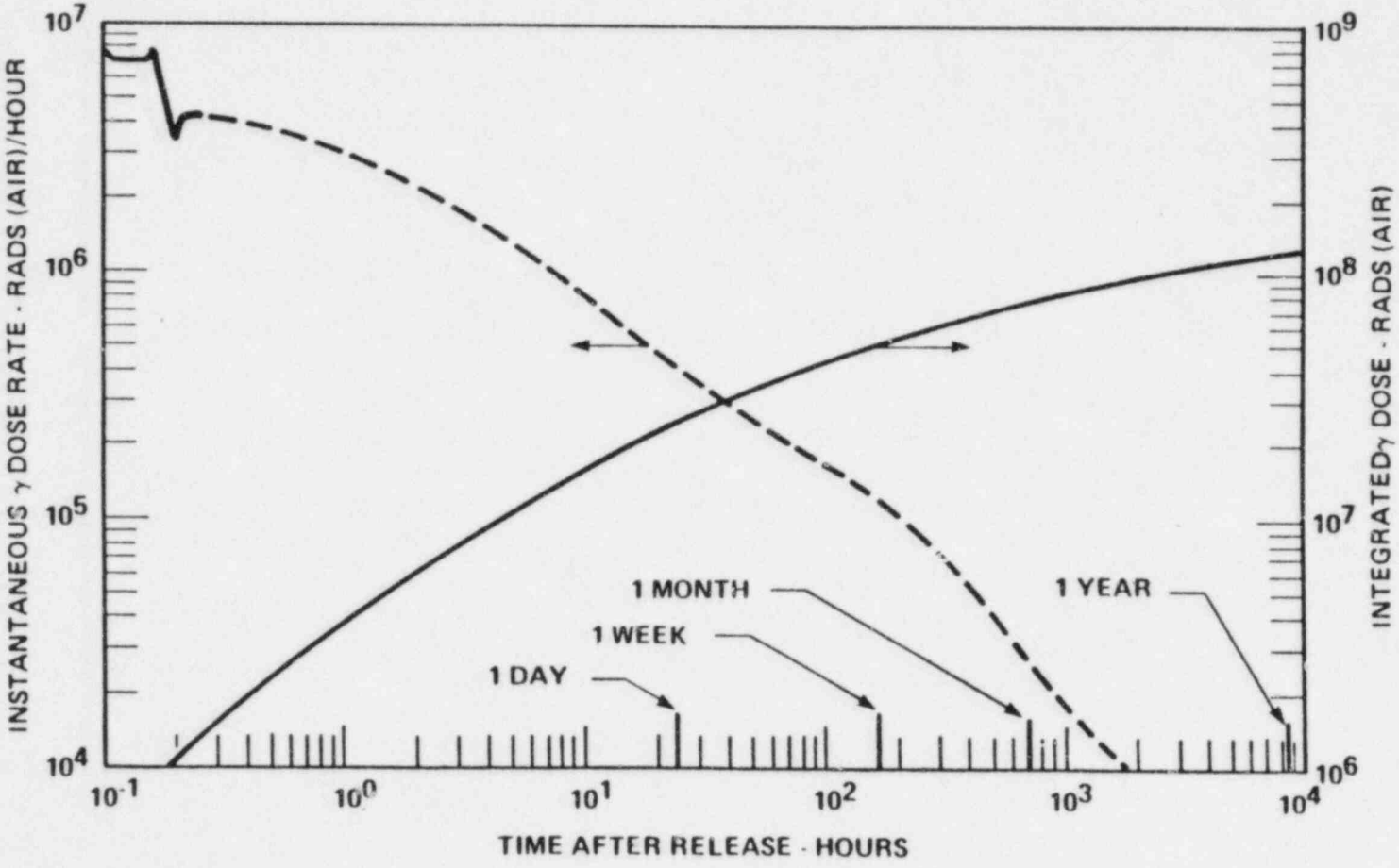

Figure 5 Gamma Dose and Dose Rate Inside the Containment as a Function of Time After LOCA

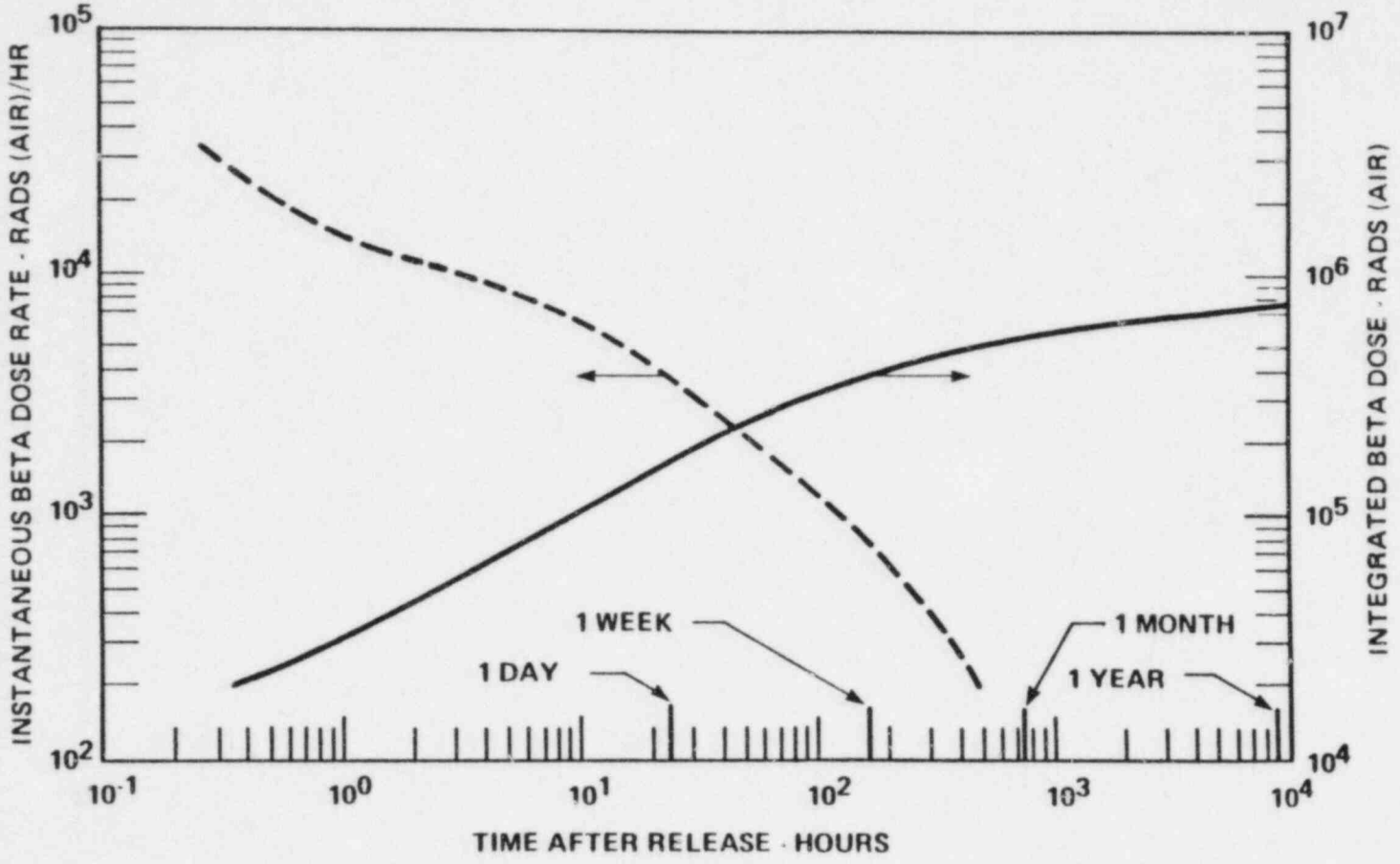

Figure 6 Beta Dose and Dose Rate Inside the Containment as a Function of Time After a Steam Line Break Accident

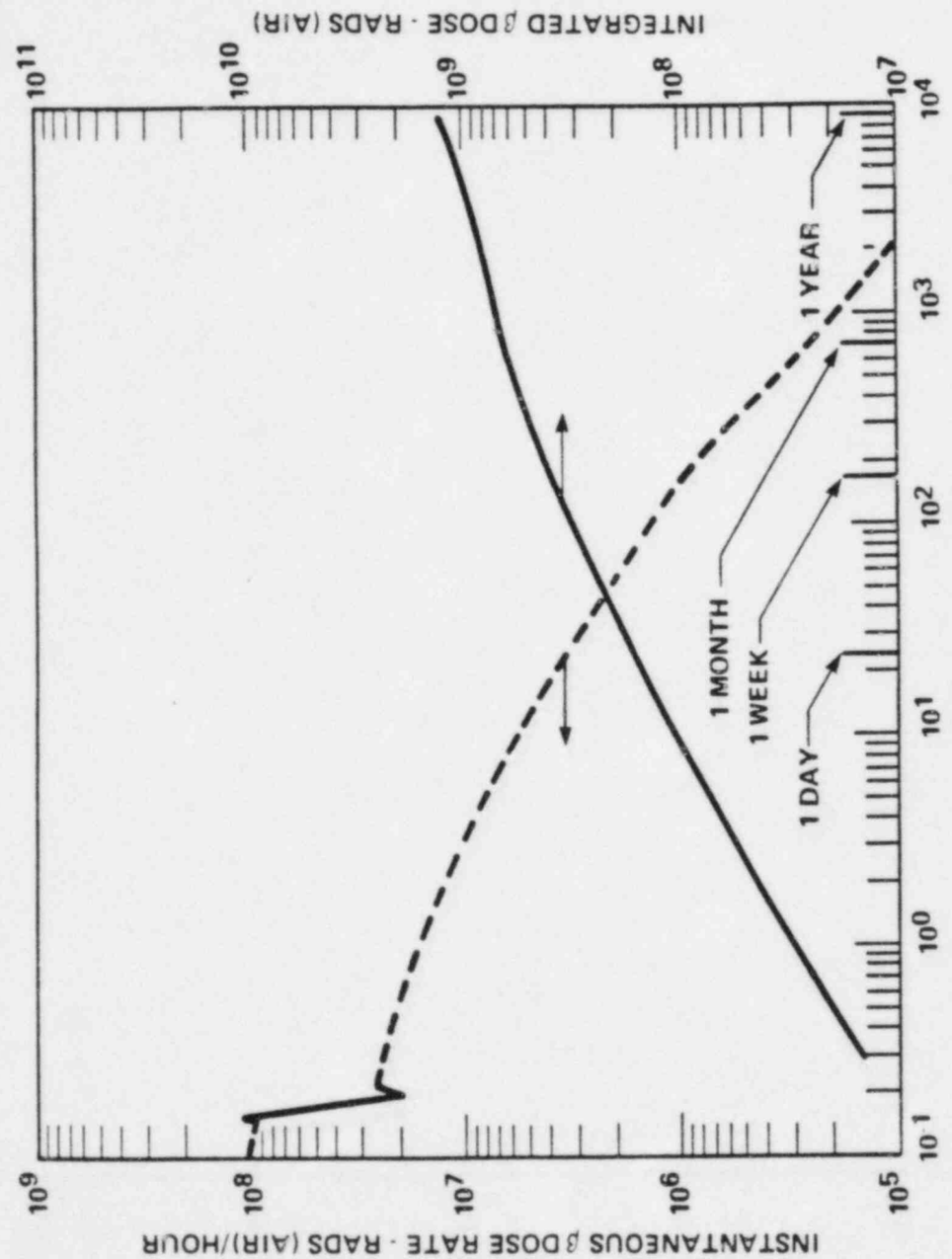

Figure 7 Beta Dose and Dose Rate Inside the Containment as a Function of Time After LOCA

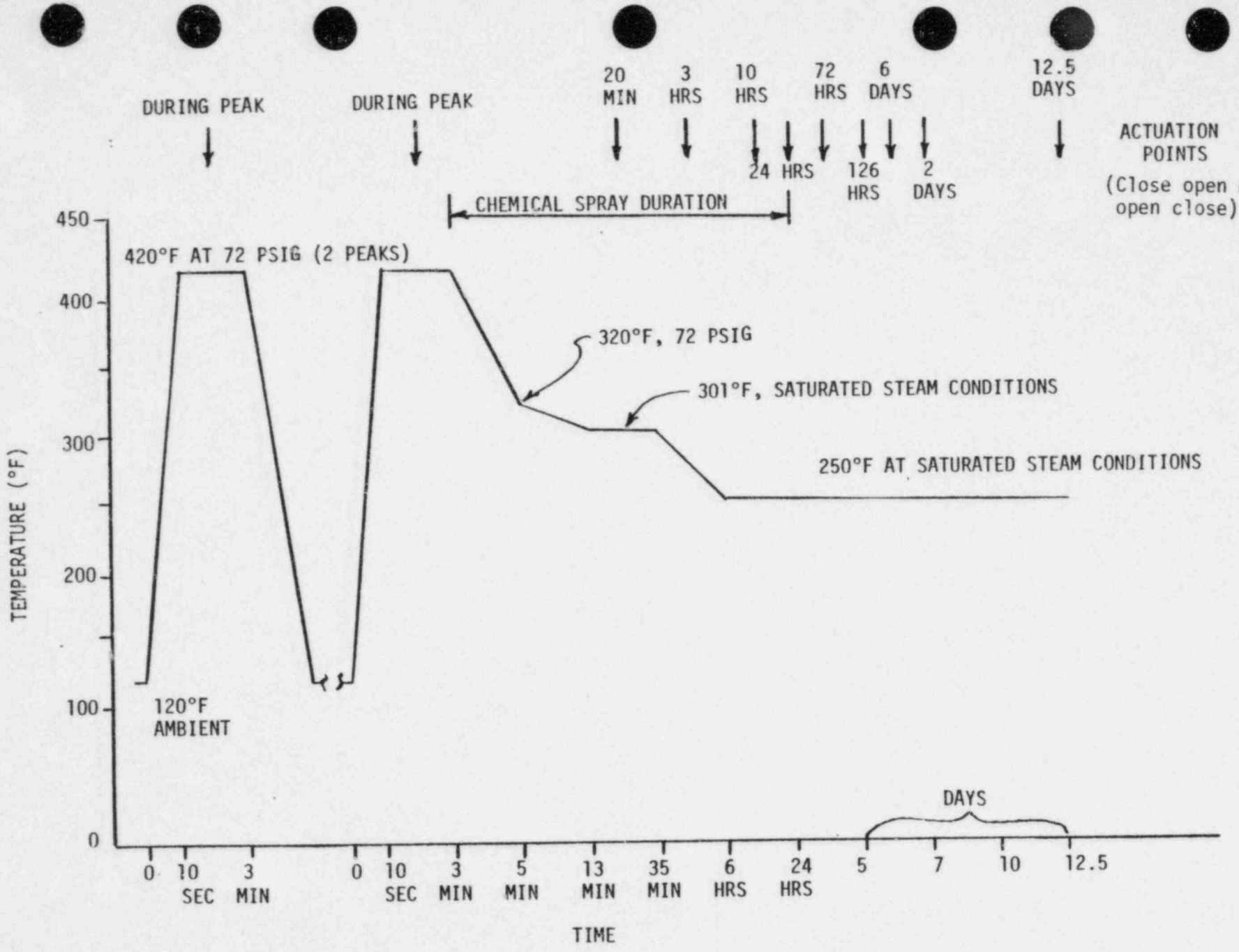

Figure 8 HELB Profile

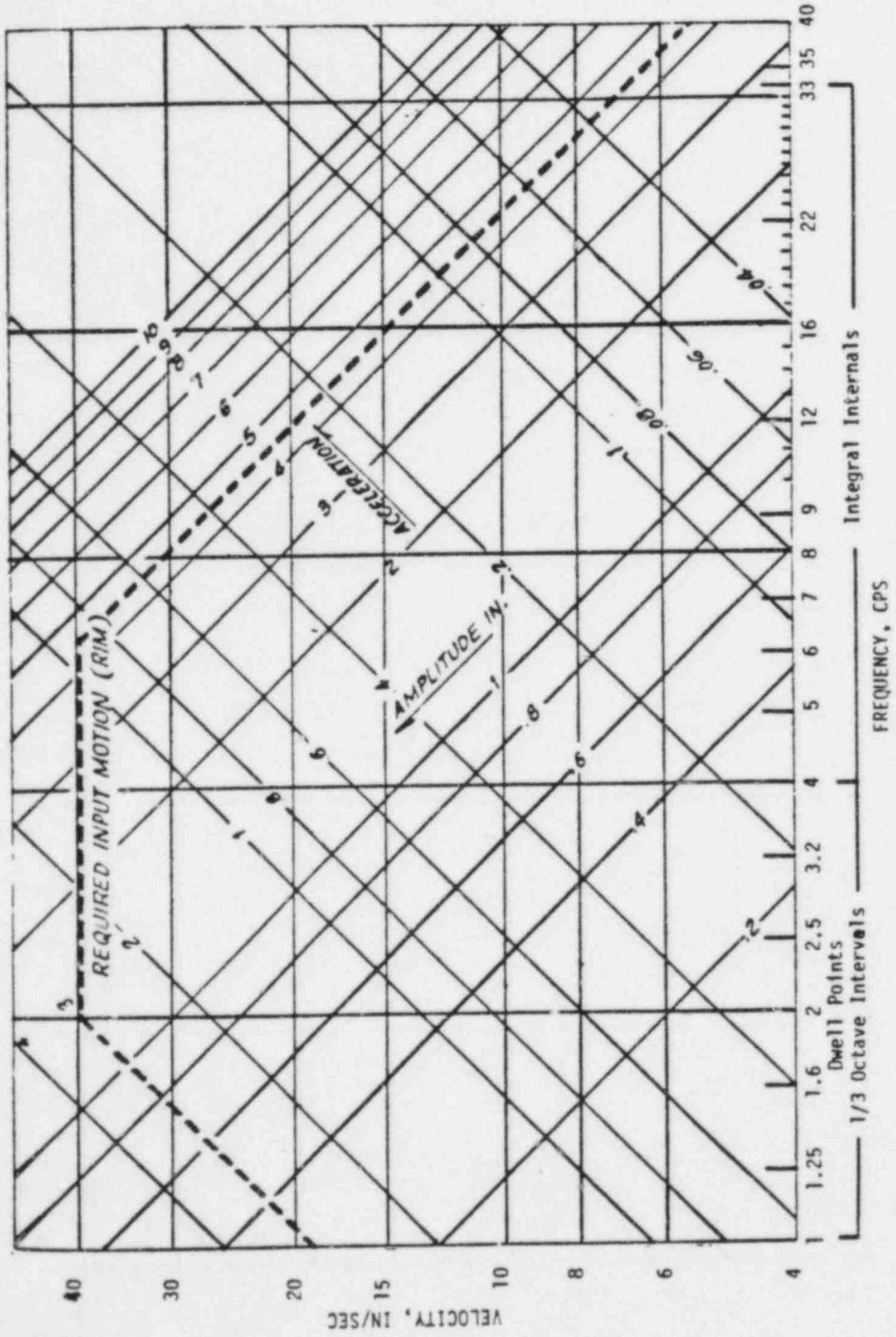

Figure 9 Seismic Qualification Required Input Motion