EQDP-HE-10A
Rev. 1, 5/84

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 the user.

HEAD VENT SYSTEM

Solenoid Operated Isolation Valve (HE-10A)

This system also includes the following pieces of equipment:

Electronic Control Module (HE-10B)
Modulating Valve (HE-10C)

Separate Equipment Qualification Data Packages (EQDPs) and Equipment Qualification Test Reports (EQTRs) have been developed for each of the above pieces of equipment utilized in the Head Vent System.

APPROVED: _____
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SOLENOID OPERATED ISOLATION VALVE

SECTION 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFICATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 90-140 VDC, nominal voltage is 120 VDC

1.1.2 Frequency: N/A

1.1.3 Load: N/A

1.1.4 Electromagnetic Interference: N/A

1.1.5 Other: N/A

1.2 Installation Requirements: The valves must be installed such that the opening to the solenoid enclosure from the conduit hub is effectively sealed from exterior moisture. These valves are line mounted in any orientation.

1.3 Auxiliary Devices: None

1.4 Preventative Maintenance Schedule: Per the Westinghouse Equipment Qualification test program, the only required maintenance to support the qualified life is replacement of the silicone rubber cover gasket with a new, qualified gasket, if the solenoid cover assembly is disassembled for any reason. 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.

1.5 Design Life: 40 years

1.6 Operating Cycles (Expected number of cycles during design life, including test): 20,000 for a 40 year life.

1.7 Performance Requirements for [b]: Solenoid Operated Isolation Valve

	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	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 (Percent RH)	10-100		Ambient	100	100	Ambient	100	100	Ambient
1.8.4	Radiation (R)	1.75×10^7 $_{\gamma}$ 1.0×10^5 Neutrons per square centimeter second		None	3.5×10^4 $_{\gamma}$ 1.8×10^5 $_{\beta}$ Fig. 4 & 6	2.3×10^7 $_{\gamma}$ 1.7×10^8 $_{\beta}$ Fig. 5 & 7	None	1.2×10^5 $_{\gamma}$ 7.8×10^5 $_{\beta}$ Fig. 4 & 6	1.3×10^8 $_{\gamma}$ 1.3×10^9 $_{\beta}$ Fig. 5 & 7	None
1.8.5	Chemicals	None		None	Note d	Note d	None	Note d	Note d	None
1.8.6	Vibration	Figure 1		None	None	None	None	None	None	None
1.8.7	Acceleration(g)	None		None	None	None	3.2/3.2/3.2 (OBE) 4/4/4 (SSE)	None	None	None

Notes:
a: DBE is the Design Basis Event.
b: Margin is not included in the parameters of this section.
c: The valve stroke time. fully closed to fully open or fully open to fully closed, shall not exceed ten (10) seconds.
d: The spray solution contains 2500 ppm Boron buffered with 0.88 percent dissolved Sodium Hydroxide to maintain a ph of 10.5.

1 1.9 Qualified Life: The demonstrated qualified life is 6.16 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 Target Rock Corporation (TRC) 1" Solenoid Operated Globe Valve was conducted at several different test facilities. All functional tests were conducted at Target Rock Corporation, East Farmingdale, N.Y. The inservice thermal aging simulation, mechanical cycling test, containment pressure test simulation, vibration aging, siesmic simulation, and the Design Basis Environment test were conducted at American Environment Co., Inc., a division of East West Technology in West Babylon, N.Y. The inservice and accident gama radiation testing was performed by Isomedix, Inc., in Parisippany, N.J. The inservice neutron radiation testing was performed at the State University of N.Y. at Buffalo.

2.1 Equipment Description: Target Rock Corporation, "one inch solenoid operated globe valve", model 79AB-001, Design Number 1032110-4.

2.2 Number Tested: 1

2.3 Mounting: As defined in Section 1.2

2.4 Connections: As specified by manufacturer on the applicable valve assembly drawings and as defined in Section 1.2

2.5 Aging Simulation Procedure

By a sequential type 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		80	Ambient	Fig. 2 and 3	Fig. 2 and 3
2.6.3	Humidity (Percent RH)	10-100 percent		Ambient	Ambient	100 percent	100 percent
2.6.4	Radiation (R)	2.0×10^7 γ 1.0×10^5 Neutron/cm^2sec		None	None	1.8×10^8 γ	Included under HELB/LOCA
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	3.2/3.2/3.2 (OBE) 4/4/4 (SSE)	None	None

NOTE: (a) The spray solution contains 2500 PPm Boron buffered with 0.88 percent dissolved Sodium Hydroxide to maintain a PH of 10.5.

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, E	A,C,D
	2.7.1.2	Pressure	B, E	A,C,D
	2.7.1.3	Moisture		A,B,C,D,E
	2.7.1.4	Composition	E	A,B,C,D
	2.7.1.5	Seismic Acceleration	C	A,B,D,E
	2.7.1.6	Time	B,C,D,E	A
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,D,E
2.7.6	Category VI - Mechanical Characteristics		
2.7.6.1	Thrust	NA	
2.7.6.2	Torque	NA	
2.7.6.3	Time	NA	
2.7.6.4	Load Profile	NA	
2.7.7	Category VII - Auxiliary Equipment	NA	

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

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/Seismic
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

The sample solenoid valves were type tested in accordance with the preferred test 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 (IEE-382-1972), the capability of the TRC 1" Globe Solenoid Operated Valves bearing the model number 79AB-001 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

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

2.10.3 Test Summary

2.10.3.1 The test valve was randomly selected from a production run, for Westinghouse, as specified by Westinghouse equipment Specification G-955186.

2.10.3.2 The valve was initially performance tested in accordance with the manufacturer's applicable Valve Test Procedure and inspected to insure no damage had occurred since manufacture. The valve successfully completed these performance tests and inspection.

2.10.3.3 The solenoid valve was thermally aged in a controlled oven for a time period and at a test temperature equivalent to a qualified life of 10 years. The valve was cycled during thermal aging 4850 times. Before thermal aging the valve was cycled an additional 15,150 cycles for a total of 20,000 cycles. The test valve was then placed in a pressure chamber and subjected to an ambient pressure of 79 psig, for 24 hours to simulate the containment pressure tests occuring during the design life of the equipment.

2.10.3.4 The valve was radiation tested by exposure to a gamma source for a dosage of 1.85×10^8 Rads. This includes a beta equivalent of 1.3×10^9.

2.10.3.5 The valve was then exposed to 3.15×10^{13} neutrons per square centimeter to simulate normal neutron radiation exposure.

2.10.3.6 The valve was vibration/seismic tested in accordance with the requirements of Figure 1 and IEEE 344-1975. (See Section 1.8.7).

2.10.3.7 The valve was then tested to the HELB environment as detailed in Figure 8.

2.10.3.8 During and after the testing identified in Sections 2.10.3.3 through 2.10.3.6 the valves was performance tested to demonstrate valve operability to the requirements of Sections 1.1 and 1.7.

2.10.4 Conclusion

The demonstrated qualified life of TRC 1 inch Solenoid Operated Valves 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 testing described herein, demonstrate the qualification of the TRC 1 inch Solenoid Operated Valves for a period of 6.16 years employing the practices recommended by Reg. Guide 1.89, 1.100 and 1.73. 1

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. Snider, J. M., "Equipment Qualification Test Report Target Rock Corporation 1 Inch Isolatin Solenoid Valve", WCAP 8687, Supplement 2-H10A (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 TRC 1 Inch Solenoid Operated Valves.

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 REQ	OPERABILITY DEM	ACCURACY(%) REQ	ACCURACY(%) DEM	QUAL LIFE	QUAL METHOD	QUAL REF	QUAL PROGRAM STATUS
Valve solenoid/ Operated/CVCS, SIS, RHR, RCS/ Category a	Containment Bldg.	Target Rock Corp. 1 Inch Solenoid Operated Globe/ 79AB-001	Temperature		420°F	1 yr. Post DBE	1 yr. Post DBE	N/A	N/A	6.16 yrs.	Seq. Test	HE-10A	Completed
			Pressure		57 psig								
			Rel. humidity		100 percent								
			Radiation		$1.85 \times 10^8 R_{(\gamma)}$								
			Chemistry		2500 ppm H_3BO_3 NaOH to 10.5 pH								

1. For definition of the equipment category, 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.

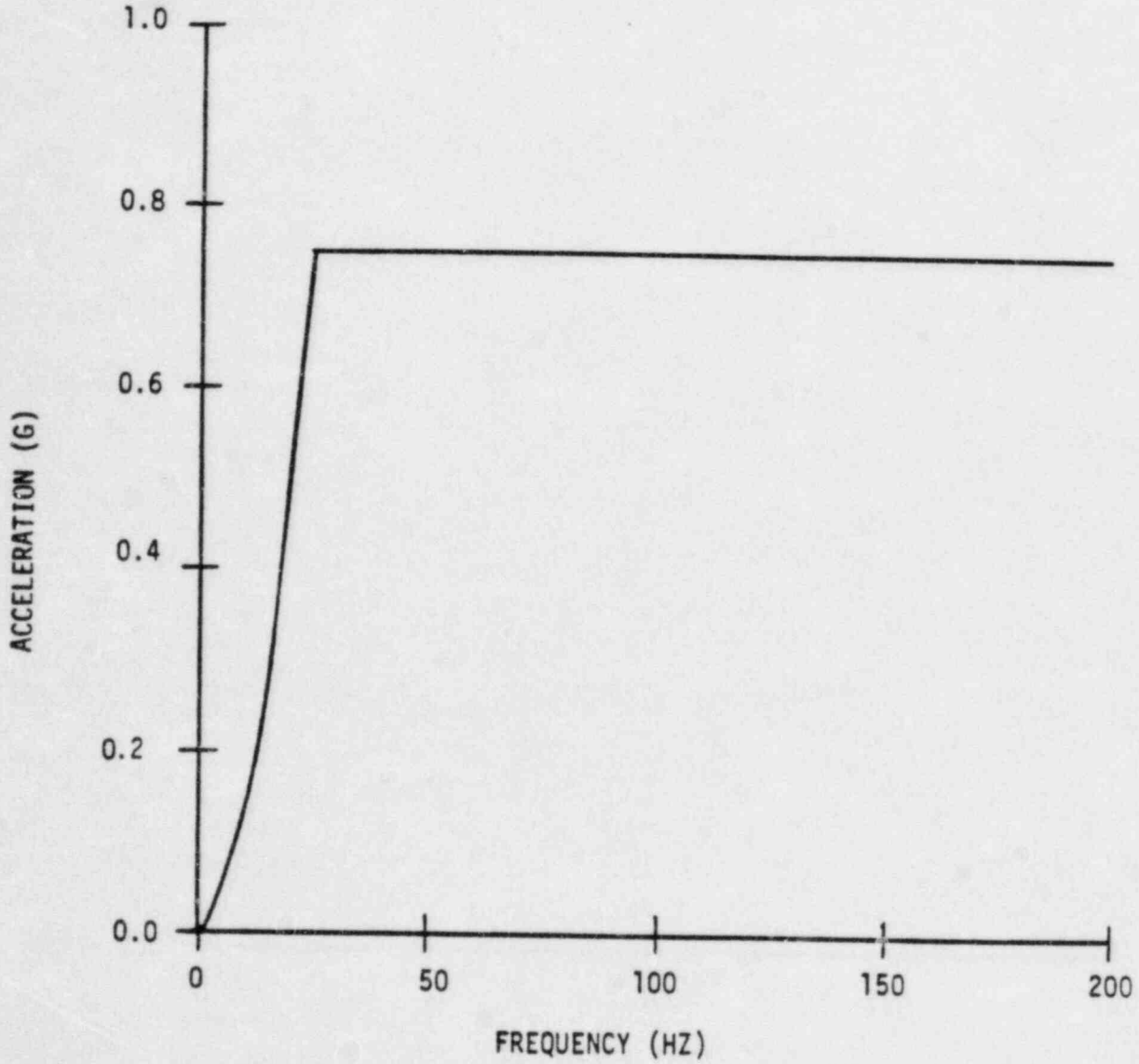

Fig. 1 : Plant Induced Vibration Linear Spectra

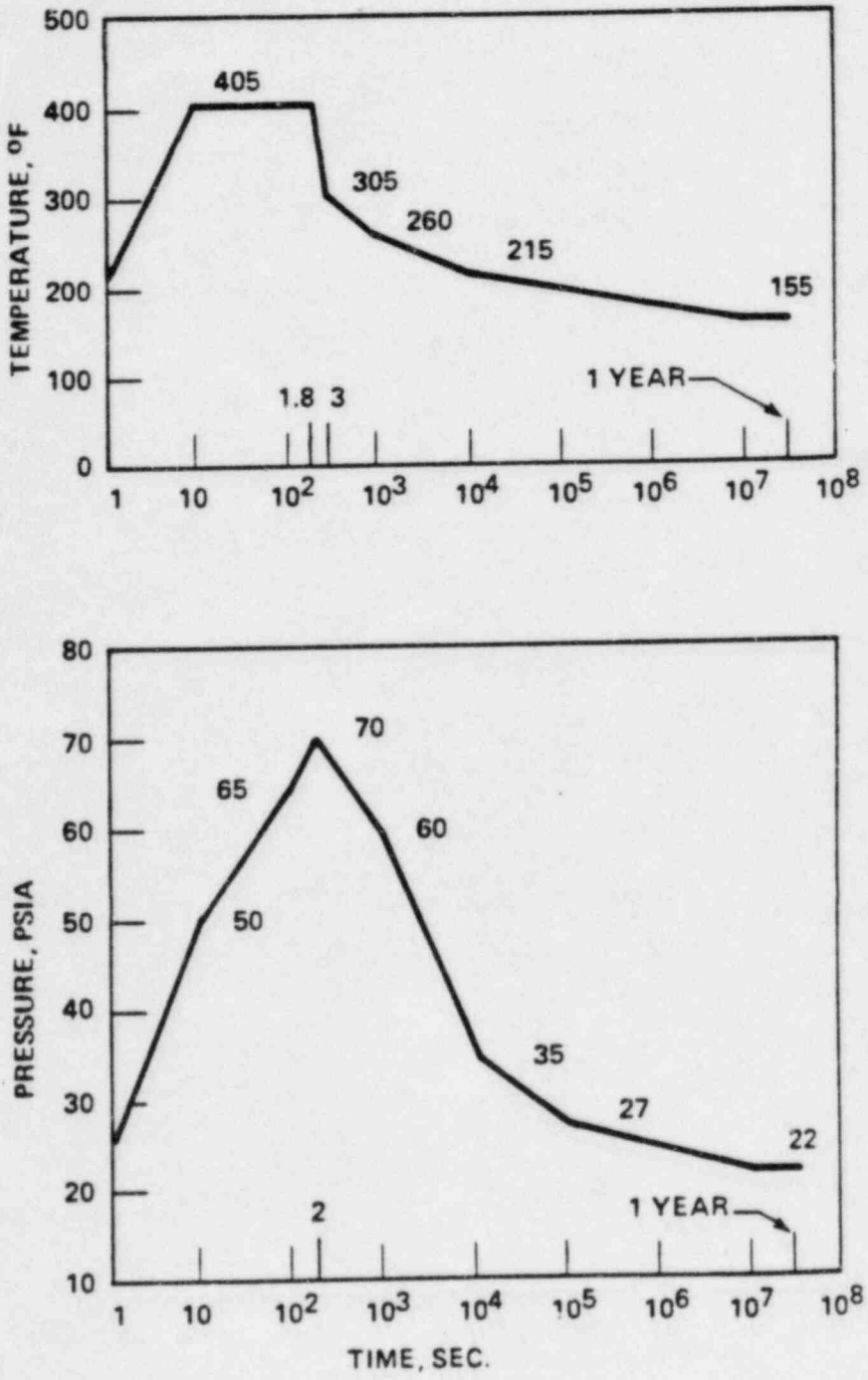

Figure 2 High Energy Line Break

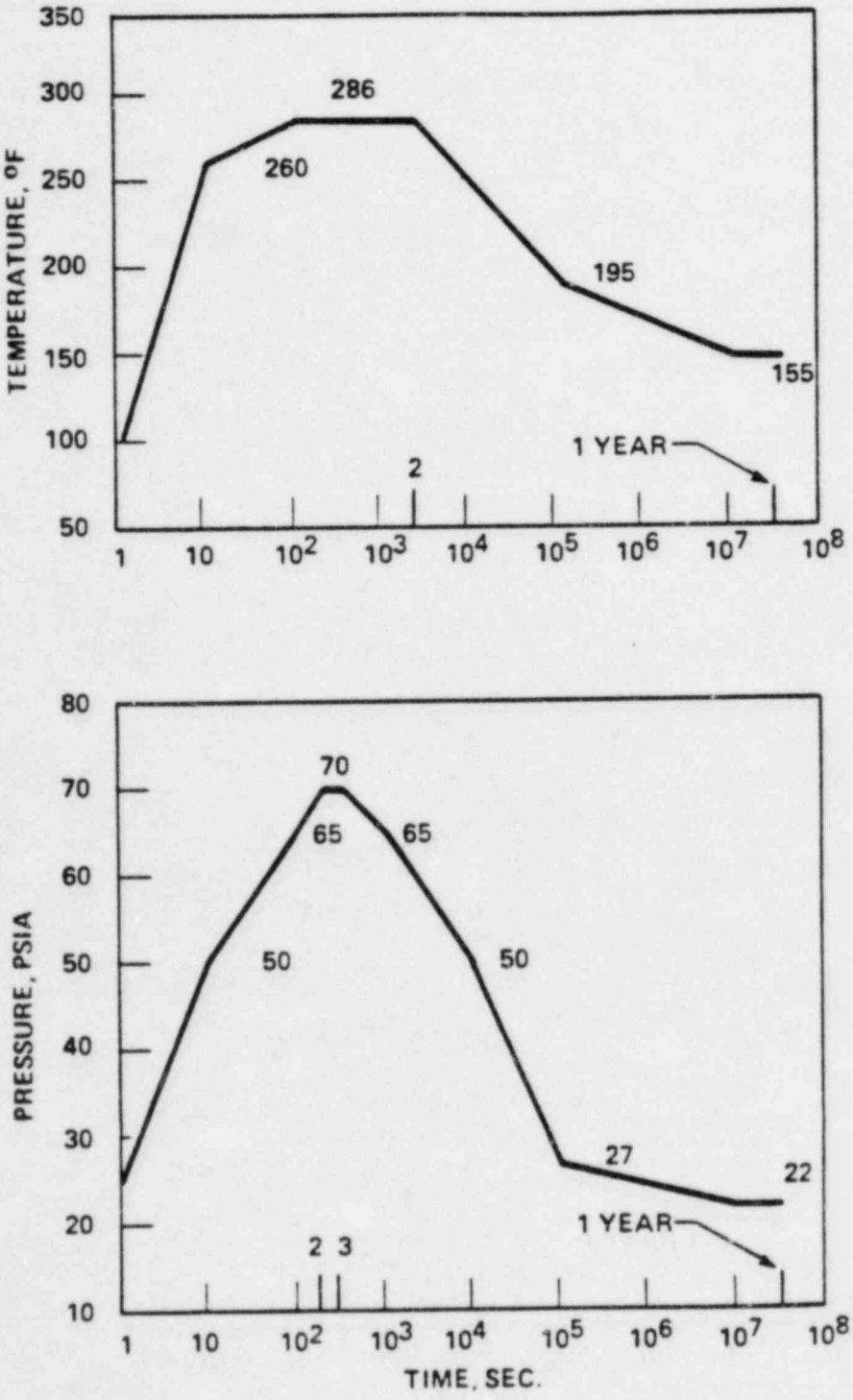

Figure 3 Loss of Coolant Accident Environment

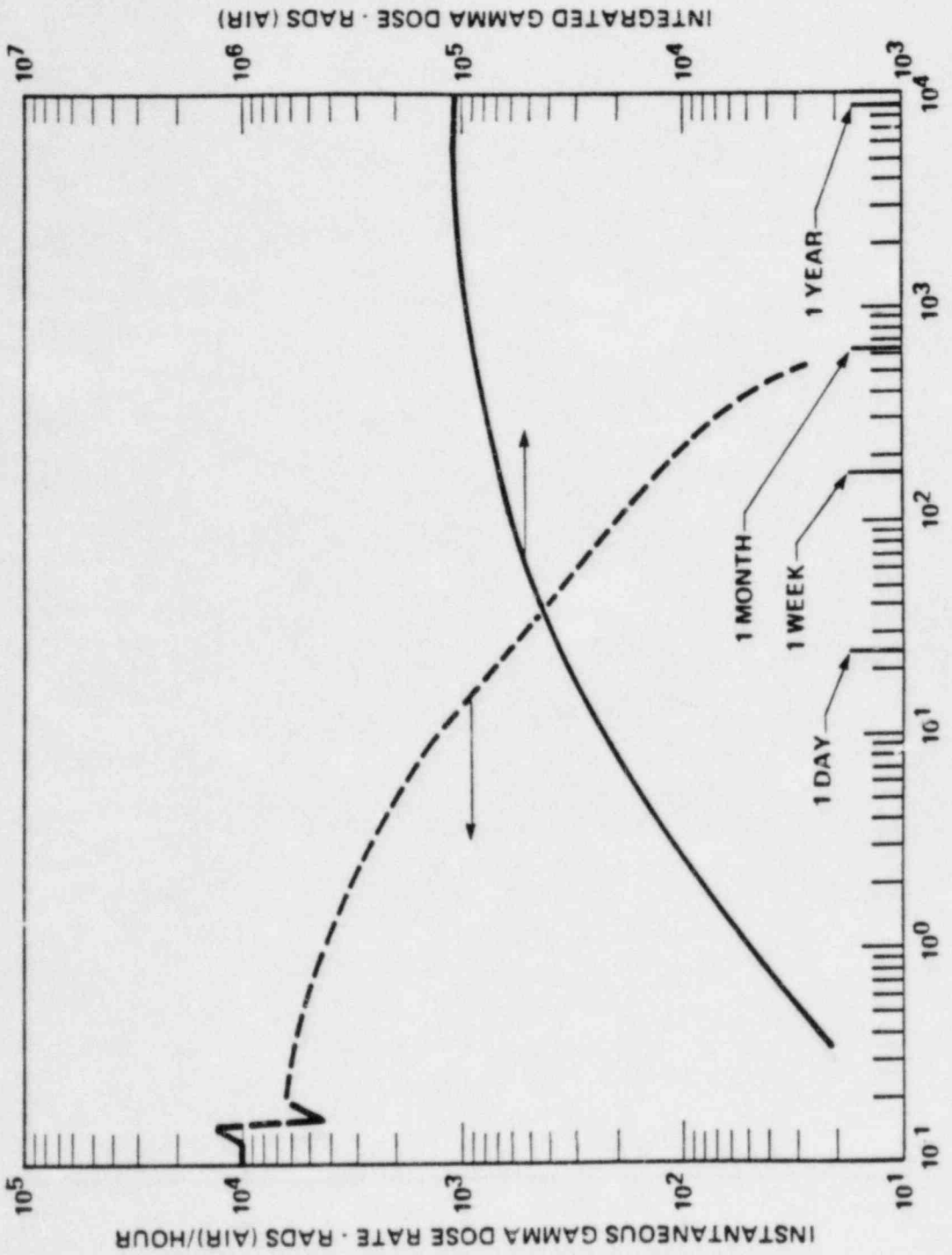

Figure 4 Gamma Dose and Dose Rate Inside the Containment as a Function of Time After a Steam Line Break Accident

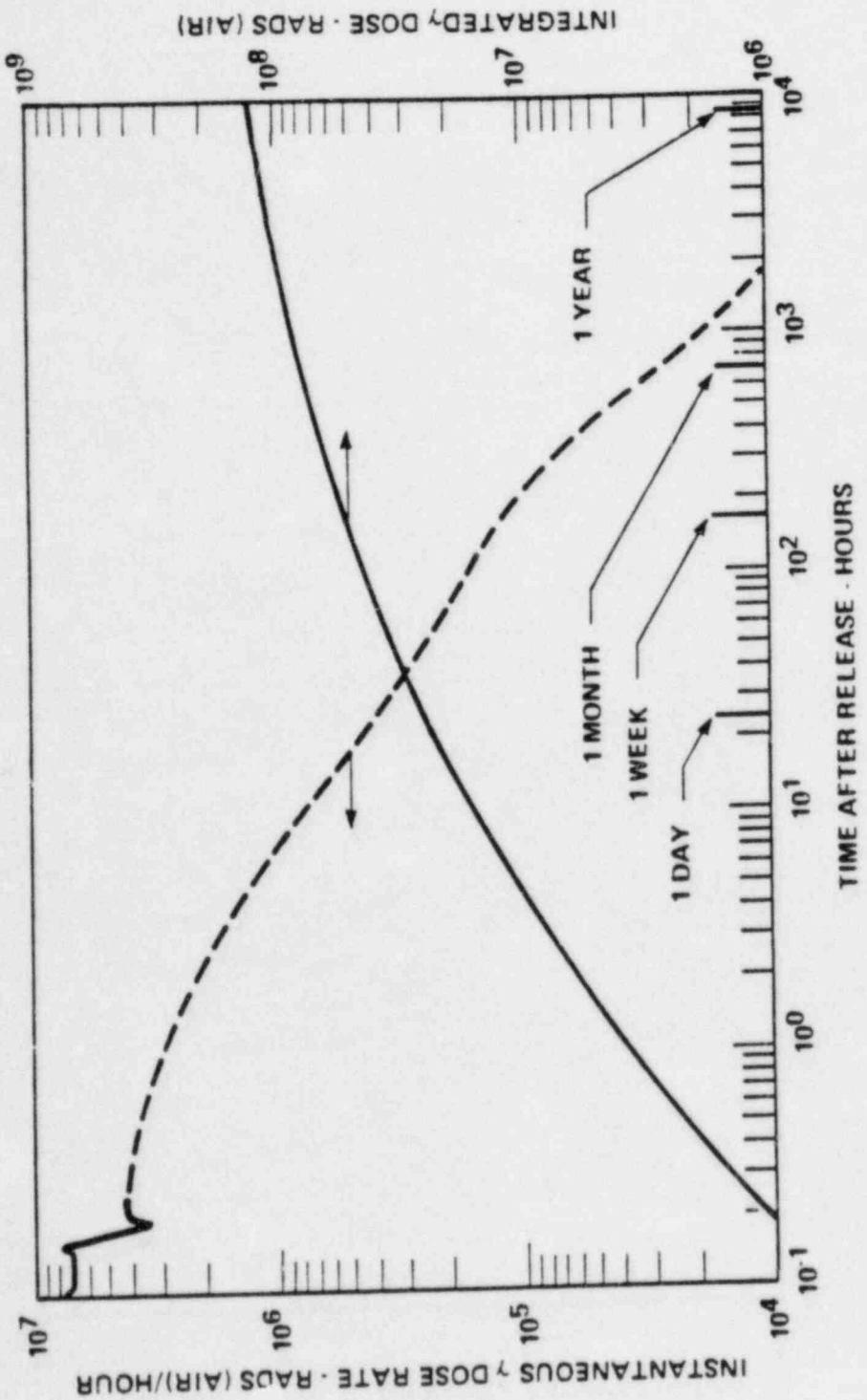

Figure 5 Gamma Dose and Dose Rate Inside the Containment as a Function of Time After LOCA

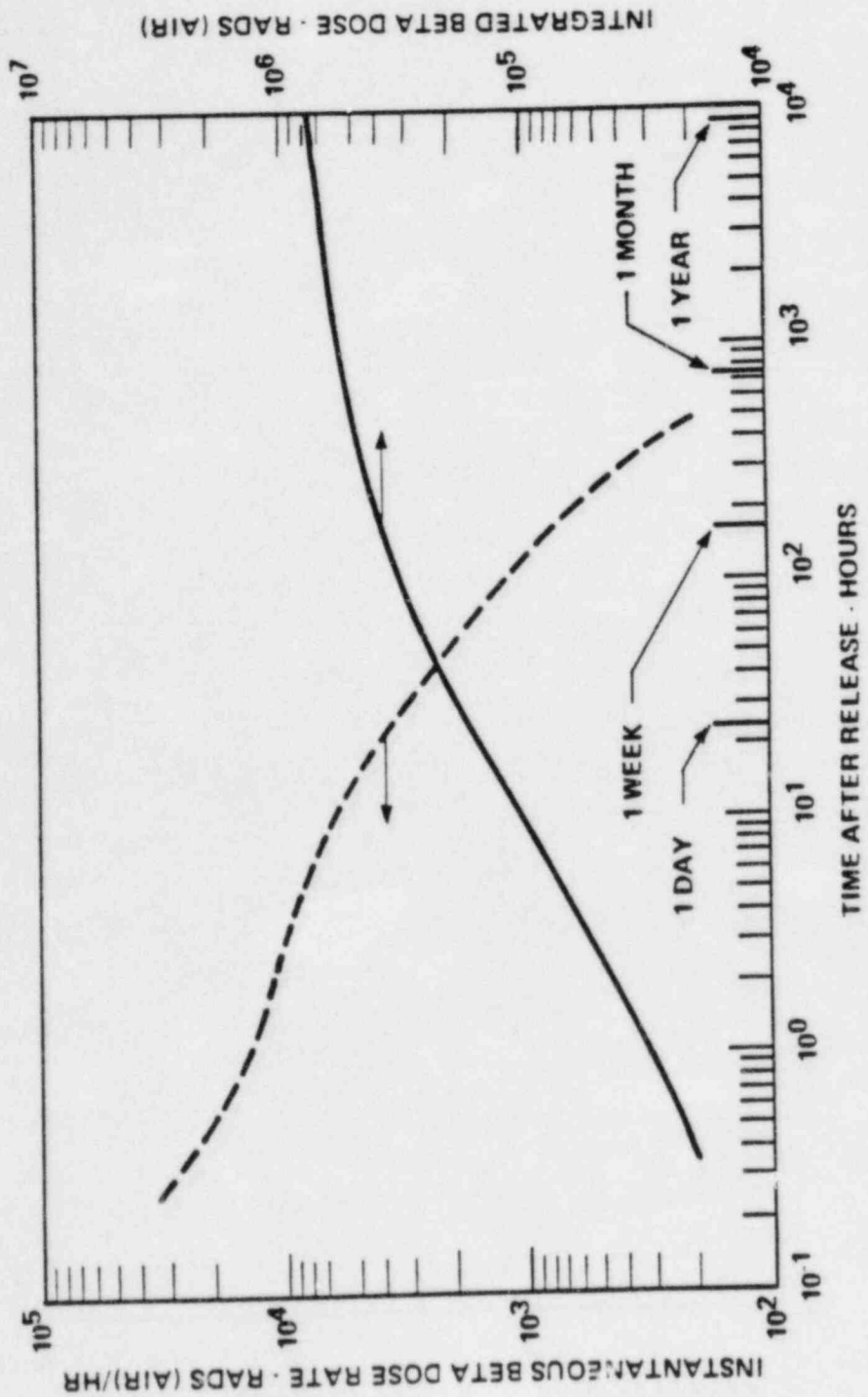

Figure 6 Beta Dose and Dose Rate Inside the Containment as a Function of Time After a Steam Line Break Accident

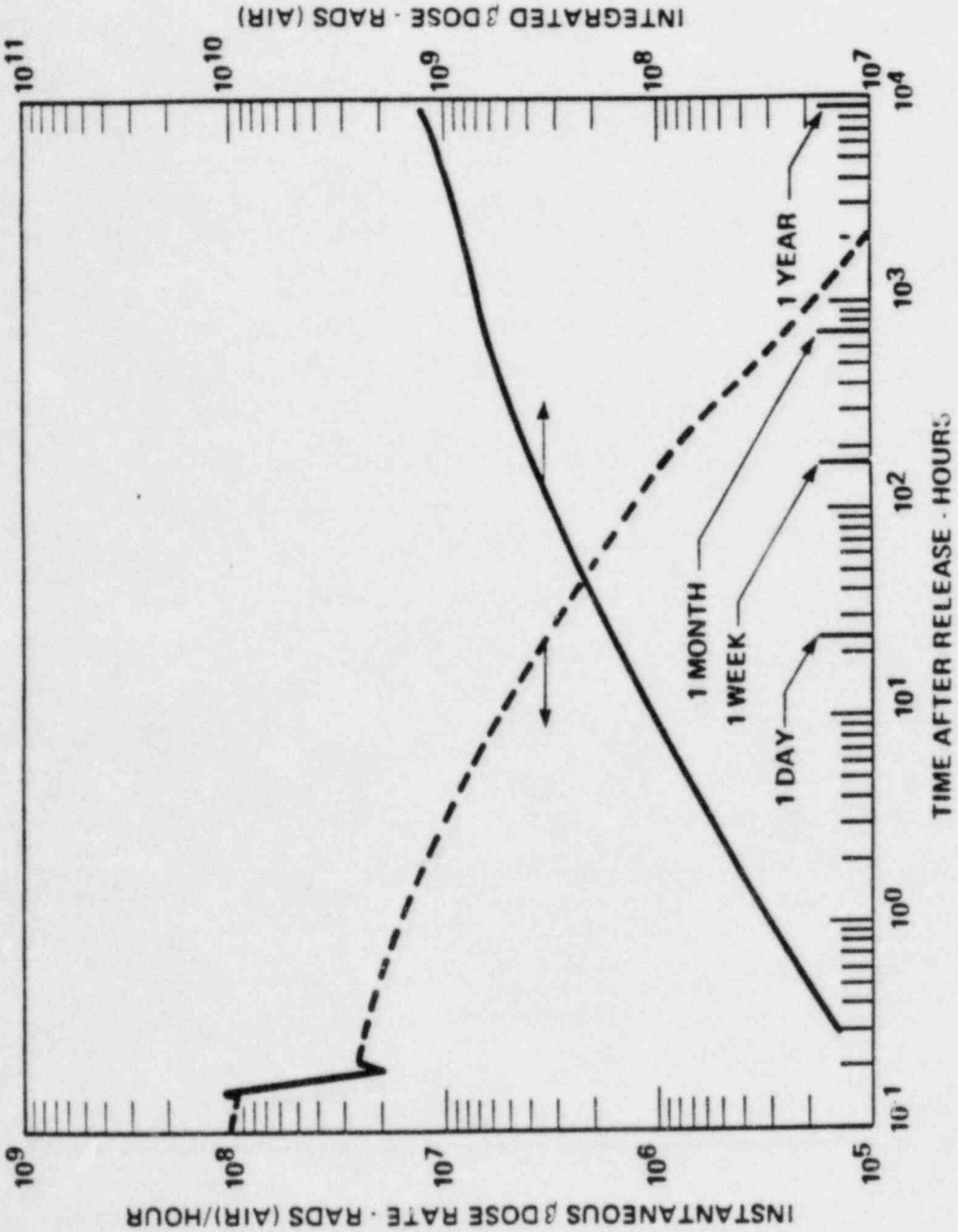

Figure 7 Beta Dose and Dose Rate Inside the Containment as a Function of Time After LOCA

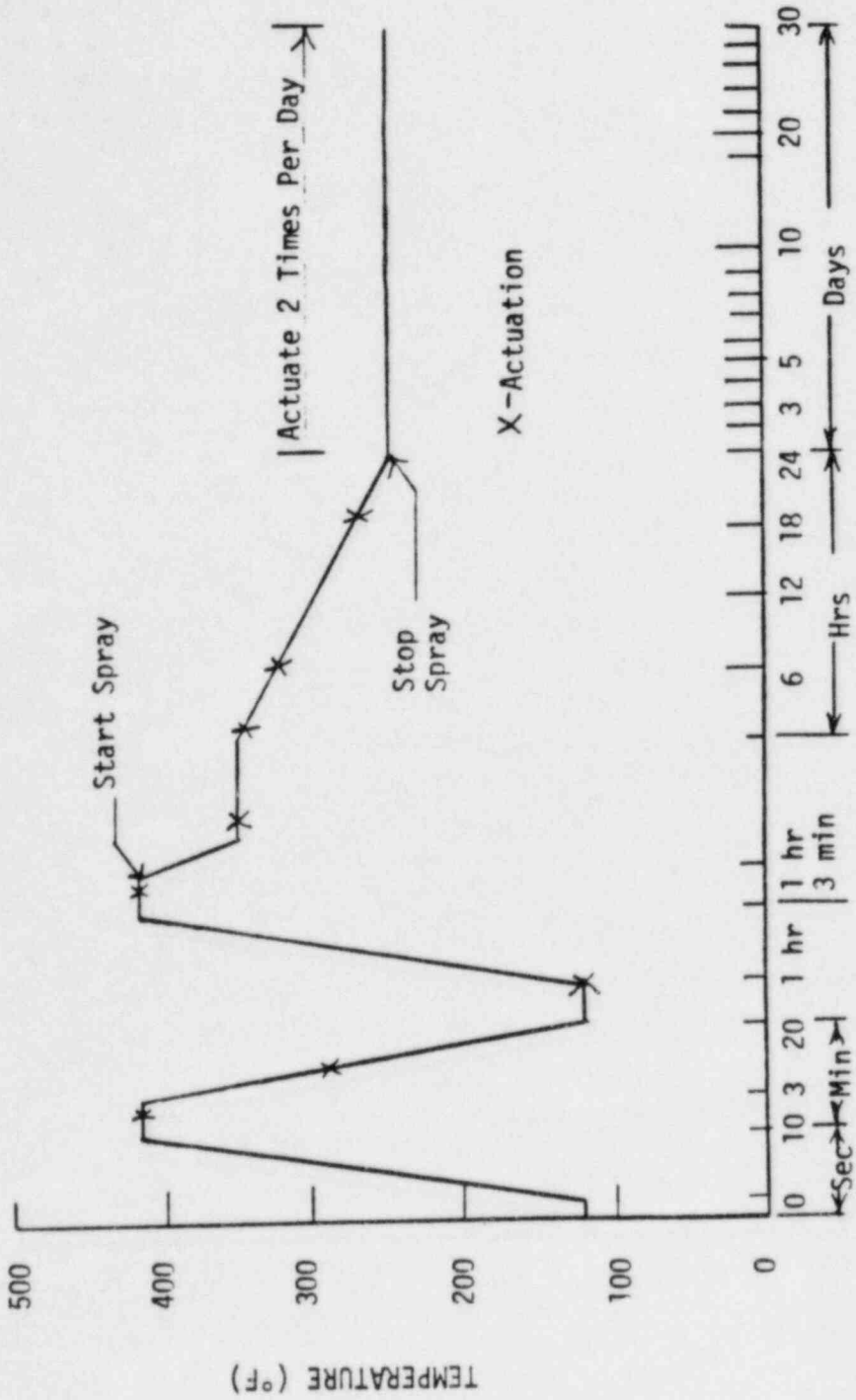

Fig _ 8 Test Chamber Profil r Accident Environment lation