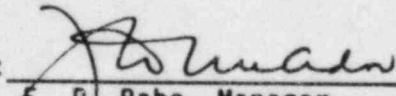


EQUIPMENT QUALIFICATION DATA PACKAGE

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.

Tobar Pressure Transmitters (Group A)

APPROVED:

  
for E. P. Rahe, Manager

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SECTION 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFICATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 20 - 45 VDC  $\pm$  1V

1.1.2 Frequency: N/A

1.1.3 Load: 4 - 20 MA

1.1.4 Electromagnetic Interference: None.

1.1.5 Other: None

1.2 Installation Requirements: Wall mounted per Westinghouse drawing 8765D68.

1.3 Auxiliary Devices: None

1.4 Preventive Maintenance Schedule: Per the Westinghouse Equipment Qualification test program, the maintenance required to maintain the qualified life stated in Section 1.9 is that the cover O-ring must be replaced each time the cover is removed. This does not preclude development of 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): Continuous duty.

1.7 Performance Requirements for<sup>(b)</sup>: Pressurizer Pressure

Parameter	Normal Conditions	Abnormal Conditions	Cont. Test Conditions	DBE Conditions (a)				Post DBE Conditions (a)	
				FLB/SLB	LOCA	Seismic	FLB/SLB	LOCA	Seismic
1.7.1 Time requirement	Continuous	Included under normal	Test Duration	< 5 mins	< 5 mins	Event Duration	4 months	4 months	Continuous
1.7.2 Performance(c) requirement(d)	$\pm 1\%$ 0.4 sec.	Included under normal	No damage	+11% - 16% 0.4 secs	+11% - 16% 0.4 secs	$\pm 11\%$	$\pm 16\%$ 0.4 secs	$\pm 16\%$ 0.4 secs	$\pm 1\%$ 0.4 secs

1.8 Environmental conditions for Section 1.7

1.8.1 Temperature (*F)	50 - 120	Included under normal	Ambient	Fig.2	Fig. 3	Ambient	Figure 2	Figure 3	Ambient
1.8.2 Pressure (psig)	-0.1/+0.3	Included under normal	70	Fig.2	Fig.3	0	Figure 2	Figure 2	0
1.8.3 Humidity (% RH)	0 - 95	Included under normal	Ambient	100	100	Ambient	100	100	Ambient
1.8.4 Radiation (R)	$< 10^4 Y$	Included under normal	None	Included under Post DBE	Included under Post DBE	None	$3.9 \times 10^4 Y$ $6.4 \times 10^8 B$	$4.1 \times 10^7 Y$ $9 \times 10^8 B$	None
1.8.5 Chemicals	None	Included under normal	None	Fig.2	Fig. 3	None	Figure 2	Figure 3	None
1.8.6 Vibration	None	Included under normal	None	None	None	None	N/A	N/A	None
1.8.7 Acceleration (g)	None	Included under normal	None	None	None	Figures 1A,1B,1C	N/A	N/A	None

(a) DBE is the Design Basis Event

(b) Margin is not included in the parameters of this section

(c) Reference accuracy specified. Values shown for accuracy under DBE and Post DBE conditions include  $\pm 1\%$  for normal conditions which is not part of the DBE induced effect.

(d) Time response

1.7 Performance Requirements for<sup>(b)</sup>: Steamline Pressure

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Parameter	Normal Condition	Abnormal Condition	Cont. Test Condition	DBE Conditions (a)			Post DBE Conditions (a)		
				FLB	SLB	Seismic	FLB	SLB	Seismic
1.7.1 Time requirement	Continuous	Included under normal	Test Duration	< 5 min	< 5 min	Event Duration	4 months	4 months	Continuous
1.7.2 Performance(c) requirement(d)	± 1.0% 0.4 sec	Included under normal	No damage	±11% 0.4 sec	±11% 0.4 sec	±11%	± 11% 0.4 secs	± 11% 0.4 secs	± 1% 0.4 secs

1.8 Environmental conditions for Same Function<sup>(b)</sup>

1.8.1 Temperature (°F)	50 - 120	Included under normal	Ambient	Fig.2	Fig. 2	Ambient	Fig. 2	Fig. 2	Ambient
1.8.2 Pressure (psig)	-0.1/+0.3	Included under normal	70	Fig.2	Fig.2	0	Fig. 2	Fig. 2	0
1.8.3 Humidity (% RH)	0 - 95	Included under normal	Ambient	100	100	Ambient	100	100	Ambient
1.8.4 Radiation (R)	< 10 <sup>4</sup> Y	Included under normal	None	Included under post DBE	Included under post DBE	None	3.9x10 <sup>4</sup> Y 6.4x10 <sup>5</sup> B	3.9x10 <sup>4</sup> Y 5.4x10 <sup>5</sup> B	None
1.8.5 Chemicals	None	Included under normal	None	Fig.2	Fig. 2	None	Fig. 2	Fig. 2	None
1.8.6 Vibration	None	Included under normal	None	None	None	None	None	None	None
1.8.7 Acceleration (g)	None	Included under normal	None	None	None	Figures 1A,1B,1C	None	None	None

(a) DBE is the Design Basis Event

(b) Margin is not included in the parameters of this section

(c) Reference accuracy specified. Values shown for accuracy under DBE and post DBE conditions include ± 1% for normal condition which is not part of the DBE induced effect.

(d) Time Response

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1.7 Performance Requirements for<sup>(b)</sup>: Reactor Coolant System Pressure (WR)

Parameter	Normal Conditions	Abnormal Conditions	Cont. Test Conditions	DBE Conditions <sup>(a)</sup>			Post DBE Conditions <sup>(a)</sup>		
				FLB/SLB	LOCA	Seismic	FLB/SLB	LOCA	Seismic
1.7.1 Time requirement	Continuous	Included under normal	Test Duration	Event Duration	Event Duration	Event duration	4 months	4 months	Continuous
1.7.2 Performance(c) requirement(d)	± 1.0% 0.4 sec	Included under normal	No damage	± 11% 0.4 secs.	± 11% 0.4 secs.	Note e	± 11% 0.4 secs.	± 11% 0.4 secs.	± 1.0% 0.4 secs

1.8 Environmental conditions for Same Function<sup>(b)</sup>

1.8.1 Temperature (°F)	50 - 120	Included under normal	Ambient	Fig.2	Fig. 3	Ambient Conditions	Fig. 2	Fig. 3	Ambient
1.8.2 Pressure (psig)	-0.1/+0.3	Included under normal	70	Fig.2	Fig.3	0	Fig. 2	Fig. 3	0
1.8.3 Humidity (% RH)	0 - 95	Included under normal	Ambient	100	100	Ambient	100	100	Ambient
1.8.4 Radiation (R)	< 10 <sup>4</sup> Y	Included under normal	None	Included under post DBE	Included under post DBE	None	3.9x10 <sup>4</sup> Y 6.4x10 <sup>8</sup> B	4.1x10 <sup>7</sup> Y 9x10 <sup>8</sup> B	None
1.8.5 Chemicals	None	Included under normal	None	Fig.2	Fig. 3	None	Fig.2	Fig. 3	None
1.8.6 Vibration	None	Included under normal	None	None	None	None	None	None	None
1.8.7 Acceleration (g)	None	Included under normal	None	None	None	Figures 1A,1B,1C	None	None	None

(a) DBE is the Design Basis Event

(b) Margin is not included in the parameters of this section

(c) Reference accuracy specified. Values shown for accuracy under DBE and Post DBE conditions include ± 1% for normal allowance which is not part of the DBE induced effect.

(d) Time Response

(e) Continued operation required, no specified accuracy or time response

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1.9 Qualified Life: The currently demonstrated qualified life is ten years (10 yrs.) assuming an average ambient temperature of 40°C (104°F). The demonstrated qualified life based on an average ambient temperature of 120°F is six years (6 yrs.).

1.10 Remarks: Beta dose only applicable to transmitter seals.

SECTION 2 - EQUIPMENT QUALIFICATION DATA

2.1 QUALIFICATION PLAN

The qualification of the Tobar Models 32PG1 and 32PA1 Pressure Transmitters (Group A) is based on a combination of analysis and testing. The testing was performed on a Veritrak Model 76PH2 Pressure Transmitter and is described in Reference 2. The analysis is described in Section 4 of this report and in Reference 1.

Complete qualification testing was performed on the Veritrak Model 76PH2 to simulate the following conditions:

- Thermal Aging
- Radiation Environment
- Containment Pressure
- Seismic Environment
- High Energy Line Break (HELB)
- Loss of Coolant Accident (LOCA)

A similarity analysis, described in Section 4, was performed in an effort to extend qualification to the Tobar Models 32PG1 and 32PA1.

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SECTION 3 - QUALIFICATION BY EXPERIENCE

Westinghouse does not employ operating experience in support of the qualification program for the Tobar Group A Pressure Transmitters.



SECTION 4 QUALIFICATION BY ANALYSIS

4.1 COMBINED ANALYSIS AND TEST APPROACH

Westinghouse does not employ methods which rely solely upon analysis in their qualification programs. In the qualification program for the Tobar Models 32PG1 and 32PA1 Pressure Transmitters a combined test and analysis approach was taken.

Testing was performed on the Veritrak Model 76PH2 Pressure Transmitter and documented in Reference 2.

4.2 ANALYSIS

A similarity analysis was performed to establish qualification for the following conditions:

- Thermal Aging
- Radiation Environment
- Containment Pressure
- Seismic Environment
- High Energy Line Break (HELB)
- Loss of Coolant Accident (LOCA)

The two-phase analysis consisted of:

1. A rigorous review of drawings for both the Tobar models and the Veritrak qualification unit. Any differences found between the Tobar Models 32PG1 and 32PA1 and the Veritrak Model 76PH2 qualification unit were noted and investigated.
2. A review of design changes which may have been implemented on the Tobar Models 32PG1 and 32PA1 but not on the Veritrak 76PH2 qualification unit.

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The similarity analysis results showed no differences between the Tobar models and the Veritrak qualification unit which would result in performance outside of the specifications given in Section 1.7 for the conditions given above.

#### 4.3 CONCLUSION

Based on the results of the similarity analysis (Reference 1) comparing the Tobar Models 32PG1 and 32PA1 with the Veritrak Model 76PH2 which was tested and qualified (Reference 2), it is concluded that the Tobar models will perform their required safety functions in an equivalent manner to the Veritrak model under the conditions described in Section 1.7.

<u>Description</u>	<u>Model</u>	<u>W Drawing Number</u>
Gage Pressure Transmitter	32PG1	8765D68/7
Absolute Pressure Transmitter	32PA1	8765D68/7

#### 4.4 REFERENCES

1. Shubert, J. J., "Equipment Qualification Analysis Report, Tobar Differential Pressure Transmitters - Group A", WCAP-8687, Supp. 2-E01C.
2. Skeers, D. M., Drost, P. S., Black, J. P., Rygg, D. E., "Equipment Qualification Test Report, Veritrak Differential Pressure Transmitters - Group A", WCAP-8687, Supp. 2-E01B.

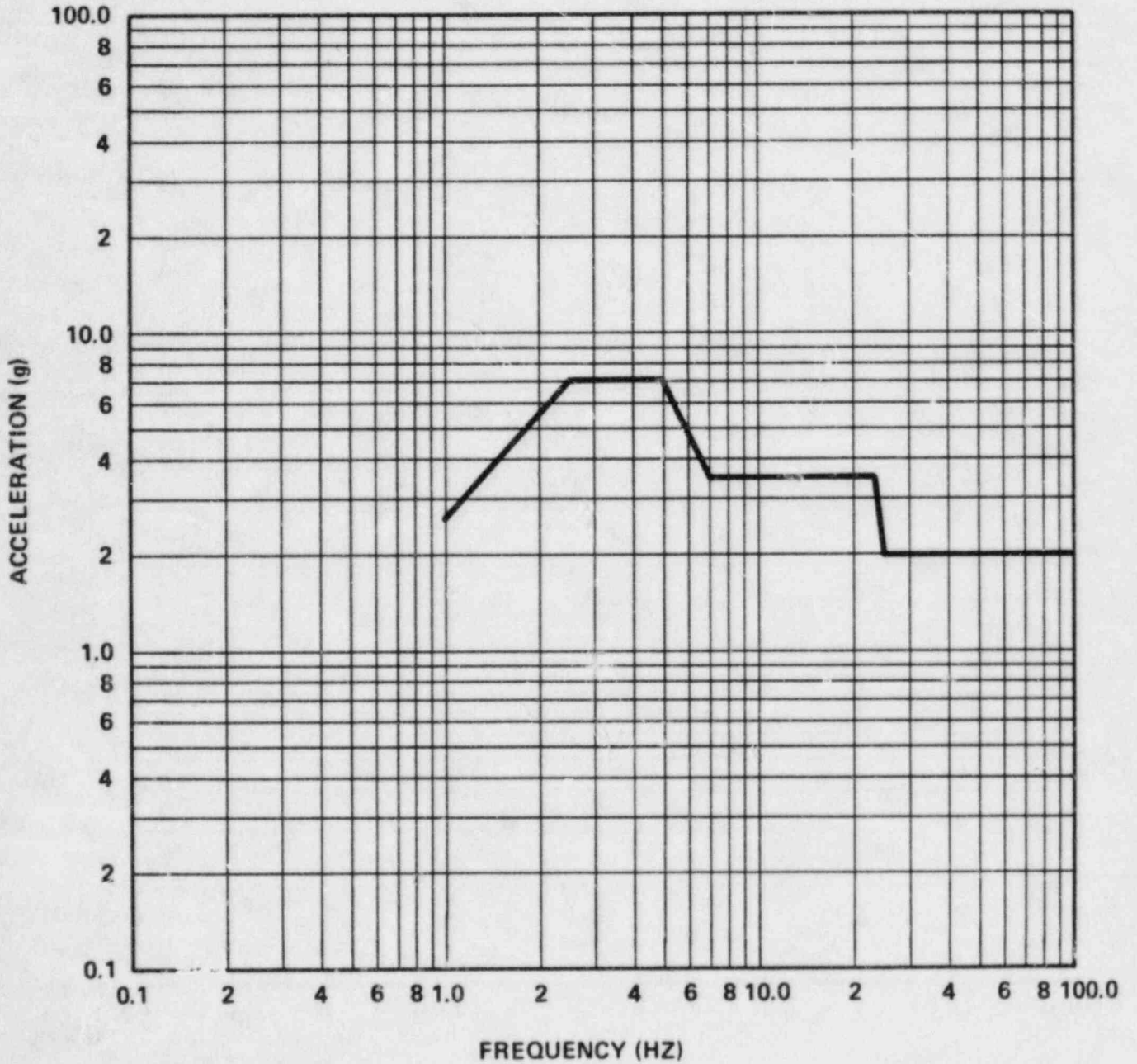


Figure 1A. Required Response Spectrum (RRS) for Safe Shutdown Earthquake (SSE) (Input A) Along the Principal Axis

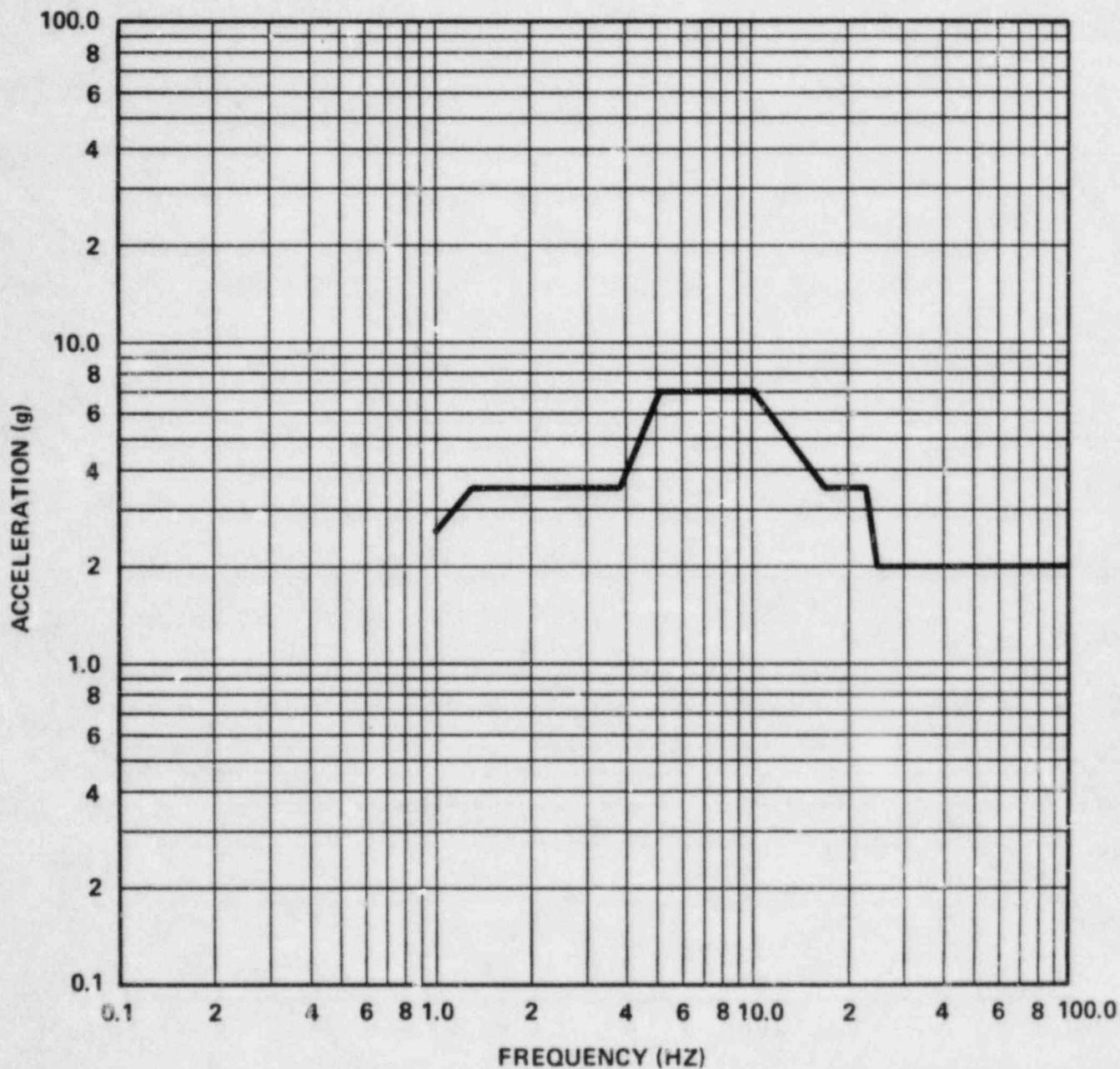


Figure 1B. Required Response Spectrum (RRS) for Safe Shutdown Earthquake (SSE) (Input B) Along the Principal Axis

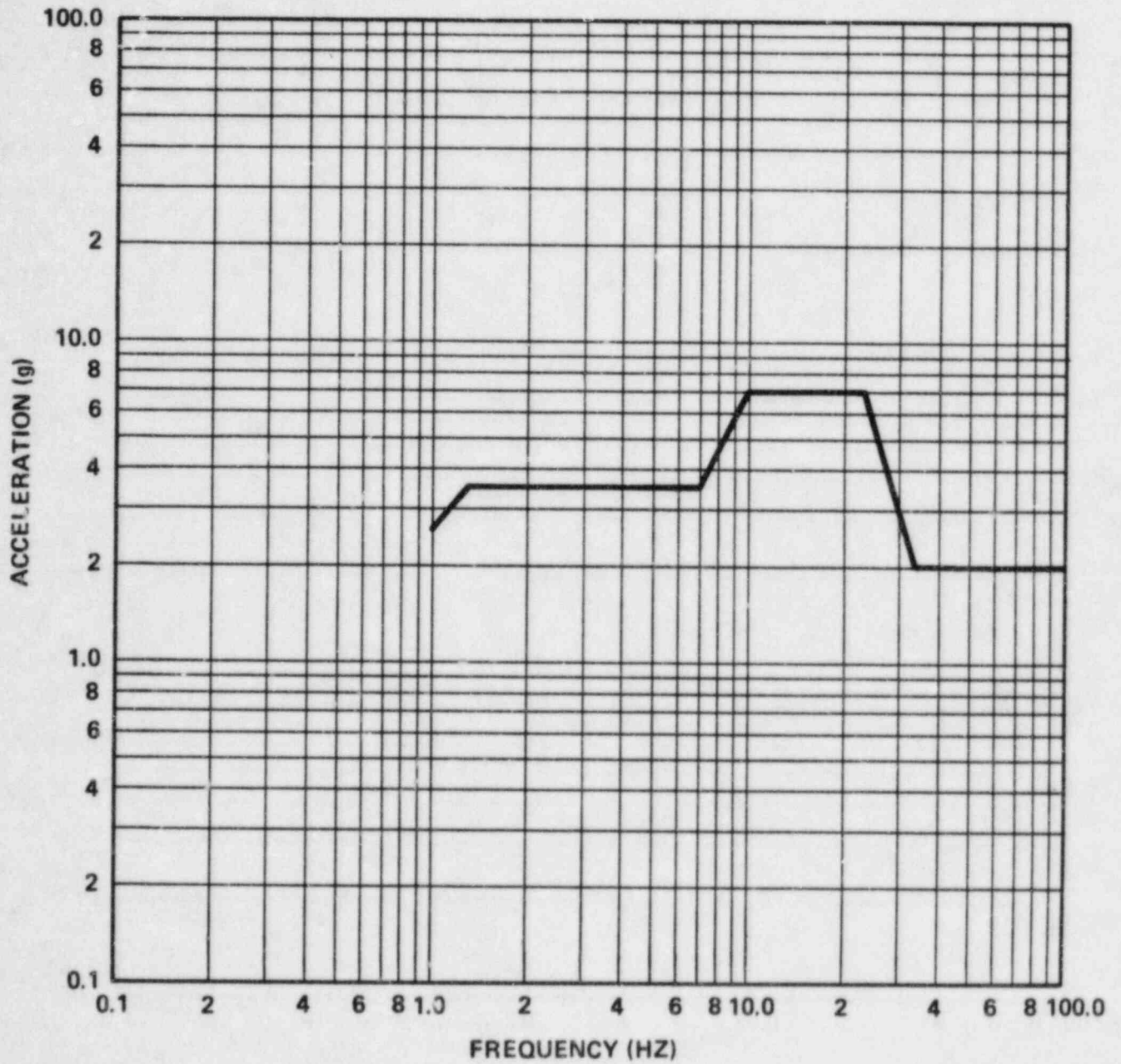


Figure 1C. Required Response Spectrum (RRS) for Safe Shutdown Earthquake (SSE) (Input C) Along the Principal Axis

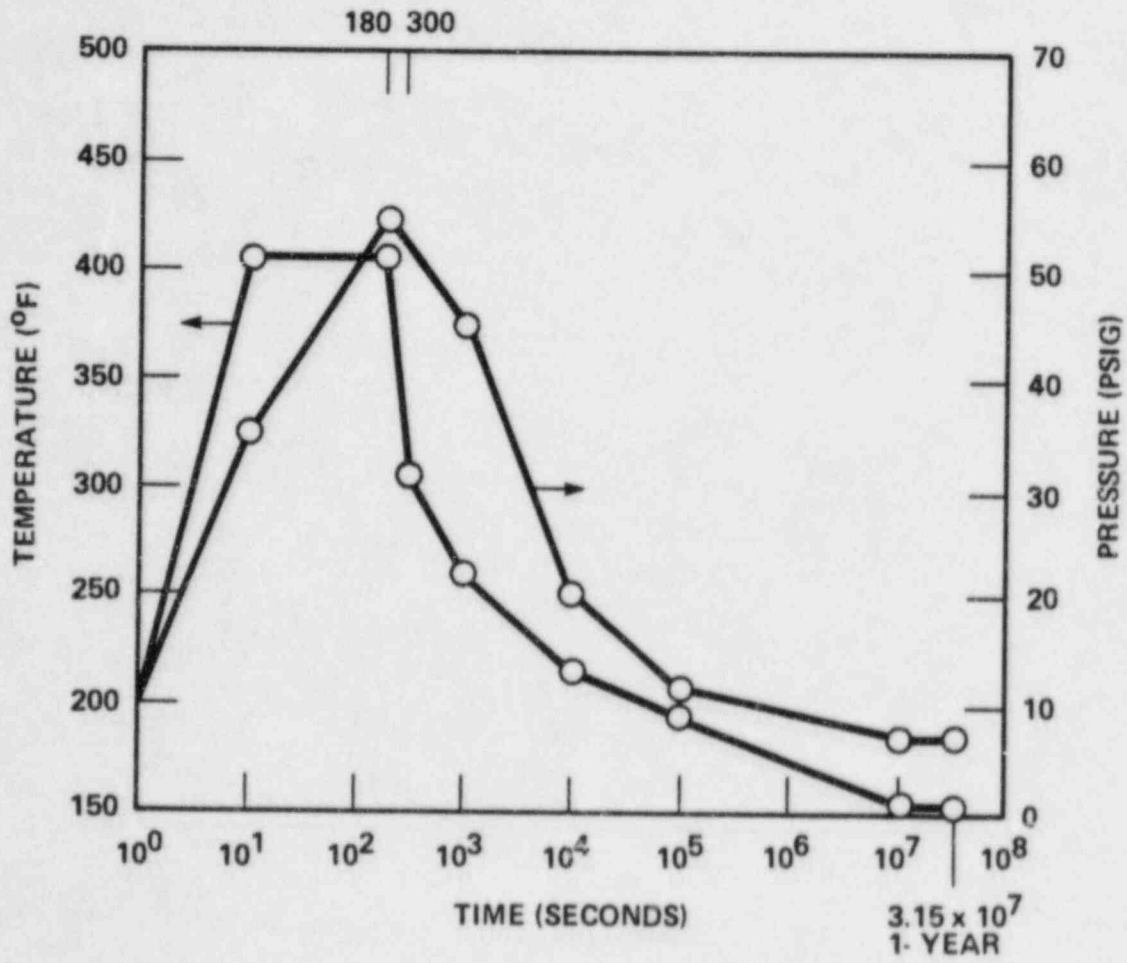
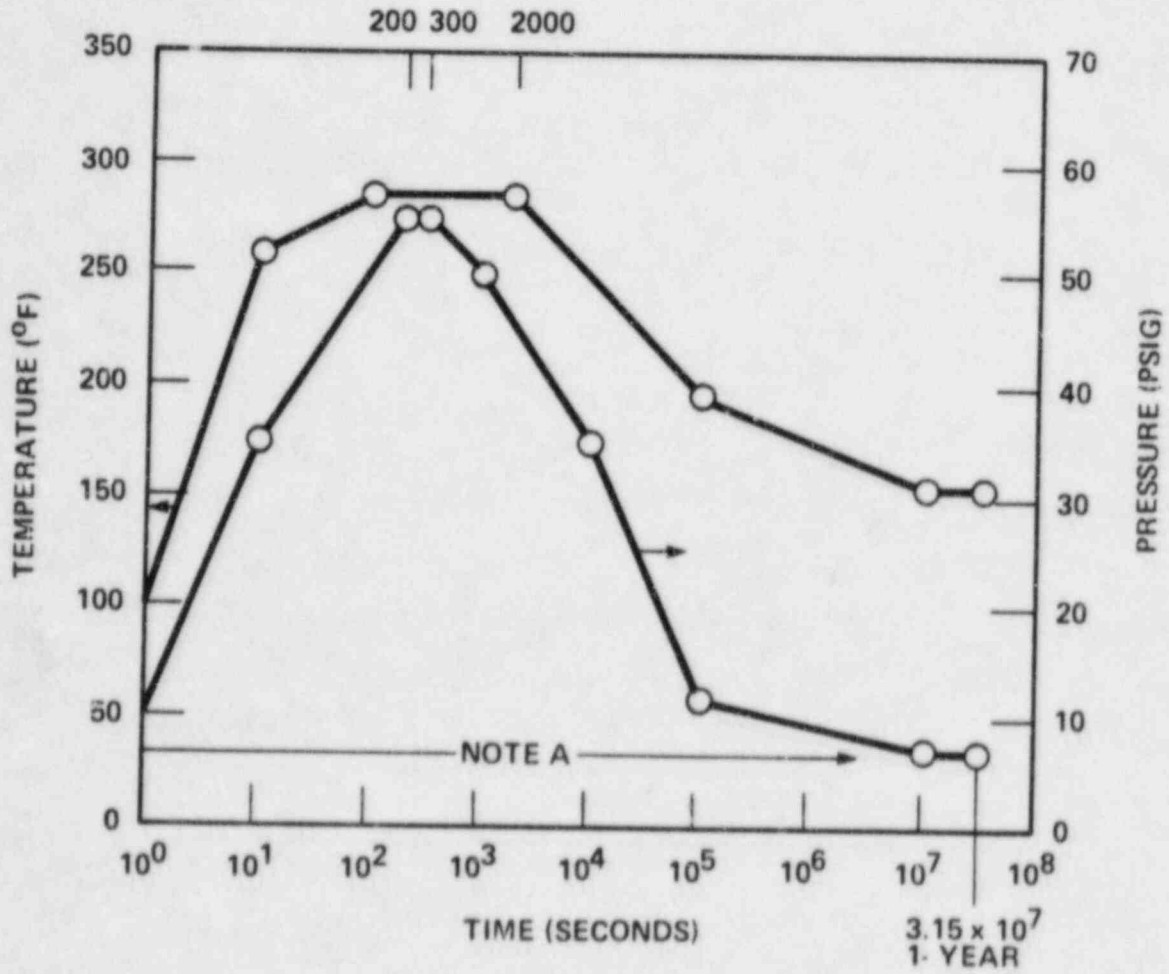


Figure 2: Required HELB Profile



NOTE A: INITIAL 24 HOUR CONTAINMENT SPRAY SOLUTION OF 2500 ppm BORON WITH 0.24% NaOH

Figure 3: Required LOCA Profile