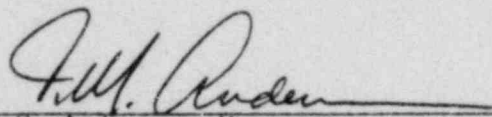


EQUIPMENT QUALIFICATION DATA PACKAGE

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.

Differential Pressure Transmitters: Qualification Group B

APPROVED:

  
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SECTION 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFICATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 40 VDC  $\pm$  1V

1.1.2 Frequency: N/A

1.1.3 Load: 4 - 20 ma

1.1.4 Electromagnetic Interference:  $\pm$ 0.5% (p-p) of output span  
in frequency range which could affect downstream modules.

1.1.5 Other: None

1.2 Installation Requirements: Wall mounted as per Reference 1.

1.3 Auxiliary Devices: Pressure Sensors (included in test program`  
Process Protection System (EQDP-ESE-13)

1.4 Preventative Maintenance Schedule: The details of any preventative  
maintenance schedule, assumed in establishing the qualified life,  
will be specified in this section on completion of the Westinghouse  
Aging Evaluation program.

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>: Reactor Coolant Flow, Feedwater Flow <sup>(d)</sup>

Parameter	Normal Conditions	Abnormal Conditions	Containment 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	N/A	N/A	Event Duration	N/A	N/A	Continuous
1.7.2 Performance (c) requirement	+ 1% 4.0 Sec					+ 11%			+ 1% 4.0 Sec

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

1.8.1 Temperature (°F)	50 - 120	Included under normal	Ambient			Ambient			Ambient Conditions
1.8.2 Pressure (psig)	0		70			0			
1.8.3 Humidity (% RH)	0 - 95		Ambient			Ambient			
1.8.4 Radiation (R)	<4 x 10 <sup>4</sup>		None			None			
1.8.5 Chemicals	None		None			None			
1.8.6 Vibration	None		None			None			
1.8.7 Acceleration (g)	None		None			Fig. 1			

- Notes:
- (a) DBE is the Design Basis Event
  - (b) Margins are not included in the parameters specified in this section
  - (c) Reference accuracy and time response specified
  - (d) For excessive cooldown system applications only

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

Parameter	Normal Conditions	Abnormal Conditions	Containment 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	N/A	<5 min	<5 min	N/A	Continuous	Continuous	Continuous
1.7.2 Performance (c) requirement	+ 1.0% 1 Sec			+ 1% 1 Sec	+ 1% 1 Sec		+ 1% 10 Sec	+ 1% 10 Sec	+ 1% 1 Sec

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

1.8.1 Temperature (°F)	50 - 120	Included under normal		Ambient conditions	Ambient Conditions		Ambient Conditions	Ambient Conditions	Ambient Conditions
1.8.2 Pressure (psiq)	0								
1.8.3 Humidity (% RH)	0 - 95								
1.8.4 Radiation (R)	<400								
1.8.5 Chemicals	None								
1.8.6 Vibration	None								
1.8.7 Acceleration (g)	None								

- Notes: (a) DBE is the Design Basis Event  
 (b) Margins are not included in the parameters in this section  
 (c) Reference accuracy and time response specified for use with containment pressure sensor (EQDP-ESE-21)

1.7 Performance Requirements for<sup>(b)</sup>: Boric Acid Tank Level, Condensate Storage Tank Level

Parameter	Normal Conditions	Abnormal Conditions	Containment 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	N/A	Event Duration	Event Dura.	Event Duration	Continuous	Continuous	Continuous
1.7.2 Performance (c) requirement	+ 1% 1 Sec			as post DBE	as post DBE	Note d	+ 1% 10 Sec	+ 1% 10 Sec	+ 1% 1 Sec
1.8 Environmental Conditions for Same Function <sup>(b)</sup>									
1.8.1 Temperature (°F)	50 - 120	Included under normal		Ambient Conds.	Ambient Conds.	Ambient Conds.	Ambient Conditions	Ambient Conditions	Ambient Conditions
1.8.2 Pressure (psig)	0								
1.8.3 Humidity (% RH)	0 - 95								
1.8.4 Radiation (R)	<400								
1.8.5 Chemicals	None								
1.8.6 Vibration	None								
1.8.7 Acceleration (g)	None								

- Notes:
- (a) DBE is the Design Basis Event
  - (b) Margin is not included in the parameters specified in this section
  - (c) Reference accuracy and time response for system including pressure sensor specified
  - (d) Continued operation required, no specified accuracy

EODP-ESE-4  
Rev. 2 5/80

1.7 Performance Requirements for<sup>(b)</sup>: Refueling Water Storage Tank Level

Parameter	Normal Conditions	Abnormal Conditions	Containment 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	N/A	N/A	N/A	Event Duration	N/A	Continuous	Continuous
1.7.2 Performance (c) requirement	+ 1% 1 Sec					Note d		+ 1% 1 Sec	+ 1% 1 Sec

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

1.8.1 Temperature (°F)	50 - 120	Included under normal				Ambient Conditions		Ambient Conditions	Ambient Conditions
1.8.2 Pressure (psig)	0								
1.8.3 Humidity (% RH)	0 - 95								
1.8.4 Radiation (R)	<400								
1.8.5 Chemicals	None								
1.8.6 Vibration	None								
1.8.7 Acceleration (g)	None								

- Notes:
- (a) DBE is the Design Basis Event
  - (b) Margin is not included in the parameters specified in this section
  - (c) Reference accuracy and time response specified
  - (d) Continued operation required, no specified accuracy

1.9 Qualified Life: The demonstrated qualified life will be specified in this section on completion of Subprogram C of the Westinghouse Aging Evaluation Program. (Appendix B to WCAP-8587).

1.10 Remarks: None

SECTION 2 - QUALIFICATION BY TEST

2.0 TEST PLAN

2.1 Equipment Description: Barton (Lot #3) Pressure Transmitters (See Section 2.10.2)

2.2 Number Tested: Four (4) units

2.3 Mounting: As described in Reference 1.

2.4 Connections: a) Electrical Connections, Two Wires,  
b) Process Connections, Capillary Tube

2.5 Aging Simulation Procedure

By a separate component test program as described by Subprogram C of Appendix B to WCAP-8587



2.6 Service Conditions to be simulated by test<sup>(1)</sup>

	<u>Normal</u>	<u>Abnormal</u>	<u>Containment Test</u>	<u>Seismic</u>	<u>HELB</u>	<u>Post-HELB</u>
2.6.1 Temp. (°F)	Note a	Included under normal	N/A	Ambient	N/A	N/A
2.6.2 Pressure (psig)				0		
2.6.3 Humidity (% RH)				Ambient		
2.6.4 Radiation (R)				None		
2.6.5 Chemicals				None		
2.6.6. Vibration				5 OBE's		
2.6.7 Acceleration (g)				TRS>RRS		

Note a: See Section 2.10.3.1.

## 2.7 Measured Variables

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

	<u>Required</u>	<u>Not Required</u>
2.7.1 Category I - Environment		
2.7.1.1 Temperature	A	B
2.7.1.2 Pressure	A	B
2.7.1.3 Moisture	A	B
2.7.1.4 Gas Composition		A,B
2.7.1.5 Seismic Acceleration	B	A
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		A,B
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

	<u>Required</u>	<u>Not Required</u>
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: Operational Test, Normal and Abnormal Conditions

B: Seismic Testing

## 2.8 Test Sequence Preferred

This section identifies the preferred test sequence 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 Seismic
- 2.8.6 Operation (Simulated High Energy Line Break Conditions)
- 2.8.7 Operation (Simulated Post HELB Conditions)
- 2.8.8 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;

The DBE is simulated by the Seismic Test sequence of Section 2.9.1. The HELB Tests (Section 2.8.6 and 2.8.7) have been excluded since the Group B Differential Pressure Transmitters are not exposed to the HELB environment due to their location. The production test of Section 2.9.2 is performed on all production units to verify their performance at normal and abnormal temperatures of 80°F and 130°F respectively as well as providing a check on the peak-to-peak noise level. The Abnormal Extremes Test of Section 2.9.2 was performed on similar equipment as permitted by IEEE-323-74 Section 6.3.2(3). The aging test employs the preferred test sequence (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 Group B Differential Pressure Transmitters. The Aging Tests will demonstrate that during the qualified life there are no in-service aging mechanisms capable of reducing the capability of the Group B Differential Pressure Transmitters to perform during or after a seismic event. As a consequence, the seismic testing on the un-aged Group B Differential Pressure Transmitters, is not prejudiced by any in-service aging mechanisms.

<u>Step</u>	<u>Notes</u>
2.9.1 Seismic Test Sequence	
2.8.1 )	Seismic (DBE) test sequence
2.8.2 )	
2.8.5 )	
2.8.8 )	
2.9.2 Production Test Sequence	
2.8.1 )	Calibration performed at 80°F and 130°F completes a performance test on all production units
2.8.2 )	
2.8.3 )	
2.8.8 )	
2.9.3 Environmental Test Sequence	
2.8.1 )	Environmental type test sequence on similar piece of equipment as permitted by IEEE-323-74 Section 6.3.2(3).
2.8.2 )	
2.8.3 )	
2.8.4 )	
2.9.4 Aging Test Sequence	
2.8.1 )	Aging to be addressed by separate testing as described in Subprogram C of Appendix B to WCAP-8587
2.8.2 )	
2.8.4 )	
2.8.5 )	
2.8.8 )	

## 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) and Reg. Guide 1.100 (IEEE 344-1975), the capability of the Differential Pressure Transmitters (Qualification Group B) to complete their safety related functions described in EQDP Section 1.7 while exposed to the applicable environments defined in EQDP Section 1.8.

### 2.10.2 Equipment Tested

#### 2.10.2.1 Normal Environment Testing

The normal environment calibration tests are performed on each production transmitter.

#### 2.10.2.2 Seismic Testing

Four Barton (Lot #3) Differential Pressure Transmitters (Qualification Group B) were tested. For more details see Table 1 of Reference 1.

#### 2.10.2.3 Aging Evaluation Program

A representative sample of critical components from the Differential Pressure Transmitters will be included in Subprogram C of the Aging Evaluation Program described in Appendix B to WCAP 8587.

### 2.10.3 Test Summary

#### 2.10.3.1 Normal and Abnormal Environment Testing

Westinghouse requires that the Qualification Group B Differential Pressure Transmitters be located such that they do not experience a consequent adverse environment when required to operate following a high energy line break either inside or outside containment. Therefore the only environmental testing required is to demonstrate equipment capabilities under normal and abnormal extremes.

Reference 2 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.

Westinghouse requires a calibration at 80<sup>0</sup>F and 130<sup>0</sup>F and a noise check on every production unit. Time response and ability to meet performance requirements at 95% RH have been verified by type test.

#### 2.10.3.2 Seismic Tests

The single design basis event capable of producing an adverse environment at the equipment location is a seismic event. The seismic testing reported

in Reference 1 was completed on new equipment employing multi-axis multi-frequency inputs in accordance with Reg. Guide 1.100 (IEEE-344-1975). The generic required response spectra (Figure 1) contains significant margin with respect to any single plant application referencing this program(1).

#### 2.10.3.3 Aging Evaluation

Subprogram C of the Westinghouse Aging Evaluation Program (Appendix B, WCAP 8587) will incorporate a representative sample of components from the Qualification Group B Differential Pressure Transmitters. This program is currently in progress and will be reported in WCAP-8587, Supplement 2, Appendix A, (Non-Proprietary), WCAP-8687, Supplement 2, Appendix A, (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 Qualification Group B Differential Pressure Transmitters to perform during or after a seismic event. As a consequence, the seismic testing on the un-aged transmitters described above, is not prejudiced by any in-service aging mechanism.

#### 2.10.4 Conclusion

The demonstrated qualified life of the Qualification Group B Differential Pressure Transmitters will be established by Subprogram C 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 Group B Differential Pressure Transmitters employing the practices recommended by Reg. Guide 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. McElhanev, D. L., R. B. Miller "Equipment Qualification Test Report Differential Pressure Transmitters - Qualification: Group B (Seismic Design Verification Testing)" WCAP-8687-Supp. 2-E04A (Proprietary), WCAP-8587-Supp. 2-E04A (Non-Proprietary), May 1980.
2. Damerow F. W., "Effects of Gamma Radiation Doses Below  $10^4$  Rads on the Mechanical Properties of Materials", WCAP-9741 (Non-Proprietary), (Currently in Progress).

SECTION 3 AND 4 QUALIFICATION BY EXPERIENCE AND/OR ANALYSIS

Westinghouse does not employ operating experience or analysis in support of the qualification program for the Differential Pressure Transmitters - Qualification Group B.

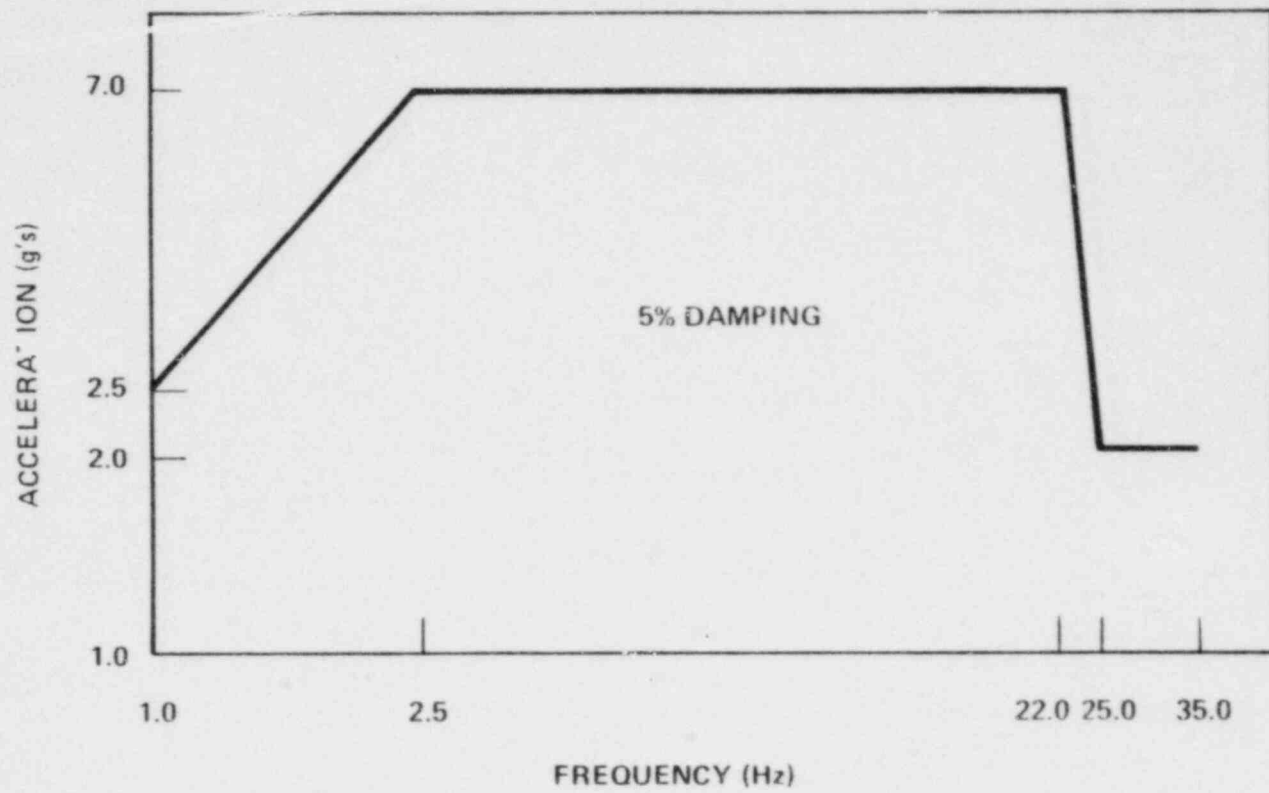


Figure 1 Required Response Spectrum for Safe Shutdown Earthquake (SSE) Transmitter Seismic Qualification  
 (Note: Operating Basis Earthquake (OBE) Required Response Spectrum = 0.5 SSE)