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

Threadow APPROVED:

Nuclear Safety Department



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WESTINGHOUSE ELECTRIC CORPORATION NUCLEAR ENERGY SYSTEMS P.O. BOX 355 PITTSBURGH, PENNSYLVANIA 15230

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Margins are not included in the parameters specified in this section

Reference accuracy (maximum normal temperature) and time response specified (b) (d)

Reference accuracy \pm 10% deviation during event

1.7 Performance Requirements for (b); Feedwater Flow (d)

				Containment	DBE	Condit	ions ^(a)	Post	DBE Conditio	ms(a)
	Parameter	Normal Conditions	Abnormal Conditions	Test Conditions	FLB/SLB	LOCA	Seismic	FLB/SLB	I DEA	Seismic
1.7.1	Time requirement	Continuous	Included under normal	N/A	N/A	N/A	Event Duration	N/Å	N/A	Cont Inuous
1.7.2	Performance (c) requirement	<u>*</u> 1 x 0.4 Sec					<u>+ 11x^(e)</u> 0.4 Sec			± 1% 0.4 Sec
1.8 Envir	onmental Conditions	for Same Functi	on(b)							
1.8.1	Temperature (⁰ F)	50 - 120	Included under normal				Ambient			Ambient Conditions
1.8.2	Pressure (psig)	0					0			
1.8.3	Humidity (% RH)	0 - 95					Amblent			
1.8.4	Radiation (R)	< 400					None			
1.8.5	Chemicals	None					None			
1.8.0	Vibration	None					None			
1.8.7	Acceleration (g)	None					Fig. 1			

Notes: (a) DBE is the Design Basis Event

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(b) Margins are not included in the parameters specified in this section.

(c) Reference accuracy (maximum normal temperature) and time response specified

(d) For excessive cooldown system applications only

(e) Reference accuracy ± 10% deviation during event

1.9 Qualified Life: The Westinghouse Aging Evaluation Program has demonstrated a qualified life of five (5) years. The qualified life due to radiation service is dependent on the location of the transmitter (Example: 10³R/year yields a 10 year qualified life.)

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1.10 Remarks: None

SECTION 2 - QUALIFICATION BY TEST

2.0 TEST PLAN

- 2.1 Equipment Description: Barton and Veritrak Differential Pressure Transmitters (See Section 2.10.2)
- 2.2 Number Tested: Four (4) Barton units Six (6) Veritrak units

2.3 Mounting: As described in References 1 and 3.

- 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

•				Required	Not Required
•	2.7.5	Category	V - Electrical		
		Characte	ristics		
		2751	Insulation Resistance		А,В
•		2.7.5.2	Output Voltage		Α,Β
-		2.7.5.3	Output Current	А, В	
		2754	Output Power		Α,Β
		2.7.5.5	Response Time	A	В
		2 7 5 6	Frequency Characteristics		Α,Β
		2.7.5.7	Simulated Lead		Α,Β
			-		
	2.7.6	Category	VI - Mechanical		
•		Characte	ristics		
•		2761	Thrust		A,B
		2.7.0.1	Torque		A,B
		2.7.0.2	Time		A,B
		2.7.0.3	Load Profile		A,B
		2.7.0.4	Load Profile		
	2.7.7	Category	/ VII - Auxiliary Equipment		
•		None			
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A: Operational Test, Normal and Abnormal Conditions

B: Seismic Testing

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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 Vibration
- 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

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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. Ninety five percent humidity, noise rejection and response time testing has been successfully performed via type testing. Auditible results for all tests are maintained by \underline{W} and owners receive calibration/production unit data. The justification for employing anything other than the preferred sequence is as follows;

The DBE is simulated by the Seismic Test sequence of Section 2.9.2. Since no mechanism exists which would degrade time response and not effect calibration, after a seismic event, the calibration check is sufficient to identify potential changes in time response. 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 2.9.1 is performed on all production units to verify their performance at normal and abnormal temperatures of 80°F and 130°F

respectively. The Abnormal Extremes Test of Section 2.9.3 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, Abnormal Extremes and mechanical cycling Sections 2.8.6, 2.8.7, and 2.8.3) on a representative sample of components from the Group B Differential Pressure Transmitters. Mechanical cycling has been included in the Level A Program and is referenced to as a type test for the Level B program. 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.

Step

Notes

2.9.1	Production	Test	Sequence
	2.8.1		Calibration performed at $80^{\circ}F$ and $130^{\circ}F$
	2.8.2		completes a performance test on all
	2.8.3		production units
	2.8.8		

- 2.9.2 Seismic Test Sequence 2.8.1 2.8.2 Seismic (DBE) test sequence 2.8.5 2.8.8
- 2.9.3 Environmental Test Sequence 2.8.1 Environmental type test sequence on similar 2.8.2 piece of equipment as permitted by 2.8.3 IEEE-323-74 Section 6.3.2(3). 2.8.8

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2.9.4 Aging Test Sequence

2.3.1	Aging to be addressed by separate testing as
2.8.2	described in Subprogram C of Appendix B to
2.8.4	WCAP-8587
2.8.5	
2 8 8	

2.10 Type Test Data

2.10.1 Objective

The objective of this test program is to demonscrate, 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

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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 Differential Pressure Transmitters (Qualification Group B) were tested. For more details see Table 1 of Reference 1.

Six Veritrak Differential Pressure Transmitters (Qualification Group B) were tested. For more details see Tables 1 and 2 of Reference 3.

2.10.2.3 Aging Evaluation Program

A representative sample of critical components from the Differential Pressure Transmitters will be included in 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.

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Reference 2 summarizes the results of available radiation testing of organic and inorganic materials and justifies that, for radiation doses less than 104 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°F and 130°F on every production unit. Peak to peak

noise, time response and ability to meet performance requirements at 95% RH have been verified by type test. The ability to survive a containment pressure test will be verified by analysis.

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 References 1 and 3 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⁾. Each plant should compare to the required respone spectra (RRS) to assure that a 10 percent margin exists based on their actual plant location.

2.10.3.3 Aging Evaluation

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The Westinghouse Aging Evaluation Program (Appendix B, WCAP 8587) will incorporate a representative sample of components from the Qualification Group B Differential Pressure Transmitters. The objective of the program 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 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

 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

- McElhaney, 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.
- WCAP-8587 (Non-Proprietary), January 1981- Appendix C "Effects of Gamma Radiation Doses Below 104 Rads on the Mechanical Properties of Materials"
- Skeers, D. M., "Equipment Qualification Test Report Differential Pressure Transmitters - Qualification Group B (Sesimic Design Verification Testing) WCAP-8687-Supp. 2-E04B (Proprietary), WCAP-8587-Supp. 2-E04B (Non-Proprietary), March 1981.

SECTION 3 QUALIFICATION BY EXPERIENCE

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