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WESTINGHOUSE CLASS 3

EQDP-HE-4
Rev. 3 3/82

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.

SAFETY RELATED LIMITORQUE VALVE ELECTRIC MOTOR OPERATORS

(Qualification Group B)

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:
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 operators identified in Table 1 of Reference 1 are 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. 3

Deviations from the above described test position may necessitate an evaluation on a case by case basis by Westinghouse. Bolt sizes or torquing are in accordance with the applicable valve maintenance manual/drawing.

1.3 Auxiliary Devices: None

1.4 Preventative Maintenance Schedule: The preventative maintenance schedule, assumed in establishing the qualified life, is detailed in Reference 1.

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	Outside Containment: Normal Conditions	Outside Containment: Abnormal Conditions	Outside 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	N/A	N/A	Event Duration	N/A	N/A	Continuous
1.7.2	Performance requirement	Note c		No Damage	N/A	N/A	Note c	N/A	N/A	Note c
1.8	Environmental Conditions for Same Function[b]									
1.8.1	Temperature(°F)	50-104	Included Under Normal	Ambient	N/A	N/A	Ambient	N/A	N/A	Ambient
1.8.2	Pressure (psig)	-6.7/+2.3		Ambient	N/A	N/A	Ambient	N/A	N/A	Ambient
1.8.3	Humidity (% RH)	10-95		Ambient	N/A	N/A	Ambient	N/A	N/A	Ambient
1.8.4	Radiation (R)	1.0×10^4 γ	4×10^6 γ[d]	None	N/A	N/A	None	N/A	N/A	None
1.8.5	Chemicals	None		None	N/A	N/A	None	N/A	N/A	None
1.8.6	Vibration	Fig. 1		None	N/A	N/A	None	N/A	N/A	None
1.8.7	Acceleration (g)	0.7		None	N/A	N/A	Figure 2	N/A	N/A	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: Applicable to radiation dose resulting from 1 year recirculation operation Post LOCA.

1.9 Qualified Life: An assumed ambient temperature of 40°C was utilized to demonstrate qualified life of 40 years based on the actual test conditions identified in Table 1. 3

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 Electric Motor Operator was conducted at several different test facilities. The Baseline Performance Test, Thermal and Wear Aging Tests and all Performance Testing was performed at the Limitorque Research and Development Testing facility in Lynchburg, Virginia. All abnormal environmental radiation testing was performed at Isomedex Inc., Parsippany, New Jersey. Vibration/seismic testing was performed at Acton Environmental Corp., Acton Massachusetts. 3

2.1 Equipment Description: Limitorque Valve Electric Motor Operators.

2.2 Number Tested: Two

Model Number SMB-00-15 (Reliance)
SMB-1-60 (Electric Apparatus)

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. 3

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 2.

2.6 Service Conditions to be Simulated by Test[1]

				Outside Containment			
		Normal	Abnormal	Test	Seismic	HELB/LOCA	Post-HELB/LOCA
2.6.1	Temp. (°F)	50-104	Included Under Normal	Ambient	Ambient	N/A	N/A
2.6.2	Pressure (psig)	-6.7/+2.3		Ambient	Ambient	N/A	N/A
2.6.3	Humidity (% RH)	10-95		Ambient	Ambient	N/A	N/A
2.6.4	Radiation (R)	Included in Abnormal	4×10^6 γ	None	None	N/A	N/A
2.6.5	Chemicals	None		None	None	N/A	N/A
2.6.6	Vibration	See Fig. 1		None	≥33 Hz	N/A	N/A
2.6.7	Acceleration (g)	0.7		None	Figure 2	N/A	N/A

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	A,C,D
	2.7.1.2	Pressure		A,B,C,D
	2.7.1.3	Moisture		A,B,C,D
	2.7.1.4	Composition		A,B,C,D
	2.7.1.5	Seismic Acceleration	C	A,B,D
	2.7.1.6	Time	A,B,C,D	
2.7.2	Category II - Input Electrical Characteristics			
	2.7.2.1	Voltage	A,B,C	D
	2.7.2.2	Current	A,B,C	D
	2.7.2.3	Frequency	A,B,C	D
	2.7.2.4	Power	A,B,C	D
	2.7.2.5	Other		A,B,C,D
2.7.3	Category III - Fluid Characteristics			
	2.7.3.1	Chemical Composition		A,B,C,D
	2.7.3.2	Flow Rate		A,B,C,D
	2.7.3.3	Spray		A,B,C,D
	2.7.3.4	Temperature		A,B,C,D
2.7.4	Category IV - Radiological Features			
	2.7.4.1	Energy Type	D	A,B,C
	2.7.4.2	Energy Level	D	A,B,C
	2.7.4.3	Dose Rate	D	A,B,C
	2.7.4.4	Integrated Dose	D	A,B,C

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

A. Performance Test
B. Environmental Aging Test
C. Vibration - Seismic Test
D. Radiation 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
2.8.6 Operation (Simulated Post HELB/LOCA Conditions)
2.8.7 Disassembly and Inspection

2.9 Test Sequence Actual

The sample operators were 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 Electric 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

Samples components from the generic group were identified and type tested. The generic components consists of the basic gear box design but with motors from different manufacturers. Manufacturing processes, production tests and material of construction for the generic components are monitored and controlled and a quality release provided.

2.10.3 Test Summary

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

2.10.3.2 Two generic components were selected and type tested for the entire sequence of tests identified in Section 2.8

2.10.3.3 Both generic components were thermally aged in an oven for a time period and at an elevated temperature equivalent to a qualified life of 40 years. The Limitorque Electric Motor Operators were cycled at least ten percent of mechanical life during aging.

2.10.3.4 The generic components were mechanically aged to a total of 2000 cycles.

2.10.3.5 The generic components were then radiation aged to a gamma radiation dose of 4.0×10^6 rads.

2.10.3.6 The generic components were 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 components were performance tested to demonstrate the Limitorque Electric Motor Operation operational integrity. Both generic components successfully completed these test.

2.10.4 Conclusion

The demonstrated qualified life of the Limitorque Electric 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 2 a 40 year qualified life of the generic design group of the Limitorque Electric 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. "Report on Qualification Program for Limitorque Valve Actuator (SMB-00-15)", Report Number B0101, Revision B, June 1981.

2. Deluse, F. K., "Equipment Qualification Test Report Limitorque Valve Electric Motor Operators (Environmental and Seismic Testing)," WCAP 8687, Supp 2. - H04A (Proprietary).

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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 d	Miscellaneous outside containment	Limitorque SMB-000-2 through SMB-5-500 and SB-000-2 through SB-3-175	Temperature Pressure Rel. humidity Radiation Chemistry		104°F Atmos. 95 4×10^6 R(γ) None	1 yr. Post LOCA	1 yr Post LOCA	N/A	N/A	40 yrs.	Seq. Test	HE-4	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.

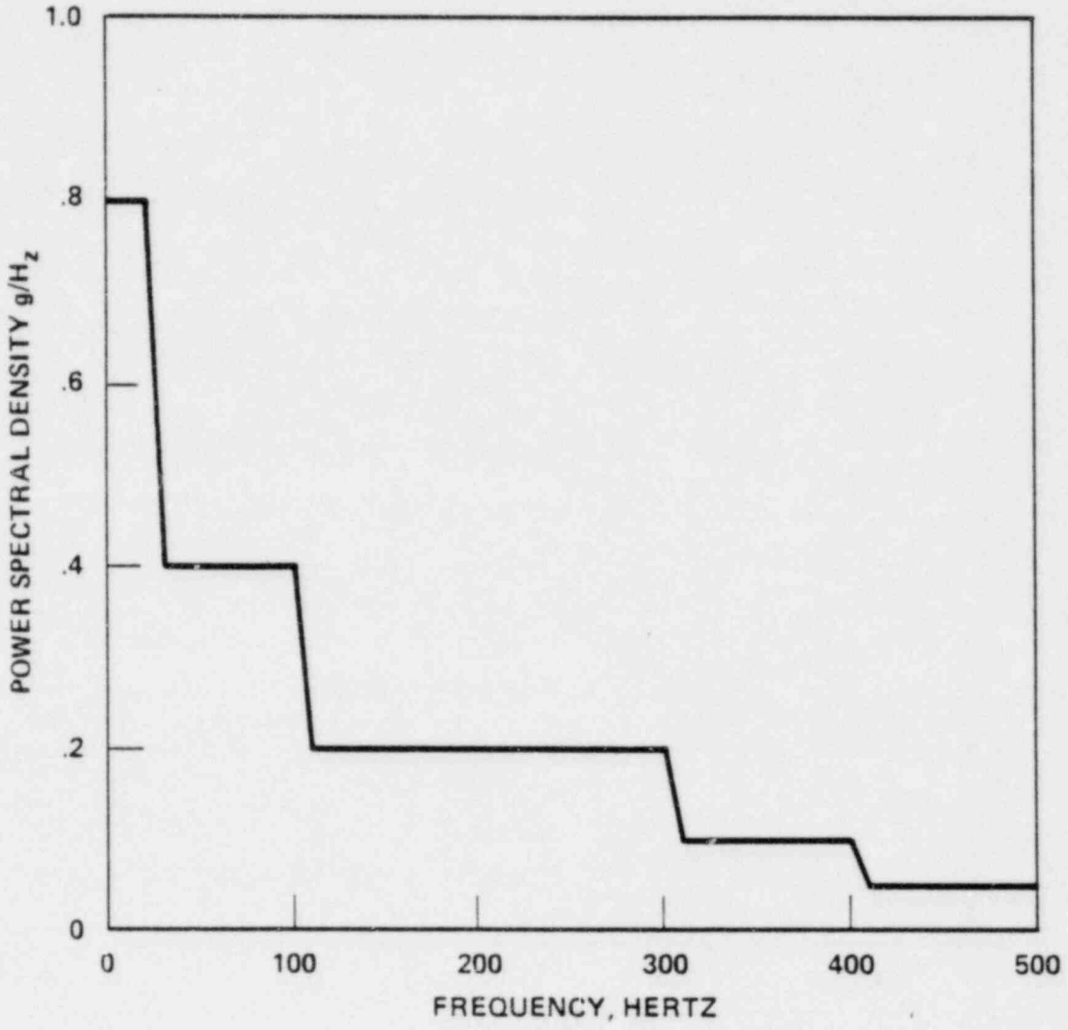

Figure 1 Plant Induced Vibration Linear Spectra Density

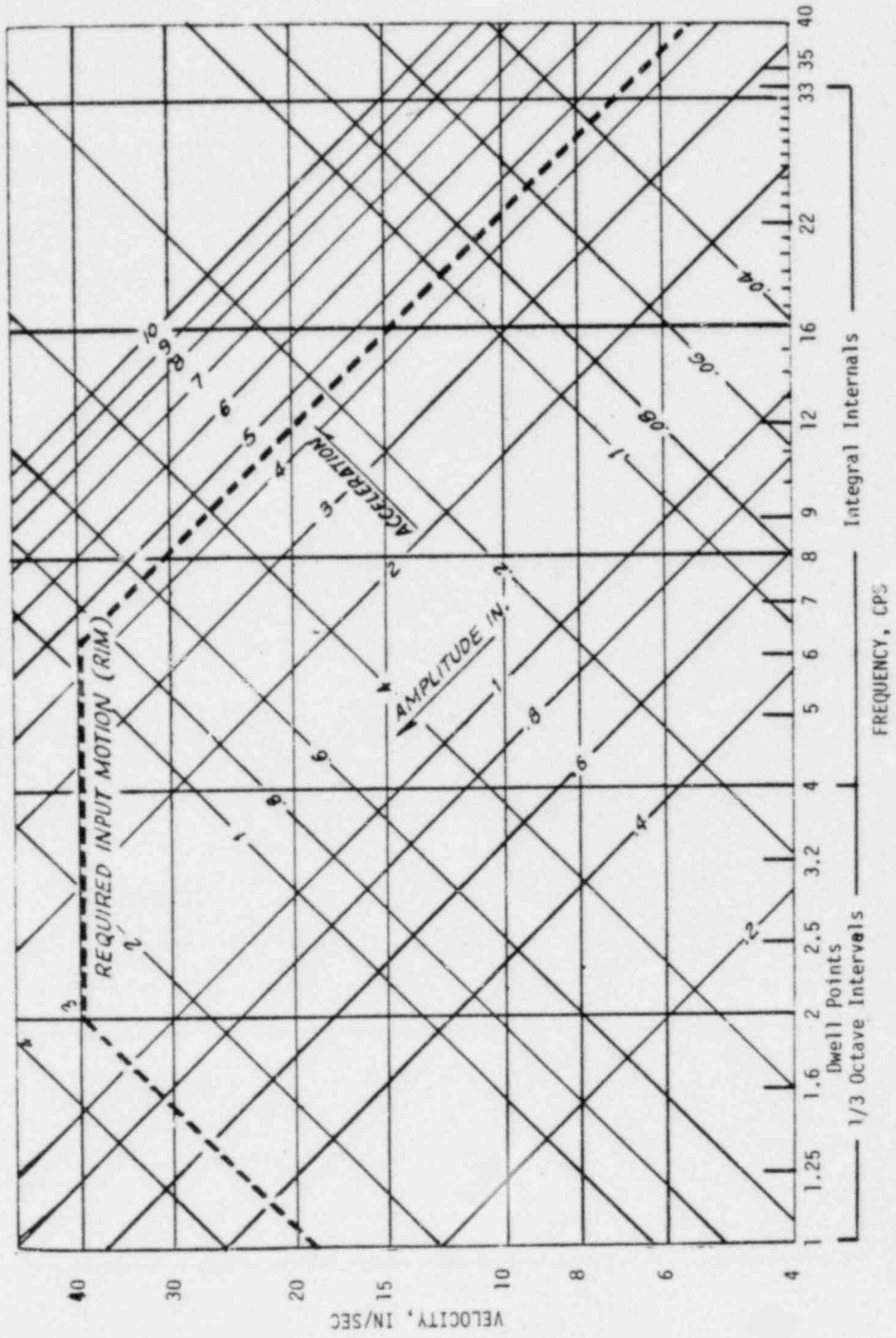

Figure 2 Seismic Qualification Required Input Motion