

WCAP 8587

"Equipment Qualification Data Packages"

Supplement 1

EQDP-HE-2/HE-5

SAFETY RELATED SOLENOID VALVES

(Qualification Group A)

(Qualification Group B)

Revision 4

Instruction Sheet

The following instructional information and checklist is being furnished to help insert the following into WCAP-8587 Supplement 1 EQDP-HE-2/HE-5 Class 3 (Non-Proprietary). Discard the old sheet and insert the new sheets as listed below. Revised information is indicated by a bar and number 4 on the outside margin of the page.

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March, 1983

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 SOLENOID VALVES

(Qualification Group A)

(Qualification Group B)

APPROVED:

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SECTION 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFICATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 90-140 VDC

1.1.2 Frequency: N/A

1.1.3 Load: As specified for each model by the
manufacturer

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. Installation instructions are provided with the applicable valve to which the solenoid valve is mounted.

1.3 Auxiliary Devices: None

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4 | 1.4 Preventative Maintenance Schedule: Per the Westinghouse Equipment Qualification test program, no preventive maintenance is required to support the equipment qualified life. 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):

Parameter	Normal Conditions	Abnormal Conditions	Containment 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	<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 (% RH)	10-100		Ambient	100	100	Ambient	100	100	Ambient
1.8.4 Radiation (R)	$1.75 \times 10^7 \gamma$		None	$3.5 \times 10^4 \gamma$ $1.8 \times 10^5 \beta$ Fig. 4 & 6	$2.3 \times 10^7 \gamma$ $1.7 \times 10^8 \beta$ Fig. 5 & 7	None	$1.2 \times 10^5 \gamma$ $7.8 \times 10^5 \beta$ Fig. 4 & 6	$1.3 \times 10^8 \gamma$ $1.3 \times 10^9 \beta$ 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	Figure 9	None	None	None

Notes:

- a: DBE is the Design Basis Event.
b: Margin is not included in the parameters of this section.
c: Solenoid valve to direct air to/from diaphragm chamber within prespecified time established by manufacturer.
d: The spray solution contains 2500 ppm Boron buffered with 0.88% dissolved Sodium Hydroxide to maintain a pH of 10.5.
e: If the component is to be used on air actuated valve in a high pressure system in a large diameter pipe in a long piping run, the hydrodynamic loads that could result from a short valve closing time (10 seconds) should be evaluated and reviewed against the vibrational environment to which the component has been qualified."

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1.9 Qualified Life: The demonstrated qualified life is 8 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 generic design group of ASCO solenoid valves was conducted at several different test facilities. The normal/abnormal environment testing was performed at ASCO test facilities in Florham Park, New Jersey. All radiation testing was conducted at Isomedix, Inc. in Parsippany, New Jersey. Vibration/seismic testing was performed at Acton Test Laboratory in Acton, Massachusetts and the DBE environmental testing was performed at Wyle Test laboratories in Huntsville, Alabama.

- 2.1 Equipment Description: ASCO Solenoid Valves - Model
numbers NP-831655E, NP-8316E34E,
210-036-1F, 206-381-6RF, NP832063E

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- 2.2 Number Tested: 5
- 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.

2.10 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 ASCO Solenoid Valves 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

Sample components from the Generic Group were identified and type tested. Manufacturing processes, production tests and materials of construction for the generic component groups 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 generic component group consists of three design families of solenoid valves. Within the design family the model numbers differ in elastomer material, body material, solenoid enclosure design, pipe and orifice size, and mode of normal operation (normally open/normally closed). The test valves contained ethylene propylene elastomers only. The test valves were of the normally closed design since the design contains the maximum number of parts (springs) with the only difference between the normally closed, normally open, and universal designs being the internal

springs. The normally closed design represents as severe a case for mechanical loading as the normally open and universal designs. The Section 2.12, Reference 1, document details the specific model numbers and design families qualified by this type testing.

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- 2.10.3.2 All 5 valves were initially performance tested in accordance with the manufacturer's applicable Valve Specification Sheet and inspected to insure no damage had occurred since manufacture. All five valves successfully completed these performance tests and inspection.
 - 2.10.3.3 All 5 solenoid valves were thermally aged in a controlled oven for a time period and at a test temperature equivalent to a qualified life of 8 years. The valves were cycled during this time for 10% of the required cyclic life of the valves. After thermal aging the valves were cycled an additional 18,000 cycles for a total of 20,000 cycles and exposed to 15 cycles of pressure transients to simulate the containment pressure tests during the design life of the equipment.
 - 2.10.3.4 All 5 valves were radiation tested by exposure to a gamma source for a dosage of 2.0×10^7 Rads.
 - 2.10.3.5 All 5 valves were vibration/seismic tested in accordance with the requirements of Figures 1 and 9 and IEEE 344-1975.
 - 2.10.3.6 All 5 valves were next radiation tested to a DBE dosage of 1.8×10^8 Rads of gamma radiation.
 - 2.10.3.7 The 5 valves were 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 2.10.3.7 the valves were 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 ASCO Solenoid Valves with Ethylene Propylene Dipolymer (EPD) elastomers 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 ASCO Solenoid Valves with EPD elastomers for a period of 8 years employing the practices recommended by Reg. Guide 1.89, 1.100 and 1.73.

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. Cesarski, W. V., "Equipment Qualification Test Report ASCO Solenoid Valves (Environmental and Seismic Test) WCAP 8687, Supplement 2 - H02A (Proprietary), June 1981.

TABLE 1

ACTUAL QUALIFICATION TEST CONDITIONS

EQUIPMENT (1) SYSTEM/CATEGORY	LOCATION STRUCTURE/AREA	MANUFACTURER TYPE/MODEL	ABNORMAL/ACCIDENT ENVIRONMENTAL EXTREMES		OPERABILITY		ACCURACY(%)		QUAL	QUAL	QUAL	QUAL	
			PARAMETER	SPECIFIED (2)	QUALIFIED	REQ	DEM	REQ	DEM	LIFE	METHOD	REF	STATUS
Valve accessory	Containment	ASCO	Temperature		420 F	1 yr.	1 yr.	N/A	N/A	8	Seq.	HE-2	Completed
solenoids/	Bldg./outside	MP 8316	Pressure		57 psig	Post	Post			yrs.	Test		
CVCS, SIS,	missile shield	MP 8320	Rel. humidity		100%	DBE	DBE						
RHR, RCS/		210-036	Radiation		2.0x10 ⁸ R(Y)								
Category a		206-381	Chemistry		2500 ppm H ₃ BO ₃ NaOH to 10.5 pH								

- 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.
- Plant specific environmental parameters are to be inserted by the applicant.