

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.

Remove
(Front/Back)

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page 2/3

4/5

6/7

12/13

14/--

16/--

Insert
(Front/Back)

Cover sheet/--

NRC Letter/NRC Letter

Table 1/Table 1

page 2/3

4/5

6/7

12/13

14/--

16/--

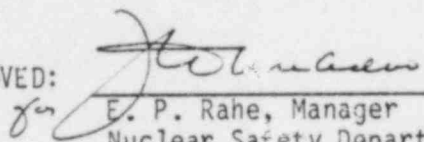
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EQUIPMENT QUALIFICATION DATA PACKAGE

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 I) 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:


E. P. Rahe, Manager
Nuclear Safety Department

**** THIS DOCUMENT HAS BEEN ****
REVIEWED AND ACCEPTED BY THE
NRC IN ACCORDANCE WITH WCAP 8587
"METHODOLOGY", REVISION 6

Westinghouse Electric Corporation
Nuclear Energy Systems
P.O. Box 355
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 10 1983

Mr. E. P. Rahe, Jr., Manager
Nuclear Safety Department
Westinghouse Electric Corporation
P. O. Box 355
Pittsburgh, Pennsylvania 15230

Dear Mr. Rahe:

Subject: Acceptance for Referencing of Licensing Topical Reports WCAP-8587, Revision 6 (NP), "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment," and WCAP-9714 (P)/9750 (NP), "Methodology for the Seismic Qualification of Westinghouse WRD Supplied Equipment"

We have completed our review of the subject topical reports submitted by Westinghouse Electric Corporation. We find these reports are acceptable for referencing in license applications to the extent specified and under the limitations described in the attached Safety Evaluation Report (SER). The SER defines the bases for acceptance of these reports.

The topical reports accepted for referencing are WCAP-8587, Revision 6 (NP), "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment" and WCAP-9714 (P)/9750 (NP), "Methodology for the Seismic Qualification of Westinghouse WRD Supplied Equipment." In addition, numerous equipment-specific non-proprietary Equipment Qualification Data Packages (EQDPs) and proprietary Equipment Qualification Test Reports (EQTRs) have been reviewed and accepted. Table 1 gives a complete list of all of the reports reviewed and accepted and their submittal dates.

The EQDPs and EQTRs have been reviewed and accepted by the staff according to the methodologies in WCAP-8587, Revision 6 (NP) and WCAP-9714 (P), respectively. The EQDPs and EQTRs have unique equipment-specific alphanumeric numbering systems. In order to differentiate the accepted EQDPs and EQTRs from those under review, Westinghouse is requested to mark the cover sheet of the accepted EQDPs and EQTRs with the statement "Accepted for Referencing in Licensing Actions Based on Conformance with WCAP-8587, Revision 6-A (NP), and WCAP-9714 A (P)/9750 A (NP)."

NOV 10 1983

The accepted EQDPs go into Supplement 1 of WCAP-8587 which is the receptacle for non-proprietary data packages, and the accepted EQTRs go into Supplement 2 of WCAP-8687. (The Westinghouse Topical Report identification number WCAP-8687 is designated as a receptacle for the proprietary accepted EQTRs).

Since the Westinghouse qualification program is an expansive program, additional reviews of equipment-specific documents will be necessary in the future. Due to the physical size of the SERs related to these reviews, it is not practical to incorporate the SER in the front of each of the EQTRs and EQDPs. Therefore, Westinghouse is requested to publish Supplement 2 to WCAP-8587, which will be the receptacle for NRC acceptance letters, associated Safety Evaluation Reports, and lists of accepted documents. A copy of this acceptance letter should be published and incorporated within the first few pages of each accepted EQDP and EQTR.

When an accepted document appears as a reference in license applications, we do not intend to repeat our review of the matters described therein and found acceptable except to assure that the material presented is applicable to the specific plant involved. Our acceptance applies only to the matters described in each accepted report.

In accordance with procedures established in NUREG-0390, it is requested that Westinghouse publish accepted versions of these reports, proprietary and non-proprietary as outlined below and within three months of receipt of this letter.

The accepted versions of WCAP-8587 (NP), Revision 6 and WCAP-9714 (P)/9750 (NP) should incorporate this letter between the title page and the abstract. The accepted versions of the above mentioned WCAPs shall include a -A (designating accepted) following the report identification symbol.

Should our criteria or regulations change such that our conclusions as to the acceptability are invalidated, Westinghouse and/or the applicants referencing the subject documents will be expected to revise and resubmit their respective documentation, or submit justification for the continued effective applicability of the documents without revision of their respective documentation.

Sincerely,

Cecil O. Thomas

Cecil O. Thomas, Chief
Standardization & Special
Projects Branch
Division of Licensing

Enclosures:

1. List of Accepted Documents
2. Safety Evaluation Report

TABLE 1

<u>Equipment Description</u>	<u>Reports Accepted by NRC</u>	
WCAP-8587, Methodology	Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment, Revision 6	
WCAP-9714/9750	Methodology for the Seismic Qualification of Westinghouse WRD Supplied Equipment, May 1980	
Medium Pump Motors	EQDP-AE-1 EQTR-A01A	Revision 4 Revision 2
Large Motors	EQDP-AE-2 EQTR-A02A	Revision 5 Revision 2
Canned Motors	EQDP-AE-3 EQTR-A03A	Revision 5 Revision 3
Pressure Transmitters Group A	EQDP-ESE-1A EQTR-E01A EQDP-ESE-1B EQTR-E01B	Revision 4 (Barton) Revision 2 (Barton) Revision 1 (Veritrak) Revision 1 (Veritrak)
Pressure Transmitters Group B	EQDP-ESE-2 EQTR-E02A EQTR-E02B	Revision 5 Revision 2 (Barton) Revision 2 (Veritrak)
DP Transmitters Group A	EQDP-ESE-3A EQTR-E03A EQDP-ESE-3B EQTR-E03B	Revision 4 (Barton) Revision 2 (Barton) Revision 1 (Veritrak) Revision 1 (Veritrak)
DP Transmitters Group B	EQDP-ESE-4 EQTR-E04A EQTR-E04B	Revision 6 Revision 2 (Barton) Revision 3 (Veritrak)
RTD's -RCS Bypass Manifold	EQDP-ESE-5 EQTR-E05A	Revision 4 Revision 2
RTD's Well Mounted	EQDP-ESE-6 EQTR-E06A	Revision 5 Revision 3
RTD's - Fast Response	EQDP-ESE-7 EQTR-E07A	Revision 5 Revision 3
Nuclear Instrumentation	EQDP-ESE-10 EQTR-E10A	Revision 5 Revision 2
Indicators	EQDP-ESE-14 EQTR-E14A	Revision 4 Revision 2
Recorders	EQDP-ESE-15 EQTR-E15A	Revision 4 Revision 1

TABLE 1 (Cont'd)

<u>Equipment Description</u>	<u>NRC Revision Accepted</u>	
Solid State Protection System	EQDP-ESE-16	Revision 5
	EQTR-E16A	Revision 2
	EQTR-E16B	Revision 2
	EQTR-E16C	Revision 0
SSPS - 3 Train	EQDP-ESE-17	Revision 3
	EQTR-E17A	Revision 0
	EQTR-E17B	Revision 0
Static Inverter	EQDP-ESE-18	Revision 5
	EQTR-E18A	Revision 1
Instrument Bus Distribution Panels	EQDP-ESE19	Revision 4
	EQTR-E19A	Revision 1
Pressure Sensor	EQDP-ESE-21	Revision 4
	EQTR-E21A	Revision 2
Power Range 4-Section Excore Detector	EQDP-ESE-22	Revision 4
	EQTR-E22A	Revision 2
Solenoid Valves (One Report)	EQDP-HE2/HE5	Revision 4
	EQTR-H02A/H05A	Revision 2
Limit Switch (One Report)	EQDP-HE3/HE6	Revision 4
	EQTR-H03A/H06A	Revision 2
Motor Operators	EQDP-HE4	Revision 4
	EQTR-H04A	Revision 2

WESTINGHOUSE CLASS 3

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

WESTINGHOUSE CLASS 3

4 1.4 Preventative Maintenance Schedule: Per the Westinghouse Equipment Qualification test program, no preventative maintenance is required to support the equipment qualified life. This does not preclude development of a preventative 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."

WESTINGHOUSE CLASS 3

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-CRF, NP832063E

4

WESTINGHOUSE CLASS 3

- 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.

- 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.

4

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	NP 8316	Pressure		57 psig	Post	Post			yrs.	Test		
CVCS, SIS,	missile shield	NP 8320	Rel. humidity		100%	DBE	DBE						
RHR, RCS/		206, 208 &	Radiation		2.0x10 ⁸ R(γ)								
Category a		210 Family	Chemistry		2500 ppm								
					H ₃ BO ₃								
					NaOH to								
					10.5 pH								

16

- 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.

WESTINGHOUSE CLASS 3