BAR NUCLEAR PLANT UNIT 1

ENNESSEE VALLEY AUTHORITY

w/ ltr. dtd. 4/30/91 50-390

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SUPPLEMENTAL INFORMATION- TVA'S COMPLIANCE TO 10 CFR50.49- ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY FOR NUCLEAR POWER PLANTS

SUPPLEMENTAL INFORMATION
TVA'S COMPLIANCE TO 10CFR50.49 - ENVIRONMENTAL QUALIFICATION
OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY
FOR NUCLEAR POWER PLANTS
VOLUME 4

TABLE OF CONTENTS

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MTR -062-0104	-B	1-MTR -062-0104	-B		692'	A10	A	100D	L	THE CCP'S MTRS ARE ESSENTIAL
CVCS PUMP MOTOR		HSDP			71C62-54114-1		A	1MO	RH/A	FOR PROPER OPERATION OF THE
							A	1MO	CV/A	PMPS WHICH ARE REQUIRED FOR
							A	1MO	AF	THE MITIGATION OF THESE
							A	1MO	AB	EVENTS
WBN-1-MTR -062-0108	-A	1-MTR -062-0108	-A		692'	A09	A	100D	L	THE CCP'S MTRS ARE ESSENTIAL
CVCS PUMP MOTOR		HSDP			71C62-54114-1		A	1MO	RH/A	FOR PROPER OPERATION OF THE
							A	1MO	CV/A	PMPS WHICH ARE REQUIRED FOR
							A	1MO	AF	THE MITIGATION OF THESE
							A	1MO	AB	EVENTS
WBN-1-MTR -063-0010	-A	1-MTR -063-0010	-A		692'	A13	A	100D	L	THE SIS PMPS MUST FUNCTION FOR
SIS PUMP MOTOR		HSDP			71C62-54114-1		C		RH/A	THE DURATION OF THE LOCA TO
							C		CV/A	ASSURE ADEQUATE CORE COOLING.
							C		AF	THEY ARE NOT REQ'D TO MITIGATE
							C		AB	ANY EVENTS IN THE AUX BLDG.
WBN-1-MTR -063-0015	-B	1-MTR -063-0015	-B		692'	A12	A	100D	L	THE SIS PMPS MUST FUNCTION FOR
SIS PUMP MOTOR		HSDP			71C62-54114-1		C		RH/A	THE DURATION OF THE LOCA TO
							C		CV/A	ASSURE ADEQUATE CORE COOLING.
							C		AF	THEY ARE NOT REQ'D TO MITIGATE
							C		AB	ANY EVENTS IN THE AUX BLDG.
WBN-1-MTR -072-0010	-B	1-MTR -072-0010	-B		676'	A08	A	30D	L	THE CSS PMPS ARE REQUIRED AND
CS PUMP MOTOR		HSW2			71C62-54114-1		C		RH/A	MUST OPERATE DURING THE
							C		CV/A	MITIGATION OF A LOCA. THE CSS
							C		AB	IS NOT REQUIRED TO MITIGATE
							C		AF	ANY EVENTS IN THE AUX BLDG.

		R 1	R	R
PREPARER/DATE	R C Foust 7/30/86	JDH 2-7-89		
CHECKED/DATE	W B Kim 7/30/86	KBK 2/8/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MTR -072-0027	-A	1-MTR -072-0027	-A		676'	A09	A	300	L	THE CSS PMPS ARE REQUIRED AND
CS PUMP MOTOR		HSW2			71C62-54114-1		C		RH/A	MUST OPERATE DURING THE
							C		CV/A	MITIGATION OF A LOCA. THE CSS
							C		AB	IS NOT REQUIRED TO MITIGATE
							C		AF	ANY EVENTS IN THE AUX BLDG.
WBN-1-MTR -074-0010	-A	1-MTR -074-0010	-A		676'	A11	A	100D	L	THESE PMPS FUNCTION AS PART
RHR PUMP MOTOR		VSW1			79P64-160412		C		RH/A	OF THE ECCS TO ENSURE ADEQUATE
							C		CV/A	CORE COOLING DURING A LOCA.
							C		AF	ACTUATION OF THE ECCS IS NOT
							C		AB	REQD FOR RH/A, CV/A, AF, OR AB
WBN-1-MTR -074-0020	-B	1-MTR -074-0020	-B		676'	A10	A	100D	L	THESE PMPS FUNCTION AS PART
RHR PUMP MOTOR		VSW1			71C62-54114-1		C		RH/A	OF THE ECCS TO ENSURE ADEQUATE
							C		CV/A	CORE COOLING DURING A LOCA.
							C		AF	ACTUATION OF THE ECCS IS NOT
							C		AB	REQD FOR RH/A, CV/A, AF, OR AB

			R 1	R	R
PREPARER/DATE	R C Foust	7/30/86	JDH 2-7-89		
CHECKED/DATE	W B Kim	7/30/86	KBL 2/8/89		

BINDER NO. WBNEQ-MOT-001 PLANT WBN	UNIT(S) 1	SHEET 1 OF 1	R R
BINDER TITLE WESTINGHOUSE	COMPUTED /R1 JDH	DATE 2-7-89	
MOTORS ON RHR,CVCS,CS, AND SIS	CHECKED /R1 KBN	DATE 2/8/89	

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-1A R1 for source of Category and Operating Time assignments.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 1 OF 27 R 1 R
BINDER TITLE WESTINGHOUSE	COMPUTED RCF	DATE 7/10/86 JDH 2-7-89	
MOTORS ON RHR, CVCS, CS, AND SIS	CHECKED WBK	DATE 7/21/86 KBN 2/8/89	

A. DOCUMENTATION (see note) |R1

Equipment Description CS, RHR, SIS, and CVCS pump motors

Vendor/Manufacturer Westinghouse

Equipment Model No.(s) See TAB A for complete listing of the equipment covered by this report.

QUALIFICATION REPORTS (see note) |R1

*(1) Title/Number/Revision WCAP-8687 EQTR-A02A, Rev. 2 RIMS B43 85041 304
"Equipment Qualification Test Report Westinghouse LMD Motor Ins." DATE March 1983

(2) Title/Number/Revision WCAP-8754, RIMS NEB 801215300
"Environmental Qualification of Class 1E Motor for Nuclear Out-of-Containment Use". DATE June 1976

(3) Title/Number/Revision WCAP-8587 EQDP AE-2, Rev. 5 RIMS B43 850401 303
"Environmental Qualification Data Package Large Pump Motors (outside containment)." DATE March 1983

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) 3170 Application Data.

(5) NP-1447 EPRI Report Project 893-1 dated July 1980, pages 3-14 through 3-20.

(6) NP-4172SP dated August 1985 (see "Lubricants" - TAB C).

(7) NP-3887 dated February 1985 (TAB G).

(8) 47E235-74 R1 Environmental drawing. R1

(9) 47E235-79 R1 Environmental drawing.

(10) 47E235-81 R1 Environmental drawing.

(11) EQ&T-EQT-3592 Rev 0 Westinghouse Report

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(12) EQ&T-EQT-2026 Rev 0 (B71 860530 004) Westinghouse Report

(13) EQ&T-EQT-3827 Rev 0 Westinghouse Report

(14) WBNOSG4-013 R12 (B26 900327200) System 62, Category and Operating Times Calculation

(15) WBNOSG4-014 R11 (B26 900309 227) System 63, Category and Operating Times Calculation R2

(16) WBNOSG4-019 R7 (B26 900309 234) System 72, Category and Operating Times Calculation

(17) WBNOSG4-020 R8 (B26 900309 232) System 74, Category and Operating Times Calculation

(18) GENNAL6-002 R2 (B45 860812 236) Areas with High Potential for Condensate Formation

(19) WBP EVAR 8602001 R0 (B43 860227 901) Degraded Voltage for Environmental Qualification Project

* WCAP-8687 is the only test report used for qualification purposes. However, WCAP-8754 and -8587 were included because they contain useful information on Westinghouse motors.

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-MOT-001 PLANT WBN UNIT(S) 1 SHEET 2 OF 27

BINDER TITLE WESTINGHOUSE MOTORS ON RHR, CVCS, CS, and SIS

COMPUTED RCF DATE 9/18/86 R ___ R ___

CHECKED WBK/AWT DATE 9/19/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified Pending Resolution of All Open Items.

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES See Open Items in front of binder.

1 - SCR EEB8618 must be resolved (see Open Item No. 6).

2 - Watts Bar must supply termination data (see Open Item No. 1).

3 - Watts Bar must supply documentation on installed motors S.O. No. 78F35296 and 79F55979 (see Open Item No. 5).

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-MOT-001 PLANT WBN UNIT(S) 1 SHEET 3 OF 27

BINDER TITLE WESTINGHOUSE MOTORS ON RHR, CVCS, CS, and SIS

COMPUTED RF DATE 7/10/86 R ___ R ___

CHECKED WWK DATE 7/21/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

____ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

_X_ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of lE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

NEMA Standard MG1-1972, IEEE 275-1966, IEEE 112A-1964, IEEE 344-1975, Reg. Guide 1.89.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 4 OF 27
BINDER TITLE WESTINGHOUSE MOTORS	COMPUTED RT	DATE 7/30/86	R ___ R ___
ON RHR, CVCS, CS, and SIS	CHECKED [illegible]	DATE 7/30/86	

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

_____ Test of Similar Items with Supporting Analysis

__X__ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The qualification of these motors is based on a Westinghouse test in which only a stator was subjected to environmental testing. Westinghouse denotes that only the thermalastic epoxy insulation system is the limiting material in these motors. The effects of accident conditions on lubricants, bearings, and interfaces are discussed in TAB C and are qualified by analysis. Westinghouse has provided a materials comparison on the tested stator versus the TVA motors. This comparison is discussed in TAB C, "Similarity."

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 5 OF 27			R	R
BINDER TITLE WESTINGHOUSE MOTORS		COMPUTED RF	DATE 7/30/86				
ON RHR, CVCS, CS, and SIS		CHECKED WMK	DATE 7/30/86				

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No
See Section A and C.

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Motor(s)	Stator	WCAP-8687 page 2
(2) Manufacturer	Westinghouse	Same	WCAP-8687 page 2
(3) Model Number(s)	See TAB C	S.O.# 76F60185	WCAP-8687 page 2
(4) Serial Number(s)	See TAB C	1S-78	

(5) Identify Component-Unique checksheet attached: Supplement 1, pages 26 and 27 of this tab.

JUSTIFICATION/COMMENTS TAB C provides a comparison between the W test stator and the TVA motors. A discussion is provided for all items which are not the same.

BINDER NO. WBNEQ-MOT-001 PLANT WBN	UNIT(S) 1	SHEET 6 OF 27	R 1 R
BINDER TITLE WESTINGHOUSE	COMPUTED RCF	DATE 7/10/86 JDH 2-7-89	
MOTORS ON RHR,CVCS,CS, AND SIS	CHECKED WBK	DATE 7/21/86 KBN 2/8/89	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	*None	N/A	
External Process Connections	*None	N/A	
Electrical Connections	*None	N/A	
Conduit Seals	None	N/A	
Connector Seals	None	N/A	
Orientation	*None	N/A	
Physical Configuration	None	N/A	
Other	None		

R1

JUSTIFICATION/COMMENTS *The W test was performed only on a stator not the motor assembly as a whole. The interfaces listed above have been analyzed and are noted in TAB C.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 7 OF 27	R	R
BINDER TITLE WESTINGHOUSE MOTORS	COMPUTED RF	DATE 7/18/86			
ON RHR, CVCS, CS, and SIS	CHECKED WM	DATE 7/21/86			

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Pg. 7 of WCAP-8687
(b) Baseline performance measurements taken	Yes	Table 4 of WCAP-8687
(c) Equipment aged:		
Thermal	Yes	Pg. 7 of WCAP-8687
Radiation	Yes	Pg. 8 of WCAP-8687
Wear	No	
(d) Vibration/seismic testing conducted	Yes	Pg. 6&8 of WCAP-8687
(e) Design basis event (DBE) exposure (radiation and humidity)	Yes	Pg. 8&9 of WCAP-8687
(f) Post-DBE exposure	N/A	--
(g) Final inspection and disassembly	No	--

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? No (Reference Table 1 and 2 of WCAP-8687).

JUSTIFICATION/COMMENTS (1)Wear aging was not defined as a pretest requirement. Following completion of the test, the stator was subjected to a series of electrical tests which proved the reliability of the insulation system. (2)Complete calibration data was not included within the text of the qualification report. However, this information is on file at Westinghouse and is available for audit.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 8 OF 27
BINDER TITLE WESTINGHOUSE MOTORS	COMPUTED RG	DATE 7/30/86	R ___ R ___
ON RHR, CVCS, CS, and SIS	CHECKED WMK	DATE 7/30/86	

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Pg. 7&8 of WCAP-8687).

JUSTIFICATION/COMMENTS The test stator was subjected to thermal, radiation, and vibration aging.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Pg. 7 of WCAP-8687
Radiation exposure	Yes	Pg. 8 of WCAP-8687
Vibration (non-seismic) aging	Yes	Pg. 6 & 8 of WCAP-8687
Operational (electrical/mechanical/process) stress aging	No	

JUSTIFICATION/COMMENTS Only a stator was tested.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? N/A (Reference ___________).

JUSTIFICATION/COMMENTS Based on available information, no known synergistic effects exist in these motors.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Pg. 7 of WCAP-8687).

JUSTIFICATION/COMMENTS Only two materials were identified as being significantly affected by thermal aging; they are the thermalastic epoxy insulation and motor lubricant. Since the motor lubricant is sampled and replaced periodically, only the insulation was subjected to thermal aging.

BINDER NO.	WBNEQ-MOT-001	PLANT	WBN	UNIT(S)	1	SHEET	9 OF 27
BINDER TITLE	WESTINGHOUSE MOTORS	COMPUTED		DATE	7/10/86	R	R
ON RHR, CVCS, CS, and SIS		CHECKED		DATE	7/21/86		

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Pg. 7 of WCAP-8687 & TAB C).

JUSTIFICATION/COMMENTS Thermalastic Epoxy insulation, see "Similarity" in TAB C.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Pg. 2&3 of WCAP-8687).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Pg. 7 of WCAP-8687).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	104°F or 40°C	210°C	See TAB C
Time	40 Years Normal	168hrs	See TAB C

JUSTIFICATION/COMMENTS See TAB C

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Pg. 7 of WCAP-8687).

JUSTIFICATION/COMMENTS See TAB C

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference Pg. 7 of WCAP-8687).

JUSTIFICATION/COMMENTS Activation energy of 1.11 ev was derived from tests performed as required by IEEE-275-1966.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? No (Reference Pg. 59 of WCAP-8687).

JUSTIFICATION/COMMENTS Arrhenius Methodology was used. See TAB C.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference ________).

JUSTIFICATION/COMMENTS Stator was meggered before and after.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Pg. 8 of WCAP-8687).

JUSTIFICATION/COMMENTS TID of 5 x 10^7 rads, gamma following thermal aging.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference Pg. 7 of WCAP-8687 and TAB C).

JUSTIFICATION/COMMENTS Thermalastic Epoxy.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Pg. 3 of WCAP-8687).

JUSTIFICATION/COMMENTS ________

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Pg. 8 of WCAP 8687).

Plant normal ambient radiation dose (rd)	3.6×10^6-40 Yr Norm
Test exposure dose (rd)	5×10^7 gamma
Test exposure dose rate (rd/hr)	9.4×10^5
Test exposure source type (e.g., Co-60 gamma)	Cobalt-60

JUSTIFICATION/COMMENTS 267 percent greater than plant specific requirement.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] (YES/NO/NA)? Yes (Reference: Pg. 8 of WCAP-8687). R1

JUSTIFICATION/COMMENTS The effects of the Vibration aging are noted on Table 4, pg 22, of WCAP-8687. Vibration aging had no effect on the insulation resistance.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: See below).

JUSTIFICATION/COMMENTS The basis for vibration aging was given in WCAP 8687, page 8.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? No (Reference:).

JUSTIFICATION/COMMENTS Only the stator of the test motor was subjected to testing environment. It is not possible to define or consider the effects of these stresses when only a stator was tested.

1 Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? N/A (Reference:).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes
(Reference: See TAB C).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS Westinghouse defines the qualified life as 5 years per pg 8 of WCAP-8687. For the TVA application, TAB C defines the qualified life.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference: Pg. 2 of WCAP-8687).

JUSTIFICATION/COMMENTS Westinghouse only requires periodic lubricant replacement, but since electrical tests were conducted throughout the test, TVA will perform periodic electrical tests to provide an indication of age related degradation and failure mechanisms (see TAB G).

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 13 OF 27				
BINDER TITLE WESTINGHOUSE MOTORS		COMPUTED [illegible]	DATE 7/10/86	R	R		
ON RHR, CVCS, CS, and SIS		CHECKED [illegible]	DATE 7/21/86				

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	See TAB C	(Similarity)			
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS Provided in TAB C.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 14 OF 27
BINDER TITLE WESTINGHOUSE MOTORS	COMPUTED RF	DATE 7/18/86	R ___ R ___
ON RHR, CVCS, CS, and SIS	CHECKED [signature]	DATE 7/21/86	

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference WCAP-8687, pgs. 3 and 12).

Identify Acceptance Criteria: The tested stator must measure greater than 5 megohms when subjected to a 2500 VDC megger and must pass a 6000 VAC hipot for one minute.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Sect. 5.1, pg. 7 of WCAP-8687).

Identify baseline and functional testing: Before and after each major test sequence, the resistance of the stator insulation was measured and the ambient temperature recorded. Resistance was measured using a 2500 VDC megger where the stator leads were tied together. The voltage was applied for 10 minutes and measurements taken at 15, 30, 45, 60, 90, and 120 seconds and at 1 minute intervals thereafter until test completion. Also see above.

JUSTIFICATION/COMMENTS ____________

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? No (Reference ____________).

JUSTIFICATION/COMMENTS Only a stator was tested; therefore, operational loading conditions could not be addressed. However, the stator passage of the electrical test described in WCAP-8687 demonstrates that the insulation system had shown no signs of significant wear and verified its integrity.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? No (Reference: ____________).

JUSTIFICATION/COMMENTS But the testing assures stator reliability

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage		
Load		
Frequency		
Accuracy		
Other(s)		

R1

JUSTIFICATION/COMMENTS See "Justification/Comments" under 5(c) page 16 of this Tab. R1

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage		
Load		
Frequency		
Accuracy		
Other(s)		

R1

JUSTIFICATION/COMMENTS

(c)

Parameter	Demonstrated Conditions	Reference
Voltage		
Load		
Frequency		
Accuracy		
Other(s)		

JUSTIFICATION/COMMENTS A discussion of these parameters is included in TAB C.

R1

BINDER NO. WBNEQ-MOT-001 PLANT WBN	UNIT(S) 1	SHEET 17 OF 27	R 1 R
BINDER TITLE WESTINGHOUSE	COMPUTED RCF	DATE 7/18/86 JDH	2-7-89
MOTORS ON RHR,CVCS,CS, AND SIS	CHECKED WBK	DATE 7/21/86 KBN	2/8/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-74, -79, and -81 |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

*(d) Radiation (rd) $3.6x10^6$

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-) |R1

(c) Humidity (%) 90

(d) Radiation (rd) $3.6x10^6$

*Greatest value for any of the motors qualified in this binder. (See TVA Calculation WBNNAL3-025) |R1

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Temperature and humidity - Up to 8 hours per excursion and less than 1 percent of plant life (excluding accident conditions).

(5) Accident (worst case for any combination of specified accident parameters including peak, duration, and profile):

(a) Temperature(°F)	110 for 30 days 104 for 70 days	Accident type	LOCA
(b) Pressure (psig)	ATM(-)	Accident type	LOCA |R1
(c) Humidity (%)	90	Accident type	LOCA
(d) Radiation (rd)	1×10^7	Accident type	LOCA
(e) Spray Type	None	Accident type	LOCA

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 18 OF 27
			R 1 R
BINDER TITLE WESTINGHOUSE	COMPUTED RCF	DATE 9/17/86 JDH 2-7-89	
MOTORS ON RHR,CVCS,CS, AND SIS	CHECKED WBK/AWT	DATE 9/17/86 KBW 2/8/89	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Under worse conditions of Post-LOCA, the CVCS, RHR, and SIS motors are required to operate 100 days. The CS motors are required for 30 days.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: See TAB C).

(7) Subject to submergence (Yes/No/NA)? No (Reference: See "Submergence" in TAB C).

Identify initiation time and duration of submergence:

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? No (Reference:).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify:

R1

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B Section A	

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 19 OF 27 R 1 R
BINDER TITLE WESTINGHOUSE	COMPUTED RCF	DATE 7/18/86 JDH 2-7-89	
MOTORS ON RHR,CVCS,CS, AND SIS	CHECKED WBK	DATE 7/21/86 KBN 2/8/89	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time	100 Days	***48 Hours	See TAB D Sec. 5.6 of WCAP 8687	R1
Temperature (°F)	110	95	See TAB D Sec. 5.6 of WCAP 8687	R1
Pressure (psig)	-0-	-0-	See TAB C	
Relative Humidity (%)	90	100	See TAB C and TAB D Sec. 5.6 of WCAP 8687	R1
Chemical Spray*	N/A	N/A	N/A	
Radiation (rd)**	1.36×10^7 gamma	5×10^7 gamma	See TAB C and TAB D Sec. 5.3 of WCAP 8687	R1
Submergence	N/A	N/A	N/A	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***Westinghouse subjected the test stator to a 100% relative humidity/environment for 48 hours. However, the TVA motors are not subject to this condition. The TVA motors are only subject to DBA radiation exposure with no appreciable increase in temperature, pressure, or humidity (see TAB C).

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS - (continued)

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference	
Temperature	Yes	See TAB C	
Pressure	Yes	See TAB C	
Relative Humidity	Yes	See TAB C	
Chemical Spray	Yes	N/A	
Submergence	N/A	N/A	R1

JUSTIFICATION/COMMENTS ______________________

BINDER NO. WBNEQ-MOT-001 PLANT WBN	UNIT(S) 1	SHEET 20 OF 27	
		R 1	R
BINDER TITLE WESTINGHOUSE	COMPUTED RCF	DATE 7/18/86 JDH 2-28-89	
MOTORS ON RHR,CVCS,CS, AND SIS	CHECKED WBK	DATE 7/21/86 KBN 2/28/89	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA (Hot Spot Margin)
*Temperature: +15 degrees F	27°F	Yes
Pressure: +10% but no more than 10 psig	N/A	N/A
Radiation: +10% of accident dose	267%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See TAB C	
Voltage: ±10% of rated value	See TAB C	
Frequency: ±5% of rated value	See TAB C	
Environmental Transient: the initial transient and the peak temperature applied twice	See TAB C and Below	
Vibration: +10% added to acceleration	See TAB C	

R1

JUSTIFICATION/COMMENTS The accident parameters are not significantly different from the max. normal with the exception of radiation. TAB C provides a discussion on each of the parameters listed above. Only a stator was tested by Westinghouse. In addition, 0588-Category I requires the application of the environmental transient twice. 0588-Category II does not.

*A 15°C (27°F) hot spot margin was added to the stator temperature as calculated in TAB C. This margin provides conservatism for the Arrhenius aging analysis. R1

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 21 OF 27				
BINDER TITLE WESTINGHOUSE MOTORS		COMPUTED *[illegible]*	DATE *7/10/86*	R		R	
ON RHR, CVCS, CS, and SIS		CHECKED *[illegible]*	DATE *7/21/86*				

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See TAB A).

JUSTIFICATION/COMMENTS

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? N/A
(Reference ________).

JUSTIFICATION/COMMENTS Only a stator was tested.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? N/A
(Reference ________).

JUSTIFICATION/COMMENTS Only a stator was tested.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference ________).

JUSTIFICATION/COMMENTS Only a stator was tested.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? N/A
(Reference ________).

JUSTIFICATION/COMMENTS No abnormal conditions or anomalies were identified.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 22 OF 27			R	R
BINDER TITLE WESTINGHOUSE MOTORS		COMPUTED RCF	DATE 7/10/86				
ON RHR, CVCS, CS, and SIS		CHECKED WHK	DATE 7/21/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1		SHEET 23 OF 27			
BINDER TITLE WESTINGHOUSE MOTORS		COMPUTED RCF	DATE 7/10/86	R		R	
ON RHR, CVCS, CS, and SIS		CHECKED WMK	DATE 7/21/86				

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	N/A
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-MOT-001 PLANT WBN UNIT(S) 1 SHEET 24 OF 27

BINDER TITLE WESTINGHOUSE MOTORS COMPUTED [illegible] DATE 7/10/86 R ___ R ___

ON RHR, CVCS, CS, and SIS CHECKED WBK DATE 7/21/86

O. <u>SUMMARY OF REVIEW</u> (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	N/A
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	N/A
(a) Was the spray testing done while under the extremes of pressure and temperature?	N/A
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	N/A
(11) Criteria regarding submergence satisfied?	N/A
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	N/A
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	N/A

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1		SHEET 25 OF 27			
BINDER TITLE WESTINGHOUSE MOTORS		COMPUTED RCF	DATE 7/10/86	R	R		
ON RHR, CVCS, CS, and SIS		CHECKED WKK	DATE 7/21/86				

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	N/A
(17) Test duration margin (1 hour + function time) satisfied?	*No
(a) Is the minimum specified operating time at least 1 hour?	N/A
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	Yes
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

*See TABS C and G. The accident conditions are not significantly different from the max. normal with the exception of radiation; therefore, the major concern is radiation and aging. TAB C provides a detailed discussion on each. Based on the analysis provided in TAB C along with this section, it is concluded that the motors covered by this report are qualified for 40 years plus 100 days post-accident.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 26 OF 27
BINDER TITLE WESTINGHOUSE MOTORS	COMPUTED RF	DATE 7/30/86	R ___ R ___
ON RHR, CVCS, CS, and SIS	CHECKED WMR	DATE 7/30/86	

SUPPLEMENT 1
COMPONENT-UNIQUE CHECKLIST
MOTORS

EQUIPMENT IDENTIFICATION

(1) Is the motor identified in the qualification report identical to the plant motors which require qualification (yes/no/NA)? No (Similar)

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(a) Insulation system materials	Thermalastic Epoxy	Same	Yes	See TAB C
(b) Coil construction (form or random wound, cast)	Form	Form	Yes	Form 3170 (See Section E7)
(c) Insulation class (B, F, H)	B	B	Yes	See TAB C and WCAP-8687
(d) Lubricant				
Manufacturer	Var.	Var.	Yes	See TAB C and E
Type	*STO-2	Var.	Yes	See TAB C
(e) Bearing				
Manufacturer	Westing-house	Westing-house	Yes	See TAB C&E
Type	Split Sleeve & Ball	N/A	Yes	See TAB C&E
Bearing life	See Sec C	N/A	Yes	See TAB C&E
(f) Seals				
Manufacturer	Unknown	Unknown	Yes	Seals are metallic
Type	Metal	Metal	Yes	See (5) on next pg
Material	Brass	Brass	Yes	See (5) on next pg

*STO-2 is a generic designator for Turbine Oils procured by TVA. See procurement specification 18.009 and TAB C.

BINDER NO. WBNEQ-MOT-001	PLANT WBN	UNIT(S) 1	SHEET 27 OF 27
BINDER TITLE WESTINGHOUSE MOTORS	COMPUTED RF	DATE 7/30/86	R ___ R ___
ON RHR, CVCS, CS, and SIS	CHECKED WWK	DATE 7/30/86	

EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(g) Motor lead insulation	Same	Treated Glass Sleeving	Yes	See TAB C

Comments: ___

(2) Does the qualification report indicate that the motorette insulation system is the same as that used on the motors (yes/no/NA)? N/A
(Reference See TAB C "Similarity" & Sections E11, E12, and E13).

Comments: Qualification testing was not performed on a motorette, but a full size stator.

(3) Has the vendor provided the bearing rating (yes/no/NA)? Yes
(Reference TAB E).

Comments: Motor Data Sheets

(4) Was the lubricant included in the test program (yes/no/NA)? No
(Reference Pg. 2 of WCAP-8687).

Comments: Motor lubricant is qualified separately in TAB C.

(5) Were the seals included in the test program (yes/no/NA)? No
(Reference See WCAP-8754, pg. 8-4, paragraph 6, TAB D).

Comments: Only a stator was tested. The seals are brass construction and are not age sensitive or susceptible to radiation degradation.

PRINT DATI

WATTS BAR NUCLEAR P T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MTR -030-0038 -A CONTAINMENT AIR RETURN FAN MOTORS	1-MTR	-030-0038 -A 42.25-26.5-1770	250	733' 1" 77K35-83165	AC3	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MTRS START ON A PHASE B CNTMT ISLN SIG & MUST OPR FOR DURATION OF EVENT. FANS ENHANCE ICE COND & CS HEAT REMVL. LIMIT H2 BUILD-UP
WBN-1-MTR -030-0039 -B CONTAINMENT AIR RETURN FAN MOTORS	1-MTR	-030-0039 -B 42.25-26.5-1770	297	740'11" 77K35-83165	AC4	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MTRS START ON A PHASE B CNTMT ISLN SIG & MUST OPR FOR DURATION OF EVENT. FANS ENHANCE ICE COND & CS HEAT REMVL. LIMIT H2 BUILD-UP.

PAGE A-1 R3

		R 2	R 3	R
PREPARER/DATE	R. S. Raymond 6/9/86	JDH 1/18/89	JDH 9/24/89	
CHECKED/DATE	W. B. Kim 7/1/86	KBN 1/18/89	KBN 9/25/89	

BINDER NO. WBNEQ-MOT-002	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
			R R
BINDER TITLE INDUCTION MOTOR-TYPE RN INSULATION-INSIDE CONTAINMENT	COMPUTED /R2 JDH	DATE 1-23-89	
	CHECKED/R2 KBN	DATE 1/25/89	

TAB A

NOTES

1. Elevations shown are <u>Actual</u> elevations for equipment located in the Reactor Building and <u>Floor</u> elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-1 for source of Category and Operating Time assignments.

BINDER NO. WBNEQ-MOT-002 PLANT WBN UNIT(S) 1 SHEET 1 OF 29

R 2 R 3

BINDER TITLE INDUCTION MOTOR- TYPE RN INSULATION-INSIDE CONTAINMENT

COMPUTED RSR DATE 6/9/86 JDH 4/19/89 JDH 9/24/89

CHECKED WBK DATE 7/1/86 KBN 4/28/89 KBN 9/23/89

A. DOCUMENTATION (SEE NOTE)

Equipment Description	Squirrel-Cage Induction Motor
Vendor/Manufacturer	Joy Fan/Reliance Electric
Equipment Model No.(s)	100hp, 460 VAC, 3ph, 60Hz, 1800rpm
	Type RN Insulation
	Inside Containment

QUALIFICATION REPORTS (SEE NOTE)

(1) Title/Number/Revision Qualification Testing of Joy Axivane Fan & Reliance Electric Motor Report X-604, Rev. 2 (TAB D, Section D-1) — RIMS NEB 831213 426 DATE 3-20-80 DATE 3-20-80

(2) Title/Number/Revision Type Test Support Analysis Random Wound Motors, Report NUC-9 + Supplement, Rev. 2 (TAB D, Section D-2) — RIMS EEB 820602 304 DATE 7-1-78/7-15-81

(3) Title/Number/Revision End of Life Type Test-Random Wound Motors, Report NUC 22, Rev. 2 (TAB D, Section D-3) — RIMS B43 850919 500 DATE 2-10-84

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) WBN-OSG4-008 R11 (B45 870123 426) System 30, Category and Operating Times Calculation.

(5) 47E235-42 R2 Environmental Drawing

(6) GENNAL3-002 R3 (B45 860423 235) Reduction of Beta dose by sheet steel

(7) QIR NEB85016 (B45 850426 254) Watts Bar Nuclear Plant-NUREG-0588

(8) WBPEVAR 86 02001 R0 (B43 860227 901) Degraded voltage for environmental qualification project

(9) WBNAPS2-041 R0 (B45 890526 235) determination of long-term post accident temperature inside containment R3

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-MOT-002 PLANT WBN	UNIT(S) 1		SHEET 2 OF 29
			R 2 R 3
BINDER TITLE INDUCTION MOTOR-TYPE RN INSULATION-INSIDE CONTAINMENT	COMPUTED RSR	DATE 9/8/86	JDH JDH 1/18/89 9/21/89
	CHECKED WBK	DATE 9/8/86	KBN KBN 1/18/89 9/23/89

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES (1) Water flow through the fan must be adequately addressed after the SCR is closed. See Open Item #1 in front of binder. R3

COMMENTS/RECOMMENDATIONS Refer to TAB C, Section 11.0.

BINDER NO. WBNEQ-MOT -002	PLANT WBN	UNIT(S) 1	SHEET 3 OF 29
BINDER TITLE INDUCTION MOTOR-TYPE RN INSULATION-INSIDE CONTAINMENT	COMPUTED [signature] DATE 6-9-86	R	R
	CHECKED [signature] DATE 6/12/86		

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 334-1974, Type Test of Continuous Duty Class 1E Motors

NEMA MG1-1967, Motors and Generators

BINDER NO. WBNEQ-MOT -002	PLANT WBN	UNIT(S) 1	SHEET 4 OF 29
			R ____ R ____
BINDER TITLE INDUCTION MOTOR-TYPE RN	COMPUTED L. S. Raymond	DATE 6-9-86	
INSULATION-INSIDE CONTAINMENT	CHECKED W B Horn	DATE 6/12/86	

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

__X__ Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Refer to Tab C, Sections 1.0 and 3.0.

BINDER NO. WBNEQ-MOT -002 PLANT WBN UNIT(S) 1 SHEET 5 OF 29

R ___ R ___

BINDER TITLE INDUCTION MOTOR-TYPE RN COMPUTED L.S. Layman DATE 6-9-86

INSULATION-INSIDE CONTAINMENT CHECKED WB Fite DATE 6/12/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Axivane Fan/ Motor	Axivane Fan/ Motor	Qual Rpt 1, Page 1
(2) Manufacturer	Joy Fan/ Reliance	Joy Fan/ Reliance	Qual Rpt 1, Page 1
(3) Model Number(s) Motor:	Refer to TAB A	150/75hp, 1185/590rpm 460VAC, 3ph 60Hz, Type RN Insul.	Qual Rpt 1, App E, Pg 3
Fan:	NA		
(4) Serial Number(s)	Motors: 1XF-882396-A1	X-319739-A1-LT	Note 1 Below
	1XF-882396-A2		

(5) Identify Component-Unique checksheet attached: Supplement 1, Component-Unique Checklist-Motors

JUSTIFICATION/COMMENTS Note 1 - Serial numbers for plant motors are found in TAB F, on page 1 of respective field verification sheets. The test motor serial number is from page 3, Appendix E to Joy report X-604, Rev. 2 (TAB D, Section D-1).

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below. If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	N/A	N/A	
External Process Connections	N/A	N/A	
Electrical Connections	Refer to Note 1 below	No	Qual Rpt 1, pg. 2
Conduit Seals	N/A	N/A	Refer to Note 2 below
Connector Seals	N/A	N/A	
Orientation	N/A	N/A	
Physical Configuration	N/A	N/A	
Other			

R2

JUSTIFICATION/COMMENTS

Note 1: During the LOCA simulation, leads were connected inside the pressure chamber to terminal studs protruding through insulating and sealing plate. Plant terminations are made inside a terminal box using materials analyzed in Watts Bar Binder WBNEQ-SPLC-001, 600 volts and below, Type NMCK Motor Connection Kit. R2

F. INSTALLATION INTERFACES (Continued)

JUSTIFICATION/COMMENTS

Note 2: During LOCA simulation, no attempt was made to prevent chemical spray and moisture from entering the motor lead conduit (reference TAB E, Div. 2 Joy/TVA Telecon Confirmation Letter).

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	TAB C, Sec 4.1
(b) Baseline performance measurements taken	Yes	Qual Rpt 1, Appendix E, p 2
(c) Equipment aged:		
Thermal	Yes	Qual Rpt 1, page 5
Radiation	No	Qual Rpt 1, page 4
Wear	No	TAB C, Sec 4.2.4
(d) Vibration/seismic testing conducted	Yes	Qual Rpt 1, pages 7-11
(e) Design basis event (DBE) exposure	Yes	Qual Rpt 1, pages 12-16
(f) Post-DBE exposure	Yes	Qual Rpt 1, page 17
(g) Final inspection and disassembly	Yes	Qual Rpt 1, page 18

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference Qual Rpt 1, App A, p 11).

JUSTIFICATION/COMMENTS Test equipment accuracies and calibration data are not significant in establishing continued operability of the motor.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Qual Rpt 1, page 5).

JUSTIFICATION/COMMENTS ___

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Qual Rpt 1, page 5
Radiation exposure	Yes	Qual Rpt 1, page 4
Vibration (non-seismic) aging	Yes	Refer to TAB C, Sec 4.2.4
Operational (electrical/mechanical/process) stress aging	No	Refer to TAB C, Sec 4.2.4

JUSTIFICATION/COMMENTS ___

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS There are no known synergistic effects based on review of the materials of construction for this motor.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Qual Rpt 1, page 5).

JUSTIFICATION/COMMENTS Motor aged in vertical non-rotating position. Accelerated aging involved aging motor at a temperature of 415°F (213°C) for 108 hours.

BINDER NO. WBNEQ-MOT -002	PLANT WBN	UNIT(S) 1	SHEET 10 OF 29
BINDER TITLE INDUCTION MOTOR-TYPE RN	COMPUTED R.L. Maynard DATE 6-9-86	R ___	R ___
INSULATION-INSIDE CONTAINMENT	CHECKED WB Fox DATE 6/12/86		

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Qual Rpt 2, pages 3-7, 19, 20).

JUSTIFICATION/COMMENTS For a listing of materials in RN insulation system, see Qual Rpt 1, App F.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Qual Rpt 1, page 5).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Qual Rpt 1, pages 5 and 6).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	TAB C, Sec 4.2.1	213°C	105°C
Time	TAB C, Sec 4.2.1	100 hrs	350,000 hrs

JUSTIFICATION/COMMENTS

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference ________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.2.1

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA (Reference ________).

JUSTIFICATION/COMMENTS Activation energies were used to establish qualified life and are referenced in TAB C, Sec 5.0.

BINDER NO. WBNEQ-MOT-002 PLANT WBN	UNIT(S) 1		SHEET 11 OF 29 R 3 R
BINDER TITLE INDUCTION MOTOR-TYPE RN INSULATION-INSIDE CONTAINMENT	COMPUTED RSR	DATE 6/9/86	JDH 9/21/89
	CHECKED WBK	DATE 6/12/86	KBN 9/23/89

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? Yes (Reference Qual Rpt 1, page 6 Qual Rpt 2, "Supplement" Page 3).

JUSTIFICATION/COMMENTS ______

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? No (Reference: ______).

JUSTIFICATION/COMMENTS The effects of temperature rise during motor operation were accounted for in the establishment of qualified life for these motors. Refer to TAB C, Section 5.0 and WAC-324. |R3

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: Qual Rpt 1, Pg 4).

JUSTIFICATION/COMMENTS Irradiation was considered unnecessary because tests conducted on the motor components show that direct damage to materials is negligible at levels considered. Refer to TAB C, Section 4.2.2 for additional information.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? Yes (Reference: Qual Rpt 1, Appendix F).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.2.2 for additional justification.

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? NA (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.2.2 for additional justification.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? NA (Reference: ________).

Plant normal ambient radiation dose (rd) ________

Test exposure dose (rd) ________

Test exposure dose rate (rd/hr) ________

Test exposure source type (e.g., Co-60 gamma) ________

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.2.2

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: Qual Rpt 1, pp. 7 and 8). R2

JUSTIFICATION/COMMENTS ________

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference: ________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.2.4

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: Qual Rpt 2, Page 19).

JUSTIFICATION/COMMENTS ________

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R2

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference:).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.2.4

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference:).

Qualified life (Document in QMDS) 40 years with maintenance program in TAB G.

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference:).

|R2

JUSTIFICATION/COMMENTS Component replacement intervals are given in the Joy Axivane Fan Operators Handbook (TAB H) and in the QMDS (TAB G).

BINDER NO. WBNEQ-MOT-002 PLANT WBN UNIT(S) 1 SHEET 14 OF 29

R 1 R

BINDER TITLE INDUCTION MOTOR-TYPE RN COMPUTED RSR - DATE 6/9/86 HOR 6/13/88

INSULATION-INSIDE CONTAINMENT CHECKED WBK DATE 6/9/86 JRA 6/20/88

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	References	Activation Energy	Reference
(a)	Type RN insulation system	-	Note 1	1.17	TAB C Att. 1
(b)	Bearing lubricant (Chevron SRI-2 grease)	2×10^8	Note 2	N/A	
(c)					
(d)					-
(e)					-

R

JUSTIFICATION/COMMENTS

Note 1: Analysis of test data on insulation components show that direct damage to to materials is negligible at greater radiation doses than experienced by TVA motors. Type RH insulation, which is similar to type RN, has withstood a total radiation dose of 2.2×10^8 RADS and maintained its ability to perform its required function. Refer to TAB C, Section 4.2.2 for additional information.

Note 2: Refer to Digital Material Aging and Radiation Effects Library, Library Code No. 157-83A and TAB C, Paragraph 6.0. R

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Qual Rpt 1, pages 5-19).

Identify Acceptance Criteria: Motor/fan assembly must operate during and after a simulated DBE described on page 16, following accelerated thermal aging and seismic testing.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Qual Rpt 1, App. A).

Identify baseline and functional testing: During DBE testing, several conditions were monitored and periodically recorded as indicated in the referenced document. Continued motor operability or a lack thereof was the sole failure criteria.

JUSTIFICATION/COMMENTS Refer to Tab C, Sections 4.1, 4.3.1, and 10.0, Qualification Report X-604, Appendix A (TAB D).

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Qual Rpt 1, pages 13-15).

JUSTIFICATION/COMMENTS In a telecon between Bob Raymond of TVA and Tom Bissett of Joy on 5-8-86, (TAB E, Div. 2), it was confirmed that the motor/vaneaxial fan assembly was operated under low speed conditions, 75 hp, 590 rpm, during the DBE simulation. A bypass loop was provided to allow for recirculation of fan air flow.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: Qual. Rpt. 1, Appendix E, Page 2).

JUSTIFICATION/COMMENTS Baseline testing conditions were equal to or more severe than normal operating condiditions.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	480 V	45W760-30-13
Load	40,000 CFM	77K35-83165
Frequency	60 Hz	77K35-83165
Accuracy	N/A	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 7.0 for discussion of voltage and frequency requirements.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference |R2
Voltage	(1) 453.13 VAC (2) 458.38 VAC	WBPEVAR8602001 Sheets D165 & D225
Load	Refer to Note 1 below	
Frequency	60 Hz	TAB C Section 7.0
Accuracy	N/A	
Other(s)		

JUSTIFICATION/COMMENTS Minimum accident voltages for motors 1-MTR-30-38-A and -39-B (453.13 VAC and 458.38 VAC, respectively) are terminal voltages at T=15 seconds after a phase B contaiment isolation signal.

(c)

Parameter	Demonstrated Conditions	Reference |R2
Voltage	460 VAC	Qual Report 1 App. E, Page 3
Load	Refer to Note 1 below	
Frequency	60 HZ	Qual. Report 1 App. E, Page 3
Accuracy	N/A	
Other(s)		

JUSTIFICATION/COMMENTS Note 1: Load consists of vane axial fans of similar design but of different size. Motors are sized by the fan manufacturer to ensure proper fan performance. TVA motors are rated 100 hp, 1800 rpm. The tested motor was a 2-speed motor rated 150/75 hp, 1200/600 rpm.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42 |R2

(1) Normal Max

(a) Temperature (°F) 120
(b) Pressure (psig) (0.3 psig) 14.7 psia
(c) Humidity (%) 80
(d) Radiation (rd) 2×10^7 MAX

(2) Abnormal Max

(a) Temperature (°F) 130
(b) Pressure (psig) (0.3 psig) 14.7 psia
(c) Humidity (%) 100
(d) Radiation (rd) --

(3) Process Interfaces: Fan mounted on motor shaft using a 3/4" x 3/4" key. Motor is mounted to fan casing through 4 threaded stud bolts in the front section of the motor.

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a)	Temperature (°F)	327	Accident type LOCA/HELB |R2
(b)	Pressure (psig)	(11.2 psig) 25.6 psia	Accident type LOCA
(c)	Humidity (%)	100	Accident type LOCA/MSLB |R2
(d)	Radiation (rd)	4.7×10^8 Beta (refer to Sect. P) 4×10^7 Gamma	Accident type LOCA
(e)	Spray Type	Refer to Comments	Accident type LOCA/HELB

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Actual accident environment is a composite of several profiles. Refer to TAB C, Section 2.0, for additional details. Chemical spray is addressed in TAB C, Section 4.3.2.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: TAB C, Section 4.2.3 and 4.3.3).

(7) Subject to submergence (Yes/No/NA)? No (Reference: TAB C, Section 9.0).

Identify initiation time and duration of submergence: ______

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: Environmental DWG. 47E235-42).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify:

2×10^6 See Section P

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B, Section A	

|R3

BINDER NO. WBNEQ-MOT-002	PLANT WBN	UNIT(S) 1	SHEET 20 OF 29 R 2 R
BINDER TITLE INDUCTION MOTOR-TYPE RN INSULATION-INSIDE CONTAINMENT	COMPUTED RSR	DATE 9/5/86 TOK 1-18-89	
	CHECKED WBK	DATE 9/5/86 KBW 1/18/89	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS R2

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	2400 hrs.	10,145 hrs.	Qual Rpt 1, page 17
Temperature (°F)	327	350 peak, 330 for 4 hours	Qual Rpt 1, pgs. 14 & 15
Pressure (psig)	11.2	78	Qual Rpt 1 pg. 14, item 5a
Relative Humidity (%)	100	100	Qual Rpt 1, App. A., pg. 8
Chemical Spray*	Refer to TAB C, Section 4.3.2		
Radiation (rd)**	2×10^6 Beta 6×10^7 Gamma	Refer to TAB C, Sec 4.2.2	
Submergence	No	No	Refer to TAB C, Sec. 9.0

R2

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	L. (1) above
Pressure	Yes	L. (1) above
Relative Humidity	Yes	L. (1) above
Chemical Spray	Refer to TAB C, Section 4.3.2	
Submergence	N/A	

JUSTIFICATION/COMMENTS Additional discussion in TAB C, Section 5.0

BINDER TITLE INDUCTION MOTOR-TYPE RN INSULATION-INSIDE CONTAINMENT	COMPUTED RSR	DATE 6/9/86 JDH 9/23/89
	CHECKED WBK	DATE 6/12/86 KBU 9/23/89

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	23°F	Yes
Pressure: +10% but no more than 10 psig	550% (AP=66psig)	Yes
Radiation: +10% of accident dose		No
Time: +10% (or 1 hour + operating time per NUREG-0588)	Refer to WAC-324 (TAB C)	Yes |R3
Voltage: ±10% of rated value		No
Frequency: ±5% of rated value		No
Environmental Transient: the initial transient and the peak temperature applied twice	Refer to Qual Rpt 1, pgs 13-16	Yes
Vibration: +10% added to acceleration	+33%	Yes

JUSTIFICATION/COMMENTS For elaboration, refer to following sections of TAB C:

Temperature Section 4.3.1

Pressure Section 4.3.1

Radiation Section 4.2.2

Time Section 5.0

*Voltage Section 7.0 *Also, See TAB E, Div. 2, Degraded Voltage Correspondence

Frequency Section 7.0

Vibration Section 4.2.4

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference ____________).

JUSTIFICATION/COMMENTS Refer to TAB A

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Qual Rpt 1, pgs. 13-16).

JUSTIFICATION/COMMENTS ____________

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Qual Rpt 1, page 17).

JUSTIFICATION/COMMENTS ____________

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference Qual Rpt 1, p 17).

JUSTIFICATION/COMMENTS Per TAB A, TVA equipment required to operate for a period of 100 days. The equipment tested performed in post-DBE environment for 10,145 hours.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference ____________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 4.3.3

BINDER NO. WBNEQ-MOT -002 PLANT WBN UNIT(S) 1 SHEET 23 OF 29

R ____ R ____

BINDER TITLE INDUCTION MOTOR-TYPE RN COMPUTED L.L. Raymond DATE 6-9-86

INSULATION-INSIDE CONTAINMENT CHECKED [illegible] DATE 6/12/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS Refer to TAB G for maintenance and surveillance practices generally accepted within industry.

BINDER NO. WBNEQ-MOT -002	PLANT WBN	UNIT(S) 1	SHEET 24 OF 29
BINDER TITLE INDUCTION MOTOR-TYPE RN	COMPUTED L.L. Lagman DATE 6-9-86	R	R o
INSULATION-INSIDE CONTAINMENT	CHECKED W.B. Kim DATE 6/12/86		

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	Yes
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	Yes
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	No
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	No
(c) Has the test analyis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	NA
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

The accident radiation doses shown in Section K, Part (5) are 4.7×10^8 rads Beta and 4×10^7 rads Gamma. The effect of this Beta radiation is reduced by motor enclosure thickness which is a minimum of 9/32 inch (see TAB E, Division 5, RIMS B70 860428 004). The value is also applicable to this binder since the same 444 frame motors were furnished for both Sequoyah and Watts Bar Nuclear Plants. The Beta reduction factor for 1/4 inch steel (see TAB E, Division 5, GENNAL3-002) is 0.004, which yields an effective Beta value of less than 2×10^6, which is insignificant in comparison to the Gamma level. Beta effect on the motor leads (which go through 2 1/2 inch conduit of 0.195 nominal wall thickness) is likewise insignificant; conduit size from vendor drawing in TAB I and wall thickness from Design Standard DS-E13.1.3. For Section O(10)(b) and O(15)(b) justifications, see TAB C, 4.3.2 and TAB B J(2) respectively. R2

BINDER NO. WBNEQ-MOT -002	PLANT WBN	UNIT(S) 1	SHEET 27 OF 29
BINDER TITLE INDUCTION MOTOR-TYPE RN	COMPUTED L.S. Raymond	DATE 6-9-86	R ___ R ___
INSULATION-INSIDE CONTAINMENT	CHECKED W Waters	DATE 7/7/86	

SUPPLEMENT 1
COMPONENT-UNIQUE CHECKLIST
MOTORS

EQUIPMENT IDENTIFICATION

(1) Is the motor identified in the qualification report identical to the plant motors which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(a) Insulation system materials	Type RN	Type RN	Yes	Refer to TAB C, Section 3.1
(b) Coil construction (form or random wound, cast)	Random	Random	Yes	Qual Rpt 2, page 5
(c) Insulation class (B, F, H)	H	H	Yes	Qual Rpt 1, page 1
(d) Lubricant				
Manufacturer	Chevron	Chevron	Yes	Refer to TAB C, Section 6.0
Type	SRI-2	SRI-2	Yes	
(e) Bearing				
Manufacturer		New Departure Hyatt	Yes	Refer to (3)
Type	Anti-friction	Anti-friction	Yes	
Bearing life	156 yr	--	Yes	Refer to TAB E, Div. 1
(f) Seals				
Manufacturer				
Type	Laby-rinth	Laby-rinth	Yes	Refer to TAB C, Section 6.0
Material	Brass	Brass	Yes	

EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(g) Motor lead insulation	Nomex Tape Glass Braid	Nomex Tape Glass Braid	Yes	TAB C, Section 3.2

Comments: The tested motor is representative of a line of motors identical in design parameters, methods of construction, etc. to which the plant motors belong. Other parameters such as physical dimensions, horsepower, etc. may not be identical (refer to Qual. Rpt 1, pg. 1).

(2) Does the qualification report indicate that the motorette insulation system is the same as that used on the motors (yes/no/NA)? Yes (Reference ____________).

Comments: Refer to Certificate of Similarity dated May 16, 1986 (TAB E, Div. 1).

(3) Has the vendor provided the bearing rating (yes/no/NA)? Yes (Reference ____________).

Comments: Bearing rating is detailed in Joy's Motor Bearing Life Calculation (TAB E, Div. 1). The bearing life or B10 life of the bearings is specified as 1,367,000 hours (B10 life is equivalent to L-10 life).

(4) Was the lubricant included in the test program (yes/no/NA)? Yes (Reference Qual Rpt 1, App C, Pg 2).

Comments: ____________

BINDER NO. WBNEQ-MOT -002	PLANT WBN	UNIT(S) 1	SHEET 29 OF 29
BINDER TITLE INDUCTION MOTOR-TYPE RN	COMPUTED R.L. Seymour DATE 6-9-86		R ___ R ___
INSULATION-INSIDE CONTAINMENT	CHECKED WB Brown DATE 6/12/86		

EQUIPMENT IDENTIFICATION (Continued)

(5) Were the seals included in the test program (yes/no/NA)? Yes
(Reference Qual Rpt 2, Pg 18).

Comments:

TVA 19537 (OE-3-86)

~~EQP135.27~~

PRINT DATE: 01/11/89

BINDER NO. : WBNEQ-MOT -003
MANUFACTURER : RELIANCE

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MTR -030-0146 ABGTS FAN MOTOR	-A	1-MTR -030-0146 1YF-832365	-A		737' 76K35-083246-1	A05	A	1000	L	MOTOR IS REQUIRED TO DRIVE COOLER TO INSURE ADEQUATE COOLING AND CONTINUED OPERATION OF THE ABGTS.
WBN-2-MTR -030-0157 ABGTS FAN MOTOR	-B	2-MTR -030-0157 1YF832365	-B		737' 76K35-083246-1	A09	A	1000	L	MOTOR IS REQUIRED TO DRIVE COOLER TO INSURE ADEQUATE COOLING AND CONTINUED OPERATION OF THE ABGTS.
WBN-1-MTR -030-0175 RHR PUMP ROOM COOLER MOTOR	-A	1-MTR -030-0175 1YF-833397	-A		676' 84K5-834550-1	A11	A	1000	L	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED RHR PUMP MOTORS.
WBN-1-MTR -030-0176 RHR PUMP ROOM COOLER MOTOR	-B	1-MTR -030-0176 1YF-833397	-B		676' 84K5-834550-1	A10	A	1000	L	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED RHR PUMP MOTORS.
WBN-1-MTR -030-0177 CTN SPR PUMP RM COOLER MOTOR	-A	1-MTR -030-0177 2YF-833397	-A		676' 84K5-834550-1	A09	A	1000	L	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED CONTAINMENT SPRAY PUMP MOTORS.

	R 2	R____	R____
PREPARER/DATE D. F. Ackerly 9/20/86	JDH 2-23-89	-----	-----
CHECKED/DATE N.M. Burstein 9/20/86	KBN 3/9/89	-----	-----

PRINT DATE: 01/11/89

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MTR -030-0178 -B CTN SPR PUMP RM COOLER MOTOR	1-MTR -030-0178 -B 2YF-883397		676' 84K5-834550-1	A08	A	100D	L	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED CONTAINMENT SPRAY PUMP MOTORS.
WBN-1-MTR -030-0179 -B SIS PUMP ROOM COOLER MOTOR	1-MTR -030-0179 -B 1YF-883397		692' 84K5-834550-1	A12	A	100D	L	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED SIS PUMP MOTORS.
WBN-1-MTR -030-0180 -A SIS PUMP ROOM COOLER MOTOR	1-MTR -030-0180 -A 1YF-883397		692' 84K5-834550-1	A13	A	100D	L	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED SIS PUMP MOTORS.
WBN-1-MTR -030-0182 -B CEN CHG PUMP RM COOLER MOTOR	1-MTR -030-0182 -B 3YF-883397		692' 84K5-834550-1	A10	A A A A A	100D 1MO 1MO 1MO 1MO	L AF/A CV/A RH/A AB	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED CENT. CHG. PUMP MOTORS
WBN-1-MTR -030-0183 -A CEN CHG PUMP RM COOLER MOTOR	1-MTR -030-0183 -A 3YF-833397		692' 84K5-834550-1	A09	A A A A A	100D 1MO 1MO 1MO 1MO	L AF/A CV/A RH/A AB	MOTOR IS REQUIRED TO DRIVE COOLER THAT COOLS THE SAFETY-RELATED CENT. CHG. PUMP MOTORS

		R 2	R____	R____
PREPARER/DATE	D. F. Ackerly 9/20/86	JDH 2-23-89	____	____
CHECKED/DATE	N. M. Burstein 9/20/86	KBL 3/9/89	____	____

PRINT DATE: 01/11/89

BINDER NO. : WBNEQ-MOT -003
MANUFACTURER : RELIANCE

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZIMUTH	ELEV(1) / CONTRACT	RM/PAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-MTR -065-0023 EGTS FAN MOTOR	-A	0-MTR -065-0023 1YF-882366	-A		757' 76K35-083246-1	A16	A	1000	L	MOTOR DRIVES FAN WHICH MUST RUN FOR THE EGTS TO PERFORM ITS SAFETY-RELATED FUNCTION.
WBN-0-MTR -065-0042 EGTS FAN MOTOR	-B	0-MTR -065-0042 1YF-882366	-B		757' 76K35-083246-1	A16	A	1000	L	MOTOR DRIVES FAN WHICH MUST RUN FOR THE EGTS TO PERFORM ITS SAFETY-RELATED FUNCTION.

		R 2	R	R
PREPARER/DATE	D. F. Ackerly 9/20/86	JPH 2-23-89		
CHECKED/DATE	N. M. Burstein 9/20/86	KG 3/9/89		

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-1 for source of Category and Operating Time assignments.

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R 2 R 3

BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT

COMPUTED DFA DATE 9/20 86 JDH 2-23-89 1/31/90

CHECKED NMB DATE 9/20/86 KBN 3-9-89 1/31/90

A. DOCUMENTATION (See Note)

Equipment Description	Continuous Duty 460 volt motors
Vendor/Manufacturer	Reliance Electric Company
Equipment Model No.(s)	Totally enclosed fan-cooled random wound motors on shop orders 1YF--, 2YF-, and 3YF-883397, 1YF-882365, and 1YF-882366.

QUALIFICATION REPORTS (See Note)

(1) Title/Number/Revision Summary Report Nuclear Power Motor System/NUC-9/July 1, 1978 including Supplement R2 dated July 15, 1981 (TAB D-1) RIMS EEB 820602304 DATE July 15, 1981

(2) Title/Number/Revision Qualification Report/End of Life Tests/NUC-22 Rev. 2 (TAB D-2) RIMS B43 850919 500 DATE Feb. 10, 1984

(3) Title/Number/Revision Limitorque PWR Valve Operator Test Report No. 600456 (excerpt TAB D-3) RIMS MED 830510 219 DATE Dec. 9, 1975

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) TVA Radiation Calculation WBNNAL3-025, R0 (B45 860401 235)

(5) TVA Radiation Calculation WBNNAL3-031, R1 (B45 880826 235)

(6) System 30 Cat. & Op. Times WBNOSG4-008, R14 (B26 900110 206) | R3

(7) System 65 Cat. & Op. Times WBNOSG4-015, R8 (B45 870209 428)

(8) TVA degraded Voltage Calc WBP-EVAR 8602001, R0 (B43 860227 901)

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BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED |R2 JOH	DATE 2-23-89	R R
	CHECKED |R2 KBN	DATE 3/9/89	

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(9) WBN Environmental Drawing 47E235-48 R3

(10) WBN Environmental Drawing 47E235-74 R1

(11) WBN Environmental Drawing 47E235-78 R3

(12) WBN Environmental Drawing 47E235-79 R1

(13) WBN Environmental Drawing 47E235-81 R1

(14) TVA Condensation Calc GENNAL6-002 R2 (B45 860812 236)

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

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B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES Refer to open items listed in the front of this binder.

1. Technical information from Reliance is outstanding.
2. "T" drains must be repositioned.
3. Installation of larger terminal boxes.
4. Vendor drawings to reflect replacement parts installed. |R2

COMMENTS/RECOMMENDATIONS See TAB C., Section 9.0, Summary. |R2

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BINDER TITLE RELIANCE-RANDOM WOUND COMPUTED Ackeyly DATE 9/20/86 R ___ R ___

MOTORS-OUTSIDE CONTAINMENT CHECKED B DATE 9/29/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

_X_ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS ___

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974 Qualifying Class 1E Equipment for Nuclear Power Generating Stations

IEEE 334-1974 Type Test of Continuous Duty 1E Motors

NEMA MG-1 Motors and Generators

IEEE 117-1974 Evaluation of Insulating Materials for Random-Wound AC Electrical Machinery.

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MOTORS-OUTSIDE CONTAINMENT		CHECKED B	DATE 9/20/86				

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

__X__ Test of Similar Items with Supporting Analysis

_____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1 for additional details.

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E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? No

	Plant Device	Qualification Document	Reference	
(1) Equipment Type	Induction Motors	Induction Motors	NUC-22, Section IV, TAB D-2	
(2) Manufacturer	Reliance	Reliance	NUC-22, Section I, TAB D-2	R2
(3) Model Number(s)	RH Insulation Systems	3 hp	NUC-22, Section III, TAB D-2	
	Other data	575 VAC, 3 ph, 60 Hz		R2
	in TAB A	1800 rpm-no load		
		RH Insulation System		
(4) Serial Number(s)	Note 1	1YF-882616-A1	TAB D-2, NUC-22, Section III	

(5) Identify Component-Unique checksheet attached: Motors - Supplement 1

JUSTIFICATION/COMMENTS Refer to TAB C, Section 2.0, Similarity.

NOTE 1 - Motor serial numbers may be referred to as either model or serial numbers on the field verification data sheets in TAB F.

PLUSEQ/99.19

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 6 OF 28
			R 2 R
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/20 86 JDH 2-23-89	
	CHECKED NMB	DATE 9/20/86 KBW 3/9/89	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. R2

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	
External Process Connections	NA	NA	
Electrical Connections	NA	NA	
Conduit Seals	NA	NA	
Connector Seals	NA	NA	
Orientation	NA	NA	
Physical Configuration	NA	NA	
Other	NA	NA	

R2

JUSTIFICATION/COMMENTS See TAB C, Section 6.0, Interfaces

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BINDER TITLE RELIANCE-RANDOM WOUND MOTORS-OUTSIDE CONTAINMENT

COMPUTED Ackerly DATE 9/20/86 R ____ R ____

CHECKED [illegible] DATE 9/24/86

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	See comments
(b) Baseline performance measurements taken	Yes	NUC-22, IV.A (p 3) TAB D-2
(c) Equipment aged:		
Thermal	Yes	NUC-22, IV.B.I (p 3) TAB D-2
Radiation	Yes	NUC-22, IV.E (p 5) TAB D-2
Wear	Yes	NUC-22, IV.B.3 (p 3) TAB D-2
(d) Vibration/seismic testing conducted	Yes	NUC-22, IV.C&F (pp 4&6) TAB D-2
(e) Design basis event (DBE) exposure	NA	See comments
(f) Post-DBE exposure	NA	See comments
(g) Final inspection and disassembly	Yes	NUC-22, IV.H (p 6) TAB D-2

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes*
(Reference TAB D-2, NUC-22, Section IV.C & E).

JUSTIFICATION/COMMENTS G.1.a-Though not documented, inspection for damage is inherent in baseline performance tests. G.1.e&f-In the locations indicated in TAB A, significant transients do not occur, and the effects of the DBE result in only moderate increases in the temperature, humidity, and in some cases, a marked increase in radiation. This represents an extension of conditions existing during normal and abnormal operating conditions which are addressed by the thermal/radiation aging phase of the test series. (See TAB C, Section 3.3).

Page B-7

*Although some of the test equipment used in the series of seismic tests may have been out of calibration, this has no bearing on the fact that the motor satisfactorily performed at rated conditions following testing intended to simulate the effects of all service conditions.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference TAB D-2, NUC-22, Section IV.B).

JUSTIFICATION/COMMENTS ______

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Refer to H.4.a
Radiation exposure	Yes	Refer to H.5.a
Vibration (non-seismic) aging	Yes	Refer to H.6.a
Operational (electrical/mechanical/process) stress aging	Yes	Refer to H.7.a

JUSTIFICATION/COMMENTS ______

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference ______).

JUSTIFICATION/COMMENTS A review of the materials used in these motors indicates that there are no known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference TAB D-2, NUC-22, p 3, Section IV.B, p 3 and Appendix 3.)

JUSTIFICATION/COMMENTS Stator winding and leads were aged 88 days at 255°C (491°F).

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference TAB D-1, NUC-9, p 19, Section VI).

JUSTIFICATION/COMMENTS Components susceptible to thermal degradation are the insulation and lubricants. Lubricant is routinely replaced, in accordance with the QMDS (TAB G) and, therefore, not subject to long-term thermal degradation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference TAB D-2, NUC-22, Section IV.B.1, & App 3, p 2).

JUSTIFICATION/COMMENTS In accordance with IEEE 334-1974, Section 9.0, a regression line developed in NUC-9 was used to obtain equivalent aging time and temperature.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference TAB D-2, NUC-22, Section IV.B and App 3).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	Refer to TAB C, Section 8.1	255°C	155°C
Time	40 years	88 days	44 years

JUSTIFICATION/COMMENTS Refer to TAB C, Section 8.1.

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H. AGING (Continued)

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference TAB D-2, NUC-22, Section IV.B and App. 3).

JUSTIFICATION/COMMENTS ___

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS Accelerated aging parameters developed in accordance with Section 9 of IEEE 334-1974 using a system regression line.

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference TAB D-1, NUC-9, Supp. p 2)

JUSTIFICATION/COMMENTS ___

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference TAB D-2 NUC-22, p 6 Section IV, F&G,).

JUSTIFICATION/COMMENTS The accelerated thermal aging process of the complete stator assembly and the motor leads accounts for the thermal stresses which would occur from prolonged normal operation. Following this process, the assembled motor, complete with the aged stator assembly and leads, was operated in a series of performance tests.

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H. AGING (Continued)

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, p 5 Section IV.E).

JUSTIFICATION/COMMENTS Complete motor assembly, including bearings and lubricant, was exposed to a total integrated dose of 2.2 x 10^8 rads, gamma.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-1, NUC-9, p 8, Section III, and TAB D-2, NUC-22, Appendix I, p 1).

JUSTIFICATION/COMMENTS Organic materials of the Reliance RH system, Spec. 4824-GZ, and bearing lubricants are identified by Reliance specification number in Section III of the NUC-9 report.

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-1, NUC-9, Section I.B (pp 1 & 2)).

JUSTIFICATION/COMMENTS Radiation test dose was selected to envelop applications occurring throughout a significant radiation range.

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, App. 5).

Plant normal ambient radiation dose (rd)	3.6×10^6	R2
Test exposure dose (rd)	2.2×10^8	

H. AGING (Continued)

Test exposure dose rate (rd/hr) 220.5 hrs at .55 MRad/hr | R2
20 hrs at .05 MRad/hr
85.7 hrs at 1.14 MRad/hr

Test exposure source type (e.g., Co-60 gamma) Co-60, gamma

JUSTIFICATION/COMMENTS Co-60 gamma source confirmed in telecon on August 29, 1986, between Don Ackerly of TVA and Gary Wheeler of Reliance Electric.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: TAB D-2, NUC-22, p 3, Section IV.B.3). | R2

JUSTIFICATION/COMMENTS Mechanically aged per Section 9 of IEEE 334-1975 for one hour at 60 cycle per second vibration, with a deflection of 8 mils pk-pk.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, p 3, Section IV.B.3).

JUSTIFICATION/COMMENTS

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, p 3, Section IV.B.3; p 4, Section IV.C.4; and p 6, Section IV.F).

JUSTIFICATION/COMMENTS Motor operated under load during multiple frequency seismic tests which followed thermal, radiation, and vibration aging. Motor also operated under no-load conditions during vibration aging addressed in TAB B, Section H, Item 6.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. | R2

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Refer to references in 7a).

JUSTIFICATION/COMMENTS Motor operated under rated conditions during both series of seismic tests. This results in stresses much greater than those encountered through normal operation.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, p 7, Section V).

Qualified life (Document in QMDS) 40+ years

JUSTIFICATION/COMMENTS NUC-22 documents a qualified life of 40 years plus 10% margin, i.e., 44 years at a total temperature of 155°C.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: TAB D-1, NUC-9, p 17, Section V.2&3).

JUSTIFICATION/COMMENTS No replaceable items were identified in the insulation system. The bearings and lubricants are routine maintenance items, the replacement of which is addressed in the Qualification Maintenance Data Sheets in TAB G. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations are detailed.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	References	Activation Energy	Reference TAB C
(a)	DuPont 10/Electrical/ Insulation	$2.2x10^8$	Note 1	1.02 eV	Note 3
(b)	Chevron/Mechanical/ Lubricant SRI No. 2	$2x10^8$ rad	Note 2	Note 4	
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS

Note 1: The Reliance RH/DuPont 10 insulation system withstood a total dose of $2.2x10^8$ RADS and maintained its ability to perform its required function as documented in Reliance Report NUC-22, TAB D-2.

Note 2: Refer to Digital Material Aging and Radiation Effects Library Code No. 157-83A and TAB C, Section 4.2.

Note 3: Refer to material Aging Calculation WAD-34. Refer to TAB D-4.

Note 4: Consideration of long-term thermal degradation of the grease is not required because it is not considered to be a substance with an infinite life. A surveillance and maintenance program is established in the QMDS in TAB G to ensure proper operation.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, p 6, Section IV.G).

Identify Acceptance Criteria: Following accelerated aging and seismic testing intended to simulate the effects of all service conditions, the motor must continue to operate at its rated load.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (Yes/No/NA)? Yes (Reference: TAB D-2, NUC-22, App. 2).

Identify baseline and functional testing: No load, locked rotor, and dielectric tests done to baseline motor performance parameters. After all environmental aging and testing, baseline tests were repeated and full load tests were also performed.

JUSTIFICATION/COMMENTS Motor test results were essentially identical with no indication of diminished capability.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (Yes/No/NA)? Yes (Reference: TAB D-2, Nuc-22, pg 6, Sect. IV.G).

JUSTIFICATION/COMMENTS The motor functioned under rated electrical and mechanical conditions during and following a simulation of the service conditions. The effects of the DBE result in only moderate increases in the temperature, humidity, and, in some cases, a marked increase in radiation. This can be represented as an extension of conditions existing during normal and abnormal operating conditions which is addressed by the thermal/radiation aging phase of the test series. |R2

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: TAB D-1, NUC-22, Section I).

JUSTIFICATION/COMMENTS Baseline tests performed are industry-standard tests used to determine performance characteristics during normal operating conditions.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of voltage and frequency requirements.

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of voltage and frequency requirements.

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	CHECKED |R2 KBU	DATE 3/9/89	

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of voltage and frequency requirements.

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			R 3 R
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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Worst Case Summary of the Next 5 Sheets

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	104	(a) Temperature (°F)	110
(b) Pressure (psig)	ATM-	(b) Pressure (psig)	ATM
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	3.6×10^{6}	(d) Radiation (rd)	NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hrs. per excursion totaling less than 1% of plant life and a total of 1600 hours during life of plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110 for 30 days	Accident type	LOCA
(b) Pressure (psig)	NA	Accident type	HELB/LOCA
(c) Humidity (%)	NA	Accident type	HELB/LOCA
(d) Radiation (rd)	1×10^{8}	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

R3

WBEP-0099Q

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-48

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM-

(c) Humidity (%) 80

(d) Radiation (rd) 8.8×10^{5}

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM-

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hrs. per excursion totaling less than 1% of plant life and a total of 1600 hours during life of plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110 for 30 days	Accident type	LOCA R3
(b) Pressure (psig)	NA	Accident type	LOCA
(c) Humidity (%)	NA	Accident type	LOCA
(d) Radiation (rd)	1×10^{8}	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

Affected Motors: 1-MTR-30-146-A, RM A5 R3
2-MTR-30-157-B, RM A9

Motors listed are required to operate only during conditions resulting from a LOCA. R3

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			R 2 R 3
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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-74

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM-

(c) Humidity (%) 80

(d) Radiation (rd) 4.3×10^{5}

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM-

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hrs. per excursion totaling less than 1% of plant life and a total of 1600 hours during life of plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 110 for 30 days Accident type LOCA |R3

(b) Pressure (psig) NA Accident type LOCA |R3

(c) Humidity (%) NA Accident type LOCA

(d) Radiation (rd) 1×10^{7} Accident type LOCA

(e) Spray Type NA Accident type NA

Affected Motors: 1-MTR-30-175-A, Rm A11 |R3
1-MTR-30-176-B, Rm A10

Motors listed are required to operate only during conditions resulting from a LOCA. |R3

WBEP-0099Q

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 17c OF 28
			R 2 R 3
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/26 86	JDH [signature] 2/23/89 2/6/90
	CHECKED NMB	DATE 9/26/86	KBN KBN 3/19/89 2/7/90

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-78

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	104	(a) Temperature (°F)	110
(b) Pressure (psig)	ATM	(b) Pressure (psig)	ATM
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	$1.8\text{x}10^3$	(d) Radiation (rd)	NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hrs per excursion totaling less than 1% of plant life and a total of 1600 hours during life of plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110 for 30 days	Accident type	LOCA	R3
(b) Pressure (psig)	NA	Accident type	LOCA	R3
(c) Humidity (%)	NA	Accident type	LOCA	R3
(d) Radiation (rd)	$1.4\text{x}10^6$**	Accident type	LOCA	
(e) Spray Type	NA	Accident type	NA	R3

Affected Motors: 0-MTR-65-23-A, Rm A16
0-MTR-65-42-B, Rm A16
Motors listed are required to operate only during conditions resulting from a LOCA. R3

**WBNNAL3-031

BINDER NO. WBNEQ-MOT-003 PLANT WBN UNIT(S) 1 SHEET 17d OF 28

BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/20 86	R 2: JDH 2/2/89 · R 3: 1/31/90
	CHECKED NMB	DATE 9/20/86	R 2: KBN 3/9/89 · R 3: KBN 1/31/90

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-79

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	104	(a) Temperature (°F)	110
(b) Pressure (psig)	ATM	(b) Pressure (psig)	ATM
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	3.6×10^6	(d) Radiation (rd)	NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hrs. per excursion totaling less than 1% of plant life and a total of 1600 hours during life of plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110 for 30 days	Accident type LOCA	R3
(b) Pressure (psig)	NA	Accident type LOCA/HELB	R3
(c) Humidity (%)	NA	Accident type LOCA/HELB	R3
(d) Radiation (rd)	1×10^7	Accident type LOCA	
(e) Spray Type	NA	Accident type NA	R3

Affected Motors: *1-MTR-30-179-B, Rm A12
*1-MTR-30-180-A, Rm A13
**1-MTR-30-182-B, Rm A10
**1-MTR-30-183-A, Rm A9

*Motor is required to operate only during conditions resulting from a LOCA.
**Motor required to operate during a LOCA or HELB condition.

R3

WBEP-0099Q

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 17e OF 28 R 2 R 3
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/20 86	JDH 2/23/89 1/31/90
	CHECKED NMB	DATE 9/20/86	KBN 3/9/89 1/31/90

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-81

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM-

(c) Humidity (%) 80

(d) Radiation (rd) 3.5×10^{4}

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM-

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hrs. per excursion totaling less than 1% of plant life and a total of 1600 hours during life of plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110 for 30 days	Accident type LOCA	R3
(b) Pressure (psig)	NA	Accident type LOCA	R3
(c) Humidity (%)	NA	Accident type LOCA	R3
(d) Radiation (rd)	1×10^{7}	Accident type LOCA	
(e) Spray Type	NA	Accident type NA	R3

Affected Motors: 1-MTR-30-177-A, Rm A9
1-MTR-30-178-B, Rm A8

Motors listed are required to operate only during conditions resulting from a LOCA. R3

WBEP-0099Q

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 18 OF 28 R 2 R
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/20 86 JDH 2-23-89	
	CHECKED NMB	DATE 9/20/86 KBW 3/9/89	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): ______

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: TAB C, Section 7.0, Submergence and moisture intrusion).

(7) Subject to submergence (Yes/No/NA)? No (Reference: Flooding in Auxiliary Building - B45 860110 218 and TAB C, Section 7.0, Submergence and moisture intrusion.).

Identify initiation time and duration of submergence: No motors of this binder are subject to submergence.

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? NA (Reference: Section P-Note 1). R2

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: ______

(9) Special environmental calculations (temp., rad., etc.) R2

Type	RIMS No.
WBNNAL3-031	See TAB B, Section A

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 19 OF 28
			R 2 R
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/20 86 JDH 2-23-89	
	CHECKED NMB	DATE 9/20/86 KBN 3/9/89	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	40 years + 100 days	44 years	NUC-22, Section V, TAB D-2
Temperature (°F)	135°C	155°C	See TAB C, Section 8.1
Pressure (psig)	ATM	ATM	See TAB C, Section 9.0
Relative Humidity (%)	100	100	TAB C, Section 8.3
Chemical Spray*	NA	NA	NA
Radiation (rd)**	1.04×10^8	2.2×10^8	NUC-22, Section V, p 7, TAB D-2 and TAB C, Section 8.2
Submergence	NA	NA	Refer to TAB C, Section 7.0

R2

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	TAB C, Sect. 8.1
Pressure	Yes	TAB C, Sect. 3.5
Relative Humidity	Yes	TAB C, Sect. 8.3
Chemical Spray	NA	TAB C, Sect. 3.4
Submergence	NA	TAB C, Sect. 7.0

JUSTIFICATION/COMMENTS ______

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	Note 1	Yes
Pressure: +10% but no more than 10 psig		NA(Note 2)

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 21 OF 28
BINDER TITLE RELIANCE-RANDOM WOUND	COMPUTED Ackerly	DATE 9/26/86	R ___ R ___
MOTORS-OUTSIDE CONTAINMENT	CHECKED B	DATE 9/26/86	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

Radiation: +10% of accident dose	10%	Yes (Note 3)
Time: +10% (or 1 hour + operating time per NUREG-0588)	10%	Yes (Note 1)
Voltage: ± 10% of rated value		NA (Note 4)
Frequency: ± 5% of rated value		NA (Note 4)
Environmental Transient: the initial transient and the peak temperature applied twice		NA (Note 5)
Vibration: +10% added to acceleration		NA (Note 6)

JUSTIFICATION/COMMENTS

Note 1 - Refer to TAB C, Section 8.1.

Note 2 - Refer to TAB C, Section 3.5.

Note 3 - Refer to TAB C, Section 8.2.

Note 4 - Refer to TAB C, Section 5.0.

Note 5 - Refer to TAB C, Section 3.3.

Note 6 - These motors do not experience significant process-related vibration and as such, the vibration margin has been accounted for during the seismic/vibration tests documented in the Nuc-22 report.

BINDER NO. WBNEQ-MOT-003 PLANT WBN UNIT(S) 1 SHEET 22 OF 28

BINDER TITLE RELIANCE-RANDOM WOUND COMPUTED Ackerly DATE 9/20/86 R ___ R ___

MOTORS-OUTSIDE CONTAINMENT CHECKED B DATE 9/20/86

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference ______).

JUSTIFICATION/COMMENTS Refer to TAB A and J(1).

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference ______).

JUSTIFICATION/COMMENTS TAB C, Section 3.3.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference ______).

JUSTIFICATION/COMMENTS TAB C, Section 3.3.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference NUC-22, p 7, Section V).

JUSTIFICATION/COMMENTS Motor operated under full-load conditions following accelerated thermal aging, irradiation, and mechanical aging.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? NA
(Reference ______).

JUSTIFICATION/COMMENTS No test anomalies were reported.

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1			SHEET 23	OF 28	
BINDER TITLE RELIANCE-RANDOM WOUND		COMPUTED	DATE 9/20/86	R		R	
MOTORS-OUTSIDE CONTAINMENT		CHECKED	DATE 9/20/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS No replaceable items were identified in the insulation system qualification program described in NUC-9 and NUC-22. The bearings and lubricants are routine maintenance items, the replacement of which is addressed in the Qualification Maintenance Data Sheets (QMDS) in this binder. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations are detailed in the QMDS located in TAB G.

BINDER NO WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 24 OF 28
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS-OUTSIDE CONTAINMENT	COMPUTED Oeferly DATE 9/26/86	R ___ R ___	
	CHECKED B DATE 9/26/86		

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes
(e) Normally operating state of device (e.g., normally energized) considered?	Yes

BINDER NO.	WBNEQ-MOT-003	PLANT	WBN	UNIT(S)	1	SHEET 25	OF 28
						R	R
BINDER TITLE	RELIANCE-RANDOM WOUND	COMPUTED	Adcock	DATE	9/20/86		
	MOTORS-OUTSIDE CONTAINMENT	CHECKED	[illegible]	DATE	9/20/86		

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	NA
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Section P Note 1
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1		SHEET 26 OF 28			
						R	R
BINDER TITLE RELIANCE-RANDOM WOUND	COMPUTED Ackerley	DATE 9/20/86					
MOTORS-OUTSIDE CONTAINMENT	CHECKED [illegible]	DATE 9/21/86					

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. Discussion

Note 1: Motors are located in areas throughout the auxiliary building. Beta-radiation is confined to the reactor building by plant design; therefore, these motors are not required to be evaluated for the effects of beta radiation.

SUPPLEMENT 1
COMPONENT-UNIQUE CHECKLIST
MOTORS

Page 1 of 2

EQUIPMENT IDENTIFICATION

(1) Is the motor identified in the qualification report identical to the plant motors which require qualification (Yes/No/NA)? No (Refer Note 1)

	Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(a)	Insulation system materials	RH	RH	Yes	TAB C, Sect. 2.1
(b)	Coil construction (form or random wound, cast)	Random	Random	Yes	TAB D-1, Nuc-9, Sect. I.D
(c)	Insulation class (B, F, H)	H	H	Yes	TAB D-2, Nuc-22, Sect. III
(d)	Lubricant				
	Manufacturer	Chevron	Chevron	Yes	TAB D-2, NUC-22, App 1, Sect. I
	Type	SRI-2	SRI-2	Yes	TAB D-2, NUC-22, App 1, Sect. I
(e)	Bearing				
	Manufacturer	Note 2	Note 2	Yes	
	Type	Anti Friction	Anti Friction	Yes	TAB C, Sect. 4.1
	Bearing life	*	*	Yes	TAB C, Sect. 4.1

R2

*See TAB G, QMDS. R2

BINDER NO. WBNEQ-MOT-003	PLANT WBN	UNIT(S) 1	SHEET 28 OF 28
			R 2 R
BINDER TITLE RELIANCE-RANDOM WOUND MOTORS- OUTSIDE CONTAINMENT	COMPUTED DFA	DATE 9/26 86 JDH 4/28/89	
	CHECKED NMB	DATE 9/26/86 KBW 4/28/89	

EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section	
(f) Seals					
Manufacturer	Note 2	Note 2	Yes		
Type	400654	400654	Yes	NUC-9, Sect.V.C.TAB D	
Material	Steel	Steel	Yes	NUC-9, Sect.V.C.TAB D	
(g) Motor lead insulation	RH	RH	Yes	NUC-9, Sect. III. 8, p 12, TAB D	R2

Comments: Note 1: Tested motors are the same as installed except for the actual physical size and rating. Differences are achieved through the use of long-time, industry standard design and construction principles.

Note 2: Tested equipment utilized components determined to be acceptable by Reliance. Bearings and seals for equipment in TAB A were also provided by Reliance.

(2) Does the qualification report indicate that the motorette insulation system is the same as that used on the motors (Yes/No/NA)? Yes
(Reference: Refer to TAB C, Section 2.1).
Comments:

(3) Has the vendor provided the bearing rating (Yes/No/NA)? Yes
(Reference: Refer to TAB C, Section 4.1).
Comments:

(4) Was the lubricant included in the test program (Yes/No/NA)? Yes
(Reference: NUC-22).
Comments: Lubricant is maintenance item only. Refer to TAB C Section 4.2 R2

(5) Were the seals included in the test program (Yes/No/NA)? Yes
(Reference: NUC-9, Section V.C.). R2

Comments: Refer to TAB C, Section 4.3

PLUSEQ/99 39

PRINT DATE: 01/11/89

BINDER NO. : WBNEQ-MOT -004
MANUFACTURER : LOUIS ALLIS

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MTR -030-0194 -A	1-MTR -030-0194 -A		737'	A05	A	100D	L	MOTOR IS REQUIRED TO DRIVE
EL 737 PENETRATION ROOM COOLER MOTOR	M.O. 4-147740		84K5-834550-2		A	1MO	AF/A	COOLER THAT COOLS
					A	1MO	CV/A	SAFETY RELATED EQUIPMENT
					A	1MO	RH/A	IN THE PENETRATION ROOM
					A	1MO	AB	
WBN-2-MTR -030-0194 -A	2-MTR -030-0194 -A		737'	A09	A	100D	L	MOTOR IS REQUIRED TO DRIVE
EL 737 PENETRATION ROOM COOLER MOTOR	M.O. 4-147745		84K5-834550-2		A	1MO	AF/A	COOLER THAT COOLS
					A	1MO	CV/A	SAFETY RELATED EQUIPMENT
					A	1MO	RH/A	IN THE PENETRATION ROOM
					A	1MO	AB	
WBN-1-MTR -030-0195 -B	1-MTR -030-0195 -B		737'	A05	A	100D	L	MOTOR IS REQUIRED TO DRIVE
EL 737 PENETRATION ROOM COOLER MOTOR	M.O. 4-147740		84K5-834550-2		A	1MO	AF/A	COOLER THAT COOLS
					A	1MO	CV/A	SAFETY RELATED EQUIPMENT
					A	1MO	RH/A	IN THE PENETRATION ROOM
					A	1MO	AB	
WBN-2-MTR -030-0195 -B	2-MTR -030-0195 -B	321	737'	A09	A	100D	L	MOTOR IS REQUIRED TO DRIVE
EL 737 PENETRATION ROOM COOLER MOTOR	M.O. 4-147745		84K5-834550-2		A	1MO	AF/A	COOLER THAT COOLS
					A	1MO	CV/A	SAFETY RELATED EQUIPMENT
					A	1MO	RH/A	IN THE PENETRATION ROOM
					A	1MO	AB	
WBN-1-MTR -030-0196 -A	1-MTR -030-0196 -A		713'	A06	A	100D	L	MOTOR IS REQUIRED TO DRIVE
EL 713 PENETRATION ROOM COOLER MOTOR	M.O. 4-147739		84K5-834550-2		A	1MO	AF/A	COOLER THAT COOLS
					A	1MO	CV/A	SAFETY RELATED EQUIPMENT
					A	1MO	RH/A	IN THE PENETRATION ROOM
					A	1MO	AB	

	R 2	R____	R____
PREPARER/DATE D F Ackerly 9/2/86	JDN 2-2-89		
CHECKED/DATE N M Burstein 9/2/86	[illegible] 2/3/89		

PRINT DATE: 01/11/89

BINDER NO. : WBNEQ-MOT -004
MANUFACTURER : LOUIS ALLIS

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS_NUMBER / DESCRIPTION		UNIT_DEVICE_ID_NO. / MODEL_NUMBER		LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/PAD	CAT (2)	OPER_TIME	EVENT	SAFETY_FUNCTION
WBN-1-MTR -030-0197	-B	1-MTR -030-0197	-B		713'	A06	A	100D	L	MOTOR IS REQUIRED TO DRIVE
EL 713 PENETRATION ROOM COOLER MOTOR		M.O. 4-147739			84K5-834550-2		A	1MO	AF/A	COOLER THAT COOLS
							A	1MO	CV/A	SAFETY RELATED EQUIPMENT
							A	1MO	RH/A	IN THE PENETRATION ROOM
							A	1MO	AB	
WBN-2-MTR -030-0200	-A	2-MTR -030-0200	-A		757'	A16	A	100D	L	EVENT L:THE EGTS MUST WORK TO
EGTS COOLER FAN MOTOR		M.O. 4-147746			84K5-834550-2		C		RH/A	PREVENT RELEASE OF RADIOACTIVE
							C		CV/A	GASES.THESE MTRS MUST FUNCTION
							C		AF	TO PREVENT OVERHEATING EGTS.
							C		AB	
WBN-2-MTR -030-0207	-B	2-MTR -030-0207	-B		757'	A16	A	100D	L	EVENT L:THE EGTS MUST WORK TO
EGTS COOLER FAN MOTOR		M.O. 4-147746			84K5-834550-2		C		RH/A	PREVENT RELEASE OF RADIOACTIVE
							C		CV/A	GASES.THESE MTRS MUST FUNCTION
							C		AF	TO PREVENT OVERHEATING EGTS.
							C		AB	

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R2

			R 2	R____	R____
PREPARER/DATE	D F Ackerly	9/2/86	JDH 2-2-89	____	____
CHECKED/DATE	N M Burstein	9/2/86	[illegible] 2/3/89	____	____

BINDER NO. WBNEQ-MOT-004	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
			R R
BINDER TITLE LOUIS ALLIS - INDUCTION MOTORS - OUTSIDE CONTAINMENT	COMPUTED /R2 JDH	DATE 2-2-89	
	CHECKED /R2 KBJ	DATE 2/8/89	

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-3 R2 for source of Category and Operating Time Assignments.

BINDER NO. WBNEQ-MOT-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

BINDER TITLE LOUIS ALLIS-INDUCTION MOTORS-OUTSIDE CONTAINMENT COMPUTED [illegible] DATE 8/23/86 R R

CHECKED [illegible] DATE 8/23/86

TAB B

TABLE OF CONTENTS

BINDER NO. WBNEQ-MOT-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 30
R 2 R

BINDER TITLE LOUIS ALLIS - INDUCTION MOTORS - OUTSIDE CONTAINMENT

COMPUTED DFA DATE 9/15/86 JDH 3-9-89

CHECKED NMB DATE 9/15/86 KBN 3/9/89

A. DOCUMENTATION (see note) |R2

Equipment Description: Squirrel-Cage Induction Motor

Vendor/Manufacturer: Louis Allis

Equipment Model No.(s): 3hp, 460 Vac, NH5 insulation system
M.O. No. 4-147739

QUALIFICATION REPORTS (see note) |R2

(1) Title/Number/Revision Insulation Sys Study RIMS B71 860512 103
Class H - Safety Class 1E-600 Volt AC Stator
(for SVC to $1x10^5$ rads); M&M Report 272 DATE January 28, 1977

(2) Title/Number/Revision ______ RIMS ______
______ DATE ______

OTHER (ANALYSIS, VENDOR DATA, ETC.) |R2

(3) System 30 Category and Operating Times WBNOSG4-008 R11
(B45 870123 426)

(4) WBN Environmental Dwg. 47E235-56 R1.

(5) TVA Radiation Calculation WBNNAL3-029 R1 (B26 881031 011).

(6) Nuclear Qualification Report 4-147739-NQR, Rev. A (TAB E-1).

(7) TVA Degraded Voltage Calculation WBP-EVAR 8602001 RO
(B43 860227 901).

(8) Material Aging Calculation WAC-081 (TAB D-7).

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references. R2

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B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES Refer to open items listed in the front of this binder.

1. Weephole to be drilled in terminal box (Open Item 6)

COMMENTS/RECOMMENDATIONS

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C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

__X__ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

_____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS __________

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 334-1974 Type Test of Continuous Duty Class 1E Motors

NEMA MG1-1982 Motors and Generators

IEEE 117-1974 Evaluation of Insulating Materials for Random-Wound AC Electric Machinery

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D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

____ Test of Similar Items with Supporting Analysis

_X_ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0, for additional details.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? No

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Induction Motor	Motorettes	TAB C Sect 3.1
(2)	Manufacturer	Louis Allis	Louis Allis	Qual Rpt 1 Title Pg
(3)	Model Number(s)	3hp, 460 Vac	NH5 Ins. Sys.	
		NH5 Ins. Sys.		
		M.O. 4-147739		
(4)	Serial Number(s)	4-147739-001	NA	TAB E-1 |R2
		4-147739-002		Rpt 4-147739-NQR Rev A, Sect B

(5) Identify Component-Unique checksheet attached: Supp 1, Component Unique Checklist, Motors.

JUSTIFICATION/COMMENTS The equipment provided for the plant consists of complete motor assemblies which included a random-wound stator with the NH5 insulation system. The qualification report documents the motorette testing performed on the NH5 insulation system in accordance with IEEE 117-1974. Applicability of the data from the qualification report is dependent solely upon the use of the NH5 system (L.A. System P4-9060) in the stator assembly and is independent of the motor horsepower rating.

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F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	
External Process Connections	NA	NA	
Electrical Connections	NA	NA	
Conduit Seals	NA	NA	
Connector Seals	NA	NA	
Orientation	NA	NA	
Physical Configuration	NA	NA	
Other			

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 6.0, Interfaces.

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G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	TAB C, Sect 3.2
(b) Baseline performance measurements taken	Yes	Note 1, Also TAB C Att 1, Sect B.2
(c) Equipment aged:		Qual. Rpt 1, App 1, pg 1, Subsect C.1,
Thermal	Yes	also TAB C, Att 1, Sect B.4
Radiation	NA	TAB C, Att 1, Sect C.2
Wear	NA	TAB C, Sect 3.1
(d) Vibration/seismic testing conducted	Yes	TAB C, Sect 3.2
(e) Design basis event (DBE) exposure	NA	TAB C, Sect 3.3
(f) Post-DBE exposure	NA	TAB C, Sect 3.3
(g) Final inspection and disassembly	NA	Note 2

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? NA (Reference Note 2

JUSTIFICATION/COMMENTS Note 1 - Refer to Qual. Rpt 1, App I, Att 2, LTP-110, pg 1, Method of Test, Sect 2.

G. TEST SEQUENCE (continued)

Note 2 - The continued ability of the motorette and the insulation system to function is predicated upon its ability to withstand dielectric proof tests as shown in TAB C, Att.1, Sect B.7. Failure of a dielectric proof test is a conclusive failure and does not require accurate and calibrated test equipment.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Qual Rpt 1, App I, pg 1, Test Procedure, Sect A).

JUSTIFICATION/COMMENTS Aging factors were applied to models of the stator insulation following methods outlined in IEEE 117-1974.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Refer to H.4.a
Radiation exposure	Yes	Refer to H.5.a
Vibration (non-seismic) aging	Yes	Refer to H.6.a
Operational (electrical/mechanical/process) stress aging	Yes	Refer to H.7.a

JUSTIFICATION/COMMENTS Motorette testing consists of subjecting models of insulation systems to a series of exposures to heat, vibration, moisture, and other environmental parameters to simulate the effects of long service, thereby simulating the cumulative effect of extended operation. Refer to TAB C, Section 3.1.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference ____

JUSTIFICATION/COMMENTS A review of the materials used in these motors indicates that there are no known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Qual. Rpt 1, App I, pg 1, Test Procedure, Section C.1).

JUSTIFICATION/COMMENTS Also refer to TAB C, Att 1, Sect B.4.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Qual Rpt 1, App I, Att 1).

JUSTIFICATION/COMMENTS Refer to TAB C, Att 1, Sect B.1.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Qual Rpt 1, App 1, Att 2, LTP-110, pg 2, Method of Test, Sect 3.a).

JUSTIFICATION/COMMENTS Refer to TAB C, Att 1, Sect B.4.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference ____________________).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature			
Time			

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.0.

(e) Was the Arrhenius methodology used for accelerated aging? (yes/no/NA)? Yes (Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.0.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA (Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.0.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? Yes
(Reference: ______).

JUSTIFICATION/COMMENTS Qualification of motors through the use of motorette tests involves the use of the equation of a regression-type implied average life characteristic. Refer to TAB C, Sect 3.0.

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? NA (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.1.

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Att 1, Sect C.2.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? Yes
(Reference: Qual Rept 1, App 2).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 1, Section C.2 R2

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? NA
(Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Att 1, Sect C.2.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? NA (Reference: ________).

Plant normal ambient radiation dose (rd) 9.3×10^3

Test exposure dose (rd) ________

Test exposure dose rate (rd/hr) ________

Test exposure source type (e.g., Co-60 gamma) ________

JUSTIFICATION/COMMENTS Refer to TAB C, Att 1, Sect C.2

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: ________). R2

JUSTIFICATION/COMMENTS Refer to TAB c, Att 1, Sect B.5

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Qual Rpt 1, App 1, Att 2, LTP-110, pg 2, Method of Test, Sect 3.b).

JUSTIFICATION/COMMENTS Mechanical stress testing performed in accordance with Sect 2.2.3 of IEEE 117-1974 to simulate forces on the winding that occur in an actual motor.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R2

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes
(Reference ______________________________
______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.1

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference ______________________________
______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.1

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference ______________________________
______________________________).

Qualified life (Document in QMDS) Expected qualified life is 40+ years.

JUSTIFICATION/COMMENTS Refer to TAB C, Att 1, Sect D.

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H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference: ____
____).

JUSTIFICATION/COMMENTS No replacement items were identified in the insulation system qualification program described in M&M Rpt 272. The bearings and lubricants are routine maintenance items, the replacement of which are addressed in individual Qualification Maintenance Data Sheets in this binder. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations, particularly regarding the neoprene slingers and gaskets, are detailed.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation, Degradation and Aging. (See Section C of EQC Binder for Detailed Materials Analysis).

	Material/Property/Function	Radiation Threshold	References	Activation Energy	Reference
(a)	Type NH5 insulation system	1×10^5	Note 1	1.24	TAB D-7, WAC-081, Calc No 1
(b)	Bearing Lubricant (Chevron SRI-2 Grease)	2×10^8	Note 2	Note 4	
(c)	Neoprene/Mechanical/ slinger & gasket	2×10^6	Note 3	Note 4	
(d)					
(e)					

JUSTIFICATION/COMMENTS

Note 1: Radiation threshold is actual rating of system. Refer to TAB C, Att. 1, Sec. C.

Note 2: Refer to Digital Material Aging and Radiation Effects Library, Library Code No. 157-83A, and TAB C, Section 4.2 R1

Note 3: Refer to Digital Material Aging and Radiation Effects Library, Library Code No. 202-83, Radiation Library Code 094-83.

Note 4: Consideration of long-term thermal degradation is not required because lubricant and slingers are not considered to be substances and devices with infinite lives. A surveillance and maintenance program is established in the QMDS in TAB G to ensure proper operation.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Qual Rpt 1, App 1, Att 2, LTP-110, pg 2, Method of Test, Sect 3.d).

Identify Acceptance Criteria: Failure to withstand 10 minute applied potential tets at the folowing levels: turn to turn - 120 Vac; coil to coil - 600 Vac; coil to ground - 600 Vac.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Qual Rpt 1, App 1, Att 2, LTP-110, pg 1, Method of Test, Sect 2).

Identify baseline and functional testing: Functional tests listed in section J.1 above. Each motorette was subjected to the following baseline tests: turn to turn - 400 Vac; coil to coil - 2000 Vac; coil to ground - 2000 Vac.

JUSTIFICATION/COMMENTS Also refer to TAB C, Att 1, Sects B.2. & B.7.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? NA (Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.3.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: ________).

JUSTIFICATION/COMMENTS Voltages applied to the motorettes during baseline testing described in J.2 were chosen to be above the maximum service voltage for motors rated 460 Vac.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 5.0 for discussion of Voltage and Frequency requirements.

R2

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 5.0 for discussion of voltage and frequency requirements.

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Sect. 5.0 for discussion of voltage and frequency requirements.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-56 |R2

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM-

(c) Humidity (%) 80

(d) Radiation (rd) 9.3×10^{3}*

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM-

(c) Humidity (%) 90

(d) Radiation (rd) -

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameters including peak, duration, and profile):

(a) Temp (°F) **	(1)196/15 min decaying to 110 in 24 hrs continuing for 30 days (2)110 for 100 days	Accident type	HELB LOCA |R2
(b) Pressure (psig)	ATM	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	1.1×10^{4}*	Accident type	LOCA
(e) Spray Type	NA	Accident type	

* Radiation site specific dose per TVA Calculation WBNNAL3-029 |R2

** For additional details, refer to TAB C, Att 1, Section C.1.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Motors are located outside containment and are not subject to chemical spray.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: WBN Environmental Drawing 47E235-56, also refer to TAB C, Sect 7.0). R2

(7) Subject to submergence (Yes/No/NA)? No (Reference: TAB C, Sect 7.0 and WBN Environmental Dwg. 47E235-56). R2

Identify initiation time and duration of submergence:

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? NA
(Reference: Section P - Note 1).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: R2

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
WBNNAL3-029	See TAB B-1 Sect A R2

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	Note 1		
Temperature (°F)	Note 1		
Pressure (psig)	ATM	Att 1, Sect 3.5	
Relative Humidity (%)	100	TAB C, Att 1 Sect B.6	
*Chemical Spray	NA	TAB C, Sect 3.4	
**Radiation (rd)	2.03×10^4	TAB C, Att 1, Sect C.2	
Submergence	NA	TAB C, Sect 7.0	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	TAB C, Att 1, Sect C.1
Pressure	Yes	TAB C, Sect 3.5
Relative Humidity	Yes	TAB C, Att 1, Sect B.6
Chemical Spray	NA	TAB C, Sect 3.4
Submergence	NA	TAB C, Sect 7.0

JUSTIFICATION/COMMENTS Note 1: Worst case temperature is the result of a HELB and is 196°F (91°C) for 15 minutes, decaying to 110°F (43.3°C) in 24 hrs. and continuing for 30 days.

Worst case life is based upon conditions resulting from a LOCA which is 110°F for a duration of 100 days. See TAB C, Att 1, Sect C.1.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	Note 1	Yes
Pressure: +10% but no more than 10 psig		NA (2)
Radiation: +10% of accident dose		Yes(6)
Time: +10% (or 1 hour + operating time per NUREG-0588)	Note 1	Yes
Voltage: ±10% of rated value		NA (3)
Frequency: ±5% of rated value		NA (3)
Environmental Transient: the initial transient and the peak temperature applied twice		NA (4)
Vibration: +10% added to acceleration		NA (5)

JUSTIFICATION/COMMENTS:

Note 1 Per TAB C, Att 1, Sect C.1, a worst case expected life is 15,079.61 years with a max. hot spot temp of 88.33°C. The required operating time is 40.27 years. A significant margin exists in the relationship between time and temperature criteria.

(2) Refer to TAB C, Sect 3.5.

(3) Refer to TAB C, Sect 5.0.

(4) Refer to TAB C, Sect 3.3.

(5) These motors do not experience significant process-related vibration and as such, a vibration margin above the levels addressed in TAB C, Att 1, Sect B.5 is not required.

(6) Refer to TAB C, Att 1, Sect C.2.

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M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference ______________________________).

JUSTIFICATION/COMMENTS Motors utilizing the stator insulation system tested, must be capable of starting and maintaining operation. Refer to TAB A.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? NA
(Reference ______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.3.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? NA
(Reference ______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 3.3.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? NA (Reference ______________________________).

JUSTIFICATION/COMMENTS TAB C, Att 1, Sect D.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? NA
(Reference ____).

JUSTIFICATION/COMMENTS No anomalies were noted throughout the motorette testing.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS No replaceable items were identified in the insulation system qualification program described in M&M Report 272 relative the insulation system. The bearings and lubricants are routine maintenance items, the replacement of which are addressed in individual Qualification Maintenance Data Sheets in this binder. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations, particularly regarding the neoprene slingers and gaskets, are detailed in the QMDS located in TAB G.

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0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	Yes
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. <u>SUMMARY OF REVIEW</u> (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	NA
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	NA
(b) Was beta radiation considered?	Section P - Note 1
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	NA
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

NOTE: Motors are located in areas throughout the Auxiliary Building. Beta-radiation is confined to the Reactor Bldg. by plant design; therefore, these motors are not required to be evaluated for the effects of beta radiation.

SUPPLEMENT 1
COMPONENT-UNIQUE CHECKLIST
MOTORS

EQUIPMENT IDENTIFICATION

(1) Is the motor identified in the qualification report identical to the plant motors which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(a) Insulation system materials	NH5 (P4-9060)	NH5 (P4-9060)	Yes	refer to (2) supplement
(b) Coil construction (form or random wound, cast)	Random	Random	Yes	Qual Rpt 1, App 1, Intro
(c) Insulation class (B, F, H)	H	H	Yes	Qual Rt 1, pg 1, Scope
(d) Lubricant				
Manufacturer	Chevron	NA	Yes	refer to TAB C, Sect 4.2
Type	SRI-2	NA	Yes	
(e) Bearing				
Manufacturer	MRC	NA	Yes	refer to (3) this supplement
Type	Anti-friction	NA	Yes	
Bearing life				
(f) Seals				
Manufacturer	-	NA		
Type	Slinger	NA	Yes	refer to (5) this supplement
Material	Neoprene		Yes	

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EQUIPMENT IDENTIFICATION (Continued)

	Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(g)	Motor lead insulation	Si Rubber	Si Rubber	Yes	TAB C, Att 1, Sect C.3

Comments:

(2) Does the qualification report indicate that the motorette insulation system is the same as that used on the motors (Yes/No/NA)? Yes
(Reference:).

Comments: TAB E-1, document 4-147739-NQR, Rev A, Sheet 1, item B.2 |R2

(3) Has the vendor provided the bearing rating (Yes/No/NA)? Yes
(Reference:).

Comments: Refer to TAB C, Sect 4.1.

(4) Was the lubricant included in the test program (Yes/No/NA)? No
(Reference:).

Comments: Refer to TAB C, Sect 4.2.

(5) Were the seals included in the test program (Yes/No/NA)? No
(Reference:).

Comments: Refer to TAB C, Sect 4.3.

LOUIS ALLIS NH7 INSULATION SYSTEM

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A. DOCUMENTATION (See Note) |R2

Equipment Description Squirrel-Cage Induction Motor

Vendor/Manufacturer Louis Allis

Equipment Model No.(s) 3hp, 460VAC, NH7 Insulation System

M.O. Nos. 4-147740 and 4-147745

QUALIFICATION REPORTS (See Note) |R2

(1) Title/Number/Revision Insulation Sys Study RIMS B71 860512 102
Class 200°C - Safety Class 1E-600 Volt A.C. DATE March 26, 1986
Random Wound Stator (1 x 10^7 Rads Total) M&M
Report No. 280B

(2) Title/Number/Revision Insulation Sys Study RIMS B71 860512 101
Class 200 + °C - Safety Class 1E - 600 VAC DATE November 13, 1980
Random Wound Stator (1 x 10^7 Rads Total) M&M
Report No. 280A-1

(3) Title/Number/Revision ________ RIMS ________
________ DATE ________

OTHER (ANALYSIS, VENDOR DATA, ETC.) |R2

(4) IEEE paper 32C3-76 and support documentation (proprietary-TAB D-5)

(5) WBN Environmental Dwg. 47E235-48 R3

(6) Material Aging Calculation WAC-169 (TAB D-6)

(7) TVA Radiation Calculation WBNNAL3-007 R1 (B45 860919 235) R3

(8) Nuclear Qualification Report 4-147740-NQR, Rev. A (TAB E-2)

(9) Nuclear Qualification Report 4-147745-NQR, Rev. A (TAB E-3)

(10) System 30 Category and Operating Times-WBNOSG4-008 R11 (B45 870123 426) R2

(11) TVA Degraded Voltage Calculation WBP-EVAR 8602001 R0 (B43 860227 901)

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references. R2

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C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS ____________

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

NEMA MG-11982 Motors and Genertors.

IEEE 334-1974 Type Test of Continuous Duty Class 1E Motors.

IEEE 117-1974 Evaluation of Insulating Materials for Random-Wound AC Electric Machinery.

TVA 19537 (OE-3-86) EQP139.41

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D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

____ Test of Similar Items with Supporting Analysis

X Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0 for additional details.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? No

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Induction Motor	Motorette	TAB C, Sect. 3.1
(2)	Manufacturer	Louis Allis	Louis Allis	Qual Rpt 1 Title Page R2
(3)	Model Number(s)	3 hp, 460VAC	NH7 ins. sys.	
		4-147740		
		4-147745		
(4)	Serial Number(s)	4-147740-001	NA	Note 1
		4-147740-002		
		4-147745-001		
		4-147745-002		

(5) Identify Component-Unique checksheet attached: Supplement 1, Component - Unique Checklist, Motors

JUSTIFICATION/COMMENTS The equipment provided for the plant consists of complete motor assemblies which includes a random wound stator with the NH7 insulation system. The qualification report documents the motorette testing performed on the NH7 insulation in accordance with IEEE 117-1974. Applicability of the data from the qualification report is dependent solely upon the use of the NH7 system (Louis Allis System P4-9128) in the stator assembly and is independent of the motor horsepower rating.

NOTE 1: Serial numbers were obtained from Section B of the appropriate NQR report. These reports are in sub-tabs located in TAB E.

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	
External Process Connections	NA	NA	
Electrical Connections	NA	NA	
Conduit Seals	NA	NA	
Connector Seals	NA	NA	
Orientation	NA	NA	
Physical Configuration	NA	NA	
Other			

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 6.0, Interfaces.

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G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	TAB C, Sect. 3.2
(b) Baseline performance measurements taken	Yes	TAB C, Att. 2, Sect. B.3.b
(c) Equipment aged:		
Thermal	Yes	TAB C, Att. 2, Sect. B.3.d
Radiation	Yes	TAB C, Att. 2, Sect. C. 2
Wear	NA	TAB C, Sect. 3.1
(d) Vibration/seismic testing conducted	Yes	TAB C, Sect. 3.2, and Att. 2, Sect. B.3.e
(e) Design basis event (DBE) exposure	NA	TAB C, Sect. 3.3
(f) Post-DBE exposure	NA	TAB C, Sect. 3.3
(g) Final inspection and disassembly	NA	Note 1

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? NA (Reference Note 1).

JUSTIFICATION/COMMENTS

Note 1 - The ability of the motorette and the insulation system to function is predicated upon its ability to withstand dielectric proof tests in TAB C, Attachment 2, Section B.3.e. Failure of a dielectric proof test is a conclusive failure and does not require accurate and calibrated test equipment.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference ___

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Sections B.1, B.2, and B.3.d.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Refer to H.4.a
Radiation exposure	Yes	Refer to H.5.a
Vibration (non-seismic) aging	Yes	Refer to H.6.a
Operational (electrical/mechanical/process) stress aging	Yes	Refer to H.7.a

JUSTIFICATION/COMMENTS Motorettes testing consists of subjecting models to heat, vibration, and moisture to simulate the effects of long service, thereby, simulating the cumulative effect of extended operation.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference ___

JUSTIFICATION/COMMENTS A review of the materials used in these motors indicates that there are no known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference ___

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section B.1.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (Yes/No/NA)? Yes (Reference: Qualification Report 1, pp 2-4, Section B).

JUSTIFICATION/COMMENTS Also refer to TAB C, Attachment 2, Section B.

(c) Was the basis for thermal aging identified in the qualification program (Yes/No/NA)? Yes (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Sections B.2 and B.3.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (Yes/No/NA)? Yes (Reference: ______).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature			
Time			

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section B.3.d.

(e) Was the Arrhenius methodolgy used for accelerated aging (Yes/No/NA)? Yes (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0 |R2

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (Yes/No/NA)? NA (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0 |R2

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? Yes (Reference:).

JUSTIFICATION/COMMENTS Qualification of the motors through the use of motorette tests involves the use of the equation of a regression-type implied average life characteristic. Refer to TAB C, Section 3.0 R2

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? NA (Reference:).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: Qualification Report, 1, p 5, Data Evaluation, Section B).

JUSTIFICATION/COMMENTS Also refer to TAB C, Attachment 2, Section C.2.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? Yes (Reference: Qualification Report 1, Attachment 7).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section C.2

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? NA (Reference:).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section C.2.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? NA (Reference: ______).

Plant normal ambient radiation dose (rd) 8.8×10^5

Test exposure dose (rd) ______

Test exposure dose rate (rd/hr) ______

Test exposure source type (e.g., Co-60 gamma) ______

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section C.2.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: ______). |R2

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section B.3.e.).

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: ______).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section B.3.e.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. |R2

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes
(Reference ______

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference ______

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference ______

Qualified life (Document in QMDS) Expected qualified life is 40 + years.

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section D.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference:).

JUSTIFICATION/COMMENTS No replaceable items were identified in the insulation system qualification program described in M&M Reports 280B and 280A-1. The bearings and lubricants are routine maintenance items, the replacement of which are addressed in individual Qualification Maintenance Data Sheets in this binder. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations, particularly regarding the neoprene slingers and gaskets, are detailed.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	References	Activation Energy	Reference
(a)	NH7 Insulation/Electrical	1×10^7	Note 1	.92	WAC-169 TAB D-6
(b)	Chevron SRI-2/Lubricant	2×10^8	Note 2	Note 4	
(c)	Neoprene/mechanical/ slinger & gasket	2×10^6	Note 3	Note 4	
(d)					
(e)					

JUSTIFICATION/COMMENTS Detailed Material Analysis is TAB C, Attachment 2.

Note 1: Value shown is insulation rating. Radiation threshold is actual rating of system. Refer to TAB C, Attachment 2.

Note 2: Refer to Digital Material Aging and Radiation Effects Library, Library Code No. 157-83, and TAB C, Section 4.2. |R1

Note 3: Refer to Digital Material Aging and Radiation Effects Library, Library Code No. 202-83A, Radiation Library Code 094-83.

Note 4: Consideration of long term thermal degradation is not required because lubricant and slingers are not considered to be substances and devices with infinite lives. A surveillance and maintenance program is established in the QMDS in TAB G to ensure proper operation.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference ____________________).

Identify Acceptance Criteria: Refer to TAB C, Attachment 2, Section B.3.e.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference ____________________

Identify baseline and functional testing: Refer to TAB C, Attachment 2, Sections B.3.b and B.3.e.

JUSTIFICATION/COMMENTS ____________________

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? NA (Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.3.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: ____).

JUSTIFICATION/COMMENTS Voltages applied to the motorettes during baseline testing addressed in TAB C, Attachment 2, Section B.3.b are conservatively typical of the stressing occurring in motors rated 460 VAC.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of Voltage and Frequency requirements.

R2

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of voltage and frequency requirements.

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of voltage and frequency requirements.

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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-48 | R2

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) $8.8x10^5$

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) -

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

	Value		Accident type
(a) Temp. (°F) (**)	(1) 196 for 15 min. decaying to 110 in 24 hours and continuing for 30 days (2) 110 for 100 days	Accident type	(1) HELB (2) LOCA | R2
(b) Pressure (psig)	ATM(-)	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	$1.2x10^{6*}$	Accident type	LOCA
(e) Spray Type	NA	Accident type	

Affected Motors: 1-MTR-30-194-A
1-MTR-30-195-B
2-MTR-30-194-A
2-MTR-30-195-B

* Location specific radiation value from TVA Calculation WBNNAL3-007 | R2

** For additional details, refer to TAB C, Att 2, Sect C.1.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Motors are located outside containment and are not subject to chemical spray.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: WBN Environmental Dwg 47E235-48 and TAB C, Section 7.0). |R2

(7) Subject to submergence (Yes/No/NA)? No (Reference: WBN Environmental Dwg 47E235-48 and TAB C, Section 7.0). |R2

Identify initiation time and duration of submergence:

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? NA
(Reference: Section P-NOTE 1).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: R2

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.	
WBNNAL3-007	See TAB B-2, Sect. A	R2

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L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	Note 1		
Temperature (^{o}F)	Note 1		
Pressure (psig)	ATM(-)	Sect. 3.5	
Relative Humidity (%)	100%	TAB C, Att.2, Sect. B.3.e	
*Chemical Spray	NA	TAB C, Sect. 3.4	
**Radiation (rd)	$2.08x10^6$	TAB C, Att. 2, Sect. C.2	
Submergence	NA	TAB C, Sect. 7.0	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	TAB C, Att.2, Sect. C.1
Pressure	Yes	TAB C, Sect. 3.5
Relative Humidity	Yes	TAB C, Att.2, Sect.B.3.e
Chemical Spray	NA	TAB C, Sect. 3.4
Submergence	NA	TAB C, Sect. 7.0

JUSTIFICATION/COMMENTS Note 1: Worst case temperature is the result of an HELB and is 196°F (91°C) for 15 minutes, decaying to 110°F (43.3°C) in 24 hours and continuing for 30 days.

Worst case life is based upon conditions resulting from a LOCA which is 110°F for a duration of 100 days. See TAB C, Attachment 2, Section C.1.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	Note 1	Yes
Pressure: +10% but no more than 10 psig		NA (2)
Radiation: +10% of accident dose		Yes (6) |R2
Time: +10% (or 1 hour + operating time per NUREG-0588)	Note 1	Yes
Voltage: ±10% of rated value		NA (3)
Frequency: ±5% of rated value		NA (3)
Environmental Transient: the initial transient and the peak temperature applied twice		NA (4)
Vibration: +10% added to acceleration		NA (5)

JUSTIFICATION/COMMENTS

Note (1) Per TAB C, Attachment 2, Section C.1, a worst case expected life is 6,066.79 years with a maximum hot spot temperature of 95.40°C. The required operating time is 40.27 years. A significant margin exists in the relationship between time and temperature criteria.

Note (2) Refer to TAB C, Section 3.5.

Note (3) Refer to TAB C, Section 5.0.

Note (4) Refer to TAB C, Section 3.3.

Note (5) These motors do not experience significant process-related vibration and as such, a vibration margin above the levels addressed in TAB C, Attachment 3, Section B.3.e, is not required.

Note (6) Refer to TAB C, Attachment 2, Section C.2.

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M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference ______________________________).

JUSTIFICATION/COMMENTS Motors utilizing the stator insulation system tested, must be capable of starting and maintaining operation. Refer to TAB A.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? NA
(Reference ______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.3.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? NA
(Reference ______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.3.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? ________ (Reference ______________________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 2, Section D.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference ____
____).

JUSTIFICATION/COMMENTS In the DuPont test, results were reported on only 9 motorettes at 260°C. The omission of the data regarding one motorette out of a total set of 50 motorettes does not have a significant adverse effect upon the implied average life characteristic developed through the use of the test data.

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N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS No replaceable items were identified in the insulation system qualification program. The bearings and lubricants are routine maintenance items, the replacement of which are addressed in individual Qualification Maintenance Data Sheets in this binder. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations particularly regarding the neoprene slingers and gaskets, are detailed in the QMDS located in TAB G.

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	CHECKED [signature] DATE 8/26/86		

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	Yes
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	NA
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate density. duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Section P-Note 1
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

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O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g.. voltage. load frequency. and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	NA
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

NOTE 1: Motors are located throughout the Auxiliary Building. Beta radiation is confined to the Reactor Building by plant design; therefore, these motors are not required to be evaluated for the effects of beta radiation.

SUPPLEMENT 1
COMPONENT-UNIQUE CHECKLIST
MOTORS

EQUIPMENT IDENTIFICATION

(1) Is the motor identified in the qualification report identical to the plant motors which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(a) Insulation system materials	NH7 (P4-9128)	NH7 (P4-9128)	Yes	Qual. Rpt.1, p 1, Object
(b) Coil construction (form or random wound, cast)	random	random	Yes	Qual. Rpt. 1, Title Page
(c) Insulation class (B, F, H)	H	H	Yes	Qual. Rpt. 1, p 5, Data Eval. Sect.A, Thermal
(d) Lubricant				
Manufacturer	Chevron	NA	Yes	Refer to TAB C, Sect. 4.2
Type	SRI-2	NA	Yes	
(e) Bearing				
Manufacturer	MRC	NA	Yes	Refer to (3) this supplement
Type	Anti-friction	NA	Yes	
Bearing life				
(f) Seals				
Manufacturer		NA		Refer to (5) this supplement
Type	Slinger	NA	Yes	
Material	Neoprene		Yes	

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EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(g) Motor lead insulation	Nomex w/ Glass Braid	Nomex/w Glass Braid	Yes	TAB C, Att. 2, Sect. C.3

Comments: ____________________

(2) Does the qualification report indicate that the motorette insulation system is the same as that used on the motors (yes/no/NA)? Yes
(Reference ____________________).

Comments: Refer to TAB C, Attachment 3, Sections B.1 and B.2.

(3) Has the vendor provided the bearing rating (yes/no/NA)? Yes
(Reference ____________________).

Comments: Refer to TAB C, Section 4.1.

(4) Was the lubricant included in the test program (yes/no/NA)? No
(Reference ____________________).

Comments: Refer to TAB C, Section 4.2.

(5) Were the seals included in the test program (yes/no/NA)? No
(Reference ____________________).

Comments: Refer to TAB C, Section 4.3.

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EQP139.41

LOUIS ALLIS NH9 INSULATION SYSTEM

B-3

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A. DOCUMENTATION (See Note) R2

Equipment Description: Squirrel-Cage Induction Motor

Vendor/Manufacturer: Louis Allis

Equipment Model No.(s): 3hp, 460 Vac, NH9 insulation system, M.O. 4-147746

QUALIFICATION REPORTS (See Note) R2

(1) Title/Number/Revision Insulation System Evaluation Qualification for Safety Class 1E Normal Service. M&M Report No. 282 — RIMS B71 860512 104 — DATE Sept. 20, 1983

(2) Title/Number/Revision ______ RIMS ______ DATE ______

OTHER (ANALYSIS, VENDOR DATA, ETC.) R2

(3) Material Aging Calculation WAC-082 (TAB D-8).

(4) WBN Environmental Dwg. 47E235-78 R3.

(5) TVA Radiation Calculation WBNNAL3-031 R1 (B45 880826 235).

(6) System 30 Category and Operating Times WBNOSG4-008 R11 (B45 870123 426).

(7) Nuclear Qualification Report 4-147746-NQR, Rev. A (TAB E-4)

(8) TVA Degraded Voltage Calculation WBP-EVAR 8602001 Rev. 0 (B43 860227 901).

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references. R2

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B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES Refer to Open Items listed in the front of this binder.

1. Obtain revised field verification (Open Item 1)

COMMENTS/RECOMMENDATIONS

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C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Oualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Oualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS ____

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 334-1974 Type Test of Continuous Duty Class 1E Motors.

NEMA MG1-1982 Motors and Generators

IEEE 117-1974 Evaluation of Insulating Materials for Random-Wound AC Electric Machinery

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D. QUALIFICATION METHODOLOGY (Check only one block)

- ___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis
- ___ Test of Similar Items with Supporting Analysis
- _X_ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions
- ___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0 for additional details.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? No

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Induction Motor	Motorettes	TAB C Sect. 3.1
(2)	Manufacturer	Louis Allis	Louis Allis	Qual. Rpt 1 Title Page
(3)	Model Number(s)	3hp, 460 Vac	NH9 Ins. Sys.	
		NH9 Ins. Sys		
		MO 4-147746		
(4)	Serial Number(s)	4-147746-001	NA	TAB E-4 Rpt 4-147746-NQR, Rev A, Sect B
		4-147746-002		

R2

(5) Identify Component-Unique checksheet attached: Supplement 1, Component - Unique Checklist, Motors

JUSTIFICATION/COMMENTS The equipment provided for the plant consists of complete motor assemblies which includes a random-wound stator with the NH9 insulation system. The qualification report documents the motorette testing performed on the NH9 insulation system in accordance with IEEE 117-1974. Applicability of the data from the qualification report is dependent solely upon the use of the NH9 system (Louis Allis System P4-9061) in the stator assembly and is independent of the motor horsepower rating.

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	
External Process Connections	NA	NA	
Electrical Connections	NA	NA	
Conduit Seals	NA	NA	
Connector Seals	NA	NA	
Orientation	NA	NA	
Physical Configuration	NA	NA	
Other			

|R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 6.0, Interfaces

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G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (Yes/No/NA)? (Note below.)

	Yes/No/NA	Reference	
(a) Equipment inspected for damage	No	TAB C Sect 3.2	
(b) Baseline performance measurements taken	Yes	Note 1 also, TAB C, Att 3, Sect B-2	
(c) Equipment aged: Thermal	Yes	Qual Rpt 1, p2 Discussion Sect D	
Radiation	Yes	Qual Rpt 1, pl Discussion Sect C	
Wear	NA	TAB C, Sect 3.1	R2
(d) Vibration/seismic testing conducted	Yes	TAB C, Sect 3.2	
(e) Design basis event (DBE) exposure	NA	TAB C, Sect 3.3	
(f) Post-DBE exposure	NA	TAB C, Sect 3.3	
(g) Final inspection and disassembly	NA	Note 2	R2

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (Yes/No/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately document (Yes/No/NA)? Yes (Reference: Note 2).

JUSTIFICATION/COMMENTS Note 1 - Refer to Qualification Report 1, Attachment 6, Document LTP-110, page 1, Method of Test, Sect 2.

Note 2 - The ability of the motorette and the insulation system function is predicated upon its ability to withstand dielectric proof tests in TAB C, Attachment 3, Section B.7. Failure of a dielectric proof test is a conclusive failure and does not require accurate and calibrated test equipment.

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H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Qualification Report 1, page 1, Discussion, Section B).

JUSTIFICATION/COMMENTS Aging factors were applied to models of the stator insulation following methods outlined in IEEE 117-1974.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	H.4.a
Radiation exposure	Yes	H.5.a
Vibration (non-seismic) aging	Yes	H.6.a
Operational (electrical/mechanical/process) stress aging	Yes	H.7.a

JUSTIFICATION/COMMENTS Motorette testing consists of subjecting models of insulation systems to a series of exposures to radiation, heat, vibration, and moisture to simulate the effects of long service, thereby simulating the cumulative effect of extended operation. Refer to TAB C, Section 3.1.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference

JUSTIFICATION/COMMENTS A review of the materials used in these motors indicates that there are no known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Qualification Report 1, page 4, Test Program, Section B, Thermal Qualification.).

JUSTIFICATION/COMMENTS Also refer to TAB C, Attachment 3, Section B.4.

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H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Qualification Report 1, Attachment 3).

JUSTIFICATION/COMMENTS Refer to TAB C, Att. 3, Section B.1.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Qualification Report 1, page 4, Section B, Thermal Qualification).

JUSTIFICATION/COMMENTS Refer to TAB C, Att. 3, Section B.4.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature			
Time			

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.0

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS Refer to TAB C. Section 3.0

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? Yes
(Reference:).

JUSTIFICATION/COMMENTS Qualificaiton of the motors through the use of motorette tests involves the use of the equation of a regression-type implied average life characteristic. Refer to TAB C, Section 3.0

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? NA (Reference:).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1.

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: Qualification Report 1, page 2, Section A. Radiation Qualification).

JUSTIFICATION/COMMENTS Also refer to TAB C, Attachment 3, Section B.3. R2

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? Yes
(Reference: Qualification Report 1, Attachment 3).

JUSTIFICATION/COMMENTS

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? Yes
(Reference: Qualification Rpt 1, page 2, Subsection A.1 General).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Qualification Report 1, page 3, Section A.4.a.).

Plant normal ambient radiation dose (rd)	1.8×10^3 TID normal
Test exposure dose (rd)	1.1×10^9 TID
Test exposure dose rate (rd/hr)	0.49×10^6 for 2245 hrs
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

R2

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: Qualification Report 1, page 4, Section B.1). R2

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 3, Section B.5.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Qualification Rpt 1, page 4, Sect B.3.b).

JUSTIFICATION/COMMENTS Mechanical stress testing performed in accordance with Section 2.2.3 of IEEE 117-1974 to simulate winding forces that occur in an actual motor.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R2

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes
(Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.1.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference ____________________).

Qualified life (Document in QMDS) Expected qualified life is 40+ years.

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 3, Section D.

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H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference:).

JUSTIFICATION/COMMENTS No replaceable items were identified in the insulation system qualification program described in M&M report 282. The bearings and lubricants are routine maintenance items, the replacement of which are addressed in individual Qualification Maintenance Data Sheets in this binder. Basically, lubrication schedules, bearing replacement intervals and electrical and mechanical surveillance recommendations, particularly regarding the neoprene slingers and gaskets, are detailed.

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation, Degradation and Aging (See Section C of EQC Binder for Detailed Materials Analysis).

	Material/Property/Function	Radiation Threshold	Radiation References	Activation Energy	Activation Reference
(a)	Type NH9 Insulation Sys	1.1×10^9	Note 1	1.22	Note 3
(b)	Bearing Lubricant (Chevron SRI-2 grease)	2.0×10^8	Note 2	Note 5	
(c)	Neoprene/mechanical/ slinger & gasket	2×10^6	Note 4	Note 5	
(d)					
(e)					

JUSTIFICATION/COMMENTS Note 1: The NH9 system withstood a total dose of 1.1×10^9 rads and maintained its ability to perform its required function as demonstrated by passing a post-exposure dielectic test. Refer to Qualification Report 1, page 2, Section A.

Note 2: Refer to Digital Material Aging and Radiation Effects, Library Code No. 157-83A, and TAB C, Section 4.2. R1

Note 3: Refer to Material Aging Calculation WAC-082. Refer to TAB D-8.

Note 4: Refer to Digital Material Aging and Radiation Effects Library, Library Code No. 202-83A, Radiation Library Code 094-83.

Note 5: Consideration of long term thermal degradation is not required because lubricant and slingers are not considered to be substances or devices with infinite lives. A surveillance and maintenance program is established in the QMDS in TAB G to ensure proper operation.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (Yes/No/NA)? Yes
(Reference: Qualification Report 1, page 4, Section B.3.d).

Identify Acceptance Criteria: Failure to withstand 30 minute applied potential tests at the following levels: turn-to-turn, 120 VAC; coil-to-coil and coils-to=ground, 600 VAC.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (Yes/No/NA)? Yes
(Reference: Qualification Report 1, Attachment 6, LTP-110, page 1, Method of Test, Section 2). R2

Identify baseline and functional testing: Functional tests listed in section J.1 above. Each motorette was subjected to the following baseline tests: turn-to-turn, 400 VAC; coil-to-coil, 2000 VAC; coils-to-ground, 2000 VAC.

JUSTIFICATION/COMMENTS Also refer to TAB C, Att 3, Sections B.2 and B.7. R2

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (Yes/No/NA)? NA
(Reference:).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.3

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: ______).

JUSTIFICATION/COMMENTS Voltages applied to the motorettes during baseline testing described in J.2 were chosen to be above the maximum service voltage for motors rated 460 VAC.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS Refer to TAB C, Section 5.0 for discussion of voltage and frequency requirements.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference |R2
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Refer to TAB C, Sect. 5.0 for discussion of voltage and frequency requirements.

(c)

Parameter	Demonstrated Conditions	Reference |R2
Voltage	NA	
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Refer to TAB C, Sect 5.0 for discussion of voltage and frequency requirements.

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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-78 | R2

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	104	(a) Temperature (°F)	110
(b) Pressure (psig)	ATM	(b) Pressure (psig)	ATM
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	1.8×10^3	(d) Radiation (rd)	NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temp. (°F)(**)	110 for 100 days	Accident type	LOCA | R2
(b) Pressure (psig)	NA	Accident type	
(c) Humidity (%)	NA	Accident type	
(d) Radiation (rd)	1.9×10^6*	Accident type	LOCA | R2
(e) Spray Type	NA	Accident type	

* Location specific dose per TVA calculation WBNNAL3-031.

** For additional details, refer to TAB C, Att 3, Section C. R2

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Motors are located outside containment and are not subject to chemical spray.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: TAB C, Section 7.0 and WBN Environmental Dwg 47E235-78). R2

(7) Subject to submergence (Yes/No/NA)? No (Reference: TAB C, Section 7.0 and WBN Environmental Dwg 47E235-78). R2

Identify initiation time and duration of submergence:

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? NA (Reference: Section P - Note 1).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: R2

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
WBNNAL3-031	See TAB B-3, Sect A R2

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time	100 days	TAB C, Att. 3, Sect. D		R2
Temperature (°F)	110	TAB C, Att. 3, Sect. D		R2
Pressure (psig)	ATM	TAB C, Sect. 3.5		
Relative Humidity (%)	100	TAB C, Att. 3, Sect. B.6		
Chemical Spray*	NA	TAB C, Sect. 3.4		
Radiation (rd)**	1.9018×10^6 gamma	TAB C, Att. 3, Sect. D		R2
Submergence	NA	TAB C, Sect. 7.0		

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference	
Temperature	Yes	TAB C, Att. 3, Sect D	R2
Pressure	Yes	TAB C, Sect. 3.5	
Relative Humidity	Yes	TAB C, Att. 3, Sect. B.6	
Chemical Spray	NA	TAB C, Sect 3.4	
Submergence	NA	TAB C, Sect 7.0	

JUSTIFICATION/COMMENTS

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	Note 1	Yes
Pressure: +10% but no more than 10 psig		NA(2)
Radiation: +10% of accident dose	10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	Note 1	Yes
Voltage: ±10% of rated value		NA(3)
Frequency: ±5% of rated value		NA(3)
Environmental Transient: the initial transient and the peak temperature applied twice		NA(4)
Vibration: +10% added to acceleration		NA(5)

JUSTIFICATION/COMMENTS: Note 1: Per TAB C, Att. 3, Sect. C.1, a worst case expected life was calculated to be 1,098,226 years with a maximum hot spot temperature of 78.33°C. The required operating time is 40.27 years. A significant margin exists in the relationship between the time and temperture criteria.

(2) Refer to TAB C, Section 3.5.

(3) Refer to TAB C, Section 5.0.

(4) Refer to TAB C, Section 3.3.

(5) These motors do not experience significant process-related vibration and as such, a vibration margin above the levels addressed in TAB C, Att. C, Section B.5 is not required.

BINDER NO. WBNEQ-MOT-004	PLANT WBN	UNIT(S) 1	SHEET 22 OF 29
BINDER TITLE LOUIS ALLIS - INDUCTION MOTORS - OUTSIDE CONTAINMENT	COMPUTED Ackerly DATE 8/28/86	R	R
	CHECKED [illegible] DATE 8/28/86		

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference ____________________).

JUSTIFICATION/COMMENTS Motors utilizing the stator insulation system tested, must be capable of starting and maintaining operation. Refer to TAB A.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? NA
(Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.3.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? NA
(Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Section 3.3.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? NA (Reference ____________________).

JUSTIFICATION/COMMENTS Refer to TAB C, Attachment 3, Section D.

M. <u>OPERABILITY TEST RESULTS</u> (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? NA

(Reference ______________________________).

JUSTIFICATION/COMMENTS <u>No anomalies were noted throughout the motorette testing.</u>

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS No replaceble items were identified in the insulation system qualification program described in M & M report 282. The bearings and lubricants are routine maintenance items, the replacement of which are addressed in individual Qualification Maintenance Data Sheets in this binder. Basically, lubrication schedules, bearing replacement intervals, and electrical and mechanical surveillance recommendations, particularly regarding the neoprene slingers and gaskets, are detailed in the QMDS located in TAB G.

BINDER NO. WBNEQ-MOT-004	PLANT WBN	UNIT(S) 1	SHEET 25 OF 29
BINDER TITLE LOUIS ALLIS - INDUCTION MOTORS - OUTSIDE CONTAINMENT	COMPUTED Ochel	DATE 8/28/86	R R
	CHECKED B	DATE 8/28/86	

0. SUMMARY OF REVIEW

Yes/No/NA

(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)? — Yes

(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified? — Yes

(3) Choice of qualification methodology adequately justified? — Yes

(4) If analysis was performed, complete the following:

(a) Were equipment performance requirements identified? — Yes

(b) Were specific features and failure modes and effects analyzed? — Yes

(c) Were assumptions and mathematical models used together with appropriate justification for their use? — Yes

(d) Were environmental parameters which affect equipment performance identified? — Yes

(5) Adequate similarity between equipment and test specimen established? — Yes

(6) Aging degradation evaluated adequately? — Yes

(a) Mechanical and/or cycle aging addressed? — Yes

(b) Equipment aged to end of life condition prior to application of DBE conditions? — Yes

(c) Absence of preaging in test/analysis justified? — NA

(d) Materials susceptible to thermal/radiation aging identified? — Yes

O. <u>SUMMARY OF REVIEW</u> (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	NA
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Section P - Note 1
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-MOT-004	PLANT WBN	UNIT(S) 1		SHEET 27 OF 29		R	R
BINDER TITLE LOUIS ALLIS - INDUCTION		COMPUTED Ackerly	DATE 8/28/86				
MOTORS - OUTSIDE CONTAINMENT		CHECKED B	DATE 8/28/86				

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	NA
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

NOTE 1: Motors are located throughout the Auxiliary Building. Beta radiation is confined to the Reactor Building by plant design; therefore, these motors are not required to be evaluated for the effects of beta radiation.

BINDER NO. WBNEQ-MOT-004	PLANT WBN	UNIT(S) 1		SHEET 28 OF 29			
				R	R		
BINDER TITLE LOUIS ALLIS - INDUCTION	COMPUTED	DATE 8/28/86					
MOTORS - OUTSIDE CONTAINMENT	CHECKED	DATE 8/28/86					

SUPPLEMENT 1
COMPONENT-UNIQUE CHECKLIST
MOTORS

EQUIPMENT IDENTIFICATION

(1) Is the motor identified in the qualification report identical to the plant motors which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(a) Insulation system materials	NH9 (P4-9061 -115)	NH9 (P4-9061 -115)	Yes	Refer to (2) this supplement
(b) Coil construction (form or random wound, cast)	RANDOM	RANDOM	Yes	Qual. Rpt 1 p 1, OBJECT
(c) Insulation class (B, F, H)	H	H	Yes	Refer to Note 1 in Comments
(d) Lubricant				
Manufacturer	CHEVRON	NA	Yes	Refer to TAB C
Type	SRI-2	NA	Yes	Section 4.2
(e) Bearing				
Manufacturer	MRC	NA	Yes	Refer to (3) this
Type	Antifriction	NA	Yes	Supplement
Bearing life		NA		
(f) Seals				
Manufacturer	-	NA	-	-
Type	Slinger	NA	Yes	Refer to (5) this
Material	Neoprene	NA	Yes	Supplement

EQUIPMENT IDENTIFICATION (Continued)

	Item	Plant	Report	Acceptable (Yes/No/NA)	Report Section
(g)	Motor lead insulation	NOMEX w/ Glass Braid	NOMEX w/ Glass Braid	Yes	TAB C, Att. 3, Sect. D

Comments: Note 1 - TAB E-4, Document 4-147746-NQR, Rev A, page 3, Item 12. R2

(2) Does the qualification report indicate that the motorette insulation system is the same as that used on the motors (Yes/No/NA)? Yes
(Reference: TAB E-4, Document 4-147746-NQR, Rev A, page 1 Section D.2). R2

Comments:

(3) Has the vendor provided the bearing rating (Yes/No/NA)? Yes
(Reference: TAB E-4, Document 4-147746-NQR, Rev A, page 4 item 13). R2

Comments: Also refer to TAB C, Section 4.1

(4) Was the lubricant included in the test program (Yes/No/NA)? No
(Reference:).

Comments: Refer to TAB C, Section 4.2.

(5) Were the seals included in the test program (Yes/No/NA)? No
(Reference:).

Comments: Refer to TAB C, Section 4.3.

PRINT DATE: 06/27/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-062-0061 -B	1-FCV -062-0061 -B	280	729' 7"	AC4	A	100D	L	REQUIRED TO CLOSE AND REMAIN
SEAL FLOW RETURN ISOLATION VALVE	SB-00		71C62-54114-1		A	1MO	RH/C	CLOSED AFTER PHASE AISOLATION
					A	1MO	CV/C	SIGNAL IS RECEIVED AND RESET.
					A	100D	FW/C	SEE NOTE 4.
					A	100D	MS/C	
WBN-1-MVOP-063-0072 -A	1-FCV -063-0072 -A		685'	A07'	A	100D	L	L: NORM CLOSED VLV MUST OPEN
CNTMT SUMP TO RHR PUMP A-A	SB-3		71C62-54114-1		B	1MO	RH/A	TO ALIGN SUCTION OF RHR PUMP
					B	1MO	CV/A	TO SUMP FOR "SI" RECIRC, MUST
					B	1MO	AB	REMAIN OPEN DURING RECIRC MODE
					B	1MO	AF	CLOSE TO MITIGATE SING FAILURE
WBN-1-MVOP-063-0073 -B	1-FCV -063-0073 -B		685'	A07'	A	100D	L	L: NORM CLOSED VLV MUST OPEN
CNTMT SUMP TO RHR PUMP B-B	SB-3		71C62-54114-1		B	1MO	RH/A	TO ALIGN SUCTION OF RHR PUMP
					B	1MO	CV/A	TO SUMP FOR "SI" RECIRC, MUST
					B	1MO	AB	REMAIN OPEN DURING RECIRC MODE
					B	1MO	AF	CLOSE TO MITIGATE SING FAILURE
WBN-1-MVOP-063-0172 -B	1-FCV -063-0172 -B		713'	A28	A	100D	L	NEEDED TO TRANSFER FROM COLD
RHR TO RCS HOTLEG 1 & 3 FLOW ISLN VLV	SB-2		71C62-54114-1		A	1MO	RH/A	LEG RECIRC TO HOT LEG RECIRC.
					A	1MO	CV/A	SEE NOTE 4.
					A	1MO	AB	
					A	1MO	AF	
WBN-1-MVOP-067-0087 -A	1-FCV -067-0087 -A				A	100D	L	ISOL FLOW TO VENT COOLER
LOWER CNTMT A COOLER DISCH ISLN VALVE IC					A	1MO	RH/C	UPON RECEIPT OF PHASE 'A'
					A	1MO	CV/C	CONTAINMENT ISOLATION SIGNAL.
					A	100D	FW/C	SEE NOTE 4.
					A	100D	MS/C	

	R 3	R 4	R
PREPARER/DATE KEITH B. NAPIER	12/12/89	CBH 7/10/90	
CHECKED/DATE D. L. KIRBY	12/12/89	KBN 7/10/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0095 -A LOWER CNTMT C COOLER DISCH ISLN VALVE IC	1-FCV -067-0095 -A				A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	ISOL FLOW TO VENT COOLER UPON RECEIPT OF PHASE 'B' CONTAINMENT ISOLATION SIGNAL SEE NOTE 4.
WBN-1-MVOP-067-0103 -B LOWER CNTMT B COOLER DISCH ISLN VALVE IC	1-FCV -067-0103 -B				A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	ISOL FLOW TO VENT COOLER UPON RECEIPT OF PHASE 'B' CONTAINMENT ISOLATION SIGNAL SEE NOTE 4.
WBN-1-MVOP-067-0111 -B LOWER CNTMT D COOLER DISCH ISLN VALVE IC	1-FCV -067-0111 -B				A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE ON A CONTAIN MENT ISOL SIGNAL AND REMAIN CLOSED. SEE NOTE 4.
WBN-1-MVOP-067-0295 -A UPPER CNTMT VENT CLR A ISLN VALVE IC	1-FCV -067-0295 -A SMB-000	030	807' 6" UC 79KA2-824589-1		A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE ON A CONTAIN MENT ISOL SIGNAL AND REMAIN CLOSED. SEE NOTE 4.
WBN-1-MVOP-067-0296 -A UPPER CNTMT VENT CLR C ISLN VALVE IC	1-FCV -067-0296 -A SMB-000	206	807' 7" UC 79KA2-824589-1		A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C MS/C FW/C	VLV MUST CLOSE ON A CONTAIN MENT ISOL SIGNAL AND REMAIN CLOSED. SEE NOTE 4.

	R 3	R	R
PREPARER/DATE Keith B. [illegible]	12/[illegible]/89		
CHECKED/DATE [illegible]	12/11/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0297 -B	1-FCV -067-0297 -B	148	807' 7"	UC	A	100D	L	VLV MUST CLOSE ON A CONTAIN
UPPER CNTMT VENT CLR B ISLN VALVE IC	SMB-000		79KA2-824589-1		A	1MO	RH/C	MENT ISOL SIGNAL AND REMAIN
					A	1MO	CV/C	CLOSED. SEE NOTE 4.
					A	100D	FW/C	
					A	100D	MS/C	
WBN-1-MVOP-067-0298 -B	1-FCV -067-0298 -B	338	807' 7"	UC	A	100D	L	VLV MUST CLOSE ON A CONTAIN
UPPER CNTMT VENT CLR D ISLN VALVE IC	SMB-000		79KA2-824589-1		A	1MO	RH/C	MENT ISOL SIGNAL AND REMAIN
					A	1MO	CV/C	CLOSED. SEE NOTE 4.
					A	100D	FW/C	
					A	100D	MS/C	
WBN-1-MVOP-068-0332 -B	1-FCV -068-0332 -B	104	787' 7"	UC	A	100D	L	VLVS MUST BE CAPABLE OF
RCS PRZR REL FLOW CONTROL	SB-00		71C62-54114-1		A	1MO	RH/C	FUNCTIONING AT ANY TIME
					A	1MO	CV/C	FOR ACCIDENT MITIGATION
					A	100D	FW/C	
					A	100D	MS/C	
WBN-1-MVOP-068-0333 -A	1-FCV -068-0333 -A	104	787' 7"	UC	A	100D	L	VLVS MUST BE CAPABLE OF
RCS PRZR REL FLOW CONTROL	SB-00		71C62-54114-1		A	1MO	RH/C	FUNCTIONING AT ANY TIME
					A	1MO	CV/C	FOR ACCIDENT MITIGATION
					A	100D	FW/C	
					A	100D	MS/C	
WBN-1-MVOP-070-0087 -B	1-FCV -070-0087 -B	302	732'11"	AC4	A	100D	L	CLOSE ON PHASE 'B' ISOL
RC PMP THERM BAR RET CNTMT ISLN VALVE	SMB-00		78K24-823298		A	1MO	RH/C	SIGNAL AND STAY CLOSED
					A	1MO	CV/C	AFTER RESET OF SIGNAL TO
					A	100D	FW/C	MAINTAIN CNTMT ISOLATION.
					A	100D	MS/C	SEE NOTE 4.

	R 3	R	R
PREPARER/DATE Kirk K[illegible]	12/4/89		
CHECKED/DATE [illegible]	12/12/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-070-0089 -B RC PMP OIL CLR RET CNTMT ISLN VALVE	1-FCV -070-0089	-B				A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	CLOSE ON PHASE 'B' ISOLATION SIGNAL AND STAY CLOSED AFTER RESET OF SIGNAL TO MAINTAIN CNTMT ISOLATION. SEE NOTE 4.
WBN-1-MVOP-074-0001 -A RHR SYSTEM ISOLATION VALVE	1-FCV -074-0001 SB-2	-A	354	710'11" 71C62-54114-1	LC	C A/B C C C	NA 15MN/1MO NA NA NA	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE IF OPEN AND REMAIN CLOSED TO MITIGATE RHR BREAK
WBN-1-MVOP-074-0002 -B RHR SYSTEM ISOLATION VALVE	1-FCV -074-0002 SB-2	-B	300	723' 0" 71C62-54114-1	AC4	C A C C C	NA 1MO NA NA NA	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE IF OPEN AND REMAIN CLOSED TO MITIGATE RHR BREAK. POS IND IS PAM VARIABLE AND MUST BE MONITORED FOR RHR BREAK. *SEE NOTE 4.* R
WBN-1-MVOP-074-0003 -A RHR PUMP A-A INLET FLOW CNTRL VLV	1-FCV -074-0003 SB-2	-A		676' 71C62-54114-1	A11	A/B C C C C	1WK/100D NA NA NA NA	L RH/A CV/A AB AF	VLV MUST CLOSE DURING SWITCH-OVER FROM THE RWST TO THE CNTMT SUMP
WBN-1-MVOP-074-0008 -A RHR SYSTEM ISOLATION BYPASS VALVE	1-FCV -074-0008 SB-1	-A	304	722' 1" 71C62-54114-1	AC4	C A C C C	NA 1MO NA NA NA	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE IF OPEN AND REMAIN CLOSED TO MITIGATE RHR BREAK. POS IND IS PAM VARIABLE AND MUST BE MONITORED FOR RHR BREAK. *SEE NOTE 4.* R

		R 3	R 4	R
PREPARER/DATE	*KEITH B. NAPIER*	12/12/89	CAD 7/10/90	
CHECKED/DATE	*D. L. KIRBY*	12/12/89	LAH 7/10/90	

PRINT DATE: 08/01/89

BINDER NO. : WBNEQ-MOV -001
MANUFACTURER : LIMITORQUE

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-074-0009 -B	1-FCV -074-0009 -B	348	709'11"	LC	C	NA	L	IF OPEN, VLV MUST CLOSE
RHR SYSTEM ISOLATION BYPASS VALVE	SB-1		71C62-54114-1		A/B	15MN/1MO	RH/C	AND REMAIN CLOSED FOR
					C	NA	CV/C	ACCIDENT MITIGATION
					C	NA	FW/C	
					C	NA	MS/C	
WBN-1-MVOP-074-0021 -B	1-FCV -074-0021 -B		676'	A10	A/B	1WK/100D	L	VLV MUST CLOSE DURING
RHR PUMP B-B INLET FLOW CONTROL VALVE	SB-2		71C62-54114-1		C	NA	RH/A	SWITCH-OVER FROM THE
					C	NA	CV/A	RWST TO THE CONTAINMENT
					C	NA	AB	SUMP
					C	NA	AF	

		R 1	R 2	R
PREPARER/DATE	DFC 5/20/86	RHM 2/8/89	RBM 9/25/89	
CHECKED/DATE	WBK 5/21/86	KBN 2/8/89	KBN 9/25/89	

TAB A - EQUIPMENT IDENTIFICATION MATRIX

The following notes apply to all pages of this TAB A.

1) Elevations shown are actual elevations for equipment located in the Reactor Building and floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2) See TAB B, Section A for a complete listing of the calculations used in this binder and their revision level.

The following notes are equipment specific.

3) Field verification for valve 1-FCV-74-3 shows an incorrect floor elevation. As constructed drawing 47W432-1 Rev. H shows the valve to be located in 1A-A RHR Pump Room and floor elevation 676'-0".

4) The category and operating time listed for this device is the most limiting, and is for the internal limit switch which is being used to monitor a PAM function. The safety function listed is for the MVOP. The PAM safety function is as follows: This limit switch performs a PAM type B function and must be monitored for the duration of each event. R4

BINDER NO. WBNEQ-MOV-001	PLANT WBN	UNIT(S) 1	SHEET 1 OF 33
			R 1 R
BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 9/22/86	RJM 2/8/89
	CHECKED WBK/HDR	DATE 9/22/86	KDR 2/8/89

A. DOCUMENTATION

Equipment Description: Motorized Valve Actuator with Type RH insulation

Vendor/Manufacturer: Limitorque

Equipment Model No.(s): See EQC TAB A

QUALIFICATION REPORTS (See EQC TAB D Table of Contents) |R1

(1) Title/Number/Revision Limitorque Valve Actuator, Qualification for Nuclear Service #B0058 and Appendix A — RIMS NEB820421203 — DATE 1-11-80

(2) Title/Number/Revision Limitorque Valve Actuator, Actuators for PWR Service #600456 — RIMS NEB820421203 — DATE 12-9-75

(3) Title/Number/Revision Limitorque Valve Actuator, Temperature Related to High Superheat Ambient #B0027 — RIMS NEB820421203 — Rev. A — DATE 10-18-78

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) Limitorque Valve Actuators with Type LR Motor for Westinghouse PWR Report B0212 Dated 4/10/85.

(5) Supplement report to NUC-9 Rev. 1, 4-14-80, Reliance Electric Company Summary Report - Nuclear Power Plant Motor Systems Type Test Support Analysis - Random Wound Motors.

(6) Qualification Type Test Report of Multi-Point Terminal Strips, for Use in Limitorque. Valve Actuators for PWR Service Dated July 1, 1982. Report B0119.

(7) Limitorque telex dated March 24, 1986. |R1

(8) WAC-49

(9) Limitorque letter dated September 25, 1985 (B70 850925 012)

(10) Limitorque letter dated September 5, 1985 (B70 850910 004)

(11) Limitorque telex dated November 6, 1985 (B70 851107 021)

(12) TVA telex dated November 6, 1985, (B70 851107 022)

(13) WAC-67

|R1

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(14) Category and Operating Times, System 62, WBNOSG4-013 R12
B26 900327 200

(15) Category and Operating Times, System 63, WBNOSG4-014 R11 R4
B26 900309 227

(16) Category and Operating Times, System 67, WBNOSG4-016 R14
B26 900319 215

(17) Category and Operating Times, System 68, WBNOSG4-017 R9
B26 890510 506

(18) Category and Operating Times, System 70, WBNOSG4-018 R13
B26 900110 200 R4

(19) Category and Operating Times, System 74, WBNOSG4-020 R8
B26 900309 232

(20) Environmental Drawing No. 47E235-41 R1

(21) Environmental Drawing No. 47E235-42 R2

(22) Environmental Drawing No. 47E235-61 R1

(23) Environmental Drawing No. 47E235-74 R1

(24) Environmental Drawing No. 47E235-77 R1

(25) Calculation GENNAL3-001 R0 - 40 year Containment Dose
B45 851117 235

(26) Calculation WBNNAL3-004 R0 - Accident Dose - Reactor Building
B45 860205 235

(27) Calculation WBNNAL3-025 R0 - 40 year Dose-Outside Shield
Building B45 860401 235

(28) Calculation WBNTSR-051, R0 - Reduction of Beta Dose by Sheet
Steel B26 891129 202

(29) Environmental drawing number 47E235-59, R2, and R4
DCA-P-02351-18-0 in accordance with DCN P-02351-A
(B26 881210 801)

Note: Documents listed above are used throughout this binder for equipment qualifications. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified
____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule
____ Equipment Qualification Not Established by Documentation
____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

(1) Qualification Status of Actuators 1-MVOP-67-87-A, 1-MVOP-67-95-A, 1-MVOP-67-103-B, 1-MVOP-67-111-B, and 1-MVOP-70-89-B must be established after replacement. See Open Item No. 1. R1

(2) Deficient internal cable is to be replaced per ECN 6025. Complete field verification must be resubmitted to the DNE binder preparer upon resolution of Open Item No. 2. R1

(3) Nylon crimp connectors on the field winding leads must be replaced with acceptable nuclear grade connectors. Complete revised field verification must be resubmitted to the DNE binder preparer upon resolution of Open Item No. 3. R1

(4) Heaters in the motor and limit switch compartments must be decommissioned prior to unit start-up. Complete revised field verification must be resubmitted to the DNE binder preparer upon resolution of Open Item No. 4. R1

(5) Black durez limit switch rotors must be replaced with qualified sub-components. Complete revised field verification must be resubmitted to the DNE binder preparer upon resolution of Open Item No. 5. R1

(6) Verification of the manufacturer and model number of the terminal blocks installed in the limit switch compartment must be determined before qualification status of the terminal block can be established. See Open Item No. 6. R1

R R

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR

COMPUTED /R1 R3hm DATE 2-14-89

CHECKED /R1 KBN DATE 2/16/89

B. CONCLUSION OF REVIEW (Check only one block) (continued)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES (continued)

(7) Valve actuators must be fitted with T-drains in the low point of the limit switch compartments. Revised field verification must be submitted upon resolution of Open Item No. 7.

(8) QMDS requires that Class H Reliance motors must have a T-drain installed in the low point of the motor housing. Revised field verification must be submitted upon resolution of Open Item No. 8.

BINDER NO. WBNEQ-MOV -001 PLANT WBN UNIT(S) 1 SHEET 3 OF 33

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR

COMPUTED D.J. Cox DATE 5/21/86 R ___ R ___

CHECKED WBHis DATE 5/21/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

__X__ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

_____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

The Limitorque Environmental Qualification Program was conducted per IEEE-382 (1972), "IEEE Guide for Type Test of Class 1E Electric Valve Operators for Nuclear Power Generating Stations" and meets the requirements of IEEE-323 (1974) as they apply to valve actuators (TR B0058, Section 2.1).

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 382-1972

TVA 19537 (OE-3-86) EQP100.61

BINDER NO. WBNEQ-MOV -001 PLANT WBN UNIT(S) 1 SHEET 4 OF 33

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR

COMPUTED D J Cox DATE 5/21/86 R ___ R ___

CHECKED [illegible] DATE 5/21/86

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The Limitorque Qualification Program was conducted to encompass the entire family of actuators - SMB, SB, SBD, and SMB/HBC in all available unit sizes (SMB-000 to SMB-5). This was accomplished by type testing. See EQC TAB C, Section 1.0. EQC TAB E Attachment 1 identifies the actuator plant ID number, the Limitorque shop order number, the actuator serial number, and the documentation reference which establishes traceability to the applicable test report.

TVA 19537 (02-5-86) EQP100-61

BINDER NO. WBNEQ-MOV -001 PLANT WBN UNIT(S) 1 SHEET 5 OF 33

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR

COMPUTED [signature] DATE 5/21/86 R ___ R ___

CHECKED [signature] DATE 5/21/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Motor Operated Valve Actuator	Motor Operated Valve Actuator	600456, Sect. 2.0
(2) Manufacturer	Limitorque	Limitorque	600456, Sect. 2.0
(3) Model Number(s)	See EQC TAB A	SMB-0	600456, Sect. 2.0
(4) Serial Number(s)	See EQC TAB E Attachment 1	Actuator 189835	600456, Sect. 2.0
		Motor 2Y267074A1EZ	600456, Sect. 2.0
Order No.	See EQC TAB E Attachment 1	Actuator 600456-A	600456, Sect. 2.0

(5) Identify Component-Unique checksheet attached: None

JUSTIFICATION/COMMENTS The Limitorque qualification program was conducted to encompass the entire family of actuators - SMB, SB, SBD, and SMB/HBC in all available unit sizes (SMB-000 to SMB-5, Reference #B0058, Section 2.1). This was accomplished by conducting the testing on a mid-size unit SMB-0 with a Reliance motor, 60 HZ, 460 VAC, insulation Class RH, type-P motor, size 40 ft.-lb. stall, 8 ft.-lb. run (Reference #600456, Section 2.0). See EQC TAB C, Section 1.

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 5/21/86	R 1 [signature] 2-14-89	R
	CHECKED WBK	DATE 5/21/86	[signature] 2/16/89	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. | R1

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	See Comments	Yes	600456 Sect. 3.4.1
Conduit Seals	None	NA	NA
Connector Seals	None	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Control and power lead connections were made through flexible pressure tight conduit connections run between the unit tested and the access ports of the test chamber (reference #600456, Section 3.4.1); however, conduit seals and special connections are not required. See EQC TAB C, Section 2 for justification. There are no specific "installation interfaces" | R1 for this equipment specified throughout the qualification program.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	See Comment
(b) Baseline performance measurements taken	Yes	600456, Tabl II&III, & App. B
(c) Equipment aged:		
Thermal	Yes	600456, Sect. 3.1.1
Radiation	Yes	600456, Sect. 3.1.3 & 3.3
Wear	Yes	600456, Sect. 3.1.2
(d) Vibration/seismic testing conducted	Yes Seismic	B0058, Sect. 2.1; 600456, Sect. 3.2
(e) Design basis event (DBE) exposure	Yes	600456, Sect. 4.4.1, 4.4.5, Tabl III Fig 6
(f) Post-DBE exposure	Yes	600456, Sect. 4.4.1, 4.4.5, Tabl III Fig 6
(g) Final inspection and disassembly	Yes	600456, Sect. 3.7, 4.5, & 4.7

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes, 600456 Sect. 4.7.1; see TAB C, Section 4 for details.

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference #600456, App. F, Tabl I).

JUSTIFICATION/COMMENTS Low level vibration is addressed in the EQC TAB C, Section 3. See EQC TAB C, Section 5.0 for discussion of test sequence with respect to radiation exposure. Preinspection is not a requirement of IEEE 323-1974; however, the equipment was manufactured per Limitorque standard nuclear B/M and no damage or deficiencies were noted per 600456, Section 2.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference B0058, Section 3.0 and 600456, Section 3.1).

JUSTIFICATION/COMMENTS None

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	B0058, Sect. 3.2 600456, Sect. 3.1.1
Radiation exposure	Yes	600456, Sect. 3.1.3 B0058, Sect. 3.4
Vibration (non-seismic) aging	Yes	B0058, Sect. 2.1
Operational (electrical/mechanical/process) stress aging	Yes	600456, Sect. 3.1.2 B0058, Sect. 3.3

JUSTIFICATION/COMMENTS None

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 600456, Sect. 3.1.1; B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS Thermal aging was conducted on Reliance motor stator. See EQC TAB C, Section 4.0 for full details.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS All organic materials subject to thermal aging degradation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS See EQC TAB C, Section 4.0 for full details.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 600456,Sect. 3.1.1; B0058,Sect. 3.2) .

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F	180°C	130°F
Time	40 Years	100 Hr	40 Yrs

JUSTIFICATION/COMMENTS Motor stator thermal aging conducted; analysis conducted on other organic materials. See EQC TAB C, Section 4.0.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS Thermal regression curve used for motor stator; analysis used for other materials. See EQC TAB C, Section 4.0.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See EQC TAB C, Section 4.0.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference B0058, Sect. 3.2.1.2).

JUSTIFICATION/COMMENTS Thermal regression curve used for motor stator. See EQC TAB C, Section 4.0.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Operation of equipment during thermal aging is not required.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 600456, Sect. 3.1.3). B0058, Sect. 3.4

JUSTIFICATION/COMMENTS None

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference B0058, Sect. 3.2) .

JUSTIFICATION/COMMENTS A specific listing of materials subject to radiation degradation was not provided; however, organic materials, as stated in Section 3.2 of B0058, would be subject to radiation degradation. During the radiation exposure for the test, the whole actuator was radiation aged.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference 600456, Sect. 3.1.3 & 3.3, and B0058, Sect. 3.4).

JUSTIFICATION/COMMENTS Aging dose was combined with the accident dose. 4 Mrd was applied for normal dose; 200 Mrd was applied for accident dose.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: 600456, Section 3.1.3, 3.3, and Appendix C).

Plant normal ambient radiation dose (rd)	20E06
Test exposure dose (rd)	204E06
Test exposure dose rate (rd/hr)	1.0E06
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

JUSTIFICATION/COMMENTS Test dose included normal aging plus accident dose.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program* Yes (Reference: B0058, Section 2.1).

JUSTIFICATION/COMMENTS Non-seismic vibration is not addressed in the Limitorque Test Program. See EQC TAB C, Section 3.0.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? No (Reference: B0058, Section 2.1).

JUSTIFICATION/COMMENTS See EQC TAB C, Section 3.0 for justification of omission of non-seismic vibration aging.

* Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: 600456, Section 3.1.2, Appendix B). R1

JUSTIFICATION/COMMENTS The actuator was cycled (mechanical aging) 1208 times; seating thrust was monitored.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: 600456, Section 3.1.2, Appendix B).

JUSTIFICATION/COMMENTS The actuator was cycled (mechanical aging) 1208 times; seating thrust was monitored.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: B0058, Section 3.2).

Qualified life (Document in QMDS) 40 Years

JUSTIFICATION/COMMENTS See EQC TAB C, Section 4.0 for full details on qualified life and aging.

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BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED /R1 RZBM	DATE 2/8/89	R R
	CHECKED /R1 KBN	DATE 2/8/89	

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference: B0058, Section 5.0 and 7.0). R1

JUSTIFICATION/COMMENTS None

BINDER NO. WBNEQ-MOV -001 PLANT WBN UNIT(S) 1 SHEET 13 OF 33

R ___ R ___

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR

COMPUTED D J Cap DATE 5/21/86

CHECKED WB Hurd DATE 5/21/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Melamine (white)	2.04×10^{8} Rads	600456 Sect. 3.1.3	1.35	See Comments
(b)	Fiberite (brown)	2.09×10^{8} Rads	B0212 Sect. 6.7	1.78	See Comments
(c)	G.P. Phenolic (black)	2.09×10^{8} Rads	B0212 Sect. 6.7	1.63	See Comments
(d)	Motor Insulation-RH	2.04×10^{8} Rads	600456 Sect. 3.1.3	1.02	See Comments
(e)	Wiring Insulation	NA	NA	NA	TAB C Sect. 4.4

JUSTIFICATION/COMMENTS Radiation threshold does not apply. Limitorque has done radiation exposure per the referenced Limitorque test reports. The values listed in threshold column represent the testing parameters. Activation energies are documented in TABS "D" and "E" as follows:

(a) Melamine - Output display from aging data calculation (WAC-49) (TAB "E").

(b) Fiberite - Limitorque test report B0212, Sect. 6.2 (TAB "D").

(c) G. P. Phenolic - Limitorque letter dated 9/5/85 (B70 850910 004) (TAB "E").

(d) Motor Insulation - RH (WAC-49) (TAB "E").

See TAB C, Section 4.1 for material analysis of phenolics and Section 4.2 for analysis of motor insulation.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference B0058, Sect. 4.1.8).

Identify Acceptance Criteria: The actuator must be capable of opening or closing a valve on demand.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Report 600456, Sect. 4.6). and Appendix B

Identify baseline and functional testing: Motor potential, run current, power, stroke time, peak current, and seating thrust were measured prior to the start of the test and are summarized in Table III of Report 600456. Insulation resistance to ground is tabulated in Table II. See TAB C, Section 9 for summary.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference See Comment).

JUSTIFICATION/COMMENTS Load cycling during the test is tabulated in Table III of the test report.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: 600456 Section 3.1.2).

JUSTIFICATION/COMMENTS Thrust measurements correspond to the thrust rating for the actuator. In addition, Appendix B of the test report shows baseline, mechanical aging, and post-test thrust measurements.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	490 VAC	600456 Table III
Load	Approx 20,000 lbs thrust	600456 Table III
Frequency	See Comment	
Accuracy	NA	
Other(s)		
NA		
NA		

JUSTIFICATION/COMMENTS Although not specifically stated, we have no reason to believe that Limitorque used anything other than a 60 Hz power source.

R1

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	See TAB C, Section 6	NA
Load	See Comment	NA
Frequency	60 Hz	See comments below
Accuracy	NA	
Other(s) NA		

R1

JUSTIFICATION/COMMENTS Load required will be thrust necessary to stroke the valve. Frequency variations would only occur during the loading of the diesel generators. Since Unit 2 is not operational, the diesels cannot be overloaded to the point of causing frequency variations. This is based on maximum loading occurring during a LOCA on Unit 1 with a full load rejection on Unit 2.

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	475VAC	600456 Table III
Load	Approx. 20,000 lbs thrust	600456 Table III
Frequency	See Comment	See Comment
Accuracy	NA	NA
Other(s)		

R1

R1

JUSTIFICATION/COMMENTS Justification for lack of reduced voltages starting tests under accident conditions is presented in EQC TAB C, Section 6.0. Although not specifically stated, we have no reason to believe that Limitorque used anything other than a 60 Hz power source.

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			R 1 R
BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 5/21/86	RHM 2/8/89
	CHECKED WBK	DATE 5/21/86	FBN 2/8/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See pp. 17A-E

(1) Normal Max

(a) Temperature (°F) See Above

(b) Pressure (psig) See Above

(c) Humidity (%) See Above

(d) Radiation (rd) See Above

(2) Abnormal Max

(a) Temperature (°F) See Above

(b) Pressure (psig) See Above

(c) Humidity (%) See Above

(d) Radiation (rd) See Above

(3) Process Interfaces: Valve body and stem connection configuration eliminates significant additional heating of the degradable actuator parts due to elevated temperatures in process fluids.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal temperatures could occur as a result of outside temperature excursions, temporarily greater than design heat loads, or degraded environment control system. This could exist for up to 8 hours per excursion and will occur less than 1% of the plant life. See TAB C, Sect. 4.0.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a)	Temperature (°F)	327	Accident type MSLB-See EQC TAB A
(b)	Pressure (psig)	12	Accident type LOCA-See EQC TAB A
(c)	Humidity (%)	100	Accident type LOCA-See EQC TAB A
(d)	Radiation (rd)	4.7×10^8 (beta)* 4×10^7 (gamma)	Accident type LOCA-See EQC TAB A R1
(e)	Spray Type	8.35pH, 0.18M H_3BO_3 2000PPM boron 0.033M NaOH Duration 30d	Accident type LOCA-See EQC TAB A

* The effect of beta radiation was considered, see TAB C Section 10.0 R1

BINDER NO. WBNEQ-MOV-001	PLANT WBN	UNIT(S) 1	SHEET 17a OF 33
BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 9/12/86	R 1 RGW 2/8/89 R
	CHECKED WBK/HDR	DATE 9/12/86	KBW 2/8/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-41 |R1

(1) Normal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) $1.0x10^6$

(2) Abnormal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: Valve body and stem connection configuration eliminates significant additional heating of the degradable actuator parts due to elevated temperatures in process fluids.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal conditions could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	160	Accident type	LOCA
(b) Pressure (psig)	12.0	Accident type	LOCA
(c) Humidity (%)	100	Accident type	LOCA
(d) Radiation (rd)	$4.7x10^8$ (beta) $3.8x10^7$ (gamma)	Accident type	LOCA |R1
(e) Spray Type	See Sheet 17	Accident type	LOCA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42 | R1

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 8×10^7

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: Valve body and stem connection configuration eliminates significant additional heating of the degradable actuator parts due to elevated temperatures in process fluids.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal conditions could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327	Accident type	MSLB
(b) Pressure (psig)	12.0	Accident type	LOCA
(c) Humidity (%)	100	Accident type	LOCA
(d) Radiation (rd)	4.7×10^8 (beta) 4.0×10^7 (gamma)	Accident type	LOCA (R1)
(e) Spray Type	See Sheet 17	Accident type	LOCA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-61

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) $7.5x10^{6}$

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: Valve body and stem connection configuration eliminates significant additional heating of the degradable actuator parts due to elevated temperatures in process fluids

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal conditions could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 210 Accident type HELB | R4

(b) Pressure (psig) ATM Accident type LOCA

(c) Humidity (%) NA Accident type LOCA

(d) Radiation (rd) $5x10^{6}$ Accident type LOCA

(e) Spray Type NA Accident type

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-74 |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) 4.3×10^5

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) LOCA

(3) Process Interfaces: Valve body and stem connection configuration eliminates significant additional heating of the degradable actuator parts due to elevated temperatures in process fluids.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal conditions could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110	Accident type	LOCA
(b) Pressure (psig)	NA	Accident type	LOCA
(c) Humidity (%)	NA	Accident type	LOCA
(d) Radiation (rd)	1×10^7	Accident type	LOCA
(e) Spray Type	NA	Accident type	

BINDER NO. WBNEQ-MOV-001	PLANT WBN	UNIT(S) 1	SHEET 17e OF 33
			R 1 R
BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 9/12/86	RHM 2/8/89
	CHECKED WBK/HDR	DATE 9/12/86	KGN 2/8/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-77 |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM

(c) Humidity (%) 80

(d) Radiation (rd) 1.8×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: Valve body and stem connection configuration eliminates significant additional heating of the degradable actuator parts due to elevated temperatures in process fluids.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal conditions could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	190	Accident type	LOCA
(b) Pressure (psig)	ATM	Accident type	LOCA
(c) Humidity (%)	90	Accident type	LOCA
(d) Radiation (rd)	1×10^7	Accident type	LOCA
(e) Spray Type	NA	Accident type	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): See EQC TAB C, Item 11.0 for discussion on chemical spray |R1

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: See EQC TAB C, Item 2).

(7) Subject to submergence (Yes/No/NA)? Yes (Reference: EQC TAB C, Item 13.0). |R1

Identify initiation time and duration of submergence: See discussion on submergence in EQC TAB C, Item 13.0. Submergence is not a qualification concern based on assessment. |R1

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: EQC TAB C, Item 10).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: 4.69×10^7 beta see discussion on beta radiation in TAB C, Item 10.0 R1

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B Section A, items 25, 26 and 27	

R1

BINDER NO. WBNEQ-MOV-001	PLANT WBN	UNIT(S) 1	SHEET 19 OF 33
			R 1 R
BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 5/21/86	RHM 2/8/89
	CHECKED WBK	DATE 5/21/86	KBN 2/8/89

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time	100d	30d	600456, Sect. 4.4.1, Fig 6	
Temperature (°F)	327	315	600456, Sect. 4.4.1, Fig 6	
Pressure (psig)	12.0	78	600456, Sect. 4.4.1, Fig 7	
Relative Humidity (%)	Steam 100	Steam 100	600456 Sect. 4.4.3	
Chemical Spray*	8.2pH;0.18M H_3BO_3 30d; 2000PPM Boron 0.033M NaOH	TAB C Item 11.0	600456 Sect. 4.4.2	R1
Radiation (rd)**	120E06	204E06	600456 Sect. 3.3	
Submergence	TAB C, Item 13.0	None	NA	R1

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See K(8) for discussion on Beta Radiation. R1

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference	
Temperature	No	600456 Fig 6	
Pressure	Yes	600456 Fig 5,6,7	
Relative Humidity	Yes	600456 Sect. 4.4.3	
Chemical Spray	Yes	600456 Sect. 4.4.2	
Submergence	No	TAB C, Item 13.0	R1

JUSTIFICATION/COMMENTS EQC TAB C, Section 7.0 presents justification for comparison of required V.S. test profile for time and temperatuare. See TAB C, Item 12.0, for enveloping test profile breakdown. R1

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

See TAB C, Item 13.0, for discussion on submergence. With respect to beta radiation, the metallic mass of the operator eliminates the concern for beta radiaion. |R1

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	None	No
Pressure: +10% but no more than 10 psig	10%	Yes
Radiation: +10% of accident dose	10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	+10%	Yes
Voltage: ±10% of rated value	See Comment	No
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	2 DWELLS	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS #600456, Section 3.0 states that the test actuator was subjected to additional load cycling after environmental tests and prior to final inspection as an added test margin. EQC TAB C, Section 7.0 presents justification for margin with respect to test temperature and time. See EQC TAB C, Section 6.0 for justification for lack of reduced voltage testing.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference: B0058, Section 2.4).

JUSTIFICATION/COMMENTS The basic function of a valve actuator is to provide the required torque and/or thrust to open or close the valve as required.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (Yes/No/NA)? Yes
(Reference: 600456, Section 4.4.5 and 5.0).

JUSTIFICATION/COMMENTS The test unit functioned adequately throughout the entire test.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (Yes/No/NA)? Yes (Reference: 600456, Section 4.4.5 and 5.0).

JUSTIFICATION/COMMENTS The test unit functioned adequately throughout the entire test.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (Yes/No/NA)? No (Reference: 600456, Figure 6).

JUSTIFICATION/COMMENTS See EQC TAB C, Section 7.0 for justification of actuator operability post-accident.

R1

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (Yes/No/NA)? Yes
(Reference: 600456, Section 4.4.5 and 4.6).

JUSTIFICATION/COMMENTS Minor problems were experienced during and after the LOCA test; however, these had no effect on actuator performance. See referenced sections of Limitorque report 600456.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See EQC TAB G.

BINDER NO. WBNEQ-MOV -001 PLANT WBN UNIT(S) 1 SHEET 23 OF 33

BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR

COMPUTED DJ Cap DATE 5/21/86 R R

CHECKED WB DATE 5/21/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes*
(c) Absence of preaging in test/analysis justified?	Yes
(d) Materials susceptible to thermal/radiation aging identified?	Yes

*Only the motor was pre-aged prior to application of DBE conditions. See TAB C for aging of switch materials.

BINDER NO. WBNEQ-MOV-001	PLANT WBN	UNIT(S) 1	SHEET 25 OF 33
			R 1 R
BINDER TITLE LIMITORQUE MOTORIZED VALVE OPERATORS WITH TYPE RH INSULATED MOTOR	COMPUTED DFC	DATE 5/21/86	RBM 2/8/89
	CHECKED WBK	DATE 5/21/86	KBN 2/6/89

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test analyis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

R1

P. DISCUSSION

R1

TAB A - EQUIPMENT IDENTIFICATION MATRIX

The following notes apply to all pages of this TAB A.

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See TAB B, Section A for a complete listing of the calculations used in this binder and their revision level.

The following notes are equipment specific.

3. Power is to be removed from 1-FCV-62-98 and 1-FCV-62-99 motors by ECN 6701. After the ECN and field verification is complete, the binder must be revised to reflect the motors as Cat. C and the actuators as Cat. B.

4. The category and operating time listed for this device is the most limiting, and is for the internal limit switch which is being used to monitor a PAM function. The safety function listed is for the MVOP. The PAM safety function is as follows: This limit switch performs a PAM type B function and must be monitored for the duration of each event. R5

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS_NUMBER / DESCRIPTION	UNIT_DEVICE_ID_NO. / MODEL_NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER_TIME	EVENT	SAFETY_FUNCTION
WBN-1-MVOP-026-0241 -B ANN STANDPIPE ISLN VALVE	1-FCV -026-0241 -B SB-00		713' 77K51-822598-6	A28	A/B	5MN/100D	L	VLV MUST CLOSE ON A PHASE A CONTAINMENT ISOL SIGNAL
WBN-1-MVOP-026-0242 -A ANN STANDPIPE ISLN VALVE	1-FCV -026-0242 -A SB-00		713' 77K51-822598-6	A28	A/B	5MN/100D	L	VLV MUST CLOSE ON A PHASE A CONTAINMENT ISOL SIGNAL
WBN-1-MVOP-026-0243 -A REACTOR COOLANT PUMP SPRAY ISLN VALVE	1-FCV -026-0243 -A SB-00		713' 77K51-822598-6	A28	A/B	5MN/100D	L	VLV MUST CLOSE ON A PHASE A CONTAINMENT ISOL SIGNAL
WBN-1-MVOP-026-0244 -B ANN SPRINKLER SYS ISLN VALVE	1-FCV -026-0244 -B SB-00		713' 77K51-822598-6	A28	A/B	5MN/100D	L	VLV MUST CLOSE ON A PHASE A CONTAINMENT ISOL SIGNAL
WBN-1-MVOP-026-0245 -A ANN SPRINKLER SYS ISLN VALVE CONT	1-FCV -026-0245 -A SB-00		713' 77K51-822598-6	A28	A/B	5MN/100D	L	VLV MUST CLOSE ON A PHASE A CONTAINMENT ISOL SIGNAL

			R 1	R	R
PREPARER/DATE	JWH	9/9/86	RSHM 2/8/89		
CHECKED/DATE	NMB	9/12/86	KBW 2/10/89		

PRINT DATE: 07/07/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-062-0063 -A SEAL FLOW RETURN ISLN VALVE	1-FCV -062-0063 -A SB-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV IS REQUIRED TO CLOSE AND REMAIN CLOSED AFTER THE PHASE A ISOLATION SIGNAL IS RECEIVED AND RESET. SEE NOTE 4. R5
WBN-1-MVOP-062-0090 -A CHARGING FLOW ISLN VALVE	1-FCV -062-0090 -A SMB-00		713' 71C62-54114-1	A28	A/B A/B A/B A/B A	5MN/100D 5D/1MO 15MN/1MO 5D/1MO 1MO	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-013. SEE TAB B FOR REVISION LEVEL.
WBN-1-MVOP-062-0091 -B CHARGING FLOW ISLN VALVE	1-FCV -062-0091 -B SMB-00		713' 71C62-54114-1	A28	A/B A/B A/B A/B A	5MN/100D 5D/1MO 15MN/1MO 5D/1MO 1MO	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-013. SEE TAB B FOR REVISION LEVEL.
WBN-1-MVOP-062-0098 -A CHARGING PUMP 1A-A MIN FLOW	1-FCV -062-0098 -A SMB-00		713' 71C62-54114-1	A28	B B B B B	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-013. SEE TAB B FOR REVISION LEVEL.
WBN-1-MVOP-062-0099 -B CHARGING PUMP 1A-A MIN FLOW	1-FCV -062-0099 -B SMB-00		713' 71C62-54114-1	A28	B B B B B	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-013. SEE TAB B FOR REVISION LEVEL.

		R 5	R	R
PREPARER/DATE	JWH 9/9/86	KBN 7/6/90		
CHECKED/DATE	NMB 9/12/86	EGM 7/18/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-062-0132 -A VCT OUTLET ISOLATION VALVE LEVEL CONTROL	1-LCV -062-0132 -A SB-00		713' 71C62-54114-1	A07'	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-013. SEE TAB B FOR REVISION LEVEL. SEE NOTE 4.
WBN-1-MVOP-062-0133 -B VCT OUTLET ISOLATION VALVE LEVEL CONTROL	1-LCV -062-0133 -B SB-00		713' 71C62-54114-1	A07'	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-013. SEE TAB B FOR REVISION LEVEL. SEE NOTE 4.
WBN-1-MVOP-063-0001 -A RWST TO RHR PUMP FLOW CONTROL VALVE	1-FCV -063-0001 -A SB-2		692' 71C62-54114-1	A08	A/B A/B	1WK/100D 1WK/1MO	L RH/A	FOR L:VLV MUST OPEN AND REMAIN OPEN TO PERMIT SAFETY INJECTION.FOR RH/A VLV MUST CLOSE AND REMAIN CLOSED TO PREVENT RWST DRN
WBN-1-MVOP-063-0003 -A SIS PUMP RECIRC TO RWST VALVE	1-FCV -063-0003 -A SMB-00		692' 71C62-54114-1	A08	A/B	1WK/100D	L	VALVE MUST CLOSE WHEN GOING FRM INJ PHASE TO RECIRC AND MUST STAY CLOSED DURING RECIRC.
WBN-1-MVOP-063-0004 -B SIS PUMP 1A-A DISCH TO RWST SHUTOFF VLV	1-FCV -063-0004 -B SMB-00		692' 71C62-54114-1	A13	A/B	1WK/100D	L	VLV MUST BE CLOSED BEFORE ALINGING THE SIS FOR RECIR VLV MUST REMAIN CLOSED TO PREVENT FLOW FROM SUMP INTO THE RWST

R5

R 5 R____ R____

PREPARER/DATE JWH 9/9/86 KBN 7/6/90

CHECKED/DATE NMB 9/12/86 EEM 7/18/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	--------LOCATION-------- AZMITH	ELEV(1) CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-063-0005 -B RWST TO SIS PUMP FLOW CONTROL VALVE	1-FCV -063-0005 -B SB-00		692' 71C62-54114-1	A08	A/B	1WK/100D	L	VLV MUST CLOSE WHEN GOING FROM INJECTION PHASE TO RECIRC AND MUST STAY CLOSED DURING RECIRC TO PREVENT FLOW FROM SUMP INTO THE RWST
WBN-1-MVOP-063-0006 -B SIS PUMP INLET TO CVCS CHG PUMP VALVE	1-FCV -063-0006 -B SB-00		692' 71C62-54114-1	A08	A/B	1WK/100D	L	VLV IS NORMALLY CLOSED AND MUST BE OPERABLE TO PROVIDE SUPPLY FROM RHR TO SIS DURING ECCS RECIRC.
WBN-1-MVOP-063-0007 -A SIS PUMP INLET TO CVCS CHG PUMP VALVE	1-FCV -063-0007 -A SB-00		692' 71C62-54114-1	A08	A/B	1WK/100D	L	VLV IS NORMALLY CLOSED AND MUST BE OPERABLE TO PROVIDE SUPPLY FROM RHR TO SIS DURING ECCS RECIRC.
WBN-1-MVOP-063-0008 -A RHR HXA TO CVCS CHG PUMP	1-FCV -063-0008 -A SB-00		713' 71C62-54114-1	A28	A/B B	1WK/100D 1MO	L RH/A	L:OPEN & REMAIN OPEN DURING RECIRC TO ALLOW SUCTION FOR SI & CC PMP. RH/A:REMAIN CLOSED TO PREVENT DRAINING RWST
WBN-1-MVOP-063-0011 -B RHR HTX B TO SIS PUMP	1-FCV -063-0011 -B SB-00		713' 71C62-54114-1	A28	A/B B	1WK/100D 1MO	L RH/A	L:OPEN & REMAIN OPEN DURING RECIRC TO ALLOW SUCTION FOR SI & CC PMP. RH/A:REMAIN CLOSED TO PREVENT DRAINING RWST.

			R 1	R	R
PREPARER/DATE	JWH	9/9/86	RDM 2/8/89		
CHECKED/DATE	MMB	9/12/86	KBW 2/16/89		

PRINT DATE: 07/07/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-063-0022 -B SIS PMP COLD LEG INJECTION	1-FCV -063-0022 -B SBD-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV MUST SWITCH FROM COLD LEG TO HOT LEG RECIRC. SEE NOTE 4.
WBN-1-MVOP-063-0025 -B SIS BORON INJECTION TANK SHUTOFF VALVE	1-FCV -063-0025 -B SBD-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR L:VLV MUST OPEN AND REMAIN OPEN AFTER AN SI SIGNAL.FOR OTHERS: VLV MUST REMAIN CLOSED TO MAINTAIN RCP SEAL INJ PATH SEE NOTE 4. R5
WBN-1-MVOP-063-0026 -A SIS BORON INJECTION TANK SHUTOFF VALVE	1-FCV -063-0026 -A SBD-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR L:VLV MUST OPEN AND REMAIN OPEN AFTER AN SI SIGNAL.FOR OTHERS: VLV MUST REMAIN CLOSED TO MAINTAIN RCP SEAL INJ PATH SEE NOTE 4.
WBN-1-MVOP-063-0047 -A SIS PMP 1A-A INLET VALVE	1-FCV -063-0047 -A SB-00		692' 71C62-54114-1	A13	A	100D	L	VLV MUST REMAIN OPEN DURING BOTH INJ AND RECIRC PHASE OF SI ,AND REMAIN OPERABLE TO ISOLATE PASSIVE FAILURE
WBN-1-MVOP-063-0048 -B SIS PMP 1B-B INLET VALVE	1-FCV -063-0048 -B SB-00		692' 71C62-54114-1	A12	A	100D	L	VLV MUST REMAIN OPEN DURING BOTH INJ AND RECIRC PHASE OF SI, AND REMAIN OPERABLE TO ISOLATE PASSIVE FAILURES.

	R 5	R	R
PREPARER/DATE JWH 9/9/86	KBN 7/11/90		
CHECKED/DATE NMB 9/12/86	EGM 7/18/90		

II

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-063-0093 -A RHR TO RCS 2 AND 3 FLOW CONTROL VALVE	1-FCV -063-0093 -A SBD-2		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV IS REQUIRED TO OPERATE TO TRANSFER FROM COLD LEG TO HOT LEG RECIRC. SEE NOTE 4.
WBN-1-MVOP-063-0094 -B RHR TO RCS 1 AND 4 FLOW CONTROL VALVE	1-FCV -063-0094 -B SBD-2		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV IS REQUIRED TO OPERATE TO TRANSFER FROM COLD LEG TO HOT LEG RECIRC SEE NOTE 4.
WBN-1-MVOP-063-0152 -A SIS PUMP 1A-A OUTFLOW CONT VALVE	1-FCV -063-0152 -A SB-00		713' 71C62-54114-1	A28	A	100D	L	VLV MUST BE OPEN FOR COLD LEG INJECTION AND RECIRC MODES OF SI.VLV IS CLOSED FOR HOT LEG RECIRC
WBN-1-MVOP-063-0153 -B SIS PUMP 1B-B OUTFLOW CONT VALVE	1-FCV -063-0153 -B SB-00		713' 71C62-54114-1	A28	A	100D	L	VLV MUST OPEN FOR COLD LEG INJECTION AND RECIRC MODES OF SI.VLV IS CLOSED FOR HOT LEG RECIRC
WBN-1-MVOP-063-0156 -A SIS PUMP OUTLET TO RCS LOOP 1 AND 3 HL	1-FCV -063-0156 -A SBD-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV MUST SWITCH FROM COLD LEG HOT LEG RECIRC. SEE NOTE 4.

R5

R5

R 5 R___ R___
KBN 7/4/90
EEM 7/18/90

PREPARER/DATE JWH 9/9/86

CHECKED/DATE NMB 9/12/86

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-063-0157 -B SIS PUMP OUTLET TO RCS LOOP 2 AND 4 HL	1-FCV -063-0157 -B SBD-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV MUST SWITCH FROM COLD LEG HOT LEG RECIRC. SEE NOTE 4. R5
WBN-1-MVOP-063-0175 -B SIS PUMP 1B-B DISCHARGE TO RWST SHUT VLV	1-FCV -063-0175 -B SMB-00		692' 71C62-54114-1	A12	A/B	1WK/100D	L	VLV MUST BE CLOSED BEFORE ALIGNING THE SIS FOR RECIRC. VLV MUST REMAIN CLOSED TO PREVENT FLOW FROM SUMP INTO THE RWST.
WBN-1-MVOP-063-0177 -A SIS PUMP INLET TO CVCS CHG PUMP	1-FCV -063-0177 -A SB-00		692' 71C62-54114-1	A08	A	100D	L	N.O. VLV MUST REMAIN OPEN TO ALLOW OPER OF RECIRC MODES OF SI AND MUST REMAIN OPERABLE TO ISOLATE PASSIVE FAILURE OF AN ADJACENT COMPONENT.
WBN-1-MVOP-067-0083 -A LOWER CNTMT A COOLER SUPPLY ISLN VALVE	1-FCV -067-0083 -A SMB-000	008	718' 2" 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED AFTER A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-067-0088 -B LOWER CNTMT A CLRS DISCH ISLN VALVE IC	1-FCV -067-0088 -B SMB-000	010	718' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED ON A PHASE B ISOL SIGNAL. SEE NOTE 4.

PREPARER/DATE JWH 9/9/86 R 5 KBW 7/11/90 R____ R____
CHECKED/DATE NMB 9/12/86 EEM 7/18/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0091 -A LOWER CNTMT C CLRS SUPPLY ISLN VALVE	1-FCV -067-0091 -A SMB-000	190	720' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED ON A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-067-0096 -B LOWER CNTMT C CLRS DISCH ISLN VALVE	1-FCV -067-0096 -B SMB-000	190	720' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED ON A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-067-0099 -B LOWER CNTMT B CLRS SUPPLY ISLN VALVE	1-FCV -067-0099 -B SMB-000	172	720' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED AFTER A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-067-0104 -A LOWER CNTMT B CLRS DISCH ISLN VALVE OC	1-FCV -067-0104 -A SMB-000	170	720' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED ON A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-067-0107 -B LOWER CNTMT D CLRS SUPPLY ISLN VALVE	1-FCV -067-0107 -B SMB-000	000	719' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED AFTER A PHASE B ISOL SIGNAL. SEE NOTE 4.

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PREPARER/DATE Keith B. Nyquist	12/11/89		
CHECKED/DATE [illegible]	12/11/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	--------LOCATION-------- AZMITH	ELEV(1) CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0112 -A LOWER CNTMT D CLRS DISCH ISLN VALVE OC	1-FCV -067-0112 -A SMB-000	350	720' 74C38-083015	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED ON A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-067-0123 -B CNTMT SPRAY HTX B SUPPLY CONTROL VALVE	1-FCV -067-0123 -B SMB-000		737' 74C38-083015	A01	A	30D	L	VLV MUST OPEN TO PROVIDE WATER TO CNTMT SPRAY HTX
WBN-2-MVOP-067-0123 -B CNTMT SPRAY HTX B SUPPLY CONTROL VALVE	2-FCV -067-0123 -B SMB-000		737' 74C38-083015	A01	B	100D	L	VLV IS NORMALLY CLOSED AND MUST REMAIN CLOSED DURING MITIGATION OF EVENT
WBN-1-MVOP-067-0124 -B CNTMT SPRAY HTX B DISCHARGE VALVE	1-FCV -067-0124 -B SMB-000		713' 74C38-083015	A06	A	30D	L	VLV MUST OPEN TO PROVIDE WATER TO CNTMT SPRAY HTX
WBN-2-MVOP-067-0124 -B CNTMT SPRAY HTX B DISCHARGE VALVE	2-FCV -067-0124 -B SMB-000		713' 74C38-083015	A19	B	100D	L	VLV NORMALLY CLOSED AND MUST REMAIN CLOSED DURING MITIGATION OF EVENT

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PREPARER/DATE	Keith B. [illegible]	12/12/89		
CHECKED/DATE	[illegible]	12/12/89		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0125 -A CNTMT SPRAY HTX A SUPPLY CNTRL VALVE	1-FCV -067-0125 -A SMB-000		737' 74C38-083015	A01	A	30D	L	VLV MUST OPEN TO PROVIDE WATER TO CNTMT SPRAY HTX
WBN-2-MVOP-067-0125 -A CNTMT SPRAY HTX A SUPPLY CNTRL VALVE	2-FCV -067-0125 -A SMB-000		737' 74C38-083015	A01	B	100D	L	VLV NORMALLY CLOSED AND MUST REMAIN CLOSED DURING MITIGATION OF EVENT.
WBN-1-MVOP-067-0126 -A CNTMT SPRAY HTX A DISCH VALVE	1-FCV -067-0126 -A SMB-000		713' 74C38-083015	A06	A	30D	L	VLV MUST OPEN TO PROVIDE WATER TO CNTMT SPRAY HTX
WBN-2-MVOP-067-0126 -A CNTMT SPRAY HTX A DISCH VALVE	2-FCV -067-0126 -A SMB-000		713' 74C38-083015	A19	B	100D	L	VLV NORMALLY CLOSED AND MUST REMAIN CLOSED DURING MITIGATION OF EVENT.
WBN-1-MVOP-067-0130 -A UPPER CNTMT VENT CLR A SUPPLY ISLN VALVE	1-FCV -067-0130 -A SMB-000	300	796' 3" 79KA2-824589-1	ANN	A A A A A	100D 1MO 1MO 100D 100D	L RH/C CV/C FW/C MS/C	VLV MUST CLOSE AND REMAIN CLOSED ON A CNTMT ISOL SIGNAL. SEE NOTE 4.

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PREPARER/DATE Keith B. [illegible]	12/12/89		
CHECKED/DATE [illegible]	12/12/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0131	-B	1-FCV -067-0131	-B	300	795' 3"	ANN	A	100D	L	VLV MUST FUNCTION TO ISOLATE
UPPER CNTMT VENT CLR A ISLN VALVE OC		SMB-000			79KA2-824589-1		A	1MO	RH/C	FLOW TO COOLER UPON RECEIPT
							A	1MO	CV/C	OF A PHASE B CNTMT ISOL
							A	100D	FW/C	SIGNAL. SEE NOTE 4.
							A	100D	MS/C	
WBN-1-MVOP-067-0133	-A	1-FCV -067-0133	-A	300	798' 4"	ANN	A	100D	L	VLV MUST CLOSE AND REMAIN
UPPER CNTMT VENT CLR C SUPPLY ISLN VALVE		SMB-000			79KA2-824589-1		A	1MO	RH/C	CLOSED ON A CNTMT ISOL
							A	1MO	CV/C	SIGNAL. SEE NOTE 4.
							A	100D	FW/C	
							A	100D	MS/C	
WBN-1-MVOP-067-0134	-B	1-FCV -067-0134	-B	320	799' 5"	ANN	A	100D	L	VLV MUST FUNCTION TO ISOLATE
UPPER CNTMT CLR C DISCH ISLN VALVE		SMB-000			79KA2-824589-1		A	1MO	RH/C	FLOW TO COOLER UPON RECEIPT
							A	1MO	CV/C	OF A PHASE B CNTMT ISOL
							A	100D	FW/C	SIGNAL. SEE NOTE 4.
							A	100D	MS/C	
WBN-1-MVOP-067-0138	-B	1-FCV -067-0138	-B	310	797' 2"	ANN	A	100D	L	VLV MUST CLOSE AND REMAIN
UPPER CNTMT VENT CLR B SUPPLY ISLN VALVE		SMB-000			79KA2-824589-1		A	1MO	RH/C	CLOSED ON A CNTMT ISOL SIGNAL.
							A	1MO	CV/C	SEE NOTE 4.
							A	100D	FW/C	
							A	100D	MS/C	
WBN-1-MVOP-067-0139	-A	1-FCV -067-0139	-A	310	798' 4"	ANN	A	100D	L	VLV MUST CLOSE AND REMAIN
UPPER CNTMT VENT CLR B ISLN VALVE OC		SMB-000			79KA2-824589-1		A	1MO	RH/C	CLOSED ON A CNTMT ISOL SIGNAL.
							A	1MO	CV/C	SEE NOTE 4.
							A	100D	FW/C	
							A	100D	MS/C	

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CHECKED/DATE	[signature]	12/1/89		

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-067-0141 -B	1-FCV -067-0141 -B	310	808'	ANN	A	100D	L	VLV MUST CLOSE AND REMAIN
UPPER CNTMT VENT CLR D SUPPLY ISLN VALVE	SMB-000		79KA2-824589-1		A	1MO	RH/C	CLOSED ON A CNTMT ISOL
					A	1MO	CV/C	SIGNAL. SEE NOTE 4.
					A	100D	FW/C	
					A	100D	MS/C	
WBN-1-MVOP-067-0142 -A	1-FCV -067-0142 -A	312	809'	ANN	A	100D	L	VLV MUST FUNCTION TO ISOLATE
UPPER CNTMT VENT CLR D ISLN VALVE OC	SMB-000		79KA2-824589-1		A	1MO	RH/C	FLOW TO COOLER UPON RECEIPT
					A	1MO	CV/C	OF A PHASE B CNTMT ISOL
					A	100D	FW/C	SIGNAL. SEE NOTE 4.
					A	100D	MS/C	
WBN-1-MVOP-070-0090 -A	1-FCV -070-0090 -A		713'	A28	A	100D	L	VLV MUST CLOSE AND REMAIN
RCP THERM BAR RET CNTMT ISLN VALVE	SMB-00		74C38-083015		A	1MO	AB	CLOSED AFTER A PHASE B ISOL
					A	1MO	AF/A	IS INITIATED. SEE NOTE 4.
					A	1MO	CV/A	
					A	1MO	RH/A	
WBN-1-MVOP-070-0092 -A	1-FCV -070-0092 -A		713'	A28	A	100D	L	VLV MUST CLOSE AND REMAIN
RCP OIL CLR RET CNTMT ISLN VALVE	SMB-000		74C38-083015		A	1MO	AB	CLOSED ON A PHASE B ISOL
					A	1MO	AF/A	SIGNAL. SEE NOTE 4.
					A	1MO	CV/A	
					A	1MO	RH/A	
WBN-1-MVOP-070-0133 -A	1-FCV -070-0133 -A		737'	A05	A/B	5MN/100D	L	VLV MUST CLOSE AND REMAIN
RCP THERM BAR CNTMT ISLN VALVE	SMB-000		74C38-083015					CLOSED AFTER A PHASE B ISOL
								IS INITIATED

	R 4	R	R
PREPARER/DATE Keith B. Napier 12/12/89	12/12/89		
CHECKED/DATE [signature]	12/12/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT (LOCATION)	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-070-0134 RCP THERM BAR CNTMT ISLN VALVE	-B	1-FCV -070-0134 SMB-000	-B		737' 74C38-083015	A05	A A A A A	100D 1MO 1MO 1MO 1MO	L AB AF/A CV/A RH/A	VLV MUST CLOSE AND REMAIN CLOSED AFTER A PHASE B ISOL IS INITIATED. SEE NOTE 4.
WBN-1-MVOP-070-0140 RCP OIL CLR HDR CNTMT ISLN VALVE	-B	1-FCV -070-0140 SMB-000	-B		713' 74C38-083015	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L AB AF/A CV/A RH/A	VVL MUST CLOSE AND REMAIN CLOSED ON A PHASE B ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-070-0143 EXCESS LETDOWN HTX CNTMT INLET ISLN VLV	-A	1-FCV -070-0143 SMB-000	-A		713' 74C38-083015	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L AB AF/A CV/A RH/A	VLV MUST CLOSE AND REMAIN CLOSED ON A PHASE A ISOL SIGNAL. SEE NOTE 4.
WBN-1-MVOP-070-0183 SAMPLE HTX HDR OUTLET VALVE	-A	1-FCV -070-0183 SMB-000	-A		713' 74C38-083015	A13	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF/A	VALVE IS REQUIRED TO BE OPERABLE TO ISOLATE NON-QUALIFIED PIPING IN THE EVENT OF A CCS LINE BREAK.
WBN-0-MVOP-070-0206 CDWE BLDG RETURN	-B	0-FCV -070-0206 SMB-000	-B		692' 77K32-822484-1	A01	A/B A A A A	1WK/100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF/A	FOR L: VLV MUST BE OPERABLE TO REALIGN CCS TO POSTACCIDENT CONFIG. OTHERS: VLV REQ'D TO FUNCTION TO PROTECT AGAINST A BREAK IN NON-Q PIPING IN CDWE.

PREPARER/DATE Keith B. Hopkins 12/12/89 R 4 R____ R____

CHECKED/DATE [signature] 12/12/89

PRINT DATE: 07/07/90

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	AZMITH (LOCATION)	ELEV(1) CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-070-0207 -B COND DEMIN WASTE EVAP BLDG SUPPLY	1-FCV -070-0207 -B SMB-000		737' 77K32-822484-1	A01	A/B A A A A	1WK/100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR L:VLV MUST BE OPERABLE TO REALIGN THE CCS TO THE POST ACCIDENT CONFIG. FOR OTHERS: VLV MUST BE OPERABLE TO ISOLATE THE CDWE.
WBN-2-MVOP-070-0207 -B COND DEMIN WASTE EVAP BLDG SUPPLY	2-FCV -070-0207 -B SMB-000		737' 77K32-822484-1	A01	A/B A A A A	1WK/100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	FOR L: VLV MUST BE OPERABLE TO REALIGN THE CCS TO THE POST ACCIDENT CONFIG. FOR OTHERS: VLV MUST BE OPERABLE TO ISOLATE THE CDWE.
WBN-0-MVOP-070-0208 -A COND DEMIN WASTE EVAP BLDG SUPPLY	0-FCV -070-0208 -A SMB-000		737' 77K32-822484-1	A01	A/B A A A A	1WK/100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF/A	FOR L: VLV MUST BE OPERABLE TO REALIGN THE CCS TO POST ACCIDENT CONFIG. FOR OTHERS: VLV MUST BE OPERABLE TO ISOLATE THE CDWE.
WBN-1-MVOP-070-0215 -A SAMPLE HX INLET ISLN VALVE	1-FCV -070-0215 -A				A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	VLV IS REQUIRED TO OPERATE TO ISOLATE NON-Q PIPING IN EVENT OF CSC LINE BREAK
WBN-1-MVOP-072-0002 -B CNTMT SPRAY HDR B ISLN VALVE	1-FCV -072-0002 -B SB-0		737' 71C62-54114-1	A05	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV MUST BE OPEN AND REMAIN OPEN DURING THE MITIGATION OF THE EVENT TO PERMIT FLOW TO THE CONTAINMENT SPRAY HEADERS. SEE NOTE 4. R5

		R 5	R____	R____
PREPARER/DATE	JWH 9/9/86	KBW 7/11/90	____	____
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PRINT DATE: 07/07/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-072-0013 -B CNTMT SPRAY PMP B RECIRC FLOW VLV	1-FCV -072-0013 -B SMB-000		692' 74C38-083015	A08	A	30D	L	VLV MUST REMAIN OPERABLE TO ALLOW MINIMUM RECIRC TO PREVENT PUMP BURNOUT
WBN-1-MVOP-072-0021 -B RWST TO SPRAY HDR B FLOW CONTROL VALVE.	1-FCV -072-0021 -B SB-0		676' 71C62-54114-1	A16	A/B A A A A	1WK/100D 30D 30D 30D 30D	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-019. SEE TAB B FOR REVISION LEVEL.
WBN-1-MVOP-072-0022 -A RWST TO SPRAY HDR A FLOW CONTROL VALVE	1-FCV -072-0022 -A SB-0		676' 71C62-54114-1	A16	A/B A A A A	1WK/100D 30D 30D 30D 30D	L RH/A CV/A AB AF	FOR LENGTHY DISCUSSION OF SAFETY FUNCTION SEE CAT & OP TIMES CALCULATION WBNOSG4-019. SEE TAB B FOR REVISION LEVEL.
WBN-1-MVOP-072-0034 -A CNTMT SPRAY PMP A RECIRC FLOW CONT VLV	1-FCV -072-0034 -A SMB-000		692' 74C38-083015	A08	A	30D	L	VLV MUST REMAIN OPERABLE TO ALLOW MINIMUM RECIRC TO PREVENT PUMP BURNOUT.
WBN-1-MVOP-072-0039 -A CNTMT SPRAY HDR A ISLN VALVE	1-FCV -072-0039 -A SB-0		737' 71C62-54114-1	A05	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV MUST BE OPEN AND REMAIN OPEN DURING THE MITIGATION OF THE EVENT TO PERMIT FLOW TO THE CONTAINMENT SPRAY HEADERS. SEE NOTE 4. R5

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PREPARER/DATE	TWH 9/9/86	KBN 7/11/90		
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PRINT DATE: 07/07/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-072-0040 -A RHR SPRAY HDR A ISLN VALVE	1-FCV -072-0040 -A SB-00		713' 71C62-54114-1	A08	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV INITIALLY CLOSED DURING A LOCA MAY BE MANUALLY OPENED TO ASSIST CS SYSTEM. SEE NOTE 4.
WBN-1-MVOP-072-0041 -B RHR SPRAY HDR B ISLN VALVE	1-FCV -072-0041 -B SB-00		713' 71C62-54114-1	A28	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF AB	VLV INITIALLY CLOSED DURING A LOCA MAY BE MANUALLY OPENED TO ASSIST CS SYSTEM. SEE NOTE 4.
WBN-1-MVOP-072-0044 -A CNTMT SUMP TO HDR A FLOW CONTROL VALVE	1-FCV -072-0044 -A SB-0		685' 71C62-54114-1	A07'	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	VLV CLOSED WHEN CS PMPS TAKING SUCTION FROM RWST. MUST OPEN FOR SUCTION FROM SUMP. MUST NOT FAIL IN MANNER TO DRAIN RWST. SEE NOTE 4.
WBN-1-MVOP-072-0045 -B CNTMT SUMP TO HDR B FLOW CONTROL VALVE	1-FCV -072-0045 -B SB-0		685' 71C62-54114-1	A07'	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AB AF	VLV CLOSED WHEN CS PMPS TAKING SUCTION FROM RWST. MUST OPEN FOR SUCTION FROM SUMP. MUST NOT FAIL IN MANNER TO DRAIN RWST. SEE NOTE 4.
WBN-1-MVOP-074-0012 -A RHR PMP A-A MINI FLOW VALVE	1-FCV -074-0012 -A SMB-000		692' 71C62-54114-1	A08	A	100D	L	MUST OPEN FOR PMP PROTECTION DURING ECCS OPER. WHEN RCS PRESS ABOVE PMP SHUTOFF HEAD A SAFETY REQMT TO CLOSE TO ALLOW THE RHRS TO MEET FLOW.

R5

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CHECKED/DATE	NMB 9/12/86	EBM 7/18/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-MVOP-074-0024 RHR PMP B-B MINI FLOW VALVE	-B	1-FCV -074-0024 SMB-000	-B		676' 71C62-54114-1	A08	A	100D	L	MUST OPEN FOR PMP PROTECTION DURING ECCS OPER. WHEN RCS PRESS ABOVE PMP SHUTOFF HEAD A SAFETY REQMT TO CLOSE TO ALLOW THE RHRS TO MEET FLOW.
WBN-1-MVOP-074-0033 RHR HT EXH A BYPASS	-A	1-FCV -074-0033 SB-00	-A		713' 71C62-54114-1	A12	A	100D	L	VLV N.O. TO ASSURE ALIGN FOR INJ PHASE OF ECCS. MUST REMAIN OPERABLE TO SWITCH FROM COLD TO HOT LEG RECIRC TO PROTECT AGAINST PASSIVE FAILURES.
WBN-1-MVOP-074-0035 RHR HT EXH B BYPASS CROSS TIE VALVE	-B	1-FCV -074-0035 SB-00	-B		713' 71C62-54114-1	A11	A	100D	L	VLV N.O. TO ASSURE ALIGN FOR INJ PHASE OF ECCS. MUST REMAIN OPERABLE TO SWITCH FROM COLD TO HOT LEG RECIRC TO PROTECT AGAINST PASSIVE FAILURES.

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PREPARER/DATE	JWH 9/9/86	RHM 2/8/89	RHM 9/21/89	
CHECKED/DATE	NMB 9/12/86	KBN 2/16/89	KBN 9/21/89	

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS	COMPUTED [illegible] DATE 8/22/86		R ___ R ___
	CHECKED [illegible] DATE 8/22/86		

INTRODUCTION TO TAB B

Use of Test Reports

Report No.	Purpose in Binder
B0003	Main Test Report for Qualification
B0058	Summary Report of Limitorque EQ Testing and EQ Philosophy
B0212	Aging of General Purpose Phenolic Material and Low Level Vibration Testing
B0119	Qualification of Marathon Terminal Blocks
B0080	Thermal Aging of Class B Motors
600198	Used to Show Actuators do not Require Conduit Sealing

TVA 19537 (OE-3-86)

EQP073.84

BINDER NO. WBNEQ-MOV-003 PLANT WBN	UNIT(S) 1	SHEET 1 OF 28	R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 9/9/86	RJM 2/8/89
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 9/12/86	KBN 2/16/89

A. DOCUMENTATION

Equipment Description Motor Operated Valve Actuators

Vendor/Manufacturer Limitorque

Equipment Model No.(s) See Tab A

QUALIFICATION REPORTS

(1) Title/Number/Revision Limitorque Valve Actuators for Outside Containment #B0003 RIMS B70851119105 DATE 6-2-76

(2) Title/Number/Revision Limitorque Valve Actuator Qualification for Nuclear Services #B0058 RIMS NEB820421203 DATE 1-11-80

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(3) Valve ID, Test Report, Contract Cross Reference

(4) MEB 811215 508

(5) MEB 820604 547

(6) MEB 841212 503

(7) B70 850910 004

(8) B70 850925 012

(9) B70 850926 001 R1

(10) B70 851107 022

(11) B70 851213 001 - Limitorque Test Report B0080 Class B Motor Effect of Thermal Aging on Locked Rotor Performance

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 1a OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 9/9/86	RHM 2-15-89
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 9/12/86	KBW 2/16/89

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(12) Limitorque Test Report B0212

(13) Limitorque Test Report B0119

(14) WAD-28 (AD-67)

(15) WAD-27 (AD-74)

(16) WAC-101

(17) WAC-111

(18) WAC-130

(19) WAC-131

(20) WCAP-7410-L

(21) B71 860623 004

(22) B70 851107 021

(23) B71 860806 004

(24) Limitorque Letter dated March 19, 1987 (B70 870325 001)

(25) Limitorque Telex dated July 11, 1988 (B36 890208 001) R1

Copies of the above reports and documents can be found in TABS D and E.

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 1b OF 28	
			R 5	R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 9/9/86	KBN 7/18/90	
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 9/12/86	GEM 7/18/90	

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

Other calculations used are:

(26) WBNNAL3-025 (B45 860328 236)

(27) WBNNAL3-026 (B45 860238 237)

(28) NEB86052 (#4) (B45 860527 265)

(29) WBNTSR-012 (B26 890317 001) R5

(30) WBNNAL3-004 (B45 860205 235)

(31) Category and Operating Times, System 26, WBNOSG4-007 R3 B45 851121 218

(32) Category and Operating Times, System 62, WBNOSG4-013 R13 B26 900706 211

(33) Category and Operating Times, System 63, WBNOSG4-014 R12 B26 900713 212

(34) Category and Operating Times, System 67, WBNOSG4-016 R14 B26 900319 215 R5

(35) Category and Operating Times, System 70, WBNOSG4-018 R13 B26 900110 200

(36) Category and Operating Times, System 72, WBNOSG4-019 R9 B26 900717202

(37) Category and Operating Times, System 74, WBNOSG4-020 R8 B26 9003090232

(38) Environmental Drawing No. 47E235-44 R1

(39) Environmental Drawing No. 47E235-46 R1

(40) Environmental Drawing No. 47E235-48 R3

(41) Environmental Drawing No. 47E235-50 R1

(42) Environmental Drawing No. 47E235-52 R1

(43) Environmental Drawing No. 47E235-56 R1

(44) Environmental Drawing No. 47E235-57 R2

(45) Environmental Drawing No. 47E235-58 R1

(46) Environmental Drawing No. 47E235-59 R2 & DCA P-02351-18-0 R5

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(47) Environmental Drawing No. 47E235-60 R1

(48) Environmental Drawing No. 47E235-61 R1

(49) Environmental Drawing No. 47E235-62 R1

(50) Environmental Drawing No. 47E235-63 R2 & DCA P-02351-19-0

(51) Environmental Drawing No. 47E235-64 R2 & DCA P-02351-20-0,21-0 R5

(52) Environmental Drawing No. 47E235-65 R2 & DCA P-02351-22-0

(53) Environmental Drawing No. 47E235-77 R1

(54) Environmental Drawing No. 47E235-79 R1

(55) Category and Operating Times, Unit 2 for Unit 1,
WBNOSG4-40 R 7 B26 900327 203 R5

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 2 OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 9/12/86	RJHW 2-15-89
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 9/12/86	KBN 2/16/89

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1) Degraded voltage for actuators 1-FCV-62-63, 1-FCV-62-90, 1-FCV-62-91, 1-FCV-62-98, 1-LCV-62-132, 1-LCV-62-133, 1-LCV-62-135, 1-LCV-62-136, 1-FCV-63-26, 1-FCV-72-2 and 1-FCV-72-39 must be justified. See Open Item No. 1.

2) 1-FCV-70-215 has a Rotork valve actuator. See Open Item No. 2.

3) Final response to NRC IE Bulletin 85-03. See Open Item No. 3. R1

4) Replace control cable internal to the actuator. See Open Item No. 4.

5) Replace nylon crimped motor lead connector with Raychem connector. See Open Item No. 5. R1

6) Disconnect limit switch and motor compartment heaters. See Open Item No. 6. R1

7) Motor on valve operator 1-FCV-62-99 must be replaced. See Open Item No. 7. R1

8) Field verification sheets do not adequately identify the terminal blocks installed in the actuators. See Open Item No. 8. R1

OPEN ITEMS AND QUALIFICATION DEFICIENCIES (Continued)

9) Provisions are required to eliminate the possibility of condensate draining into the limit switch compartments of valve actuators. A T-drain is to be added to the low point of the limit switch compartment for those actuataors that are subjected to high humidity. The binder to be revised upon resolution of this open item. See Open Item #9.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974) R3

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

The Limitorque Environmental Qualification program was conducted per IEEE-382 (1972), "IEEE Guide for Type Test of Class 1 Electric Valve Operators for Nuclear Power Generating Stations" and meets the requirements of IEEE-323 (1974) as they apply to valve actuators (#B0058, Section 2.1).

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The Limitorque qualification program was conducted to encompass the entire family of actuators - SMB, SB, SBD, and SMB/HBC in all available unit sizes (SMB-000 to SMB-5). This was accomplished by type testing - see Tab C, Section 1. Tab E, Attachment 1 identifies the actuator plant ID number, the Limitorque shop order number, the actuator serial number, and the documentation which establishes traceability to the applicable test report.

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 5 OF 28				
			R	R			
BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS	COMPUTED [illegible]	DATE 8/22/86					
	CHECKED [illegible]	DATE 8/22/86					

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Motor Operated Valve Actuator	Motor Operated Valve Actuator	B0003, Sect. 3.0
(2) Manufacturer	Limitorque	Limitorque	B0003, Sect. 3.0
(3) Model Number(s)	See Tab A	SMB-0	B0003, Sect. 3.0
(4) Serial Number(s)	See Tab E	195004	B0003, Sect. 3.0
Order Number(s)	See Tab E	600461	B0003, Sect. 3.0

(5) Identify Component-Unique checksheet attached: None

JUSTIFICATION/COMMENTS See Tab C, Section 1.

(4 and 5) Tab E, Attachment 1, information was taken from Field Verification Sheet in Tab F.

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 6 OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86 RWM 2-15-89	
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 8/22/86 KBN 2/16/89	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	NA	NA (See Comment)	NA
Conduit Seals	None	No	B0058 Sect 3.2.3 and 4.1.2 |R1
Connector Seals	None	No	B0058 Sect 3.2.3 & 4.1.2
Orientation	Motor horizontal with limit switch compartment up	No	See TAB G, Sect A1
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Report B0003 makes no mention of any specific installation interface requirements; however, B0058 Sections 3.2.3 and 4.1.2 concludes that sealing of the actuators (i.e conduit seals, seals and gaskets) are of no importance for the qualification of the actuators. See TAB C, Section 3.0. See TAB C, Section 7, concerning orientation of the actuator. See TAB C, Section 8.2, concerning electrical connection of the actuator. For electrical connections, a qualified cable shall be used. |R1

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 7 OF 28

R ____ R ____

BINDER TITLE LIMITORQUE COMPUTED JWA DATE 9/9/86

ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS CHECKED B DATE 9/12/86

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	See Comments
(b) Baseline performance measurements taken	Yes	B0003, Fig. 2A and 2B
(c) Equipment aged:		
Thermal	Yes	B0003, Sect. 4.1
Radiation	Yes	B0003, Sect. 4.3
Wear	Yes	B0003, Sect. 4.2
(d) Vibration/seismic testing conducted	Yes-Seismic	B0003, Sect. 4.4
(e) Design basis event (DBE) exposure	Yes	B0003, Sect. 4.5.1
(f) Post-DBE exposure	Yes	B0003. Sect. 4.5.1
(g) Final inspection and disassembly	Yes	B0003, Sect. 4.5.3

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference B0003, Appendix I).

JUSTIFICATION/COMMENTS (a) There is no evidence in the report that the equipment was inspected prior to start of the test. However, pre-inspection is not a requirement of IEEE 323 (1974). (b) Baseline performance measurements were taken at time 0. They are within nominal and are acceptable. (d) Low level vibration is addressed in Tab C, Section 2.0

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 8	OF 28		R	R
BINDER TITLE LIMITORQUE		COMPUTED [illegible]	DATE 8/22/86				
ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS		CHECKED [illegible]	DATE 8/22/86				

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference B0058, Sect. 3.0).

JUSTIFICATION/COMMENTS None

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	B0003, Sect. 4.1.4 B0058, Sect. 3.2
Radiation exposure	Yes	B0058, Sect. 3.4 B0003, Sect. 4.3
Vibration (non-seismic) aging	Yes	B0058, Sect. 2.1
Operational (electrical/mechanical/process) stress aging	Yes	B0058, Sect. 3.3 B0003, Sect. 4.2

JUSTIFICATION/COMMENTS None

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference B0003, Sect.4.1).
B0058, Sect.3.2

JUSTIFICATION/COMMENTS See Tab C, Section 8.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS See Tab C, Section 8.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS See Tab C, Section 8.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference B0003, Sect.4.1
B0058, Sect.3.2.1.1).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	110°F	See Comments	See Comments
Time	40 years	See Comments	See Comments

JUSTIFICATION/COMMENTS See Tab C, Section 8. All materials which are potentially susceptible to aging have qualified or expected life of greater than 40 years.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference B0058, Sect. 3.2).

JUSTIFICATION/COMMENTS See Tab C, Section 8.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA
(Reference NA).

JUSTIFICATION/COMMENTS See Tab C, Section 8.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference B0058, Sect. 3.2.1.3).

JUSTIFICATION/COMMENTS See Tab C, Section 8. Regression analysis provided for Class "B" insulated motor.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference B0003, Sect. 4.1).

JUSTIFICATION/COMMENTS None

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference B0003, Sect.2.3 App. II, and B0058, Sect.3.4).

JUSTIFICATION/COMMENTS None

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? NA (Reference B0058, Sect. 3.4).

JUSTIFICATION/COMMENTS Limitorque concluded after several tests that "there was no noticeable detrimental effect of radiation on any component in any of the test sequence or radiation level employed".

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference B0058, Sect. 3.4).

JUSTIFICATION/COMMENTS None

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: B0003, Sect. 2.3, 4.3 and App. II).

Plant normal ambient radiation dose (rd) — 1.8×10^{7}

Test exposure dose (rd) — 2.04×10^{8} - Motor only; 2×10^{7} - Other - See Comments

Test exposure dose rate (rd/hr) — 1.0×10^{6}

Test exposure source type (e.g., Co-60 gamma) — Co-60 gamma

JUSTIFICATION/COMMENTS See TAB C, Section 9.0

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program* Yes (Reference: B0058, Sect 2.1).

JUSTIFICATION/COMMENTS Non-seismic (low level) vibration was considered but determined to be of no consequence based on experience. See TAB C, Section 2.0

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference: B0058, Section 2.1).

JUSTIFICATION/COMMENTS See TAB C, Section 2.0 for justification of omission of non-seismic vibration aging

* Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

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			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86	RWM 2/8/89
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 8/22/86	KBN 2/10/89

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: B0003,Sect 4.1.5 and 4.2). R1

JUSTIFICATION/COMMENTS The actuator was cycled (mech aging) 1993 times.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: B0003, Sect. 4.2, B0058, Sect. 3.3).

JUSTIFICATION/COMMENTS The actuator was required to provide its full output rating at the torqued seated position during cycling.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: B0058, Sect. 3.2 and 7.0).

Qualified life (Document in QMDS) greater than 40 years

JUSTIFICATION/COMMENTS None

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference: B0058, Section 7.0).

JUSTIFICATION/COMMENTS None

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 13 OF 28
			R 3 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 9/9/86	RHM 9/21/89
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 9/12/86	KBN 9/21/89

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis).

Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a) Durez (Red)	$2x10^{7}$	B0003(4.3)	1.02	TAB E, item 18 See Comments
(b) G.P. Phenolic (Black)	$2.09x10^{8}$	B0212(6.7)	1.63	See Comments
(c) Motor Insulation-CL-"B"	$2.04x10^{8}$	B0003(2.3) and App.II	0.93	See Comments
(d) Wiring Insulation	$2.0x10^{8}$	WBNEQ-CABL -044	NA	See Tab C, Sect. 4.0
(e)				

JUSTIFICATION/COMMENTS Radiation threshold does not apply. Limitorque has performed radiation exposure per the referenced Limitorque test reports. The values listed in the threshold column represent the testing parameters. (a) See Tab C, Section 9.0

Activation energies are documented in Tab E as follows:

a. Durez - Limitorque telex September 25, 1985 (B70850926001)

b. G. P. Phenolic - Limitorque letter September 15, 1985(B70850910004)

c. Motor insulation - Limitorque letter September 25, 1985 (B70850926001). Motors may be upgraded to inside containment type (Class RH insulation). Qualification of these motors is addressed in Binder MOV-001. R3

See Tab C, Section 8.0 for material analysis. Limitorque's telex dated November 6, 1985 (B70 851107 021), shows the correlation between the material color, material name, and the test report.

PLUSEQ/80.46

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference B0058, Sect. 4.1.8).

Identify Acceptance Criteria: The actuator must be capable of opening or closing a valve on demand. TVA Quality Assurance procedures and pre-operational test results provide assurance that the actuator will perform its intended function.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference B0003, Sect.4.0, Fig.1, 2A, and 2B)

Identify baseline and functional testing: See Tab C, Section 11.

JUSTIFICATION/COMMENTS None

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS B0003 does not describe mechanical loads during DBE testing. Electrical characteristics and stroke time during DBE cycling are shown in Figure 2B of B0003.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: B0003, Sect. 4.1, 4.2 and 4.5 & Fig. 2A and 2B).

JUSTIFICATION/COMMENTS None

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	490 VAC	*600456 Table III
Load	Approx 20,000 lbs thrust	*600456 Table III
Frequency	See Comment	See Comment
Accuracy	NA	NA
Other(s)		
NA		
NA		

JUSTIFICATION/COMMENTS Although not specifically stated, we have no reason to believe that Limitorque used anything other than a 60 Hz power source. R1

* Report 600456 is Appendix C of Report B0058 and a copy can be found in WBNEQ-MOV-001, TAB D.

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			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86	RJM 2/8/89
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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	See Comment	See Comment
Load	See Comment	NA
Frequency	60 Hz ± 3.2%	WBN FSAR p 8.3-17
Accuracy	NA	NA
Other(s)		

R1

JUSTIFICATION/COMMENTS Justification for lack of reduced voltage starting tests under accident conditions is presented in TAB C, Sect. 5.0. Actuators are sized to produce the required torque for each valve under specified applications and conditions.

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	490 - 500 VAC	B0003, Fig. 2B
Load	Thrust 20,000 lbs	B0003, Sect. 4.1
Frequency	See Comment	B0003, App. III, page 3A
Accuracy	NA	NA
Other(s)		

R1

JUSTIFICATION/COMMENTS Although the test report does not address demonstrated frequency, we have no reason to believe that the operator was tested at other than 60Hz. Also, per Limitorque letter dated 6/18/86 (B71 860623 004, TAB E, item 19) the actuator motor is purchased to NEMA standards that require the motor to operate at plus or minus 5 percent of nominal frequency.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Worst case listed below - See pp 16A through 16M for all operating environments

(1) Normal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 1.8×10^7

(2) Abnormal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: Valve body and stem connection configuration isolates the degradable actuator parts from significant additional heating due to the high temperature of process fluids.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal temperatures could occur as a result of outside temp. excursions, temporarily greater than design heat loads, or degraded environment control systems. This could exist for up to eight hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

* (a)	Temperature (°F)	162.00	Accident type LOCA (See TAB A)
(b)	Pressure (psig)	0	Accident type HELB (See TAB A)
(c)	Humidity (%)	100	Accident type HELB (See TAB A)
** (d)	Radiation (rd)	1.2×10^7	Accident type LOCA (See TAB A) R1
(e)	Spray Type	NA	Accident type NA

*This is the most severe temperature because the duration of the temperature does not drop off as rapidly as the peak temperatures listed on sheet 16G, 16H, 16I (209°F) and sheet 16K (190°F).

**This dose includes a beta contribution of 6×10^5 rads. See environmental drawing 47E235-44, Note 37. R1

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-44 (Annulus) | R1

(1) Normal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 1×10^6

(2) Abnormal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	133.7	Accident type LOCA
(b) Pressure (psig)	0	Accident type HELB
(c) Humidity (%)	61	Accident type HELB
(d) Radiation (rd)	1.2×10^7	Accident type LOCA
(e) Spray Type	NA	Accident type NA

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 16b OF 28 R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86 RJM 2/8/89	
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 8/22/86 KBN 2/16/89	

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-46 (737 A1) |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 2.1×10^5

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a)	Temperature (°F) 128	Accident type	HELB
(b)	Pressure (psig) 0	Accident type	LOCA
(c)	Humidity (%) 100	Accident type	HELB
(d)	Radiation (rd) $<1 \times 10^4$	Accident type	LOCA
(e)	Spray Type NA	Accident type	NA

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 16c OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86 RJM 2/8/89	
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 8/22/86 KBN 2/16/89	

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-48 (737 A5, A9) |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 8.8×10^5

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a)	Temperature (°F) 110	Accident type	LOCA
(b)	Pressure (psig) 0	Accident type	LOCA
(c)	Humidity (%) NA	Accident type	LOCA
** (d)	Radiation (rd) 1.8×10^6	Accident type	LOCA
(e)	Spray Type NA	Accident type	NA

** See QIRNEB86092 (B46860721252) for accident radiation dose.

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 16d OF 28

R 1 R

BINDER TITLE LIMITORQUE ACTUATORS COMPUTED JWH DATE 8/22/86 RHM 2/8/89

OUTSIDE CONTAINMENT WITH CLASS B CHECKED NMB DATE 8/22/86 KBN 2/16/89

MOTORS

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-50 (713 A11, A12, A15, A16) |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 4.3×10^{5}

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 110 Accident type LOCA

(b) Pressure (psig) 0 Accident type LOCA

(c) Humidity (%) NA Accident type LOCA

(d) Radiation (rd) 1.0×10^{7} Accident type LOCA

(e) Spray Type NA Accident type NA

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 16e OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS	COMPUTED JWH	DATE 8/22/86	RJM 2/8/89
	CHECKED NMB	DATE 8/22/86	KBN 2/16/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-52 (713 A1, A13, A14) | R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 1.8×10^{7}

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	128	Accident type	HELB
(b) Pressure (psig)	0	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	$<1.0 \times 10^{4}$	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 16f OF 28

R 1 R

BINDER TITLE LIMITORQUE ACTUATORS COMPUTED JWH DATE 8/22/86 RHM 2/8/89

OUTSIDE CONTAINMENT WITH CLASS B CHECKED NMB DATE 8/22/86 KBM 2/16/89

MOTORS

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-56 (713 A6, A19) |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 2.2×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 110 Accident type LOCA

(b) Pressure (psig) 0 Accident type LOCA

(c) Humidity (%) NA Accident type LOCA

(d) Radiation (rd) 2.0×10^6 Accident type LOCA

(e) Spray Type NA Accident type NA

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 16g OF 28
			R 1 R 5
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86	RHM KBN
			2/89 7/18/90
OUTSIDE CONTAINMENT WITH CLASS B	CHECKED NMB	DATE 8/22/86	KBN EEM
MOTORS			2/16/89 7/18/90

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-58 (676, A16, A17)

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 7.5×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a)	Temperature (°F)	210	Accident type	HELB | R5
(b)	Pressure (psig)	0	Accident type	HELB
(c)	Humidity (%)	100	Accident type	HELB
(d)	Radiation (rd)	5.0×10^6	Accident type	LOCA
(e)	Spray Type	NA	Accident type	NA

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BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 16h OF 28

R 1 R

BINDER TITLE LIMITORQUE ACTUATORS COMPUTED JWH DATE 8/22/86 RHM 2/8/89

OUTSIDE CONTAINMENT WITH CLASS B MOTORS CHECKED NMB DATE 8/22/86 KBN 2/16/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-60, -59 (692 A8, A24) |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 7.5×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	209	Accident type	HELB
(b) Pressure (psig)	0	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	5.0×10^6	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 16i OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86 RJM 2/8/89	
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 8/22/86 KBN 2/16/89	

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-61, 59 (713,A28,A29) | R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 7.5×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	209	Accident type HELB
(b) Pressure (psig)	0	Accident type HELB
(c) Humidity (%)	100	Accident type HELB
(d) Radiation (rd)	5.0×10^6	Accident type LOCA
(e) Spray Type	NA	Accident type NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-62, -63, -64, -65 (692 A1)

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 5.6×10^5

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	144	Accident type	HELB | R5
(b) Pressure (psig)	0	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	$<1.0 \times 10^4$	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-77 (RSVR) (685 A7',A25') | R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 1.8×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 190 Accident type LOCA

(b) Pressure (psig) 0 Accident type LOCA

(c) Humidity (%) 90 Accident type LOCA

(d) Radiation (rd) 1.0×10^7 Accident type LOCA

(e) Spray Type NA Accident type NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-79 (692 A9, A10, A11, A12,A13,A19,A20,A21,A22,A23) |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) 0

(c) Humidity (%) 80

(d) Radiation (rd) 3.5×10^{4}

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 110 Accident type LOCA

(b) Pressure (psig) 0 Accident type LOCA

(c) Humidity (%) NA Accident type LOCA

(d) Radiation (rd) 1.0×10^{7} Accident type LOCA

(e) Spray Type NA Accident type NA

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 16m OF 28
			R 1 R
BINDER TITLE LIMITORQUE ACTUATORS	COMPUTED JWH	DATE 8/22/86	RJHM 2/8/89
OUTSIDE CONTAINMENT WITH CLASS B MOTORS	CHECKED NMB	DATE 8/22/86	KBN 2/16/89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-56, -57 (713 A7') |R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) 5.8×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See page 16.

(4) State anticipated occurrence frequency and duration of abnormal conditions: See page 16.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	190	Accident type	HELB
(b) Pressure (psig)	0	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	5.0×10^6	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): None

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: TAB C, Section 7.0 and Open Item #9). R1

(7) Subject to submergence (Yes/No/NA)? No (Reference: TAB C, Section 12.0).

Identify initiation time and duration of submergence: NA

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes
(Reference: Environmental drawing 47E235-44, Note 37).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: NA R1

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
Radiation OIR NEB 86092	B46 860721 252

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 18 OF 28

R ____ R ____

BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS COMPUTED [handwritten initials] DATE 8/22/86

CHECKED [handwritten initials] DATE 8/22/86

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	16 days	B0003, Sect. 4.5 & Fig. 1
Temperature (°F)	209	250	B0003, Fig.1
Pressure (psig)	0	25	B0003, Fig.1
Relative Humidity (%)	100	100	B0003, Sect. 2.5.2 & Fig. 1
*Chemical Spray	NA	NA	NA
**Radiation (rd)	1.8×10^7	2×10^7 - Other 2.04×10^8 - Motor Only	B0003, Sect. 2.3 & App. II See Comments
Submergence	NA	NA	NA

*Includes spray concentration, flowrate, density, duration, and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

JUSTIFICATION/COMMENTS Please note that the radiation levels in K(1) and K(5) on page 16 are not additive and the worst case is based on sheet 16E. See Tab C, Section 9.0 for discussion of radiation testing for switches. See Tab C, Section 6.0 for post-accident operability time justification.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	B0003, Fig.1
Pressure	Yes	B0003, Fig.1
Relative Humidity	Yes	B0003 Sect. 4.1.4
Chemical Spray	NA	NA
Submergence	NA	NA

JUSTIFICATION/COMMENTS ____

TVA 19537 (OE-3-86) EQP073.84

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS - (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA	
Temperature: +15 degrees F	15°F	Yes-B0003 Fig. 1	
Pressure: +10% but no more than 10 psig	10%	Yes-B0003 Fig. 1	
Radiation: +10% of accident dose	10%	Yes-B0003 Sect 4.3	
Time: +10% (or 1 hour + operating time per NUREG-0588)	-	No - See Comment	
Voltage: ±10% of rated value	+8.7%	No - See Comments TAB C Sect 5	R1
Frequency: ±5% of rated value		See Comments	R1
Environmental Transient: the initial transient and the peak temperature applied twice	2 Dwells	Yes-B0003 Fig. 1	
Vibration: +10% added to acceleration	NA	NA-TAB C Sect 2	

JUSTIFICATION/COMMENTS See above references for all items except time margin. See TAB C, Section 6.0. See comments on frequency in TAB B, Section J(5). Although the test margin is only 8.7% Limitorque letter dated 6-19-86 (B71 860623 004, TAB E, Item 20) states that Limitorque purchase actuator motors to Nema standards requiring the motors to be capable of operating at plus or minus 10% voltage or plus or minus 5% of nominal frequency.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference: B0058, Section 2.4
).

JUSTIFICATION/COMMENTS The actuator must be capable of providing the required torque and/or thrust to open or close the valve as required.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (Yes/No/NA)? Yes
(Reference: B0003, Section 5.0
).

JUSTIFICATION/COMMENTS None

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (Yes/No/NA)? Yes (Reference: B0003, Section 5.0
).

JUSTIFICATION/COMMENTS None

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (Yes/No/NA)? No (Reference:
B0003, Figure 1, 2A and 2B).

JUSTIFICATION/COMMENTS See TAB C, Section 6.0 for justification of post-accident actuator operability.

R1

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 20a OF 28

R 1 R

BINDER TITLE LIMITORQUE ACTUATORS COMPUTED JWH DATE 8/22/86 RWM 2-15-89

OUTSIDE CONTAINMENT WITH CLASS B CHECKED NMB DATE 8/25/86 KBW 2/16/89

MOTORS

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (Yes/No/NA)? Yes
(Reference: B0003, Section 4.5.2).

JUSTIFICATION/COMMENTS Minor problems were experienced during the LOCA test. These problems had no effect on overall actuator performance. See the referenced section of report B0003.

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 21 OF 28

R ____ R ____

BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS

COMPUTED JWB DATE 8/22/86

CHECKED B DATE 8/23/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See Tab G.

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 22 OF 28
BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS	COMPUTED [illegible]	DATE 8/22/86	R ___ R ___
	CHECKED [illegible]	DATE 8/22/86	

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	Yes
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-MOV-003	PLANT WBN	UNIT(S) 1	SHEET 24 OF 28				
			R	R			
BINDER TITLE LIMITORQUE ACTUATORS OUTSIDE CONTAINMENT WITH CLASS B MOTORS	COMPUTED [illegible]	DATE 8/22/86					
	CHECKED [illegible]	DATE 8/25/86					

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

BINDER NO. WBNEQ-MOV-003 PLANT WBN UNIT(S) 1 SHEET 25 OF 28

R_____ R_____

BINDER TITLE LIMITORQUE ACTUATORS COMPUTED /RI Rdm DATE 2/8/89

OUTSIDE CONTAINMENT WITH CLASS B CHECKED /RI KBN DATE 2/16/89

MOTORS

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Pages B-42 thru B-45 were deleted per revision 1 .

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

R____ R____

BINDER TITLE CONAX ELECTRICAL COMPUTED /R1 JJW DATE 1-24-89

PENETRATION, LV POWER & CONTROL CHECKED /R1 WCJ DATE 1-25-89

PENT-002

TAB A

Equipment Identification Matrix

Notes:

1. Elevation shown are actual elevations for equipment located in the Reactor Building. Actual elevations are documented in TAB F and on drawing 45W860-3 in TAB E.

2. Category and Operating Times for penetrations, which are passive devices, are not assigned directly but are dictated by the category and operating times of devices served.

PRINT DATE: 06/25/90

BINDER NO. : WBNEQ-PENT-002
MANUFACTURER : CONAX CORPORATION

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0006 -A PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0006 -A 7429-10001-02	015	737' 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0007 -B PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0007 -B 7429-10001-02	167	737' 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0008 -A PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0008 -A 7429-10001-02	199	727' 8" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY CAT (B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0009 -B PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0009 -B 7429-10001-02	333	738' 1" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0014 -A PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0014 -A 7429-10002-04	097	737' 6" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)

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PREPARER/DATE	DDD 7-26-86	[illegible] 7/23/90		
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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0015	-A	1-PENT-293-0015	-A	101	737' 6"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-03			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0016	-B	1-PENT-293-0016	-B	112	737' 6"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-03			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0017	-B	1-PENT-293-0017	-B	120	737' 7"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-04			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTERGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0021	-A	1-PENT-293-0021	-A	238	718' 9"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-02			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	

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CHECKED/DATE	WBK 7-27-86	[illegible] 8-30-90		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0027	-A	1-PENT-293-0027	-A	019	727'11"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-05			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0036	-B	1-PENT-293-0036	-B	150	737' 7"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-05			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0044	-A	1-PENT-293-0044	-A	209	733' 6"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10002-05			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0052	-B	1-PENT-293-0052	-B	345	738'10"	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY
PRIMARY CONTAINMENT ELEC PENETRATION		7429-10001-05			76K61-087064		A/B	100/100D	MS/C	(CAT B) AND
							A/B	100/100D	FW/C	ELECTRICAL INTEGRITY (CAT A)
							A/B	1MO/1MO	RH/C	
							A/B	1MO/1MO	CV/C	

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		R3	R	R
PREPARER/DATE	DDD 7-26-86	7/23/90		
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A. DOCUMENTATION

Equipment Description: Electrical Penetration, Low Voltage Power and Control

Vendor/Manufacturer: Conax Corporation

Equipment Model No.(s): 7429-10001 and 7429-10002

QUALIFICATION REPORTS

(1) Title/Number/Revision "Design Qualification Report for Electrical Penetration Assemblies for Watts Bar Nuclear Plant Units 1 & 2"/IPS-752/Rev. A. RIMS EEB 820115 315 DATE December 09, 1981

(2) Title/Number/Revision "Design Qualification Mtl Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies"/IPS-325/Rev. D. RIMS EEB 811110 300 DATE May 14, 1981

(3) Title/Number/Revision "Design Qualification Test Report of a Low Volt Pwr & Control Service Classification (BF-LVP/C) Electrical Penetration Assembly"/IPS-585.3/Rev. A. RIMS EEB 811110 304 DATE February 11, 1981

|R3

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(5) IPS-325, Rev. E, Design Qualification Material Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies

(6) IPS-214, Rev. C, Instruction and Maintenance Manual for Electric Penetration Assemblies for Watts Bar Nuclear Plant, Units 1 and 2

(7) IPS-213, Rev. 0, Packaging, Shipping, and Storage Procedures for Electric Penetration Assemblies for Watts Bar Nuclear Plant, Units 1 and 2 |R3

(8) IPS-250, Packaging, Shipping, and Storage Procedures for Spare Parts for Electrical Penetration Assemblies for Watts Bar Nuclear Plant, Units 1 and 2

A. DOCUMENTATION (Continued)

(8) IPS-250, Packaging, Shipping, and Storage Procedures for Spare Parts for Electrical Penetration Assemblies for Watts Bar Nuclear Plant, Units 1 and 2

(9) Conax Drawing PL7429-10001-01, Rev. C, Sheets 1, 2, & 3 of 3, Parts List

(10) Conax Drawing PL7429-10001-02, Rev. C, Sheets 1, 2, & 3 of 3, Parts List

(11) Conax Drawing PL7429-10001-03, Rev. C, Sheets 1, 2, & 3 of 3, Parts List

(12) Conax Drawing PL7429-10001-04, Rev. C, Sheets 1, 2, & 3 of 3, Parts List

(13) Conax Drawing PL7429-10001-05, Rev. C, Sheets 1, 2, & 3 of 3, Parts List

(14) Conax Drawing PL7429-10001-06, Rev. C, Sheets 1, 2, & 3 of 3, Parts List

(15) Conax Drawing PL7429-10002-01, Rev. D, Sheets 1, 2, & 3 of 3, Parts List

(16) Conax Drawing PL7429-10002-02, Rev. D, Sheets 1, 2, & 3 of 3, Parts List

(17) Conax Drawing PL7429-10002-03, Rev. D, Sheets 1, 2, & 3 of 3, Parts List

(18) Conax Drawing PL7429-10002-04, Rev. D, Sheets 1, 2, & 3 of 3, Parts List

(19) Conax Drawing PL7429-10002-05, Rev. D, Sheets 1, 2, & 3 of 3, Parts List

(20) Conax Drawing PL7429-10002-06, Rev. D, Sheets 1, 2, & 3 of 3, Parts List

(21) Conax Drawing 7429-10001, Rev. E, Sheets 1 & 2 of 2, - LVP Electric Penetrations for Watts Bar Units 1 & 2 (Rev. E in binder for information only. Refer to DCRM for latest revision) R2

A. DOCUMENTATION (Continued)

(23) Conax Drawing 7429-24001, Sheet 1, Rev. 0 - Enclosure Sub-Assy

(24) Conax Drawing 7429-24002, Sheet 1, Rev. A - Enclosure Sub-Assy

(25) WBN Drawing 45N860-3, R7 - Conduit and Grounding, Floor El 702.78, Details - Sheet 1

(26) WBN Drawing 45W860-10, R8 - Conduit and Grounding, Electrical Penetration Details

(27) Watts Bar Environmental Drawings 47E235-41 R1, -42 R2, -44 R1, and -45 R1. Drawings -41R1, -42R2 and -45R1 have been modified by DCN P-04104-C (B26 0908 819) and S-09715-A. R3

(28) Reference deleted R3

(29) Calculation deleted.

(30) Reference deleted

(31) Reference deleted

(32) WBNEQ-GEN-001 - Environmental Qualification Generic Binder

(33) WBNEQ-SPLC-001 - Environmental Qualification Binder for Raychem Heat Shrink Splices

(34) WB-DC-30-5, R3 (B26 880713 055)

(35) GENAPS3-023 (B04 900320 300)

(36) WBNEEB-MS-TI06-0002, R6 (B26 900629 422) R3

(37) WBNEEB-MS-TI08-0015, R3, (B26 900615 412)

(38) WBNEEB-MS-TI08-0028, R7, (B26 900615 408)

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-PENT-002	PLANT WBN	UNIT(S) 1	SHEET ___ OF ___
BINDER TITLE CONAX ELECTRICAL	COMPUTED /R1 JFW	DATE 1-23-89	R ___ R ___
PENETRATION, LV POWER & CONTROL	CHECKED /R1 WCP	DATE 1-25-89	

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Page B-4 was deleted per revision 1 .

IPS-752 is the document submitted by Conax Corporation as the key qualification report for the Watts Bar Penetrations. It is a very comprehensive summary report and documents qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies of a universal design previously qualified by type tests conducted in accordance with IEEE 317-1976 at levels equal to or more severe than TVA specified requirements for Watts Bar. Most references in this binder are to IPS-752. |R3

IPS-325 documents qualification of Conax Electric Penetration Assemblies from the standpoint of material tests, as a minimum satisfying requirements of Section 6.3 of IEEE 317-1976. Appendix A of IPS-325 includes Conax's thermal evaluation program. IPS-325 is referenced in this binder for identification of materials susceptible to aging degradation and to support Arrhenius Aging Calculations. IPS-325 documents an ongoing test program. Revision D of IPS-325 is referenced in IPS-752 and is included in Binder TAB D, Section D-2. A later revision of IPS-325, Rev. E is included in Binder TAB E, Section E-4, and is referenced in several places in this binder. Contrary to the note on page B3 IPS-325 revision levels are repeated throughout TAB B. |R3

IPS-585.3 documents tests on the low voltage power and control penetration assembly referred to as test data base one in IPS-752. It is a more detailed test report than IPS-752 that includes raw data and therefore it is referenced in a few places in this binder.

R3

BINDER NO. WBNEQ-PENT-002	PLANT WBN	UNIT(S) 1	SHEET 2 OF 29
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BINDER TITLE CONAX ELECTRICAL	COMPUTED DDD	DATE 9/16/86 JFW 12/20/88	8/16/90
PENETRATION, LV POWER & CONTROL	CHECKED OM	DATE 9/23/86 WCG 1/25/89	9-30-91

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satifies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

Open Item Number	Punchlist Item Number
1	PENT-002-001

R3

COMMENTS/RECOMMENDATIONS These modular-type electrical penetrations are used to convey both safety-related and non-safety related low voltage power and control circuits (480V nominal or less) into primary containment. These penetrations are qualified to maintain pressure integrity and electrical integrity within prescribed limits before, during, and after a LOCA, steam line, CVCS, RHR, or FW break occuring any time within the 40-year plant design life, contingent on satisfactory resolution of open items and qualification deficiencies noted above.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET ___ OF ___

R ___ R ___

BINDER TITLE CONAX ELECTRICAL COMPUTED /R1 JLW DATE 1-23-89

PENETRATION, LV POWER & CONTROL CHECKED /R1 WEP DATE 1-25-89

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Page B-7 was deleted per revision 1 .

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract Date: 11/14/75. Although procured, delivered, and installed prior to 2/22/83, these electrical penetrations meet NUREG-0588, Category I requirements.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 317-1976 - Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations.

ASME Boiler and Pressure Vessel Code Section III, Subsection NE, for Class MC Components, 1974 Edition & Addenda Through Winter 1974.

IEEE 344-1975 - Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.

U. S. Nuclear Regulatory Commission Regulatory Guide 1.63, Revision 2, July 1978 - Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 4 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED CCD DATE 8/19/86 R ___ R ___

CHECKED WMK DATE 8/20/86

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Conax Qualification Report IPS-752, Section 1.2. See binder TAB D, Section D-1 for copy of IPS-752. IPS-752, Section 4.3 states "The design and construction of the subject penetrations of Para. 3.1 contains the identical leakage paths, leak mechanisms, feedthrough concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar design which would affect qualification."

BINDER NO. WBNEQ-PENT-002	PLANT WBN	UNIT(S) 1	SHEET 5 OF 29				
			R	R			
BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL	COMPUTED ODB	DATE 7/26/86					
	CHECKED WK	DATE 7/21/86					

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Elec. Pen. LVP & C	Same	IPS-752, Sect. 4.1
(2)	Manufacturer	Conax Corporation	Same	IPS-752, Sect. 4.1
(3)	Model Number(s)	See TAB A	7508-10003	IPS-585.3, Sect. 4.2
(4)	Serial Number(s)	See TAB F	NA	IPS-585.3 Appx. A

(5) Identify Component-Unique checksheet attached: See TAB B, Supplement 3.

JUSTIFICATION/COMMENTS Conax Summary Qualification Report IPS-752 documented qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies previously qualified by type tests conducted at levels equal to or more severe than TVA specified requirements for Watts Bar. Test data base one is the applicable test specimen for low voltage power and

JUSTIFICATION/COMMENTS (Continued)

control classification penetrations. See IPS-752, Table 4.1, for a detailed description of the tested penetration (test data base one). IPS-585.3 is the type test report for test data base one described in IPS-752. IPS-585.3 is much more detailed and therefore it is referenced at some points in this binder. Some Watts Bar penetrations include spliced-on outboard pigtail extension for size 8 AWG and larger which are not part of test base one. However, the annulus does not experience any steam accident environment. The splice insulations are Raychem WCSF-N as shown in instruction manual IPS-214 (binder TAB H, Section H-1) and are qualified in accordance with binder WBNEQ-SPLC-001. See Sheets 5B and 5C for correlation of plant devices EQIS No.'s, Model No.'s, Serial No.'s, and Types.

All WBN Primary Containment Penetrations are tabulated on TVA Drawing 45N860-3 in binder TAB E, Section E-2. Penetrations covered in this binder are low voltage power and control types and are listed on 46N860-3 as being for node voltage levels 3A, 3B, 4A, and 4B. R3

Penetrations for node voltage levels 2A, 2B, 2D, 2E, 2F, and 2G are covered in binder WBNEQ-PENT-003. R3

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5B OF 29
R 3 R

BINDER TITLE CONAX ELECTRICAL COMPUTED DDD DATE 7/26/86

PENETRATION, LV POWER & CONTROL CHECKED WBK DATE 7/27/86

EQIS NO.		MODEL NO.	SERIAL NO.	TYPE
				R3
WBN-1-PENT-293-0006	-A	7429-10001-03	374	L.V. Power
WBN-1-PENT-293-0007	-B	7429-10001-03	375	L.V. Power
WBN-1-PENT-293-0008	-A	7429-10001-03	376	L.V. Power
WBN-1-PENT-293-0009	-B	7429-10001-03	383	L.V. Power
				R3
WBN-1-PENT-293-0014	-A	7429-10002-04	363	L.V. Power
WBN-1-PENT-293-0015	-A	7429-10002-03	370	L.V. Power
WBN-1-PENT-293-0016	-B	7429-10002-03	371	L.V. Power
WBN-1-PENT-293-0017	-A	7429-10002-04	364	L.V. Power
WBN-1-PENT-293-0021	-A	7429-10002-02	365	L.V. Power

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5C OF 29
R 3 R

BINDER TITLE CONAX ELECTRICAL COMPUTED DDD DATE 7/26/86 10/25/90

PENETRATION, LV POWER & CONTROL CHECKED WBK DATE 7/27/86 9-30-90

EQIS NO.		MODEL NO.	SERIAL NO.	TYPE	
					R3
WBN-1-PENT-293-0027	-A	7429-10002-05	358	L.V. Control	
					R3
WBN-1-PENT-293-0036	-B	7429-10002-05	359	L.V. Control	
					R3
WBN-1-PENT-293-0044	-A	7429-10002-05	360	L.V. Control	
					R3
WBN-1-PENT-293-0052	-B	7429-10001-05	379	L.V. Control	

BINDER NO. WBNEQ-PENT-002	PLANT WBN	UNIT(S) 1	SHEET 6 OF 29		R	R	
BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL		COMPUTED DOD	DATE 7/26/86				
		CHECKED WMK	DATE 7/27/86				

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	NA-See Note 1 below	NA	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA-See Note 2 below	Yes	IPS-752, Table 4.1
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Note 1: In-line splice insulations for connection of field cable to penetration conductor pigtails were provided by TVA and are not part of the penetration assembly qualification. See binder WBNEQ-SPLC-001 for splice qualification.

Note 2: Header plate, feedthrough tube material, feedthrough seal, conductor sealants, conductor insulation, copper conductors, installation weld. There are no required external process requirements, no conduit seals (penetrations are seals), and orientation is not a consideration for penetrations.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (Yes/No/NA)? (Note below.)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	NA
(b) Baseline performance measurements taken	Yes	Sect. 5.0
(c) Equipment aged:		
Thermal	Yes	Sect. 5.7.4
Radiation	Yes	Sect. 5.7.5
Wear	No	NA
(d) Vibration/seismic testing conducted	Yes	Sect. 5.12
(e) Design basis event (DBE) exposure	Yes	Sect. 5.14.1
(f) Post-DBE exposure	Yes	Sect. 5.14.1
(g) Final inspection and disassembly	No	NA

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (Yes/No/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately document (Yes/No/NA)? Yes
(Reference: IPS-585.3, p. 32).

JUSTIFICATION/COMMENTS

G(1)(a) - Although Conax does not state that an initial visual inspection was done, they have completed numerous successful test programs and there is no reason to believe a visual inspection was not done. However, an initial visual inspection is not required by IEEE 317-1976.

G(1)(c) - Electrical penetrations are passive devices and are not subject to wear as an aging mechanism. Wear aging is not required by IEEE 317-1976. The penetrations, however, were subjected to simulated operational stresses which included thermal cycling (IPS-752, Section 5.7.3) and short-term overload and fault current tests (IPS-752, Sections 5.10.1 and 5.11.1) as recommended by IEEE 317-1976. R1

JUSTIFICATION/COMMENTS G(1)(g)-Conax does not state that a final inspection and disassembly was done, but extensive final evaluation testing was performed (IPS-752, Section 5.14.2) in accordance with IEEE 317-1976, fully proving the post-accident integrity and operability of the assembly. It is reasonable to assume that a manufacfacturer of Conax's experience did make a visual inspection. However, a final visual inspection and disassembly are not required by IEEE 317-1976.

G(1)(e) and G(2) - Test data base 1 was exposed to the sequence as listed above. However, the DBE exposure did not include any chemical spray. All of the penetrations listed herein are located such that they are not subject to chemical spray. Per environmental drawing 47E235-42 the only areas in lower compartment subject to chemical spray outside the crane wall is in Accumulator Room #3 between Az 242° and 269° below elevation 733 and Accumulator Room #4 between Az 289° and 305°, below elevation 739.5. None of the penetrations listed herein are located in these areas. R3

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-752, Section 5.7).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	IPS-752 Reference
Thermal aging	Yes	Sect. 5.7.4
Radiation exposure	Yes	Sect. 5.7.5
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.12.1, 5.13.1 & 5.15.1

JUSTIFICATION/COMMENTS Vibration aging not required by IEEE 317-1976 (Penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No synergistic effects known for these penetrations, based on a literature review of applicable materials data for materials used in Conax L. V. Power and Control Penetrations.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.4).

JUSTIFICATION/COMMENTS Aging based on materials tests and analysis done in IPS-325 (binder TAB D, Section D-2) by Conax.

H. AGING (Continued)

(4) (b) Were the materials susceptible to thermal aging degradation identified in the qualification program (Yes/No/NA)? Yes (Reference: IPS-325, Table 3.1 and IPS-752, Tables 3.2 and 3.3).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (Yes/No/NA)? Yes (Reference: IPS-752, Section 5.7.24.2).

JUSTIFICATION/COMMENTS Thermal aging based on conductor feed-through life. See analysis of feedthrough in IPS-325, Appx. A.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (Yes/No/NA)? Yes (Reference: IPS-752, Section 5.7.24.2).

Parameter	Plant Maximum Normal	Test	Equivalent	
Temperature	110°F	150°C	120°C	R1
Time	40 yrs.	100 hrs.	40 yrs.	

JUSTIFICATION/COMMENTS See Sheet 9A

(e) Was the Arrhenius methodolgy used for accelerated aging (Yes/No/NA)? Yes (Reference: IPS-752, Section 5.7.24.2).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (Yes/No/NA)? Yes (Reference: IPS-325, Rev. E, Section 6.4.1 (Footnote at bottom of page) in binder TAB E, Section E-4).

JUSTIFICATION/COMMENTS

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H.(4)(d) Aging:

The thermal age conditioning curve shown in IPS-752, Figure 5.7.1, shows a 40-year life at 120°C. Note in IPS-752, Table 5.9.4, that the full load current test ambient temperature (TIA) is greater than the normal ambient at Watts Bar, the test total operating temperature (TIF) is less than 90°C in every case, and the test current is greater than the Watts Bar required current (See *contract 76K61-87064, Section E4g.(1) in binder TAB E, Section E-1) in every case. Therefore, a greater than 40-year thermal life is conservatively established for the subject penetration assemblies. Conax document IPS-325 covers an ongoing test program. A newer revision of IPS-325/Rev. E shows the latest Conax calculation of activation energy for their feed-throughs is 3.916, which agrees closely with the regression line presented in IPS-325, Figure 5.7.1. See in binder TAB E, Section E-4, IPS-325, Rev. E, page 26. See Material Aging Calculation Report WAC-343 in binder TAB C, Section C-1 for calculation of qualified life at 90°C. R2

*NOTE - Contract reference is not required for qualification but is for information only. Refer to DCRM at WBN for latest revision of Design Specification WBNP-DS-1805-2697-00 applicable to this contract. R2

H. AGING (Continued)

(4) (g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Appendix A in binder TAB E, Section E-4).

JUSTIFICATION/COMMENTS Also, see IPS-752, Figure 5.7.1 and binder sheet 9A.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976. Aging time and temperature was sufficient to account for penetration operating temperature which is ambient, plus temperature rise due to electrical loading.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.5).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Table 3.1 and IPS-752, Tables 3.2 and 3.3).

JUSTIFICATION/COMMENTS All materials were irradiated to the same level.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Dose applied exceeded Watts Bar 40-year plus accident dose to penetrations.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: IPS-752, Section 5.7.5).

Plant normal ambient radiation dose (rd)	2.0E+07	
Test exposure dose (rd)	1.28E+08 (H_2O) or 1.156E+08 (air)	R1
Test exposure dose rate (rd/hr)	1.09E+06 (H_2O) or 0.98E+08 (air)	
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma	

JUSTIFICATION/COMMENTS Test exposure dose is the sum of 40-year normal dose plus accident dose. See Sheet 11A for dose conversion from water to air equivalent.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program* No (Reference: NA). R1

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976. (Penetrations are passive devices and vibrating stress is not a significant aging degradation mechanism).

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference: NA).

JUSTIFICATION/COMMENTS See H(6)(a).

* Qualification program refers to the test report and any supplemental documentation including TVA analyses in Tab C of the binder. R1

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Dose conversion from rads water to rads air for the incident Co-60 gamma ray flux used in the irradiation portion of the test program is proportional to the ratio of the mass absorption coefficient (μ_a/ρ) for gamma rays in air and water, assuming an average Co-60 gamma energy of 1.25 meV. The air equivalent dose is 1.285×10^8 rads (μ_a/ρ) air/(μ_a/ρ) water or 1.156×10^8 rads. Mass absorption coefficient values of 0.0268 cm^2/6m for air and 0.0298 cm^2/6m for water were used. (Reference: ANL-5800, reactor physics constants)

In the same manner the test exposure dose rate of 1.09×10^6 rad/hr (water) converts to 0.98×10^6 rad/hr (air).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.13.1, and 5.15.1).

JUSTIFICATION/COMMENTS Thermal cycle test, continuous current test, short time overload test, short circuit test, repeat continuous current test, and maximum duration of short circuit tests.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.12.1, 5.13.1, & 5.15.1).

JUSTIFICATION/COMMENTS Stresses induced were in accordance with IEEE 317-1976.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect 1.4).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See Justification/Comments in H(9).

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H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? NA
(Reference: NA
).

|R1

JUSTIFICATION/COMMENTS IPS-752, Section 1.4 states "...materials as used in Conax electric penetration are not susceptible to any significant degradation due to thermal aging and radiation and that no age or service related common failure modes exist that would preclude a qualified life of 40 years."

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Polysulfone/Sealant	NA	NA	NA	NA
(b)	Kapton Polyimide Film/ Conductor Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS Penetration feedthrough sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE Standard 317-1976. Test program included tests on insulation and sealant materials. No materials analysis by TVA is required.

Refer to TAB D, Section D-2, IPS-325, for Conax's discussion of materials susceptible to thermal and radiation degradation and aging.

R R

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-752, Sect. 1.5, 5.1.1.1, 5.4.1, 5.5.1 & 5.14.2).

Identify Acceptance Criteria: Baseline acceptance criteria includes leak rate less than 1E-06 SCC/SEC helium, dielectric strength test at 2.7 kV for 5 seconds with no failures, and insulation resistance greater than 1E+08 ohms. During DBA, function and operate at specified service levels without loss of mechanical or electrical integrity. After DBA, gas leak rate less than 1E-02 scc/sec nitrogen, dielectric strength test with no failures, insulation resistance greater than 1E+08 ohms.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.0, 5.14.1, 5.14.2, and 5.15.3.1).

Identify baseline and functional testing: Baseline testing included gas leak rate, pneumatic pressure, dielectric strength, insulation resistance, and conductor continuity. During DBA test, penetration was energized and carrying load except for 10 intervals when insulation resistance was taken. Post-DBA tests included gas leak rate, dielectric strength, insulation resistance, and conductor continuity.

JUSTIFICATION/COMMENTS Tests were in accordance with IEEE 317-1976.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1.1 and 5.14.1.2).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? No (Reference: IPS-752, Sections 5.1 - 5.5).

JUSTIFICATION/COMMENTS Baseline testing consisted of insulation resistance, conductor continuity, and hipot tests which provide an indication of the electrical condition of the penetration, but are not the actual voltage and load carried by the penetrations in service in the plant. Tests were in accordance with IEEE 317-1976.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference	
Voltage	480 VAC, max nom system volt	(34)	R3
Load	Various	**	
Frequence	NA	NA	
Accuracy	NA	NA	
Other(s)	NA	NA	

JUSTIFICATION/COMMENTS Electrical penetrations are not frequency sensitive and have no accuracy requirements. R3

**See TAB C, Section C-1.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (b)

Parameter	Specific Accident Conditions	Reference
Voltage	526.9 VAC max.	(36) R3
Load	Various	**
Frequency	NA	NA
Accuracy	NA	NA
Other(s)	NA	NA

JUSTIFICATION/COMMENTS **See J.(5)(a). Reference (36) documents that 480 VAC circuits could reach a maximum potential of 526.9 VAC during unit shutdown.

(5) (c)

Parameter	Demonstrated Conditions	Reference
Voltage	528 VAC during the DBA Simulation	IPS-752 Sections 5.14.1.2
Load	Various	IPS-752 Section 5.14.1.1
Frequency	60 Hz	IPS-585.3 Sect. 3.2
Accuracy	NA	NA
Other(s)		
Insulation Resistance	1E+06 minimum	IPS-752 Section 5.14.1.3
Leakage Current	0.12 milliamps maximum	IPS-752 Section 5.14.1.4

JUSTIFICATION/COMMENTS

The penetration maintained required loads throughout the DBA test. For low voltage power and control penetrations, a minimum insulation resistance of 1E+06 ohms and a maximum leakage current of 0.12 milliamps at the maximum application voltage

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (c)

is also sufficient to support the electrical operability and circuit integrity for category A and B devices served. See generic binder WBNEQ-GEN-001, Section III.C.4 for discussion of low voltage power and control cable applications.

For nondivisional and other devices served that may not be qualified and could fail in an accident, electrical circuit protection has been provided to ensure penetration containment boundary integrity. All divisional circuits are also similarly protected. See references 37 and 38. R3

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 19a

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 2.0E+07

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and occurring less than 1% of plant life. 20°F difference in maximum temperature for this time period is negligible.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 128° long-term Accident type HELB

(b) Pressure (psig) 11.2 Accident type LOCA

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) 1.2E+07 gamma 4.7E06 beta Accident type LOCA

(e) *Spray Type N/A Accident type

R3

*See Tab B, Section G.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): One end of each penetration is exposed to annulus environment. Containment ends are in lower compartment (outermost small rooms), or lower compartment instrument room. Parameters shown are worst case; see Sheet 19a. R3

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: IPS-752, Sect. 5.14.1).

(7) Subject to submergence (Yes/No/NA)? No Reference: See note 5 on environmental drawing 47 E235-42 for maximum containment water level for flood elevation (EL 717.7 outside crane wall) where penetrations are located and field verification in binder TAB F for location. R3

Identify initiation time and duration of submergence: NA

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes
(Reference: See Sheet 19a).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: See Sheet 19b

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Section A	

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AREA/ENVIRONMENTAL DWG SUMMARY

	Lower* Compartment (47E235-42)**	Annulus (47E235-44)	Instrument Room (47E235-45)**
Max Normal Temperature, °F	120(1) (105)	110	75
Max Abnormal Temperature, °F	130	120	120
Max Normal Pressure, PSIG	0.3	ATM(-)	0.3
Max Abnormal Pressure, PSIG	0.3	ATM(-)	0.3
Max Normal R.H. %	80	80	60
Max Abnormal R.H. %	100	90	90
40-Yr Normal (gamma) Radiation, Rads	2.0E+07	1.0E+06	3.5E+05
Peak Accident Temperature, °F	327	134	327
Peak Accident Pressure, PSIG	11.2	ATM(-)	11.2
Accident (gamma) Radiation, Rads (beta)	1.0E+07 4.7E6(2)	1.2E+07 included	1.0E+07 4.7E6(2)
Total 40-Year Plus Accident Radiation, Rads	3.47E7 gamma plus beta	1.3E+07 gamma plus beta	1.5E7 gamma plus beta

R3

*Fan rooms and accumulator rooms (outermost small rooms).
**These drawings have been modified by DCN P-04104-C and S-09715-A

(1) Documented average temperature. See note 34 on 47E235-42
(2) See Sheet 19b.

R3

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Page B-32 was deleted per revision 1 .

The accident beta radiation dose to the penetrations is determined as follows: The maximum containment accident beta dose is 4.7E+08 rads in accordance with environmental drawing 47E235-45. (Note: None of these penetrations are located in upper compartments.) R3

The penetration terminal boxes, which enclose all radiation sensitive materials, are constructed of 18 gauge minimum sheet steel as shown on drawings 7429-24001 and 7429-24002 in TAB I. Per reference 35 the Reduction of Beta Dose by Sheet Steel, for 26 gauge (or thicker) box is less than one percent. Therefore the reduced beta dose is 1.E-2 x 4.7E8 = 4.7E6. R3

R3

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	IPS-752 Reference
Operating Time	100 days	13.54 days	Fig. 5.14.1
Temperature (°F)	327	370	Fig. 5.14.1
Pressure (psig)	11.2	75	Fig. 5.14.1
Relative Humidity (%)	100	100	Fig. 5.14.1
Chemical Spray*	N/A	N/A	See Tab B, Section G
Radiation (rd)**	△3.47E7 gamma plus beta	1.156E+08(air) or 1.285E+08(H_2O)	Sect. 5.7.5
Submergence	None	None	NA

R3

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

△ See Page B-31 R3

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	Fig. 5.14.1
Pressure	Yes	Fig. 5.14.1
Relative Humidity	Yes	Fig. 5.14.1
Chemical Spray	NA	N/A
Submergence	NA	N/A

JUSTIFICATION/COMMENTS None of the penetrations listed herein are located below flood level or subject to chemical spray. R3

JUSTIFICATION/COMMENTS (Continued)

~~Parameters shown are a composite resultant concentration.~~ 7/25/90 All of these penetrations are enclosed in junction boxes and are not subject to chemical spray impingement. All penetrations, are protected from chemical spray by the concrete floor slab above them. These physical barriers negate the effects of spray. Also see TAB B, sheet 7A, Justification/Comments for G(1)(e) and G(2). As is seen in TAB C, Section C-1, Report WAC-343, the test profile does not envelop the WBN accident profile for approximately the first 100 seconds. This exists due to starting at a lower temperature and the difficulty in getting the temperature to rise in the steam chamber as fast as the WBN accident profile does, a common problem in steam tests. Report WAC-343 does not include the first test temperature transient. This extra transient and the significantly higher test temperatures compensate for the slightly slower transient rise time. Also, noted in IPS-752, Section 5.14.10.1, testing without a terminal box is more severe than with the box due to thermal lag and dew point effects associated with the box. Thus, this small deviation in the profile for the first few seconds is not significant. R3 R3

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L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	43°F	Yes
Pressure: +10% but no more than 10 psig	63.8 psig	Yes
Radiation: +10% of accident dose	> 10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See TAB C, Sect. C-1	Yes
Voltage: 10% of rated value	480 VAC + 10% during test	Yes
Frequency: 5% of rated value	0	No
Environmental Transient: the initial transient and the peak temperature applied twice	transient applied twice	Yes
Vibration: +10% added to acceleration	NA	NA

R3

JUSTIFICATION/COMMENTS Margins applied per IEEE 317-1976. Frequency margin not required by IEEE 317-1976. Electrical penetrations function electrically as insulated conductors, and they are not frequency sensitive in the low frequency range of power and control applications. Sheet 1 of Material Aging Calculation Report WAC-343 (see TAB C, Section C-1) shows the test post-accident operating time equivalent is considerably more than 10% over the Watts Bar required operating time. ~~R2~~

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M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference IPS-752, Sect. 1.5).

JUSTIFICATION/COMMENTS Maintain pressure boundary and electrical integrity.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1).

JUSTIFICATION/COMMENTS ______

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1).

JUSTIFICATION/COMMENTS ______

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1 & 5.14.2).

JUSTIFICATION/COMMENTS Test was for 13 1/2 days. See analysis extending time to 100 days in IPS-752, Sect. 5.14.10.1C.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference IPS-585.3, Sect. 6.18.1.1, 6.21.1.1, and 6.24).

JUSTIFICATION/COMMENTS ______

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N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G - QMDS.

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	CHECKED WK DATE 7/27/86		

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) adequately justified?	NA (No exceptions taken)
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (preaging performed)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Crieria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	N/A R3
(a) Was the spray testing done while under the extremes of pressure and temperature?	N/A R3
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	N/A (See TAB B, Sect. L(2))
(11) Criteria regarding submergence satisfied?	N/A (Penetrations not submerged
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA(penetrations qualified for 100 days)
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 27A OF 29

R ____ R ____

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED DCP DATE 7/26/86

CHECKED WKK DATE 7/27/86

P. DISCUSSION

Conax Report IPS-752 is the qualification document for these penetrations. The penetrations contain the identical possible leakage paths, leak mechanisms, feedthrough concepts, seals, insulation system, and materials as the test data base penetration No. 1 described in IPS-752. Detailed raw test data for the tested assemblies is contained in IPS-585.3. IPS-752 is a summary document of the reports on the tested assemblies. It is a very thorough summary and is the document submitted by Conax Corporation as the key qualification report for the subject low voltage power and control penetration assemblies.

SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

	Item	Plant	Report	Acceptable Yes/No/NA	IPS-752 Report Section
(a)	Penetration type	LVP & C	LVP & C	Yes	Table 4.1
(b)	Mounting	See p 29A	See p 29A	Yes	NA
(c)	External connections	in-line splices	NA	NA	NA

Comments: TVA provided in-line splices. Conax test was of similar items with supporting analysis, per IPS-752, Sect. 1.0.

(2) Does the qualification report identify the following performance characteristics:

	Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(a)	Temperature rating	Yes	5.7.24.2
(b)	Voltage rating	Yes	See Sheet 29A
(c)	Continuous current rating	Yes	5.9.5
(d)	Short-time overload current rating & duration	Yes	5.10.4
(e)	Rated short circuit current & duration	Yes	5.11.2
(f)	Pressure rating	Yes	5.1 & 5.2

BINDER NO. WBNEQ-PENT-002	PLANT WBN	UNIT(S) 1	SHEET 29 OF 29
BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL	COMPUTED DDD	DATE 7/26/86	R ___ R ___
	CHECKED WDR	DATE 8/8/86	

EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(g) Maximum gas leakage rate	Yes	5.1.1.1

Comments: See page 29A

(3) Does the qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Continuous current rating	Yes	5.9.2
(b) Short-time overload current rating and duration	Yes	5.10.1
(c) Short circuit current rating and duration	Yes	5.11.1
(d) Rated maximum duration of rated short circuit current	Yes	5.15.1
(e) Pneumatic pressure rating	Yes	5.2.1
(f) Maximum gas leakage rate	Yes	5.1.1
(g) Conductor continuity	Yes	5.3.1
(h) Dielectric strength	Yes	5.4.1
(i) Impulse	NA	NA
(j) Insulation resistance	Yes	5.5.1
(k) Flame	Yes	6.3

Comments: Impulse tests not required for low voltage penetrations per IEEE 317-1976.

BINDER NO. WBNEQ-PENT-002	PLANT WBN	UNIT(S) 1	SHEET 29A OF 29
BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL	COMPUTED DDB	DATE 7/26/86	R ___ R ___
	CHECKED WBK	DATE 7/27/86	

Additional Comments for Supplement 3

(1)(b) Watts Bar L. V. Power and Control Penetrations are mounted by welding the penetration assembly header plate to the annulus (outside containment) end of the containment nozzle. The containment nozzles are horizontal. The inboard ends are supported by a support plate resting in the inboard end of the nozzle and located by support rods attached to the header plate. Inside containment junction boxes for connection of penetration conductor pigtails to field cables are bolted to slip-on flanges welded to the inboard end of the containment nozzle. Outside containment junction boxes, where used, are bolted to the penetration header plate in the annulus.

The test penetration assembly was inserted horizontally into the environmental test chamber as shown in IPS-585.3, Appendix D, photographs 5.0 through 8.0. Whether it was bolted in or welded in or whether it incorporated an inboard support plate is not stated, but this is in no way material to the results of the DBA test. No junction boxes were used as stated in IPS-752, Section 5.14.1, which is conservative as discussed in IPS-752, Section 5.14.10.1A.

(2)(b) The voltage rating of the penetrations is implied but not specifically stated in the qualification report. The voltage rating was specified to be 600 volts in contract 76K61-87064. Dielectric strength tests before the DBA test at 2.7 kV and after the DBA tests at 660 volts are consistent with a voltage rating of 600 volts in accordance with IEEE 317-1976, Sections 4.2.1, 7.3.2, and 6.4.13. See IPS-752, Sections 5.4.1 and 5.14.2.2.

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 1 OF 1
R R

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION

COMPUTED /R1 JHW DATE 2-16-89

CHECKED /R1 [signature] DATE 2-17-89

PEN1-005

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building. Actual elevations are documented in TAB F and on drawing 45W860-3 in TAB E.

2. Category and Operating Times for penetrations, which are passive devices, are not assigned directly but are dictated by the category and operating times of devices served.

PRINT DATE: 01/20/89

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0018 -B PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0018 -B 7429-10003-05	093	737' 7" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
WBN-1-PENT-293-0019 -E PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0019 -E 7429-10003-03	017	733' 7" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
WBN-1-PENT-293-0020 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0020 7429-10003-10	116-30'	733' 7" 76K61-087064	ANN	B B B B B	100D 100D 100D 1MO 1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B)
WBN-1-PENT-293-0022 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0022 7429-10003-10	073-30'	718'10" 76K61-087064	ANN	B B B B B	100D 100D 100D 1MO 1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B).
WBN-1-PENT-293-0023 -F PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0023 -F 7429-10003-06	241-45'	731'11" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).

Cont. Spray maybe?, Clos

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0025 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0025 7429-10003-01	254-30°	770' 1" 76K61-087064	ANN	B	100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B).
					B	100D	MS/C	
					B	100D	FW/C	
					B	1MO	RH/C	
					B	1MO	CV/C	
WBN-1-PENT-293-0028 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0028 7429-10003-02	027	737' 7" 76K61-087064	ANN	B	100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B).
					B	100D	MS/C	
					B	100D	FW/C	
					B	1MO	RH/C	
					B	1MO	CV/C	
WBN-1-PENT-293-0029 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0029 7429-10003-04	030	737' 7" 76K61-087064	ANN	B	100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B).
					B	100D	MS/C	
					B	100D	FW/C	
					B	1MO	RH/C	
					B	1MO	CV/C	
WBN-1-PENT-293-0030 -B PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0030 -B 7429-10003-09	021	725'11" 76K61-087064	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
					A/B	100/100D	MS/C	
					A/B	100/100D	FW/C	
					A/B	1MO/1MO	RH/C	
					A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0031 -G PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0031 -G 7429-10003-05	025	733' 7" 76K61-087064	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
					A/B	100/1000	MS/C	
					A/B	100/100D	FW/C	
					A/B	1MO/1MO	RH/C	
					A/B	1MO/1MO	CV/C	

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0033 -A PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0033 -A 7429-10003-04	153	737' 7" 76K61-087064	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
					A/B	100/100D	MS/C	
					A/B	100/100D	FW/C	
					A/B	1MO/1MO	RH/C	
					A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0034 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0034 7429-10003-02	151	733' 7" 76K61-087064	ANN	B	100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B).
					B	100D	MS/C	
					B	100D	FW/C	
					B	1MO	RH/C	
					B	1MO	CV/C	
WBN-1-PENT-293-0037 -A PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0037 -A 7429-10003-07	155	736' 6" 76K61-087064	ANN	A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
					A/B	100/100D	MS/C	
					A/B	100/100D	FW/C	
					A/B	1MO/1MO	RH/C	
					A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0038 -D PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0038 -D 7429-10003-03	159	727' 6" 76K61-087064		A/B	100/100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
					A/B	100/100D	MS/C	
					A/B	100/100D	FW/C	
					A/B	1MO/1MO	RH/C	
					A/B	1MO/1MO	CV/C	
WBN-1-PENT-293-0039 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0039 7429-10003-02	195	737' 7" 76K61-087064	ANN	B	100D	LOCA	MAINTAIN PRESSURE BOUNDARY (CAT B).
					B	100D	MS/C	
					B	100D	FW/C	
					B	1MO	RH/C	
					B	1MO	CV/C	

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	LOCATION: ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0040 -A PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0040 -A 7429-10003-08	207	737' 7" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
WBN-1-PENT-293-0043 -D PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0043 -D 7429-10003-06	205	733' 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
WBN-1-PENT-293-0045 -F PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0045 -F 7429-10003-03	197	733' 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
WBN-1-PENT-293-0049 -G PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0049 -G 7429-10003-03	335	733' 1" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).
WBN-1-PENT-293-0050 - PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0050 7429-10003-02	339	727' 8" 76K61-087064	ANN	B B B B B	100D 100D 100D 1MO 1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B).

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PRINT DATE: 01/20/89

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RH/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PENT-293-0054 -E PRIMARY CONTAINMENT ELEC PENETRATION	1-PENT-293-0054 -E 7429-10003-06	306-30°	717'10" 76K61-087064	ANN	A/B A/B A/B A/B A/B	100/100D 100/100D 100/100D 1MO/1MO 1MO/1MO	LOCA MS/C FW/C RH/C CV/C	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A).

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BINDER NO. WBNEQ-PENT-003	PLANT WBN	UNIT(S) 1	SHEET 1 OF 29
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BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION	COMPUTED DDD	DATE 9/15/86	OM 2-6-89
	CHECKED OM	DATE 9/18/86	2-7-89

A. DOCUMENTATION

Equipment Description: Electrical Penetrations, Instrumentation & Indication

Vendor/Manufacturer: Conax Corporation

Equipment Model No.(s): 7429-10003-01 through 7429-10003-10

QUALIFICATION REPORTS

(1) Title/Number/Revision Design Qualification Report for Electrical Penetration Assemblies for Watts Bar Nuclear Plant Units 1&2/IPS-752/Rev. A. — RIMS EEB 820115 315 — DATE 12/9/81

(2) Title/Number/Revision Design Qualification Material Test Report for materials used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies/IPS-325/Rev. D. — RIMS EEB 811110 300 — DATE 5/14/81

(3) Title/Number/Revision Test Report Qualification of Instrumentation Service Classification Electric Penetration/IPS-585.2 — RIMS EEB 811110 306 — DATE 1/18/81

(4) Title/Number/Revision Test Report Qualification of Conax Instrumentation Classification Coaxial Feedthrough Subassemblies/IPS-585.4 — RIMS EEB 811110 303 — DATE 1/16/81

(5) Title/Number/Revision Design Qualification Rpt for a 42 Conductor #18 AWG Conax Low Volt. Service Classification Feedthrough Assembly Consistent with the Requirements of IEEE Standard 317-1976 & NRC Regulatory Guide 1.63, 7/78"/IPS-353.10/Rev. B. — RIMS B26 860801 048 — DATE 6/23/83

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(6) IPS-325, Rev. E. Design Qualification Material Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies. R1

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QUALIFICATION REPORTS

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(7) IPS-214, Rev C, Instruction and maintenance manual for electric penetration assemblies for Watts Bar Nuclear Plant, Units 1 and 2.

(8) IPS-213, Packaging, shipping, and storage procedures for electric penetration assemblies for Watts Bar Nuclear Plant, Units 1 and 2.

(9) IPS-250, Packaging, shipping, and storage procedures for spare parts for electrical penetration assemblies for Watts Bar Nuclear Plant, Units 1 and 2.

*(10) Conax Drawing 7429-10003, Rev. F, Sheets 1&2 of 2, Electrical Penetrations for Watts Bar. (Rev. E in binder for information only. Refer to DCRM for latest revision) R2

(11) Conax Drawing 7429-24002, Sheet, Rev A - Enclosure SUB-ASSY.

(12) Conax Drawing PL7429-10003-01, Rev. E, Sheets 1 & 2 of 2, Parts List.

(13) Conax Drawing PL7429-10003-02, Rev. E, Sheets 1 & 2 of 2, Parts List.

(14) Conax Drawing PL7429-10003-03, Rev. E, Sheets 1 & 2 of 2, Parts List.

(15) Conax Drawing PL7429-10003-04, Rev. E, Sheets 1 & 2 of 2, Parts List.

(16) Conax Drawing PL7429-10003-05, Rev. E, Sheets 1 & 2 of 2, Parts List.

(17) Conax Drawing PL7429-10003-06, Rev. E, Sheets 1 & 2 of 2, Parts List.

(18) Conax Drawing PL7429-10003-07, Rev. E, Sheets 1 & 2 of 2, Parts List.

(19) Conax Drawing PL7429-10003-08, Rev. E, Sheets 1 & 2 of 2, Parts List.

(20) Conax Drawing PL7429-10003-09, Rev. E, Sheets 1 & 2 of 2, Parts List.

QUALIFICATION REPORTS (continued)

(21) Conax Drawing PL7429-10003-10, Rev. E, Sheets 1 & 2 of 2, Parts List.

*(22) WBN Drawings 45A8601-1 to -54, Electric Penetration connection Drawings.

(23) WBN Drawing 45N860-3 R9 - Conduit and Grounding - Floor E1702.78, Details - Sheet 1

(24) 45W860-10, R8 - Conduit and Grounding - Electrical Penetration Details

*(25) Watts Bar Environmental Drawings 47E235-41 R1, -42 R2, -44 R1, and -45 R1. Drawings -41 R1, -42 R2 and -45 R1 have been modified by DCN P-04104-C (B26 0908819) R2

(26) TI-RPS-48 (R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235).

R2

(28) GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235).

(29) GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235).

(30) QIR NEB 86160-Beta Dose to Low Voltage Electrical Penetrations (B46 860917 257).

(31) WBNEQ-IXT-001 - Environmental Qualification Binder for Acoustic Monitors.

(32) WBNEQ-SPLC-001 - Environmental Qualificaiton Binder for Raychem Heat Shrink Splices.

*(33) WB-DC-30-5R3 - "Power, Control and Signal Cables for use in Category I Structures - (See TAB G).

* Not Included in Binder.

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

QUALIFICATION REPORTS (continued)

IPS-752 is the document submitted by Conax Corporation as the key qualification report for the Watts Bar Penetrations. It is a very comprehensive summary report and documents qualificaitons by analysis and comparison to similar modular-type low voltage power and control penetration assemblies of a universal design previously qualified by type tests conducted in accordance with IEEE 317-1976 at levels equal to or more severe than TVA specified requirements for Watts Bar. Most references in this binder are to IPS-752.

IPS-325 documents qualification of Conax Electric Penetration Assemblies from the standpoint of material tests, as a minimum satisfying requirements of Section 6.3 of IEEE 317-1976. Appendix A of IPS-325 includes Conax's thermal evaluation program. IPS-325 is referenced in this binder for identification of materials susceptible to aging degradation and to support Arrhenius Aging Calculation. IPS-325 documents an ongoing test program. Revision D of IPS-325 is referenced in IPS-752 and is included in Binder TAB D, Section D-2. A later revision of IPS-325, Rev. E, is included in Binder TAB E, Section E-4, and is referenced in several places in this binder. Contrary to the note on sheet 1b, wherever IPS-325 is referenced in this binder the proper revision level is listed.

IPS-585.4 documents tests on a coax penetration assembly referred to as test data base 3 in IPS-752. It is a more detailed test report than IPS-752 that includes raw data and therefore requires reference in a few places in this binder. Only the RG-59 coax is applicable to Watts Bar as indicated in IPS-752, Table 4.3.

IPS-585.2 documents tests on an instrumentation penetration assembly referred to as test data base 4 in IPS-752. It also is more detailed than IPS-752, contains raw data, and requires reference in a few places in this binder. IPS-752, Table 4.4 indicates which portions of test data base 4 are applicable to Watts Bar.

IPS-353.10 document qualification tests of a low voltage penetration module consistent with the requirements of IEEE 317-1976. For this binder it provides environmental qualification documentation for chemical spray, supporting IPS-752 in the same way that IPS-325,Rev.D, IPS-585.2, and IPS-585.4 do. R2

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	CHECKED OM	DATE 9/18/86 CAG	2/17/89 HOR 10-17-89

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

Open Item Number	Punchlist Item Number
1	PENT-003-001
~~2~~	~~PENT-003-002~~

R2

COMMENTS/RECOMMENDATIONS These modular-type electrical penetrations are used to convey both safety related and non-safety related low voltage indication, communications, annunciation, and instrumentation circuits into primary containment. These penetrations are qualified to maintain pressure integrity and electrical integrity for the worst case postulated environmental conditions at their location before, during and after a LOCA or steam line break occurring any time within the 40 year plant design life, pending satisfactory resolution of the above open items.

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C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract Date: Nov. 14, 1975. Although procured, delivered, and installed prior to February 22, 1983, these electrical penetrations meet NUREG-0588, Category I Requirments.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 317-1976 - Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations.

IEEE 323-1974 - Standard for Qualifying Class 1E Equipment for Nuclear Power Generation Station.

ASME Boiler and Pressure Code, Section III, Subsection NE, for Class MC Components, 1974 Edition, and Addenda through Winter 1974. R1

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Conax Qualification Report IPS-752, Section 1.2. See binder TAB D, Section D-1 for copy of IPS-752.

IPS-752, Section 4.3 states "The design and construction of the subject penetrations of para. 3.1 contains the identical leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar Design which would affect qualification." Test data bases 3 and 4 are the applicable test items for this binder. See IPS-752, Table 3.3 for a general description of the WBN LVI type penetration and Tables 4.3 and 4.4 for a description of the test data bases.

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E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Elec. Pene. Instr.& Ind.	Elec. Pene. Assemblies	IPS-752 Sec. 4.1
(2) Manufacturer	Conax Corporation	Conax Corporation	IPS-752 Sec. 4.1
(3) Model Number(s)	See TAB A	Data Base Three	IPS-752 Table 4.3
		Data Base Four	IPS-752 Table 4.4
(4) Serial Number(s)	See TAB F	Not stated	NA

(5) Identify Component-Unique checksheet attached: See TAB B, Supplement 3

JUSTIFICATION/COMMENTS

IPS-752, Section 4.3 states "The design and construction of the subject penetrations of para. 3.1 contains the identical leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar Design which would affect qualification." Test data bases 3 and 4 are the applicable test items for this binder. See IPS-752, Table 3.3 for a general description of the WBN LVI type penetration and Tables 4.3 and 4.4 for a description of the test data bases.

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EQUIPMENT DESCRIPTION (Continued)

IPS-585.2 and IPS-585.4 are the type test reports for test data bases three and four described in IPS-752. IPS-585.2 and IPS-585.4 are much more detailed and therefore require reference at some points in this binder. Test data base 3 is the test item for RG-59 coax. Test data base 4 is the test item for RG-11 triax, 14 AWG, 16 AWG, and thermocouple types. Other conductor types in the test items (RG-114 for example) are not used at Watts Bar. See *Contract 76K61-87064 in TAB E, Section E-1, for description of WBN penetrations. Although Conax does state a type for test data bases 3 or 4, they include the conductor types TVA used for instrumentation, indication, communication, and annunciation circuits in the electrical penetrations at WBN. R2

See sheet 5b for correlation of WBN plant device EQIS numbers, model numbers, serial numbers, and types. Test data bases do not have model or serial numbers. This is not significant since the test data bases include the same conductor types as the WBN penetrations and Conax states there are no significant differences that would affect qualification.

All WBN primary containment electrical penetrations are tabulated on TVA Drawing 45N860-3 in binder TAB E, Section E-2. Penetrations covered in this binder are instrumentation and indication types and are listed on 45N860-3 as being for node voltage levels ~~1,~~ 1A, 1B, ~~2,~~ 2A, 2B, 2D, 2E, 2F, and 2G. (Penetrations ~~for node voltage level 5 are covered in Binder WBNEQ-PENT-001 and those~~ for node voltage levels ~~3,~~ 3A, 3B, ~~4,~~ 4A, and 4B are covered in Binder WBNEQ-PENT-002).

*Note: Contract reference is not required for qualification but is for information only. Refer to DCRM at WBN for latest revision of Design Specification WBNP-DS-1805-2697-00 applicable to this contract. R2

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EQUIPMENT DESCRIPTION (Continued)

EQIS NO.	MODEL NO.	SERIAL NO.	TYPE	
WBN-1-PENT-293-0018-B	7429-10003-05	400	Instrumentation	R1
WBN-1-PENT-293-0019-E	7429-10003-03	391	Instrumentation	
WBN-1-PENT-293-0020	7429-10003-10	404	Instr. & Indic.	
WBN-1-PENT-293-0022	7429-10003-10	405	Instr. & Indic.	
WBN-1-PENT-293-0023-F	7429-10003-06	393	Instrumentation	
WBN-1-PENT-293-0025	7429-10003-01	397	Instrumentation	
WBN-1-PENT-293-0028	7429-10003-02	385	Instrumentation	
WBN-1-PENT-293-0029	7429-10003-04	398	Instrumentation	
WBN-1-PENT-293-0030-B	7429-10003-09	402	Instr. & Post-Acc. Rad. Monit.	
WBN-1-PENT-293-0031-G	7429-10003-06	394	Instrumentation	
WBN-1-PENT-293-0033-A	7429-10003-04	399	Instrumentation	R1
WBN-1-PENT-293-0034	7429-10003-02	386	Instrumentation	
WBN-1-PENT-293-0037-A	7429-10003-07	401	Instr. & Indic. & Post-Acc.Rad.Monit.	
WBN-1-PENT-293-0038-D	7429-10003-03	392	Instrumentation	
WBN-1-PENT-293-0039	7429-10003-02	387	Instrumentation	
WBN-1-PENT-293-0040-A	7429-10003-08	403	Instr. & Indic.	
WBN-1-PENT-293-0043-D	7429-10003-06	395	Instrumentation	
WBN-1-PENT-293-0045-F	7429-10003-03	389	Instrumentation	
WBN-1-PENT-293-0049-G	7429-10003-03	390	Instrumentation	
WBN-1-PENT-293-0050	7429-10003-02	388	Instrumentation	
WBN-1-PENT-293-0054-E	7429-10003-06	396	Instrumentation	

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F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	See Note 1	Yes*	IPS-752, Table 4.3 & 4.4
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS There are no required external process requirements, no conduit seals (penetrations are seals), and orientation is not a consideration for penetrations. The Watts Bar penetrations are welded into their nozzles. (Continued on sheet 6A)

INSTALLATION INTERFACES (Continued)

Note 1: Raychem WCSF-N in-line splice insulations for connection of field cables, other than coax and triax, to penetration conductor pigtails were provided by TVA and are not part of the penetration assembly qualification. For coax and triax connectors Conax furnished jacks and plugs with Raychem WCSF-N sleeves. See TVA drawing 45W860-10, detail J10 in binder TAB E, Section E-3, and Conax manual IPS-214, sections 5.4.4 and 5.4.5 in binder TAB H, Section H-1 for installation instructions and details. See binder WBNEQ-SPLC-001 for Raychem WCSF-N splice insulation qualification. R1

*Interface is an installation requirement but needs no maintenance and is not listed in QMDS.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	IPS-752 Reference
(a) Equipment inspected for damage	No	NA
(b) Baseline performance measurements taken	Yes	5.0
(c) Equipment aged:		
Thermal	Yes	5.7.15, 5.7.21
Radiation	Yes	5.7.16, 5.7.22
Wear	No	NA
(d) Vibration/seismic testing conducted	Yes	5.12
(e) Design basis event (DBE) exposure	Yes	5.14.3, 5.14.5
(f) Post-DBE exposure	Yes	5.14.3, 5.14.5
(g) Final inspection and disassembly	No	NA

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference IPS-585.2, page 32 and IPS-585.4, page 27).

JUSTIFICATION/COMMENTS G(1)(a) Although Conax does not state that an initial visual inspection was done, they have completed numerous successful test programs and there is no reason to

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believe a visual inspection was not done. However, an initial visual inspection is not required by IEEE 317-1976.

G(1)(c) Electrical penetrations are passive devices and are not subject to wear as an aging mechanism. Wear aging is not required by IEEE 317-1976.

G(1)(g) Conax does not state that a final inspection and disassembly was done, but extensive evaluation testing was performed (IPS-752, Sect 5.14.4 and 5.14.6) in accordance with IEEE 317-1976, fully proving post-accident integrity and operability of the assembly. It is reasonable to assume that a manufacturer of Conax's experience did make a visual inspection. However, a final visual inspection and disassembly are not required by IEEE 317-1976.

G(1)(e) and G(2) Test data bases 3 and 4 were exposed to the sequence as listed above. However the DBA test for test data base 3 did not include any chemical spray and the DBA test for test data base 4 included only a short period of spray. Spray compatibility of Conax penetrations was established in report IPS-353.10 as stated in IPS-752, Section 5.14.10.2. Report IPS-353.10 documents environmental qualification tests on another (not test data base 3 or 4) penetration assembly. This assembly received sequential thermal aging, thermal cycling, radiation exposure, and DBA accident profile at levels approximately equal to test data bases 3 and 4 and in excess of WBN requirements. Thermal aging was somewhat less and radiation exposure somewhat more than test data bases 3 and 4. See Conax Justification/Comparison in IPS-752, Section 5.14.10.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	IPS-752 Reference
Thermal aging	Yes	5.7.15, 5.7.21
Radiation exposure	Yes	5.7.16, 5.7.22
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	5.7.14, 5.7.20

JUSTIFICATION/COMMENTS Vibration aging not required by IEEE 317-1976 (penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No synergistic effects known for these penetrations, based on a literature review of applicable materials data for materials used in Conax instrumentation and indication penetrations.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.15 and 5.7.21).

JUSTIFICATION/COMMENTS Aging based on materials tests and analysis done in IPS-325 (binder TAB D, Section D-2) by Conax.

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H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-325, Table 3.1 and IPS-752, Table, 3.3.).

JUSTIFICATION/COMMENTS See IPS-325, Rev. D, in binder TAB D, Section D-2.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.24.2).

JUSTIFICATION/COMMENTS Thermal aging based on conductor feedthru life. See analysis of feedthrus in IPS-325, Appendix A.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.24.2).

Parameter	Plant Maximum Normal	Test(1)	Equivalent
Temperature	$110^{o}F$(2)	$150^{o}C$	$120^{o}C$
Time	40 years	100 hrs	40 years

JUSTIFICATION/COMMENTS (1)Test data base three was aged at 151.6°C for 102 hours. (2)Worst case, see sheet 19A. See sheet 9A for discussion of aging.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.24.2).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Sect 6.4.1 (Footnote at bottom of page) in Binder TAB E, Section E-4.

JUSTIFICATION/COMMENTS

The thermal age conditioning curve shown in IPS-752, Figure 5.7.1 shows a 40 year life at 120°C. This is far greater than the plant maximum normal and maximum abnormal temperature for penetrations (120°F and 130°F, respectively), and therefore a far greater than 40 year qualified life is established for the subject penetrations. There is little or no temperature rise associated with the low power indication, communication, annuciation, and instrumentation circuits passing through these penetrations. |R2

Conax document IPS-325 covers an ongoing test program. A newer revision of IPS-325 (Rev. E) shows the latest Conax calculation of activation energy is 3.916, which agrees closely with the regression line presented in IPS-752, Figure 5.7.1. See page 26 of IPS-325, Rev. E in binder TAB E, Section E-4.

See Material Aging Calculation Report WAC-344, page C-8, in binder TAB C, Section C-1, for calculation of qualified life at 130°F (54.44°C). Worst case maximum normal ambient temperature is 120°F, however the qualified life is calculated at 130°F for conservatism. |R2 |R2

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H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-325, Rev. E, in Appendix A, binder TAB E, Section E-4).
JUSTIFICATION/COMMENTS Also see IPS-752, figure 5.7.1. and binder Sheet 9A.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976. Aging times and temperatures were based on typical penetration operating temperature, which is ambient plus temperature rise due to loading. However, there is little or no temperature rise for these penetrations which are used for low power instrumentation, communication, annunciation, and indication circuits.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.16 and 5.7.22).

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Table 3.1 and IPS-752, Table 3.3).

JUSTIFICATION/COMMENTS All materials were irradiated to the same level.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Dose applied exceeded Watts Bar 40 year plus accident dose to penetrations.

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H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: IPS-752, Sec. 5.7.16 and 5.7.22).

	Data Base Three	Data Base Four	
Plant normal ambient radiation dose (rd)	2.0E+07 gamma	2.0E+07 gamma	
Test exposure dose (rd)	1.1E+08(H_2O)	1.9E+08(H_2O)	R1
Test exposure dose rate (rd/hr)	5.4E+05 (H_2O)	7.7E+05 (H_2O)	
Test exposure source type (e.g., Co-60 gamma)	Co-60 Gamma	Co-60 Gamma	

JUSTIFICATION/COMMENTS Test exposure dose is the sum of 40 year normal dose plus accident dose. See Sheet 11A for dose conversion from water to air equivalent.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program* No (Reference: NA). R1

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976 (penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference: NA).

JUSTIFICATION/COMMENTS See H(6)(a)

* Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

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Dose conversion from rads water to rads air for the incident Co-60 gamma ray flux used in the irradiation portion of the test program is proportional to the ratio of the mass absorption coefficient (Na/p) for gamma rays in air and water, assuming an average Co-60 gamma energy of 1.25 meV. The air equivalent dose for test data base 3 is 1.1×10^8 rads water $\times \frac{(Na/\rho)\text{air}}{(Na/\rho)\text{water}}$ = 0.989×10^8 rads air. Mass absorption coefficient values of 0.0268 cm^2/gm for air and 0.0298 cm^2/gm for water were used. (Reference: ANL-5800, Reactor Physics Constants). In the same manner the test exposure dose rate of 5.4×10^5 rad/hr (water) for test data base 3 converts to 4.856×10^5 rad/hr (air).

For test data base four the test exposure of 1.9×10^8 rads (water) converts to 1.709×10^8 rads (air) and the dose rate of 7.7×10^5 rads/hr (water) converts to 6.925×10^5 rads (air).

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H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.13, 5.7.14, 5.7.18, and 5.7.20).

JUSTIFICATION/COMMENTS Shipping and storage tests and thermal cycle test.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.13, 5.7.14, , 5.7.18, and 5.7.20).

JUSTIFICATION/COMMENTS Stresses induced were in accordance with IEEE 317-1976.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 1.4).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See Justification/Comments in H(9).

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H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? No
(Reference: NA
).

|R1

JUSTIFICATION/COMMENTS IPS-752, Sec. 1.4 states "...Materials as used in Conax electric penetrations are not susceptible to any significant degradation due to thermal aging and radiation and that no age or service related common failure modes exist that would preclude a qualified life of 40 years."

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Polysulfone/sealant	NA	NA	NA	NA
(b)	Kapton Polyimide film/ Conductor Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS Penetration feedthru sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE 317-1976 and test program included tests on insulation and sealant materials. No materials analysis by TVA is required.

Refer to TAB D, Section D-2, IPS-325 for Conax's discussion of materials susceptible to thermal and radiation degradation and aging.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-752, Sections 1.5, 5.1.3, 5.1.4, 5.5.3, 5.5.4, 5.14.4, and 5.14.6).

Identify Acceptance Criteria: Baseline gas leak rate less than 1E-06 SCC/SEC helium (1E-08 for test data base three). Insulation resistance greater than 1E+08 ohms for 16 AWG, 1E+12 ohms for coax and triax. During DBA, function and operate at specified service levels without loss of mechanical or electrical integrity. After DBA, gas leak rate less than 1E-02 SCC/SEC nitrogen, continuity and dielectric strength test with no failures.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-752, Sections 5.1.3, 5.1.4, 5.2.1, 5.3.1, 5.4.3, 5.4.4, 5.5.3, 5.5.4, 5.14.3, 5.14.4, 5.14.5, and 5.14.6).

Identify baseline and functional testing: Baseline testing included gas leak rate, pneumatic pressure, dielectric strength, insulation resistance, and conductor continuity. During DBA test, penetrations were energized and leakage current monitored except for 11 intervals when insulation resistance was measured on triax. Post-DBA tests included leak rate, conductor continuity, dielectric strength, and an insulation resistance on the 16 AWG size conductors.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (Yes/No/NA)? Yes (Reference: IPS-752, Sec. 5.14.3.1 and 5.14.5.1).

JUSTIFICATION/COMMENTS

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? No (Reference: IPS-752, Sections 5.1 through 5.5).

JUSTIFICATION/COMMENTS Electrical baseline testing consisted of insulation resistance and hipot tests which provide an indication of the electrical condition of the penetrations but are not the actual voltage and load carried by the penetrations in service in the plant. Tests were in accordance with IEEE 317-1976.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	Various	Open Item
Load	NA	NA
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

R1

JUSTIFICATION/COMMENTS See J.(5)(b)

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

R1

(5)(b)

Parameter	Specific Accident Conditions	Reference
Voltage	Various	Open Item
Load	NA	NA
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS For instrumentation/indication penetrations the required electrical characteristics depend on the end device served. Category A and B divisional devices served by these penetrations can be categorized into 6 groups.

Group	Device Served
1	Switches
2	Transmitters
3	RTDs
4	Incore Thermocouples
5	Acoustic Monitors
6	GA Post-Accident Radiation Monitors (PAM)

Refer to TVA drawing 45N860-3 in binder TAB E, Section E-2, for a general descriptoin of each penetration's use. For a complete tabulation of devices and/or cables connected to each penetration, see TVA drawing series 45A860.

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BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION		COMPUTED [illegible]	DATE 9/15/86	R	R		
		CHECKED [illegible]	DATE 9.18.86				

Except for PAM circuits, category A divisional devices served by these penetrations operate at a maximum nominal system voltage of 120 VAC or 125 VDC. The PAM monitors are served by RG11 A/U triax modules added to penetrations 30 and 37, See notes 6 and 7 on TVA Drawing 45W 860-10 binder TAB E, Section E-3) and penetration circuit tabulation Drawing 45A860-3 and 45A860-37. The GA radiation monitor operates at 875 VDC bias voltage and requires a minimum insulation resistance of 1×10^9 ohms.

These instrumentation and indication penetrations are not assigned any rated current. Loads served carry 1 ampere or less, with most in the milliamp range. These small currents cause essentially no heat rise or other stress in the penetrations.

Electrical penetrations are not frequency sensitive and have no accuracy requirements themselves. Loop accuracy for the end devices served is addressed in the individual device binder.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(c)

Parameter	Demonstrated Conditions	Reference	
			R1
Voltage	300 VDC	IPS-752, Sec. 5.14.3.1 and 5.14.5.1	
Load	50 mA for 16 AWG	IPS-752 Sec. 5.14.5.1	
Frequency	NA	NA	
Accuracy	NA	NA	
Other(s) Insulation Resistance for TRIAX	1.0E + 10 ohms minimum	IPS-585.2, App. A, Sheet 1	R1
Insulation Resistance for 16 AWG	1.8E + 05 ohms minimum	IPS-585.2, App. A, Sheet 3	

JUSTIFICATION/COMMENTS Devices in Groups 1 through 5 switches, transmitters, RTDs, thermocouples and acoustic monitors - See Sheet 16) operate at 125 volts or less. The 300 volt DBA test voltage represents a 140 percent margin.

The Group 6 PAM monitors are the only divisional devices served by these penetrations Triax circuits that must operate after a DBA. Conax performed a baseline dielectric strength test on the Triax module at 5.0kVAC for 1 minute (IPS-752, Sec. 5.4.4) and a post-DBA test at 3.0 KVAC for 5 minutes (IPS-752, Sec. 5.4.4) and a post-DBA test at 3.0 KVAC for 5 minutes (IPS-752, sec. 5.14.6.3) with no breakdown. This shows the basic insulation rating is well over 1000 volts and remains that good after 40 years thermal and radiation aging and a DBA much more severe than the maximum postulated at Watts Bar. During the DBA test, the insulation resistance was measured at 500 VAC on 11 occasions with values ranging from 1.0E+10 to 4.0E+11 ohms (IPS-752, sec. 5.14.5.2), which exceeds the requirement of 1.0E+09 ohms. The first measurement was made at 5 hours with the temperature over 330°F and the pressure over 50 psig, in excess of the peak Watts Bar values. During the DBA test, Conax energized the triax with 300 VDC with maximum measured leakage current of 0.13 milliamps (IPS-752, sec. 5.14.5.1). Assuming leakage current is R1

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

JUSTIFICATION/COMMENTS (Continued)

proportional to voltage in this small range indicates a leakage current maximum of 0.38 milliamps at 875 VDC, which is acceptable. Since the triax module passed the post-DBA tests at 3.0 KVAC center conductor to shield with no signs of insulation failure and the insulation resistance values and leakage currents measured during the DBA indicate no problem would be experienced at 875 volts, the triax module is qualified for this service. This is additionally proven by other tests Conax has performed on the same triax modules using 1000 volts during DBA testing. These tests are documented in Conax Qualification Report IPS-1334 and Test Report IPS-1054, which Conax furnished TVA to qualify triax penetrations for identical GA radiation monitors at Sequoyah Nuclear Plant. Those triax modules were originally furnished on Watts Bar Contract 76K61-87064 along with the rest of the penetrations covered in this binder and were transferred to Sequoyah as discussed in Sequoyah Binder SQNEQ-PENE-005. R1

Devices in Groups 1 through 5 are all served by 16 AWG copper conductors in these penetrations. Group 6 devices are served by RG 11A/U Triax. Group 1 switches are very similar to low voltage power and control devices due to their applications, such as 120 volts at 1 amp. A minimum insulation resistance of 1.8E+05 ohms is acceptable for these applications. Group 5 acoustic monitors do not have accuracy requirements that would be adversely affected by a penetration insulation resistance of 1.8E+05 ohms minimum. See Binder WBNEQ-IXT001. R1

For Groups 2, 3, 4, and 6, adequacy of penetration DBA insulation resistance is covered by Open Item No. 3 in this binder.

Penetration coax conductors, thermocouple conductors, and 14 AWG conductors do not serve any Category A or B divisional devices and therefore they have no DBA electrical requirements.

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BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION	COMPUTED /R1 JWW	DATE 2-16-89	R____ R____
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BINDER NO. WBNEQ-PENT-003	PLANT WBN	UNIT(S) 1	SHEET 18 OF 29
			R 1 R 2
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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 19a

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 2.0E+07

(2) Abnormal Max

(a) Temperature (°F) 130 | R2

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to 8 hours per excursion and occuring less than 1% of plant life. 20°F difference in maximum temperature for this time period is negligible.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a)	Temperature (°F)	327 128° long term	Accident type HELB — R2
(b)	Pressure (psig)	11.2	Accident type LOCA
(c)	Humidity (%)	100	Accident type LOCA/HELB
(d)	Radiation (rd)	1.34E+07 gamma 3.7E+07 beta	Accident type LOCA ~~R1~~ JAA
(e)	Spray Type	Chemical*	Accident type LOCA/HELB

*0.19 molar H_3BO_3, 0.033 molar NaOH, pH 8.3. ~~R1~~ JAA

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): One end of each penetration is exposed to annulus environment. Containment ends are in lower compartment (outermost small rooms), lower compartment instrument room, or upper compartment. Parameters shown are worst case; see Sheet 19a.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: IPS-752, Sections 5.14.3 and 5.14.5).

(7) Subject to submergence (Yes/No/NA)? No (Reference:

See note 5 on environmental drawings for maximum containment water level for flood elevation (EL 717.7 outside crane wall where penetrations are located), and binder TAB A for penetration elevation. Also, see DWG. 45N860-3 in binder TAB E, Section E-2 and field verification in binder TAB F for location). R2

Identify initiation time and duration of submergence: NA

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: See Sheet 19a).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: See Sheet 19a and QIR NEB 86160 (TAB E, Section E-11)

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Section A	

PLUSEQ/92.42

BINDER NO. WBNEQ-PENT-003	PLANT WBN	UNIT(S) 1	SHEET 19a OF 29
			R 1 R 2
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AREA/ENVIRONMENTAL DWG SUMMARY

	Upper Compartment (47E235-41)**	Lower* Compartment (47E235-42)**	Annulus (47E235-44)	Instrument Room (47E235-45)**	
Max Normal Temperature, °F	110	120(1)	110	75	R2
Max Abnormal Temperature, °F	120	130	120	120	
Max Normal Pressure, PSIG	0.3	0.3	ATM(-)	0.3	
Max Abnormal Pressure, PSIG	0.3	0.3	ATM(-)	0.3	
Max Normal R.H. %	80	80	80	60	
Max Abnormal R.H. %	90	100	90	90	
40-Yr Normal (gamma) Radiation, Rads	1.0E+06	2.0E+07	1.0E+06	3.5E+05	
Peak Accident Temperature, °F	161	327	134	327	
Peak Accident Pressure, PSIG	11.2	11.2	ATM(-)	11.2	
Accident (gamma) Radiation, Rads (beta)	1.34E+07(3) 3.7E+07(2)	1.0E+07 3.7E+07(2)	1.2E+07 included	1.0E+07 3.7E+07(2)	
Total 40-Year Plus Accident Radiation, Rads	5.14E+07 gamma plus beta	6.7E+07 gamma plus beta	1.3E+07 gamma plus beta	4.735E+07 gamma plus beta	

* Fan rooms and accumulator rooms (outermost small rooms).
** These drawings have been modified by DCN P-04104-C. |R2

(1) Documented average temperature is 105°F.
(2) See QIR release NEB 86160 (TAB E, Section E-11)
(3) See Calculation TI-RPS-48, Sheet 7.19.

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	CHECKED OM	DATE 9/18/86 [illegible] 2-17-89	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Data Base 3,4 Demonstrated	IPS-752 Reference	
Operating Time	100 days	13 days, 15 days	Fig. 5.14.2 & 5.14.3	R1
Temperature (°F)	327	400,395	Fig. 5.14.2 & 5.14.3	
Pressure (psig)	11.2	70,80	Fig. 5.14.2 & 5.14.3	R1
Relative Humidity (%)	100	100,100	Fig. 5.14.2 & 5.14.3	
Chemical Spray*	0.19 molar H_3BO_3 0.033 molar NaOH pH 8.3	6200 ppm boron 50 ppm Hydrazine & Trisodium Phosphate, pH 9.23	Section 5.14.10.2	R1
Radiation (rd)**	6.7E+07 gamma plus beta	0.989E+08 gamma (air) 0.709E+08 gamma (air)	5.7.16 & 5.7.22	R1
Submergence	None	None	NA	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	IPS-752 Reference
Temperature	Yes	Fig. 5.14.2 & 5.14.3
Pressure	Yes	Fig. 5.14.2 & 5.14.3
Relative Humidity	Yes, See Sheet 20B	Fig. 5.14.2 & 5.14.3
Chemical Spray	NA	Section 5.14.10.2
Submergence	NA	

JUSTIFICATION/COMMENTS

L(1) Chemical Spray - Specified containment spray is 30 days and the flow rate is 0.92 gpm/ft^2. Spray chemistry varies with

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

JUSTIFICATION/COMMENTS (Continued)
time. Parameters shown are a composite resultant concentration. All of these penetrations are enclosed in junction boxes and are not subject to direct chemical spray impingement. All penetrations except No. 25 (which is nondivisional) are additionally protected from chemical spray by the concrete floor slab above them. These physical barriers negate the effect of spray flow rate and difference in spray chemistry. Also see TAB B, sheet 7A, Justification/Comments for G(1)(e) and G(2).

L(1) Radiation - Worst case total radiation is in lower compartment. See Sheet 19a.

L(2) Temperature - As is seen in TAB C, Section C-1, Report WAC-344, the test profiles do not envelop the WBN accident profile for R2
approximately the first 100 seconds. This exists due to starting at a lower temperature and the difficulty in getting the temperataure to rise in the steam chamber as fast as the WBN accident profile does, a common problem in steam tests. Report WAC-344 does not include the first test temperature transients. R2
This extra transient and the significantly higher test temperatures compensate for the slightly slower transient rise times. Also, as noted in IPS-752, Section 5.14.10.1, testing without a terminal box is more severe than with the box due to thermal lag and dew point effects, associated with the box. Thus, this small deviation in the profiles for the first few seconds is not significant.

L(2) Relative Humidity - Conax test reports do not state the humidity in the environmental chamber during DBE testing. The relative humidity was not maintained at 100% throughout the entire tests conducted by Conax, but did occur at various times. Because the test profiles were a combination of both the LOCA and HELB conditions, saturated steam, obviously, could not be the test medium throughout. However, portions of the tests were performed under saturated steam, while the HELB conditions were simulated by low humidity superheated steam. Both the temperatures and pressures used throughout the tests were well in excess of maximum Watts Bar values which is conservative for electrical penetrations. R2

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Page B-39 was deleted per revision 2 .

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	>15°F	Yes
Pressure: +10% but no more than 10 psig	>10 psig	Yes
Radiation: +10% of accident dose	>10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See Note 1	Yes
Voltage: ±10% of rated value	See Note 2	Yes
Frequency: ±5% of rated value	0	No
Environmental Transient: the initial transient and the peak temperature applied twice	Transient applied twice	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS Electrical penetrations are not frequency sensitive in this range and frequency margin is not required by IEEE 317-1976.

Note 1: Material Aging Calculation Report WAC-344 in binder TAB C shows the time margin (conservatism factor) far exceeds 10%. Note 2: Voltage margin was 150% of maximum plant voltage for size 16 AWG and 14 AWG conductors used for instrumentation and indication service. Margin was 0 for coax and triax conductors. See discussion on sheet 17a. R2

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference IEEE 317-1976).

JUSTIFICATION/COMMENTS Maintain pressure boundary and electrical integrity.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-752, Sec. 5.14.3, 5.14.4, 5.14.5, and 5.14.6).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-752, Sec. 5.14.3, 5.14.4, 5.14.5, 5.14.6).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.14.10.1.C).

JUSTIFICATION/COMMENTS Tests were for 13 and 15 days. See analysis extending time to 100 days in IPS-752, Sec. 5.14.10.1.C.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (Yes/No/NA)? Yes
(Reference: ______________________________).

JUSTIFICATION/COMMENTS

No anomalies were reported in IPS-752 for test data bases three and four. IPS-585.2, Sec. 5.2.6.6.1 does report shipping damage that was the probable cause of eventual problems with the 14 AWG feedthru in test data base four; see IPS-752, Sec. 5.3.3.1. This is reasonable since no problems were experienced with the 16 AWG feedthru of the same design and construction. Also 14 AWG feedthru was included in test data base one and was fully qualified as documented in IPS-752. At Watts Bar 14 AWG conductors do not serve any Category A or B divisional devices. See Sheets 17 through 17a. The minimum measured insulation resistance for 16 AWG during DBE was 1.8E x 05 ohm. Adequacy of this value for WBN applications is covered by open item No. 3 in this binder. RG-59 coax and thermocouple conductor types do not serve any Category A or B divisional devices and their DBA electrical characteristics do not need to be addressed. R1 R1

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			R	R
BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION	COMPUTED ODD	DATE 9/16/86		
	CHECKED Dry	DATE 9.20.86		

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA (No exceptions taken)
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (Preaging performed)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

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BINDER TITLE CONAX ELECTRICAL COMPUTED DDD DATE 9/15/86

PENETRATION, INSTRUMENTATION & INDICATION CHECKED Am DATE 9.18.86

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA (See TAB B Sec. L(2))
(11) Criteria regarding submergence satisfied?	NA (Penet. not submerged)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA (Penet. qualified for 100 days)
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

Conax Report IPS-752 is the qualification document for these penetrations. The penetrations contain the identical possible leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as the test data base penetrations number three and four described in IPS-752. Detailed raw test data for the tested assemblies is contained in IPS-585.2 and IPS-585.4. IPS-752 is a

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BINDER TITLE CONAX ELECTRICAL COMPUTED ODD DATE 9/15/86

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P. DISCUSSION (Continued)

summary document of the reports on the tested assemblies. It is a very thorough summary and is the document submitted by Conax Corporation as the key qualification report for the subject penetration assemblies.

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SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Penetration type	Instrm. & Indication	Instrm. & Indication	Yes	Tables 4.3&4.4
(b) Mounting	Welded	Welded & Bolted	Yes	Tables 4.3&4.4
(c) External connections	Connectors or Splices	Connectors or Splices	Yes	Tables 4.3&4.4

Comments: Conax test was of similar items with supporting analysis per IPS-752, Sec. 1.0. TVA provides the in-line splices.

(2) Does the qualification report identify the following performance characteristics:

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(a) Temperature rating	Yes	5.7.24.2
(b) Voltage rating	Yes	5.4.3 & 5.4.4
(c) Continuous current rating	NA	5.9.4
(d) Short-time overload current rating & duration	NA	5.10.3
(e) Rated short circuit current & duration	NA	5.11.3
(f) Pressure rating	Yes	5.1 & 5.2

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EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(g) Maximum gas leakage rate	Yes	5.1.3 & 5.1.4

Comments:

(3) Does the Qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Continuous current rating	NA	5.9.4
(b) Short-time overload current rating and duration	NA	5.10.3
(c) Short circuit current rating and duration	NA	5.11.3
(d) Rated maximum duration of rated short circuit current	NA	5.15.6
(e) Pneumatic pressure rating	Yes	5.2
(f) Maximum gas leakage rate	Yes	5.1.3 & 5.1.4
(g) Conductor continuity	Yes	5.3.1
(h) Dielectric strength	Yes	5.4.3 & 5.4.4
(i) Impulse	NA	NA
(j) Insulation resistance	Yes	5.5.3 & 5.4.4
(k) Flame	Yes	6.3

Comments: Impulse tests not require for low voltage penetrations per IEEE 317-1976.

TVA 19537 (OE-3-86)

SUPPLEMENTAL INFORMATION
TVA'S COMPLIANCE TO 10CFR50.49 - ENVIRONMENTAL QUALIFICATION
OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY
FOR NUCLEAR POWER PLANTS
VOLUME 5

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BINDER TITLE SOLENOID VALVES		COMPUTED	RJP	DATE	7/7/86	R	
TARGET ROCK - MODELS 79AB-001 AND 79AB-003		CHECKED	SS	DATE	7/10/86		

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TAB A

EQUIPMENT IDENTIFICATION

EQP357.41

TVA

W A T T S B A R N C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -068-0394 -A REACTOR VESSEL HEAD VENT ISLN VALVE	1-FSV -068-0394 -A 79AB-001	050	741' 8" 71C62-54114-1	LC	A A A A A	100D 100D 100D 1HO 1HO	L MS/C FW/C RH/C CV/C	SOLENOID VLV MUST OPERATE TO RELEASE NONCONDENSABLES FROM REACTOR VESSEL HEAD
WBN-1-FSV -068-0395 -B REACTOR VESSEL HEAD VENT ISLN VALVE	1-FSV -068-0395 -B 79AB-001	045-30	742' 3" 71C62-54114-1	LC	A A A A A	100D 100D 100D 1HO 1HO	L MS/C FW/C RH/C CV/C	SOLENOID VLV MUST OPERATE TO RELEASE NONCONDENSABLES FROM REACTOR VESSEL HEAD
WBN-1-FSV -068-0396 -B REACTOR VESSEL HEAD VENT THROTTLE VALVE	1-FSV -068-0396 -B 79AB-003	060	742' 6" 71C62-54114-1	LC	A A A A A	100D 100D 100D 1HO 1HO	L MS/C FW/C RH/C CV/C	SOLENOID VLV MUST OPERATE TO RELEASE NONCONDENSABLES FROM REACTOR VESSEL HEAD
WBN-1-FSV -068-0397 -A REACTOR VESSEL HEAD VENT THROTTLE VALVE	1-FSV -068-0397 -A 79AB-003	063	742' 3" 71C62-54114-1	LC	A A A A A	100D 100D 100D 1HO 1HO	L MS/C FW/C RH/C CV/C	SOLENOID VLV MUST OPERATE TO RELEASE NONCONDENSABLES FROM REACTOR VESSEL HEAD

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			R 1	R	R
PREPARER/DATE	RJP	7/7/86	ajm 2/23/89		
CHECKED/DATE	SRP	7/10/86	KBR 3/21/89		

TAB A

NOTES

1. Floor/Actual Elevation - All elevations shown are actual elevations as documented on field verification sheets found in TAB F.

2. See TAB B, Section A for Category and Operating Times Calculations used in this binder.

3. Contract Column - Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

BINDER NO. WBNEQ-SOL -001	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1				
BINDER TITLE SOLENOID VALVES	COMPUTED RSP	DATE 7/7/86	R	R
TARGET ROCK - MODELS 79AB-001 AND 79AB-003	CHECKED GP	DATE 7/10/80		

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TAB B

CHECKLIST FOR EVALUATION OF ENVIRONMENTAL QUALIFICATION

EQP357.41

TVA

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 1 OF 24
			R 1 R
BINDER TITLE SOLENOID VALVES TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP	DATE 7/15/86	2/23/89
	CHECKED SRP	DATE 7/15/86	3/21/89

A. DOCUMENTATION

Equipment Description: Solenoid Valves

Vendor/Manufacturer: Target Rock

Equipment Model No.(s): 79AB-001

79AB-003

QUALIFICATION REPORTS

(1) Title/Number/Revision Equipment Qualification Data Package/EQDP-HE-10A/Revision 2 RIMS B45 851205 360 DATE January 1985

(2) Title/Number/Revision Equipment Qualification Test Report/WCAP-8687,Supp.2-H10A/R2 RIMS B45 851205 364 DATE January 1985

(3) Title/Number/Revision Equipment Qualification Data Package/EQDP-HE-10C/Revision 1 RIMS B45 851205 359 DATE January 1985

(4) Title/Number/Revision Equipment Qualification Test Report/WCAP-8687,Supp.2-H10C/R1 RIMS B45 851205 362 DATE January 1985

NOTE: Throughout this binder, references are made to the above qualification reports which may be identified as "(1)", "(2)", "(3)", or "(4)" as shown in these references.

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(5) Target Rock Test Report No. 4207 (B71 860616 101) (TAB C, Section C-2)

(6) Target Rock Letter No. TRC C5815 (B70 851121 004) (TAB C, Section C-1)

(7) Target Rock Letter No. TRC C5702 (B71 860616 102) (TAB E, Section E-2)

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A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(8) Target Rock Drawing 79AB-001 (TAB I, Section I-1)

(9) Target Rock Drawing 79AB-003 (TAB I, Section I-2)

(10) Target Rock Letter dated May 21, 1986, Rims No. B71 860602 001 with attachments (TAB C, Section C-2)

(11) WBNP Environmental Data Drawing 47E235-42 R2 with DCAs P-04104-02-0, -03-0, -05-0 R2

(12) Calculation TI-RPS-048 R2 (B45 851105 235), Integrated Accident Dose I/C

(13) Calculation WBNNAL3-004 R0 (B45 860205 235), Accident Dose Inside Reactor Building

(14) DNE Calculation WBNTSR-051 (B26 891129 202), Reduction of Beta Dose by Sheet Steel

(15) Category and Operating Times Calculation WBNOSG4-017 ~~R11~~ R10 (~~B18 900612 252~~) B18 890828 251 R2

(16) Calculation WBNOSG4-045 R1 (B45 860902 219), Status and Duty Cycles of Solenoid Valves

(17) DNE Calculation WBN-EEB-MS-TI11-0004 R0 (B26 900202 407) "125 VDC Voltage Analysis" R2

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

(1) DELETED PER REVISION 2.

(2) DELETED PER REVISION 2. R2

(3) Deleted per revision 2.

COMMENTS/RECOMMENDATIONS

R2

BINDER NO. WBNEQ-SOL-001 PLANT WBN UNIT(S) 1 SHEET 3 OF 24

BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003

COMPUTED RJP DATE 7/7/86 R ___ R ___

CHECKED SP DATE 7/10/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulleting No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 382-1972 "IEEE Trial Use Guide for Type Test of Class I Electric Valve Operators for Nuclear Power Generating Stations"

IEEE 323-1974 "IEEE standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations"

IEEE 344-1975 "Guide for Seismic Qualification of Class IE Electrical Equipment for Nuclear Power Generating Stations"

TVA EQP357.21

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS ___

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 5 OF 24		
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJL	DATE 7/7/86		R	R
	CHECKED	DATE 7/10/86			

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Solenoid Valve	Solenoid Valve	Ref. (2) & (4) Sect. 2.0
(2) Manufacturer	Target Rock	Target Rock	Ref. (2) & (4) Sect. 2.0
(3) Model Number(s)	79AB-001	79AB-001	Ref. (2), Sect. 2.0
	79AB-003	79AB-003*	Ref. (4) Sect. 2.0
(4) Serial Number(s)	See TAB F	55	Sect. 2.0
		Design No. 1032110-4	Ref. (1) Sect. 2.1
	See TAB F	Design No. 1033110-1	Ref. (4) Sect. 2.0

(5) Identify Component-Unique checksheet attached: None

JUSTIFICATION/COMMENTS In references (2) and (4), Section 2.0, Westinghouse lists solenoid valve design identification numbers that are considered generically qualified by these reports. The Westinghouse solenoid valve design number (WNEED Tag No.) as specified on the valve drawings contained in TAB I and listed in the aforementioned references are as follows:

Target Rock Model No.	WNEED Tag No.
79AB-001	1IS88RA
79AB-003	1RS78RA

*The controllers for the Model 79AB-003 modulating valves are located in the Auxiliary Building in a mild environment in the Control Rod Drive Equipment Room, room No. A1.

TVA EQP357.21

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 6 OF 24
			R 1 R
BINDER TITLE SOLENOID VALVES TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP	DATE 7/07/86 GJM 2/23/89	
	CHECKED SRP	DATE 7/10/86 KBN 3/21/89	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. R1

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA		
Conduit Seals	Conax Seal Used	Yes	Ref. (2), Sect 5.8 Ref. (4), Sect 6.9
Connector Seals	NA		
Orientation	NA		Ref. (1), Sect. 1.2 Ref. (3), Sect. 1.2
Physical Configuration	NA		
Other	NA		

JUSTIFICATION/COMMENTS Refer to QMDS Section B.1 for Conax seal to be used as required by TVA Environmental Qualification Binder No. WBNEQ-CSC-001.

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 7 OF 24	R	R
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP	DATE 7/16/86			
	CHECKED SRP/DK	DATE 7/16/86			

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Ref. (2) & (4) Sect. 5.3
(b) Baseline performance measurements taken	Yes	Ref. (2) & (4) Sect. 5.3 & Tbl 2
(c) Equipment aged:		Ref. (2), Sect. 5.4.2
Thermal	Yes	Ref. (4), Sect. 5.4
		Ref. (2), Sect. 5.5.1
Radiation	Yes	Ref. (4), Sect. 5.5
Wear		Ref. (2), Sect. 5.4.1 & Sect. 5.4.2
	Yes	Ref. (4) Sect. 5.4
(d) Vibration/seismic testing conducted	Yes	Ref. (2) & (4), Sect. 5.6
(e) Design basis event (DBE) exposure	Yes	Ref. (2) & (4), Sections 5.7 & 5.8
(f) Post-DBE exposure	Yes	Ref. (2) & (4) Sect. 5.8
		Ref. (2), Sect. 6.5
(g) Final inspection and disassembly	Yes	Ref. (4), Sect. 5.8

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes (See comment on sheet 7A).

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? No (See comment on sheet 7B). (Reference Ref. (2) & (4), Table I).

COMMENT FOR SECTION G(2):

Model 79AB-001: 2 reed switches and cover-to-body gasket were repaired (Ref. (2), Section 6.5, Pg. 20). Silicone potting around reed switches had worked loose due to handling and gasket had been broken during disassembly. Switches were repotted and gasket was repaired with RTV and the entire solenoid valve was then subjected to the steam/spray exposure.

Model 79AB-003: Same valve was used. However, during the HELB simulation the LVDT failed and the terminal board shorted to ground. These failures were attributed to the fact that the caustic spray/steam combination had entered the unsealed conduit connection, since the LVDT did not show insulation degradation due to thermal aging, radiation aging or cyclic aging. This assumption was proven correct when a new, unaged LVDT was installed in the test valve and degraded in the same manner, and at an equivalent time into the HELB test, as the fully aged LVDT. The second test showed that the degradation was not an aging related phenomenon, but rather a result of the HELB test environment entering the electrical compartment and attacking the insulation of the LVDT. After installation of new LVDT, terminal board, terminal board strip marker, cover gasket, and Conax conduit seal to prevent HELB test environment intrusion, the test was successfully completed (Ref. (4), Sect. 6.9).

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		CHECKED SJP	DATE 7/15/86				

COMMENT FOR SECTION G(3):

A list of instrumentation used in testing is attached to qualification report Ref. (2) as Table I; however, accuracy and calibration are not mentioned. In Ref. (4), Table 1 lists equipment and calibration dates but accuracy is not addressed. Even though Westinghouse failed to provide the aforementioned information, it does not significantly impact the qualification status of the valves in this binder, due to the fact that the qualification tests would still envelop the WBN requirements even if an instrumentation inaccuracy as high as 5% was present during testing.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Ref. (2), Sect. 4.1.2 & Ref. (4), Sect. 5.4).

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Ref. (2), Sect. 4.1.2 Ref. (4), Sect. 5.4
Radiation exposure	Yes	Ref. (2), Sect. 4.1.3 Ref. (4), Sect. 5.5
Vibration (non-seismic) aging	Yes	Ref. (2), & (4), Sect. 5.6.1
Operational (electrical/mechanical/process) stress aging	Yes	Ref. (2), Sect. 5.4.1 Ref. (4), Sect. 5.4

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference Ref. (2), Section 5.1).

JUSTIFICATION/COMMENTS Ref. (4) did not address synergistic effects, however, since similarity of Model 79AB-001 to Model 79AB-003 is documented by Target Rock Letter No. C5815 (see TAB C, Section C-1, Attachment 6) it is safe to conclude that both model valves would not have any synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (Yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.4.2 & Ref. (4), Sect. 5.4).

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes*/No** (Reference: *Ref. (2),Attachment 3).

JUSTIFICATION/COMMENTS **Ref. (4), Sect. 5.4 and 7.3.5.

Value of 0.5 eV was assumed for all valve components.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.4.2 & Ref. (4), Sect. 5.4).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.4.2 Ref. (4), Sect. 5.4).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F	325°F	120°F
Time	40 Years	485hrs	6.16 yrs.

JUSTIFICATION/COMMENTS References (2) and (4) state that the thermal aging performed during the tests corresponded to 6.16 years at 120°F assuming an activation energy of 0.5eV. We prove a longer life in TAB C.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.4.2 & Ref. (4), Sect. 5.4).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? No (Reference Ref. (2), Att. 3 & Ref. (4), Sect. 5.4).

JUSTIFICATION/COMMENTS Westinghouse conservatively assumed an activation energy of 0.5 eV for all valve materials.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? N/A (Reference ______________).

JUSTIFICATION/COMMENTS ______________

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.4.2 & Ref. (4), Sect. 5.4).

JUSTIFICATION/COMMENTS Both the Model 79AB-001 and Model 79AB-003 were cycled more than 4,850 times during thermal aging.

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.5.1 & Ref. (4), Sect. 5.5).

JUSTIFICATION/COMMENTS ______________

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes*/No** (Reference *Ref. (2), Attachment 3).

JUSTIFICATION/COMMENTS **Ref. (4) radiation qualification by test.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Ref. (2), Sect. 5.5.1 & Ref. (4), Sect. 5.5).

JUSTIFICATION/COMMENTS ______________

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Ref (2), Sect. 5.7 & Ref (4), Sect. 5.5).

Plant normal ambient radiation dose (rd): 2×10^7 rads

Test exposure dose (rd): *185 Megarads (Mod 79AB-001) *205.1 Megarads (Mod 79AB-003)

Test exposure dose rate (rd/hr): 1.46 Mrad/Hr (Mod 79AB-001) .67&.75 Mrads/Hr (Mod 79AB-003)

Test exposure source type (e.g., Co-60 gamma): Co-60 GAMMA

JUSTIFICATION/COMMENTS The tested values of 185 Mrads and 205.1 Mrads exceed plant TID of 1.34×10^8 rads (see sheet 18A). R2

Westinghouse, who designed and installed the head vent system, determined the radiation dose rates necessary for qualification of these valves to be 1.75×10^7 rads GAMMA for a 40 year TID or a 10 year dose of 8.76×10^5 rads GAMMA combined with a 10 year neutron dose of 3.15×10^{13} N/cm^2 (reference (2), Att. 2, page 49). The test enveloped the requirement in that it consisted of both a 40 year TID of 1.85×10^8 rads GAMMA and a 10 year Neutron dose of 3.52×10^{13} N/cm^2.

H. AGING (continued)

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference:

Ref. (2) & (4), Sect. 5.6.1).

JUSTIFICATION/COMMENTS

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Ref (2), Sect. 3.1.6, 5.6.1, and Fig 1

Ref. (4), Sect. 3.1.5, 5.6.1, and Fig. 1).

JUSTIFICATION/COMMENTS The vibration aging documented in Ref. (2) & (4) is identical to that in IEEE 382-1980. Vibration aging testing provides a vibratory environment which is representative of normal plant-induced vibration. Normal service flow vibration is not significant for the valves in the binder because vessel head venting is performed only during an accident or after refueling.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: Ref. (2) & (4), Sect. 5.4).

JUSTIFICATION/COMMENTS

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

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MODELS 79AB-001 AND 79AB-003	CHECKED SRP	DATE 7/15/86	KBN 3/21/89

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Rev. (2) & (4) Sects. 3.4 & 5.4).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: Ref (2),Sect. 5.4.2 & Ref. (4), Sect. 5.4).

Qualified life (Document in QMDS) 40 years*

JUSTIFICATION/COMMENTS *Providing the elastomers are changed at intervals specified in the QMDS. Westinghouse conservatively qualified the valves for 6.16 years. We have extended elastomer life to 17.3 years using the rationale listed in TAB C.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: Ref. (2), Sect. 6.5 & Ref. (4), Sect. 6.9, p 23).

|R1

JUSTIFICATION/COMMENTS The tests qualify the complete valves for 6.16 years based on a very conservative activation energy of 0.5 eV. We prove a longer qualified life in TAB C, of the binder. Also, Section 6.5 of Reference (2) and Section 6.9 of Reference (4) require the cover gasket to be replaced every time it is disturbed or the cover is removed.

BINDER NO. WBNEQ-SOL-001 PLANT WBN UNIT(S) 1 SHEET 13 OF 24

R ___ R ___

BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003 COMPUTED RJP DATE 7/7/86

CHECKED SJP DATE 7/10/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Class H Insulation/ Solenoid Assy. & LVDT	NA		See Below	Ref. (2), Att. 3 Ref. (4), Sect. 5.4 TRC Letter C5815
(b)	Silicone Rubber (RTV)/ Seal/Potting	NA		See Below	Ref. (2), Att. 3 Ref. (4), Sect. 5.4
(c)	Silicone Rubber/Gasket	NA		See Below	Ref. (2), Att. 3 Ref. (4), Sect. 5.4
(d)	Silicone Rubber/O-Ring	NA		See Below	Ref. (2), Att. 3 Ref. (4), Sect. 5.4
(e)	GP Phenolic/Term. Board	NA		See Below	Ref. (2), Att. 3 Ref. (4), Sect. 5.4

JUSTIFICATION/COMMENTS Although Reference 4 does not provide a detailed list of the materials of construction, Target Rock Letter No. TRC C5815 (see Attachment 6, TAB C, Section C-1) states that the materials of construction are the same for Models 79AB-001 and 79AB-003 except for the LVDT which is contained only in the Model 79AB-003 valve. The LVDT in the Model 79AB-003 valve is constructed of Class H insulation which is listed above. Also, it should be noted that in the above references, Westinghouse assigned a conservative value of 0.5 eV to the entire valve. Refer to TAB C, Section C-1, Attachments 1 and 3.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Ref. (2) & (4), Sect. 5.1).

Identify Acceptance Criteria: Valve model 79AB-001 must shift position under all postulated conditions at maximum and mininum differential pressure upon application of 90-140 VDC power and shift to closed position when power is removed. Valve model 79AB-003 must position proportionally to a 4-20 mA signal corresponding to fully closed and open and with either a loss of power or a signal from the controller return to fully closed and remain closed at any value between the maximum and minimum pressure differential. Position indication must indicate valve states under all conditions.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Ref. (2) & (4), Sect. 5.3).

Identify baseline and functional testing: Hydrostatic proof tests, seat leakage test, operational performance test, insulation and solenoid resistance tests.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Ref. (2), Sect. 4.1.6, 5.7, 5.8, & 6.5 & Ref. (4) Sect. 4.1.6, 5.7, 5.8, & 6.9).

JUSTIFICATION/COMMENTS The valves were connected to high pressure lines and cycled under pressure thoughout the DBE, thermal aging, cyclic aging, and vibration aging exposures.

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference Ref. (2) & (4), Sect. 5.3)

JUSTIFICATION/COMMENTS Model 79AB-001: Voltage was varied from 55-140 VDC. Valve was under process pressure of 2485 psig. Model 79AB-003: Valve was cycled via controller from fully closed (4mA input to controller) to fully opened (20 mA) while valve was under process pressure of 2500 psig.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	125 VDC	TVA Drawing 45W600-68-2 R2
Load	1.0 Amps (Max) @ Any Condition	T.R. Dwgs 79AB-001 & 79AB-003
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	84.37 VDC Min.	See comments
Load	See J(5)(a)	
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS DNE Calculation WBN-EEB-MS-TI11-0004. R2

SEE TAB C, SECTION C-2 "ACCIDENT VOLTAGE VS OPERATION" FOR JUSTIFICATION OF OPERATION UNDER SUPPLIED VOLTAGE DURING AN ACCIDENT. R2

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BINDER TITLE SOLENOID VALVES TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP	DATE 7/07/86		[illegible] 2/23/89	[illegible] 8/24/90
	CHECKED SRP	DATE 7/10/86		KBN 3/21/89	[illegible] 8/24/90

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	90-140 VDC	Ref.(1)&(3) Sect. 1.1.1, Ref.(2) SECT. 5.1 & 6.5 REF.(4) SECT. 5.8 R2
Load	NA	Ref. (1)&(3) Sect. 1.1.3
Frequency	NA	Ref. (1)&(3) Sect. 1.1.2
Accuracy	NA	
Other(s)		
	NA	

JUSTIFICATION/COMMENTS THE CONDITIONS LISTED WERE DEMONSTRATED DURING HELB TESTING. IN REFERENCE (2) WESTINGHOUSE STATED THAT THE VALVE WAS ACTUATED DURING THE TEST WITH THE APPLICATION OF 90-140V DC. IN REFERENCE (4) WESTINGHOUSE STATED THAT THE VALVE WAS CYCLED DURING THE HELB TEST UTILIZING A VOLTAGE OF 90 V DC. ALSO, DRAWING NO. 79AB-003 STIPULATES THAT VOLTAGE DROP BETWEEN THE CONTROLLER AND VALVE SHALL NOT EXCEED 2.5 VOLTS AT 1 AMP COIL CURRENT DRAIN. DUE TO THE DISTANCE BETWEEN THE CONTROLLER AND VALVE (488 FT. FOR 1-FSV-68-396), WE EXPECT A VOLTAGE DROP OF 3.33 VOLTS. PER TARGET ROCK'S LETTER NO. C652 (SEE SECTION E-4), WHICH WAS WRITTEN FOR CONDITIONS AT SQN, THIS WILL NOT INTERFERE WITH OPERATION OF THE VALVE EXCEPT POSSIBLY AT WORST-CASE CONDITIONS WHERE VALVE MAY BE ABLE TO OPEN ONLY 90 PERCENT. SINCE VALVE Cv IS HIGHER THAN SPECIFIED, REDUCED FLOW IS NOT A PROBLEM. R2

SEE TAB C, SECTION C-2 "ACCIDENT VOLTAGE VS OPERATION" FOR JUSTIFICATION OF OPERATION UNDER SUPPLIED VOLTAGE DURING AN ACCIDENT.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	120	(a) Temperature (°F)	130
(b) Pressure (psia)	14.7	(b) Pressure (psia)	14.7
(c) Humidity (%)	80	(c) Humidity (%)	100
(d) Radiation (rd)	$2x10^7$ TID	(d) Radiation (rd)	N/A

(3) Process Interfaces: The temperature of the process fluid dead-headed against the Model 79AB-001 valves could be the only interface with a significant impact. Since the process fluid is non-condensable gases, which would cool to ambient temperature by the time it reaches the valves through over 50 feet of one inch pipe, it is safe to conclude that the process fluid temperature would have no detrimental effect on the valves.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Will occur less than 1% of plant life and could exist for up to 8 hours per excursion.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327	Accident type	LOCA/HELB
(b) Pressure (psia)	25.6	Accident type	LOCA/HELB
(c) Humidity (%)	100	Accident type	LOCA/HELB
(d) Radiation (rd)	$7.4x10^7$(BETA)* $4x10^7$(GAMMA)*	Accident type	LOCA/HELB
(e) Spray Type	2000 ppm Boron pH 8.3	Accident type	LOCA/HELB

R2

* See comment on Sheet 18A.

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K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): The duration of the containment spray is 30 days. Containment spray flow rate is equal to 9500 Gal/Min or 0.92 GPM per square foot of containment cross section.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: See comment on sheet 17A).

(7) Subject to submergence (Yes/No/NA)? No (Reference: Dwg. 47E235-42). R1

Identify initiation time and duration of submergence: Following an accident inside primary containment, only those valves below elevation 722' are subject to submergence. All valves in this binder are above that elevation.

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: TAB B, Section L(1)).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: See TAB B, Section L(1) R1

(9) Special environmental calculations (temp., rad., etc.)

Type RIMS No.

See TAB B, Section A for a listing of all calculations used in this binder.

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1		SHEET 17A OF 24	R	R
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP		DATE 7/7/86			
	CHECKED SRP		DATE 7/10/86			

COMMENTS FOR SECTION K(6):

All valves in this binder have Conax conduit seals installed. Refer to QMDS Section B.1 (Binder TAB G) for Conax seal to be used as required by TVA Environmental Qualification Binder No. WBNEQ-CSC-001.

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 18 OF 24 R 2 R
BINDER TITLE SOLENOID VALVES TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP CHECKED SRP/AWT	DATE 9/05/86 DATE 9/08/86	[illegible] 8/24/90 [illegible] 8/24/90

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 Days	30 Days	Ref. (2)&(4) Sect. 5.8
Temperature (°F)	327°F	435°F(79AB-001) 500°F(79AB-003)	Ref. (2), Sect. 5.8 & Fig. 16 Ref. (4), Fig. 15
Pressure (psig)	25.6 psia (11.2 psig)	57 psig (79AB-001) 70 psig (79AB-003)	Ref. (1), Tbl 1, p 16, Ref. (3), Tbl. 1 p 14
Relative Humidity (%)	100%	100%	Ref. (1) & (3), Tbl. 1
Chemical Spray*	2000ppm Boron pH 8.3;$_2$.92 GPM/Ft. 30 Days	2500ppm Boron pH 10.5$_2$.15 GPM/Ft. 23 Hrs	Ref. (2), Sect. 3.3.1&5.8 Ref. (4), Sects. 3.3.2.2 & 5.8
Radiation (rd)**	$1.34x10^8$ (BETA/GAMMA)	$1.85x10^8$ (79AB-001) $2.05x10^8$rads (79AB-003)	Ref. (1)&(3) Tbl.1,Ref.(2)&(4) Att.1&Sec. 5.7
Submergence	N/A	None	N/A

R2

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type. See comment on sheet 18A.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See (1) Above
Pressure	Yes	See (1) Above
Relative Humidity	Yes	See (1) Above
Chemical Spray	Yes	See comment on sheet 18B
Submergence	N/A	N/A

COMMENTS FOR SECTION L(1) (RADIATION):

The 100-day accident radiation doses given by Environmental Data Drawing 47E235-42 are 4.7×10^8 rads BETA and 4×10^7 rads GAMMA. R2
Post-DBA BETA Radiation must be addressed for all equipment located inside containment which is required for LOCA mitigation. The valves in this binder are within that scope. All non-metallic parts of these solenoid valves are enclosed by metal and the minimum metal thickness is the cover, which is .048" thick (18 ga) 300-series stainless steel. DNE Calculation WBNTSR-051 "Reduction of Beta Dose by Sheet Steel," page 3, shows the beta reduction factor for 18-gauge steel is equal to .158. R2 This reduces the total 100-day BETA dose to the valve internal parts to $(4.7\text{x}10^8) \text{ x } (1.58\text{x}10^{-1}) = 7.4\text{x}10^7$ rads TID BETA. R2
In the Lower Compartment, the total combined 100-day BETA and GAMMA accident radiation dose will equal ($7.4\text{x}10^7$ BETA) + ($4\text{x}10^7$GAMMA) = $1.14\text{x}10^8$ rads. The combined 100-day accident radiation plus the 40 year dose ($2\text{x}10^7$rads) equal a total radiation dose of $1.34\text{x}10^8$ rads (BETA/GAMMA). R2 These Target Rock valves are qualified to $1.85\text{x}10^8$ rads for the Model 79AB-001 valves and $2.05\text{x}10^8$ rads for the Model 79AB-003 valves, which envelop the requirement.

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 18B OF 24			R	R
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003		COMPUTED RJP	DATE 9/5/86				
		CHECKED SRP/AWT	DATE 9/8/86				

COMMENTS FOR SECTION L(1) AND (2) (CHEMICAL SPRAY):

Containment spray flow rate is equal to 9500 gal/min or 0.92 GPM per square foot of containment cross section. The chemical spray concentration is 2000 ppm Boron with a pH of 8.3. The test valve was subjected to a spray solution of 2500 ppm Boron with a pH of 10.5. The spray rate was 0.15 GPM per square foot of projected area of the test valve. The test solution is more corrosive than the containment spray. Therefore, all valves listed in this binder fall within the qualification provided by the test valve. Additionally, these valves have gasketed covers and are not susceptible to spray. This was demonstrated by the 23 hour spray test. Since spray or leakage intrusion is not acknowledged to be time dependent in enclosed devices, it can be concluded that the device is qualified for 30 days in spray based on the 23 hour test.

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 19 OF 24 R 1 R 2
BINDER TITLE SOLENOID VALVES TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP	DATE 9/05/86 AMM 2/23/89 AMM 8/24/90	
	CHECKED SRP/AWT	DATE 9/08/86 KBN 3/21/89 CKH 8/24/90	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied (Mod. 79AB-001/Mod. 79AB-003)	Yes/No/NA
Temperature: +15 degrees F	>15°F	Yes
Pressure: +10% but no more than 10 psig	+45.8 psig/ +58.8 psig	Yes
Radiation: +10% of accident dose	+45%/+62%	Yes R2
Time: +10% (or 1 hour + operating time per NUREG-0588)	See Comment Below	No
Voltage: ±10% of rated value	+12% to -56%/ +12% to -28%	Yes
Frequency: ±5% of rated value	NA/NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	+108°F/+173°F	Yes
(Seismic) Vibration: +10% added to acceleration	Ref (2) & (4), Sect. 5.6.3	Yes

JUSTIFICATION/COMMENTS see TAB C, Section C-2, which proves the 30-day test envelops the 100-day post-accident requirement. Voltage variations were applied during testing ranging from 55 VDC minimum to 140 VDC maximum (Model 79AB-001) and 90 VDC minimum to 140 VDC maximum (Model 79AB-003).

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 20 OF 24				
						R	R
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003		COMPUTED RJP		DATE 7/7/86			
		CHECKED GH		DATE 7/10/86			

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See TAB A).

JUSTIFICATION/COMMENTS Solenoids must operate to release non-condensables from reactor vessel head.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Ref. (2), Sect. 6.5 & Ref. (4), Sect. 7.2).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Ref. (2), Sect. 6.5 & Ref. (4), Sect. 6.9).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference).

JUSTIFICATION/COMMENTS See TAB C, Section C-2, "Post-Accident Operability"

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference Ref. (2), Sect. 7.2 & Ref. (4), Sect. 6.9).

JUSTIFICATION/COMMENTS We have reviewed and concur with the disposition of anomalies in the test report. There is no impact on installed equipment.

BINDER NO.	WBNEQ-SOL-001	PLANT	WBN	UNIT(S)	1	SHEET	21	OF	24
BINDER TITLE	SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED	RSP	DATE	7/7/86	R		R	
		CHECKED	SP	DATE	7/10/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS (Ref. (1) & (3), Section 1.4).

See QMDS (TAB G).

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1		SHEET 22 OF 24		R	R
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003		COMPUTED RJL	DATE 7/7/86				
		CHECKED SH	DATE 7/10/86				

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	N/A
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	N/A
(b) Were specific features and failure modes and effects analyzed?	N/A
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	N/A
(d) Were environmental parameters which affect equipment performance identified?	N/A
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 23 OF 24				
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJP	DATE 7/7/86	R ___	R ___
	CHECKED SP	DATE 7/10/86		

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	N/A
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-SOL-001	PLANT WBN	UNIT(S) 1	SHEET 24 OF 24
BINDER TITLE SOLENOID VALVES - TARGET ROCK - MODELS 79AB-001 AND 79AB-003	COMPUTED RJL	DATE 7/7/86	R R
	CHECKED SP	DATE 7/10/86	

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	N/A
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	N/A
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FCV -001-0007 -B SG1 BLOWDOWN FLOW SOL VALVE	1-FCV -001-0007 -B 82AB-001	001	729' 82K22-832045	A01	A/B A/B	(3)/100D 5MN/100D	MS V FW V	MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED TO ISOLATE STEAM GENERATOR
WBN-1-FCV -001-0014 -A SG2 BLOWDOWN FLOW SOL VALVE	1-FCV -001-0014 -A 82AB-001	001	729' 82K22-832045	A01	A/B A/B	(3)/100D 5MN/100D	MS V FW V	MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED TO ISOLATE STEAM GENERATOR
WBN-1-FCV -001-0025 -B SG3 BLOWDOWN FLOW SOL VALVE	1-FCV -001-0025 -B 82AB-001	350	729' 82K22-832045	A01	A/B A/B	(3)/100D 5MN/100D	MS V FW V	MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED TO ISOLATE STEAM GENERATOR
WBN-1-FCV -001-0032 -A SG4 BLOWDOWN FLOW SOL VALVE	1-FCV -001-0032 -A 82AB-001	350	729' 82K22-832045	A01	A/B A/B	(3)/100D 5MN/100D	MS V FW V	MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED TO ISOLATE STEAM GENERATOR
WBN-1-FCV -001-0181 -A SG1 BLOWDOWN ISLN VALVE INSIDE CONTMT	1-FCV -001-0181 -A 82AB-001	349	734'10" 82K22-832045	FN1	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED TO ISOLATE CONTAINMENT

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PREPARER/DATE	RJP 9/9/86	97m 7/24/89		
CHECKED/DATE	R.K. WHITE 9/10/86	ECM 8/24/89		

PRINT D 2/89

BINDER NO. : WBNEQ-SOL -002
MANUFACTURER : TARGET ROCK

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FCV -001-0182 -B	1-FCV -001-0182 -B	011	732' 4"	FN1	A/B	5MN/100D	L	MUST DE-ENERGIZE AND
SG2 BLOWDOWN ISLN VALVE INSIDE CONTMT	82AB-001		82K22-832045		A/B	5MN/100D	MS/C	REMAIN DE-ENERGIZED TO
					A/B	5MN/100D	FW/C	ISOLATE CONTAINMENT
					A/B	15MN/1MO	RH/C	
					A/B	1HR/1MO	CV/C	
WBN-1-FCV -001-0183 -A	1-FCV -001-0183 -A	012	733'10"	FN1	A/B	5MN/100D	L	MUST DE-ENERGIZE AND
SG3 BLOWDOWN ISLN VALVE INSIDE CNTNMT	82AB-001		82K22-832045		A/B	5MN/100D	MS/C	REMAIN DE-ENERGIZED TO
					A/B	5MN/100D	FW/C	ISOLATE CONTAINMENT
					A/B	15MN/1MO	RH/C	
					A/B	1HR/1MO	CV/C	
WBN-1-FCV -001-0184 -B	1-FCV -001-0184 -B	347	735' 1"	FN1	A/B	5MN/100D	L	MUST DE-ENERGIZE AND
SG4 BLOWDOWN ISLN VALVE INSIDE CNTNMT	82AB-001		82K22-832045		A/B	5MN/100D	MS/C	REMAIN DE-ENGERIZED TO
					A/B	5MN/100D	FW/C	ISOLATE CONTAINMENT
					A/B	15MN/1MO	RH/C	
					A/B	1HR/1MO	CV/C	
WBN-1-FSV -030-0134 -B	1-FSV -030-0134 -B	291	740' 1"	AC4	A/B	5MN/100D	L	MUST DE-ENERGIZE AND
CNTMNT ANNULUS DP ISLN VALVE	77J-001		77K3-821270		A/B	5MN/100D	MS/C	REMAIN DE-ENERGIZED TO
					A/B	5MN/100D	FW/C	ISOLATE CONTAINMENT
					A/B	15MN/1MO	RH/C	
					A/B	1HR/1MO	CV/C	
WBN-1-FSV -030-0135 -A	1-FSV -030-0135 -A	288	745' 7"	ANN	A/B	5MN/100D	L	MUST DE-ENERGIZE AND
CNTMNT ANNULUS DP ISLN VALVE	77J-001		77K3-821270		A/B	5MN/100D	MS/C	REMAIN DE-ENERGIZED TO
					A/B	5MN/100D	FW/C	ISOLATE CONTAINMENT
					A/B	15MN/1MO	RH/C	
					A/B	1HR/1MO	CV/C	

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PREPARER/DATE RJP 9/9/86	[illegible]		
CHECKED/DATE R.K. WHITE 9/10/86	[illegible]		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0250 -A	1-FSV -043-0250 -A	285	730'	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG HOT LEG NO.1 ISLN VALVE	82KK-001		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0251 -A	1-FSV -043-0251 -A	289	728' 7"	AC4	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG HOT LEG NO.1 ISLN VALVE	82KK-001		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0268 -A	1-FSV -043-0268 -A		713'	A28	A	100D	L	CAT A - MUST OPERATE DURING
POST ACD SMPLG RHR HEAT EXCH 1A ISLN VLV	82KK-001		82K29-830702		B	1MO	CV/A	OR AFTER ACCIDENT TO OBTAIN
					B	1MO	AF/A	SAMPLES.
					B	1MO	AB/A	CAT B - VLV MUST REMAIN
					B	1MO	RH/A	CLOSED.
WBN-1-FSV -043-0287 -A	1-FSV -043-0287 -A	304	731' 8"	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG AIR ISLN VALVE	82KK-002		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0288 -A	1-FSV -043-0288 -A	305	726' 1"	AC4	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG CNTMNT AIR ISLN VLV	82KK-002		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	

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PREPARER/DATE	RJP 9/9/86	gam 7/24/89		
CHECKED/DATE	R.K. WHITE 9/10/86	ECM 8/24/89		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0307 -A	1-FSV -043-0307 -A	300	733'	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG AIR ISLN VALVE	82KK-002		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0309 -B	1-FSV -043-0309 -B	252	729' 6"	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG HOT LEG NO.3 ISLN VALVE	82KK-001		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0310 -B	1-FSV -043-0310 -B	235	719' 5"	AC3	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG HOT LEG NO.3 ISLN VALVE	82KK-001		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0312 -B	1-FSV -043-0312 -B		713'	A28	A	100D	L	CAT A - MUST OPERATE DURING
POST ACD SMPLG RHR HEAT EXCH 1B ISLN VLV	82KK-001		82K29-830702		B	1MO	CV/A	OR AFTER LOCA TO OBTAIN
					B	1MO	AF/A	SAMPLES.
					B	1MO	AB/A	CAT B - VLV MUST REMAIN
					B	1MO	RH/A	CLOSED.
WBN-1-FSV -043-0318 -B	1-FSV -043-0318 -B	281	733' 7"	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG CNTMNT AIR ISLN VLV	82KK-002		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	

R2

		R 1	R 2	R
PREPARER/DATE	RJP 9/9/86	AFM 7/24/89	AJM 5/2/90	
CHECKED/DATE	R.K. WHITE 9/10/86	EEM 8/24/89	CKH 7/12/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0319 -B	1-FSV -043-0319 -B	289	728' 7"	AC4	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG CNTMNT AIR ISLN VLV	82KK-002		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0325 -B	1-FSV -043-0325 -B	282	723'	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG CNTMNT AIR ISLN VLV	82KK-002		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO OBTAIN
					A	100D	FW/C	SAMPLES.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0341 -B	1-FSV -043-0341 -B	282	724'	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG DR TOCNTMNT SUMP ISLN VLV	82KK-004		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO EMPTY
					A	100D	FW/C	PAS WASTE HOLDUP TANK
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -043-0342 -A	1-FSV -043-0342 -A	301	730' 8"	ANN	A	100D	L	MUST OPERATE DURING OR
POST ACD SMPLG DR TOCNTMNT SUMP ISLN VLV	82KK-004		82K29-830702		A	100D	MS/C	AFTER ACCIDENT TO EMPTY
					A	100D	FW/C	PAS WASTE HOLDUP TANK
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-PCV -068-0334 -B	1-PCV -068-0334 -B	099	785'10"	PRS	A	100D	L	PRESSURIZER VENTNG PURPOSES. |R2
RCS PRZR PWR RELIEF VALVE	82UU-001		82K22-831934		A	100D	MS/C	MUST OPERATE UNTIL RCS IS
					A	100D	FW/C	SUFFICIENTLY DEPRESSURIZED
					A	1MO	RH/C	THEN REMAIN CLOSED.
					A	1MO	CV/C	

		R 1	R 2	R
PREPARER/DATE	RJP 9/9/86	AFM 7/24/89	GJM 5/2/90	
CHECKED/DATE	R.K. WHITE 9/10/86	EEM 8/24/89	CRJ 7/12/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PCV -068-0340A -A	1-PCV -068-0340A -A	097	785'10"	PRS	A	100D	L	PRESSURIZER VENTNG PURPOSES. | R2
RCS PRZR PWR RELIEF VALVE	82UU-001		82K22-831934		A	100D	MS/C	MUST OPERATE UNTIL RCS IS
					A	100D	FW/C	SUFFICIENTLY DEPRESSURIZED
					A	1MO	RH/C	THEN REMAIN CLOSED.
					A	1MO	CV/C	

		R 1	R 2	R
PREPARER/DATE	RJP 9/9/86	AFM 7/24/89	GJM 5/2/90	
CHECKED/DATE	R.K. WHITE 9/10/86	EEM 8/23/89	CSH 7/14/90	

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
			R 2 R
BINDER TITLE SOLENOID VALVES -	COMPUTED /R1 AFM	DATE 4/25/89	CAM 5/16/90
TARGET ROCK	CHECKED /R1 EEM	DATE 8/24/89	CAH 7/12/90

TAB A

NOTES

1. Floor/Actual Elevation - Actual Elevations are documented on field verification sheets found in TAB F. All elevations shown are floor elevations except actual elevations are shown for those devices located inside the reactor building.

2. See TAB B, Section A for a complete listing of Category and Operating Times Calculations used in this binder.

3. Operating Time is dependent on MSLB size, refer to TAB C, Section C-2, Group III valves, for further information. R2

4. Contract Column - Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 1 OF 26
			R 1 R 2
BINDER TITLE SOLENOID VALVES -	COMPUTED RJP	DATE 8/27/86	AFM 4/25/89 AFM 6/18/90
TARGET ROCK	CHECKED WBK	DATE 8/27/86	EEM ~~AFM~~ 8/24/89 CAY 7/12/90

AFM 6/18/90

A. DOCUMENTATION

Equipment Description Solenoid Valves

Vendor/Manufacturer Target Rock Corporation

Equipment Model No.(s) 82AB-001, 77J-001, 82KK-001, 82KK-002, 82KK-004, 82UU-001

QUALIFICATION REPORTS

(1) Title/Number/Revision Qualification Test Report/2375/G RIMS EEB831003510 DATE 5/3/83

(2) Title/Number/Revision Qualification Extension Analysis/3543 RIMS EEB830324501 DATE 1/10/83

(3) Title/Number/Revision Qualification Extension Analysis/3563 RIMS EEB830215500 DATE 1/10/83

(4) Title/Number/Revision Qualification Extension Analysis/3619/A RIMS EEB840130501 DATE 12/13/83

(5) Title/Number/Revision Analysis Report/557-1468/A RIMS B71860611101 DATE 11/2/83

(6) Title/Number/Revision Qualification Extension LetterNo. C5631 - Model 77J-001 valves RIMS B43 ~~8~~85 0913 001 DATE 9/6/85

OTHER (ANALYSIS, VENDOR DATA, ETC.)

- Target Rock Test Report No. 4207 (B71 860616 101) (TAB E, Section E-3).
- OE Calculation WBNOSG4-004 R10 (B45 861017 218) "Main Steam System (1) NUREG 0588 Category and Operating Times"
- OE Calculation WBNOSG4-008 R14 (B26 900110 206) "Containment Ventilation System (30) NUREG 0588 Category and Operating Times"
- OE Calculation WBNOSG4-011 R9 (B45 860623 218) "Sampling System (43) NUREG 0588 Category and Operating Times"

R2

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

- OE Calculation WBNOSG4-017 R9 (B26 890510 506) "Reactor Coolant System (68) NUREG 0588 Category and Operating Times"
- DNE Calculation WBNOSG4-045 R1 (B45 860902 219) "Status and Duty Cycles of 1E Solenoid Valves Located in Potentially Harsh Environments"
- OE Calculation WBNOSG4-003 R2 (B45 851112 218) "Safety Evaluation of Superheated Steam in the Valve Vaults caused by a Main Steam Line Break"
- OE Calculation WBNTSR-051 R0 (B26 891129 202) "Reduction of Beta Dose by Sheet Metal"
- WBNP Environmental Data Drawing 47E235-42 R2 With DCA's P04104-02-0, -03-0, -05-0
- WBNP Environmental Data Drawing 47E235-44 R1
- WBNP Environmental Data Drawing 47E235-59 R2 W/DCA-P02351-18-0
- WBNP Environmental Data Drawing 47E235-61 R1
- WBNP Environmental Data Drawing 47E235-76 R3
- OE Calculation WBNNAL3-004 R0 (B45 860205 235) "Accident Dose Inside Reactor Building"
- Calculation WBNTSR-022 R0 (B26 891106 202) "Flowing Media Radiation Doses".
- DNE Calculation WBN-EEB-MS-TI06-0017 R0 (B26 900202 410) "120 VAC Vital Instrument Power Voltage Profile."
- DNE Calculation WBN-EEB-MS-TI11-0004 R0 (B26 900202 407) "125V DC Voltage Analysis."

R2

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-SOL-002 PLANT WBN UNIT(S) 1 SHEET 2 OF 26
R 1 R 2

BINDER TITLE SOLENOID VALVES - COMPUTED RJP DATE 9/16/86 AFM [signature] 8/21/89 7/11/90

TARGET ROCK CHECKED RKW DATE 9/16/86 EEM [signature] 8/24/89 7/12/90

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

(1) THE QUALIFICATION TEST REPORT DOES NOT DEMONSTRATE THAT THE VALVES WILL OPERATE DURING ACCIDENT CONDITIONS AT THE MIN. VOLTAGE. R2

(2) A conduit seal for Target Rock, Valve 1-FSV-30-134 is required.

(3) Deleted by revision 2 R2

(4) Deleted by revision 2

(6) VALVES 1-FSV-1-7,14,25,32,181,182,183,184 MUST BE ANALYZED FOR HEAT RISE DUE TO PROCESS AND ENERGIZED SOLENOID.

~~COMMENTS/RECOMMENDATIONS~~ VALVE 1-FSV-30-135 MUST HAVE THE FIELD WIRING REPLACED. R2

WBEP-0136Q

BINDER NO. WBNEQ-SOL-002 PLANT WBN UNIT(S) 1 SHEET 3 OF 26

R ___ R ___

BINDER TITLE SOLENOID VALVES - TARGET ROCK

COMPUTED RJP DATE 8/27/86

CHECKED WMK DATE 8/27/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 382-1972 "IEEE Trial Use Guide for Type Test of Class I Electric Valve Operators for Nuclear Power Generating Stations"

IEEE 323-1974 "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations"

IEEE 344-1975 "Guide for Seismic Qualification for Class IE Electrical Equipment for Nuclear Power Generating Stations"

BINDER NO. WBNEQ-SOL-002 PLANT WBN UNIT(S) 1 SHEET 4 OF 26

R 2 R

BINDER TITLE SOLENOID VALVES - TARGET ROCK

COMPUTED RJP DATE 8/27/86 AJM 6/18/90

CHECKED WBK DATE 8/27/86 DAH 7/12/90

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

_X_ Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Target Rock Report No. 2375 is a type test for Target Rock Solenoid Operated valves. All Target Rock valves listed in this binder are qualified by analysis or comparison to the test valve in the 2375 report. All valves listed in TAB A use the same/similar materials, details of construction, and design features as the tested Model 77CC-001. Target Rock certifies this similarity by their Qualification Extension Analyses Nos. 3543, 3563, and 3619, ~~all of which are in TAB D.~~ AND QUALIFICATION EXTENSION LETTER NO. C5631, ALL OF WHICH ARE IN TAB D. R2

BINDER NO. WBNEQ-SOL-002 PLANT WBN UNIT(S) 1 SHEET 5 OF 26

BINDER TITLE SOLENOID VALVES - TARGET ROCK

COMPUTED RJP DATE 8/27/86 R ___ R ___

CHECKED WWK DATE 8/27/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Solenoid Vlv	Solenoid Vlv	2375, Sec. 1.0
(2)	Manufacturer	Target Rock	Target Rock	2375, Sec. 1.0
(3)	Model Number(s)	See TAB A	77CC-001	2375, Sec. 1.0
(4)	Serial Number(s)	See TAB F		

(5) Identify Component-Unique checksheet attached: None

JUSTIFICATION/COMMENTS

TVA EQP012.55

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. R1

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	None Specified	N/A	
External Process Connections	None Specified	N/A	
Electrical Connections	None Specified	N/A	
Conduit Seals	Rubber Cement Sealing Used at Conduit Conn.	No	2375 Section 4.1.15
Connector Seals	None Specified	N/A	
Orientation	Solenoid Coil must be Tilted 45° below Horizontal for 1-PCV-68-334, 340A	Yes	Target Rock Dwg. 82UU-001 R1
Physical Configuration	None Specified	N/A	
Other	N/A		

JUSTIFICATION/COMMENTS Rubber cement sealing compound was used during qualification testing to seal the test instrumentation wires at the conduit connection. During the course of the test, this sealing compound shrivelled and pulled away, completely opening the switch compartment to the borated water spray. Although the test valve remained operational throughout the test, valves subject to borated water spray will be sealed with a qualified Conax conduit seal in accordance with TVA Environmental Qualification Binder No. WBNEQ-CSC-001.

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 7 OF 26				
					R	R	
BINDER TITLE SOLENOID VALVES -	COMPUTED RS	DATE 8/27/86					
TARGET ROCK	CHECKED WHK	DATE 8/29/86					

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	2375 Sec. 4.1.1
(b) Baseline performance measurements taken	Yes	2375 Sec. 4.1.1
(c) Equipment aged:		
Thermal	Yes	2375 App.A Sec. 4.1.1
Radiation	Yes	2375 Sec. 4.1.2 & 4.1.11
Wear	Yes	2375,App.A Sec. 4.2
(d) Vibration/seismic testing conducted	Yes	2375, App.A Sec. 4.3
(e) Design basis event (DBE) exposure	Yes	2375, Sec. 4.1.9 & App. A Sec. 4.4
(f) Post-DBE exposure	Yes	2375 Sec. 4.1.10 & App. A Sec. 4.4.8
(g) Final inspection and disassembly	Yes	2375 Sec. 4.1.15 & App. E

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference 2375, App.A, Sec.2.0).

JUSTIFICATION/COMMENTS

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 2375, App.A, Sec.4.1).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	2375 App. A Sec.4.1.1
Radiation exposure	Yes	2375 Sec.4.1.2
Vibration (non-seismic) aging	No	
Operational (electrical/mechanical/process) stress aging	Yes	2375 App. A Sec. 4.2

JUSTIFICATION/COMMENTS See Item 1 under "Discussion" on sheet 25.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? No (Reference).

JUSTIFICATION/COMMENTS See comment on sheet 8A.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 2375, App.A, Sec.4.1.1).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 8A OF 26 R 1 R
BINDER TITLE SOLENOID VALVES -	COMPUTED RJP	DATE 8/27/86 ABM 8/21/85	
TARGET ROCK	CHECKED WBK	DATE 8/27/86 EEM 8/24/87	

COMMENT FOR H(3):

Target Rock did not address synergistic effects in Test Report 2375. However, it is apparent that Target Rock solenoid valves contain materials in which radiation-induced synergisms, even though mild, could occur. Silicone rubber (per NUREG/CR-2763) and ethylene propylene rubber (per NUREG/CR-2157) exhibit insignificant dose rate effects at doses up to 20 Mrad. The worst case 40-year TID for the valves in this binder is 20 Mrad. Therefore, synergistic effects will be negligible for normal service aging. Also, potential dose rate and test sequence synergisms will not impact qualification for accident conditions as demonstrated by 2375. In the event an accident occurs, dose rates will be comparable to test conditions. Therefore the test sequence of thermal aging followed by aging plus accident radiation is a reasonable simulation of actual plant requirements. Additional assurance is provided by the severity of the radiation test because the specimen was exposed to 135 Mrads, whereas a worst case actual dose of 124 Mrads is required. |R1

PLUSEQ/136.25

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes
(Reference: 2375, APP. F-IC, Para. 3).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? YES
(Reference: 2375, App. F-I, Para. 3)

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? YES
(Reference: 2375, App. A, Sec. 4.1.1) |R1

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	130°F (worst Case)	350°F	120°F
Time	40 years	792 hours	40 years |R1

JUSTIFICATION/COMMENTS See Qualified Life Calculations in TAB C.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? YES
(Reference: 2375, App. F-I, Para. 3)

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? YES
(Reference: 2375, App. F-IC, Para. 3)

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? N/A (Reference ________).

JUSTIFICATION/COMMENTS ________

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference 2375, App. A, Sec. 4.1.1).

JUSTIFICATION/COMMENTS The test valve was de-energized throughout thermal aging except when it was energized to cycle open once each day for the 33-day duration of the aging test.

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 2375, App. F, Sec. 4.2 & 6.5).

JUSTIFICATION/COMMENTS ________

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference 2375, App. F, Sec. 4.2 & 6.5 and App. C).

JUSTIFICATION/COMMENTS The entire valve assembly was irradiated without regard for specific components, thus demonstrating operability regardless of radiation threshold values.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference 2375,App.F-I,Para. 2).

JUSTIFICATION/COMMENTS ________

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: 2375, App. F-I, Paragraph 2 & App. C).

Plant normal ambient radiation dose (rd)	2.0×10^7 rads (worst case)
Test exposure dose (rd)	1.35×10^8 rads
Test exposure dose rate (rd/hr)	.45 MRADS/HR - Post-DBE Not Specified-Pre Aging
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma - Post-DBE Not Specified-Pre Aging

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] No (Reference:). R1

JUSTIFICATION/COMMENTS See item 1 under "Discussion" on sheet 25.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? No (Reference:).

JUSTIFICATION/COMMENTS See item 1 under "Discussion " on sheet 25.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

BINDER NO. WBNEQ-SOL-002 PLANT WBN UNIT(S) 1 SHEET 12 OF 26
R 1 R

BINDER TITLE SOLENOID VALVES - COMPUTED RJP DATE 8/27/86 ~~8/27/86~~ 4/25/89

TARGET ROCK CHECKED WBK DATE 8/27/86 5/24/89

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: 2375, App. A, Sec. 4.2, App. F, Sec. 4.6 and App. F-IC, Para. 4). R1

JUSTIFICATION/COMMENTS

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: 2375, App. A, Sec. 4.2 and App. F-IC, Para. 4).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: 2375, App. F-IB, Para. 3).

Qualified life (Document in QMDS) 40 years
JUSTIFICATION/COMMENTS Parameters are defined (see Ref.) but actual life is determimed by qualified life calculations (see TAB C)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: 3543, 3563 & 3619).

R1

JUSTIFICATION/COMMENTS In Qualification Extension Analysis Reports 3543, 3563, and 3619 (see TAB D) Target Rock recommends replacement of all silicone rubber O-rings and gaskets every five years. However, our calculations, which are based on the Target Rock test parameters project a longer life. See TAB C.

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 13 OF 26
			R 2 R
BINDER TITLE SOLENOID VALVES -	COMPUTED RJP	DATE 9/09/86	ADM 7/5/90
TARGET ROCK	CHECKED RKW	DATE 9/09/86	CAH 7/12/90

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis) R2

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Silicone rubber/ sealing/potting			1.14	557-1468, Sec. 5.2.13
(b)	EPR/O-Ring			0.95	557-1468, Sec. 5.2.5
(c)	* RECTIFIER			0.98	557-1468, Tbl. III
(d)	* COIL ASSEMBLY & REED SWITCH			1.05	557-1468, Tbl. III
(e)	TERMINAL BOARD			1.04	557-1468, TBL. III

R2

JUSTIFICATION/COMMENTS In Test Report 2375 Target Rock defined the most temperature sensitive material as silicone rubber with an assigned activation energy of 0.61 eV. However, Target Rock later had National Technical Systems perform a materials analysis on a randomly selected solenoid valve to determine the parameters for the accelerated aging of the materials to a state of degradation equivalent to that incurred in normal service. We have listed above, and will use, the activation energies founded by NTS in the referenced report for all life calculations performed for the valves in this binder (see TAB C).

* THE ACTIVATION ENERGY LISTED IS THE LOWEST ACTIVATION ENERGY OF ANY MATERIAL IN THE COMPONENT.

BINDER NO. WBNEQ-SOL-002 PLANT WBN UNIT(S) 1 SHEET 14 OF 26

R ____ R ____

BINDER TITLE SOLENOID VALVES - COMPUTED RS DATE 8/22/86

TARGET ROCK CHECKED WBK DATE 8/21/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 2375, App. G, p. 18).

Identify Acceptance Criteria: Valve must operate at minimum 60 Vac and maximum 144 Vac. Allowable seat leakage must not exceed 0.4cc/ 12 min. Position indicators, when applicable, must satisfactorily indicate when valve is cycled.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 2375, App. G).

Identify baseline and functional testing: See (1) above

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 2375,App.A,Sec. 4.4).

JUSTIFICATION/COMMENTS The valve was connected to high pressure lines and cycled under pressure throughout the DBE, thermal aging, and cyclic aging exposure.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: 2375, App. B).

JUSTIFICATION/COMMENTS Voltage was varied from 60-144 Vac. Valve was under process pressure of 2485 psig.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
		Dwgs. 45N600-1-3 45N600-30-10 45W600-68-1
Voltage	125 Vdc - 120 Vac	45N600-43-4
Load	See comments	Vendor Drawings TAB I
Frequency	60 Hz for AC	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS

Model	Voltage	Load (Amps)
77J-001	125 VDC	0.5
82AB-001	125 VDC	3.5
82KK-001	120 VAC	0.6
82KK-002	120 VAC	0.6
82UU-001	125 VDC	1.3
82KK-004	120 VAC	0.6

R2

R2

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 16 OF 26		
				R 1	R 2
BINDER TITLE SOLENOID VALVES -	COMPUTED RJP		DATE 8/27/86	AFM 8/24/89	ajm 7/11/90
TARGET ROCK	CHECKED WBK		DATE 8/27/86	EEM 8/24/89	CBH 7/12/90

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	84.37 VDC MIN. 93.9 VAC MIN.	SEE COMMENTS
Load	See J (5)(a)	
Frequency	60 Hz for AC	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS DNE Calculation WBN-EEB-MS-TI06-0017 (AC Voltage) and WBN-EEB-MS-TI11-0004 (DC Voltage). R2

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	60-144 VAC (SEE COMMENTS)	(1) App B
Load	365 mA @ 120 VAC	(1) App B
Frequency	60 Hz	(1) App B
Accuracy	NA	
Other(s)		
	NA	

R2

JUSTIFICATION/COMMENTS The tested valve successfully completed pre-DBE and post-DBE simulation functional testing at voltages ranging from 60 VAC minimum to 144 VAC maximum. However, the DBE simulation test, the valve was cycled using 120 VAC only. THEREFORE, THE TEST DOES NOT DEMONSTRATE THAT THE VALVE WILL OPERATE DURING ACCIDENT CONDITIONS AT THE MIN. VOLTAGE. THIS DISCREPANCY MUST BE RESOLVED (SEE OPEN ITEM #1). R2 R2

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 17 OF 26
			R 1 R
BINDER TITLE SOLENOID VALVES -	COMPUTED RJP	DATE 9/9/86	GJM 8/21/89
TARGET ROCK	CHECKED RKW	DATE 9/9/86	EEM 8/24/89

K. REQUIRED OPERATING ENVIRONMENT (Worst Case for All Environmental Areas) R1

Reference Environmental Drawing No. 47E235-61, 47E235-44, 47E235-76 47E235-42 R1

(1) Normal Max

(a) Temperature (°F) 130°F

(b) Pressure (psig) 14.4 psia

(c) Humidity (%) 80%

(d) Radiation (rd) 2×10^7 rads; 40 yr TID

(2) Abnormal Max

(a) Temperature (°F) 140°F

(b) Pressure (psig) 14.4 psia

(c) Humidity (%) 100%

(d) Radiation (rd) N/A R1

(3) Process Interfaces: See TAB C for addressing of appropriate process interface.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Will occur less than 1% of plant life and could exist for up to 8 hours per excursion.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327°F Accident type LOCA/HELB

(b) Pressure (psig) 25.6 psia Accident type LOCA/HELB

(c) Humidity (%) 100% Accident type LOCA/HELB

(d) Radiation (rd) 7.4×10^7 rads (beta)* 3.3×10^7 rads (gamma)* Accident type LOCA R1

(e) Spray Type 2000ppm Boron pH 8.3 Accident type LOCA/HELB

* See comments on Sheet 19A.

PLUSEQ/136.31

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 18 OF 26 R 1 R
BINDER TITLE SOLENOID VALVES -	COMPUTED RJP	DATE 9/16/89 AGM 8/21/89	
TARGET ROCK	CHECKED RKW	DATE 9/16/89 EEM 8/24/89	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): The duration of the containment spray is 30 days. Containment spray flow rate is equal to 9500 gal/min or 0.92 gpm per square foot of containment cross section.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: See Sec. P2 "Discussion").

(7) Subject to submergence (Yes/No/NA)? No (Reference: TVA Environmental Dwg 47E235-42). R1

Identify initiation time and duration of submergence: See Justification Comments on Sheet 19.

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: TAB B, Section L (1)).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify:

See TAB B, Section L(1)

R1

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B, Section A for a listing of calculations used in this binder.	

PLUSEQ/136.32

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	14 days	2375, App. A Sec. 4.4.6
Temperature (°F)	327°F	385°F	2375, App. A Sec. 4.4.2
Pressure (psig)	25.6 psia (11.2 psig)	66 psig	2375, App. A Sec. 4.4.2
Relative Humidity (%)	100%	100%	2375, App. A Sec. 4.4.2
*Chemical Spray	2000 ppm Boron (H_2BO_3) pH 8.3	6200 ppm Boron (H_3BO_3) pH 8.6-10.0	2375, App. A Sec. 4.4.2
**Radiation (rd)	1.24×10^8 rads (beta/gamma)	1.35×10^8 rads gamma	2375, App. C
Submergence	NA	NA	***

*Includes spray concentration, flowrate, density, duration and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type. See comments on Sheet 19A.

(2) Comparison of worst case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	YES	See (1) above
Pressure	YES	See (1) above
Relative Humidity	YES	See (1) above
Chemical Spray	YES	See Sec. Page 3
Submergence	NA	***

JUSTIFICATION/COMMENTS ***Equipment located inside containment inside the crane wall below elevation 722 (surge level) could become submerged following an accident. Outside the crane wall, the steady state flood level is 717.7'. None of the valves inside containment are located below these levels. All valves in the Auxiliary Building and south valve room are located above the max. flood levels of 713'3" in the auxiliary Bldg (Rm A28) and 731.5' for significant wetting in the south valve room. Therefore, no valves in this binder are subject to submergence. R2

COMMENTS FOR SECTION L(1) (RADIATION):

The worst-case total radiation dose is in the reactor building lower compartment. The 100-day accident dose given by WBN Environmental Data Drawing 47E235-42 is 4.7×10^8 rads BETA and 4×10^7 rads GAMMA. The 40 year dose is 2.0×10^7 rads. All of the solenoid valves in this binder that are located in the lower compartment are in a fan room, or an accumulator room, except the System 68 valves which are located above the pressurizer at elevation 78~~5~~6'. The 100-day accident GAMMA dose for the accumulator and fan rooms is 1×10^7 rads given by drawing 47E235-42. OE Calculation WBNNAL3-004 recommends an accident dose of 4.0×10^7 for equipment next to the sump water level (Elev. 722') and 3.3×10^7 rads for equipment further above it. Since the System 68 valves are located at Elev. 78~~5~~6', the accident radiation dose for these valves is 3.3×10^7 rads. Therefore, the worst-case radiation dose for the solenoid valves in this binder is 4.7×10^8 rads BETA and 3.3×10^7 rads GAMMA for the 100-day accident dose and 2.0×10^7 rads GAMMA for the 40 year dose. AFM 6/12/90 | R2

Post-DBA BETA Radiation must be addressed for all equipment located inside containment which is required for LOCA mitigation. The valves listed in TAB C, Section C-1 (I) & (II) are within that scope. All non-metallic parts of these solenoid valves are contained in a .048" thick (18ga) 300-series stainless steel metal enclosure. OE Calculation WBNTSR-051 "Reduction of Beta Dose by Sheet Steel, " page 3, shows the beta reduction factor for 18-gauge steel is equal to .158. This reduces the total 100-day BETA dose to the valve internal parts to $(4.7 \times 10^8) \times (1.58 \times 10^{-1}) = 7.4 \times 10^7$ rads BETA. | R2

VALVES LOCATED IN A FAN ROOM OR ACCUMULATOR ROOM

The total combined 100-day BETA and GAMMA accident radiation dose for the non-metallic parts of these solenoid valves is $(7.4 \times 10^7 \text{ BETA}) + (1.0 \times 10^7 \text{ GAMMA}) = 8.4 \times 10^7$ rads. The combined 100-day accident radiation plus the 40-year dose (2×10^7 rads) equal a total radiation dose of 1.04×10^8 rads (BETA/GAMMA). The Target Rock valves contained in this binder are qualified to 1.35×10^8 rads, which envelops the requirement with margin.

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 19B OF 26
			R 2 R
BINDER TITLE SOLENOID VALVES -	COMPUTED /R1 AFM	DATE 8/24/89	AFM 5/2/90
TARGET ROCK	CHECKED /R1 EEM	DATE 8/24/89	CAH 7/12/90

SYSTEM 68 VALVES LOCATED ABOVE PRESSURIZER

The total combined 100-day BETA and GAMMA accident
the non-metallic parts of these solenoid valves is
7.4×10^7 rads BETA + 3.3×10^7 rads GAMMA = 1.07
(BETA/GAMMA). The 40-year TID (2.0×10^7) + 100-d
(1.07×10^8) + 10% margin (1.07×10^7) = 1.38×10^8
above the qualified value of 1.35×10^8 rads. In c
radiation requirement to the qualification level, t
be reduced. The qualified dose (1.35×10^8) - 10%
- accident dose (1.07×10^8) = 1.73×10^7 rads. Th
TID cannot be greater than 1.73×10^7 rads. Forty ... Ratio
($1.73 \times 10^7 \div 2.0 \times 10^7$) = 34.6 years. Therefore, all non-metallic
materials in the System 68 valves must be replaced every 34.6 years
to meet the radiation requirements (See TAB G). The total radiation
dose will be (1.73×10^7) + (1.07×10^8) = 1.24×10^8 rads.

This sounds like the govt. on taxes. Tax it everytime it changes hands. Looks to me like the 10% has already been accounted for. CAH

AFM 5/2/90

POST ACCIDENT AIR SAMPLING VALVES

Sampling valves 1-FSV-43-287, 288, 307, 318, 319, and 325 have discs made from organic compounds and, therefore, are subject to the effects of radiation from the containment atmosphere. Calculation WBNTSR-022 gives the 100 day accident dose from all sources as 6.62×10^6. The 40-year dose for any of these valves is 2×10^7 rad TID. The combined total dose is 2.662×10^7 rads. The Target Rock valves contained in this binder are qualified to 1.35×10^8 rads, which envelopes the requirement with margin. VALVES 1-FSV-43-287, ~~28~~ 307, 318, AND 325 ARE LOCATED IN THE ANNULUS, AND 1-FSV-43-288, 319 ARE LOCATED IN THE LOWER COMPARTMENT. R2

AFM 6/12/90

WBEP-0136Q

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA	
Temperature: +15 degrees F	+58°F	Yes	
Pressure: +10% but no more than 10 psig	+54.8 psig	Yes	
Radiation: +10% of accident dose	+10%	Yes	
Time: +10% (or 1 hour + operating time per NUREG-0588)	See Below	No	
Voltage: ±10% of rated value	Later		R1
Frequency: ±5% of rated value	N/A	N/A	R1
Environmental Transient: the initial transient and the peak temperature applied twice		Yes	
Vibration: +10% added to acceleration	2375, App A Sec. 4.3.2	Yes	

JUSTIFICATION/COMMENTS See TAB C, Sections C-1 and C-2, which proves the 14-day test envelops the 100-day post-accident requirements. Voltage variations were applied during testing ranging from 60V ac minimum to 144V ac maximum.

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 21 OF 26
BINDER TITLE SOLENOID VALVES -	COMPUTED RS	DATE 8/27/86	R ___ R ___
TARGET ROCK	CHECKED WWK	DATE 8/29/86	

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference See TAB A).

JUSTIFICATION/COMMENTS Functions are varied. All are listed in TAB A.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference 2375,Sec. 2.0 & App. A, 5.3).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference 2375, Sec. 2.0 & App. A, 5.3).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference 2375, Sec. 2.0 & App. A, 4.4).

JUSTIFICATION/COMMENTS See TAB C, Sections C-1 and C-2, "Post-Accident Life"

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference 2375,Sec.2.0/4.1.10).

JUSTIFICATION/COMMENTS The test anomaly addressed in Sec. 4.1.10 relative to relay contacts, applies only to the model 77J-001 valves in this binder, since they are the only valves herein having relays. The relays failed to make contact due to surface corrosion but functioned properly after they were polished. Target Rock did not address the cause of the relay contact corrosion. However, after reviewing the test report it is reasonable to deduce that moisture entered the test valve during accident simulation via an unsealed conduit entry to cause the damage. The model 77J-001 valves in this binder, which are subject to moisture intrusion, are equipped with Conax conduit seals to prevent such intrusion, and therefore, prevent the aforementioned anomaly.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See QMDS

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 23 OF 26				
BINDER TITLE SOLENOID VALVES - TARGET ROCK	COMPUTED RL	DATE 8/20/86	R	R			
	CHECKED WBK	DATE 8/27/86					

O. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	N/A
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	N/A
(b) Were specific features and failure modes and effects analyzed?	N/A
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	N/A
(d) Were environmental parameters which affect equipment performance identified?	N/A
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1	SHEET 24 OF 26		R	R
BINDER TITLE SOLENOID VALVES - TARGET ROCK		COMPUTED RL	DATE 8/27/86			
		CHECKED WBK	DATE 8/27/86			

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

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O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	N/A
(18) Criteria regarding synergistic effects satisfied?	YES ~~N/A~~ AJM 6/13/90 R2
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

1. Non-seismic vibration aging (sec. H.(6)). Non-seismic vibration aging was not performed as required by IEEE 323-1974. This does not affect the qualification of the tested or installed valves for the following reasons:

BINDER NO. WBNEQ-SOL-002	PLANT WBN	UNIT(S) 1		SHEET 26 OF 26	
				R	R
BINDER TITLE SOLENOID VALVES -		COMPUTED RSP	DATE 8/27/86		
TARGET ROCK		CHECKED WVK	DATE 8/29/86		

P. DISCUSSION (Continued)

(A) There were no test anomalies associated with the seismic portion of the qualification testing.

(B) Non-seismic vibration aging is not a recognized problem for solenoid valves. Other solenoid valves, including some Target Rock models, have been subjected to this type testing with no discrepancies noted.

(C) Periodic maintenance and surveillance activities will detect any problems which would result from the effects of non-seismic vibration aging.

2. Moisture or liquid intrusion (Sec.K (6)).

The valves requiring protection from moisture or liquid intrusion have had Conax conduit seals installed and are identified in Section 1 of the QMDS, which is located in TAB G of the binder.

3. Chemical Spray (Sec. L (1) & (2)).

The containment spray flow rate is equal to 9500 gal/min or 0.92 gpm per square foot of containment cross section. The chemical spray concentration is 2000ppm boron with a pH of 8.35. The Target Rock test valve was subjected to a spray solution of 6200ppm boron and 50ppm hydrazine with a pH of 8.6-10.0. The spray rate was 0.15 gpm per square foot of projected area of the test valve. The test solution is more corrosive than the containment spray. Therefore, all valves listed in this binder fall within the qualification provided by the test valve.

PRINT DATE: 09/29/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

QIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER	AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PSV -001-0006A SG1 MAIN STM HDR PWR RELF CONT VLV PILOT	-A	1-PSV -001-0006A X206-381-3RF	-A	729' 80KJ3-827551	A01	B B	100D 100D	MS/V FW/V	PSV MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER THAT WOULD PREVENT THE PAM FUNCTION OF ITS ASSOC LIMIT SWITCHES.
WBN-1-PSV -001-0006B SG1 MAIN STEAM HDR PWR RELIEF CNTL VLV	-A	1-PSV -001-0006B X206-381-3RF	-A	729' 80KJ3-827551	A01	A B	100D 100D	FW/V MS/V	MUST ENERGIZE TO ASSURE SECONDARY SIDE PORV CLOSURE. MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS. R5
WBN-1-PSV -001-0013A SG2 MAIN STM HDR PRESS RLF CNTL VLV	-B	1-PSV -001-0013A X206-381-3RF	-B	729' 80KJ3-827551	A02	B B	100D 100D	MS/V FW/V	PSV MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER THAT WOULD PREVENT THE PAM FUNCTION OF ITS ASSOC LIMIT SWITCHES.
WBN-1-PSV -001-0013B SG2 MAIN STEAM HDR PRESS RLF CNTL VLV	-B	1-PSV -001-0013B X206-381-3RF	-B	729' 80KJ3-827551	A02	A B	100D 100D	FW/V MS/V	MUST ENERGIZE TO ASSURE SECONDARY SIDE PORV CLOSURE. MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS. R5
WBN-1-PSV -001-0024A SG3 MAIN STM HDR PRESS RLF CNTL VLV	-A	1-PSV -001-0024A X206-381-3RF	-A	729' 80KJ3-827551	A02	B B	100D 100D	MS/V FW/V	PSV MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER THAT WOULD PREVENT THE PAM FUNCTION OF ITS ASSOC LIMIT SWITCHES.

R 4 CDH 8/21/90 AFM
R 5 CAH 10/17/90 PEN
R____

PREPARER/DATE EEM 8/21/86
CHECKED/DATE WBK 8/21/86

E00-705

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PSV -001-0024B -A SG3 MAIN STEAM HDR PRESS RLF CNTL VLV	1-PSV -001-0024B -A X206-381-3RF		729' 80KJ3-827551	A02	A B	100D 100D	FW/V MS/V	MUST ENERGIZE TO ASSURE SECONDARY SIDE PORV CLOSURE. MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-PSV -001-0031A -B SG4 MAIN STM HDR PRESS RLF CNTL VLV	1-PSV -001-0031A -B X206-381-3RF		729' 80KJ3-827551	A01	B B	100D 100D	MS/V FW/V	PSV MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER THAT WOULD PREVENT THE PAM FUNCTION OF ITS ASSOC LIMIT SWITCHES.
WBN-1-PSV -001-0031B -B SG4 MAIN STEAM HDR PRESS RLF CNTL VLV	1-PSV -001-0031B -B X206-381-3RF		729' 80KJ3-827551	A01	A B	100D 100D	FW/V MS/V	MUST ENERGIZED TO ASSURE SECONDARY SIDE PORV CLOSURE. MUST NOT FAIL DURATION OF EACH EVENT IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -001-0147 -A SG LOOP 1 WARMING VALVE	1-FSV -001-0147 -A X206-381-6RVF		729' 84PK4-343461	A01	A/B B	5MN/100D 100D	FW/V MS/V	MUST DEENERGIZE TO CLOSE ASSOC FCV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -001-0148 -B SG LOOP 2 WARMING VALVE	1-FSV -001-0148 -B X206-381-6RVF		729' 84PK4-343461	A02	A/B B	5MN/100D 100D	FW/V MS/V	MUST DEENERGIZE TO CLOSE ASSOC FCV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.

		R 4	R 5	R
PREPARER/DATE	EEM 8/21/86	CDH 8/21/90	CAH 10/17/90	
CHECKED/DATE	WBK 8/21/86	AFM 8/28/90	RGN 10/17/90	

WATTS BAR N[illegible]LEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -001-0149 -A SG LOOP 3 WARMING VALVE	1-FSV -001-0149 -A X206-381-6RVF		729' 84PK4-343461	A02	A/B B	5MN/100D 100D	FW/V MS/V	MUST DEENERGIZE TO CLOSE ASSOC FCV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -001-0150 -B SG LOOP 4 WARMING VALVE	1-FSV -001-0150 -B X206-381-6RVF		729' 84PK4-343461	A01	A/B B	5MN/100D 100D	FW/V MS/V	MUST DEENERGIZE TO CLOSE ASSOC FCV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL IN A MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-LSV -003-0172 -A SG3 LEVEL CONTROL SOL VLV	1-LSV -003-0172 -A 206-381-3RVU		737' 80KJ3-827551	A05	A/B B B B B	5MN/100D 1 MO 1 MO 1 MO 1 MO	LOCA AF RH/A CV/A AB	LOCA: MUST DEENERGZ AND REMAIN TO PREVENT ASSOC LCV CLOSING. ALL OTHER EVENTS: MUST NOT FAIL IN MANNER TO PREVENT PAM FUNCTION OF ASSOC LIMIT SWS.
WBN-1-LSV -003-0173 -B SG2 LEVEL CONTROL SOL VLV	1-LSV -003-0173 -B 206-381-3RVU		737' 80KJ3-827551	A05	A/B B B B B	5MN/100D 1 MO 1 MO 1 MO 1 MO	LOCA AF RH/A CV/A AB	LOCA: MUST DEENERGZ AND REMAIN TO PREVENT ASSOC LCV CLOSING. ALL OTHER EVENTS: MUST NOT FAIL IN MANNER TO PREVENT PAM FUNCTION OF ASSOC LIMIT SWS.
WBN-1-LSV -003-0174 -B TDAFWP STM GEN 1 LEVEL SOL VALVE	1-LSV -003-0174 -B 206-381		729'	A01	B A/B	100D 5MN/100D	MS/V FW/V	MS/V: MUST NOT FAIL IN MANNER THAT WOULD PREVENT PAM FUNCT OF ASSOC LIMIT SWS. FW/V: MUST DEENERGIZE AND REMAIN SO ASSOC LCV WILL MODULATE.

R4

		R 4	R____	R____
PREPARER/DATE	EEM 8/21/86	CAH 8/21/90		
CHECKED/DATE	WBK 8/21/86	AFM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-LSV -003-0175 -A TDAFWP STM GEN 4 LEVEL SOL VALVE	1-LSV -003-0175 -A 206-381-3RVU		729' 80KJ3-827551	A01	B A/B	100D 5MN/100D	MS/V FW/V	MS/V: MUST NOT FAIL IN MANNER THAT WOULD PREVENT PAM FUNCT OF ASSOC LIMIT SWS. FW/V: MUST DEENERGIZE AND REMAIN SO ASSOC LCV WILL MODULATE.
WBN-1-FSV -003-0185 -B SG1 MAIN FW CHECK VALVE BYPASS	1-FSV -003-0185 -B 206-381-2F		729' 78K3-822950	A01	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS ARE ISOLATED ON A FW ISOLATION SIGNAL. VLVS MUST DEENERGIZE TO VENT OPR FOR MS/V EVENT.
WBN-1-FSV -003-0186 -A SG2 MAIN FW CHECK VALVE BYPASS	1-FSV -003-0186 -A 206-381-2F		729' 78K3-822950	A02	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS ARE ISOLATED ON A FW ISOLATION SIGNAL. VLVS MUST DEENERGIZE TO VENT OPR FOR MS/V EVENT.
WBN-1-FSV -003-0187 -B SG3 MAIN FW CHECK VALVE BYPASS	1-FSV -003-0187 -B 206-381-2F		729' 78K3-822950	A02	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS ARE ISOLATED ON A FW ISOLATION SIGNAL. VLVS MUST DEENERGIZE TO VENT OPR FOR MS/V EVENT.
WBN-1-FSV -003-0188 -A SG4 MAIN FW CHECK VALVE BYPASS	1-FSV -003-0188 -A 206-381		729'	A01	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS ARE ISOLATED ON A FW ISOLATION SIGNAL. VLVS MUST DEENERGIZE TO VENT OPR FOR MS/V EVENT.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CSH 8/21/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -003-0236A UPPER TAP MAIN FW SG1 ISLN VALVE	-A	1-FSV -003-0236A 206-381	-A		729'	A01	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓ WBN-1-FSV -003-0236B UPPER TAP MAIN FW SG1 ISLN VALVE	-B	1-FSV -003-0236B 206-381	-B		729'	A01	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓ WBN-1-FSV -003-0239A UPPER TAP MAIN FW SG2 ISLN VALVE	-A	1-FSV -003-0239A 206-381-2F	-A		729' 78K3-822950	A02	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓ WBN-1-FSV -003-0239B UPPER TAP MAIN FW SG2 ISLN VALVE	-B	1-FSV -003-0239B 206-381	-B		729'	A02	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓ WBN-1-FSV -003-0242A UPPER TAP MAIN FW SG3 ISLN VALVE	-A	1-FSV -003-0242A 206-381	-A		729'	A02	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CAH 8/21/90		
CHECKED/DATE	WBK 8/21/86	ATM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
✓WBN-1-FSV -003-0242B UPPER TAP MAIN FW SG3 ISLN VALVE	-B	1-FSV -003-0242B 206-381-2F	-B		729' 78K3-822950	A02	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓WBN-1-FSV -003-0245A UPPER TAP MAIN FW SG4 ISLN VALVE	-A	1-FSV -003-0245A 206-381	-A		729'	A01	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓WBN-1-FSV -003-0245B UPPER TAP MAIN FW SG4 ISLN VALVE	-B	1-FSV -003-0245B 206-381-2F	-B		729' 78K3-822950	A01	A/B A/B	(3)/100D 5MN/100D	MS/V FW/V	VLVS MUST CLOSE ON FW ISLN SIGNAL,THESE VLVS ALSO PERFORM CONTAINMENT ISLN FUNCTION. VLVS MUST DEENERGIZE FOR MS/V EVENT.
✓WBN-1-FSV -030-0002 PURGE AIR SUP FAN A ISLN VALVE	-A	1-FSV -030-0002 206-381-3RF	-A		737' 84K6-835731	A05	A/B	5MN/100D	L	DAMPERS ARE ACTIVATED BY A CNTMT VENT ISLN SIGNAL AND REQUIRED TO CLOSE AND REMAIN CLOSED FOR THE DURATION OF THE EVENT.
✓WBN-1-FSV -030-0005 PURGE AIR SUP FAN B ISLN VALVE	-A	1-FSV -030-0005 206-381-3RF	-A		737' 84K6-835731	A05	A/B	5MN/100D	L	DAMPERS ARE ACTIVATED BY A CNTMT VENT ISLN SIGNAL AND REQUIRED TO CLOSE AND REMAIN CLOSED FOR THE DURATION OF THE EVENT.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CAH 8/21/90		
CHECKED/DATE	WBK 8/21/86	ATM 8/28/90		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
✓WBN-1-FSV -030-0007 -A UPPER COMPT PURGE ISLN VALVE	1-FSV -030-0007 -A X206-381-3RF	286	795'8" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV'S ON A CNTMT VENT ISLN SIGNAL AND RESET.
WBN-1-FSV -030-0008 -B UPPER COMPT PURGE ISLN VALVE	1-FSV -030-0008 -B X206-381-3RF	289	797'2" 80KJ3-827551	UC	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -030-0009 -B UPPER COMPT PURGE ISLN VALVE	1-FSV -030-0009 -B X206-381-3RF	263	800'9" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV'S ON A CNTMT VENT ISLN SIGNAL & RESET.
✓WBN-1-FSV -030-0010 -A UPPER COMPT PURGE ISLN VALVE	1-FSV -030-0010 -A X206-381-3RF	261	797' 80KJ3-827551	UC	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
✓WBN-1-FSV -030-0012 -A ANNULUS PURGE VALVE SOLENOID	1-FSV -030-0012 -A X206-381-2RU	260	795'8" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A CNTMT VENT ISLN SIGNAL AND CANNOT FAIL CAUSING FCV TO REMAIN OPEN.

		R 4	R____	R____
PREPARER/DATE	EEM 8/21/86	CAH 8/21/90		
CHECKED/DATE	WBK 8/21/86	ARM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
✓WBN-1-FSV -030-0013 -A INTERIM ABSCE ISLN VALVE	1-FSV -030-0013 -A X206-381-2RU		713' 80KJ3-827551	A06	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOCIATED FCV ON ABI SIGNAL. MUST REMAIN DEENERGIZED TO PREVENT VALVE OPENING AFTER SIGNAL IS RESET.
✓WBN-1-FSV -030-0014 -A LOWER COMPT PURGE ISLN VALVE	1-FSV -030-0014 -A X206-381-3RF	305	738'10" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A CNTMT VENT ISLN SIGNAL AND CANNOT FAIL CAUSING FCV TO REMAIN OPEN.
WBN-1-FSV -030-0015 -B LOWER COMPT PURGE ISLN VALVE	1-FSV -030-0015 -B X206-381-3RF	298	740'5" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
✓WBN-1-FSV -030-0016 -B LOWER COMPT PURGE ISLN VALVE	1-FSV -030-0016 -B X206-381-3RF	239	732'10" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV ON A CNTMT VENT ISOLATION SIGNAL AND RESET.
WBN-1-FSV -030-0017 -A LOWER COMPT PURGE ISLN VALVE	1-FSV -030-0017 -A X206-381-3RF	233	741'3" 80KJ3-827551	AC3	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CAH 8/21/90		
CHECKED/DATE	WBK 8/21/86	DAM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
✓WBN-1-FSV -030-0018 -B INTERIM ABSCE ISLN VALVE	1-FSV -030-0018 -B X206-381-2RU		713' 80KJ3-827551	A06	A/B	5MN/100D	L	MUST DEENERGIZE AND REMAIN DEENERGIZED SO FCO DOES NOT OPEN WITH AN ABI SIGNAL PRESENT.
WBN-1-FSV -030-0019 -B INCORE INSTR RM PURGE ISLN VALVE	1-FSV -030-0019 -B X206-381-3RF	057	730' 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A CNTMT VENT ISLN SIGNAL AND CANNOT FAIL CAUSING FCV TO REMAIN OPEN.
✓WBN-1-FSV -030-0020 -A INCORE INSTR RM PURGE ISLN VALVE	1-FSV -030-0020 -A X206-381-3RF	057	727'11" 80KJ3-827551	IIR	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -030-0028 -A INTERIM ABSCE ISLN VALVE	1-FSV -030-0028 -A X206-381-2RU		737' 80KJ3-827551	A05	A/B	5MN/100D	L	MUST DEENERGIZE ON AN ABI SIGNAL AND REMAIN DEENERGIZED TO PREVENT VALVE OPENING AFTER RESET.
WBN-1-FSV -030-0029 -B INTERIM ABSCE ISLN VALVE	1-FSV -030-0029 -B X206-381-2RU		737' 80KJ3-827551	A05	A/B	5MN/100D	L	MUST DEENERGIZE ON AN ABI SIGNAL AND REMAIN DEENERGIZED TO PREVENT VALVE OPENING AFTER RESET.

	R 4	R____	R____
PREPARER/DATE EEM 8/21/86	CRR 8/21/90		
CHECKED/DATE WBK 8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -030-0037 -B LOWER COMPT PURGE SOLENOID	1-FSV -030-0037 -B X206-381-3RF	285	714'6" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED ON A CNTMT VENT ISLN SIGNAL AND RESET.
WBN-1-FSV -030-0040 -A LOWER COMPT PURGE SOLENOID	1-FSV -030-0040 -A X206-381-3RF	286	721'11" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -030-0050 -B UPPER CNTMT EXHAUST ISLN VALVE	1-FSV -030-0050 -B X206-381-3RF	292	718'9" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO CLOSE ASSO FCV'S ON CNTMT VENT ISO SIG & PREVENT OPENINT ON SIG RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNC ASSO LS'S.
WBN-1-FSV -030-0051 -A UPPER CNTMT EXHAUST ISLN VALVE	1-FSV -030-0051 -A X206-381-3RF	290	745'10" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV ON A CNTMT VENT ISLN SIGNAL AND RESET.
WBN-1-FSV -030-0052 -A UPPER CNTMT EXHAUST ISLN VALVE	1-FSV -030-0052 -A X206-381-3RF	252	754' 80KJ3-827551	UC	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CKH 8/21/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

P DATE: 08/15/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT QUALIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -030-0053 -B UPPER CNTMT EXHAUST ISLN VALVE	1-FSV -030-0053 -B X206-381-3RF	252	747'11" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV ON A CNTMT VENT ISLN SIGNAL AND RESET.
WBN-1-FSV -030-0054 -A ANNULUS EXHAUST ISLN VALVE SOLENOID	1-FSV -030-0054 -A X206-381-2RU	039	729' 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A CNTMT VENT ISLN SIGNAL AND CANNOT FAIL CAUSING FCV TO REMAIN OPEN.
WBN-1-FSV -030-0056 -A LOWER CNTMT EXHAUST ISLN VALVE	1-FSV -030-0056 -A X206-381-3RF	038	737'10" 80KJ3-827551	AC1	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH CNTMT VENT ISO SIG PRESENT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -030-0057 -B LOWER CNTMT EXHAUST ISLN VALVE	1-FSV -030-0057 -B X206-381-3RF	033	732'8" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A CNTMT VENT ISLN SIGNAL AND CANNOT FAIL CAUSING FCV TO REMAIN OPEN.
WBN-1-FSV -030-0058 -B INCORE INSTR RM EXHAUST ISLN VALVE	1-FSV -030-0058 -B X206-381-3RF	118	738'9" 80KJ3-827551	IIR	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO CLOSE ASSO FCV'S ON CNTMT VENT ISOL SIG AND PREVENT REOPENING MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CSK 8/2/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -030-0059 -A INCORE INSTR RM EXHAUST ISLN VALVE	1-FSV -030-0059 -A X206-381-3RF	116	740'11" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A CNTMT VENT ISLN SIGNAL AND CANNOT FAIL CAUSING FCV TO REMAIN OPEN.
WBN-1-FSV -030-0060 -A INTERIM ABSCE ISLN VALVE	1-FSV -030-0060 -A X206-381-2RU		757' 80KJ3-827551	A16	A/B	5MN/100D	L	MUST DEENERGIZE ON AN ABI SIGNAL AND REMAIN DEENERGIZED TO PREVENT VALVE OPENING AFTER SIGNAL IS RESET.
WBN-1-FSV -030-0061 -A PURGE AIR EXH UNIT A SUCTION VALVE	1-FSV -030-0061 -A 206-381-3RF		713' 84K6-835731	A06	A/B	5MN/100D	L	DAMPERS ARE ACTIVATED BY CNTMN VENT ISLN SIGNAL AND ARE REQUIRED TO CLOSE AND REMAIN CLOSED FOR DURATION OF EVENT.
WBN-1-FSV -030-0062 -A PURGE AIR EXH UNIT B SUCTION VALVE	1-FSV -030-0062 -A 206-381-3RF		713' 84K6-835731	A06	A/B	5MN/100D	L	DAMPERS ARE ACTIVATED BY CNTMN VENT ISLN SIGNAL AND ARE REQUIRED TO CLOSE AND REMAIN CLOSED FOR DURATION OF EVENT.
WBN-1-FSV -030-0069 -B INTERIM ABSCE ISLN VALVE	1-FSV -030-0069 -B X206-381-2RU		757' 80KJ3-827551	A16	A/B	5MN/100D	L	MUST DEENERGIZE ON ABI SIGNAL AND REMAIN DEENERGIZED TO PREVENT VLV OPENING AFTER SIGNAL IS RESET.

	R 4	R	R
PREPARER/DATE EEM 8/21/86	CSR 8/24/90		
CHECKED/DATE WBK 8/21/86	AJM 8/28/90		

WATTS BAR N LEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -030-0296 -A INTERIM ISLN DAMPER CDWE	1-FSV -030-0296 -A 206-381		729'	A04	A/B	5MN/100D	L	VLVS MUST CLOSE AND REMAIN CLOSED AFTER ABI.
WBN-1-FSV -030-0297 -B INTERIM ISLN DAMPER CDWE	1-FSV -030-0297 -B 206-381		729'	A04	A/B	5MN/100D	L	VLVS MUST CLOSE AND REMAIN CLOSED AFTER ABI.
WBN-1-FSV -030-0298 -B INTERIM ISLN DAMPER CDWE	1-FSV -030-0298 -B 206-381		729'	A04	A/B	5MN/100D	L	VLVS MUST CLOSE AND REMAIN CLOSED AFTER ABI.
WBN-1-FSV -030-0299 -A INTERIM ISLN DAMPER CDWE	1-FSV -030-0299 -A 206-381		729'	A04	A/B	5MN/100D	L	VLVS MUST CLOSE AND REMAIN CLOSED AFTER ABI.
WBN-1-FSV -031-0305 -B INCORE INST RM CHILL A CWR ISLN VALVE	1-FSV -031-0305 -B X206-381-2RU	060	736'8" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE FCV AND REMAIN DEENERGIZED WHEN PHASE A ISOLATION SIGNAL IS PRESENT OR ON RESET.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CSH 8/21/90		
CHECKED/DATE	WBK 8/21/86	GJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -031-0306 -A INCORE INST RM CHILL A CWR ISLN VALVE	1-FSV -031-0306 -A X206-381-3RF	063	738' 80KJ3-827551	IIR	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH PHASE A CONT ISO SIG PRESNT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -031-0308 -A INCORE INST RM CHILL A CWS ISLN VALVE	1-FSV -031-0308 -A X206-381-2RU	060	739' 80KJ3-827551	IIR	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH PHASE A CONT ISO SIG PRESNT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -031-0309 -B INCORE INST RM CHILL A CWS ISLN VALVE	1-FSV -031-0309 -B X206-381-2RU	060	738'8" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE FCV AND REMAIN DEENERGIZED WHEN PHASE A ISOLATION SIGNAL IS PRESENT OR ON RESET.
WBN-1-FSV -031-0326 -A INCORE INST RM CHILL B CWR ISLN VALVE	1-FSV -031-0326 -A X206-381-2RU	100	733'2" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE FCV AND REMAIN DEENERGIZED WHEN PHASE A ISOLATION SIGNAL IS PRESENT OR ON RESET.
WBN-1-FSV -031-0327 -B INCORE INST RM CHILL B CWR ISLN VALVE	1-FSV -031-0327 -B X206-381-2RU	103	733'7" 80KJ3-827551	IIR	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH PHASE A CONT ISO SIG PRESNT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.

	R 4	R____	R____
PREPARER/DATE EEM 8/21/86	CSD 8/21/90		
CHECKED/DATE WBK 8/21/86	AFM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	AZMITH	LOCATION ELEV(1) CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -031-0329 -B INCORE INST RM CHILL B CWR ISLN VALVE	1-FSV -031-0329 -B X206-381-2RU	102	733'2" 80KJ3-827551	IIR	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING WITH PHASE A CONT ISO SIG PRESNT & RESET. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -031-0330 -A INCORE INST RM CHILL B CWS ISLN VALVE	1-FSV -031-0330 -A X206-381-2RU	109	733'10" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE FCV AND REMAIN DEENERGIZED WHEN PHASE A ISOLATION SIGNAL IS PRESENT OR ON RESET.
WBN-1-FSV -043-0002 -B PRESSURIZER GAS CNTMT ISLN VALVE	1-FSV -043-0002 -B 206-381-3RF	282	720' 5" 75C63-085629-2	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN IN SPITE OF A PHASE A CNTMT ISOLATION SIGNAL.
WBN-1-FSV -043-0003 -A PRESSURIZER GAS CNTMT ISLN VALVE	1-FSV -043-0003 -A X206-381-3RF	293	721'10" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0011 -B PRESSURIZER LIQUID CNTMT ISLN VALVE	1-FSV -043-0011 -B 206-381-3RU	289	723'8" 84PJ5-835888	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN IN SPITE OF A PHASE A CNTMT ISOLATION SIGNAL.

	R 4	R	R
PREPARER/DATE EEM 8/21/86	CRF 8/21/90		
CHECKED/DATE WBK 8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0012 -A PRESSURIZER LIQUID CNTMT ISLN VALVE	1-FSV -043-0012 -A X206-381-3RF	289	720' 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0022 -B RCS HOT LEG HDR CNTMT ISLN VALVE	1-FSV -043-0022 -B 206-381-3RU	291	721'3" 84PJ5-835888	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN IN SPITE OF A PHASE A CNTMT ISOLATION SIGNAL.
WBN-1-FSV -043-0023 -A RCS HOT LEG HDR CNTMT ISLN VALVE	1-FSV -043-0023 -A X206-381-3RF	314	729'10" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0034 -B ACCUM TK HDR CNTMT ISLN VALVE	1-FSV -043-0034 -B 206-381-3RU	295	735'11" 84PJ5-835888	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN IN SPITE OF A PHASE A CNTMT ISOLATION SIGNAL.
WBN-1-FSV -043-0035 -A ACCUM TK HDR CNTMT ISLN VALVE	1-FSV -043-0035 -A 206-381-3RU	285	717'10" 84PJ5-835888	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CBJ 8/21/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	AZMITH (LOCATION)	ELEV(1) (LOCATION) CONTRACT	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0054D -B STEAM GEN 1 SAMPLE CNTMT ISLN VALVE	1-FSV -043-0054D -B X206-381-3RF	298	721'9" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0055 -A STEAM GEN 1 BLDN SAMPLE ISLN VALVE	1-FSV -043-0055 -A 206-381-3RU	291	718' 84PJ5-835888	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0056D -B STEAM GEN 2 CNTMT ISLN VALVE	1-FSV -043-0056D -B 206-381-3RU	287	719'10" 84PJ5-835888	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0058 -A STEAM GEN 2 BLDN SAMPLE ISLN VALVE	1-FSV -043-0058 -A 206-381-3RU	288	717'9" 84PJ5-835888	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0059D -B STEAM GEN 3 CNTMT ISLN VALVE	1-FSV -043-0059D -B 206-381	285	718'11"	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.

			R 4	R	R
PREPARER/DATE	EEM	8/21/86	CRH 8/21/90		
CHECKED/DATE	WBK	8/21/86	QTM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0061 -A STEAM GEN 3 BLOWDOWN SAMPLE ISLN VALVE	1-FSV -043-0061 -A 206-381-3RU	285	723' 84PJ5-835888	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0063D -B STEAM GEN 4 CNTMT ISLN VALVE	1-FSV -043-0063D -B 206-381-3RU	285	718'7" 84PJ5-835888	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0064 -A STEAM GEN 4 BLOWDOWN SAMPLE ISLN VALVE	1-FSV -043-0064 -A 206-381-3RU	286	721'5" 84PJ5-835888	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.
WBN-1-FSV -043-0075 -B DNSTR EXCESS LETDOWN HTX ISLN VALVE	1-FSV -043-0075 -B 206-381-3RU	318	721'2" 84PJ5-835888	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN IN SPITE OF PHASE A CNTMT ISOLATION SIGNAL.
WBN-1-FSV -043-0077 -A DNSTR EXCESS LETDOWN HTX ISLN VALVE	1-FSV -043-0077 -A 206-381-3RU	313	721' 84PJ5-835888	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE ON A PHASE A ISOLATION SIGNAL AND REMAIN DEENERGIZED SO THAT THE FCV DOES NOT OPEN.

			R 4	R	R
PREPARER/DATE	EEM	8/21/86	CXR 8/21/90		
CHECKED/DATE	WBK	8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -043-0201 -A LOCA H2 CNTMT MONITOR ISLN SOL VLV	1-FSV -043-0201 -A X206-381-2RU	226	723'3" 80KJ3-827551	AC3	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MUST FUNCTION TO ALLOW SAMPLING OF CNTMT ATMOSPHERE DURING THESE EVENTS.
WBN-1-FSV -043-0202 -A LOCA H2 CNTMT MONITOR ISLN SOL VLV	1-FSV -043-0202 -A X206-381-2RU	230	723' 80KJ3-827551	AC3	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MUST FUNCTION TO ALLOW SAMPLING OF CNTMT ATMOSPHERE DURING THESE EVENTS.
WBN-1-FSV -043-0207 -B LOCA H2 CNTMT MONITOR ISLN SOL VLV	1-FSV -043-0207 -B X206-381-2RU	300	728' 80KJ3-827551	AC4	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MUST FUNCTION TO ALLOW SAMPLING OF CNTMT ATMOSPHERE DURING THESE EVENTS.
WBN-1-FSV -043-0208 -B LOCA H2 CNTMT MONITOR ISLN SOL VLV	1-FSV -043-0208 -B X206-381-2RU	287	727'8" 80KJ3-827551	AC4	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MUST FUNCTION TO ALLOW SAMPLING OF CNTMT ATMOSPHERE DURING THESE EVENTS.
WBN-2-FSV -065-0007 -B EGTS TRAIN A UNIT 2 SUCTION VALVE	2-FSV -065-0007 -B 206-381-3RF		757' 85K8-836669	A16	B	100D	L	FOR A UNIT 1 LOCA, THIS FSV MUST NOT FAIL IN A MANNER THAT COULD OPEN THE ASSOCIATED FCV.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CNF 8/21/90		
CHECKED/DATE	WBK 8/21/86	gJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -065-0008 -B EGTS TRAIN A UNIT 1 SUCTION VALVE	1-FSV -065-0008 -B 206-381-3RU		757' 84PJ5-835888	A16	A	100D	L	THESE REDUNDANT ISOLATION SOLENOIDS ARE MANUALLY OPERATED AND MAY BE REQUIRED ANYTIME DURING LOCA.
WBN-1-FSV -065-0010 -A EGTS TRAIN A UNIT 1 SUCTION VALVE	1-FSV -065-0010 -A 206-381-3RF		757' 84K6-835731	A16	A	100D	L	MUST ENERGIZE TO OPEN ASSOCIATED FCV AND REMAIN ENERGIZED FOR DURATION OF EVENT.
WBN-1-FSV -065-0026 -A UNIT 1 SHIELD BLDG EXHAUST A VALVE	1-FSV -065-0026 -A 206-381-3RF		757' 84K6-835731	A16	A	100D	L	DAMPERS MUST OPEN ON A CNTMT ISLN SIGNAL SO EGTS CAN DISCHARGE.
WBN-1-FSV -065-0027 -B UNIT 1 SHIELD BLDG EXHAUST B VALVE	1-FSV -065-0027 -B 206-381-3RF		757' 84K6-835731	A16	A	100D	L	DAMPERS MUST OPEN ON A CNTMT ISLN SIGNAL SO EGTS CAN DISCHARGE.
WBN-0-FSV -065-0028A -B EGTS TRAIN A DECAY COOL VALVE A	0-FSV -065-0028A -B 206-381-3RU		757' 84PJ5-835888	A16	A	100D	L	AUTOMATICALLY ACTIVATES TO OPEN DAMPERS WHICH REMOVE DECAY HEAT WHENEVER TRAIN IS ISOLATED.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CSN 8/21/90		
CHECKED/DATE	WBK 8/21/86	GJM 8/28/90		

WATTS BAR NU[illegible]EAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-FSV -065-0028B -B EGTS TRAIN A DECAY COOL VALVE B	0-FSV -065-0028B -B 206-381-3RU		757' 84PJ5-835888	A16	A	100D	L	AUTOMATICALLY ACTIVATES TO OPEN DAMPERS WHICH REMOVE DECAY HEAT WHENEVER TRAIN IS ISOLATED.
WBN-1-FSV -065-0030 -B EGTS TRAIN B UNIT 1 SUCTION VALVE	1-FSV -065-0030 -B 206-381-3RF		757' 84K6-835731	A16	A	100D	L	MUST ENERGIZE TO OPEN ASSOCIATED FCV AND REMAIN ENERGIZED FOR DURATION OF EVENT.
WBN-0-FSV -065-0047A -A EGTS TRAIN B DECAY COOL VALVE A	0-FSV -065-0047A -A 206-381-3RU		757' 84PJ5-835888	A16	A	100D	L	AUTOMATICALLY ACTIVATES TO OPEN DAMPERS WHICH REMOVE DECAY HEAT WHENEVER TRAIN IS ISOLATED.
WBN-0-FSV -065-0047B -A EGTS TRAIN B DECAY COOL VALVE CONT	0-FSV -065-0047B -A 206-381-3RU		757' 84PJ5-835888	A16	A	100D	L	AUTOMATICALLY ACTIVATES TO OPEN DAMPERS WHICH REMOVE DECAY HEAT WHENEVER TRAIN IS ISOLATED.
WBN-2-FSV -065-0050 -A EGTS TRAIN B UNIT 2 SUCTION VALVE	2-FSV -065-0050 -A 206-381-3RF		757' 85K8-836669	A16	B	100D	L	FOR A UNIT 1 LOCA, THIS FSV MUST NOT FAIL IN A MANNER THAT COULD OPEN THE ASSOCIATED FCV.

		R 4	R____	R____
PREPARER/DATE	EEM 8/21/86	[illegible] 8/21/90		
CHECKED/DATE	WBK 8/21/86	GJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -065-0051 -A EGTS TRAIN B UNIT 1 SUCTION VALVE	1-FSV -065-0051 -A 206-381-3RU		757' 84PJ5-835888	A16	A	100D	L	THESE REDUNDANT ISLN SOLENOIDS ARE MANUALLY OPERATED & MAY BE REQUIRED ANYTIME DURING LOCA.
WBN-1-FSV -065-0052 -A CNTMT ANNULUS VAC FANS ISLN DMPR	1-FSV -065-0052 -A X206-381-3RF		757' 80KJ3-827551	A16	A/B	5MN/100D	L	DAMPERS MUST CLOSE ON A CNTMT ISLN SIGNAL TO ISOLATE THE ANNULUS VACUUM FANS.
WBN-1-FSV -065-0053 -B CNTMT ANNULUS VAC FANS ISLN DMPR	1-FSV -065-0053 -B X206-381-3RF		757' 80KJ3-827551	A16	A/B	5MN/100D	L	DAMPERS MUST CLOSE ON A CNTMT ISLN SIGNAL TO ISOLATE THE ANNULUS VACUUM FANS.
WBN-1-FSV -068-0307 -A RCS FLOW CNTL VALVE WDS GA TO PRT	1-FSV -068-0307 -A 206-381-3RF	313	718' 75C63-85629-2	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN TO PREVENT VLV OPENING UPON RECPT PHASE A CNTMT ISO SIGNAL. MUST NOT FAIL IN MANNER TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS. R5
WBN-1-FSV -070-0085 -B EXCESS LETDOWN HTX OUTLET VALVE	1-FSV -070-0085 -B X206-381-2RU		713' 80KJ3-827551	A28	A/B B B B B	5MN/100D 1MO 1MO 1MO 1MO	L CV/A RH/A AF/A AB/A	MUST REMAIN DEENERZD DURATION ALL EVENTS AS LISTED TO ENSURE FCV CONT ISOL FOR LOCA AND LS PAM FUNCTION ALL OTHER EVENTS.

		R 4	R 5	R
PREPARER/DATE	EEM 8/21/86	CDH 8/21/90	CAN 10/17/90	
CHECKED/DATE	WBK 8/21/86	AFM 8/28/90	[illegible] 10/17/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -077-0127 -B REAC BLDG SUMP DISCH FLOW SOL VALVE	1-FSV -077-0127 -B X206-381	296	720'10"	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE ASSOC ISOL VLV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCTION OF ASSOC LIMIT SWS.
WBN-1-FSV -077-0128 -A REAC BLDG SUMP DISCH FLOW SOL VALVE	1-FSV -077-0128 -A X206-381-3RF		713' 80KJ3-827551	A28	B B B B A/B	1MO 1MO 1MO 1MO 5MN/100D	RH/A CV/A AF AB L	MUST DEENERGIZE TO CLOSE ASSOC ISOL VLV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -090-0107 -A CNTMT BLDG LWR COMPT MON ISLN VALVE	1-FSV -090-0107 -A X206-381-3RF	294	741'11" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0108 -B CNTMT BLDG LWR COMPT MON ISLN VALVE	1-FSV -090-0108 -B X206-381-3RF	297	737'9" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0109 -B CNTMT BLDG LWR COMPT MON ISLN VALVE	1-FSV -090-0109 -B X206-381	298	737' 7"	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.

R4

		R 4	R____	R____
PREPARER/DATE	EEM 8/21/86	CNT 8/21/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -090-0110 -B CNTMT BLDG LWR COMPT MON ISLN VALVE	1-FSV -090-0110 -B X206-381-3RF	296	738'1" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0111 -A CNTMT BLDG LWR COMPT MON ISLN VALVE	1-FSV -090-0111 -A X206-381-3RF	293	741'11" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0113 -A CNTMT BLDG UPPER COMPT MON ISLN VALVE	1-FSV -090-0113 -A X206-381-3RF	292	740'5" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0114 -B CNTMT BLDG UPPER COMPT MON ISLN VALVE	1-FSV -090-0114 -B X206-381-3RF	295	737'9" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0115 -B CNTMT BLDG UPPER COMPT MON ISLN VALVE	1-FSV -090-0115 -B X206-381-3RF	294	737'9" 80KJ3-827551	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	8/21/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -090-0116 -B CNTMT BLDG UPPER COMPT MON ISLN VALVE	1-FSV -090-0116 -B X206-381	291	737' 8"	AC4	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.
WBN-1-FSV -090-0117 -A CNTMT BLDG UPPER COMPT MON ISLN VALVE	1-FSV -090-0117 -A X206-381-3RF	290	741'7" 80KJ3-827551	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE AND REMAIN DEENERGIZED TO CLOSE FCV WITH CNTMT VENT ISOLATION SIGNAL PRESENT OR RESET.

		R 4	R	R
PREPARER/DATE	EEM 8/21/86	CKH 8/21/90		
CHECKED/DATE	WBK 8/21/86	AJM 8/28/90		

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
			R 4 /R
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED /R2 CDH	DATE 4/30/90 CDH 8/21/90	
	CHECKED /R2 AFM	DATE 4/30/90 AFM 8/28/90	

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-3 for source of Category and Operating Time assignments.

3. See TAB C-4, page C-90 for a discussion on post-accident conditions for these valves.

4. Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 1 OF 26
			R 2 R
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86	4/30/90
	CHECKED WBK	DATE 8/21/86	4/30/90

A. DOCUMENTATION (See Note on Page B-3) R2

Equipment Description: Solenoid Valves

Vendor/Manufacturer: Automatic Switch Company (ASCO)

Equipment Model No.(s): 206-381-2RU 206-281-3RVU

206-381-3RU 206-381-6RVF

206-381-3RF 206-381-2F

QUALIFICATION REPORTS (See TAB C, "Discussion")(See Note on Page B-3) R2

(1) Title/Number/Revision "Report on Qualification of Automatic Switch Co. (ASCO) Catalog NP-1 Solenoid Vlvs for Safety-Related Applications in Nuclear Power Generating Stations", AQR-67368, Rev. 1 — RIMS B45 850514 428 — DATE 8/19/83 R2

(2) Title/Number/Revision "Equipment Qualification Research-Test Program & Failure Analysis of Class 1E Solenoid Vlvs", F-C5569-309/315, Appendix C. — RIMS NEB 840925 351 — DATE Nov. 1983

(3) Title/Number/Revision "Aging and Qualification Research on Solenoid Operated Valves," NUREG/CR-5141 RV — RIMS B74 890623 502 — DATE August 1988

(4) Title/Number/Revision "ASCO Engineering Report No. 177" — RIMS B25 870612 003 — DATE 12/11/79

OTHER (ANALYSIS, VENDOR DATA, ETC.)

Refer to Sheets 1A & 1B

Note: Throughout this TAB, references are made to the ASCO qualification report listed above. This report is identified as (2) in these references. Although the COCs in TAB E certify compliance to ASCO test report AQS21678/TR, Rev. A, NRC Information Notice 85-08, para. 4.b (see TAB J-4) considers all ASCO NP-1 valves (except NP8316 series) qualified to (1) above. Therefore, we are using (1) above for qualification of the valves in this binder.

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 1a OF 26 R 2 R	R1
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 9/24/86 CRH 4/30/90		
	CHECKED WBK/HDR	DATE 9/24/86 GTM 4/30/90		

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued) R2

	Description	RIMs No.
(5)	Wyle Test Report No. 17523-1, Test Program on Sealants for Class 1E Devices	EEB 840731 501
(6)	Wyle Laboratories Letter dated December 10, 1985.	B45 851213 008
(7)	ASCO Letter dated April 29, 1985; NP Valve Mounting Orientation.	B43 850502 015
(8)	ASCO Letters dated May 8, 1986 and May 16, 1986; respectively; Coil Heat Rise Versus Ambient Temperature Data.	B71 860512 001 & B71 860520 001
(9)	Status and Duty Cycles of 1E Solenoid Valves Located in Potentially Harsh Environments (WBNOSG4-045 R1).	B45 860902 219
(10)	Reduction of Beta Dose by Sheet Steel (WBNTSR-051 R0).	B26 891129 202
(11)	Deleted by Revision 2.	
(12)	Beta Dose Reduction From Finite Volume (WBNTSR-057 R0).	B26 891221 201
(13)	100-Day LOCA Dose to Electrical Equipment in the EGTS Filter Train Room (WBNNAL3-031 R1).	B45 880826 235
(14)	LOCA Temperature Profile in the Dead-Ended Compartments (QIR NEB86170).	B45 860922 253
(15)	Safety evaluation of superheated steam in the valve vaults caused by a main steam line break (WBNOSG4-003 R2).	B45 851112 218
(16)	Solenoid Valve Voltage Study WBNEEB-MS-TI 11-0004 ~~(WBPE VAR 8602002)~~.	B26 900202 407 ~~Later~~
(17)	Integrated Accident Dose inside Primary Containment (TI-RPS-48 R2).	B45 851105 235

R2

CAH 4/17/90

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BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 1b OF 26 R 3 R 4
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 9/24/86 CDH 5/11/90	CDH 8/28/90
	CHECKED WBK/HDR	DATE 9/24/86 AFM 5/17/90	AFM 8/28/90

A. DOCUMENTATION
OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

	Type		RIMs No.	
	Category and Operating Times			
(18)	System 1	(WBNOSG4-004 R11)	B18 900612 253	R4
(19)	System 3	(WBNOSG4-005 R10)	~~B45~~ B26 900314 202 CDH 8/28/90	
(20)	System 30	(WBNOSG4-008 R15)	B26 900309 231	
(21)	System 31	(WBNOSG4-009 R7)	B26 900309 233	
(22)	System 43	(WBNOSG4-011 R10)	B26 900309 228	R4
(23)	System 65	(WBNOSG4-015 R10)	B26 900309 226	
(24)	System 68	(WBNOSG4-017 R9)	B26 890510 506	
(25)	System 70	(WBNOSG4-018 R13)	B26 900110 200	
(26)	System 77	(WBNOSG4-021 R5)	B18 900612 251	R4
(27)	System 90	(WBNOSG4-026 R7)	B45 870227 426	
(28)	U2 for U1	(WBNOSG4-040 R5)	B26 890321 016	

(29) TVA Environmental Drawing 47E235-41 R1 and DCA-P04104-01-0 per DCN P-04104-C (B26 890908 819)

(30) TVA Environmental Drawing 47E235-42 R2 and DCA-P04104-03-0 and DCA-P04104-05-0 per DCN P-04104-C (B26 890908 819)

(31) TVA Environmental Drawing 47E235-44 R1

(32) TVA Environmental Drawing 47E235-45 R1 and DCA-P04104-06-0 per DCN P-04104-C (B26 890908 819)

(33) TVA Environmental Drawing 47E235-48 R3

(34) TVA Environmental Drawing 47E235-56 R1

(35) TVA Environmental Drawing 47E235-61 R1

(36) TVA Environmental Drawing 47E235-76 R3

(37) TVA Environmental Drawing 47E235-78 R3

(38) Attenuation Factors for Postaccident Beta Dose in Primary Containment (GENAPS3-023 R0) — B04 900320 300

(39) Dose Grid Around the EGTS Filter (WBNTSR-018 R0) — B26 891106 203

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 2 OF 26
			R 3 R 4
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 9/24/86 CDH 5/17/90	CRH 8/21/90
	CHECKED WBK/HDR	DATE 9/24/86 AFM 5/17/90	AFM 8/28/90

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

_______ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

_______ Equipment Qualification Not Established by Documentation

_______ Equipment Not Qualified

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

(1) Deleted by revision 2.

(2) Deleted by revision 2.

(3) Deleted by revision 2.

(4) Deleted by revision 2.

(5) Solenoid valves with missing nameplates must be replaced with qualified models and must be field verified.

(6) Replace four solenoid valves which must be environmentally qualified to perform their intended safety-related functions.

(7) Deleted by revision 2.

(8) Conduit seal must be installed on several valves to meet PAM requirements.

(9) WBN position on possibility of multiple ground faults existing in DC distribution systems must be established.

R4

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 3 OF 26
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381-SERIES (DC CONSTRUCTION)	COMPUTED EEm	DATE 8/21/86	R ___ R ___
	CHECKED WHK	DATE 8/21/86	

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE 323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE 323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974, IEEE 344-1975, IEEE 382-1980, and IEEE 627-1980

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 4 OF 26
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381-SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86	R ___ R ___
	CHECKED WMK	DATE 8/21/86	

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS See TAB C

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 5 OF 26
			R 2 R
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86	4/30/90
	CHECKED WBK	DATE 8/22/86	5/1/90

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? No

		Plant Device	Qualification Document	Reference	
(1)	Equipment Type	Solenoid Vlv	Solenoid Vlv	Page 1 of (1)	
(2)	Manufacturer	ASCO	ASCO	Page 1 of (1)	
(3)	Model Number(s)	206-381-2F	206-381-6RF	Page 1 & 5 of (1)	R2
		206-381-3RU	K206-380-3RVF (Viton)	Table 3.2 of (1)	
		206-381-RU	NP832070E (Coil only)	App. I of (1)	
		206-381-3RF			
		206-381-3RVU			
		206-381-6RVF			
(4)	Serial Number(s)	See TAB F	Test Valve #3	Table 3.2 of (1)	R2
			Test Valve #2 (Viton)	Table 3.2 of (1)	

(5) Identify Component-Unique checksheet attached: None

JUSTIFICATION/COMMENTS "X" Prefix to model numbers listed in TAB A indicated A 1/2" NPT conduit connection in place of standard 3/4" NPT connection. Differences between installed models and tested models are orifice size, mode of operation (i.e., normally closed, normally open, universal) and seat material. Orifice size and mode of operation do not affect qualification. Both elastomeric materials used as seats have been addressed in TAB C and metal-to-mtal seats are not environmentally degradable.

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	None Specified;See TAB C,"Interfaces"	No	NA
External Process Connections	None Specified;See TAB C,"Interfaces"	Yes	See Below and Ref(1) Section 9.5.3 p D-98
Electrical Connections	None Specified;See TAB C,"Interfaces"	Yes	NA
Conduit Seals	See TAB C-9	Yes	Section 5.3 of (1)
Connector Seals	N/A	No	NA
Orientation	Vertical & Upright ±45°	Yes	App. A, pg A2 of (1) & ASCO Letter (TAB E-9)
Physical Configuration	Conduit/Junction Box must be oriented such that moisture does not drain into coil housing	No	Ref (1) Sec. 5.3 and P-1 this TAB
Other	See below	Yes	See below

R2

JUSTIFICATION/COMMENTS ASCO does not identify specific interfacing requirements except to require a 90° street elbow facing downward connected to exhaust port or similar configuration to prevent moisture intrusion from liquid spray. This is required only on valves located inside containment and subject to containment spray. (Reference: Page A18, Section 9.5.3 of (1)). See TAB C-15 for TVA's position on this. TAB G lists valves requiring elbows. See TAB C for a description of the TVA interfaces. The process fluid for these valves is oil-free instrument air. See TAB J-2 for discussion. R2

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 7 OF 26
			R 2 R
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86	CAW 4/30/90
	CHECKED WBK	DATE 8/22/86	AMM 5/1/90

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (Yes/No/NA)? (Note below.)

	Yes/No/NA	Reference	
(a) Equipment inspected for damage	Yes	Sect. 4, pg. 8 of (1)	
(b) Baseline performance measurements taken	Yes	Sect. 4, pgs. 8,23,24 of(1)	
(c) Equipment aged:			
Thermal	Yes	Sect. 4.1.1, pg. 8 of (1)	
Radiation	Yes	Sect. 4.1.4, pg. 15 of (1)	R2
Wear	Yes	Sect. 4.1.2, pg. 12 of (1)	
(d) Vibration/seismic testing conducted	Yes	Sect. 4.1.5, pg. 15 Sect. 4.1.6, pg. 17 of (1)	
(e) Design basis event (DBE) exposure	Yes	Sect. 4.2, pgs. 19-23 of (1)	
(f) Post-DBE exposure	Yes	Sect. 4.2.3, pgs. 22 & 23 of (1)	
(g) Final inspection and disassembly	Yes	Sect. 4.4, pg. 24 of (1)	

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (Yes/No/NA)? Yes | R2

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (Yes/No/NA)? Yes (Reference: Appendix G of (1)). | R2

JUSTIFICATION/COMMENTS Test Valve #2 was utilized to qualify the Viton elastomers. Refererence to this valve is in regard to Viton | R2 elastomers qualification only unless otherwise noted.

Appendix I of (1) is used for coil qualification. | R2

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H. AGING

(1) Was aging considered in the qualification program (Yes/No/NA)? Yes (Reference: Appendix A, Sect. 9.4, pg. A10 of (1), and TAB C). R2

JUSTIFICATION/COMMENTS Aging was done using nitrogen as the process fluid in lieu of instrument air. See TAB C-11.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	App. A, Sect. 9.4.1 of (1)
Radiation exposure	Yes	App. A, Sect. 9.4.4 of (1)
Vibration (non-seismic) aging	Yes	App. A, Sect. 9.4.5 of (1)
Operational (electrical/mechanical/ process) stress aging	Yes	App. A, Sect. 9.4.2 and 9.4.3 of (1)

R2

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (Yes/No/NA)? Yes (Reference: NA).

JUSTIFICATION/COMMENTS See Discussion, P-4.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (Yes/No/NA)? Yes (Reference: App. A, Sect. 9.4.1, pg. A10 of (1) and TAB C). R2

JUSTIFICATION/COMMENTS

WBEP-0007Q

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (Yes/No/NA)? Yes
(Reference: App. B of (1)). | R2

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (Yes/No/NA)? Yes
(Reference: Sect. 4.1.1 & App. A, sect. 9.4.1 of (1)). | R2

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (Yes/No/NA)? Yes (Reference: App. A, Sect. 9.4.1 of (1)). | R2

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	130° F (worst case)	250°F	140°F
Time	40 years	18-1/4 days	8 years

JUSTIFICATION/COMMENTS The above equivalent time is based | R2
on the activation energy of the EPDM Elastomers (0.94eV) and does not consider heat rise due to the coil being energized. See TAB C-13 for heat rise analysis.). | R2

(e) Was the Arrhenius methodolgy used for accelerated aging (Yes/No/NA)? Yes (Reference: Pg. 9 & App. A, Section 9.4.1 of (1) & TAB C). | R2

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (Yes/No/NA)? Yes
(Reference: App. B of (1)). | R2

JUSTIFICATION/COMMENTS

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H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? N/A
(Reference: ________________).

JUSTIFICATION/COMMENTS ________________

____

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? Yes (Reference: Sect. 4.1.1, pg. 11 of (1)). R2

JUSTIFICATION/COMMENTS ________________

____

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: App. A, Sect. 9.4.4 & 9.5.2 of (1)). R2

JUSTIFICATION/COMMENTS ________________

____

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? No
(Reference: ________________).

JUSTIFICATION/COMMENTS ASCO's intent was not to subject the test specimen to radiation exposure in accordance with the limiting material. Their intent was to demonstrate operability regardless of the radiation threshold values by testing the entire assembly.

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? Yes
(Reference: Sect. 4.1.4 & 4.2.2 & App. A, Sect. 9.4.4 & 9.5.2 of (1)). R2

JUSTIFICATION/COMMENTS ________________

H. AGING (Continued)

(5) (d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Sect. 4.1.4 of (2)).

Plant normal ambient radiation dose (rd)	$2x10^7$ (worst case)
Test exposure dose (rd)	$2.3x10^7$, gamma
Test exposure dose rate (rd/hr)	0.71 Mrad/hr
Test exposure source type (e.g., Co-60 gamma)	Co-60, gamma

R2

JUSTIFICATION/COMMENTS Test valve was exposed to a combined aging and accident dose of $2.05x10^8$ Rads, which exceeds the worst case combined plant dose of $6x10^7$ Rads. Valves with Viton elastomers must be limited to $2x10^7$ Rads combined normal and accident dose if required to shift position after exposure. CAH 4/30/90

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: App. A, Sect. 9.4.5, pg. A13; and Sect. 4.1.5 of (1)). R2

JUSTIFICATION/COMMENTS No failure which could be attributed to vibration aging was identified.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Sect. 4.1.5; App. A, Sect. 9.4.5; of (1)). R2

JUSTIFICATION/COMMENTS

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (Yes/No/NA)? Yes (Reference: Sect. 4.1.2, 4.1.3, & 4.1.5 of (1)).

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R2

H. AGING (Continued)

(7) (a) JUSTIFICATION/COMMENTS Effects resulting from these stresses were not discernable from other effects. However, the valves successfully passed the baseline tests following thermal aging, wear aging, pressurization aging, and radiation aging.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: App. A, Sects. 9.4.2, 9.4.3 & 9.4.5 of (1)). | R2

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: Sect. 4.1.1 of (1)). | R2

Qualified life (Document in QMDS) See TABS C and G

JUSTIFICATION/COMMENTS The qualified life is different, in most cases, from the value given in the test report. TAB C provides rationale.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: App. C of (1)). | R2

JUSTIFICATION/COMMENTS Replacement intervals and qualified life are a function of plant specific conditions in comparison to test conditions. TABS C and G define the replacement intervals and qualified life and their basis. | R2

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 13 OF 26
			R 2 R
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/23/86 CRL 4/30/90	
	CHECKED WBK	DATE 8/23/86 ATM 5/1/90	

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis).

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference	
(a)	(Coil) IsoMica bonded with Hi-Temp Epoxy	NA	NA	1.00	App. B, pg. B5-B7 of (1)	
(b)	(Seats) Ethylene Propylene Terpolymer	NA	NA	0.94	App.B,pg. B3 of (1)	R2
(c)	Viton (Seats)	NA	NA	1.04	App.B,pg. B4 of (1)	
(d)	*DC 550 Lubricant	NA	NA	NA	NA	
(e)						

JUSTIFICATION/COMMENTS Note: The Class H coil is composed of six primary materials. Of these, the one with the lowest activation energy is Iso-Mica bonded with hi-temperature epoxy. Its activation energy is 1.00 eV. The materials of coil construction along with their activation energies are identified in Appendix B, page B5 through B7 of (1). Radiation values are not required because no analysis was performed. The devices were qualified by test.

*Although not stated in reference 1, DC 550 lubricant was used on tested valves as verified by ASCO letter dated January 5, 1988 (see TAB E-12). R2

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (Yes/No/NA)? Yes
(Reference: App. A, Sect. 6.1, 6.2, and 6.3 of (1)). R2

Identify Acceptance Criteria: Coil only taken from (1) - Must operate at any voltage between 90VDC and 140VDC. Battery operated DC valves must operate on demand at any voltage between 28% below and 12% above the specified nominal DC voltage. Insulation resistance must measure greater than or equal to 1 megohm at 500VDC. Leakage current must be less than 0.5 milliamps at 1250 VAC for 1 minute. For seats and discs, as taken from (1) - Valves must operate at the minimum and maximum operating pressure differential. Valves must not have a pressure increase at a cylinder port which is required to be vented or a pressure decrease at a cylinder port which is required to be pressurized in excess of 10% of the maximum operating pressure differential. Valves must shift to energized position upon application of power within limits specified above and shift to deenergized position when power is removed, with inlet press. applied at any value between max. and min. pressure differential. R2

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (Yes/No/NA)? Yes
(Reference: Ref. App. A, Sects. 6.1, 6.2, 7.1, 7.2, and Table 4.4 of (1)). R2

Identify baseline and functional testing: Recording coil excitation, coil dielectric, seat leakage at 125 psig and 10 psig in both the energized and deenergized state, noise test, external leakage at 125 psi, operational test from 125 psig to 0 psig, insulation resistance and number of active coil turns during initial baseline and following DBA simulation.

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (Yes/No/NA)? Yes (Reference: Appendix A, Sect 9.5.3 & Fig 9.2, page A26 of (1)) | R2

JUSTIFICATION/COMMENTS

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: Table 4.3 and Table 4.4 of (1)). | R2

JUSTIFICATION/COMMENTS

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	125V DC	See Below
Load	35.1 Watts	Contracts, TAB E
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Wiring diagrams drawings #45N600-1-2,4; -3-2,11; -30-8,9,11,12; -31-1, -43-1,2; -65-1,3; -68-1; -70; -77-2,6; -90-1.

R2

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	90 VDC Min. (See comment)	
Load	Not specified	
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS TVA Calculation WBN EEB-MS-TI11-0004 determines voltage available to each valve during accident conditions. (See comment after J.(5)(c)).

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	90 VDC	Fig. 9.2 P. A26 of (1) App. ~~IK,~~ AI pg. AI-2 of (1)
Load	35.1 Watts	
Frequency	NA	
Accuracy	NA	
Other(s)		

R4 CAH 8/12/96

JUSTIFICATION/COMMENTS Ref. (1), App. A, Section 6.1.1, requires 125VDC valves to operate on demand at any voltage between 90-140VDC. Per Figure 9.2 of Ref. (1) the test valve was successfully tested at 90VDC. A primary concern with solenoid valves is that of voltage available at the coil terminals. TVA calculation WBN EEB-MS-TI11-0004 shows that the valves in this binder are supplied voltage within their environmentally qualified minimum rating as required to perform their safety functions during accident conditions. R4

K. REQUIRED OPERATING ENVIRONMENT (Worst Case for All Environmental Areas)

Reference Environmental Drawing No. 47E235-42 and 47E235-76

(1) Normal Max

(a) Temperature (°F) 130°F

(b) Pressure (psig) 14.7 psia

(c) Humidity (%) 80%

(d) Radiation (rd) $2x10^7$ rads TID

(2) Abnormal Max

(a) Temperature (°F) 140°F

(b) Pressure (psig) 14.7 psia

(c) Humidity (%) 100%

(d) Radiation (rd) NA

(3) Process Interfaces: The process fluid for these valves is oil-free instrument air with a maximum design temperature of 100°F. Therefore, the bounding temperature for these valves is the ambient.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and less than 1% of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327°F* Accident type LOCA/HELB

(b) Pressure (psig) 11.2 psig 25.6 psia Accident type LOCA/HELB

(c) Humidity (%) 100% Accident type LOCA/HELB

(d) Radiation (rd) $4.7x10^8$ rads (beta) $3.8x10^7$ rads (gamma) Accident type LOCA/HELB

(e) Spray Type 0.1847 molar H_3BO_3 (2000 ppm Boron) 0.333 molar NaOH pH 8.3 @ 25°C Accident type LOCA/HELB

*See Tab C-4, Page C-90, for discussion of MSLB in the main steam valve rooms. R4

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): The duration of the containment spray is 30 days. Containment spray flow rate is equal to 9500 gal/min or 0.92 GPM per square foot of containment cross section.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: See Sect. P. (1) "Discussion").

(7) Subject to submergence (Yes/No/NA)? Yes (Reference:).

Identify initiation time and duration of submergence: See sheet 19A of this tab for discussion on valves subject to submergence. R2

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes
(Reference: Environmental Drawing 47E235-41, -42, -44, -45).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: See Section P(3) this TAB R2

(9) Special environmental calculations (temp., rad., etc.) R2

Type	RIMS No.
See TAB B, Sect. A	

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BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 19 OF 26 R 2 R
BINDER TITLE ASCO SOLENOID VALVES, MODEL 206-381 - SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86 CEH 4/30/90	
	CHECKED WBK	DATE 8/21/86 AMM 5/1/90	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days [1]	30 days	Fig. 4.2, pg. 26 of (1)
Temperature (°F)	327°F	450°F	Fig. 4.2, pg. 26 of (1)
Pressure (psig)	25.6 psia 11.2 psig	86 psig	Fig. 4.2, pg. 26 of (1)
Relative Humidity (%)	100% [2]	100%	Fig. 4.2, pg. 26 of (1)
Chemical Spray*	2000 Boron (H_3BO_3) pH 8.3	3000 ppm Boron pH 10.5	App. A, pg. A20 & A21 of (1)
Radiation (rd)**	6.42×10^7 rads	2.01×10^8 rads [3] gamma	Sect. 4.1.4, 4.2.2, 5.2, Table 5.1, App. D of (1)
Submergence	Yes	No	See Sheet 19A

R2

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type. 2.52×10^7 Beta (Attenuated dose) + 3.8×10^7 Gamma + 1×10^6 40-year dose = 6.42×10^7 Rads TID. (See Section P.(3) of this TAB for beta radiation discussion and TID to each room after attentuation of beta dose. R2

[1] Within 30 days the temperature will return to maximum normal.
[2] At 27.78 hours the humidity declines linearly to the maximum normal at 30 days.
[3] Valves containing viton elastomers are only qualified to a maximum of 2×10^7 rads gamma.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See (1) above
Pressure	Yes	See (1) above
Relative Humidity	Yes	See (1) above
Chemical Spray	Yes	See Sect. P.(2)
Submergence	No	See Sheet 19A & TAB C, Sect. C-10

JUSTIFICATION/COMMENTS

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

JUSTIFICATION/COMMENTS

Equipment located inside containment inside the crane wall below elevation 722' (surge level) could become submerged following an accident. Outside the crane wall, the steady state flood level is 717'9". No valves listed in this binder are located inside the crane wall and none are located below these levels. Some valves in the Valve Vault Rooms could be subjected to submergence. Environmental Data Drawing 47E235-76 lists the maximum flood levels for the Valve Vault Rooms to be 730.84' for the South Room and 730.87' for the North Room. The valves in this binder located in the Valve Vault Rooms are addressed under TAB C, Section C-4 (Group D Valves). | R2

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	>15°F	Yes
Pressure: +10% but no more than 10 psig	>10%	Yes
Radiation: +10% of accident dose	>10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	*	No
Voltage: ±10% of rated value	+12 to -28%	Yes
Frequency: ±5% of rated value	N/A	N/A
Environmental Transient: the initial transient and the peak temperature applied twice	Yes	Yes
Vibration: +10% added to acceleration	See Sect. 4.2.1 of (1)	Yes

JUSTIFICATION/COMMENTS See Appendix E of (1) for detailed information on margins. R2

*The post accident life calculation in TAB C proves that the 30-day test envelops the 100-day post accident requirement.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference: See TAB A).

JUSTIFICATION/COMMENTS Functions are varied. All are listed in TAB A.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (Yes/No/NA)? Yes (Reference: Sect. 5, Table 5.1, pg. 59, App. J, and pg. 33 of (1)). R2

JUSTIFICATION/COMMENTS The test valve is assumed to be normally energized and required to deenergize on receipt of accident signal, then to remain operable for 30 days post-DBA. The specific DBA functions of the TVA valves are described in TAB C.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (Yes/No/NA)? Yes (Reference: Sect. 4.2.3, App. J of (1)). R2

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (Yes/No/NA)? Yes (Reference: Table 5.1, Pg. 59 and App. J, Table 1 of (1)). R2

JUSTIFICATION/COMMENTS See TAB C for the analysis of the test DBA versus the plant specific DBA. The test valve demonstrated operability in accordance with the requirements defined in M(2) above.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (Yes/No/NA)? Yes (Reference: Sects. 5.2 and 5.3, pgs. 56 and 57 of (1) and page 33 of (1)). R2

JUSTIFICATION/COMMENTS We have reviewed and concur with the disposition of anomalies in the test report. There is no impact on installed equipment.

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						R	R
BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-381-SERIES (DC CONSTRUCTION)		COMPUTED EEm	DATE 8/21/86				
		CHECKED WWK	DATE 8/21/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TABS C and G

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 23 OF 26
BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-381-SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86	R ___ R ___
	CHECKED WAK	DATE 8/21/86	

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	N/A
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	N/A
(b) Were specific features and failure modes and effects analyzed?	N/A
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	N/A
(d) Were environmental parameters which affect equipment performance identified?	N/A
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 24 OF 26	R	R
BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-381-SERIES (DC CONSTRUCTION)	COMPUTED EEM	DATE 8/21/86			
	CHECKED WWK	DATE 8/21/86			

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-SOL-003	PLANT WBN	UNIT(S) 1	SHEET 25 OF 26
BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-381-SERIES (DC CONSTRUCTION)	COMPUTED EEm DATE 8/21/86	R	R
	CHECKED WKK DATE 8/21/86		

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	N/A
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	N/A
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

(1) Moisture or liquid intrusion (Sect. K.(6)).

The valves requiring protection from moisture or liquid intrusion have had Conax conduit seals installed and are identified in Section 1 of the QMDS, which is located in TAB G of the binder. See TAB C-9, submergence for elaboration.

P. DISCUSSION (Continued)

(2) Chemical Spray (Sec. L. (1) & (2)).

The containment spray flow rate is equal to 9500 gal/min or 0.92 GPM per square foot of containment cross section and the duration is 30 days. The chemical spray concentration is 2000 ppm Boron with a pH of 8.3. The ASCO test valve was subjected to a 30-day exposure to steam, chemical spray and clear water simulating a combined LOCA/HELB and post-accident cool-down. The chemical spray solution of 3000 ppm Boron as Boric Acid in solution with 0.064 molar sodium thiosulfate buffered with sodium hydroxide to a pH value of 10.5 at room temperature was applied at a rate of 0.7 GPM per square foot of valve area projected in a horizontal plane. The test solution is more corrosive than the containment spray. Therefore, all valves listed in this binder fall within the qualification provided by the test valve. R2

(3) Beta Radiation (Sec. 0.(12)(b)).

Post-DBA beta radiation must be addressed for all equipment located inside containment which is required for LOCA mitigation. Solenoid valves in Group A are located inside containment in the Lower Compartment, in the Accumulator and Fan Rooms, Group B valves are in the Upper Compartment, Group C valves are in the Annulus and Group G valves are in the Instrument Room. R2 R2

Per drawing 47E235-44, which covers the Annulus, the 100-day accident radiation dose is 1.2 x 10^7 rads (includes a Beta dose contribution of 6 x 10^5 rads). Since the ASCO valves are qualified to 2.0~~5~~ x 10^8 rads, no credit for reduction of the beta dose is necessary for the valves in Group C. R2

4-16-90

Per drawing 47E235-45, which covers the Instrument Room, the 100-day accident radiation dose is 4.7x10^8 Rads Beta and 1x10^7 Rads Gamma. R2

Per drawing 47E235-42, which covers the Lower Compartment, the 100-day accident radiation dose is 4.7 x 10^8 rads beta and 1 x 10^7 rads gamma. R2

Per Drawing 47E235-41, which covers the Upper Compartment, the 100-day accident radiation dose is 4.7 x 10^8 beta and 3.8 x 10^7 rads gamma. R2

Since the combined gamma/beta doses possible in the Lower (Group A), Upper (Group B), Compartments and Instrument Room (Group G), exceed the qualified level of the valves on face value, it is necessary to consider the inherent shielding afforded these valves. R2

P. DISCUSSION (Continued)

(3) Beta Radiation (Sec. 0.(12)(b)). (Continued)

All non-metallic parts of the valves are totally enclosed by metal with the exception of the 18" wire pigtails. The minimum thickness of metal is assumed to be the coil housing, which is 3/32" (0.09375) steel, per ASCO's Tom Hays telecon with TVA's Dean Helton on January 7, 1986. OE Calculation WBNTSR-051 "Reduction of Beta Dose by Sheet Steel," page 3.1, shows the beta reduction factor for 14 gauge (0.0747)" steel is equal to 0.0536. This reduces the total 100-day Beta dose to the valve internal parts to $(4.7 \times 10^8) \times (5.36 \times 10^{-2}) = 2.52 \times 10^7$ rads TID beta. |R4

In the Instrument Room, the total combined 100-day Beta and accident radiation dose will equal $(2.52 \times 10^7$ Beta$)+(1 \times 10^7$ Gamma$)= 3.52 \times 10^7$ Rads. The combined 100-day accident radiation plus the 40-year dose(3.5×10^5) equals a total radiation dose of 3.55×10^7 Rads TID.

In the Lower Compartment, the total combined 100-day beta and accident radiation dose will equal $(2.52 \times 10^7$ beta$) + (1.0 \times 10^7$ gamma$) = 3.52 \times 10^7$ rads. The combined 100-day accident radiation plus the 40-year dose (2×10^7) equals a total radiation dose of 5.52×10^7 rads TID.

In the Upper Compartment, the total combined 100-day Beta dose and Gamma accident radiation dose will equal $(2.52 \times 10^7$ Beta$) + 3.8 \times 10^7$ Gamma $= 6.32 \times 10^7$ rads. The combined 100-day accident radiation plus the 40-year dose (1×10^6) equals a total radiation dose of 6.42×10^7 rads TID.

The 2.01×10^8 rads the valves are qualified to clearly envelops the above requirements plus 10% Margin. |R4

The pigtail leads to valves No. 1-FSV-43-201, -202, -207, and -208 (subgroup A-2) terminate in a splice inside a piece of 1" solid conduit which attaches to a Conax connector. Inasmuch as these valves must be operable for 100 days after an accident, the pigtails must be qualified for the full 100-day radiation dose. Since a calculation on the reduction of beta dose afforded by solid conduit has not been made at this time, we will relate the wall thickness of the conduit to the aforementioned "Reduction of Beta Dose by Sheet Steel" calculation for this calculation. One-inch rigid conduit has a wall thickness of 0.135". Page 3.1 of the sheet steel calculation shows the beta reduction factor for 1/8-inch sheet steel is equal to 0.0090. This reduces the total 100-day beta dose to $(4.7 \times 10^8) \times (9.03 \times 10^{-3}) = 4.24 \times 10^6$ rads.

P. DISCUSSION (Continued)

(3) Radiation (Sec. 0.(12)(b) (Continued)

Thus, the total combined 100-day beta and gamma accident radiation dose (4.24×10^6 beta) + (1.0×10^7 gamma) = 1.42×10^7 rads, plus the 40-year dose (2.0×10^7 rads) equals a total radiation dose of 3.42×10^7 rads. The 2.01×10^8 rads the valves are qualified to clearly envelops the requirement. |R4

The pigtail leads of all other valves in Groups A and B are covered by 1/2 or 3/4 inch diameter flexible stainless steel conduit. Since these valves are required to operate for only 5 minutes into a LOCA, the pigtails are not required to be qualified for the full 100-day beta dose. OE Calculation TI-RPS-48 "Integrated Accident Dose Inside Primary Containment," Table VI-14, page 7.24, shows the total beta dose at 2 hours into the accident to equal 4.12×10^7 rads TID. The toal combined beta and gamma radiation dose will equal (4.12×10^7 beta) + (3.8×10^7 gamma) = 7.92×10^7 rads TID. Accident radiation plus the larger upper compartment 40-year dose (1.0×10^6 rads) equals a total radiation dose of 8.02×10^7 rads TID. The ASCO valves are qualified for 2.01×10^8 rads. |R4

CKH 8/21/90 OE Calculation ~~GENNAL3-013~~ WBNTSR-057, "Beta Dose Reduction from Finite Volume" provides reduction factors for beta radiation doses based on the free space or "box volume" found inside each device. The free space volume for the 206-381 series solenoid valves was calculated to be 692cm^3. This was done by calculating the volume of a cylinder with dimensions corresponding to the extreme outside dimensions shown on drawing JVA-206-381 (TAB I) for the coil housing. The cylindrical volume of the conduit entry nipple was added to this and the combined volume was treated as if none of the space was occupied by internal components (space occupied by coil, wiring, etc. was not subtracted). As can be seen from the drawing, this free space volume calculation is extremely conservative.

CKH 8/21/90 Using the 692 cm^3 free space volume value and corresponding beta dose reduction factor (per ~~GENNAL3-013~~ WBNTSR-057), the effective beta radiation dose for the valves in this binder may be calculated:

692 cm^3 < 1000 cm^3; use 1.44×10^{-6} reduction factor

Effective Beta Dose = (4.7×10^8 rads)(1.44×10^{-6}) = 676.8 rads

P. DISCUSSION (Continued)

(3) Radiation (Sec. 0.(12)(b) (Continued)

The beta dose due to free space volume inside the valve is insignificant (676.8 rads < 3 x 10^7 rads).

Recently issued DNE calculation GENAPS3-023, Attenuation Factors for postaccident beta dose in primary containment, in summary states:

> "With the thickness of standard plate given as . . . 18.75 mils for 26 guage sheet metal, all radiosensitive material contained in an enclosure formed of . . . 26 guage or thicker iron will receive a beta dose of no more than one percent of the free-field beta dose. The dose from airborne activity within the enclosure may be neglected due to the small volume."

The thinest metal on these valves is the coil housing, which is 3/32" (0.09375) steel. Thus, the worst beta dose would be 4.7 X 10^6, which is much less than the 2.52 X 10^7 from calculation WBNTSR-051 which we have used in this discussion. | R4

(4) Synergistic Effects (Sec. H(3))

Ethylene Propylene Terpolymer (EPDM) elastomer is used in the construction of ASCO solenoid valves as gaskets and diaphragms. EPDM is the only material having a potential for radiation induced synergisms based on a review of technical information provided in NUREG/CR-2157 and NUREG/CR-2553. Data in NUREG/CR-2157 suggests that dose rate effects in EPR materials are insignificant up to doses of 10 to 20 MRADs. A review of the location and environments of ASCO solenoid valves listed in TAB C-1 indicates that the maximum normal radiation dose will be seen by valves in subgroup A-2. These valves are qualified for 40 years without replacement of elastomer parts and will therefore be exposed to a maximum normal dose of 20 MRADs. Since all elastomer parts are totally enclosed in metal, the radiation dose to these parts will be less than 20 MRADs. Synergistic effects will be negligible for normal service aging.

Potential dose rate and test sequence synergisms will not impact qualification for accident conditions as demonstrated by Test Report AQR-67368. The test sequence of thermal aging followed by radiation aging plus accident radiation at high dose rates (0.71 MRADs/HR-Aging, 0.9 MRADs/HR-Accident) is a reasonable simulation of actual plant requirements. Additional assurance is provided by the severity of the radiation test because the test valve was exposed to 201 MRADs whereas an actual dose of about 48 MRADs (28 MRADs accident plus 20 MRADs normal service) is required.

BINDER NO. WBNEQ-SOL -004 PLANT WBN UNIT(S) 1 SHEET 1

R ____ R

BINDER TITLE MSIV AIR MANIFOLD COMPUTED RHL DATE 6/11/86

ASSEMBLY/SOLENOID VALVES-GOULD ALLIED CHECKED WBR DATE 6/12/86

TAB A

EQUIPMENT IDENTIFICATION MATRIX

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -001-0004A SG 1 MAIN STM HDR ISLN VALVE	-A	1-FSV -001-0004A 321X-21	-A		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0004B SG 1 MAIN STM HDR ISLN VALVE	-B	1-FSV -001-0004B 321X-21	-B		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0004D SG 1 MAIN STM HDR ISLN VALVE	-A	1-FSV -001-0004D 321X-21	-A		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0004E SG 1 MAIN STM HDR ISLN VALVE	-A	1-FSV -001-0004E 321X-21	-A		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0004F SG 1 MAIN STM HDR ISLN VALVE TEST	-A	1-FSV -001-0004F 321X-21	-A		729' 76K38-83080	A01	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.

		R 1	R	R
PREPARER/DATE	R. H. Loveday 6/11/86	AJM 2/17/89		
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WATTS BAR NU AR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -001-0004G -B SG 1 MAIN STM HDR ISLN VALVE	1-FSV -001-0004G -B 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0004H -B SG 1 MAIN STM HDR ISLN VALVE	1-FSV -001-0004H -B 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0004J -B SG 1 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0004J -B 321X-21		729' 76K38-83080	A01	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.
WBN-1-FSV -001-0011A -A SG 2 MAIN STM HDR ISLN VALVE	1-FSV -001-0011A -A 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0011B -B SG 2 MAIN STM HDR ISLN VALVE	1-FSV -001-0011B -B 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	AZMITH (LOCATION)	ELEV(1) (LOCATION) CONTRACT	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -001-0011D -A SG 2 MAIN STM HDR ISLN VALVE	1-FSV -001-0011D -A 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0011E -A SG 2 MAIN STM HDR ISLN VALVE	1-FSV -001-0011E -A 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0011F -A SG 2 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0011F -A 321X-21		729' 76K38-83080	A02	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.
WBN-1-FSV -001-0011G -B SG 2 MAIN STM HDR ISLN VALVE	1-FSV -001-0011G -B 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
WBN-1-FSV -001-0011H -B SG 2 MAIN STM HDR ISLN VALVE	1-FSV -001-0011H -B 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

IS NUMBER / SCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
N-1-FSV -001-0011J -B 2 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0011J -B 321X-21		729' 76K38-83080	A02	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.
N-1-FSV -001-0022A -A 3 MAIN STM HDR ISLN VALVE	1-FSV -001-0022A -A 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
N-1-FSV -001-0022B -B 3 MAIN STM HDR ISLN VALVE	1-FSV -001-0022B -B 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
N-1-FSV -001-0022D -A 3 MAIN STM HDR ISLN VALVE	1-FSV -001-0022D -A 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
N-1-FSV -001-0022E -A 3 MAIN STM HDR ISLN VALVE	1-FSV -001-0022E -A 321X-21		729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN

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PREPARER/DATE	R. H. Loveday 6/11/86	ajm 2/17/89		
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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

IS NUMBER / SCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
N-1-FSV -001-0022F -A 3 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0022F -A 321X-21		729' 76K38-83080	A02	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.
N-1-FSV -001-0022G -B 3 MAIN STM HDR ISLN VALVE	1-FSV -001-0022G -B 321X-21	174	729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
N-1-FSV -001-0022H -B 3 MAIN STM HDR ISLN VALVE	1-FSV -001-0022H -B 321X-21	174	729' 76K38-83080	A02	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
N-1-FSV -001-0022J -B 3 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0022J -B 321X-21	174	729' 76K38-83080	A02	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.
N-1-FSV -001-0029A -A 4 MAIN STM HDR ISLN VALVE	1-FSV -001-0029A -A 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

[T]S NUMBER / [DE]SCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
[?]-1-FSV -001-0029B -B 4 MAIN STM HDR ISLN VALVE	1-FSV -001-0029B -B 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
[?]-1-FSV -001-0029D -A 4 MAIN STM HDR ISLN VALVE	1-FSV -001-0029D -A 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
[?]-1-FSV -001-0029E -A 4 MAIN STM HDR ISLN VALVE	1-FSV -001-0029E -A 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
[?]-1-FSV -001-0029F -A 4 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0029F -A 321X-21		729' 76K38-83080	A01	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.
[?]-1-FSV -001-0029G -B 4 MAIN STM HDR ISLN VALVE	1-FSV -001-0029G -B 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN

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W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

IS NUMBER / SCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
N-1-FSV -001-0029H -B 4 MAIN STM HDR ISLN VALVE	1-FSV -001-0029H -B 321X-21		729' 76K38-83080	A01	A/B A/B	15S/100D 5MN/100D	MS/V FW/V	SOLENOIDS MUST FUNCTION TO SHUT THE MSIV'S PREVENTING THE NON-FAULTED SG'S FROM BLOWING DOWN
N-1-FSV -001-0029J -B 4 MAIN STM HDR ISLN VALVE TEST	1-FSV -001-0029J -B 321X-21		729' 76K38-83080	A01	A/C A/C	15S/100D 5MN/100D	MS/V FW/V	MUST DEENERGIZE TO OPEN MSIV VENT PATH. RE-ENERGIZATION WILL NOT ADVERSELY AFFECT MSIV.

		R 1	R____	R____
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BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
			R ____ R ____
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY SOLENOID VALVES - GOULD ALLIED	COMPUTED /R1 AJM	DATE 2/17/89	
	CHECKED /R1 KBW	DATE 2/27/89	

TAB A NOTES

1. Floor/Actual Elevation - Actual elevations are documented on field verification sheets found in TAB F. All elevations shown are floor elevations except for those devices located inside the reactor building.

2. See TAB B, Section A for Category and Operating Times calculations used in this binder.

3. Contract Column - Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 1 OF 30
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/SOLENOID VALVES-GOULD ALLIED	COMPUTED RHL	DATE 6/11/86	R R
	CHECKED WBK	DATE 6/12/86	

TAB B

CHECKLIST FOR EVALUATION OF
ENVIRONMENTAL QUALIFICATION
INCLUDING SUMMARY AND CONCLUSION

NOTE: It is recommended that Section D - Justification/Comments (sheets 5 through 7) be closely reviewd for a clearer understanding of rationale applied towards qualification of the subject main steam isolation valves (MSIV) Air Manifold Assembly/Solenoid Valves.

A. DOCUMENTATION

Equipment Description: MSIV Air Manifold Assembly/Solenoid Valves
Atwood & Morrill (Valve Actuator)
Chicago Fluid Power (Air Manifold Assembly)

Vendor/Manufacturer: Gould Allied (Solenoid Valves)

Equipment Model No.(s): 321X-21

QUALIFICATION REPORTS

(1) Title/Number/Revision A&M Valve Actuator Qualification Test Report/Procedure No. 201-39500/Rev. 0 RIMS B70 850917 100 DATE 5-18-79

(2) Title/Number/Revision Wyle NEQ Test Report/17514-1/Rev. A RIMS B71 860514 100 DATE 3-14-85

NOTE: Throughout this binder, references are made to the above qualification reports which may be identified as "(1)" or "(2)" as shown in these references.

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(3) Category and Operating Times Calculations, WBNOSG4-004 R11 (B18 900612 253) R2

(4) WBNP Environmental Data Drawing 47E235-76 R3.

(5) Calculation WBNAPS2-001 R1 (B45 860822 235), Flooding Levels in the North and South Valve Vaults.

(6) Calculation WBNOSG4-045 R1 (B45 860902 219), Status and Duty Cycles of Solenoid Valves.

(7) Calculation WBNOSG4-003 R2 (B45 851112 218) Superheated Steam in Valve Vaults (MSLB).

(8) Deleted by Revision 2. R2

BINDER NO. WBNEQ-SOL-004 PLANT WBN UNIT(S) 1 SHEET 2a OF 30

BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY SOLENOID VALVES - GOULD ALLIED

COMPUTED /R1 AJM DATE 2/17/89 R____ R____

CHECKED /R1 KBW DATE 2/27/89

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(9) Calculation (B25 850920 800), Sequoyah Nuclear Plant - Solenoid Valves Normal Status.

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-SOL-004 PLANT WBN	UNIT(S) 1	SHEET 3 OF 30	
		R 1 R	
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY SOLENOID VALVES - GOULD ALLIED	COMPUTED RHL	DATE 9/8/86	GJM 2/17/89
	CHECKED RKW	DATE 9/9/86	KBW 2/21/89

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satifies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

R1

COMMENTS/RECOMMENDATIONS Equipment qualification is based primarily on similarity to test devices noted in Atwood & Morrill test procedure No. 201-39500 with supplemental justification provided in Wyle Test Report 17514-1. For detailed explanation see Section D Justification/Comments (Sheets 5 through 7).

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 4 OF 30
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/SOLENOID VALVES-GOULD ALLIED	COMPUTED RHL	DATE 6/11/86	R ___ R ___
	CHECKED WBK	DATE 6/12/86	

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

_____ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

__X__ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE-323-1974: "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations".

IEEE-344-1975: "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations".

IEEE-382-1972: "IEEE Trial Use Guide for Type Test of Class 1E Electric Valve Operators for Nuclear Power Generating Stations".

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 5 OF 30
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/~~SOLENOID VALVES-~~ GOULD ALLIED	COMPUTED RHL DATE 6/11/86	R ___	R ___
	CHECKED WBK DATE 6/12/86		

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions of Under Similar Conditions with Supporting Analysis

_X_ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS

WBN Main Steam Isolation Valve (MSIV) actuators provided by Atwood and Morrill (A&M) have Chicago Fluid Power air manifold assemblies with Gould Allied solenoid valves model No. 321X-21 which are 125V DC, Class C insulation. Environmental qualification of the subject items is based primarily on similarity to Hartsville Nuclear Plant (HTN) MSIV actuators tested for A&M Procedure No. 201-39500 (see Tab D/D1). HTN MSIV actuators provided by A&M have Chicago Fluid Power air manifold assemblies with Airmatic-Allied solenoid valves model No. 321X-22* which are 115V AC, Class C insulation. Justification for similarity to the above is noted in Tab C/C1 and C2. A detailed comparison of air manifold assemblies by means of respective instruction manuals (see Tab H [WBN] and E/E8 [HTN]) indicates that at a minimum materials are similar, and in most cases identical.

*Gould Allied officially changed titles to Airmatic-Allied (w/both being a subsidiary to Snap-tite, Incorporated) on March 17, 1978, and relocated headquarters from Plantsville, Connecticut, to Wilmington, Ohio.

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D. JUSTIFICATION/COMMENTS (Continued)

When A&M test data is applied to WBN environmental parameters (normal life, DBE & Post-DBE), all WBN requirements are enveloped. However, due to a very restricted thermal aging program, limiting materials (i.e., O-rings) have a qualified life of less than one year when Arrehenius equation is applied. Therefore an additional test report, WYLE NEQ 17514-1 (see Tab D/D2) is included which addresses similar air manifold assemblies that were subjected to a more extensive thermal aging program (as well as enveloping all other WBN environmental parameters). The WYLE test report is applicable to Browns Ferry Nuclear Plant (BFN) MSIV air manifold assemblies manufactured by Automatic Valve Corporation with Airmatic-Allied solenoid valves model No. V320X-XX. Three types of these solenoids were tested: 250V DC-Class H, 120V AC - Class H, and 120V AC - Class C. Similarity is justified to the 120V AC, Class C solenoid (test solenoid No. 3/test specimen No. 9A3), with exception of demonstrated voltage, and lubricant application to static seals which is justified by similarity to 250V DC Class H (test solenoid No. 1/test specimen No. 9D1), per Tab C/C2, C3, and C4 and Tab D/D2: WYLE test report 17514-1, page No. xvii, comment No. 10 & 11. Air manifold assemblies consist of mechanical valves. A detailed comparison of air manifold assemblies (less solenoid valves) indicates that materials are similar (with majority of parts being metallic) and the most limiting material is identical (O-rings: Fluorocarbon Rubber/Viton E60C per Tab D/D2: Section XVII, Table I-Aging Matrix, and Tab H: Chicago Fluid Power Service Manual DM52377 Reference Drawings). In addition WBN solenoid terminal strips (G.E. CR151B, see Tab B/Section I: item 5, page No. 17 and 18) are more compatible to WYLE-tested terminal strips (see Tab D/D2: page No. xviii, comment No. 14) than those tested by A&M.

Therefore, qualification for the items of this binder are based primarily on A&M test report No. 201-39500 with supplemental references to WYLE test report No. 17514-1 as necessary (i.e., thermal aging results, terminal strip similarity, vibration aging, and additional justification).

Additional References:
Material aging calculation reports (see Tab C/C4A - C4C).

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E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? No | R1

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Air Manifold Assembly/Solenoid Valve	Same	(1) Intro.: p 1 (2) ppXVII-10,-11,-12
(2) Manufacturer	Chicago Fluid Pwr/ Gould Allied	Same	(1) Intro.: p 1
		Automatic Valve Corp/Airmatic-Allied	(2)ppXVII -10,-11,-12
(3) Model Number(s)	321X-21	321X-22	(1): Tab C/C1
		V320X-XX	(2) pp XVI-8, -9
(4) Serial Number(s)	NA	NA	(1) NA
		Specimen	(2) p xxi
		9A3 (9D1 for O-ring w/Parker Super-O-Lube)	

(5) Identify Component-Unique checksheet attached: NA

JUSTIFICATION/COMMENTS

R1

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F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. R1

Interface	Identify Interface	Plant Requirement? (Yes/No/NA)	Reference Test Report R1
Mounting Bolts	None Specified	NA	(1) NA
External Process Connections	None Required	NA	(1) Section 3.2,p5 (2) Section XVII, para. 1.3.4
Electrical Connections	See Below	Yes	(1) Section 3.2, p 5 (2) Section I, para. 2.2.1
Conduit Seals	None Required/ See below	Yes	(2) p xviii, Comment 12
Connector Seals	See Below	Yes	(2) p xviii, Comment 12
Orientation	See Below	Yes	(1) Section 3.2, p 5 (2) Section XVII, para.3.5.3.1
Physical Configuration	See Below	Yes	(1) NA (2) p I-13, Fig. I-2
Other	Supply Air Pressure: 90-100 psig	Yes	(1) Section 3.2

JUSTIFICATION/COMMENTS See Page 8A R1

F. INSTALLATION INTERFACES (continued)

JUSTIFICATION/COMMENTS: The three test solenoids were electrically connected (flexible conduit with 1" NPT conduit fitting) through a NEMA 4 junction box which houses a terminal strip ((2) pg. No. I-12, Figure I-1). Solenoid assembly was mounted at a 45° angle (with conduit hub directed downward) to simulate worst case in-service mounting. A 1/4" hole at the lowest point of the junction box eliminates conduit seal requirements. WBN MSIV solenoids are housed within a NEMA 4 junction box with terminal strips housed in an adjoining junction block (See TAB H, Drawing No. CFP-305C). Although not required, WBN electrical connections include Conax conduit seals* (see TAB F and Binder WBNEQ-CSC-001). Solenoid assembly is mounted at a 45° angle (with conduit hub directed upward). Weep hole requirements are met per TAB G, Section A, item 3. Wyle BFN test set-up was a worst case installation, therefore, WBN installation based on being similar and less severe is acceptable. R2

*Not a requirement, see TAB C/C5.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

		Yes/No/NA	Reference
(a)	Equipment inspected for damage	Yes	(2)Sect. I, para. 1.1;(1) No*
(b)	Baseline performance measurements taken	Yes	(1)Sect. 3.2, 4.0,6.0, 9.0,10.0; (2)Sect. I, para 1.4
(c)	Equipment aged:		
	Thermal	Yes	(1)Sect. 3.5, 6.0; (2)Sect. VI, para 2.0
	Radiation	Yes	(1)Sect. 3.4, 5.0; (2)Sect. II, para 1.0; Sect. IV, para 1.0
	Wear	Yes	(1)Sect. 3.3,4.0; (2)Sect. VII, para 1.0
(d)	Vibration/seismic testing conducted	Yes	(1)Sect. 3.6,3.7,3.8 7.0,8.0, & 9.0; (2)Sect. XI
(e)	Design basis event (DBE) exposure	Yes	(1)Sect. 3.9, 10.0; (2)Sect. XIV, XV
(f)	Post-DBE exposure	Yes	(1)Sect. 3.9, 10.0; (2)Sect. XIV, XV
(g)	Final inspection and disassembly	Yes	(1)Results, p 3; (2)Sect. XVII, para. 3.6 & 3.7, Sect XVI, para 1.0

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes (w/exception of items 2 and 4, p. 10.)

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference (1)Section 1.0; (2)See Instrumentation Equipment sheets in appendices of sections referenced above .)

JUSTIFICATION/COMMENTS *(1)IEEE-323-1974, paragraph 6.3.2 states "Inspection may be performed to assure that a test unit has not been damaged due to handling..."; therefore, this is constituted as a precautionary measure and not an actual requirement.

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G. TEST SEQUENCE (Continued)

(2) Wear aging was the first phase of the test sequence. Upon completion of the 39th test interval and prior to start-up of the 40th test interval (simulating the 40th-year of service), all non-metallics were replaced, and three solenoid valves were replaced due to noise emanating from air control panel assembly. Since normal hands-on maintenance was allowed between each interval, the replacement of seals and solenoids is considered to be normal maintenance procedures. No piece replacements of equipment were required for the duration of all remaining phases of the test sequence.

(3) In reference to G(1) Test Sequence: Section XVII of Wyle test report 17514-1 ((2) p. 10) established qualification sequence.

(4) 40-Year life could not be achieved due to problems experienced during Post-Radiation functional test. New solenoid test sets (specimens 9A and 9D) with revised 10-year and 5-year equivalent radiation exposure plus accident dose were subjected to baseline functional and radiation testing ((2) Notice of Anomaly No. 3 and 3, Rev. A; page No. iii of Wyle test report 17514-1). 120V AC Class C solenoid valve (test specimen 9A3) was used throughout the test sequence and is qualified for a 10-year life (see note).

Note: Qualified life figures referenced above are based on meeting BFN environmental parameters; for equivalency to WBN requirements see TAB C/C4A-C4C.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference (1) Section 3.1).

JUSTIFICATION/COMMENTS ______

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	(1) Sect. 3.5, 6.0 (2) Sect. XVII: para. 3.4 & App. I & II
Radiation exposure	Yes	(1) Sect. 3.4, 5.0
Vibration (non-seismic) aging	Yes	(2) Sect XVII, para. 3.4.12 & 3.5.1.2.2
Operational (electrical/mechanical/process) stress aging	Yes	(1) Sect. 3.3, 4.0

JUSTIFICATION/COMMENTS A&M report yielded limiting thermal aging data; therefore, more extensive WYLE thermal aging results were used. In addition, WYLE vibration aging is used since A&M test results did not include these effects.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference --).

JUSTIFICATION/COMMENTS No known synergistic effects have been reported for the materials applicable to the subject devices with the exception of silicone rubber (lead wire insulation) as noted: Dose rate synergisms have been reported as minor in NUREG/CR-2763 and were observed to have no significant impact on qualification.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference (2) Sect. XVII: para. 3.4 and App. I & II).

JUSTIFICATION/COMMENTS ______

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H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: See Below).

JUSTIFICATION/COMMENTS

(2) Section XVII/para. 3.4.4.1-3.4.4.7, 3.4.1, 3.4.2, Table I (aging matrix), and II.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference See Below).

JUSTIFICATION/COMMENTS (2) Section XVII/Appendix I.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference See Below).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	130°F+58°C Coil Heat Rise	125°C+38°C Rise 120°C+38°C Rise	See Tab C/ C4A-C4C (C4B: Coil Heat Rise)
Time	40 Years	2407H(120°C) 95H (125°C)	Material Aging Rpt

JUSTIFICATION/COMMENTS (2) Section XVII/Appendix I and II

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference See Sect. H(4)(d) above).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference See Below).

JUSTIFICATION/COMMENTS (2) Section XVII/Table III Reference list and para. 3.4.3.

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H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ____________).

JUSTIFICATION/COMMENTS ____________

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference (1) Sect. 3.5, 2nd para; (2) Sect. XVII/para. 3.4.6

JUSTIFICATION/COMMENTS See TAB C/C6

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference (1)Sect. 3.4 & 5.0).

JUSTIFICATION/COMMENTS ____________

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference --).

JUSTIFICATION/COMMENTS For justification, refer to TAB B: Section I.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference (1)Sect. 3.4, 1st para.).

JUSTIFICATION/COMMENTS ____________

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference:

(1) Sect.3.4, 5.0 Appendix A (pg. 50)).

Plant normal ambient radiation dose (rd)	*1.8×10^3 (Total 40-yr integrated)
Test exposure dose (rd)	1.74×10^7
Test exposure dose rate (rd/hr)	0.5 Mrd/hr.
Test exposure source type (e.g., Co-60 gamma)	Cobalt 60 gamma

JUSTIFICATION/COMMENTS *See WBNP Environmental Data Drawing 47E235-76. R1

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: See below). R1

JUSTIFICATION/COMMENTS (2)Section XVII/para. 3.4.12 and 3.5.1.2.2

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: See below).

JUSTIFICATION/COMMENTS (2) Section XVII/para. 2.1.3.1.1, 3.4.12, and 3.5.1.2.2

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference:

(1) Sect. 3.3, 3.5, 3.9, 4.0, 5.0, 6.0, & 10.0).

JUSTIFICATION/COMMENTS

(1) Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

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H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference:

(1) Sect. 3.3 and 3.5)..

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes
(Reference: (2) Page xxi & Section XVII, App. II/para. 1.1.3).

Qualified life (Document in QMDS) 12 years (normally energized solenoids), 40 years (exerciser solenoids, air manifold assembly mechanical valves, and terminal strips only) - see TAB G.

JUSTIFICATION/COMMENTS See TAB C/C4A-C4C for WBN equivalency to BFN WYLE test results.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference: (2) pg. No. xxi

).

|R1

JUSTIFICATION/COMMENTS See TAB C/C4A-C4C for WBN equivalency to BFN WYLE test results.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Ryton R-4/Mechanical/ Bobbin	$5x10^8$	See Below	1.00	See Below
(b)	Silicone Rubber/Mechanical/ Insulation	$1x10^6$	See Below	1.44	See Below
(c)	Viton/Mechanical/Seal	$5x10^6$	See Below	1.16	See Below
(d)	Prye-ML/Electrical/ Insulation	$1.5x10^8$	See Below	1.42	See Below
(e)	Phenolic/Electrical/ Terminal Strip	$3.8x10^5$	See Below	1.06	See Below
(f)	Silicone/Electrical/ Varnish	$1x10^8$	See Below	1.25	See Below
(g)	Polymide/Mechanical/ Winding Cover	$1.5x10^8$	See Below	1.73	See Below

JUSTIFICATION/COMMENTS Reference: Digital Engineering System 1000 "Materials Aging & Radiation Effects Library" (see Tab C/C4A-C4C for detailed materials analysis calculation).

(1) Gasket material was not addressed in materials analysis since its degradation does not affect operability of the solenoid valves ((2) page No. xv comment 2). The gaskets serve as a seal between the pilot exhaust tube nut and junction box cover, and between the junction box (which houses the solenoid valves), junction box cover and the dump valve assembly (see Tab H, dwg. No. CFP-305-C for exploded view). Failure of the gaskets would not result in moisture or liquid intrusion (see Tab C/C5). Material composition of the gaskets is primarily

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I. MATERIALS ANALYSIS

JUSTIFICATION/COMMENTS (Continued)

asbestos with neoprene acting as a binder. Because asbestos is inorganic and considered not to be age-sensitive, it could still provide a marginal level of sealing at a minimum (even though sealing is not required - (2) page No. xviii, comment 12 for justification.)

(2) Electrical tape (Scotch brand #69 Glass Cloth - per Tab C/C1) was not addressed in materials analysis since its degradation/failure is not considered detrimental to the safety function of the solenoids ((2) Section XVII/para. 3.4.4.7, and Table I: item No 1.24.2.1.3).

(3) Although WBN solenoid valves are comprised of the same materials as those solenoids (specimen 9A and 9D) tested at Wyle Labs, lower activation energies were applied to the most limiting materials in order to factor a degree of conservatism into the comparative results (see Tab C/C4A-C4C).

(4) Bobbin material is not significant, as failure of this component is judged to not adversely affect the safety-related function of the solenoids ((2) Section XVII, Appendix II, para. 1.1.3).

(5) Visual inspections and per telecon with Richard Mills of Chicago Fluid Power on September 26, 1985, indicate that General Electric CR151B

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I. MATERIALS ANALYSIS

JUSTIFICATION/COMMENTS (Continued)

terminal strips were supplied in WBN MSIV solenoid junction blocks. Per GE letter dated Feb. 24, 1978 (see TAB E/E1), these terminal |R1 strips are comprised of the same materials as noted by Wyle Labs for a G.E. CR151A terminal strip (which was qualified based on similarity to a tested Square D KC-1 terminal strip - (2) pg. No. xviii, comment No. 14). Test results were applied to a conservative terminal strip activation energy of 1.06 (See TAB C/C4C).

(6) Per Tab H/Chicago Fluid Power drawings: Air manifold assembly/ solenoid valves contain O-rings and seals which are comprised of either DuPont Viton E-60C or 3M Flourel 2170. Since both materials are fluorocarbon rubber, Wyle Labs assumed Viton E-60C with an activation energy of 1.18 as the worst case (see (2) Section XVII, para. 3.4.4.1). As it has been determined that Viton E-60C has a lower activation energy than 3M Flourel (1.16 vs. 1.26, see TAB C/C4C: sheets 8 and 8A); Viton E-60C shall be the most limiting O-ring/seal material.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference (1)Section 3.2).

Identify Acceptance Criteria: Test parameters recorded during test sequence were compared against set limits; but if operation of valve actuator was not affected, failure to meet these limits would not be considered essential.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference (1)Section 3.2)

Identify baseline and functional testing:

Valve Closing Time: 3 to 5 seconds

Valve Opening Time: 6.5 to 19.5 seconds

Pneumatic System Leakage (valve open or closed): .5 SCFH max.

JUSTIFICATION/COMMENTS Exhaust pressures and times were measured during all subsequent functional tests ((1)Section 4.0, 5.0, 6.0, 9.0, and 10.0).

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference (1)Sect. 3.2, last para.).

JUSTIFICATION/COMMENTS

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: (1) Sect. 3.2).

JUSTIFICATION/COMMENTS

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	125 $^{+12\%}_{-16\%}$ VDC	Vendor Drawing No. 13824-01-H
Load	11 Watts	Solenoid Nameplate
Frequency	NA	
Accuracy	NA	
Other(s)		

R1

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	NA**	|R1
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS **Solenoid valves are deenergized during accident conditions per calculation WBNOSG4-045. |R1

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	109 VDC min 140 VDC max*	(2) p xvii, comment No.10&11
Load	NA	
Frequency	NA	
Accuracy	NA	
Other(s)	NA	

JUSTIFICATION/COMMENTS *125VDC coils are used in Gould Allied model No. 321X-21 solenoid valves for WBN valve actuators. Airmatic-Allied model No. 321X-22 solenoid valves tested by A&M use AC coils. Demonstrated voltage is based on similarity to Wyle DC test coil. Materials similarity is addressed in TAB B/Section D: Justification/Comments, sheets 5 through 7 (based on comparison of instruction manuals-actual to tested, see TAB H and E/E2). |R1

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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-76 |R1

(1) Normal Max

(a) Temperature (°F) 130

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 50

(d) Radiation (rd) 1.8×10^3 TID

(2) Abnormal Max

(a) Temperature (°F) 140

(b) Pressure (psig) ATM

(c) Humidity (%) 100

(d) Radiation (rd) NA |R1

(3) Process Interfaces: Main steam design process temperature = 600°F; valve body and stem configuration eliminate significant additional thermal effects which could degrade solenoid components beyond ambient conditions.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Will exist up to 8 hours per excursion and will occur less than 1% of the plant life. Humidity only: could exist up to 8 hours and return to normal max of 50% RH in 8 hour period linearly. This condition should occur no more than twice during plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 325* Accident type HELB

(b) Pressure (psig) 25.18 psia* Accident type HELB

(c) Humidity (%) 100* Accident type HELB

(d) Radiation (rd) NA Accident type HELB

(e) Spray Type NA Accident type NA

*See Required Operating Environment on next page.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): **See TVA drawing No. 47E235-76 for duration and profiles, and TAB C/C8 and WBNOSG4-003 for temperature justification during a main steam line break/superheated steam condition. Valves are required to operate during an HELB outside containment accident only; therefore, 1×10^4 rd LOCA radiation dose is not applicable. R1

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: TAB C/C5).

(7) Subject to submergence (Yes/No/NA)? No (Reference: Calculation WBNAPS2-001). R1

Identify initiation time and duration of submergence: Maximum flood level in steam valve vault will not exceed EL 730.87. MSIV air manifold assembly lowest elevation is EL 742.0; therefore, submergence is not applicable (see TAB F for reference to elevation).

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? No (Reference: TAB B, Section L(1)).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: R1

(9) Special environmental calculations (temp., rad., etc.)

See TAB B Section A for a listing of all calculations used in this binder. R1

BINDER NO. WBNEQ-SOL-004 PLANT WBN UNIT(S) 1 SHEET 24 OF 30

R ___ R ___

BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/SOLENOID VALVES-GOULD ALLIED COMPUTED RHL DATE 6/11/86

CHECKED [illegible] DATE 6/12/86

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	FW/V: 5 min. MS/V: 15 sec	1 hour	(1)Figure 5, pg. 56; Tab C/C4C
Temperature (°F)	***380	***398	(1)Figure 5; Tab C/C9, C10; Tab C/C8 (MS/V only)
Pressure (psig)	(25.18-14.7) = 10.48	110	(1)Sect. 3.2, Tab C/C9
Relative Humidity (%)	100@24hrs	100 @ 10 Days	(1)Figure 5, Tab C/C9
*Chemical Spray	NA	NA	—
**Radiation (rd)	$1.8x10^3$ (gamma)	$1.74x10^7$	(1)Sect. 3.4, App. A pg. 50
Submergence	NA	NA	—

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See Sect.
Pressure	Yes	L.(1) Ref.
Relative Humidity	Yes	above
Chemical Spray	NA	
Submergence	NA	

JUSTIFICATION/COMMENTS Sect. L.(1) Radiation: Beta contributions not considered during testing since solenoid valves are sufficiently shielded by a junction box comprised of cold rolled steel. Beta dose is not applicable to the subject devices, as they are not required to operate during a LOCA and are located outside of containment.

***Specified and demonstrated temperatures include coil heat rise: See Tab C/C4B, items B and C.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	>15°F	Yes
Pressure: +10% but no more than 10 psig	10psig	Yes
Radiation: +10% of accident dose	>10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	>10%	Yes
Voltage: ±10% of rated value	>±10%	Yes
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	Same	Yes
Vibration: +10% added to acceleration	>10%	Yes

R1

JUSTIFICATION/COMMENTS These are suggested margins only. Radiation, time, and temperature figures envelope postulated DBE conditions to such a large degree that the margins are not considered to be critical.

BINDER NO. WBNEQ-SOL-004 PLANT WBN	UNIT(S) 1	SHEET 26 OF 30	
		R 1	R
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY SOLENOID VALVES - GOULD ALLIED	COMPUTED RHL	DATE 6/11/86	ARM 2/17/89
	CHECKED WBK	DATE 6/12/86	KBN 2/27/89

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference: See TAB A). | R1

JUSTIFICATION/COMMENTS

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (Yes/No/NA)? Yes
(Reference: (1) Section 10.0).

JUSTIFICATION/COMMENTS Valves are required to de-energize 5 min. into an Feedwater line break and 15 sec into a Main Steam line break (ref. M(1)). Valves were operated every 10 min. during the first hour of test.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (Yes/No/NA)? Yes (Reference: (1) Figure 5).

JUSTIFICATION/COMMENTS During Post-DBE the solenoids are not required to operate but must not fail in a manner detrimental to plant safety (ref. M(1)) except test solenoids 1-FSV-001-4F, 4J, 11F, 11J, 22F, 22J, 29F and 29J are category C during post-DBE. Since DBE test conditions envelope actual Post-DBE requirements, this criteria has been met (see TAB C/C4C). R1

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (Yes/No/NA)? Yes (Reference: (1) Section 10.0).

JUSTIFICATION/COMMENTS See M.(2) above.

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 26a OF 30
			R ____ R ____
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY SOLENOID VALVES - GOULD ALLIED	COMPUTED /R1 AHM	DATE 2/17/89	
	CHECKED /R1 KBN	DATE 2/27/89	

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (Yes/No/NA)? Yes
(Reference: (1) Results, pg. 2 and 3; (2) p iii through xix).

JUSTIFICATION/COMMENTS We have reviewed and concur with the disposition of anomalies documented in the reference (1) and (2) test reports. There is no impact on installed equipment; however, TAB G documents those findings which resulted in maintenance activities for corrective action.

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 27 OF 30				
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/SOLENOID VALVES-GOULD ALLIED		COMPUTED RHL	DATE 6/11/86	R	R		
		CHECKED WBK	DATE 6/12/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS (2) Page No. xv through xix, see items 7 and 15.

Note: Maintenance and surveillance requirements are based on more extensive WYLE thermal aging results than results from A&M; therefore, only WYLE information is included (for detailed explanation, see Section D: Justification/Comments, sheets 5 through 7).

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 28 OF 30
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/SOLENOID VALVES-GOULD ALLIED	COMPUTED RHL	DATE 6/11/86	R R
	CHECKED WKK	DATE 6/12/86	

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	No
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-SOL-004	PLANT WBN	UNIT(S) 1	SHEET 29 OF 30				
BINDER TITLE MSIV AIR MANIFOLD ASSEMBLY/SOLENOID VALVES-GOULD ALLIED		COMPUTED RHL	DATE 6/11/86	R		R	
		CHECKED WBK	DATE 6/12/86				

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	NA
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

PR ATE 13/89

WATTS BAR NUC R PLANT
TAB A - EQUIPMENT IDENTI CATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -030-0146A AUX BLDG GAS TMT FAN A-A EXH DMPR	-A	1-FSV -030-0146A -A 206-380-2RVU		737' 80KJ3-827551	A05	A	100D	L	SOLENOIDS ARE ACTUATED BY AN ABI SIGNAL AND ARE RE- QUIRED TO BE OPERABLE DURING THE MITIGATION OF THIS EVENT.
WBN-1-FSV -030-0146B AUX BLDG GAS TMT FAN A-A EXH DMPR	-A	1-FSV -030-0146B -A 206-380-2RVU		737' 80KJ3-827551	A05	A	100D	L	SOLENOIDS ARE ACTUATED BY AN ABI SIGNAL AND ARE RE- QUIRED TO BE OPERABLE DURING THE MITIGATION OF THIS EVENT.
WBN-2-FSV -030-0157A AUX BLDG GAS TMT FAN A-A EXH DMPR	-B	2-FSV -030-0157A -B 206-380-2RVU		737' 80KJ3-827551	A09	A	100D	L	SOLENOIDS ARE ACTUATED BY AN ABI SIGNAL AND ARE RE- QUIRED TO BE OPERABLE DURING THE MITIGATION OF THIS EVENT.
WBN-2-FSV -030-0157B AUX BLDG GAS TMT FAN B-B SUCT	-B	2-FSV -030-0157B -B 206-380-2RVU		737' 80KJ3-827551	A09	A	100D	L	SOLENOIDS ARE ACTUATED BY AN ABI SIGNAL AND ARE RE- QUIRED TO BE OPERABLE DURING THE MITIGATION OF THIS EVENT.
WBN-1-FSV -032-0080A REACTOR BLDG UNIT 1 TRAIN A ISLN	-A	1-FSV -032-0080A -A 206-380-3RU	294	724' 78K3-822950	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	SOLENOIDS MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED AFTER A PHASE B ISOLATION SIGNAL IS RECEIVED AND RESET

R 1 9741 2/1/89 R____ R____

PREPARER/DATE Randy Foust 8/27/86

CHECKED/DATE W. B. Kim 8/27/

S00-705

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -032-0080B -A REACTOR BLDG UNIT 1 TEST SOL	1-FSV -032-0080B -A 206-380-2RU	296	718' 4" 80KJ3-827551	ANN	B B B B B	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	SOLENOID FAILURE MUST NOT CAUSE ASSOCIATED CNTMT ISOL VALVE TO OPEN AFTER A PHASE B ISOLATION SIGNAL IS RECEIVED AND RESET
WBN-1-FSV -032-0102A -B REACTOR BLDG UNIT 1 TRAIN B ISLN	1-FSV -032-0102A -B 206-380-3RU	278	727'10" 78K3-822950	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	SOLENOIDS MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED AFTER A PHASE B ISOLATION SIGNAL IS RECEIVED AND RESET
WBN-1-FSV -032-0102B -B REACTOR BLDG UNIT 1 TEST SOL	1-FSV -032-0102B -B 206-380-2RU	279	727'10" 80KJ3-827551	ANN	B B B B B	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	SOLENOID FAILURE MUST NOT CAUSE ASSOCIATED CNTMT ISLN VLV TO OPEN AFTER A PHASE B ISOLATION SIGNAL IS RECEIVED AND RESET
WBN-1-FSV -032-0110A -A RB UNIT 1 NON-ESNTL CONT AIR ISLN	1-FSV -032-0110A -A 206-380-3RU	295	718' 8" 78K03-822950	ANN	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	SOLENOIDS MUST DE-ENERGIZE AND REMAIN DE-ENERGIZED AFTER A PHASE B ISOLATION SIGNAL IS RECEIVED AND RESET |R2
WBN-1-FSV -032-0110B -A RB UNIT 1 NON-ESNTL CONT AIR ISLN	1-FSV -032-0110B -A 206-380-2RU	296	718' 8" 80KJ3-827551	ANN	B B B B B	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	SOLENOID FAILURE MUST NOT CAUSE ASSOCIATED CNTMT ISLN VLV TO OPEN AFTER A PHASE B ISOLATION SIGNAL IS RECEIVED AND RESET |R2

		R 1	R 2	R
PREPARER/DATE	RANDY FOUST 8/27/86	AFM 2/17/89	CNH 5/21/90	
CHECKED/DATE	W. B. KIM 8/27/86	EEM 2/23/89	CHM 5/21/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-FSV -065-0024 -A EGTS TRAIN A FAN A-AISLN DMPR	0-FSV -065-0024 -A 206-380-2RU		757' 80KJ3-827551	A16	A	100D	L	SOLENOIDS MUST REMAIN OPERABLE FOR THE DURATION OF THE LOCA.
WBN-0-FSV -065-0043 -B EGTS TRAIN B FAN B-B ISLN DMPR	0-FSV -065-0043 -B 206-380-2RU		757' 80KJ3-827551	A16	A	100D	L	SOLENOIDS MUST REMAIN OPERABLE FOR THE DURATION OF THE LOCA.
WBN-2-FSV -067-0336 -A EMERG GAS TRTMT ROOM COOLER A ICR	2-FSV -067-0336 -A 206-380-2RU		757' 80KJ3-827551	A16	A ~~A~~ ~~A~~ ~~A~~ ~~A~~	100D ~~1 MO~~ ~~1 MO~~ ~~1 MO~~ ~~1 MO~~	L ~~RH/A~~ ~~AF/A~~ ~~AB/A~~ ~~CV/A~~	MUST OPERATE TO SUPPORT OPERATION OF EGTS & PEN ROOM COOLERS CKH 5/21/90
WBN-2-FSV -067-0338 -B EMERG GAS TRTMT ROOM COOLER B ICR	2-FSV -067-0338 -B 206-380-2RU		757' 80KJ3-827551	A16	A	100D	L	MUST OPERATE TO SUPPORT OPERATION OF EGTS & PEN ROOM COOLERS | R2
WBN-1-FSV -067-0350 -A PEN RM CLR A2 SUP CNTL VLV	1-FSV -067-0350 -A 206-380-2RU		713' 80KJ3-827551	A06	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF/A AB	SOLENOIDS MUST FUNCTION TO PROVIDE FLOW TO COOLERS WHICH SERVE ESF EQUIPMENT

		R 1	R 2	R
PREPARER/DATE	RANDY FOUST 8/27/86	AFM 2/17/89	CKH 5/21/90	
CHECKED/DATE	W. B. KIM 8/27/86	EEM 2/23/89	AJM 5/21/90	

PR[illegible]E: 01/18/89

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -067-0352 -B PEN RM CLR B2 SUP CNTL VLV	1-FSV -067-0352 -B 206-380-2RU		713' 80KJ3-827551	A06	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF/A AB	SOLENOIDS MUST FUNCTION TO PROVIDE FLOW TO COOLERS WHICH SERVE ESF EQUIPMENT
WBN-1-FSV -067-0354 -A PEN RM CLR A3 SUP CNTL VLV	1-FSV -067-0354 -A 206-380-2RU		737' 80KJ3-827551	A05	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF/A AB	SOLENOIDS MUST FUNCTION TO PROVIDE FLOW TO COOLERS WHICH SERVE ESF EQUIPMENT
WBN-2-FSV -067-0354 -A PEN RM CLR A3 SUP CNTL VLV	2-FSV -067-0354 -A 206-380-2RU	313	737' 80KJ3-827551	A09	A	100D	L	SOLENOIDS MUST FUNCTION TO PROVIDE FLOW TO COOLERS WHICH SERVE ESF EQUIPMENT
WBN-1-FSV -067-0356 -B PEN RM CLR B3 SUP CNTL VLV	1-FSV -067-0356 -B 206-380-2RU		737' 80KJ3-827551	A05	A A A A A	100D 1MO 1MO 1MO 1MO	L RH/A CV/A AF/A AB	SOLENOIDS MUST FUNCTION TO PROVIDE FLOW TO COOLERS WHICH SERVE ESF EQUIPMENT
WBN-2-FSV -067-0356 -B PEN RM CLR B3 SUP CNTL VLV	2-FSV -067-0356 -B 206-380-2RU		737' 80KJ3-827551	A09	A	100D	L	SOLENOIDS MUST FUNCTION TO PROVIDE FLOW TO COOLERS WHICH SERVE ESF EQUIPMENT

		R 1	R____	R____
PREPARER/DATE	Randy Foust 8/27/86	ABm 2/17/89		
CHECKED/DATE	W. B Kim 8/27/86	EEm 2/23/89		

BINDER NO. WBNEQ-SOL-005 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

R_____ R_____

BINDER TITLE ASCO SOLENOID VALVES COMPUTED/R1 AHW DATE 2/7/89

MODEL 206-380 SERIES

(AC CONSTRUCTION) CHECKED/R1 EEM DATE 2/23/89

TAB A NOTES:

1) Floor/Actual Elevation - Actual Elevations are documented on field verification sheets found in TAB F. All elevations shown are floor elevations except for those devices located inside the reactor building.

2) See TAB B, Section A for a complete listing of Category and Operating Times Calculations used in this binder.

3) Contract Column - Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

References:

TAB B

ENVIRONMENTAL QUALIFICATION CHECKLIST

NOTE: The units common, 1 and 2 solenoid valves covered by this binder are required for Unit 1 operation.

A. DOCUMENTATION

Equipment Description: Solenoid Valves

Vendor/Manufacturer: Automatic Switch Company (ASCO)

Equipment Model No.(s): 206-380-2RVU

206-380-3RU

206-380-2RU

QUALIFICATION REPORTS

(1) Title/Number/Revision "Report on Qualification of Automatic Switch Co. (ASCO) Catalog NP-1 Solenoid Vlvs for Safety-Related Applications in Nuclear Power Generating Stations", AQR-67368, Rev. 1. RIMS B45 850514 428 DATE 8/19/83

NOTE: Throughout this Binder, references are made to the ASCO qualification report listed above. This report is identified as "(1)" in these references.

(2) Title/Number/Revision "Equipment Qualification Research-Test Program & Failure Analysis of Class IE Solenoid Vlvs", F-C5569-309/315 Appendix C, and pages F-3 and F-4. RIMS NEB 840925 351 DATE Nov. 1983 R2

(3) Title/Number/Revision "Aging and Qualification Research on Solenoid Operated Valves," NUREG/CR-5141 RV RIMS B74 890623 502 DATE August 1988

(4) Title/Number/Revision "ASCO Engineering Report No. 177" RIMS B25 870612 003 DATE 12/11/79

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(5) Category and Operating Times Calculation WBNOSG4-008 R15 (System 30) (B26 900309 231)

(6) Category and Operating Times Calculation WBNOSG4-010 R4 (System 32) (B26 891205 200)

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(7) Category and Operating Times Calculation WBNOSG4-015 R10 (System 65) (B26 900309 226) R2

(8) Category and Operating Times Calculation WBNOSG4-016 R14 (System 67) (B26 900319 215)

(9) WBNP Environmental Data Drawing 47E235-44 R1

(10) WBNP Environmental Data Drawing 47E235-48 R3

(11) WBNP Environmental Data Drawing 47E235-49 R2 and DCA-P02351-11-0 per DCN P-02351-A (B26 88 1210 801) R2

(12) WBNP Environmental Data Drawing 47E235-56 R1

(13) WBNP Environmental Data Drawing 47E235-57 R2 and DCA-P02351-17-0 per DCN P-02351-A (B26 88 1210 801) R2

(14) WBNP Environmental Data Drawing 47E235-78 R3

(15) Calculation WBNNAL3-007 R3 (B26 890605 308), Location Specific Radiation Dose

(16) Deleted by Revision 2. R2

(17) Calculation WBNOSG4-044 R1 (B45 860908 218), Flooding

(18) Calculation GENNAL6-002 R2 (B45 860812 236), Moisture Intrusion

(19) Calculation WBNOSG4-045 R1 (B45 860902 219), Status and Duty Cycles of Solenoid Valves

(20) Calculation WBNNAL3-031 R1 (B45 880826 235), 100-day LOCA Dose in EGTS Filter Train Room

(21) Calculation WBN-EEB-MS-TI06-0017 (B26 900202 410) Solenoid Valve Voltage Study R2

(22) Calculation TI-ECS-79 R2 (B45 860319 235), EGTS Room Temperature

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(23) ASCO Letter, W. M. Brown to F. W. Chandler dated April 29, 1985 (B43 850502 015)

(24) Material Aging Data Request WAD-3

(25) ASCO Certification of Compliance (B43 850326 508, MED 840202 206, B26 860728 022) R2

(26) TVA Memorandum D. L. Reed to EEB files dated October 9, 1984 (EEB 841010946)

(27) Deleted by Revision 2.

(28) ASCO Letter, W. M. Brown to D. L. Kitchel dated May 8, 1986 (B71 860512 001). R2

(29) CATEGORY AND OPERATING TIMES CALCULATION WBNOSG4-040, R7 U2 COMPONENTS REQUIRED FOR U1 SAFE SHUTDOWN (B26 900327 203).

NOTES:

(1) Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

(2) Although most valves in this binder were purchased and certified to be in compliance with ASCO Test Report No. AQS21678/TR, NRC recognizes this model valve as being qualified to the later ASCO Test No. AQR 67368 (see NRC Information Notice 85-08 in TAB J). Therefore, qualification of the valves in this binder is to the parameters of the later test although the COCs from ASCO in TAB E are to the older test.

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1) Conduit seals must be installed on valve Nos. 1-FSV-67-350-A, -352-B, -354-A, and -356-B. R2

COMMENTS/RECOMMENDATIONS None

BINDER NO. WBNEQ-SOL-005 PLANT WBN UNIT(S) 1 SHEET 3 OF 27

BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION) COMPUTED RCF DATE 8/27/86 R ___ R ___

CHECKED WBK DATE 8/29/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

_X_ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS __________

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974, IEEE 344-1975, IEEE 382-1980, and IEEE 627-1980.

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BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)	COMPUTED RCF	DATE 8/27/86	R R
	CHECKED WWK	DATE 8/27/86	

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS See TAB C

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (Yes/No/NA)? yes

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Solenoid Vlv	Solenoid Vlv	See TAB C
(2)	Manufacturer	ASCO	ASCO	See TAB C
(3)	Model Number(s)	206-380-2RVU	K206-380-3RVF	See TAB C & pg. 5 of (1)
		206-380-3RU	K206-380-3RF	See TAB C & pg. 5 of (1)
		206-380-2RU		
(4)	Serial Number(s)	See TAB F	Not Listed	

R2

(5) Identify Component Unique checksheet attached: NA

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-SOL-005	PLANT WBN	UNIT(S) 1	SHEET 6 OF 27
BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)	COMPUTED RC	DATE 8/27/86	R 2 CKH 5/18/90 R
	CHECKED	DATE 8/27/86	ADM 5/21/90

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	None Specified, See TAB C, "Interfaces"		
External Process Connections	None Specified, See TAB C, "Interfaces"		
Electrical Connections	TAB C, "Interfaces"		
Conduit Seals	See TAB C, "Interfaces"		
Connector Seals	NA		
Orientation	Vertical & Upright ± 45°	Yes	App. A, Pg. A2 of (/) & ASCO Ltr IN TAB E-2 | R2
Physical Configuration	N/A		
Other	See below	Yes	See below

JUSTIFICATION/COMMENTS 1. ASCO requires the installation of a 90° street elbow facing downward connected to exhaust port or similar configuration to prevent moisture from entering valve internals (Reference: Page A18 of /). The purpose of this requirement is to prevent moisture intrusion resulting from a liquid spray. Since these valves are not subject to any spray condition the installation of a 90° street elbow is not required. | R2

F. INSTALLATION INTERFACES (Continued)

JUSTIFICATION/COMMENTS (Continued)

2). Medium must be oil free instrument air and a strainer or filter must be installed on the inlet as close to the valve as possible (Reference: ASCO Bulletin for Model 206-380 valves Tab H). ASCO does not identify specific interfacing requirements except as noted above. It is incumbent on each utility to ensure that interfaces are such that they do not interfere with the proper operation or qualification of the solenoid valve. See TAB C for a description of the TVA interfaces. R2

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BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)	COMPUTED AL	DATE 8/27/86	CAH 5/18/90		
	CHECKED	DATE 8/29/86	GJM 5/21/90		

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Sect. 4, pg 8 of (1)
(b) Baseline performance measurements taken	Yes	Sect. 4, pg 8 of (1)
(c) Equipment aged:		
Thermal	Yes	Sect 4.1.1, pg 8 of (1).
Radiation	Yes	Sect 4.1.4, pg 15 of (1).
Wear	Yes	Sect 4.1.2, pg 12 of (1).
(d) Vibration/seismic testing conducted	Yes	Sect. 4.1.5, pg 15, Sect. 4.1.6, pg 17 & Sect. 4.2.1, pg 19 of (1).
(e) Design basis event (DBE exposure	Yes	Sect. 4.2, pgs 19-23 of (1)
(f) Post-DBE exposure	Yes	Sect. 4.2.3, pgs 22 & 23 of (1)
(g) Final inspection and disassembly	Yes	Sect. 4.4, pg 24 of (1).

R2

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference Appendix G of (1)). R2

JUSTIFICATION/COMMENTS

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R 2 R

BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION) COMPUTED DATE 8/27/86 5/18/90

CHECKED DATE 8/27/86 5/21/90

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Appendix A, Sect. 9.4, pg A10 of (/); and TAB C).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	App. A, Sect. 9.4.1 of (/)
Radiation exposure	Yes	App. A, Sect. 9.4.4 of (/)
Vibration (non-seismic) aging	Yes	App. A, Sect. 9.4.5 of (/)
Operational (electrical/mechanical/process) stress aging	Yes	App. A, Sect. 9.4.2 and 9.4.3 of (/).

R2

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? No (Reference).

JUSTIFICATION/COMMENTS Synergistic effects were considered in the qualification of these valves. Each section of TAB C contains a discussion on this subject.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference App. A, Sect. 9.4.1, pg. A10 of (/), and TAB C). R2

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-SOL-005 PLANT WBN UNIT(S) 1 SHEET 10 OF 27

BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)

COMPUTED [illegible] DATE 5/27/86 R 2 [illegible] 5/18/90 R

CHECKED WBK DATE 8/27/86 [illegible] 5/21/90

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: App. B of (1)). R2

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference See H (1) this Tab).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference App. A, Sect. 9.4.1 of (1)). R2

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature			
Time			

JUSTIFICATION/COMMENTS See TAB C, "Aging"

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference See H(4)(d) this Tab & TAB C).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference See H(4)(b) this Tab).

JUSTIFICATION/COMMENTS

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H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? N/A (Reference ________).

JUSTIFICATION/COMMENTS

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference Sect. 4.1.1, pg. 11 of (1)). |R2

JUSTIFICATION/COMMENTS

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference App. A, Sect. 9.4.4 of (1)). |R2

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference ________).

JUSTIFICATION/COMMENTS ASCO's intent was not to subject the test specimen to radiation exposure in accordance with the limiting material. Their intent was to demonstrate operability regardless of the radiation threshold values.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference See H(5)(a) this Tab).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Section 4.1.4 of (/) and Appendix D of (/)). R2

Plant normal ambient radiation dose (rd)	Various-See TAB C
Test exposure dose (rd)	2.3×10^7 rads, gamma
Test exposure dose rate (rd/hr)	0.71 Mrad/hr for 33 hours
Test exposure source type (e.g., Co-60 gamma)	Co-60, gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: App. A. Section 9.4.5 and Section 4.1.5 of (/)). R2

JUSTIFICATION/COMMENTS No failure which could be attributed to vibration aging was identified.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: App. A. Section 9.4.5 of (/)) R2

JUSTIFICATION/COMMENTS

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder.

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			R 1 R 2
BINDER TITLE ASCO SOLENOID VALVES MODEL 206-380 SERIES (AC CONSTRUCTION)	COMPUTED RCF	DATE 8/27/86	GJM 2/17/89 CAH 5/8/90
	CHECKED WBK	DATE 8/27/86	ESM 2/23/89 AJM 5/21/90

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: App. A. Section 9.4.2 and 9.4.3 of (/)). R2

JUSTIFICATION/COMMENTS

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: App. A. Section 9.4.2 & 9.4.3 of (/)). R2

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: See below, TAB C, and Section 9.4.1 Appendix A of (/)). R2

Qualified life (Document in QMDS)

JUSTIFICATION/COMMENTS

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: See below and TAB C).

JUSTIFICATION/COMMENTS Replacement intervals and qualified life are a function of plant specific conditions in comparison to test conditions. TABS C and G define the replacement intervals and qualified life and their basis.

BINDER NO. WBNEQ-SOL-005	PLANT WBN	UNIT(S) 1	SHEET 14 OF 27
			R 2 R
BINDER TITLE ASCO SOLENOID VALVES MODEL 206-380 SERIES (AC CONSTRUCTION)	COMPUTED RCF	DATE 8/27/86	CAH 5/18/90
	CHECKED WBK	DATE 8/27/86	WJM 5/21/90

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/ Property/Function	Radiation Threshold	Reference	Activation Energy	Reference	
(a)	(Coil) IsoMica bonded with Hi-Temp Epoxy	1×10^9 rads	See below	1.00	See below	
(b)	Ethylene Propylene Therpolymer (Seats)	1×10^7 rads	See below	0.94	App. B pg B3 of (/)	R2
(c)	Viton (Seats)	5×10^6 rads	See below	1.04	App. B pg B4 of (/)	
(d)	*DC 5~~0~~5 0 Lubricant	NA	NA	NA	NA	R2
(e)						

JUSTIFICATION/COMMENTS Note: The Class H coil is composed of six primary materials. Of these, the one with the lowest activation energy is Iso-Mica bonded with hi-temp epoxy. Its activation energy is 1.00 eV. The materials of coil construction along with their activation energies are identified in Appendix B, page B5 of (/). R2 Radiation threshold values are typical for these materials and listed for information only. These values were not taken from the test report but were supplied by the Digital Materials Data Base. (See TAB E).

*Although not stated in Ref. (/), DC 550 lubricant was used on tested valves as verified by ASCO letter dated 1/5/88 (see TAB E-11). R2

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference App. A, Sect. 6.1 and 6.2 of (/)).

Identify Acceptance Criteria: Coil only taken from (/) - Must operate at any voltage between 102 VAC and 132 VAC. Insulation resistance must measure greater than or equal to 1 megohm at 500 VDC. Leakage current must be less than 0.5 milliamps at 1240 VAC for 1 minute. For seats and discs, as taken from (/) - Valves must operate at the minimum and maximum operating pressure differentials. Valves must not have a pressure increase at a cylinder port which is required to be vented or a pressure decrease at a cylinder port which is required to be pressurized in excess of 10% of the maximum operating pressure differential. R2

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Ref. App. A, Sects. 6.1, 6.2, and App. AIII of (/).) R2

Identify baseline and functional testing: Recording coil excitation, coil dielectric, seat leakage at 150 psig and 10 psig in both the energized and de-energized state, noise test, external leakage at 150 psi, operational test from 150 psig to 0 psig, insulation resistance and number of active coil turns during initial baseline and following DBA simulation.

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BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)

COMPUTED [illegible] DATE [illegible] R 2 [illegible] 5/18/90 R

CHECKED [illegible] DATE [illegible] [illegible] 5/21/90

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Appendix A, Figure 9.2, page A26 of (1)). |R2

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: Tbl 4.3, page 30 of (/)). | R2

JUSTIFICATION/COMMENTS Loads of voltage and pressure. Actual plant voltage during normal operation is within the required range of 120VAC $^{+10\%}_{-15\%}$ except as noted below. Plant operating pressure is within the range tested. However, maximum operating pressure differential is function of the specified valve design. (See TAB C).

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions[1]	Reference	
Voltage	120 VAC ± 10%	Procurement Contracts, Sec. E8 & E9	R2
Load	SEE SHEET 18A	Procurement Contracts, Sec. E8 & E9	R2
Frequency	60 HZ	Procurement Contracts Sec. E8 & E9	R2
Accuracy	NA	—	
Other(s)			

JUSTIFICATION/COMMENTS | R2

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (b)

Parameter	Specific Accident Conditions[1]	Reference	
Voltage	Varies	Procurement Contracts, Sec. E8 & E9	R2
Load	Not specified	Procurement Contracts, Sec. E8 & E9	
Frequency	Not specified	Procurement Contracts, Sec. E8 & E9	
Accuracy	NA	—	
Other(s)			

JUSTIFICATION/COMMENTS See Sheet 18A

(5) (c)

Parameter	Demonstrated Conditions	Reference	
Voltage	120 VAC + 10% - 15%	Tbl 4.3 pg 30, Sect. 4.2.3 p 22, App. A Sect. 9.5.3 and App. A Fig. 9.2 of (/)	R2
Load	0.249 amps[2] to 0.262 amps at 102 VAC	Tbl 4.3 p 30 of (/)	R2
Frequency	60 Hz±0%	App. A, pg. A26 of (/)	R2
Accuracy	NA		
Other(s)			

JUSTIFICATION/COMMENTS SEE SHEET 18A R2

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JUSTIFICATION/COMMENTS

1 Valves were procured to be qualified in accordance with IEEE 323-1974 which specifies that operability shall be demonstrated at rated voltage ±10% and rated frequency ±5% unless otherwise specified. Contract 827551 and 822950 did not specify a plant unique range. None of the contracts specified frequency or frequency range. TVA Calculation WBN-EEB-MS-TI06-0017 documents that the terminal voltage for all 206-380 series solenoid valves is more than the demonstrated minimum voltage of 102 VAC. Additionally, testing performed by Franklin Research, as documented in Test Report F-C5569-309/315, demonstrates the ability of these valves to operate at a voltage much less than the 102 VAC. Franklin successfully demonstrated the ability of these valves to energize and shift position at voltages between 77 VAC and 95 VAC after exposure to conditions much more severe than what the TVA valves will experience. It is therefore concluded that adequate voltage is supplied for successful operation under worst-case accident conditions. R2

2 The TVA valves have a 20 watt AC rating. Per ASCO Catalog NP-1 (TAB E, Section E1), these solenoids are rated at 41.5 volt-amps holding and 195 volt-amps in-rush. The demonstrated volt-amps holding is determined as follows:
0.262 amps x 102 VAC = 26.72 volt-amps.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Various - See TAB C | R2

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	Various See TAB C	(a) Temperature (°F)	Various See TAB C
(b) Pressure (psig)	Various See TAB C	(b) Pressure (psig)	Various See TAB C
(c) Humidity (%)	Various See TAB C	(c) Humidity (%)	Various See TAB C
(d) Radiation (rd)	Various See TAB C	(d) Radiation (rd)	Various See TAB C

(3) Process Interfaces: The process fluid is oil free instrument air with a design temperature of 100°F maximum. Therefore, the bounding temperature for these valves is the ambient. | R2

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and less that one percent of plant life. See TAB C.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

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(a) Temperature (°F)	110°F/2~~2~~0°F	Accident Type	LOCA/HELB
(b) Pressure (psig)	ATM(-)	Accident type	LOCA/HELB
(c) Humidity (%)	100%	Accident Type	LOCA/HELB
(d) Radiation (rd)	1 X 10~~8~~ RADS	Accident Type	LOCA/HELB
(e) Spray Type	N/A	Accident Type	NA ~~LOCA/HELB~~

R2

CAH 5/18/90

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R 2 R

BINDER TITLE ASCO SOLENOID VALVES COMPUTED/R1 AFM DATE 2/17/89 CAH 5/18/90

MODEL 206-380 SERIES

(AC CONSTRUCTION) CHECKED/R1 EEM DATE 2/23/89 AGM 5/21/90

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Worst case accident environment for the valves in this binder is for the Group E valves. Temperature will be 110°F for 30 days following a LOCA. Following an RHR line break, temperature will spike to 200°F at 11 minutes, decreasing to maximum normal at 24 hours. R2

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: All valves subject to such conditions require conduit seals and are identified in TAB G.). R2

(7) Subject to submergence (Yes/No/NA)? No (Reference: See TAB C).

Identify initiation time and duration of submergence: N/A

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: Only ~~only~~ the Group B valves are subject to ~~to~~ a Beta contribution.). R2

CAH 5/18/90

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: The total accident dose of 1.2×10^7 RADS includes a Beta dose contribution of 6×10^5 RADS per TVA environmental drawing 47E235-44. R2

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.

See TAB B, Section A for a listing of all calculations used in this binder.

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BINDER NO. WBNEQ-SOL-005	PLANT WBN	UNIT(S) 1	SHEET 21 OF 27 R 1 R 2
BINDER TITLE ASCO SOLENOID VALVES MODEL 206-380 SERIES	COMPUTED RCF	DATE 8/28/86	ADM 2/17/89 CDL 5/18/90
(AC CONSTRUCTION)	CHECKED WBK	DATE 8/28/86	EEM 2/23/89 ADM 5/21/90

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	1 100 days	30 days	Fig. 4.1, pg. 25 of (1)
Temperature (°F)	200 @ 11 minutes	448	Fig. 4.1, pg. 25 of (1)
Pressure (psig)	-0-	68 psig	Fig. 4.1, pg. 25 of (1)
Relative Humidity (%)	2 100	100	Fig. 4.1, pg. 25 of (1) R2
Chemical Spray*	3 N/A	pH 10.5 (22 hours)	App. A, pg. A20 A21 of (1)
Radiation (rd)**	1X10^8 RADS	2.05×10^{8} gamma 4 2×10^{7} gamma	App. D of (1) & IN 85-08 TAB J
Submergence	N/A	N/A	N/A

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

1 - At 30 days the temperature returns to maximum normal.
2 - At 24 hours the humidity returns to maximum normal.
3 - Valves are not subject to containment spray.
4 - Valves containing Viton elastomers are only qualified to a maximum of 2×10^{7} rads, gamma. See TAB C.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See TAB C
Pressure	Yes	See TAB C
Relative Humidity	Yes	See TAB C
Chemical Spray	N/A	See TAB C
Submergence	N/A	See TAB C

JUSTIFICATION/COMMENTS

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA	
Temperature: +15 degrees F	15 °F	Yes	
Pressure: +10% but no more than 10 psig	68 psig	Yes	
Radiation: +10% of accident dose	1.05×10^8 RADS	Yes	R2
Time: +10% (or 1 hour + operating time per NUREG-0588)	SEE EQUIV. CALCS. IN TAB C	Yes-See Generic Binder WBNEQ-GEN-001 Sec. III.C.4	R2
Voltage: ±10% of rated value	+10% -15%	Yes	
Frequency: ±5% of rated value	None	Yes	
Environmental Transient: the initial transient and the peak temperature applied twice	—	Yes	
Vibration: +10% added to acceleration	See TAB. C for description of test	Yes	

JUSTIFICATION/COMMENTS: See TAB C for detailed information on margins as they apply to the TVA valves. TVA Calculation WBN-EEB-MS-TI06-0017 documents a degraded voltage condition which has the highest probability of occurrence. Thus, qualification is better substantiated by proving operability under a degraded voltage condition. R2

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				R 2		R	
BINDER TITLE ASCO SOLENOID		COMPUTED	DATE 8/28/86	5/18/90			
VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)		CHECKED	DATE 8/28/86	5/21/90			

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See TAB A).

JUSTIFICATION/COMMENTS FUNCTIONS ARE VARIED. ALL ARE LISTED IN TAB A. R2

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Ref. TBL 5.1, p.59; App. J; p. 30 OF (1)). R2

JUSTIFICATION/COMMENTS The test valve was assumed to be normally energized and required to de-energize on receipt of accident signal, then to remain operable for 30 days post-DBA. The specific DBA functions of the TVA valves are described in TAB. C.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? YES (Ref. 4.2.3, App. J OF (1)). R2

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? YES (Reference TBL 5.1, p.59; App. J, TBL 1 OF (1)). R2

JUSTIFICATION/COMMENTS See TAB C for the analysis of the test DBA versus the plant specific DBA. However, the test valve did demonstrate operability in accordance with the requirements defined in M(2) above.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference Sections 5.2 and 5.3, pgs. 56 and 57 of (1) and page 31 of (1)). R2

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-SOL-005 PLANT WBN UNIT(S) 1 SHEET 24 OF 27

BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION) COMPUTED RF DATE 8/27/86 R ___ R ___

CHECKED WMK DATE 8/27/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TABS C and G

BINDER NO. WBNEQ-SOL-005 PLANT WBN UNIT(S) 1 SHEET 25 OF 27

BINDER TITLE ASCO SOLENOID COMPUTED [illegible] DATE 8/28/86 R ___ R ___

VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION) CHECKED [illegible] DATE 8/28/86

O. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	N/A
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	N/A
(b) Were specific features and failure modes and effects analyzed?	N/A
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	N/A
(d) Were environmental parameters which affect equipment performance identified?	N/A
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-SOL-005	PLANT WBN	UNIT(S) 1		SHEET 26		OF 27	
				R 2		R	
BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION)		COMPUTED	DATE 8/27/86	5/18/90			
		CHECKED	DATE 8/27/86	5/21/90			

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA	
(e) Normally operating state of device (e.g., normally energized) considered?	Yes	
(7) Qualified life or replacement schedule established?	Yes	
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes	
(a) Peak temperature adequate	Yes	
(b) Peak pressure adequate	Yes	
(c) Duration adequate	Yes	
(d) Required profile enveloped adequately	Yes	
(e) Steam exposure adequate	Yes	
(9) Criteria regarding test sequence satisfied?	Yes	
(10) Criteria regarding spray satisfied?	N/A	
(a) Was the spray testing done while under the extremes of pressure and temperature?	N/A	
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	N/A	
(11) Criteria regarding submergence satisfied?	YES	R2
(12) Criteria regarding radiation satisfied?	Yes	
(a) Was dose rate considered?	Yes	
(b) Was beta radiation considered?	Yes	
(13) Criteria regarding operability status/mode satisfied?	Yes	
(14) Criteria regarding test failures or anomalies satisfied?	Yes	

BINDER TITLE ASCO SOLENOID VALVES, MODEL NO. 206-380-SERIES (AC CONSTRUCTION) COMPUTED RY DATE 8/27/86

CHECKED WAK DATE 8/28/86

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	N/A
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	N/A
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

The TVA valves as listed in this report are fully qualified to the requirements of NUREG 0588 Cat. I (IEEE 323-1974) and 10CFR50.49. TAB C provides a detailed analysis to support this claim.

BINDER NO. WBNEQ-SOL-006 PLANT WBN UNIT(S) 1 SHEET 1 OF
R R
BINDER TITLE ASCO SOLENOID VALVES - COMPUTED EEM DATE 7/14/86
MODEL NP 8316 SERIES CHECKED WHK DATE 7/16/86

SOL-006

TAB A
EQUIPMENT IDENTIFICATION MATRIX

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -061-0097 -B	1-FSV -061-0097 -B	300	772' 1"	UC	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
INLET ISLN VLV REACTOR BLDG	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	FCV ON CONT ISO SIG & REMAIN
					A/B	5MN/100D	FW/C	CLOSED TO PREVENT REOPENING.
					A/B	15MN/1MO	RH/C	MUST NOT FAIL SO AS TO PREVENT
					A/B	1HR/1MO	CV/C	PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -061-0122 -B	1-FSV -061-0122 -B	300	776' 5"	UC	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
OUTLET ISLN VLV REACTOR BLDG	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	FCV ON CONT ISO SIG & REMAIN
					A/B	5MN/100D	FW/C	CLOSED TO PREVENT REOPENING.
					A/B	15MN/1MO	RH/C	MUST NOT FAIL SO AS TO PREVENT
					A/B	1HR/1MO	CV/C	PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -061-0192 -B	1-FSV -061-0192 -B	300	807'10"	UC	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
GYLCOL SUPPLY ISOLATION VALVE	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	FCV ON CONT ISO SIG & REMAIN
					A/B	5MN/100D	FW/C	CLOSED TO PREVENT REOPENING.
					A/B	15MN/1MO	RH/C	MUST NOT FAIL SO AS TO PREVENT
					A/B	1HR/1MO	CV/C	PAM FUNCT OF ASSO LIMIT SWS.
WBN-1-FSV -061-0194 -B	1-FSV -061-0194 -B	300	808'	UC	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
GYLCOL RETURN ISOLATION VALVE	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	FCV ON CONT ISO SIG & REMAIN
					A/B	5MN/100D	FW/C	CLOSED TO PREVENT REOPENING.
					A/B	15MN/1MO	RH/C	MUST NOT FAIL SO AS TO PREVENT
					A/B	1HR/1MO	CV/C	PAM FUNCT OF ASSO LIMIT SWS.
WBN-1-FSV -062-0069 -A	1-FSV -062-0069 -A	132	728' 4"	LC	A/B	1HR/1MO	CV/C	THE CLOSING OF THIS VLV IS NECESSARY TO ISOLATE A BREAK IN THE CVCS LETDOWN LINE INSIDE CONTAINMENT.
RC LOOP 3 LETDOWN FLOW	NPX831654E		80KJ3-827551					

R4

PAGE A-2 R4

		R 1	R 4	R
PREPARER/DATE	EEM 7/30/86	JDH 3/17/89	[illegible] 9/18/90	
CHECKED/DATE	WBK 7/30/86	KBN 3/21/89	[illegible] 9/24/90	

W A T T S B A R N[illegible]E A R P L A N T
TAB A - EQUIPMENT I[illegible]IFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION	
✓ WBN-1-FSV -062-0070 -A RC LOOP 3 LETDOWN FLOW	1-FSV -062-0070 -A NPX831654E	133	723' 9" 80KJ3-827551	AC2	A/B	1HR/1MO	CV/C	THE CLOSING OF THIS VLV IS NECESSARY TO ISOLATE A BREAK IN THE CVCS LETDOWN LINE INSIDE CONTAINMENT.	
✓ WBN-1-FSV -062-0072 -A REGEN HTX LTDN ISLN VALVE A	1-FSV -062-0072 -A NPX831654E	042	703' 1" 80KJ3-827551	RW	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE ASSOC FCV'S ON CONT ISO SIG & REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.	R3
✓ WBN-1-FSV -062-0073 -A REGEN HTX LTDN ISLN VALVE B	1-FSV -062-0073 -A NPX831654E	052	703' 7" 80KJ3-827551	RW	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE ASSOC FCV'S ON CONT ISO SIG & REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.	R3
✓ WBN-1-FSV -062-0074 -A REGEN HTX LTDN ISLN VALVE C	1-FSV -062-0074 -A NPX831654E	052	704' 8" 80KJ3-827551	RW	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE ASSOC FCV'S ON CONT ISO SIG & REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.	R3
✓ WBN-1-FSV -062-0076 -A REGEN HTX LTDN ISLN VALVE	1-FSV -062-0076 -A NPX831654E	052	707' 1" 80KJ3-827551	RW	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DEENERGIZE TO CLOSE ASSOC FCV'S ON CONT ISO SIG & REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS.	R3

		R 1	R 3	R
PREPARER/DATE	EEM 9/19/86	JDH 3/17/89	[illegible] 5/18/90	
CHECKED/DATE	WBK 9/19/86	KBN 3/21/89	GPM 5/18/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -062-0077 -B	1-FSV -062-0077 -B		713'	A28	A/B	5MN/100D	L	MUST DEENERGIZE AND REMAIN TO
LETDOWN LINE ISOLATION VALVE	NP8316				B	1 MO	RH/A	PREVENT VLV OPENING WITH PHASE
					A/B	15MN/1MO	CV/A	A CONT ISO SIG PRESNT & RESET. R4
					B	1 MO	AF	MUST NOT FAIL SO AS TO PREVENT
					B	1 MO	AB	PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -063-0023 -B	1-FSV -063-0023 -B		713'	A28	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE FCV
SIS ACCUM FILL LINE ISLN SW	NP831654E		84KK1-835541		B	1 MO	RH/A	IF OPEN AND NOT FAIL IN THE
					B	1 MO	CV/A	ENERGIZED POS. MUST NOT FAIL
					B	1 MO	AF	IN MANNER TO PREVENT PAM FUNCT
					B	1 MO	AB	OF ASSO LIMIT SWITCHES.
WBN-1-FSV -063-0064 -A	1-FSV -063-0064 -A		713'	A28	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE FCV
SIS ACCUM TANK NO 2 HDR INLET VLV	NP831654E		84KK1-835541		B	1 MO	RH/A	IF OPEN AND NOT FAIL IN THE
					B	1 MO	CV/A	ENERGIZED POS. MUST NOT FAIL
					B	1 MO	AF	IN MANNER TO PREVENT PAM FUNCT
					B	1 MO	AB	OF ASSOC LIMIT SWITCHES.
WBN-1-FSV -063-0071 -A	1-FSV -063-0071 -A	290	724' 1"	AC4	A/B	5MN/100D	L	MUST DEENERGIZE AND REMAIN TO
SIS CHECK VLV LEAK TEST ISLN VALVE	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	PREVENT VLV OPENING WITH PHASE
					A/B	5MN/100D	FW/C	A CONT ISO SIG PRESNT & RESET.
					A/B	15MN/1MO	RH/C	MUST NOT FAIL SO AS TO PREVENT
					A/B	1HR/1MO	CV/C	PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -063-0084 -B	1-FSV -063-0084 -B		713'	A28	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE FCV
SIS CHECK VLV LEAK TEST ISLN VALVE	NP831654E		84KK1-835541		B	1 MO	RH/A	IF OPEN AND NOT FAIL IN THE
					B	1 MO	CV/A	ENERGIZED POS. MUST NOT FAIL
					B	1 MO	AF	IN MANNER TO PREVENT PAM FUNCT
					B	1 MO	AB	OF ASSOC LIMIT SWITCHES.

		R 1	R 3	R 4
PREPARER/DATE	EEM 9/19/86	JDH 3/17/89	CDH 5/18/90	[illegible] 9/18/90
CHECKED/DATE	WBK 9/19/86	RBN 3/21/89	AFM 5/18/90	AJM 9/24/90

PRINT DATE[illegible]14/90

W A T T S   B A R   N U C L E A R   P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PSV -065-0081 -A	1-PSV -065-0081 -A	001	832'10"	ANN	A	100D	L	MUST OPERATE WHENEVER
SHLD BLDG VENT AND CONT ANNLS ISLN VLV	NP831654E		84KK1-835541		A	100D	MS/C	NEEDED TO HELP REGULATE
					A	100D	FW/C	ANNULUS PRESSURE.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-PSV -065-0083 -B	1-PSV -065-0083 -B	360	830'9"	ANN	A	100D	L	MUST OPERATE WHENEVER
SHLD BLDG VENT AND CONT ANNLS ISLN VLV	NP831654E		84KK1-835541		A	100D	MS/C	NEEDED TO HELP REGULATE
					A	100D	FW/C	ANNULUS PRESSURE.
					A	1MO	RH/C	
					A	1MO	CV/C	
WBN-1-FSV -068-0305 -A	1-FSV -068-0305 -A		713'	A28	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
RCS FLOW CNTL VLV WDS N2 MAN TO PRT	NP831654E		84KK1-835541		B	1MO	AB	FCV ON CONT ISO SIG & REMAIN
					B	1MO	AF	CLOSED TO PREVENT REOPENING.
					B	1MO	CV/A	MUST NOT FAIL SO AS TO PREVENT
					B	1MO	RH/A	PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -068-0308 -B	1-FSV -068-0308 -B	318	723'11"	AC4	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
RCS FLOW CNTL VLV WDS GA TO PRT	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	FCV ON CONT ISO SIG & REMAIN
					A/B	5MN/100D	FW/C	CLOSED TO PREVENT REOPENING.
					A/B	15MN/1MO	RH/C	MUST NOT FAIL SO AS TO PREVENT
					A/B	1HR/1MO	CV/C	PAM FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -077-0009 -B	1-FSV -077-0009 -B	279	725' 3"	AC4	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
RCDT PMP DISCH FLOW CONTROL VALVE	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	ISOL VLV AND REMAIN CLOSED TO
					A/B	5MN/100D	FW/C	PREVENT REOPENING. MUST NOT
					A/B	15MN/1MO	RH/C	FAIL SO AS TO PREVENT PAM
					A/B	1HR/1MO	CV/C	FUNCT OF ASSOC LIMIT SWS.

R4

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		R 1	R 4	R
PREPARER/DATE	EEM 9/19/86	JDH 3/19/89	CKH 9/18/90	
CHECKED/DATE	WBK 9/19/86	RBN 3/21/89	CMM 9/24/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -077-0010 -A	1-FSV -077-0010 -A		713'	A28	B	1MO	RH/A	MUST DEENERGIZE TO CLOSE ASSOC
RCDT PMP DISCH FLOW CONTROL VALVE	NP831654E		84KK1-835541		B	1MO	CV/A	ISOL VLV AND REMAIN CLOSED TO
					B	1MO	AF	PREVENT REOPENING. MUST NOT
					B	1MO	AB	FAIL SO AS TO PREVENT PAM
					A/B	5MN/100D	L	FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -077-0016 -B	1-FSV -077-0016 -B	285	718' 9"	AC4	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
RCTD TO GAS ANALYZER FLOW SOL VALVE	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	ISOL VLV AND REMAIN CLOSED TO
					A/B	5MN/100D	FW/C	PREVENT REOPENING. MUST NOT
					A/B	15MN/1MO	RH/C	FAIL SO AS TO PREVENT PAM
					A/B	1HR/1MO	CV/C	FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -077-0017 -A	1-FSV -077-0017 -A		713'	A28	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
RCDT TO GAS ANALYZER FLOW CONTROL VALVE	NP831654E		84KK1-835541		B	1MO	CV/A	ISOL VLV AND REMAIN CLOSED TO
					B	1MO	RH/A	PREVENT REOPENING. MUST NOT
					B	1MO	AB	FAIL SO AS TO PREVENT PAM
					B	1MO	AF	FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -077-0018 -B	1-FSV -077-0018 -B	283	725' 4"	AC4	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE ASSOC
RCDT TO VENT HDR FLOW CONTROL VALVE	NPX831654E		80KJ3-827551		A/B	5MN/100D	MS/C	ISOL VLV AND REMAIN CLOSED TO
					A/B	5MN/100D	FW/C	PREVENT REOPENING. MUST NOT
					A/B	15MN/1MO	RH/C	FAIL SO AS TO PREVENT PAM
					A/B	1HR/1MO	CV/C	FUNCT OF ASSOC LIMIT SWS.
WBN-1-FSV -077-0019 -A	1-FSV -077-0019 -A		713'	A28	B	1MO	RH/A	MUST DEENERGIZE TO CLOSE ASSOC
RCDT TO VENT HDR FLOW CONTROL VALVE	NP831654E		84KK1-835541		B	1MO	CV/A	ISOL VLV AND REMAIN CLOSED TO
					B	1MO	AF	PREVENT REOPENING. MUST NOT
					B	1MO	AB	FAIL SO AS TO PREVENT PAM
					A/B	5MN/100D	L	FUNCT OF ASSOC LIMIT SWS.

R4

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		R 1	R 4	R
PREPARER/DATE	EEM 9/19/86	JDH 3/17/89	CAK 9/18/90	
CHECKED/DATE	WBK 9/19/86	KBN 3/21/89	GJM 9/24/90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FSV -077-0020 -A RCDT N2 SUPPLY FLOW CONTROL VALVE	1-FSV -077-0020 -A NP831654E		713' 84KK1-835541	A28	B B B B A/B	1MO 1MO 1MO 1MO 5MN/100D	RH/A CV/A AF AB L	MUST DEENERGIZE TO CLOSE ASSOC ISOL VLV AND REMAIN CLOSED TO PREVENT REOPENING. MUST NOT FAIL SO AS TO PREVENT PAM FUNCT OF ASSOC LIMIT SWS. R4
WBN-1-FSV -081-0012 -A PW RCS PRESS RELIEF TK & RCP STAND PIPES	1-FSV -081-0012 -A NP831654E		713' 84KK1-835541	A28	A/B	5MN/100D	L	MUST DE-ENERGIZE TO CLOSE THE ISOLATION VALVES AND REMAIN IN THAT POSITION
WBN-1-FSV -087-0007 -A TEST LINE ISOLATION VALVE FLOW CONTROL	1-FSV -087-0007 -A NPX831654E	222	708' 5" 80KJ3-827551	RW	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DE-ENERGIZE ON PHASE "A" ISOLATION SIGNAL AND REMAIN DE-ENERGIZED.
WBN-1-FSV -087-0008 -A TEST LINE ISOLATION VALVE FLOW CONTROL	1-FSV -087-0008 -A NPX831654E	222	706' 8" 80KJ3-827551	RW	A/B A/B A/B A/B A/B	5MN/100D 5MN/100D 5MN/100D 15MN/1MO 1HR/1MO	L MS/C FW/C RH/C CV/C	MUST DE-ENERGIZE ON PHASE "A" ISOLATION SIGNAL AND REMAIN DE-ENERGIZED.

		R 1	R 4	R
PREPARER/DATE	EEM 9/19/86	JDH 3/17/89	CSH 9/18/90	
CHECKED/DATE	WBK 9/19/86	KBN 3/21/89	AJM 9/24/90	

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1	R	R
BINDER TITLE ASCO SOLENOID	COMPUTED /R1 JDH	DATE 3/13/89			
VALVES MODEL NP8316 SERIES	CHECKED /R1 KBN	DATE 3/21/89			

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-3 for source of Category and Operating Time assignments.

3. Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1		SHEET 1	OF 1		
				R	R		
BINDER TITLE ASCO SOLENOID VALVES		COMPUTED EEM	DATE 7/14/86				
MODEL NP8316 SERIES		CHECKED WAK	DATE 7/16/86				

TAB B

ENVIRONMENTAL QUALIFICATION CHECKLIST

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 1 OF 33 R 1 R 2
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 9/19/86 JDH 3/13/89	[illegible] 3/22/90
VALVES MODEL NP8316 SERIES	CHECKED WBK/HDR	DATE 9/19/86 KBN 3/21/89	[illegible] 3/22/90

A. DOCUMENTATION (See Note on Page B-4)

Equipment Description Solenoid Valves

Vendor/Manufacturer ASCO

Equipment Model No.(s) NPX831654E

NP831654E

QUALIFICATION REPORTS (TAB D)(See also TAB C "Discussion" on Page C-3) (See Note on Page B-4) R2

(1) Title/Number/Revision Automatic Switch Company Test Report No. AQS21678/TR/Rev A — RIMS B43 850627 322 — DATE July 1979

(2) Title/Number/Revision ASCO Catalog NP-1 valves/AQS21678/TR/Supplement 3 — RIMS NEB 840328 363 — DATE March 8, 1983

(3) Title/Number/Revision Automatic Switch Company Test Report No. AQR-67368, Rev 1 — RIMS B45 850514 428 — DATE August 19, 1983

(4) Title/Number/Revision Franklin Research Center Test Report F-C5569-309/315, Appendix C — RIMS NEB 840925 351 — DATE November 1983

(5) Title/Number/Revision "Aging and Qualification Research on Solenoid Operated Valves," NUREG/CR-5141 RV — RIMS B74 890623 502 — DATE August 1988

(6) Title/Number/Revision "ASCO Engineering Report No. 177" — RIMS B25 870612 003 — DATE Dec. 11, 1979 R2

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(7) ASCO Letter dated April 29, 1985 (B43 850502 015) NP Valve Mounting Orientation (TAB E-7).

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A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

	Type	RIMS No.	
	Category and Operating Times		
(8)	System 61 (WBNOSG4-012 R5)	B18 900531 252	R4
(9)	System 62 (WBNOSG4-013 ~~R12~~ 15) 9/18/90	B26 90~~0327~~ 0829 ~~200~~ 202	
(10)	System 63 (WBNOSG4-014 R11)	B26 900309 227	
(11)	System 65 (WBNOSG4-015 R10)	B26 900309 226	
(12)	System 68 (WBNOSG4-017 R11)	B18 900612 252	R4
(13)	System 77 (WBNOSG4-021 R5)	B18 900612 251	
(14)	System 81 (WBNOSG4-023 R3)	B45 851127 219	
(15)	System 87 (WBNOSG4-025 R3)	B45 860313 218	
(16)	Status and Duty Cycles of IE Solenoid Valves Located in Potentially Harsh Environments (WBN-OSG4-045 R1)	B45 860902 219	
(17)	Solenoid Valve Voltage Study (WBNEEB-MS-TI11-0004)	B26 900202 407	
(18)	Wyle Laboratories Test Report No. 17523-1	EEB 840731 501	

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

	Type	RIMS No.	
(19)	Integrated Accident Dose Inside Containment (TI-RPS-48 R2)	B45 851105 235	
(20)	Deleted by Revision 2		
(21)	Reduction of Beta Dose by Sheet Steel (WBNTSR-051 R0)	B26 891129 202	
(22)	Flooding Level Outside the Crane Wall Following Main Feedwater (MFW) and Main Steamline Break (MSLB) (WBNNAL6-005 R0)	B45 860520 235	
(23)	TVA Environmental Drawing 47E235-41 R1 and DCA-P04104-01-0 per DCN P-04104-C (B26 890908 819)		
(24)	TVA Environmental Drawing 47E235-42 R2 and DCA-P04104-03-0 and DCA-P04104-05-0 per DCN P-04104-C (B26 890908 819)		
(25)	TVA Environmental Drawing 47E235-44 R1		
(26)	TVA Environmental Drawing 47E235-61 R1		
(27)	Deleted by Revision 4.		R4
(28)	QIR MNMWBN90099 R0, Flooding of CVCS Letdown Line Valves 1, 2-FCV-62-72, -73, -74 & -76.	B26 900720 259	R4

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 2 OF 33
			R 3 R 4
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 9/19/86 CDH	CDH 5/18/90 9/18/90
VALVES MODEL NP8316 SERIES	CHECKED WBK/HDR	DATE 9/19/86 AFM	AFM 5/18/90 9/24/90

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1) Nameplate data not available for 1-FSV-62-77-B.

2) Deleted by revision 2.

3) Deleted by revision 2.

4) Deleted by revision 2.

5) Deleted by revision 2.

6) Deleted by revision 2.

7) Remove valves 1-FSV-087-7, -8 from TAB A upon completion of ECN 6429. R4

8) Valves requiring conduit seals to comply with Reg. Guide 1.97 (PAM). R4

COMMENTS/RECOMMENDATIONS

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BINDER NO. WBNEQ-SOL-006 PLANT WBN UNIT(S) 1 SHEET 3 OF 33

BINDER TITLE ASCO SOLENOID VALVES COMPUTED EEM DATE 7/14/86 R ____ R ____

MODEL NP8316 SERIES CHECKED WAK DATE 7/16/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

__X__ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

_____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS ____________________

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET:

IEEE 323-1974 IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations.

IEEE 382-1972 IEEE Trial-Use Guide for Type Test of Class I Electric Valve Operators for Nuclear Power Generating Stations.

IEEE 382 (Draft 3, Rev. 1, June 1977) Draft American National Standard for the Qualfication of Safety-Related Valve Actuators.

BINDER NO. WBNEQ-SOL-006 PLANT WBN UNIT(S) 1 SHEET 4 OF 33

R ___ R ___

BINDER TITLE ASCO SOLENOID VALVES COMPUTED EEM DATE 7/14/86

MODEL NP8316 SERIES CHECKED WBK DATE 7/16/86

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS See "Similarity Table", page 6

TVA 10537 (05-3-86) EQP099.51

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (Yes/No/NA)? NO

		Plant Device	Qualification Document	Reference	
(1)	Equipment Type	Solenoid Vlv	Solenoid Vlv		
(2)	Manufacturer	ASCO	ASCO		
(3)	Model Number(s)	NPX831654E'	NP 831665E	Ref (1) Section 2 Table 1	
		NP 831654E			
			NP 832070E (coil only)	Ref (3) Appendix I	R2
(4)	Serial Number(s)	See TAB F	6	Ref (1) Section 2 Table 1	
			2	Ref (3) Section 3 Table 3.2	

(5) Identify Component-Unique checksheet attached: NONE

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ASCO SOLENOID VALVES

MODEL NP8316 SERIES

SIMILARITY TABLE

Specification	ASCO Test Valve Model No. NP831665E	TVA Valve Model No. NPX831654E	TVA Valve Model No. NP831654E
Description	Three-way direct acting solenoid valve with packless const	Same	Same
Application	Pilot Vlv Controlling Oil Free Instr Air	Same	Same
Form of Flow	Normally Closed	Same	Same
Pipe Size	3/8"	3/8"	3/8"
Orifice Size	5/8"	5/8"	5/8"
Body Material	Brass	Brass	Brass
Coil Class	H	H	H
Seat & Disc Material	Ethylene Propylene	Ethylene Propylene	Ethylene Propylene
Disc Holder Material	303 Stainless Steel	303 Stainless Steel	303 Stainless Steel
Core Tube Material	300 Series Stainless Steel	300 Series Stainless Steel	300 Series Stainless Steel
Core Material	400 Series Stainless Steel	400 Series Stainless Steel	400 Series Stainless Steel
Coil Enclosure	NEMA 4,7,9	NEMA 6	NEMA 6
Maximum Operating Pressure Differential	175 psi	175 psi	175 psi
Nominal Voltage	125V DC	125V DC	125V DC
Power Rating	17.4 Watts	17.4 Watts	17.4 Watts
Conduit Connection	3/4" NPT	1/2" NPT	3/4" NPT
Applicable Form Number	V5967	V5967R1	V5967 R1
Terminal Connection	Pigtails (Splice)	Pigtails (Splice)	Pigtails (Splice)
Ambient Temperature	32 - 140°F	120°F - as specified	120°F - as specified
Maximum Fluid Temperature	180°F based on 140°F Ambient	Same	Same
Safe Working Pressure	300 psig	Same	Same
	Notes: From Test Report AQS-21678 TR/Rev A (TAB D-1) Form V5967 (TAB D-1) & ASCO Cat. NP-1 (TAB E-5)	Notes: From Contract 827551, (TAB E-1) Form V5967 R1 (TAB H) & ASCO Cat. NP-1 (TAB E-5). "X" in Model Number denotes 1/2" NPT conduit connection.	Notes: From Contract 835541 (TAB E-3) Form V5967 R1 (TAB H) & ASCO Cat. NP-1 (TAB E-5)

		R	R	R
Preparer/Date	E. E. McBee	7/14/86		
Checked/Date	W. [illegible]	7/16/86		

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BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 7 OF 33 R 1 R
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 7/14/86 JDH 3/13/89	
VALVES MODEL NP8316 SERIES	CHECKED WBK	DATE 7/16/86 KBN 3/21/89	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report	
Mounting Bolts	None Specified, See TAB C-1,"Interfaces" For Typical Discussion, TABS C-2 through C-4 Identical	No		R1
External Process Connections	See TAB C-1 through C-4	Yes	See Below and Ref (3) App. A, Pg A2	
Electrical Connections	None specified, See TAB C-1,"Interfaces" For Typical Discussion, TAB C-2 through C-4 Identical	Yes		
Conduit Seals	See TAB C-1 through C-4 "Conduit Seals"	No	Ref (3) Section 5.3	
Connector Seals	N/A	N/A		
Orientation	Any orientation	N/A	See Note Below	
Physical Configuration	Conduit/junction box must be orientated such that moisutre does not drain into coil housing	No	Ref (3) Sec. 5.3 & P-1 this TAB	R1
Other	NONE			

NOTE: See ASCO letter in TAB E-7.

PLUSEQ/121.29

F. INSTALLATION INTERFACES (Continued)

JUSTIFICATION/COMMENTS ASCO does not identify specific interfacing requirements except as follows: (1) ASCO requires a 90° street elbow facing downward connected to exhaust port or similar configuration to prevent moisture instrusion from liquid spray. This is required only on valves located inside containment and subject to containment spray (See TAB C-7). (2) Flowing Medium |R2 must be oil-free instrument air and a strainer or filter must be installed on the inlet as close to the valve as possible. See TAB C for a description of the TVA interfaces and TAB J-2 for disucssion of TVA instrument air system.

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 8 OF 33
			R 1 R
BINDER TITLE: ASCO SOLENOID	COMPUTED EEM	DATE 7/14/86 JDH 3/13/89	
VALVES MODEL NP8316 SERIES	CHECKED WBK	DATE 7/16/86 KBN 3/21/89	

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (Yes/No/NA)? (Note below.)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Ref (3) p 8 & Ref (1) App. A, Sec. 9.4.2.1
(b) Baseline performance measurements taken	Yes	Ref (3) p 8 & Ref (1) App. A, Sec. 9.4.2.2
(c) Equipment aged: Thermal	Yes	Ref (1) App. A, Sec. 9.4.2.3.1 & Ref (3), p 8
Radiation	Yes	Ref (1) App. A, Sec. 9.4.2.3.2 & Ref (3), App D
Wear	Yes	Ref (1) App. A, Sec. 9.4.2.3.3 & Ref (3), p 12
(d) Vibration/seismic testing conducted	Yes	Ref (1) App. A, Sec. 9.4.2.4 & Ref (3), p 15
(e) Design basis event (DBE) exposure	Yes	Ref (1) App. A, Sec. 9.4.2.4 & Ref (3), p 15
(f) Post-DBE exposure	Yes	Ref (1) App. A, Sec. 9.4.2.4 & Ref (3), p 23
(g) Final inspection and disassembly	Yes	Ref (1), App. A, Sec. 9.4.3 & Ref (3), p 24

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (Yes/No/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately document (Yes/No/NA)? Yes (Reference: Ref (1), App. C., Ref (3), Appendix G).

JUSTIFICATION/COMMENTS AQR-67368, was utilized to qualify the Class H coils. Reference to this report is in regard to coil qualification only unless otherwise noted. |R1

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 9 OF 33				
			R 2	R			
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 7/14/86	CSR 3/22/90				
VALVES MODEL NP8316 SERIES	CHECKED WBK	DATE 7/16/86	AOM 3/23/90				

H. AGING

(1) Was aging considered in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1) Sec. 4.2, App. A, Sec. 9.4.2.3 & Ref (3) Sec. 4.1, App. A, Section 9.4).

JUSTIFICATION/COMMENTS See TAB C-1 Thru C-4

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
		Ref (1), App. A
Thermal aging	Yes	Section 9.4.2.3.1
Radiation exposure	Yes	Section 9.4.2.3.2
Vibration (nonseismic) aging	Yes	Section 9.4.2.3.4
Operational (electrical/mechanical/ process) stress aging	Yes	9.4.2.3.3

JUSTIFICATION/COMMENTS See Reference (3), App. A, Section 9.4. Also, thermal aging was done using nitrogen as the process fluid in lieu of instrument air (see TAB C-8). R2

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (Yes/No/NA)? Yes (Reference: NA).

JUSTIFICATION/COMMENTS See Discussion, Section P-4.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1) App. A, Section 9.4.2.3.1, Ref (3) App. A, Section 9.4.1).

JUSTIFICATION/COMMENTS See TAB C-1 Thru C-4 "Aging."

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Ref (2) Sections 1-6).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Ref (2) Sections 1-6).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Ref (1) App. A Section 9.4.2.3.1 & Ref. 3, App. A, Section 9.4.1).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	*	*	*
Time			

JUSTIFICATION/COMMENTS *See TAB C-1 through C-4, "Aging".

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Ref (2) Section 6).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference Ref (2), Section 4).

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ________).

JUSTIFICATION/COMMENTS ________

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference Ref (1), Section 4.2, Ref (3), App. A Section 9.4.1).

JUSTIFICATION/COMMENTS ________

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Ref (1) Section 4.3 & 4.6 Ref (3), App. A, Section 9.4.4 and 9.5.2).

JUSTIFICATION/COMMENTS ________

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? NO (Reference ________).

JUSTIFICATION/COMMENTS Effect on individual materials not considered. Only effect of radiation on overall valve performance.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Ref (1), Sec. 8.1.5, 8.2.5, App. A, Section 9.4.2.3.2 & 9.4.2.4.1).

JUSTIFICATION/COMMENTS ________

BINDER NO. WBNEQ-SOL-006 PLANT WBN UNIT(S) 1 SHEET 12 OF 33
R 1 R

BINDER TITLE ASCO SOLENOID COMPUTED EEM DATE 7/14/86 JDH 3/13/89

VALVES MODEL NP8316 SERIES CHECKED WBK DATE 7/16/86 KBW 3/21/89

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Ref (1) Section 4.3, App. D Ref (3) App. D).

Plant normal ambient radiation dose (rd)	Various - See TABS C-1 through C-4
Test exposure dose (rd)	5×10^7 - Aging 1.5×10^8 - Accident
Test exposure dose rate (rd/hr)	5.1×10^5 for 99 hours 8.0×10^5 for 188.5 hrs accident
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] (Yes/No/NA)? Yes (Reference: Ref (1), Section 4.5, Ref (3), Section 4.1.5). R1

JUSTIFICATION/COMMENTS

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1) App. A Section 8.1.6, Ref (3), App. A, Sec. 9.4.5).

JUSTIFICATION/COMMENTS

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: (1) Section 4.4, Ref (3) Section 4.1.2).

JUSTIFICATION/COMMENTS

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

RLISED/121 25

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1) App. A Section 7.1 & 5.2, Ref (3), App. A, Section 9.4.2).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: Ref (2), Section 6 Ref (1), Section 3.2.2, Ref (3), Appendix C, p. C-8).

Qualified life (Document in QMDS) See TABS C and G

JUSTIFICATION/COMMENTS The qualified life is different, in most cases, from the value given in the test report. TAB C, page C-3, provides rationale. R2

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: Ref (2) Section 8).

JUSTIFICATION/COMMENTS Replacement interval depends upon maximum normal ambient temperature and percentage time solenoid valve is energized. R2

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 14 OF 33		
			R 2	R	
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 7/14/86	CJH 3/22/90		
VALVES MODEL NP8316 SERIES	CHECKED WBK	DATE 7/16/86	AM 3/23/90		

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis).

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	EPDM	1×10^7	See TAB E6	0.94	Ref (2) Sec. 4.1.1
(b)	VITON	5×10^6	See TAB E6	1.04	Ref (2) Sec. 4.1.2
(c)	NOMEX	7×10^6	See TAB E6	0.96	Ref (2) Sec. 4.1.3
(d)	MAGNET-WIRE ENAMEL	1×10^7	See TAB E6	1.16	Ref (2) Sec.4.2.1
(e)	ISO-MICA W/EPOXY	1×10^9	See TAB E6	1.00	Ref (2) Sec. 4.2.6
(f)	SILICONE RUBBER LEAD WIRE INSULATION	1×10^6	See TAB E6	1.59	Ref (2) Sec. 4.2.5
* (g)	DC 550 LUBRICANT	NA	NA	NA	NA R2

JUSTIFICATION/COMMENTS The above materials are those with lowest activation energies listed in reference (2), Section 4.1, and 4.2. Radiation threshold values are typical for these materials and are listed for information only. These values were not taken from the test report, but were supplied by the Digital Engineering System 1000, Materials Data Base (see TAB E6).

*Although not stated in reference (2), DC 550 lubricant was used on tested valves as verified by ASCO letter dated January 5, 1988 (see TAB E-12). R2

BINDER NO. WBNEQ-SOL-006 PLANT WBN UNIT(S) 1 SHEET 15 OF 33

R ___ R ___

BINDER TITLE ASCO SOLENOID VALVES COMPUTED CEM DATE 7/14/86

MODEL NP8316 SERIES CHECKED WBK DATE 7/16/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Ref (1), App. A, Sec.6.1 & 6.2).

Identify Acceptance Criteria: Valves must operate from 90-140VDC at minimum and maximum operating pressure differential. Coil insulation resistance must be a minimum of 1.0 megohm at 500VDC. During Hypot test, current leakage must be less than 0.5 milliamp at twice the rated voltage plus 1000VAC applied for a period of one minute. Valves must operate at test or low voltage condition (90VDC) at maximum pressure differential under all conditions. Valves are not to have a pressure build-up at a vented cylinder port or a pressure decrease at a cylinder port which is required to be pressurized in excess of 10% the nominal inlet supply pressure under all postulated environmental conditions.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Ref (1) Section 4.1).

Identify baseline and functional testing: Recording coil excitation seat leakage, noise test, operational test, external leakage in energized and de-energized state before and after thermal, radiation, wear and vibration aging, and accident radiation and LOCA simulation. Measurement of insulation resistance & coil dielectric tests before thermal aging & after completion of accident radiation and LOCA simulation.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Ref (1) Appendix A, Section 7.0).

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference Ref (1), Section 4.8 & Ref (3), Table 4.3).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	125 VDC	TAB E-1, p. E-6 TAB E-3, p. E-22
Load	Not specified	
Frequency	NA (all valves DC)	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	90 VDC min. (See comment below)	
Load	Not specified	
Frequency	NA (All valves DC powered)	NA
Accuracy	NA	NA
Other(s)		

R2

JUSTIFICATION/COMMENTS TVA Calculation WBN EEB-MS-TI11-0004 determines voltage available to each valve during accident conditions (see comment after J.(5) (C)). R2

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(c)

Parameter	Demonstrated Conditions	Reference	
Voltage	90 VDC	Ref(3) Fig. 9.2 p A26, App. A	R4
Load	.080 AMPS	Ref(3) Table 4.7	
Frequency	NA		
Accuracy	NA		
Other(s)			

JUSTIFICATION/COMMENTS Reference (3), Appendix A, Section 6.1.1, requires 125 VDC valves to operate on demand at any voltage between 90-140 VDC. Per Figure 9.2 of reference (3), the test valve was successfully tested at 90 VDC. A primary concern with solenoid valves is that of voltage available at the coil terminals. TVA Calculation WBN EEB-MS-TI11-0004 shows that the valves in this binder are supplied voltage within their environmentally qualified minimum ratings as required to perform their safety function during accident conditions. R4

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Various - See TABS C-1 thru C-4

(1) Normal Max

(a) Temperature (°F) Various
(b) Pressure (psig) Various
(c) Humidity (%) Various
(d) Radiation (rd) Various

(2) Abnormal Max

(a) Temperature (°F) Various
(b) Pressure (psig) Various
(c) Humidity (%) Various
(d) Radiation (rd) Various

(3) Process Interfaces: The process fluid for these valves is oil-free instrument air with a maximum design temperature of 100°F. Therefore, the bounding temperature for these valves is the ambient.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Will occur less than 1 percent of plant life and could exist for up to 8 hours per excursion.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327°F Accident type LOCA/HELB

(b) Pressure (psig) 25.6 psia (11.2 psig) Accident type LOCA/HELB R2

(c) Humidity (%) 100% Accident type LOCA/HELB

(d) Radiation (rd) 4.7×10^8 rads beta 4.0×10^7 rads gamma Accident type LOCA/HELB

(e) Spray Type 2000 PPM BORON pH 8.3 at 25°C Accident type LOCA/HELB R2

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K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): The worse case accident profile combination was not utilized as the enveloping environment. Qualification to the environment would only produce replacement/refurbishment schedules which would be overly conservative for many of the valves. Qualification and replacement schedules were based on valve specific environments which are defined in TAB C-1 through C-4. TAB G defines the maintenance which is reflective of these environments.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: See P.1 "Discussion").

(7) Subject to submergence (Yes/No/NA)? Yes (Reference: See P.1, "Discussion," TAB C-4).

Identify initiation time and duration of submergence: Following an accident inside primary containment, valves identified in TAB C-4 and located below elevation 722' inside the crane wall or 717.7' outside the crane wall are subject to submergence. However, these valves will all complete their safety function prior to submergence (See TAB C-4). No valves located outside containment and covered by this binder are subject to submergence. R4

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: Environmental Drawing 47E235-42).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: See Section P

WBEP-0121Q

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 19 OF 33 R 1 R
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 9/19/86 TDH 3/13/89	
VALVES MODEL NP8316 SERIES	CHECKED WBK/HDR	DATE 9/19/86 KBN 3/21/89	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

(9) Special environmental calculations (temp., rad., etc.) R1

Type	RIMS No.
See TAB B Sect. A	

PLUSEQ/121.43

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Page B-23 was deleted per revision 1.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time	100 Days	30 days	Ref (1) Fig 2	
Temperature (°F)	327°F	346°F	Ref (1) Sec 4.7	
Pressure (psig)	25.6 psia (11.2 psig)	110 psig	Ref (1) Sec 4.7	R2
Relative Humidity (%)	100%	100%	Ref (1) Sec 4.7	
Chemical Spray*	2000 ppm Boron pH 8.3	3000 ppm Boron pH 9.5-10.5	Ref (1) Sec 4.7	R2
Radiation (rd)**	8.52×10^7 rads	2.01×10^8	Ref (1) app D	R2
Submergence	Yes	Yes	See P. 1 "Discussion"	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type. 2.52×10^7 beta (attenuated dose) + 4.0×10^7 gamma + 2×10^7 40-year dose = 8.52×10^7 rads TID. The total dose on the pigtails only is 1.01×10^8 (see section P.3 of this TAB). R2

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 22 OF 33
BINDER TITLE ASCO SOLENOID VALVES	COMPUTED EEM	DATE 7/14/86	R ___ R ___
MODEL NP8316 SERIES	CHECKED WMK	DATE 7/16/86	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See (1) above
Pressure	Yes	See (1) above
Relative Humidity	Yes	See (1) above
Chemical Spray	Yes	See P. 2 "Discussion"
Submergence	Yes	See P. 1 "Discussion"

JUSTIFICATION/COMMENTS ____________________

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	+19°F	Yes
Pressure: +10% but no more than 10 psig	+98psig	NA
Radiation: +10% of accident dose	+136%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	None	Yes*
Voltage: ±10% of rated value	No**	No**
Frequency: ±5% of rated value	N/A	N/A
Environmental Transient: the initial transient and the peak temperature applied twice	Yes	Yes
Vibration: +10% added to acceleration (during seismic testing)	Ref (1), Section 9.4.2.4.2 Ref (3) Sec. 4.1.6	Yes

JUSTIFICATION/COMMENTS *Accident degradation calculation (see TAB C) proves that the 30-day test envelops the 100-day post-accident requirement. See Generic Binder WBNEP-GEN-001, Section III.C.4.

**The valve was tested at a minimum 90 VDC during operability testing which is better proof of operability than increased coil voltage. During all other tests, either the nominal voltage of 125VDC or the test current of .080 amps was used. | R4

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 24 OF 33
			R ___ R ___
BINDER TITLE ASCO SOLENOID VALVES	COMPUTED EEM	DATE 7/14/86	
MODEL NP8316 SERIES	CHECKED WWK	DATE 7/16/86	

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference See TAB A and TAB C).

JUSTIFICATION/COMMENTS Functions are varied. All are listed in TAB A and TABS C-1 through C-4.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference Ref (1) Section 5).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference Ref (1) Section 5).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference ________).

JUSTIFICATION/COMMENTS See TABS C-1 through C-4 for the analysis of the test DBA versus the plant specific DBA.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference Ref (1) Table 2F Ref (3), App. J).

JUSTIFICATION/COMMENTS TVA has reviewed test anomalies and concurs with disposition.

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 25 OF 33
BINDER TITLE ASCO SOLENOID VALVES	COMPUTED EEM	DATE 7/14/86	R ___ R ___
MODEL NP8316 SERIES	CHECKED WEK	DATE 7/16/86	

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TABS C and G.

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1		SHEET 26 OF 33			
BINDER TITLE ASCO SOLENOID VALVES		COMPUTED EEM	DATE 7/14/86	R	R		
MODEL NP8316 SERIES		CHECKED WMK	DATE 7/16/86				

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 27 OF 33
BINDER TITLE ASCO SOLENOID VALVES	COMPUTED EEM	DATE 7/14/86	R R
MODEL NP8316 SERIES	CHECKED WAK	DATE 7/16/86	

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes*
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

*See P. 3 "Discussion".

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

1. Moisture or liquid intrusion and submergence (Sec. K(6) & K(7)).

All solenoid valves covered by this binder that are subject to moisture intrusion other than submergence are required to operate only 1-hour into an accident, deenergize and remain deenergized. R4.

P. DISCUSSION (Continued)

Each solenoid valve is enclosed in a NEMA 6 enclosure. Per NEMA publication 250, section 3.09 (c), the design test required for a NEMA 6 rating requires the enclosure to be submerged to a depth of 6 feet of water for 30 minutes without moisture intrusion. In addition, testing done by Wyle Laboratories for TVA (reference Test Report 17523-1, and Wyle letter in TAB E-10) demonstrated that an ASCO solenoid valve (specimen A) operated 114.5 hours and a second valve (specimen D) operated for the full 30-day LOCA test with their enclosures full of water. Based on the above facts, we conclude that these valves will operate for 1 hour regardless of moisture intrusion from condensation. All valves in this binder subject to submergence will perform their safety function for all events prior to being flooded (See TAB C-4, pages C-91 and C-92). R4

The above rationale notwithstanding, TVA has thoroughly analyzed moisture intrusion and has installed conduit seals as necessary. TVA's Environmental Data Drawings list areas in the plant subject to moisture intrusion. To determine which valves required conduit seals, TVA's analysis considered NRC Information Notice 88-86 (TAB J-9), Reg. Guide 1.97 PAM concerns, and Category A to Category C interaction. From this analysis, those valves determined to require seals are listed in the QMDS (TAB G). TVA utilizes either Conax or Namco conduit seals for this application. Binder No. WBNEQ-CSC-001 documents qualification of the Conax seals. The Namco seals are qualified in Binder WBNEQ-CSC-002. R4

BINDER NO. WBNEQ-SOL-006	PLANT WBN	UNIT(S) 1	SHEET 30 OF 33
BINDER TITLE ASCO SOLENOID VALVES	COMPUTED EBM	DATE 9/19/86	R ___ R ___
MODEL NP8316 SERIES	CHECKED WBK/	DATE 9/19/86	

P. DISCUSSION (Continued)

2. Chemical Spray (Sec L. (1) & (2)).

The containment spray flow rate is equal to 9500 gal/min or 0.92 gpm per square foot of containment cross section. The spray duration is 30 days. The chemical spray composition is an Alkaline borate solution (ph 8.3) produced by mixing boric acid (H_3BO_3) with sodium tetraborate ($NA_2B_4O_7 \cdot 10\ H_2O$). The ASCO test valve was subjected to a spray solution of 3000ppm Boron as Boric Acid in solution with 0.064 molar sodium thiosulfate buffered with sodium hydroxide to a pH value of 10 at room temperature at a rate of 0.306 gpm per square foot of area covered by the spray for the full 30 days of the test. The test solution is more corrosive than the containment spray. Therefore all valves listed in this binder subjected to containment spray fall within the qualification provided by the test valve.

Reference: Environmental Drawings 47E235-41 and -42.

P. DISCUSSION

3. Beta Radiation (Sect. 0.12.b)

Post-DBA beta radiation must be addressed for all equipment located inside containment which is required for LOCA mitigation. Solenoid valves in Group D are located inside containment in the Lower Compartment, in the Accumulator Rooms and Fan Rooms; Group A valves are in the Upper Compartment; and Group B valves are in the Annulus.

Per drawing 47E235-44, which covers the Annulus, the 100-day accident radiation dose is 1.2×10^7 rads (includes a Beta dose contribution of 6×10^5 rads). Since the ASCO valves are qualified to 2.01×10^8 rads, no credit for reduction of the beta dose is necessary for the valves in Group B.

Per drawing 47E235-42, which covers the Lower Compartment, the 100-day accident radiation dose is 4.7×10^8 rads beta and 4×10^7 rads gamma. R2

Per drawing 47E235-41, which covers the Upper Compartment, the 100-day accident radiation dose is 4.7×10^8 rads beta and 3.8×10^7 rads gamma.

Since the combined gamma/beta doses possible in the Lower (Group D) and Upper (Group A) Compartments exceed the qualified level of the valves on face value, it is necessary to consider the inherent shielding afforded these valves.

All non-metallic parts of the valves are totally enclosed by metal with the exception of the 18" wire pigtails. The minimum thickness of metal is assumed to be the coil housing, which is 3/32" (0.09375) steel, per ASCO's Tom Hays telecon with TVA's Dean Helton on January 7, 1986. OE Calculation WBNTSR-051 "Reduction of Beta Dose by Sheet Steel," page 3.1, shows the beta reduction factor for 14 gauge (0.0747)" steel is equal to 0.0536. This reduces the total 100-day beta dose to the valve internal parts to $(4.7 \times 10^8) \times (5.36 \times 10^{-2}) = 2.52 \times 10^7$ rads TID beta.

In the Lower Compartment, the total combined 100-day beta and accident radiation dose will equal $(2.52 \times 10^7$ beta$) + (4.0 \times 10^7$ gamma$) = 6.52 \times 10^7$ rads. The combined 100-day accident radiation plus the 40-year dose (2×10^7) equals a total radiation dose of 8.52×10^7 rads TID.

P. DISCUSSION (Continued)

4. Synergistic Effects (Sec. H(3))

Ethylene Propylene Terpolymer (EPDM) elastomer is used in the construction of ASCO solenoid valves as gaskets and diaphragms. EPDM is the only material having a potential for radiation induced synergisms based on a review of technical inforamtion provided in NUREG/CR-2157 and NUREG/CR-2553. Data in NUREG/CR-2157 suggests that dose rate effects in EPR materials are insignificant up to doses of 10 to 20 MRADS. A review of the location and environments of ASCO solenoid valves listed in TABs C-1 through C-4 indicate that the maximum normal radiation dose will be seen by valves in subgroup D-2. These valves are qualified for 40 years without replacement of elastomer parts and will therfore be exposed to a maximum normal doses to 20 MRADs. Since all elastomer parts are totally enclosed in metal, the radiation dose to these parts will be less than 20 MRADs. Synergistic effects will be negligible for normal service aging.

Potential dose rate and test sequence synergisms will not impact qualification for accident conditions as demonstrated by Test Report AQS-21678. The test sequence of thermal aging followed by radiation aging plus accident radiation at high (0.8 MRAD/HR) dose rate is a reasonable simulation of actual plant requirements. Additional assurance is provided by the severity of the radiation test because the test valve was exposed to 201 MRADS whereas an actual dose of about 101 MRADs (81 MRADs accident plus 20 MRADs normal service) is required. | R2

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1		SHEET 1 OF	
				R	R
BINDER TITLE ASCO SOLENOID VALVES -	COMPUTED EEM	DATE 7/24/86			
MODEL NP 8321 SERIES	CHECKED FWN	DATE 7/28/86			

SOL-007

TAB A

EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
BINDER TITLE ASCO SOLENOID	COMPUTED |R1 CHM DATE 3/13/89	R	R
VALVES-MODEL NP8321 SERIES	CHECKED |R1 JDH DATE 3/13/89		

TAB A

NOTES

1. Floor/Actual Elevation - Actual elevations are documented on field verification sheets found in TAB F. All elevations shown are floor elevations.

2. See TAB B, Section A for Category and Operating Times calculations used in this binder.

3. Contract Column - Contract numbers shown in this TAB were obtained by tracing the serial number on each valve through TVA procurement records and did not depend on field verification data for contract numbers.

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-2-FSV -065-0004 -B CNTMT ANN VAC FAN ISLN DMPR	2-FSV -065-0004 -B NP8321A2E		80KJ3-827551		A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE DAMPER AFTER A PHASE A CNTMNT ISOL SIGNAL TO ISOLATE VACUUM FANS.
WBN-2-FSV -065-0005 -A CNTMT ANN VAC FANS ISLN DMPR	2-FSV -065-0005 -A NP8321A2E		757' 80KJ3-827551	A16	A/B	5MN/100D	L	MUST DEENERGIZE TO CLOSE DAMPER AFTER A PHASE A CNTMT ISLN SIGNAL TO ISOLATE VACUUM FANS.
WBN-2-FSV -065-0009 -A EGTS TRAIN A UNIT 2 SUCTION	2-FSV -065-0009 -A NP8321A2E		757' 80KJ3-827551	A16	B	100D	L	DAMPER IS NORMALLY CLOSED AND MUST REMAIN CLOSED DURING THE MITIGATION OF THIS ACCIDENT.
WBN-2-FSV -065-0029 -B EGTS TRAIN B UNIT 2 SUCTION	2-FSV -065-0029 -B NP8321A2E		757' 80KJ3-827551	A16	B	100D	L	DAMPER IS NORMALLY CLOSED AND MUST REMAIN CLOSED DURING THE MITIGATION OF THIS ACCIDENT.

PAGE A-2R1

		R 1	R____	R____
PREPARER/DATE	E.E. McBEE 9/18/86	AMM 3/13/89	-----	-----
CHECKED/DATE	F.W. VOSBURY 9/18/86	JDH 3/13/89	-----	-----

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1			R	R
BINDER TITLE ASCO SOLENOID VALVES		COMPUTED EEM	DATE 7/24/86				
MODEL NP8321 SERIES		CHECKED FLW	DATE 7/28/86				

TAB B

ENVIRONMENTAL QUALIFICATION CHECKLIST

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1	SHEET 1 OF 28
			R 1 R 2
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 9/18/86	AFM 3/13/89 [handwritten initials] 7/20/90
VALVES-MODEL NP8321 SERIES	CHECKED FWV	DATE 9/18/86	JDH 3/13/89 [handwritten initials] 8/7/90

A. DOCUMENTATION

Equipment Description Solenoid Valves

Vendor/Manufacturer ASCO

Equipment Model No.(s) NP8321A2E

QUALIFICATION REPORTS

(1) Title/Number/Revision Automatic Switch Company Test Report AQS-21678/TR/Rev. A — RIMS B43 850627 322 — DATE July, 1979

(2) Title/Number/Revision Automatic Switch Company Test Report AQR-67368, Rev. 1 — RIMS B45 850514 428 — DATE August 19, 1983

(3) Title/Number/Revision ASCO Catalog NP-1 Valves AQS 21678/TR/Supplement 3 — RIMS NEB 840328 363 — DATE March 8, 1983

(4) Title/Number/Revision Franklin Research Center Test Report F-C5569-309/315, Appendix C — RIMS NEB 840925 351 — DATE November, 1983

(5) Title/Number/Revision "Aging and Qualification Research on Solenoid Operated Valves," NUREG/CR-5141 RV — RIMS B74 890623 502 — DATE August 1988 — R2

(6) Title/Number/Revision "ASCO Engineering Report No. 177" — RIMS B25 870612 003 — DATE Dec. 11, 1979

NOTE: Throughout this binder references are made to the above qualification reports which may be identified as (1), (2), or (3), etc., as shown, in these references.

OTHER (ANALYSIS, VENDOR DATA, ETC.)

		RIMS Number	
(7)	Category and Operating Times for Unit 2 Components Required for Unit 1 Operation (WBNOSG4-040 R8)	B26 900626 224	R2
(8)	Status and Duty Cycles of IE Solenoid Valves Located in Potentially Harsh Environments (WBNOSG4-045 R1)	B45 860902 219	R2

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

		RIMS Number	
(9)	Solenoid Valve Voltage Study (WBN EEB-MS-TI11-0004)	B26 900202 407	
(10)	100-Day Loss of Coolant Accident Dose to Electrical Equipment in the EGTS Filter Train Room (WBNNAL3-031 R1)	B45 880826 235	R2
(11)	WBNP Environmental Data Drawing 47E235-78 R3		

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES 1) Deleted by Revision 2 R2

2) Valve 2-FSV-65-4 not installed. Nameplate data not available for 2-FSV-65-9.

3) Deleted by Revision 2. R2

4) Location specific radiation calculations must be reanalyzed for all valves.

5) Deleted by Revision 2.

6) Deleted by Revision 2. R2

7) Deleted by Revision 2.

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-SOL-007 PLANT WBN UNIT(S) 1 SHEET 3 OF 28

R ___ R ___

BINDER TITLE ASCO SOLENOID VALVES COMPUTED EEM DATE 7/24/86

MODEL NP8321 SERIES CHECKED [illegible] DATE 7/28/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of lE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974 IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.

IEEE 382-1972 IEEE Trial-Use Guide for Type Test of Class 1 Electric Valve Operators for Nuclear Power Generating Stations.

IEEE 382 (Draft 3, Rev 1, June 1977) Draft American National Standard for the Qualification of Safety-Related Valve Actuators.

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1		SHEET 4 OF 28		R	R
BINDER TITLE ASCO SOLENOID VALVES		COMPUTED EEM	DATE 7/24/86				
MODEL NP8321 SERIES		CHECKED HW	DATE 7/28/86				

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS See "Similarity Table," page 6.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (Yes/No/NA)? No

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Solenoid Vlv	Solenoid Vlv	
(2)	Manufacturer	ASCO	ASCO	
(3)	Model Number(s)	NP8321A2E	NP8321A5E	Ref (1) Section 2 Table 1
			NP832070E (coil only)	Ref (2) App. I
(4)	Serial Number(s)	See TAB F	Test Valve 8	Ref (2) Section 3 Table 3.2
			(coil only) Test Valves 15 and 16	Ref (2) App. I Sec. 2

R2

(5) Identify Component Unique checksheet attached: None

JUSTIFICATION/COMMENTS

See "Similarity Table," page 6. Valve data sheets in TAB E indicate a NEMA 4 enclosure was specified. The valve furnished by ASCO has a NEMA 6 enclosure. The NEMA 6 enclosure is a tighter closure than NEMA 4.

ASCO SOLENOID VALVES

MODEL NP8316 SERIES

SIMILARITY TABLE

Specification	ASCO Test Valve Model No. NP8321A5E	TVA Valve Model No. NP8321A2E
Description	Three-way direct acting solenoid valve with packless const	Same
Application	Pilot Vlv Controlling Oil Free Instr Air	Same
Form of Flow	Normally Closed	Same
Pipe Size	1/4"	3/8"
Orifice Size	9/32" Pressure 11/32" Exhaust	9/32" Pressure 11/32" Exhaust
Body Material	Brass	Brass
Coil Class	H	H
Seals & Disc Material	Ethylene Propylene	Ethylene Propylene
Disc Holder Material	Stainless Steel	Stainless Steel
Core Tube Material	300 Series Stainless Steel	300 Series Stainless Steel
Core Material	400 Series Stainless Steel	400 Series Stainless Steel
Coil Enclosure	NEMA 4,7,9	NEMA 6
Maximum Operating Pressure Differential	150 psi	150 psi
Nominal Voltage	125V DC	125V DC
Power Rating	17.4 Watts	17.4 Watts
Conduit Connection	3/4" NPT	3/4" NPT
Applicable Form Number	V5971	V5971R1
Terminal Connection	Pigtails (Splice)	Pigtails (Splice)
Ambient Temperature	32 - 180°F	120°F - as specified
Maximum Fluid Temperature	180°F based on 140°F Ambient	Same
Safe Working Pressure	200 psig	Same
	Notes: From Test Report AQS-21678 TR/Rev A (TAB D-1) Form V5971 (TAB D-1) & ASCO Cat. NP-1 (TAB E-3)	Notes: From Contract 827551 (TAB E-1), Form V5971 R1 (TAB H) & ASCO Cat. NP-1 (TAB E-3)

		R	R	R
Preparer/Date	E. E. McBee 7/24/86			
Checked/Date	[illegible] 7/28/86			

PAGE B-8

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. R1

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	None specified; See TAB C-3, "Interfaces"	No	
External Process Connections	See TAB C-3	Yes	See Below and Ref. (2) App. A, p A2
Electrical Connections	None specified; See TAB C-3, "Interfaces"	Yes	
Conduit Seals	See TAB C-3 "Conduit Seals"	No	Ref (2) Section 5.3
Connector Seals	N/A	N/A	
Orientation	Any Orientation	Yes	See Note Below
Physical Configuration	Conduit/Junction box must be oriented such that moisture does not drain into coil housing	N/A	Ref (2) Section 5.3 and TAB C-3
Other	None		

R1

JUSTIFICATION/COMMENTS
ASCO does not identify specific interfacing requirements except as follows: (1) ASCO requires a 90° street elbow facing downward connected to exhaust port or similar configuration to prevent moisture intrusion from liquid spray. This is required only on valves located inside containment and subject to containment spray. (2) Flowing medium must be oil-free instrument air and a strainer or filter must be installed on the inlet as close to the valve as possible. See TAB C for a description of the TVA interfaces and TAB J-2 for discussion of TVA instrument air system.

NOTE: See ASCO letter in TAB E-5.

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1	SHEET 8 OF 28 R 1 R
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 7/24/86	ATM 3/13/89
VALVES-MODEL NP8321 SERIES	CHECKED FWV	DATE 7/28/86	JDH 3/13/89

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (Yes/No/NA)? (Note below.)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Ref (2), p 8 & Ref (1) App. A Sec. 9.4.2.1
(b) Baseline performance measurements taken	Yes	Ref (2), p 8 & Ref (1) App. A Sec. 9.4.2.2
(c) Equipment aged:		
Thermal	Yes	Ref (1) App. A, Sec. 9.4.2.3.1 & Ref (2), p 8
Radiation	Yes	Ref (1) App. A Sec. 9.4.2.3.2 & Ref (2), App. D
Wear	Yes	Ref (1) App. A, Sec. 9.4.2.3.3 & Ref (2), p 12
(d) Vibration/seismic testing conducted	Yes	Ref (1) App. A, Sec. 9.4.2.3.4 & Ref (2), p 15
(e) Design basis event (DBE) exposure	Yes	Ref (1) App. A Sec. 9.4.2.4 & Ref (2), p 19
(f) Post-DBE exposure	Yes	Ref (1) App. A Sec. 9.4.2.4 & Ref (2), p 23
(g) Final inspection and disassembly	Yes	Ref (1) App. A Sec. 9.4.3 & Ref (2), p 24

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (Yes/No/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (Yes/No/NA)? Yes (Reference: Ref (1), App. C; Ref (2), App. G).

JUSTIFICATION/COMMENTS

Reference (2) was utilized to qualify the Class H coils. Reference to this report is in regard to coil qualification only unless otherwise noted. R1

PLUSEQ/122.23

H. AGING

(1) Was aging considered in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1), App. A, Sec. 9.4.2.3 and Ref (2), App. A, Sec. 9.4).

JUSTIFICATION/COMMENTS See TAB C-3.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
		Ref (1), App. A
Thermal aging	Yes	Section 9.4.2.3.1
Radiation exposure	Yes	Section 9.4.2.3.2
Vibration (non-seismic) aging	Yes	Section 9.4.2.3.4
Operational (electrical/mechanical/ process) stress aging	Yes	Section 9.4.2.3.3

JUSTIFICATION/COMMENTS See Reference (2), App. A, Section 9.4. Also, thermal aging was done using nitrogen as the process fluid in lieu of instrument air (See TAB C-5). R2

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (Yes/No/NA)? Yes (Reference: NA).

JUSTIFICATION/COMMENTS See discussion, Section P-1.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1), App. A Sec. 9.4.2.3.1; Ref (2), App. A, Sec. 9.4.1).

JUSTIFICATION/COMMENTS See TAB C-3 "Thermal Aging"

H. AGING (Continued)

(b) Were the materials susceptible to thermal degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Ref (2), Appendix B & Ref (3), Section 4).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference: Ref (3), Sections 5 & 6).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference: Ref (1), App A, Section 9.4.2.3.1 & Ref (2), App. A, Section 9.4.1).

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Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	*	*	*
Time			

JUSTIFICATION/COMMENTS *See TABs C-1 & C-3 "Thermal Aging."

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference: Ref (3), Sections 5 & 6).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference: Ref (2), Appendix B & Ref (3), Section 4). R2

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ____________).

JUSTIFICATION/COMMENTS ____________

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference: Ref (1), Section 4.2; Ref (2), Section 4.1).

JUSTIFICATION/COMMENTS ____________

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Ref (1), Section 4.3 and 4.6; Ref (2), App. A, Sections 9.4.4 and 9.5.2).

JUSTIFICATION/COMMENTS ____________

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference ____________).

JUSTIFICATION/COMMENTS Effect on individual materials not considered. Only effect of radiation on overall valve performance.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Ref (1), App. A, Sections 9.4.2.3.2 & 9.4.2.4.1; Ref (2), App. A, Sections 9.4.4 & 9.5.2). R2

JUSTIFICATION/COMMENTS ____________

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Ref (1), Section 4.3, App. D; Ref (2), App. D).

Plant normal ambient radiation dose (rd)	1.8×10^3
Test exposure dose (rd)	2.01×10^8 CAH 7/20/90
Test exposure does rate (rd/hr)	5.1×10^5 for 99 hour 8.0×10^5 for 188.5 hours
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

R2

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes (Reference: Ref (I), Section 4.5; Ref (2), Section 4.1.5).

JUSTIFICATION/COMMENTS

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1), App. A, Section 8.1.6; Ref (2), App. A, Section 9.4.5).

JUSTIFICATION/COMMENTS

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder.

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1), Section 3.2.4; Ref (2), Section 4.1.2 & 4.1.3).

JUSTIFICATION/COMMENTS

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1), App. A, Section 7.1; Ref (2), App. A, Sections 9.4.2 & 9.4.3).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: Ref (1), Section 3.2.2; Ref (2), Appendix C, p C-8, 4.1.1).

Qualified life (Document in QMDS) See TABS C and G R2

JUSTIFICATION/COMMENTS The qualified life is different from the value given in the test report. TAB C-1 provides rationale. R2

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: Ref (3), Section 8; ref (2), App. C R2
).

JUSTIFICATION/COMMENTS Replacement interval depends upon maximum normal ambient temperature and percentage time solenoid valve is energized.

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			R 2 R
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 7/24/86	CRH 7/20/90
VALVES-MODEL NP8321 SERIES	CHECKED FWV	DATE 7/28/86	ASM 8/7/90

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis).

Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a) EPDM	NA	NA	0.94	Ref(3)&(2)App.B Sec. 4.1.1
(b) VITON	NA	NA	1.04	Ref(3)&(2)App.B Sec. 4.1.2
(c) NOMEX	NA	NA	0.96	Ref(3)&(2)App.B Sec. 4.1.3
(d) MAGNET-WIRE ENAMEL	NA	NA	1.16	Ref(3)&(2)App.B Sec. 4.2.1
(e) ISO-MICA W/EPOXY	NA	NA	1.00	Ref(30&(2)App.B Sec. 4.2.6
(f) SILICONE RUBBER LEAD WIRE INSULATION	NA	NA	1.59	Ref(3)&(2)App.B Sec. 4.2.5
*(g) DC 550 LUBRICANT	NA	NA	NA	NA

R2

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JUSTIFICATION/COMMENTS The above materials are those with lowest activation energies listed in Reference (3), Section 4.1 and 4.2. Radiation threshold values are not required because no analysis was performed. The devices were qualified by test. R2

* Although not stated in references (1) or (2), DC 550 lubricant was used on tested valves as verified by ASCO letter dated January 5, 1988 (See TAB E-9). R2

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BINDER NO.	WBNEQ-SOL-007	PLANT	WBN	UNIT(S)	1	SHEET	15 OF 28
						R 2	R
BINDER TITLE	ASCO SOLENOID	COMPUTED	EEM	DATE	7/24/86	CAH 1/20/90	
VALVES-MODEL	NP8321 SERIES	CHECKED	RWV	DATE	7/28/86	AJM 8/7/90	

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not yet (yes/no/NA)? Yes (Reference: Ref (1) & (2), App. A, Sections 6.1 & 6.2). |R2

Identify Acceptance Criteria: Valves must operate from 90-140VDC at minimum and maximum operating pressure differential. Coil insulation resistance must be a minimum of 1.0 megohm at 500VDC. During Hypot test, current leakage must be less than 0.5 milliamp at twice the rated voltage plus 1000 VAC applied for a ~~long~~ period of one minute. Valves must operate at test or low voltage condition (90VDC) at maximum pressure differential under all conditions. Valves are not to have a pressure build-up at a vented cylinder port or a pressure decrease at a cylinder port which is required to be pressurized in excess of 10% the nominal inlet supply pressure under all postulated environmental conditions. CAH 1/20/90

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Ref (1), Section 4.1; (2) TABLE 4.10). CAH 1/20/90 |R2

Identify baseline and functional testing: Recording coil excitation, seat leakage, noise test, operational test, external leakage in energized and de-energized state before and after thermal, radiation, wear and vibration aging, and accident radiation and LOCA simulation. Measurement of insulation resistance and coil dielectric tests before thermal aging and after completion of accident radiation and LOCA simulation.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference: Ref (1), App. A, Section 7.0, Ref (2), Table 4.10, Fig. 9.2). |R2

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference Ref (1), Section 4.8 & Ref (2), Table 4.10). |R2

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	90-140 VDC	Section J(5)(b) of this TAB
Load	20 Watts	NP-1 Catalog
Frequency	NA	
Accuracy	NA	
Other(s)		

R2

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference	
Voltage	90 VDC Min. (See comment below)		R2
Load	Not Specified		
Frequency	NA	NA	
Accuracy	NA	NA	
Other(s)			

JUSTIFICATION/COMMENTS TVA Calculation WBN EEB-MS-TI11-0004 determines voltage available during accident conditions (see comment after J.(5)(c)). R2

(c)

Parameter	Demonstrated Conditions	Reference	
Voltage	~~65~~ 90 VDC	Ref (2) FIG. 9.2 ~~Table 4.10,~~ ~~p-44~~ A26, App. A p-44	R2
Load	.080 amps	Ref (2) Table 4.10	
Frequency	NA		
Accuracy	NA		
Other(s)			

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JUSTIFICATION/COMMENTS: Reference (3), Appendix A, Section 6.1.1, requires 125 VDC valves to operate on demand at any voltage between 90-140 VDC. Per ~~Table 4.10~~ FIGURE 9.2 of reference (2), the test valve was successfully tested at ~~65~~ 90 VDC. A primary concern with solenoid valves is that of voltage available at the coil terminals. TVA calculation WBN EEB-MS-TI11-0004 shows that the valves in this binder are supplied voltage within their environmentally qualified minimum ratings as required to perform their safety function during accident conditions.

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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-78

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM

(c) Humidity (%) 80

(d) Radiation (rd) 1.8×10^3

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: The process fluid for valves is oil-free instrument air with a maximum design temperature of 100°F. Therefore, the bounding temperature for these valves is the ambient.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Will occur less than 1 percent of plant life and could exist for up to 8 hours per excursion.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 110 (1) Accident type LOCA

(b) Pressure (psig) NA Accident type LOCA

(c) Humidity (%) NA Accident type LOCA

(d) Radiation (rd) 3.3×10^6 rads (2) Accident type LOCA R2

(e) Spray Type NA Accident type LOCA

(1) Returns to maximum normal after 30 days.
(2) Per Calculation WBNNAL3-031.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): ______

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: Drawing 47E235-78). | R1

(7) Subject to submergence (Yes/No/NA)? No (Reference: Drawing 47E235-78). | R1

Identify initiation time and duration of submergence: ______

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? No
(Reference: See note below).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: ______ R1

Note: Beta dose is not applicable to the subject devices as they are located outside of containment.

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B, Section A for a listing of all calculations used in this binder.	

R1

The information on this page was deleted per Revision 1.

BINDER NO. WBNEQ-SOL-007	PLANT WBN	UNIT(S) 1	SHEET 20 OF 28
			R 2 R
BINDER TITLE ASCO SOLENOID	COMPUTED EEM	DATE 7/24/86	CAH 7/20/90
VALVES-MODEL NP8321 SERIES	CHECKED FWV	DATE 7/28/86	ATM 8/7/90

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 Days	30 Days	Ref (1) Fig 2
Temperature (°F)	110°F	346°F	Ref (1) Sec. 4.7
Pressure (psig)	ATM	110 psig	Ref (1) Sec. 4.7
Relative Humidity	90%	100 %	Ref (1) Sec. 4.7
*Chemical Spray	NA	3000ppm Boron pH 9.5-10.5	Ref (1) Sec. 4.7
**Radiation (rd)	3.3×10^6 rads gamma	$2.01 \times 10^{\cancel{8}\,8}$ rads	Ref (1) App D |R2 CAH 8/6/90
Submergence	No	No	

*Includes spray concentration, flowrate, density, duration, and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See (1) above
Pressure	Yes	See (1) above
Relative Humidity	Yes	See (1) above
Chemical Spray	NA	
Submergence	NA	

JUSTIFICATION/COMMENTS

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323 (74)	Margin Applied	Yes/No/NA	
Temperature: +15 degrees F	>15 °F	Yes	
Pressure: +10% but no more than 10 psig	>10%	Yes	
Radiation: +10% of accident dose	5990 ~~5090~~%	Yes	R2 CAH 8/6/90
Time: +10% (or 1 hour + operating time per NUREG-0588)	None	Yes*	
**Voltage: ±10% of rated value	+12% to -28%*	Yes	R2 CAH 8/6/90
Frequency: ±5% of rated value	NA	NA	
Environmental Transient: the initial transient and the peak temperature applied twice	Yes	Yes	
Vibration: +10% added to acceleration (during seismic testing)	Ref (1), Sec. 9.4.2.4.2 Ref (2), Sec. 4.1 6	Yes	

JUSTIFICATION/COMMENTS: *Accident degradation calculation (See TAB C) proves that the 30-day test envelops the 100-day post-accident requirement.

**The valve was tested at 65 VDC during BASELINE operability testing, which is better proof of operability than increased coil voltage. ~~During all other tests, either the nominal voltage of 125VDC or the test current of .080 amps was used.~~ DURING LOCA/HELB TESTING THE VALVE WAS ENERGIZED AT 90 VDC (SEE FIGURE 9.2, APPENDIX A, PAGE A26 OF REF. (2)). R2 CAH 8/6/90

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See TAB A and TAB C).

JUSTIFICATION/COMMENTS Functions are varied. All are listed in TAB A and TAB C-1.

(2) Did the equipment performs its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference: Ref (1), Section 5).

JUSTIFICATION/COMMENTS The test valve is assumed to be normally energized and required to de-energize on receipt of accident signal, then to remain operable for 30 days post-DBA. The specific DBA functions of the TVA valves are described in TAB C. R2

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)?
Yes (Reference: Ref (1), Section 5).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference Ref (6)). R2

JUSTIFICATION/COMMENTS See TAB C-1 for the analysis of the test DBA versus the plant specific DBA. The test valve demonstrated operability in accordance with the requirements R2 defined in M(2) above.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference Ref (1), Table 2H; Ref (2), App. J).

JUSTIFICATION/COMMENTS TVA has reviewed test anomalies and concurs with disposition.

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R ____ R ____

BINDER TITLE ASCO SOLENOID VALVES COMPUTED EEM DATE 7/24/86

MODEL NP8321 SERIES CHECKED FEW DATE 7/28/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TABS C and G.

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0. <u>SUMMARY OF REVIEW</u> (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	NA
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

		Yes/No/NA
(15)	Criteria regarding functional testing satisfied?	Yes
	(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
	(b) Was an initial baseline test done to establish required performance characteristics?	Yes
	(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical chaacteristics) can be ensured?	Yes
(16)	Criteria regarding instrument accuracy satisfied?	NA
(17)	Test duration margin (1 hour + function time) satisfied?	Yes
	(a) Is the minimum specified operating time at least 1 hour?	Yes
	(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18)	Criteria regarding synergistic effects satisfied?	Yes | R2
(19)	Criteria regarding margins satisfied?	Yes
(20)	Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

1. Synergism Effects (Sec. H(3))

Ethylene Propylene Terpolymer (EPDM) elastomer is used in the construction of ASCO solenoid valves as gaskets and diaphragms. EPDM is the only material having a potential for radiation induced synergisms based on a review of technical information provided in NUREG/CR-2157 and NUREG/CR-2553. Data in NUREG/CR-2157 suggests that dose rate effects in EPR materials are insignificant up to doses of 10 to 20 MRADS. A reivew of the location and environments of ASCO solenoid valves listed in TAB C-1 indicates that the maximum normal radiation dose will be seen by valves in subgroup A-2. These valves are qualified for 40 years without replacement of elastomer parts and will therefore be exposed to a maximum normal dose of .001 MRADS. Since all elastomer parts are totally enclosed in metal, the radiation dose to these parts will be less than .001 MRADS. Synergism effects will be negligible for normal service aging. CAH 7/20/90

Potential dose rate and test sequence synrgisms will be impact qualification for accident conditions as demonstrated by Test Report AQS-21678. The test sequence of thermal aging followed by radiation aging plus accident radiation at high (0.8 MRAD/HR) dose rate is a reasonable simulation of actual plant requirements. Additional assurance is provided by the severity of the radiation test because the test valve was exposed to 201 MRADs whereas an actual dose of about 3.3 MRADs (3.3 MRADs accident plus .001 MRADs | R2
normal service) is required.

INT D 11/8

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

S NUMBER / CRIPTION	UNIT DEVICE ID NO.	MODEL NUMBER	AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
N-0-SPLC-510-0001 - W VOLTAGE TUBING	0-SPLC-510-001	WCSF-N		VARIOUS VARIOUS		A A	100D 100D	L HELB	PROVIDE INSULATING PROPERTIES FOR ELECTRICAL CONNECTIONS.
3N-0-SPLC-510-0002 - OW VOLTAGE MOLDED PARTS	0-SPLC-510-002	END CAPS		VARIOUS VARIOUS		A A	100D 100D	L HELB	PROVIDE INSULATING PROPERTIES FOR ELECTRICAL CONNECTIONS.
VBN-0-SPLC-510-0003 - LOW VOLTAGE MOLDED PARTS	0-SPLC-510-003	BREAKOUTS		VARIOUS VARIOUS		A A	100D 100D	L HELB	PROVIDE INSULATING PROPERTIES FOR ELECTRICAL CONNECTIONS.
WBN-0-SPLC-510-0004 - LOW VOLTAGE KIT TB REPLACEMENT	0-SPLC-510-004	NPKI		VARIOUS VARIOUS		A A	100D 100D	L HELB	PROVIDE INSULATING PROPERTIES FOR ELECTRICAL CONNECTIONS.
WBN-0-SPLC-510-0005 - LOW VOLTAGE KIT CONTROL CABLE SPLICE	0-SPLC-510-005	NPKC		VARIOUS VARIOUS		A A	100D 100D	L HELB	PROVIDE INSULATING PROPERTIES FOR ELECTRICAL CONNECTIONS.

	R 2	R___	R___
PREPARER/DATE HDR / 9-23-86	[initials] 8-11-89		
CHECKED/DATE NMB / 9-23-86	[initials] 8-15-89		

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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-SPLC-510-0006	-	0-SPLC-510-006		VARIOUS		A	100D	L	PROVIDE INSULATING PROPERTIES
LOW VOLTAGE KIT POWER CABLE SPLICE		NPKP		VARIOUS		A	100D	HELB	FOR ELECTRICAL CONNECTIONS.
WBN-0-SPLC-510-0007	-	0-SPLC-510-007		VARIOUS		A	100D	L	PROVIDE INSULATING PROPERTIES
LOW VOLTAGE KIT INSTRUMENT CABLE SPLICE		NPKS		VARIOUS		A	100D	HELB	FOR ELECTRICAL CONNECTIONS.
WBN-0-SPLC-510-0008	-	0-SPLC-510-008		VARIOUS		A	100D	L	PROVIDE INSULATING PROPERTIES
LOW VOLTAGE KIT "V" STUB CONNECTION		NPKV		VARIOUS		A	100D	HELB	FOR ELECTRICAL CONNECTIONS.
WBN-0-SPLC-510-0009	-	0-SPLC-510-009		VARIOUS		A	100D	L	PROVIDE INSULATING PROPERTIES
LOW VOLTAGE KIT MOTOR CONNECTION		NMCK		VARIOUS		A	100D	HELB	FOR ELECTRICAL CONNECTIONS.
WBN-0-SPLC-510-0010	-	0-SPLC-510-010		VARIOUS		A	100D	L	PROVIDE INSULATING PROPERTIES
LOW VOLTAGE KIT CABLE BREAKOUT		NCBK		VARIOUS		A	100D	HELB	FOR ELECTRICAL CONNECTIONS.

		R	R	R
PREPARER/DATE	/R2 C. Stevens 8-11-89			
CHECKED/DATE	/R2 J Wagner 8-15-89			

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER		--------LOCATION-------- AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-SPLC-510-0011	-	0-SPLC-510-011		VARIOUS		A	100D	L	PROVIDE INSULATING PROPERTI
LOW VOLTAGE KIT END SEALING KIT		NESK		VARIOUS		A	100D	HELB	FOR ELECTRICAL CONNECTIONS.

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		R 3	R	R
PREPARER/DATE	IR2 CAG 8-11-89	[illegible] 6/4/90		
CHECKED/DATE	IR2 JFW 8-15-89	N.O.R 7-26-90		

BINDER NO. WBNEQ-SPLC-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 40

R ____ R ____

BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES

COMPUTED HDR DATE 9/20/86

CHECKED B DATE 9/21/86

A. DOCUMENTATION

Equipment Description: Heat Shrink Cable Sleeve (for applications of 600 VAC or less)

Vendor/Manufacturer: Raychem Corporation

Equipment Model No.(s): Raychem's complete line of nuclear grade cable connection heat shrink splices and terminations (600 volts or less) (Raychem material Type-52 and/or WCSF).

QUALIFICATION REPORTS

Report No. 1 Title/Number/Revision See title below/ Wyle Labs Report 58722-2/Revision 0 — RIMS B70 851119 101 — DATE Nov. 18, 1982

Report No. 2 Title/Number/Revision See title below/ Raychem Report EDR 5046 — RIMS B70 851112 102 — DATE March 4, 1982

Report No. 3 Title/Number/Revision See title below/ Raychem Report EDR 5040 — RIMS B70 851112 101 — DATE Oct. 15, 1981

OTHER (ANALYSIS, VENDOR DATA, ETC.) Report Titles:

1. "Environmental Qualification Test Report of Raychem WCSF-N In-Line Bolted Splice Assemblies."
2. Analysis of Heat Aging Data on WCSF Material to Determine Pre-Aging Conditions for Nuclear Qualification Testing."
3. Analysis of Heat Aging Data on -52 Molding Material to Determine Pre-Aging Conditions for Nuclear Qualification Testing.

See TAB E for additional qualification documentation. (Listed on pages 2 and 3).

BINDER NO. WBNEQ-SPLC-001	PLANT WBN	UNIT(S) 1	SHEET 2 OF 40 R 1 R
BINDER TITLE Environmental Qualification of Raychem Heat Shrink Cable Splices	COMPUTED HDR	DATE 9/22/86	CAA 12-1-88
	CHECKED NMB	DATE 9/22/86	AWC 12-2-88

ADDITIONAL DOCUMENTATION

1. Environmental Qualification Test Report of Raychem NRPKV Nuclear Plant Stub Connection Kit for Raychem Corporation Report 58722-1 Rev. 0.	RIMS EEB 830228 035 DATE August 24, 1982
2. Environmental Qualification Test Report of Raychem Nuclear Cable Breakout and End Sealing Kits Report 58442-2 Rev. 0.	RIMS B70 851119 102 DATE April 3, 1981
3. Qualification Report Supplement for Raychem Nuclear Grade Adhesive S119 Report EDR 5021 Rev. 0.	RIMS B70 851119 104 DATE April 23, 1980
4. Wyle Laboratories Report "Environmental Qualification Test Report on Raychem Nuclear Plant Kit (NPK) Report 58722-6 Rev. 0.	RIMS B70 851112 105 DATE Dec. 21, 1982
5. Raychem Palo Verde I Test Report EDR 5019	RIMS B70 851015 102 DATE March 4, 1982

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references. R1

ADDITIONAL DOCUMENTATION

6. Environmental Qualification Test Report of Raychem N-MCK Nuclear Motor Connection Kits Report 58442-3 Rev. 0.
   RIMS B70 851112 104
   DATE July 28, 1980

7. Environmental Qualification Test Report of Raychem WCSF-050-N Shim Stock Report 58722-5, Revision 0.
   RIMS B36 900604 001
   DATE December 21, 1982

8. Cable inside conduit temperature transient during a MSLB in the Valve Vault. Calculation WBNNAL6001.
   RIMS B45 850912 235
   DATE September 12, 1985

9. Safety evaluation of superheated steam in the valve vaults caused by a main steam line break. Calculation No. WBNOSG4-003, Rev 2.
   RIMS B45 851112 218
   DATE November 12, 1985

10. Environmental Drawings TVA Dwgs 47E235-42 Rev. 2, and 47E235-76 Rev. 3.
   RIMS NA
   DATE NA

11. Qualification Test Report for Commonwealth Edison Co. Wyle Lab Report No. 17859-02B
   RIMS L33 870318 801
   DATE March 18, 1987

12. WBPEVAR 8904055 RO, Class IE Splice List - Unit 1, Common, and Unit 2 Required for Unit 1 Safe Shutdown
   RIMS B26 890511 501
   DATE March 26, 1989

R3

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

The reports on page 2 will help substantiate the qualification of the different configurations of heat shrink cable connections used at Watts Bar (see TAB B).

Report 1 - Covers NPKV kits (Stub Connection Kit)

Report 2 - Covers the nuclear cable breakout (-52 material) and end caps.

Report 3 - Qualification report for new adhesive (S1119) which replaced S1024. This report demonstrates that the new adhesive is equivalent or superior to the S1024.

Report 4 - Covers NPK kits nuclear cable break-out (-52 material).

Report 5 - Covers in-line splices using both the S1119 and S1024 adhesives.

Report 6 - Covers N-MCK Kits Motor connect connection kits.

Report 7 - Covers WCSF-050-N shim stock. R3

The DBE profiles for these tests encompass the Watts Bar profile and are qualified for 40 years at 90°C, one DBE and 100 days post-accident time. Some of the test items failed to hold the 1,000 volts AC test voltage during the test. In all cases the failures were shown to be caused by overaging of the test cable that the splices were used on. All splices passed the voltage withstand test and had acceptable IR measurements in a water bath when tested with the damaged portion of the leads out of the water during the test. The remainder of the test item held the test voltage (1000 AC) during the complete DBE test.

The above reports (located in TAB E) along with the binder test report 58722-2 qualifies all Raychem splices 600 volts and below at Watts Bar Nuclear Plant.

BINDER NO. WBNEQ-SPLC-001 PLANT WBN UNIT(S) 1 SHEET 4 OF 40

BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES

COMPUTED JOR DATE 9/20/86 R R

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B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

COMMENTS/RECOMMENDATIONS The nuclear grade Raychem cable connection heat shrink splices are environmentally qualified for 40 years at 90°C including a DBA and 100 day post-accident operation for the accident and normal conditions at the Watts Bar Nuclear Plant.

Note: Qualification contingent on resolution of all open items.

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BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES		COMPUTED HDR	DATE 9/22/86	R		R	
		CHECKED [illegible]	DATE 9/22/86				

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

__X__ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

_____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 383-1974

BINDER NO. WBNEQ-SPLC-001 PLANT WBN UNIT(S) 1 SHEET 6 OF 40

R ___ R ___

BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES

COMPUTED ZHR DATE 9/20/86

CHECKED JB DATE 9/21/86

D. QUALIFICATION METHODOLOGY (Check only one block)

______ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

______ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

______ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS This binder qualifies the different configurations of the Raychem cable connection heat shrink splices using WCSF and/or -52 type nuclear grade heat shrink materials. The test reports used in TAB B for qualification are for the WCSF-N sleeve configuration. Additional test reports have been included in TAB E detailing other configurations that have been tested. All the profiles encompass the Watts Bar environmental accident conditions and all tested samples were aged (heat and radiation) to levels well above those required for Watts Bar. All anomalies were addressed in each test report and no failures of the Raychem materials were noted in any of the test. All apparent failures were not Raychem failures but were attributed to excessive heat aging (causing cracks in cable insulation) of the cable used in the tests.

All cable connections must be made using TVA Standard Construction Specification G-38 which requires nuclear grade Raychem heat shrink be used on all safety-related equipment located in a harsh environment that are spliced. This specification details the sizes of heat shrink sleeves and breakouts to use for each cable size and configuration. This specification is used in conjunction with the installation instructions supplied with the heat shrink material (see TAB H).

This binder covers all nuclear grade Raychem splices 600 volts or less. No safety-related equipment, located in a harsh environment, requiring a nuclear-grade Raychem splice is rated more than 600 volts. The splice loading during the DBE test is less than the 90°C cable rating per National Electric Code 1990. For the purpose of the qualification, the additional heat rise resulting from the difference between these current values is calculated and added to the accident profiles (see TAB C). R3

The IR measurements taken during the DBE test of the test specimens (Raychem splice and connecting cable) were much greater than comparable readings taken during the qualification testing for TVA Type MS cable (signal cable) used in instrumentation circuits. The splices are required to maintain its required performance during all postulated service conditions. Thus, assurance is provided that the presence of splices in these cables will not result in degraded signal levels caused by current leakage resulting from the use of the Raychem splices.

All Raychem splice material and applications covered in this binder are consistent with Watts Bar applications.

The above information gives reasonable assurance that the nuclear grade Raychem heat shrink splices and terminations at Watts Bar Nuclear Plant are environmentally qualified for 40 years at 90°C and one DBA with 100 days post-accident operation.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification. (Yes/No/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Cable Sleeve	Cable Sleeve	Report 1 Sec. 2.1.1
(2) Manufacturer	Raychem	Raychem	Report 1 Sec. 2.1.1
(3) Model Number(s)	See Comments	See Comments	NA
(4) Serial Number(s)	NA	NA	NA

(5) Identify Component-Unique checksheet attached: None

JUSTIFICATION/COMMENTS This binder qualifies the complete line of LOCA-qualified Raychem nuclear grade products consisting of -52 molding material and/or WCSF sleeves. The following products are covered: WCSF-N, NPKC (control cable), NPKS (instrumentation cables); NPKV (V stub connection); NPKP (power cable); NMCK (motor connection); NCBK (cable breakout kit); NESK (end sealing kit); low voltage molded parts (end caps and breakouts); and NPK I (terminal block replacement kit). R3

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification. R2

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA		
Conduit Seals	NA		
Connector Seals	NA		
Orientation	NA		
Physical Configuration	NA		
Other	NA		

JUSTIFICATION/COMMENTS 1) Raychem nuclear grade splices are designed to provide an environmental seal to smooth non-woven surfaces including polyolefin, most synthetic cable jackets and to many metals (TAB H Product Features). The qualification status of the Raychem splice is conditional upon the capability of the substrate materials maintaining physical integrity under the same conditions under which the Raychem materials are qualified. All safety related cables at WBN are qualified and are expected to maintain their physical integrity under the normal and DBE conditions at WBN (Ref. all cable qualification binders).

F. INSTALLATION INTERFACES (Continued)

JUSTIFICATION/COMMENTS (1)

The test reports included in this binder do not include all sizes of Raychem splices used at WBN or all cable jacket/insulation material to which the splices must seal. As stated above, the Raychem will seal most cable material. Also during qualification testing of safety related cables used at WBN, Raychem splices were required to connect the cable being tested to the test leads. These splices used during qualification of the cable show that the cable sizes and material types at WBN are compatable with and provide a qualified seal on the cable installations at WBN.

2) Splice installation is to be done in accordance with the latest revision of TVA Standard Drawings (SD)-E12.5.6, E12.5.7-1, E12.5.7-2, and E12.5.8 and Raychem installation instructions taking into account the two-inch minimum seal length after shrinking for in-containment applications. The test set-up utilized Raychem's installation instructions which also require a two-inch minimum seal length. (See TAB H for vendor installation/inspection guides and TAB G installation).

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	CHECKED B	DATE 9/2/86			

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	(1) See Comments	See Comments
(b) Baseline performance measurements taken	Yes	58722-2, Sec. 3.2
(c) Equipment aged:		
Thermal	Yes	58722-2, Sec. 3.3.1
Radiation	Yes	58722-2, Sec. 3.3.2
Wear	(2) NA*	--
(d) Vibration/seismic testing conducted	(2) NA*	--
(e) Design basis event (DBE) exposure	Yes	58722-2, Sec. 3.4
(f) Post-DBE exposure	Yes (Total of 30 days)	58722-2, Sec. 3.4
(g) Final inspection and disassembly	Yes	58722-2, Sec. 4.3

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference 58722-2, Appendix B).

JUSTIFICATION/COMMENTS 1) The report did not describe test specimen inspection; however Raychem has conducted many test programs and we have no reason to believe that inspection was not done.

2) See TAB B, Section P.

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CATION OF RAYCHEM HEAT SHRINK CABLE SPLICES	CHECKED B	DATE 9/24/86			

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	58722-2, Sec. 3.3.1
Radiation exposure	Yes	58722-2, Sec. 3.3.2
Vibration (non-seismic) aging	No*	
Operational (electrical/mechanical/process) stress aging	Yes*	

JUSTIFICATION/COMMENTS See TAB B, Section P.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference None

JUSTIFICATION/COMMENTS See TAB B, Section P.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.1).

JUSTIFICATION/COMMENTS

TVA 19537 (OE-3-86)

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H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes
(Reference: IEEE 383-1974 & Raychem Reports EDR 5046 and EDR 5040).

JUSTIFICATION/COMMENTS All insulation materials are considered susceptible to aging degradation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Section 3.3.1)

JUSTIFICATION/COMMENTS Analysis of heat aging data found in Raychem Reports EDR 5046 and EDR 5040 (see TAB D).

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes
(Reference 58722-2, Section 3.3.1)

Parameter	Plant Maximum Normal	Test	Equivalent	
Temperature	90°C	150°C	90°C	R3
Time	40 years	916.75 HRs	>40 years	

JUSTIFICATION/COMMENTS For analysis see Raychem Reports EDR 5046 (TAB D) and EDR 5040 (TAB D). Also see TAB C.

(e) Was the Arrhenius methodology used for accelerated aging (Yes/no/NA)? Yes
(Reference 58722-2, Section 3.3.1)

JUSTIFICATION/COMMENTS Also see Raychem Reports EDR 5046 and 5040.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical date (Yes/no/NA)? No Reference NA.

JUSTIFICATION/COMMENTS See H(4)(g).

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? Yes
(Reference: See below).

JUSTIFICATION/COMMENTS Rychem Reports EDR 5046 and EDR 5040. A failure mode of retaining 30% of initial elongation was used, since this resulted in the lowest activation energy and is considered the most conservative case.

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? No (Reference: NA).

JUSTIFICATION/COMMENTS Thermal aging calculation based on 90°C maximum conductor temperature.

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program (Yes/No/NA)? Yes (Reference: 58722-2, Section 3.3.2).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? No
(Reference: NA).

JUSTIFICATION/COMMENTS Splices were subjected to a total dose of 2.2×10^8 rads and passed all functional tests. This dose exceeds the worst case dose at WBN. (See page B-35). R1

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? Yes
(Reference: 58722-2, Section 3.3.2).

JUSTIFICATION/COMMENTS Aging and accident dose done at the same time at 5.7E+5 rads/hour for 386 hours yielding TID of 2.2E+8 rads.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: 58722-2, Section 3.2.2 and Table I).

Plant normal ambient radiation dose (rd)	$1x10^8$ (See Section K)
Test exposure dose (rd)	2.2E+8 (accident included)
Test exposure dose rate (rd/hr)	5.7E+5
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

R3

JUSTIFICATION/COMMENTS Radiation dose and rate are acceptable in accordance with IEEE 383-1974.

(6) Vibration (nonseismic) Aging:

(a) Were the effects of nonseismic vibration induced during normal and abnormal operation addressed in the qualification program* NA (Reference: NA).

JUSTIFICATION/COMMENTS Seismic concerns are not applicable to cable splicing systems which have inherently high damping and for which vibration is not a principal failure mode.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference:).

JUSTIFICATION/COMMENTS

* Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the binder.

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes
(Reference ____________________).

JUSTIFICATION/COMMENTS See TAB B, Section P.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference ____________________).

JUSTIFICATION/COMMENTS See TAB B, Section P.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference 58722-2, Sec. 3.3.1).

Qualified life (Document in QMDS) 40 years at 90°C

JUSTIFICATION/COMMENTS Also see Raychem Reports EDR 5046 and EDR 5040. See TAB C for qualified life calculation.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? NA
(Reference: ______________________________).

|R1

JUSTIFICATION/COMMENTS See TAB C for aging equivalent.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference	
a.	Raychem-52 Molding Material			1.30	EDR 5040 and TAB C	R3
b.	Raychem WCSF-N Sleeving	NA	NA	1.33	EDR 5046 and TAB C	
c.						
d.						

JUSTIFICATION/COMMENTS The insulation material (polyolefin) and sealant are considered susceptible to thermal and radiation degradation. The test was done in accordance with IEEE 383-1974 and IEEE 323-1974 and the test values exceeded those values expected during a DBE. The test program included tests on all materials used in the splices; therefore, no material analysis is required.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1.) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 58722-2, Section 1.0)

Identify Acceptance Criteria: IEEE 383-1974 criteria - FunctionContinuously during test then pass high-voltage withstand test after conclusion of DBE simulation.

(2.) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference: See page 18.1.)

Identify baseline and functional testing: Immersed in water for 16 hours then IR measurements at 500 VDC and voltage withstand test with 3600 VAC hi-pot while still immersed in water.

JUSTIFICATION/COMMENTS

(3.) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 58722-2. Section 3.4). ~~90A~~

JUSTIFICATION/COMMENTS 90A | R3

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS R1

1) Functional Test Baseline (Ref. 58722-2 Section 3.1 and 3.2)

- Immersed in water for 16 hours
- Insulation resistance in water at 500 VDC
- 3600 VAC voltage withstand test in water

2) Post Thermal and Radiation Aging (Ref. 58722-2 Section 3.3.3) - Same as above (1)

3) DBE Exposure (Ref. 58722-2 Section 3.4; Fig. 4 and Table 3)

- Energized at 1000 volts AC at 90 amps (nominal)

4) Post DBE (Ref. 58722-2 Section 4.3)

- Same as above (1)

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: 58722-2 sec 3.4).

JUSTIFICATION/COMMENTS Baseline testing consisted of insulation resistance at 500V DC voltage withstand at 3600 volts AC. The connection splices are qualified to the relevant industry standards and IEEE-383-1974.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	480V	
Load	NA	
Frequence	NA	
Accuracy	NA	
Other(s)		

R1

JUSTIFICATION/COMMENTS

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	MFG STD (600 volts or less)	See comments
Load	See Comments	See comments
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS The splice loading during the DBE test is less than 90°C cable rating per National Electric Code 1990. For the purpose of the qualification, additional heat rise resulting from the difference between these current values is calculated and added to the accident profiles (see TAB C). R3

(c)

Parameter	Demonstrated Conditions	Reference
Voltage	1000 VAC	58722-2 Sec. 3.4
Load	90 amps	58722-2 Sec. 3.4
Frequency	NA	NA
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Worst case 47E235-42 and 47E235-76

(1) Normal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 1.0×10^8

(2) Abnormal Max

(a) Temperature (°F) 140

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA R3

(3) Process Interfaces: None.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal service conditions duration is less than eight hours per occurrence and total time is less than 1 percent of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327* Accident type LOCA/HELB

(b) Pressure (psig) 11.2 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) 4×10^7 gamma 4.7×10^8 beta Accident type LOCA/HELB

(e) Spray Type Yes (See L(2)) Accident type LOCA/HELB

* See TAB B, Section P for discussion on temperature for the MSLB in the steam valve rooms. R3

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Refer to Watts Bar Environmental Data Drawing Series 47E235 and discussions in TAB B on Radiation and Temperature.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? No (Reference: NA).

(7) Subject to submergence (Yes/No/NA)? Yes (Reference: See TAB B, Discussion page).

Identify initiation time and duration of submergence: NA

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes
(Reference: GENNAL3-002 & 47E235-42).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: Splices are located in junction boxes which are conservatively assumed to be fabricated of 16 ga sheet steel which provides a beta reduction factor of 9.98E-2. Therefore, the maximum beta dose the splices will be exposed to is 4.7E + 07 rads (4.7E+8 x 9.98E-2). R1

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.

4

BINDER NO. WBNEQ-SPLC-001 PLANT WBN	UNIT(S) 1		SHEET 25 OF 40 R 3 R
BINDER TITLE Environmental Qualification of Raychem Heat Shrink Cable Splices	COMPUTED HDR	DATE 9/20/86	7/25/90
	CHECKED NMB	DATE 9/21/86	7-26-90

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time (days)	100	31.3 days (See TAB C)	58722-2, Sec. 4.2 (c), Fig. 6	
Temperature (°F)	373***	442	58722-2, Fig.6, (p10)	R3
Pressure	25.6 psia	132 psig	58722-2, Fig.6, (p10)	
Relative Humidity (%)	100	100	58722-2, Sec. 5.0	
*Chemical Spray	Yes	IEEE 323-1974 (See L(2) for Justification	58722-2, Sec. 3.4	
**Radiation (rd)	1.4×10^8 gamma 4.7×10^8 beta	2.2E+8 gamma	58722-2, Table 1, p 17	R3
Submergence	No	No	TAB B, Sec. P, "Submergence"	

*Includes spray concentration, flowrate, density, duration, and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type. See discussion TAB B, Section P "Radiation."
***327°F + 46°F heat rise = 373°F R3

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference	
Temperature	Yes (Reference discussion in Sect. P.)	58722-2, Fig. 6, (p 10)	R3
Pressure	Yes	58722-2, Fig. 6, (p 10)	
Relative Humidity	Yes (saturated steam)	58722-2, Sec. 5.0	
Chemical Spray	Yes (see below)	58722-2, Sec. 3.4	
Submergence	NA	TAB B, Sec. P, "Submergence"	

JUSTIFICATION/COMMENTS - All cables in containment at WBN are enclosed in conduit; therefore, the splices are not subject to direct impingement of chemical spray. Test chemical spray encompasses requirements for WBN composition. (See TAB B Discussion.)

BINDER NO. WBNEQ-SPLC-001	PLANT WBN	UNIT(S) 1	SHEET 26 OF 40
			R ___ R ___
BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES	COMPUTED [illegible]	DATE 9/20/86	
	CHECKED [illegible]	DATE 9/21/86	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	15°F	Yes
Pressure: +10% but no more than 10 psig	10%	Yes
Radiation: +10% of accident dose	10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	10% (equivalent)	Yes*
Voltage: ±10% of rated value	10%	Yes
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	2 Transients	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Note: Margins noted are the difference between the required WBN values and the values of the test.

*Refer to TAB C for operating time evaluation.

TVA 19537 (OE-3-86)

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference None).

JUSTIFICATION/COMMENTS To maintain mechanical and electrical integrity and insulation characteristics during and following a DBE to allow the cable to which the splice is attached to maintain its required performance during all postulated service conditions.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference 58722-2, Section 5.0).

JUSTIFICATION/COMMENTS Ten of twelve test assemblies maintained rated current and voltage during test. All sleeves passed voltage withstand test and had high IR measurements. (See TAB B, Section P).

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference 58722-2, Section 5.0).

JUSTIFICATION/COMMENTS See M(2) above.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Time required is 100 days. Test included 31.3-day LOCA test only (See TAB C).

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference 58722-2, Section 5.0).

JUSTIFICATION/COMMENTS See TAB B, Discussion.

BINDER NO. WBNEQ-SPLC-001	PLANT WBN	UNIT(S) 1		SHEET 29	OF 40		
				R	R		
BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES		COMPUTED HOR	DATE 9/20/86				
		CHECKED B	DATE 9/2/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G. There were no surveillance or maintenance requirements identified from the vendor or test documentation; however, TVA does have a maintenance and surveillance program at the plant.

TVA 19537 (OE-3-86)

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	None taken
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA (type test)
(b) Were specific features and failure modes and effects analyzed?	NA (type test)
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA (type test)
(d) Were environmental parameters which affect equipment performance identified?	NA (Type test)
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	NA
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (aging)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

TVA 19537 (OE-3-86)

BINDER NO. WBNEQ-SPLC-001	PLANT WBN	UNIT(S) 1	SHEET 31 OF 40
			R ___ R ___
BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES	COMPUTED HR	DATE 9/20/86	
	CHECKED B	DATE 9/21/86	

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

TVA 19537 (OE-3-86)

BINDER NO. WBNEQ-SPLC-001	PLANT WBN	UNIT(S) 1	SHEET 32 OF 40
			R ___ R ___
BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES	COMPUTED HOR	DATE 9/23/86	
	CHECKED B	DATE 9/2/86	

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

See continuation page.

TVA 19537 (OE-3-86)

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P. DISCUSSION (Continued)

A. Radiation

In their worst-case installed environment (inside containment), the total radiation exposure is 14 x 10^7 rads gamma (including 40-year dose of 1 x 10^8 rads) and a beta dose of 4.7 x 10^8 rads. The cables are routed in either rigid steel conduit or American Boa flexible conduit and are terminated in 16-gauge (minimum) sheet steel enclosures. The rigid steel conduit effectively blocks beta radiation completely. Per calculation GENAPS3-023 R0, all radiosensitive material contained in an enclosure formed of 26 gauge or thicker iron will receive a beta dose of no more than one percent of the free-field beta dose. Per calculation is WBNTSR-015, the minimum wall thickness of the American Boa Supra flex conduit is 5.9 mils. This type of conduit is made up of corrugated steel sections that are welded together. The sections are overlapped so that the outermost layers of the conduit are double thickness (11.8 mils). From Figure 1 of WBNTSR-015, it can be seen that the axial distance of each convex or concave section is so small (0.0492") that a typical 6" long flexible conduit (minimum length of Raychem WCSF sleeve is 6") is covered by approximately 50 convex portions (11.8 mils thick) and 50 concave portions (5.9 mils thick) along the length of the conduit. Therefore, it is reasonable to determine the beta reduction afforded by this conduit based on the average thickness of these two portions. For an average thickness of 8.8 mils (5.9 mils + 11.8 mils /2 = 8.8 mils), the corresponding beta dose reduction factor is 14 (See Figure 1 of GENAPS3-023). To conservatively calculate beta radiation transmitted through American Boa flexible conduit, only 70 percent of this factor is utilized. Applying a fraction of 0.102 (1/9.8) to the beta dose of 4.7 x 10^8 yields a dose of 4.8 x 10^7. This dose added to the total gamma yields a worst case total 100 day radiation dose to the conductor insulation of 1.88 x 10^8 rads. R3

The worst-case radiation dose for inside containment installation is shown below:

40-year normal gamma dose	= 1.0 x 10^8 rads (reference TVA drawing 47E235-42)	R3
Accident gamma dose	= 4.0 x 10^7 rads (reference TVA drawing 47E235-42)	
Accident beta dose	= 4.8 x 10^7 rads (see above)	R3

P. DISCUSSION (Continued)

The 40-year dose plus accident dose with margin is calculated as:

40-year normal gamma dose	= 10.0×10^7 rads
Accident gamma dose	= 4.0×10^7 rads
Accident beta dose	= 4.8×10^7 rads
10-percent accident margin	= 8.8×10^6 rads

R3

R3

1.968×10^8 rads = Total worst-case dose for a 40-year qualified life

R3

P. DISCUSSION (Continued)

B. Submergence |R1

The only safety related cables which have cable splices that are subjected to submergence are connected to the following devices:

1-FSV-62-72	1-FSV-1-147
1-FSV-62-73	1-FSV-3-185
1-FSV-62-74	1-FSV-3-186
1-FSV-62-76	1-FSV-3-187
1-FSV-87-7	
1-FSV-87-8	

The required operating time for the above devices is one hour or less. The cables become de-energized and failure of the splice after this time would not be a safety concern (see EQ Binders WBNEQ-SOL-006 and WBNEQ-SOL-003 for operating time justification). No splices are required for submergence longer than the 1 hour given above.

The splices are located in conduit and/or steel junction boxes and therefore not exposed to the direct chemical spray solution. When the conduit or junction box becomes submerged, the solution may submerge the splice. The splices were subjected to the direct chemical spray at a much higher pressure and temperature (than plant accident conditions) for 31.3 days. Also the splices were subjected to a 16 hour water bath prior to the performance of each functional test cycle. The 31.3 day exposure to direct chemical spray and the 42 hour water bath (3 at 16 hours) ensure that the splices will not fail during the required 1 hour of submergence.

P. DISCUSSION (Continued)

C. Temperature

The maximum accident temperature the splices will be subjected to is 453°F (MSLB in steam valve rooms, see QIR NUMWBN90032, (B26 900226 251), but per QIR MNMWBN90057 (B26 900515 250), Raychem splices are only exposed to a peak accident ambient of 349° F. This peak temperature is enveloped by the peak temperature of the test profile with a margin of 93°F (see TAB B, Sect. L.(1)). In addition, the duration of the MSLB is short, i.e., the temperature reaches the peak of 349°F in about 580 seconds and then drops rapidly to 140°F in 40 seconds, while the accident temperature inside containment remains above 150°F for approximately 147,000 seconds after attaining a peak of 324.2°F (see WBN Generic Curve #4, B44 900222 803). Since the splices have been demonstrated to be qualified for use inside containment, they are qualified for the MSLB.

R3

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BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1		SHEET 1 OF 1	
				R 3	R 5
[BIN]DER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 7/16/86		JDH 3/7/90	JDH 9/14/90
TERMINAL BLOCKS	CHECKED ETD	DATE 7/18/86		WCG 3/21/90	

TB-001

DISCUSSION FOR TAB A

|R5

1. This binder addresses the qualification of General Electric CR151B terminal blocks which have been installed in category A/B Class 1E harsh environment junction boxes at WBN. Field verification for the terminal blocks is provided in TAB F. The qualification on any General Electric terminal blocks supplied by a manufacturer with his equipment package is addressed in the binder(s) for that equipment.

2. Since the terminal blocks are in many safety-related circuits, some of which are required to operate for 100 days following an accident, the category and operating times for all terminal blocks are designated as "a" and "100 days", respectively, for all accidents. |R5

3. The terminal block EQIS and unit device identification nos. are synonymous with the junction box EQIS and unit device identification nos. except for the component function code (TBLK). There are multiple terminal blocks in some junction boxes; however, each individual terminal block within a junction box is not identified. |R5

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-276-L182A TERMINAL BLOCK	-D	1-TBLK-276-L182A CR151B	-D	183	721' 6" VARIOUS	FN2	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L182B TERMINAL BLOCK	-D	1-TBLK-276-L182B CR151B	-D	181	721' 6" VARIOUS	FN2	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L183A TERMINAL BLOCK	-E	1-TBLK-276-L183A CR151B	-E	005	721' 6" VARIOUS	FN1	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L183B TERMINAL BLOCK	-E	1-TBLK-276-L183B CR151B	-E	002	721' 6" VARIOUS	FN1	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L183C TERMINAL BLOCK	-B	1-TBLK-276-L183C CR151B	-B	359	721' 6" VARIOUS	FN1	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	WOR 10-31-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-276-L196 TERMINAL BLOCK	-D	1-TBLK-276-L196 CR151B	-D		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L197 TERMINAL BLOCK	-E	1-TBLK-276-L197 CR151B	-E		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L216 TERMINAL BLOCK	-A	1-TBLK-276-L216 CR151B	-A		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-276-L217 TERMINAL BLOCK	-A	1-TBLK-276-L217 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0004 TERMINAL BLOCK	-A	1-TBLK-292-0004 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOK 10-30-90		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION	
WBN-2-TBLK-292-0006 TERMINAL BLOCK	-B	2-TBLK-292-0006 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER	R5
WBN-0-TBLK-292-0228 TERMINAL BLOCK	-A	0-TBLK-292-0228 CR151B	-A		729' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER	
WBN-0-TBLK-292-0229 TERMINAL BLOCK	-B	0-TBLK-292-0229 CR151B	-B		729' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER	
WBN-1-TBLK-292-0358 TERMINAL BLOCK	-B	1-TBLK-292-0358 CR151B	-B		692' VARIOUS	A12	A	100D	ALL	DISTRIBUTE POWER	
WBN-1-TBLK-292-0359 TERMINAL BLOCK	-B	1-TBLK-292-0359 CR151B	-B		692' VARIOUS	A13	A	100D	ALL	DISTRIBUTE POWER	

		R 5	R	R
PREPARER/DATE	J.L.H 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	NDR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
				--------LOCATION--------						
WBN-1-TBLK-292-0530 TERMINAL BLOCK	-B	1-TBLK-292-0530 CR151B	-B		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0540 TERMINAL BLOCK	-A	1-TBLK-292-0540 CR151B	-A		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0567 TERMINAL BLOCK	-A	1-TBLK-292-0567 CR151B	-A		676' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0569 TERMINAL BLOCK	-B	1-TBLK-292-0569 CR151B	-B		676' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0593 TERMINAL BLOCK	-A	1-TBLK-292-0593 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	NDR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-0748 TERMINAL BLOCK	-B	1-TBLK-292-0748 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0772 TERMINAL BLOCK	-B	1-TBLK-292-0772 CR151B	-B		676' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0773 TERMINAL BLOCK	-A	1-TBLK-292-0773 CR151B	-A		676' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0846 TERMINAL BLOCK	-B	1-TBLK-292-0846 CR151B	-B		692' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-0847 TERMINAL BLOCK	-A	1-TBLK-292-0847 CR151B	-A		692' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	NDR 10-30-90		

PRINT DATE: 10/10/90

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1005 TERMINAL BLOCK	-A	1-TBLK-292-1005 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1006 TERMINAL BLOCK	-B	1-TBLK-292-1006 CR151B	-B		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1008 TERMINAL BLOCK	-B	2-TBLK-292-1008 CR151B	-B		737' VARIOUS	A09	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-1163 TERMINAL BLOCK	-B	0-TBLK-292-1163 CR151B	-B		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-1164 TERMINAL BLOCK	-A	0-TBLK-292-1164 CR151B	-A		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	JDH 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1189 TERMINAL BLOCK	-A	1-TBLK-292-1189 CR151B	-A		692' VARIOUS	A09	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1190 TERMINAL BLOCK	-B	1-TBLK-292-1190 CR151B	-B		692' VARIOUS	A10	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1195 TERMINAL BLOCK	-A	1-TBLK-292-1195 CR151B	-A		692' VARIOUS	A13	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1196 TERMINAL BLOCK	-B	1-TBLK-292-1196 CR151B	-B		692' VARIOUS	A12	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1235 TERMINAL BLOCK	-A	1-TBLK-292-1235 CR151B	-A		713' VARIOUS	A13	A	100D	ALL	DISTRIBUTE POWER

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		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.O. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1246 TERMINAL BLOCK	-A	1-TBLK-292-1246 CR151B	-A		713' VARIOUS	A13	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1352 TERMINAL BLOCK	-A	1-TBLK-292-1352 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1353 TERMINAL BLOCK	-A	1-TBLK-292-1353 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1354 TERMINAL BLOCK	-B	1-TBLK-292-1354 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1355 TERMINAL BLOCK	-B	1-TBLK-292-1355 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HDR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1356 TERMINAL BLOCK	-A	1-TBLK-292-1356 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1357 TERMINAL BLOCK	-A	1-TBLK-292-1357 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1358 TERMINAL BLOCK	-B	1-TBLK-292-1358 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1367 TERMINAL BLOCK	-A	1-TBLK-292-1367 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1368 TERMINAL BLOCK	-B	1-TBLK-292-1368 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER

	R5	R	R
PREPARER/DATE J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1369 TERMINAL BLOCK	-A	1-TBLK-292-1369 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1370 TERMINAL BLOCK	-A	1-TBLK-292-1370 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1371 TERMINAL BLOCK	-B	1-TBLK-292-1371 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1391 TERMINAL BLOCK	-S	1-TBLK-292-1391 CR151B	-S		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1421 TERMINAL BLOCK	-A	1-TBLK-292-1421 CR151B	-A		713' VARIOUS	A12	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	SHON 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1422 TERMINAL BLOCK	-B	1-TBLK-292-1422 CR151B	-B		713' VARIOUS	A11	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1425 TERMINAL BLOCK	-A	1-TBLK-292-1425 CR151B	-A		713' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1426 TERMINAL BLOCK	-B	1-TBLK-292-1426 CR151B	-B		713' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1446 TERMINAL BLOCK	-B	1-TBLK-292-1446 CR151B	-B		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1447 TERMINAL BLOCK	-A	1-TBLK-292-1447 CR151B	-A		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-2-TBLK-292-1448 TERMINAL BLOCK	-B	2-TBLK-292-1448 CR151B	-B		713' VARIOUS	A19	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1449 TERMINAL BLOCK	-A	2-TBLK-292-1449 CR151B	-A		713' VARIOUS	A19	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1502 TERMINAL BLOCK	-A	1-TBLK-292-1502 CR151B	-A		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1503 TERMINAL BLOCK	-A	2-TBLK-292-1503 CR151B	-A		713' VARIOUS	A19	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1504 TERMINAL BLOCK	-B	1-TBLK-292-1504 CR151B	-B		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	[illegible] 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-2-TBLK-292-1505 TERMINAL BLOCK	-B	2-TBLK-292-1505 CR151B	-B		713' VARIOUS	A19	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1512 TERMINAL BLOCK	-A	1-TBLK-292-1512 CR151B	-A		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1514 TERMINAL BLOCK	-A	1-TBLK-292-1514 CR151B	-A		729' VARIOUS	A02	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1516 TERMINAL BLOCK	-B	1-TBLK-292-1516 CR151B	-B		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1518 TERMINAL BLOCK	-B	1-TBLK-292-1518 CR151B	-B		729' VARIOUS	A02	A	100D	ALL	DISTRIBUTE POWER

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		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	[illegible] 10-31-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1543 TERMINAL BLOCK	-A	1-TBLK-292-1543 CR151B	-A		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1544 TERMINAL BLOCK	-B	1-TBLK-292-1544 CR151B	-B		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-1547 TERMINAL BLOCK	-A	0-TBLK-292-1547 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-1548 TERMINAL BLOCK	-B	0-TBLK-292-1548 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1549 TERMINAL BLOCK	-A	1-TBLK-292-1549 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HDR 10-30-90		

PRINT DATE: 10/10/90

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-2-TBLK-292-1550 TERMINAL BLOCK	-A	2-TBLK-292-1550 CR151B	-A		737' VARIOUS	A09	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1551 TERMINAL BLOCK	-B	1-TBLK-292-1551 CR151B	-B		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1552 TERMINAL BLOCK	-B	2-TBLK-292-1552 CR151B	-B		737' VARIOUS	A09	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1553 TERMINAL BLOCK	-A	2-TBLK-292-1553 CR151B	-A		692' VARIOUS	A25	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1554 TERMINAL BLOCK	-B	2-TBLK-292-1554 CR151B	-B		692' VARIOUS	A25	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JLH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	HWR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-2-TBLK-292-1555 TERMINAL BLOCK	-A	2-TBLK-292-1555 CR151B	-A		692' VARIOUS	A25	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-1556 TERMINAL BLOCK	-B	2-TBLK-292-1556 CR151B	-B		692' VARIOUS	A25	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1564 TERMINAL BLOCK	-A	1-TBLK-292-1564 CR151B	-A		692' VARIOUS	A08	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1565 TERMINAL BLOCK	-B	1-TBLK-292-1565 CR151B	-B		692' VARIOUS	A08	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1566 TERMINAL BLOCK	-B	1-TBLK-292-1566 CR151B	-B		692' VARIOUS	A08	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOH 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1567 TERMINAL BLOCK	-A	1-TBLK-292-1567 CR151B	-A		692' VARIOUS	A08	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1598 TERMINAL BLOCK	-A	1-TBLK-292-1598 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1599 TERMINAL BLOCK	-B	1-TBLK-292-1599 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1933 TERMINAL BLOCK	-S	1-TBLK-292-1933 CR151B	-S		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-1942 TERMINAL BLOCK	-A	0-TBLK-292-1942 CR151B	-A		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JLH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-TBLK-292-1943 TERMINAL BLOCK	-B	0-TBLK-292-1943 CR151B	-B		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1964 TERMINAL BLOCK	-B	1-TBLK-292-1964 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1966 TERMINAL BLOCK	-A	1-TBLK-292-1966 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1968 TERMINAL BLOCK	-A	1-TBLK-292-1968 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1970 TERMINAL BLOCK	-B	1-TBLK-292-1970 CR151B	-B		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	Hore 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1972 TERMINAL BLOCK	-B	1-TBLK-292-1972 CR151B	-B		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1974 TERMINAL BLOCK	-A	1-TBLK-292-1974 CR151B	-A		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1985 TERMINAL BLOCK	-A	1-TBLK-292-1985 CR151B	-A		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1986 TERMINAL BLOCK	-B	1-TBLK-292-1986 CR151B	-B		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-1987 TERMINAL BLOCK	-B	1-TBLK-292-1987 CR151B	-B		729' VARIOUS	A02	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JAH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-1988 TERMINAL BLOCK	-A	1-TBLK-292-1988 CR151B	-A		729' VARIOUS	A02	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2007 TERMINAL BLOCK	-B	1-TBLK-292-2007 CR151B	-B		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2008 TERMINAL BLOCK	-A	1-TBLK-292-2008 CR151B	-A		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2012 TERMINAL BLOCK	-B	1-TBLK-292-2012 CR151B	-B		713' VARIOUS	A13	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2013 TERMINAL BLOCK	-A	1-TBLK-292-2013 CR151B	-A		713' VARIOUS	A13	A	100D	ALL	DISTRIBUTE POWER

R5

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HDR 10-30-90		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2063 TERMINAL BLOCK	-A	1-TBLK-292-2063 CR151B	-A		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2064 TERMINAL BLOCK	-B	1-TBLK-292-2064 CR151B	-B		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2065 TERMINAL BLOCK	-A	1-TBLK-292-2065 CR151B	-A		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2066 TERMINAL BLOCK	-B	1-TBLK-292-2066 CR151B	-B		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2070 TERMINAL BLOCK	-	1-TBLK-292-2070 CR151B			737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	Hon 10-30-90		

PRINT DATE: 10/10/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2071 TERMINAL BLOCK	-A	1-TBLK-292-2071 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2122 TERMINAL BLOCK	-A	1-TBLK-292-2122 CR151B	-A		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2140 TERMINAL BLOCK	-A	1-TBLK-292-2140 CR151B	-A		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2141 TERMINAL BLOCK	-B	1-TBLK-292-2141 CR151B	-B		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2202 TERMINAL BLOCK	-A	1-TBLK-292-2202 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.O. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2204 TERMINAL BLOCK	-A	1-TBLK-292-2204 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2205 TERMINAL BLOCK	-A	1-TBLK-292-2205 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2206 TERMINAL BLOCK	-A	1-TBLK-292-2206 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2207 TERMINAL BLOCK	-A	1-TBLK-292-2207 CR151B	-A		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2208 TERMINAL BLOCK	-B	1-TBLK-292-2208 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.O. 7/26/86	Hon 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2209 TERMINAL BLOCK	-B	1-TBLK-292-2209 CR151B	-B		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2211 TERMINAL BLOCK	-B	1-TBLK-292-2211 CR151B	-B		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2212 TERMINAL BLOCK	-B	1-TBLK-292-2212 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-2215 TERMINAL BLOCK	-	2-TBLK-292-2215 CR151B			737' VARIOUS	A09	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2234 TERMINAL BLOCK	-S	1-TBLK-292-2234 CR151B	-S		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2236 TERMINAL BLOCK	-S	1-TBLK-292-2236 CR151B	-S		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2238 TERMINAL BLOCK	-S	1-TBLK-292-2238 CR151B	-S		692' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2242 TERMINAL BLOCK	-S	1-TBLK-292-2242 CR151B	-S		692' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2252 TERMINAL BLOCK	-A	1-TBLK-292-2252 CR151B	-A		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2257 TERMINAL BLOCK	-A	1-TBLK-292-2257 CR151B	-A		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HGN 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2260 TERMINAL BLOCK	-B	1-TBLK-292-2260 CR151B	-B		713' VARIOUS	A06	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2262 TERMINAL BLOCK	-B	1-TBLK-292-2262 CR151B	-B		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2265 TERMINAL BLOCK	-B	1-TBLK-292-2265 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2386 TERMINAL BLOCK	-B	1-TBLK-292-2386 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2387 TERMINAL BLOCK	-A	1-TBLK-292-2387 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JLH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	HGR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2388 TERMINAL BLOCK	-A	1-TBLK-292-2388 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-2389 TERMINAL BLOCK	-A	2-TBLK-292-2389 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-2390 TERMINAL BLOCK	-B	2-TBLK-292-2390 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-2391 TERMINAL BLOCK	-A	2-TBLK-292-2391 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2503 TERMINAL BLOCK	-B	1-TBLK-292-2503 CR151B	-B		676' VARIOUS	A08	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JLH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HDK 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-2504 TERMINAL BLOCK	-A	1-TBLK-292-2504 CR151B	-A		676' VARIOUS	A09	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2507 TERMINAL BLOCK	-B	1-TBLK-292-2507 CR151B	-B		676' VARIOUS	A10	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-2508 TERMINAL BLOCK	-A	1-TBLK-292-2508 CR151B	-A		676' VARIOUS	A11	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-2761 TERMINAL BLOCK	-B	2-TBLK-292-2761 CR151B	-B		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-2-TBLK-292-2762 TERMINAL BLOCK	-A	2-TBLK-292-2762 CR151B	-A		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JBH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-TBLK-292-2765 TERMINAL BLOCK	-A	0-TBLK-292-2765 CR151B	-A		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-2766 TERMINAL BLOCK	-B	0-TBLK-292-2766 CR151B	-B		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-2856 TERMINAL BLOCK	-A	0-TBLK-292-2856 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-2894 TERMINAL BLOCK	-B	0-TBLK-292-2894 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-3032 TERMINAL BLOCK	-B	1-TBLK-292-3032 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HDR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-3033 TERMINAL BLOCK	-A	1-TBLK-292-3033 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-3208 TERMINAL BLOCK	-A	1-TBLK-292-3208 CR151B	-A		692' VARIOUS	A07	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-3213 TERMINAL BLOCK	-B	0-TBLK-292-3213 CR151B	-B		692' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-3214 TERMINAL BLOCK	-B	1-TBLK-292-3214 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-3215 TERMINAL BLOCK	-A	0-TBLK-292-3215 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H 7/26/86	JDH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	HOR 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-0-TBLK-292-3341 TERMINAL BLOCK	-B	0-TBLK-292-3341 CR151B	-B		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-0-TBLK-292-3342 TERMINAL BLOCK	-A	0-TBLK-292-3342 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-3422 TERMINAL BLOCK	-A	1-TBLK-292-3422 CR151B	-A		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-3423 TERMINAL BLOCK	-B	1-TBLK-292-3423 CR151B	-B		713' VARIOUS	A28	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-3870 TERMINAL BLOCK	-A	1-TBLK-292-3870 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
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W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-4011 TERMINAL BLOCK	-A	1-TBLK-292-4011 CR151B	-A		729' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4013 TERMINAL BLOCK	-A	1-TBLK-292-4013 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4015 TERMINAL BLOCK	-B	1-TBLK-292-4015 CR151B	-B		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4026 TERMINAL BLOCK	-B	1-TBLK-292-4026 CR151B	-B		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4027 TERMINAL BLOCK	-A	1-TBLK-292-4027 CR151B	-A		737' VARIOUS	A05	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-292-4166 TERMINAL BLOCK	-A	1-TBLK-292-4166 CR151B	-A		729' VARIOUS	A04	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4167 TERMINAL BLOCK	-B	1-TBLK-292-4167 CR151B	-B		729' VARIOUS	A04	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4275 TERMINAL BLOCK	-A	1-TBLK-292-4275 CR151B	-A		737' VARIOUS	A01	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4984 TERMINAL BLOCK	-A	1-TBLK-292-4984 CR151B	-A		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-292-4985 TERMINAL BLOCK	-B	1-TBLK-292-4985 CR151B	-B		757' VARIOUS	A16	A	100D	ALL	DISTRIBUTE POWER

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		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	Jon 10-30-90		

PRINT DATE: 10/10/90

BINDER NO. : WBNEQ-TB -001
MANUFACTURER : GENERAL ELECTRIC

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-0159 TERMINAL BLOCK	-B	1-TBLK-293-0159 CR151B	-B		804' 3" VARIOUS	UC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0368 TERMINAL BLOCK	-B	1-TBLK-293-0368 CR151B	-B		806' VARIOUS	UC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0394 TERMINAL BLOCK	-A	1-TBLK-293-0394 CR151B	-A	045	706' VARIOUS	RW	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0542 TERMINAL BLOCK	-A	1-TBLK-293-0542 CR151B	-A	234	736' 4" VARIOUS	AC3	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0544 TERMINAL BLOCK	-A	1-TBLK-293-0544 CR151B	-A	248	754' VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-0546 TERMINAL BLOCK	-B	1-TBLK-293-0546 CR151B	-B	300	724' 5" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0548 TERMINAL BLOCK	-B	1-TBLK-293-0548 CR151B	-B	248	753'10" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0550 TERMINAL BLOCK	-A	1-TBLK-293-0550 CR151B	-A	287	792' VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0553 TERMINAL BLOCK	-A	1-TBLK-293-0553 CR151B	-A	294	744' 6" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0574 TERMINAL BLOCK	-A	1-TBLK-293-0574 CR151B	-A	013	734' 9" VARIOUS	FN1	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	Hon 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-0578 TERMINAL BLOCK	-B	1-TBLK-293-0578 CR151B	-B	349	730' 5" VARIOUS	FN1	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0596 TERMINAL BLOCK	-B	1-TBLK-293-0596 CR151B	-B	346	706' 7" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0656 TERMINAL BLOCK	-A	1-TBLK-293-0656 CR151B	-A	132	731' 7" VARIOUS	AC2	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0691 TERMINAL BLOCK	-A	1-TBLK-293-0691 CR151B	-A	213	706' VARIOUS	RW	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0724 TERMINAL BLOCK	-B	1-TBLK-293-0724 CR151B	-B	059	748' 6" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	Han 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-0745 TERMINAL BLOCK	-A	1-TBLK-293-0745 CR151B	-A	199	805' 8" VARIOUS	UC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0760 TERMINAL BLOCK	-B	1-TBLK-293-0760 CR151B	-B	115	731' 4" VARIOUS	IIR	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0762 TERMINAL BLOCK	-A	1-TBLK-293-0762 CR151B	-A	105	751' 6" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0764 TERMINAL BLOCK	-A	1-TBLK-293-0764 CR151B	-A	060	740' 2" VARIOUS	IIR	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0766 TERMINAL BLOCK	-B	1-TBLK-293-0766 CR151B	-B	291	745' VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JOH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	[illegible] 10-30-90		

PRINT DATE: 10/10/90

BINDER NO. : WBNEQ-TB -001
MANUFACTURER : GENERAL ELECTRIC

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-0768 TERMINAL BLOCK	-A	1-TBLK-293-0768 CR151B	-A	297	731' 4" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0775 TERMINAL BLOCK	-A	1-TBLK-293-0775 CR151B	-A	035	720' 4" VARIOUS	AC1	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0788 TERMINAL BLOCK	-A	1-TBLK-293-0788 CR151B	-A	287	727' 9" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0792 TERMINAL BLOCK	-B	1-TBLK-293-0792 CR151B	-B	285	722' VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-0795 TERMINAL BLOCK	-A	1-TBLK-293-0795 CR151B	-A	283	728' 9" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
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WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-1034 TERMINAL BLOCK	-A	1-TBLK-293-1034 CR151B	-A	006	835' 9" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1036 TERMINAL BLOCK	-B	1-TBLK-293-1036 CR151B	-B	357	835' 9" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1255 TERMINAL BLOCK	-A	1-TBLK-293-1255 CR151B	-A	028	727'10" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1277 TERMINAL BLOCK	-A	1-TBLK-293-1277 CR151B	-A	311	804'10" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1283 TERMINAL BLOCK	-B	1-TBLK-293-1283 CR151B	-B	317	804'10" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	HAh 10-30-90		

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-1285 TERMINAL BLOCK	-B	1-TBLK-293-1285 CR151B	-B	319	804'10" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1287 TERMINAL BLOCK	-A	1-TBLK-293-1287 CR151B	-A	313	804'10" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1576 TERMINAL BLOCK	-A	1-TBLK-293-1576 CR151B	-A	100	787' VARIOUS	PRS	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1736 TERMINAL BLOCK	-B	1-TBLK-293-1736 CR151B	-B	304	738' 6" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1738 TERMINAL BLOCK	-B	1-TBLK-293-1738 CR151B	-B	285	720' VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER

R 5 R____ R____

PREPARER/DATE J.L.H. 7/26/86 JDH 10/16/90

CHECKED/DATE E.T.D. 7/26/86 HOH 10-30-90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-1750 TERMINAL BLOCK	-A	1-TBLK-293-1750 CR151B	-A	308	724'10" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1758 TERMINAL BLOCK	-B	1-TBLK-293-1758 CR151B	-B	280	719'10" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1764 TERMINAL BLOCK	-B	1-TBLK-293-1764 CR151B	-B	285	719'11" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1883 TERMINAL BLOCK	-B	1-TBLK-293-1883 CR151B	-B	165	727'11" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1885 TERMINAL BLOCK	-A	1-TBLK-293-1885 CR151B	-A	191	727'11" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	HDH 10-30-90		

PRINT DATE: 10/10/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-1887 TERMINAL BLOCK	-A	1-TBLK-293-1887 CR151B	-A	007	725' 3" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1889 TERMINAL BLOCK	-B	1-TBLK-293-1889 CR151B	-B	350	728' 2" VARIOUS	ANN	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-1921 TERMINAL BLOCK	-A	1-TBLK-293-1921 CR151B	-A	297	718' 1" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-2649 TERMINAL BLOCK	-A	1-TBLK-293-2649 CR151B	-A		805' 7" VARIOUS	UC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-3193 TERMINAL BLOCK	-B	1-TBLK-293-3193 CR151B	-B		784'10" VARIOUS	UC	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JDH 10/16/90		
CHECKED/DATE	E.T.D. 7/26/86	[illegible] 10-30-90		

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-3201 TERMINAL BLOCK	-B	1-TBLK-293-3201 CR151B	-B	285	720' 3" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-3203 TERMINAL BLOCK	-A	1-TBLK-293-3203 CR151B	-A	235	721' 2" VARIOUS	AC3	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-3317 TERMINAL BLOCK	-B	1-TBLK-293-3317 CR151B	-B	280	732'11" VARIOUS	AC4	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-4326 TERMINAL BLOCK	-D	1-TBLK-293-4326 CR151B	-D	30	720' 5" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-4328 TERMINAL BLOCK	-D	1-TBLK-293-4328 CR151B	-D	050	721'11" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JLH 10/6/90		
CHECKED/DATE E.T.D. 7/26/86	[illegible] 10-30-90		

PRINT DATE: 10/10/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		LOCATION AZMITH	LOCATION ELEV(1) / CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-4330 TERMINAL BLOCK	-E	1-TBLK-293-4330 CR151B	-E	150	721' VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-4332 TERMINAL BLOCK	-E	1-TBLK-293-4332 CR151B	-E	135	721' 3" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-4334 TERMINAL BLOCK	-F	1-TBLK-293-4334 CR151B	-F	224	723' 7" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-4336 TERMINAL BLOCK	-F	1-TBLK-293-4336 CR151B	-F	229	720' 8" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER
WBN-1-TBLK-293-4338 TERMINAL BLOCK	-G	1-TBLK-293-4338 CR151B	-G	333	720' 9" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER

		R 5	R	R
PREPARER/DATE	J.L.H. 7/26/86	JLH 10/16/90		
CHECKED/DATE	E.T.O. 7/26/86	NBK 10-30-90		

PRINT DATE: 10/10/90

W A T T S   B A R   N U C L E A R   P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH (LOCATION)	ELEV(1) / CONTRACT (LOCATION)	RM/RAD (LOCATION)	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-TBLK-293-4340 TERMINAL BLOCK	-G	1-TBLK-293-4340 CR151B	-G	315	717' 1" VARIOUS	LC	A	100D	ALL	DISTRIBUTE POWER

	R 5	R	R
PREPARER/DATE J.L.H. 7/26/86	JLH 10/16/90		
CHECKED/DATE E.T.D. 7/26/86	HON 10-30-90		

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BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B1 OF B39

R 2 R 3

BINDER TITLE GENERAL ELECTRIC COMPUTED JLH DATE 7/30/86 CAG 9/18/89 JDH 3/7/90

TERMINAL BLOCKS CHECKED ETD DATE 7/30/86 WCG 9/20/89 WCG 3-21-90

A. DOCUMENTATION

Equipment Description Terminal Block

Vendor/Manufacturer General Electric Company

Equipment Model No.(s) CR151B

QUALIFICATION REPORTS

*(1) Title/Number/Revision "Nuclear Environmental Qualification Test Program on Terminal Blocks and Cables for Tennessee Valley Authority," Wyle Test Report No. 17733-1, Revision B RIMS B43 860514 501 DATE 3/19/86

(2) Title/Number/Revision RIMS

DATE

(3) Title/Number/Revision RIMS

DATE

OTHER (ANALYSIS, VENDOR DATA, ETC.)

*The report addresses the qualification of terminal blocks (coated and uncoated) and certain cables. Only the data on the terminal blocks (specimens 1 through 20) is used in this binder. R3

ADDITIONAL DOCUMENTATION

Other (Analysis, Vendor Data, etc) (Continued)

4. WBN-OSG4-048 R4 (B26 890510 504), "Equipment Submergence Requirements in Reactor Building."

5. WBNTSR-057R0 (B26 891221 201), "Beta Dose Reduction From Finite Volume."

6. TVA Environmental Drawing 47E235-Series (specifically 47E235-42 R2 and DCA P-04104-02-1 and DCA P-04104-03-0).

7. TVA Central Laboratories Technical Report M86-86-0032, dated November 13, 1985 (E13 851113 251), "TB Terminals From Sequoyah Nuclear Plant Environmental Qualification."

8. John A. Raulston memorandum, with attachments, to R. A. Sessoms dated November 20, 1985 (B45 851120 263).

9. WBNTSR-051R0 (B26 891129 202), Reduction of Beta by Sheet Steel.

10. TVA Central Laboratories Technical Report C186-86-1186, dated August 8, 1986 (E13 860808 251), "Examination of Electrical Terminal Blocks Manufactured by General Electric Company."

11. General Electric Company letter dated July 16, 1986 (B70 860721 100).

12. General Electric Company letter dated February 24, 1978. | R5

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-TB-001 PLANT WBN	UNIT(S) 1	SHEET B2 OF B39	R 1 R 2
BINDER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 7/16/86 CAG 1/17/89	9-18-89
TERMINAL BLOCKS	CHECKED ETD	DATE 7/18/86 JFW 1/23/89	9-20-89

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified *

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES *The conclusion of equipment qualified is conditional depending upon resolution of the technical issues listed (see front of binder). R2

COMMENTS/RECOMMENDATIONS The General Electric terminal blocks are qualified for inside and outside containment service for 40 years. The blocks are qualified for power and control applications in any area of the plant. R2 TVA supplied and installed terminal blocks in local junction boxes inside containment and the main steam valve vault rooms are coated with Dow Corning RTV 3140 coating.

R2

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET ___ OF ___
			R ___ R ___
BINDER TITLE GENERAL ELECTRIC	COMPUTED /R1 [illegible]	DATE 1-23-89	
TERMINAL BLOCKS	CHECKED /R1 JHW	DATE 1-23-89	

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BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B3 OF B39

BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS COMPUTED JHH DATE 7/26/86 R ___ R ___

CHECKED R.T.D. DATE 7/26/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of lE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS NA

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE Standard 344-1975

10CFR50/Appendix B

ANSI N45.2

NEMA ICS4

UL 1059

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B4 OF B39 R 2 R
BINDER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 7/16/86	9-18-89
TERMINAL BLOCKS	CHECKED ETD	DATE 7/18/86	9-20-89

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS | R2

PLUSEQ/28.22

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? Yes R5

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Terminal Block	Terminal Block	Page I-2, Par. 2.1
(2)	Manufacturer	General Electric	General Electric	Page I-2, Par. 2.1
(3)	Model Number(s)	CR151B Series	CR151B6	Page I-2, Par. 2.1
(4)	Serial Number(s)	NA	NA	NA

(5) Identify Component-Unique checksheet attached: NA

JUSTIFICATION/COMMENTS New CR151B6 blocks were tested in the Wyle Test Report No. 17733-1 Revision B, dated March 19, 1986. TVA concludes that the tested blocks' base material was mineral filled phenolic, rather than cellulose-filled pneholic, as Wyle concluded in the test program, since General Electric states in their letter to B. Hooper dated July 16, 1986 (See TAB E), that the block material was changed from cellulose-filled phenolic mineral-filled phenolic in May of 1983, approximately. This conclusion has been proven to be valid based upon a material analysis performed by TVA's Central Laboratories and documented in Report No. C186-86-1186 (see TAB C-3). R5

The CR151B terminal blocks in TAB A are composed of a phenolic material, either cellulose-filled or mineral-filled. These two types of phenolic materials are similar in appearance, texture, and resistance to the effects of high temperatures. R5

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BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B8 OF B39				
			R	R			
BINDER TITLE GENERAL ELECTRIC	COMPUTED JTH	DATE 7/16/86					
TERMINAL BLOCKS	CHECKED EWD	DATE 7/18/86					

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	Terminal Block Mounting Screws	(3) Yes	Page X-11, Par. 3.2.1
External Process Connections	None	NA	NA
Electrical Connections	Terminal Lugs (1) See Comment	(3) Yes	Page I-2, Par. 2.2.1
Conduit Seals	None	NA	NA
Connector Seals	None	NA	NA
Orientation	Horizontal or Vertical	(2)(3) No	Page X-10, Par. 3.2.1
Physical Configuration	Mounted Inside Enclosures	(3) Yes	Page VIII-3, Par. 2.1.1
Other	Junction Boxes and Jumper Wiring	(3)(4) Yes	Page I-2, Par. 2.2.1; Page VIII-3, Par. 2.1.1

JUSTIFICATION/COMMENTS (1) All terminations on terminal blocks at Watts Bar are made using prescribed materials and procedures per TVA General Construction Specification G-38. Included in G-38 are crimp type insulated and uninsulated terminals (tin coated for oxidation/corrosion inhibition and compatibility with terminal block materials) which are installed by using the appropriate terminal manufacturer's calibrated crimping tools. Sources for these terminals are the AMP Products Corp., Burndy Corp., and Thomas and Betts Company.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B9 OF B39

R ___ R ___

BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS COMPUTED JJH DATE 7/16/86

CHECKED ESD DATE 7/18/86

F. INSTALLATION INTERFACES (Continued)

The performance of the terminals in the test confirms the suitability of these materials. Terminal blocks screws are tightened to provide a snug connection with terminals, unless otherwise instructed by terminal block or terminal vendors. These procedures are required by TVA General Construction Specification G-38, "Installing Insulated Cables Rated Up to 15,000 Volts," and Watts Bar Nuclear Plant Modifications and Additions Instruction M&AI-4, "Installation and Inspection of Cable Terminations."

(2) Terminal block orientation in test was vertical with open conduit entering top of box. This allowed the chemical spray entering junction box to flow or drip down terminal block across adjacent circuits, thus increasing chances of leakage currents and subsequent failure of the safety-related circuits. Although the blocks were not located directly under the conduit entry in the test, the possibility exists that some blocks may be located directly under top entry conduits at Watts Bar. But in the high accident pressure areas where steam/chemical spray might be forced into the boxes (i.e., containment and the main steam valve vault rooms), the conduit systems are closed to minimize this possibility and the terminal blocks are coated inside containment and the main steam valve vault rooms to help protect them. Also see note (3).

F. INSTALLATION INTERFACES (Continued)

(3) The standard physical configuration is to install terminal blocks in enclosures per the National Electrical Code Article 110-17 and the NEMA Standard Publication 250. The attachment of the terminal blocks to the enclosure internal panels by mounting screws, the attachment of wiring to the terminal blocks by terminal lugs, and the orientation of the terminal blocks within the enclosures are all standard considerations in all terminal block applications/installations and do not require any special considerations for QMDS. Terminal blocks in WBN safety-related circuits are installed in gasketed and ungasketed sheet steel enclosures (see Binder WBNEQ-JBOX-001). The enclosures provide a degree of physical protection but are not relied upon for environmental qualification other than for direct spray impingement. The Wyle test program, 17733-1, qualified terminal blocks installed in NEMA 12 (gasketed) enclosures. However, since the enclosures had weepholes drilled in them and they had open conduits entering them, the test essentially applied to ungasketed enclosures, also.

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B11 OF B39
			R R
BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS	COMPUTED JBH	DATE 7/16/86	
	CHECKED EBD	DATE 7/18/86	

F. INSTALLATION INTERFACES (Continued)

(4) The environmental qualification of junction boxes and jumper wire interfaces of the terminal blocks is addressed in the following binders:

Binder No.	Interface
WBNEQ-JBOX-001	Junction Box
WBNEQ-CABL-044	Rockbestos XLPE Jumper Wire

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Page I-1, Par. 2.1
(b) Baseline performance measurements taken	Yes	Page I-3, Par. 2.3
(c) Equipment aged:		
Thermal	Yes*	Page IV-1, Par. 2.0
Radiation	Yes	Page II-1, Par. 2.0
Wear	Yes	See Page B-15 |R5
(d) Vibration/seismic testing conducted	Yes	Page VI-2, Par. 2.0
(e) Design basis event (DBE) exposure	Yes	Page VIII-4, Par. 2.4
(f) Post-DBE exposure	Yes	Page VIII-4, Par. 2.4
(g) Final inspection and disassembly	Yes	Page IX-1, Par. 3.0

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference Page vii, paragraph 8.0).

JUSTIFICATION/COMMENTS *Only coated terminal blocks were thermally aged, since the Dow Corning RTV 3140 was considered to be sensitive to thermal aging. The uncoated blocks in the test were not thermally aged, since the thermal bock materials were deemed not age-sensitive to time-temperature effects (see 17733-1, page X-19, paragraph 3.6.5 and Page B-15). |R5

G.(1)(c) Thermal - The basis for evaluating the thermal sensitivity of each non-metallic material is to determine the expected life in its service environment. Per Wyle Test Report No. 17733-1, Page X-52, if the expected life is greater than 1,000 years for materials located in a mild environment, and 10,000 years for materials located in a harsh environment, the material is considered age insensitive for the application. Page X-32, Table II, gives the expected life of phenolic as 6 x 10^6 years at 49°C (120°F) and page X-30, Table I, states that phenolic is age insensitive.

A test report by R. M. Schuster of General Electric Company dated November 6, 1973, "Terminal Block LOCA Test for Electrical Penetration Assemblies" showed that terminal block performance was not significantly affected by high temperatures (260°F minimum and 340°F maximum during a 10-day test). See TAB E. R5

Sandia Laboratories Report No. NUREG/CR3691 dated September 1984, "An Assessment of Terminal Blocks in the Nuclear Power Industry," concluded that the terminal block phenolilc material is not a significant factor to terminal block failures, but rather leakage currents caused by conductive film formation on the terminal block insulating surfaces. Several sources exist which contribute to the film formation: contaminants (dust, manufacturing residues, body salts from handling, etc.) in the block crevices and on its surfaces; corrosion of the block metallics (conductive strips, screws) and condensation formed from both normal and accident conditions.

G.(1)(c) Wear - The terminal blocks contain no moving parts and thus, wear aging is not appropriate for this equipment. The blocks are passive electrical devices that are energized at levels below the manufacturer's ratings (30A,600V). Thus there are no electrical, mechanical, or process stresses induced in them.

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B14	OF B39			
			R	R			
BINDER TITLE GENERAL ELECTRIC		COMPUTED JJH	DATE 7/16/86				
TERMINAL BLOCKS		CHECKED ETD	DATE 7/18/86				

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Page IV-1, par. 2.0 and Page II-1, par. 2.0).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Page IV-1, Par. 2.0
Radiation exposure	Yes	Page II-1, Par. 2.0
Vibration (non-seismic) aging	No	See TAB C
Operational (electrical/mechanical/process) stress aging	No	See Sht. B1

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA. (Reference NA).

JUSTIFICATION/COMMENTS See sheet B15.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Page IV-1, par. 2.0).

JUSTIFICATION/COMMENTS

TEST SEQUENCE AND SYNERGISTIC EFFECTS, SECTIONS G AND H (3)

A review of NUREG/CR-2157 and 2932 determined that there are no known synergistic effects on the RTV coating material that would cause unsatisfactory performance of the terminal blocks. The terminal block materials were assumed to be insensitive to thermal aging effects, and the test program proved that they are not sensitive to radiation effects of the levels exposed. As shown in Sections I, III, and V of Wyle Test Report 17733-1 (see TAB D), the result of sequential radiation and thermal aging on the thermal block coating material was increased insulation resistance after each exposure from initial baseline measurements. No visible damage or degradation to the terminal blocks or coating had occurred. Because each exposure (thermal aging and radiation exposure) on its own increased the insulation resistance of the blocks, it is reasonable to conclude that the reverse sequence of exposure or simultaneous exposure to these parameters would have the same effect. It is concluded that sequence has no effect on these materials.

No dose rate synergisms are known to apply to the RTV or terminal block materials. Moisture is the only other environmental parameter that could have a potential synergistic effect on the terminal blocks. EPRI Report No. NP-2129, "Radiation Effects on Organic Materials in Nuclear Plants," states that cellulose-filled phenolics become more susceptible to moisture damage after irradiation. However, this phenomenon was not observed in Wyle Test Report 17733-1. Also, any moisture induced cracking of the phenolic insulating material would be minimized as the entire block is held intact and rigid by the mounting screws. In addition, changes in relative humidity could cause condensation to form on the terminals, thus increasing the chances of corrosion; however, terminal blocks in areas that experience periods of 100 percent relative humidity during nonaccident conditions (i.e., containment and the main steam valve vault rooms are coated with Dow Corning RTV 3140 coating.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Section X, paragraph 3.6 through 3.6.4.1: Tables I and II: Appendix IV).

JUSTIFICATION/COMMENTS Phenolics were shown not to be age-sensitive. (Refer to Justification/Comments, Section I). R5

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Page X-15, paragraph 3.6).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Page X-16, paragraph 3.6.4.1: Page X-19, paragraph 3.6.5).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	130°F (54.4°C)	90°C	130°F (54.4°C) R5
Time	40-years	498 hrs	40-years

JUSTIFICATION/COMMENTS See Page B-19A

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Page X-49, Appendix IV).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference Page X-16, paragraph 3.6.4.1).

JUSTIFICATION/COMMENTS The RTV activation energy was used as the basis for the aging program because phenolics are not age-sensitive. Resultant age-conditioning was comparable to 40 years on the RTV coating. R5

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference See below).

JUSTIFICATION/COMMENTS Regression line not used.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference Page X-19, paragraph 3.6.5).

JUSTIFICATION/COMMENTS See sheet B18.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Page II-1, paragraph 2.0).

JUSTIFICATION/COMMENTS ___

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference Page X-30, Items 1.1 & 1.2; Page X-14, paragraph 3.4.1).

JUSTIFICATION/COMMENTS ___

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Page X-15, paragraph 3.4.3).

JUSTIFICATION/COMMENTS ___

H. AGING (Continued)

4. (d) JUSTIFICATION/COMMENTS (continued)

Thermal aging performed in the Wyle 17733-1 test program equates to a qualified life of 40 years at 120°F and 14.2 | R5 years at 130°F (maximum normal temperature in the MSVV rooms). Based on the following, however, the qualified life is extended to 40 years at 130°F.

The thermal aging program was performed to assess time-temperature effects on the RTV coating, since the terminal block phenolic material was determined to be insensitive to thermal aging effects over a 40-year lifetime for temperatures present at Watts Bar. Since the coating has a U.L. rating of 365°F (180°C) (per page X-17, Section 3.6.4.1.2 of 17733-1), it is reasonable to expect it to be qualified for 40 years at 130°F. The results of the 17733-1 test program revealed that there is little difference, if any, on terminal block performance during an accident whether or not they are coated. Therefore, for DBE qualification, the presence of RTV coating on the blocks is not required. However, as an added measure of conservatism, TVA applies the coating to blocks inside containment and the MSVV rooms to help protect the terminal block conducting materials (terminal screws and connector plates) from corrosion and potential leakage currents if the block is exposed to moisture.

H.(4)(h) JUSTIFICATION/COMMENTS - The terminal blocks were not energized during thermal aging sequence of Wyle test program 17733-1 for the following reasons:

1. The terminal blocks are passive devices. Thus, there is no need to monitor their performance during thermal aging.
2. Any temperature rise in the blocks' enclosures due to energization is negligible due to the following:
   a. The results of the 17733-1 test program revealed that there is little difference, if any, on terminal block performance during an accident whether or not they are coated. Thus, the effect of temperature on the coating material is irrelevant. Wyle had concluded that the terminal block materials were not sensitive to time-temperature effects over a 40-year lifetime (page X-19, paragraph 3.6.5).
   b. There is minimal thermal contribution from terminal blocks inside enclosures because: (1) instrumentation circuits operate with low current, thus there is no heat rise and (2) safety-related control circuits are operated only periodically.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: Page II-1 Para. 2.0).

Plant normal ambient radiation dose (rd)	2.0×10^{7} gamma
Test exposure dose (rd)	2.534×10^{8} gamma
Test exposure dose rate (rd/hr)	$<1.0 \times 10^{6}$
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program* No (Reference: NA).

JUSTIFICATION/COMMENTS Equipment installed in enclosures which are rigidly mounted. See TAB C (pg C2). R2

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? NA (Reference: NA).

JUSTIFICATION/COMMENTS

* Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the binder.

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B20 OF B39
BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS	COMPUTED JBH	DATE 7/16/86	R R
	CHECKED ETW	DATE 7/18/86	

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS See sheet B13.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See sheet B13.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference Page v, paragraph 4.0).

Qualified life (Document in QMDS) 40-years

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? No
(Reference: See below

). R1

JUSTIFICATION/COMMENTS No replacement intervals; Terminal blocks qualified for 40 years.

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B220FB39 R 3 R
BINDER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 7/16/86	JDH 3/7/90
TERMINAL BLOCKS	CHECKED ETD	DATE 7/18/86	WCJ 3-21-90

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis).

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	DOW Corning RTV 3140 Coating	unknown	Page X-30	1.61	Page X-30
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS The phenolic material forms the base of the terminal block and is used as the insulating material between circuits on the block. The RTV coating is used to help protect the terminal block conducting materials (terminal screws and connector plates) from corrosion and potential leakage currents if the block is exposed to moisture. The RTV activation energy was used as the basis for the thermal aging program because phenolics are not age-sensitive. The resultant age-conditioning was equivalent to 37 years on the terminal blocks that had the coating, the coating was R3 aged to the equivalent of 40 years (activation energy 1.61). A detailed analysis for the phenolic and coating is presented in Wyle Test Report No. 17733-1, Section X, paragraphs 3.4 and 3.6.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B23 OF B39

R ____ R ____

BINDER TITLE GENERAL ELECTRIC COMPUTED JLH DATE 7/16/86

TERMINAL BLOCKS CHECKED ETD DATE 7/18/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Page VIII-2, paragraph 1.5).

Identify Acceptance Criteria: The terminal blocks shall distribute sufficient power for proper operability of end devices during the LOCA test. Proper operability of (see sheet B24).

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Page VIII-2, paragraph 1.5).

Identify baseline and functional testing: Insulation resistance measurements after thermal aging, radiation exposure, seismic testing, load current monitoring during accident simulation, and periodic leakage current measurements during accident simulation.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Page VIII-2, paragraph 1.5.1).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B24	OF B39			
				R	R		
BINDER TITLE GENERAL ELECTRIC		COMPUTED JPH	DATE 7/16/86				
TERMINAL BLOCKS		CHECKED ETD	DATE 7/18/86				

J.(1)(Continued): end devices is defined as follows:

1. RTD End Devices - The output resistance shall be within ± 20 percent of the values recorded during the pre-LOCA operability checks.

2. Transmitter End Devices - The output currents shall be within ± 20 percent of the values recorded during the pre-LOCA operability checks.

3. Solenoid Valve End Devices - The solenoid valves shall remain energized during the LOCA test and not change state.

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B25 OF B39 R 1 R
BINDER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 9/15/86	1-6-89
TERMINAL BLOCKS	CHECKED ETD	DATE 9/15/86	1-6-89

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? No (Reference: NA).

JUSTIFICATION/COMMENTS See Page B-29. R1

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	120 VAC, 125 VDC	NA
Load	NA (1)	NA (1)
Frequency	NA (1)	NA (1)
Accuracy	NA (2)	NA (2)
Other(s)		

R1

JUSTIFICATION/COMMENTS (1) Electrical parameters for terminal blocks, under specified accident conditions, are the same as under plant normal conditions. The Watts Bar terminal blocks are used in control applications where control circuit loads range up to 1 amp (typically these loads are less than 1 amp).

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Specific Accident Conditions	Reference | R1
Voltage	120 VAC, 125 VDC	NA
Load	NA (1)	NA (1)
Frequency	NA (1)	NA (1)
Accuracy	NA (2)	NA (2)
Other(s)		

JUSTIFICATION/COMMENTS

(5)(c)

Parameter	Demonstrated Conditions	Reference | R1
Voltage	120 VAC, 125 VDC (3)	pV111-20
Load	432ma, 108ma	pV111-20
Frequency	NA	NA
Accuracy	(2)	(2)
Other(s) NA	NA	NA

JUSTIFICATION/COMMENTS (2) The test program was designed to determine the ability of the terminal blocks to provide sufficient power for proper operability of end devices during an accident at loads typical of those at Watts Bar. There are no 10CFR50.49 instrumentation transmitter and RTD circuits terminated on terminal blocks at Watts Bar. Therefore, accuracy is not a consideration. The demonstrated values of voltage and load throughout the test compared

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(c)

JUSTIFICATION/COMMENTS (continued)

close to values which were predetermined by pre-LOCA operability checks of the end devices.

(3) See TAB C, sheet C-9, for discussion of qualification of terminal blocks for 480 VAC applications.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B27 OF B39

R ___ R ___

BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS

COMPUTED JJH DATE 7/16/86

CHECKED ETD DATE 7/18/86

J.(4) JUSTIFICATION/COMMENTS

Only insulation resistance measurements were performed for baseline testing. Testing for operability with test loads was considered unnecessary because terminal blocks are not complex equipment, and insulation resistance measurements and visual inspection did not provide indication to the contrary that the terminal blocks would not carry the load. Pre-accident simulation load conditions were established. See J.(5).

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Worst case 47E235-42 and 47E235-76 | R5

(1) Normal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) $2x10^7$

(2) Abnormal Max

(a) Temperature (°F) 140 | R5

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA | R5

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) *340 Accident type HELB | R5

(b) Pressure (psig) 11.2 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd)** $4.7x10^8$ Beta $4.0x10^7$ Gamma Accident type LOCA | R5

(e) Spray Type Chemical Accident type LOCA/HELB

*See page B-32 for discussion of this temperature.

**See TAB C, page C-105, for explanation of beta dose radiation and gamma equivalent calculation. | R5

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): Spray duration is 30 days and flow rate is 0.92 gpm/ft^2. Spray composition is an alkaline borate solution (pH 8.3) produced by mixing boric acid with sodium tetraborate.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: Section P, Discussion). R5

(7) Subject to submergence (Yes/No/NA)? No (Reference: ______). R5

Identify initiation time and duration of submergence: ______

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes
(Reference: WBNTSR-051, TVA DWG 47E235-42).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: Terminal blocks are located in junction boxes which are conservatively assumed to be fabricated of 16 GA sheet steel which provides a beta reduction factor of 9.98E-02. Therefore, the max Beta dose the TB's will be exposed to is 4.7E+07 rads.

See page C-105.

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B, Section A	

K. REQUIRED OPERATING ENVIRONMENT (continued)

(5)(a)
Accident temperature: A peak temperature of 535°F occurs in the main steam valve rooms in the event of a main steam line break (MSLB) per TVA environmental drawing 47E235-76. However, QIR MNMWBN90057 documents a peak temperature exposure to the terminal block after the MSLB of 340°F for qualification purposes. This value will be revised after WBN specific thermal lag analysis is completed in 1991.

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B30 OF B39	R 3	R 5
BINDER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 9/15/86		JDH 3/7/90	JDH 9/14/90
TERMINAL BLOCKS	CHECKED ETD	DATE 9/15/86		WCG 3/21/90	[illegible] 10-31-90

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	83 hours	PP VIII-28, 29, 30 P X-26, Par. 3.10.7
Temperature (°F)	340	350	P VIII-28 |R5
Pressure (psig)	NA	NA	NA
Relative Humidity (%)	100	100	P X-25, Par. 3.10.7 P VIII-28
*Chemical Spray	2000ppm boron pH 8.3	2000ppm boron pH 8.3 + 1	P VIII-4 Par. 2.4
Radiation (rd)*	2.31E+08gamma and beta	2.53E+08gamma	p II-1 Par. 2.0
Submergence	NA	NA	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See TAB C, page C-105, for Beta Radiation Dose Reduction Calculation

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	P VIII-28
Pressure	Yes	P VIII-28
Relative Humidity	Yes	P VIII-28
Chemical Spray	Yes	P VIII-4
Submergence	NA	NA

JUSTIFICATION/COMMENTS

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)		Margin Applied	Yes/No/NA
		See Page B-32	
Temperature: +15 degrees F		10°F	Yes | R5
Pressure: +10% but no more than 10 psig	(4)	NA	NA
Radiation: +10% of accident dose		+ 10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)		None	Yes
Voltage: ±10% of rated value	(1)	None	NA
Frequency: ±5% of rated value	(1)	None	NA
Environmental Transient: the initial transient and the peak temperature applied twice	(2)	NA	NA
Vibration: +10% added to acceleration	(3)	NA	NA

JUSTIFICATION/COMMENTS (1) Only the necessary levels of voltage and frequency to operate the end devices were applied.

(2) Although required by IEEE-323(74), the twice applied environmental transient is generally recognized to not be needed if sufficient margin is added to the temperature and pressure parameters. This is consistent with the option provided in IEEE-323(83).

(3) The terminal blocks were qualified seismically as devices in the test program, which is more stringent than qualification as assemblies, which they are, as actually installed (mounted inside enclosures which are affixed to some rigid structure).

(4) Pressure is not a failure mode for terminal blocks.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference: Page X-9, paragraph 2.2).

JUSTIFICATION/COMMENTS The terminal blocks distribute sufficient power for proper operability of safety-related devices before, during, and after design basis accidents.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (Yes/No/NA)? Yes
(Reference: Page VIII-5, paragraph 3.0).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (Yes/No/NA)? Yes (Reference: Page VIII-5, paragraph 3.0).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (Yes/No/NA)? Yes (Reference: Page VIII-5, paragraph 3.0; TAB C, Page C-54). R5

JUSTIFICATION/COMMENTS

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (Yes/No/NA)? Yes
(Reference: Pages ii, iii, iv, v; paragraph 4.0).

JUSTIFICATION/COMMENTS Only Anomalies 1 and 2 are applicable to the terminal blocks being addressed in this binder. Anomalies 3-5 apply to cables which are addressed in other binders. See Section P for discussion of anomalies.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEETB34 OFB39 R 3 R
BINDER TITLE GENERAL ELECTRIC	COMPUTED JLH	DATE 7/16/86	JDH 3/7/90
TERMINAL BLOCKS	CHECKED ETD	DATE 7/18/86	WCP 3-21-90

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	Yes
(d) Materials susceptible to thermal/radiation aging identified?	Yes

R3

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B35	OF B39	
			R	R	
BINDER TITLE GENERAL ELECTRIC		COMPUTED JHH	DATE 7/16/86		
TERMINAL BLOCKS		CHECKED EAD	DATE 7/18/86		

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-TB-001	PLANT WBN	UNIT(S) 1	SHEET B36 OF B39				
			R		R		
BINDER TITLE GENERAL ELECTRIC	COMPUTED JSH	DATE 7/16/86					
TERMINAL BLOCKS	CHECKED ETD	DATE 7/16/86					

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

See sheet B37.

TVA 19537 (OE-3-86) EQP127.31

P. DISCUSSION (Continued)

1. The terminal blocks are used to terminate circuits of safety-related equipment inside and outside containment and applications are in the 120 VAC and 125 VDC range. All 10CFR50-49 instrumentation transmitter and RTD circuits have been spliced out at Watts Bar. This action was taken to relieve uncertainties due to leakage currents which are inherent in low voltage instrumentation circuit/terminal block applications under accident conditions and which degrade instrumentation signal levels/loop accuracies. Wyle test program 17733-1 showed that leakage currents are a potential problem for terminal blocks in accident conditions, and corrosion is a contributing factor to the leakage current. The test program also showed that coating of terminations can reduce the levels of leakage currents. Coating will also reduce corrosion effects during normal, nonaccident conditions. TVA-supplied and installed terminal blocks used in local junction boxes inside containment and the main steam valve vault rooms at Watts Bar in safety-related circuits are coated with Dow Corning RTV 3140. R3

P. DISCUSSION (Continued)

The blocks are constructed of a phenolic material and are rated for 30 amps and 600 volts. They utilize screw terminals for circuit wire connections. The terminal blocks are mounted in enclosures to provide a degree of protection from the environment. All 10CFR50.49 terminal blocks are located above the maximum postulated flood levels. Terminal block enclosures in areas susceptible to high accident pressures (containment and the main steam vault rooms) and areas subject to moisture instrusion (see environmental drawings) have weep holes drilled in them. | R3

Wyle Laboratories test program 17733-1 proved that the terminal | R3
blocks are qualified for 40 years and will perform adequately before, during, and after design basis accidents.

2. Anomalies that occurred during the Wyle Laboratories 17733-1 test program that could affect the terminal blocks' ability to perform their safety functions are addressed below:

   A. Anomaly No. 1: Terminal barriers on terminal block specimens 2, 4, and 15 were broken during shipment from the radiation facility. Since the functional operability of the terminal blocks was demonstrated in subsequent functional tests and accident testing, the damage does not affect the qualification of the terminal blocks.

P. DISCUSSION (Continued)

B. Anomaly No. 2: The output of the RTD end device for terminal block specimens 4 and 9 was less than the required 1.04 mA (approximately 0.9 mA) after 15 hours into the LOCA test. Measurements taken on the blocks revealed that specimen 4 was the problem. Testing was continued successfully with specimen 9 only in the circuit. A post-LOCA inspection of specimen 4 revealed a loose terminal screw. The screw was tightened and the voltage was applied to specimen 4 only with the RTD end device. The output was normal, indicating that the cause of the anomaly was probably the loose screw, and the terminal block would have performed adequately in the test with the tightened screw.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

R ___ R ___

BINDER TITLE BARTON 764 COMPUTED AWL DATE 5/22/86

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

XMTR-001

TAB A - Identification of Equipment

Comprising the Equipment Type

PRINT DATE: [illegible]14/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FT -001-0003A -D SG1 MAIN STEAM HDR FLOW CHAN 1	1-FT -001-0003A -D 764 LOT 7		 71C62-54114-1	(3)	A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0003B -E SG1 MAIN STEAM HDR FLOW CHAN 2	1-FT -001-0003B -E 764 LOT 7		 71C62-54114-1	(3)	A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0010A -D SG2 MAIN STEAM HDR FLOW CHAN 1	1-FT -001-0010A -D 764 LOT 7		 71C62-54114-1	(3)	A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0010B -E SG2 MAIN STEAM HDR FLOW CHAN 2	1-FT -001-0010B -E 764 LOT 7		 71C62-54114-1	(3)	A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0021A -D SG 3 MAIN STEAM HDR FLOW CHAN 1	1-FT -001-0021A -D 764 LOT 7		 71C62-54114-1	(3)	A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW

		R 1	R 2	R
PREPARER/DATE	A.W. Lewis 9/23/86	WCG 2-24-89	WCG 3-21-90	
CHECKED/DATE	D.D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	

PRINT DATE: 07/06/90

BINDER NO. : WBNEQ-XMTR-001
MANUFACTURER : BARTON

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-FT -001-0021B -E SG 3 MAIN STEAM HDR FLOW CHAN 2	1-FT -001-0021B -E 764 LOT 7		(3) 71C62-54114-1		A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0028A -D SG 4 MAIN STEAM HDR FLOW CHAN 1	1-FT -001-0028A -D 764 LOT 7		(3) 71C62-54114-1		A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0028B -E SG 4 MAIN STEAM HDR FLOW CHAN 1	1-FT -001-0028B -E 764 LOT 7		(3) 71C62-54114-1		A A	5MIN 5MIN	MS/C FW/C	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-LT -003-0038 -E SG 1 LEVEL XMTR (NR)	1-LT -003-0038 -E 764 LOT 7		(3) 71C62-54114-1		A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM/TMI
WBN-1-LT -003-0039 -F SG 1 LEVEL XMTR (NR)	1-LT -003-0039 -F 764 LOT 7		(3) 71C62-54114-1		A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM

|R4

PAGE A-3

R4

	R 1	R 2	R 4
PREPARER/DATE A.W. Lewis 9/23/86	WCG 1-24-89	WCG 3-21-90	WCG 5-30-90
CHECKED/DATE B. D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	EB-M 8/3/90

PRINT DATE: 07/06/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	---LOCATION--- AZMITH	ELEV(1) CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-LT -003-0042 -G SG 1 LEVEL XMTR (NR)	1-LT -003-0042 -G 764 LOT 7		 71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L FW/C MS/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM /TMI
WBN-1-LT -003-0043 -F STM GEN 1 LEVEL WIDE RANGE	1-LT -003-0043 -F 764 LOT 7		 71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L FW/C MS/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF A SG HAS BLOWN DRY. ALSO USED FOLLOWING RX TRIP WHEN THE NR LVL IS TEMPORARILY OFF SCALE. PAM
WBN-1-LT -003-0051 -D SG 2 LEVEL XMTR (NR)	1-LT -003-0051 -D 764 LOT 7		 71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM/TMI
WBN-1-LT -003-0052 -F SG 2 LEVEL XMTR (NR)	1-LT -003-0052 -F 764 LOT 7		 71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L FW/C MS/C CV/C RH/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM /TMI
WBN-1-LT -003-0055 -G SG 2 LEVEL XMTR (NR)	1-LT -003-0055 -G 764 LOT 7		 71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM/ TMI

R4 R4 R4 R4

		R 1	R 2	R 4
PREPARER/DATE	A.W. Lewis 9/23/86	WCG 2-24-89	WCG 3-21-90	[illegible] 8-30-90
CHECKED/DATE	B.D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	[illegible] 8/30/90

PRINT DATE: 07/06/90

BINDER NO. : WBNEQ-XMTR-001
MANUFACTURER : BARTON

W A T T S   B A R   N U C L E A R   P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION	
WBN-1-LT -003-0056 -G STM GEN 2 LEVEL WIDE RANGE	1-LT -003-0056 -G 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L FW/C MS/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF A SG HAS BLOWN DRY. ALSO USED FOLLOWING RX TRIP WHEN THE NR LVL IS TEMPORARILY OFF SCALE. PAM	
WBN-1-LT -003-0093 -D SG 3 LEVEL XMTR (NR)	1-LT -003-0093 -D 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM/TMI	R4
WBN-1-LT -003-0094 -F SG 3 LEVEL XMTR (NR)	1-LT -003-0094 -F 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM / TMI	R4
WBN-1-LT -003-0097 -G SG 3 LEVEL XMTR (NR)	1-LT -003-0097 -G 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C CV/C RH/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM / TMI	R4
WBN-1-LT -003-0098 -G R4 SG 3 LEVEL XMTR (WR)	1-LT -003-0098 -G 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L FW/C MS/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF A SG HAS BLOWN DRY. ALSO USED FOLLOWING RX TRIP WHEN THE NR LVL IS TEMPORARILY OFF SCALE. PAM	

PAGE A-5 R4

		R 1	R 2	R 4
PREPARER/DATE	A.W. Lewis 9/23/86	WCG 2-24-89	WCG 3-21-90	[illegible] 8-30-90
CHECKED/DATE	B.D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	EEM 8/31/90

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	LOCATION AZMITH	LOCATION ELEV(1) CONTRACT	LOCATION RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-LT -003-0106 -E SG 4 LEVEL XMTR (NR)	1-LT -003-0106 -E 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM/TMI
WBN-1-LT -003-0107 -F SG 4 LEVEL XMTR (NR)	1-LT -003-0107 -F 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM
WBN-1-LT -003-0110 -G SG 4 LEVEL XMTR (NR)	1-LT -003-0110 -G 764 LOT 7		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF SI CAN BE TERMINATED, CONTROL SG LVL AND DETECT A BREACH OF CONTAINMENT THRU THE SG. PAM /TMI
WBN-1-LT -003-0111 -F SG 4 LEVEL XMTR (WR)	1-LT -003-0111 -F 764 LOT 4		71C62-54114-1	(3)	A A A A A	100D 100D 100D 1MO 1MO	L FW/C MS/C RH/C CV/C	MEASURES SG WATER LVL TO DETER MINE IF A SG HAS BLOWN DRY. ALSO USED FOLLOWING RX TRIP WHEN THE NR LVL IS TEMPORARILY OFF SCALE. PAM
WBN-1-PDT -030-0042 -G CNTMT PRESS DIFF XMTR	1-PDT -030-0042 -G 764 LOT 7	301	728' 7" 71C62-54114-1	ANN	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM

	R 1	R 2	R 4
PREPARER/DATE A.W. Lewis 9/23/86	WCG 2-24-89	WCG 3-21-90	WCG 8-30-90
CHECKED/DATE B.D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	EEM 8/30/90

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER DESCRIPTION	UNIT DEVICE ID NO. MODEL NUMBER	AZMITH	--------LOCATION-------- ELEV(1) CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PDT -030-0043 -F CNTMT PRESS DIFF XMTR	1-PDT -030-0043 -F 764 LOT 7	296	729' 1" 71C62-54114-1	ANN	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
WBN-1-PDT -030-0044 -E CNTMT PRESS DIFF XMTR	1-PDT -030-0044 -E 764 LOT 7	285	746' 1" 71C62-54114-1	ANN	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
WBN-1-PDT -030-0045 -D CNTMT PRESS DIFF XMTR	1-PDT -030-0045 -D 764 LOT 7	307	728' 7" 71C62-54114-1	ANN	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
WBN-1-LT -063-0180 -D CNTMT LEVEL MIN LEVEL RHR RECIR	1-LT -063-0180 -D 764 LOT 7	169	720' 3" 71C62-54114-1	FN2	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	DETECT HIGH SUMP WATER LVL INITIATE SWITCHOVER ON LOW RWST, PAM
WBN-1-LT -063-0181 -E CNTMT LEVEL MIN LEVEL RHR RECIR	1-LT -063-0181 -E 764 LOT 7	359	720' 2" 71C62-54114-1	FN1	A A A A A	100D 100D 100D 1MO 1MO	L MS/C FW/C RH/C CV/C	DETECT HIGH SUMP WATER LVL INITIATE SWITCHOVER ON LOW RWST, PAM

PAGE A-7 R2

		R 1	R 2	R
PREPARER/DATE	A.W. Lewis 9/23/86	WCG 2-24-89	WCG 3-21-90	
CHECKED/DATE	B.D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION		UNIT DEVICE ID NO. / MODEL NUMBER		AZMITH	LOCATION ELEV(1) / CONTRACT	RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-LT -063-0182	-F	1-LT -063-0182	-F	277	720' 2"	AC4	A	1WK	L	DETECT HIGH SUMP WATER LVL
CNTMT LEVEL MIN LEVEL RHR RECIR		764 LOT 7			71C62-54114-1		A	1WK	MS/C	INITIATE SWITCHOVER ON LOW
							A	1WK	FW/C	RWST
							A	1WK	RH/C	
							A	1WK	CV/C	
WBN-1-LT -063-0183	-G	1-LT -063-0183	-G	072	720' 2"	IIR	A	1WK	L	DETECT HIGH SUMP WATER LVL
CNTMT LEVEL MIN LEVEL RHR RECIR		764 LOT 7			71C62-54114-1		A	1WK	MS/C	INITIATE SWITCHOVER ON LOW
							A	1WK	FW/C	RWST
							A	1WK	RH/C	
							A	1WK	CV/C	
WBN-1-LT -068-0320	-F	1-LT -068-0320	-F	120	730'10"	IIR	A	100D	L	ISOLATE RCS LETDOWN, CONTROL
RCS PRZR LEVEL		764 LOT 7			71C62-54114-1		A	100D	MS/C	RCP SEAL WATER INJECTION, PAM-
							A	100D	FW/C	MUST BE MONITORED TO ENSURE
							A	1MO	CV/C	PROPER RCS PRESS AND INVENTORY
							A	1MO	RH/C	CONTROL DURING EACH EVENT.
WBN-1-LT -068-0335	-E	1-LT -068-0335	-E	085	732' 4"	IIR	A	100D	L	ISOLATE RCS LETDOWN, CONTROL
RCS PRZR LEVEL		764 LOT 7			71C62-54114-1		A	100D	MS/C	RCP SEAL WATER INJECTION, PAM-
							A	100D	FW/C	MUST BE MONITORED TO ENSURE
							A	1MO	CV/C	PROPER RCS PRESS AND INVENTORY
							A	1MO	RH/C	CONTROL DURING EACH EVENT.
WBN-1-LT -068-0339	-D	1-LT -068-0339	-D	103	732' 8"	IIR	A	100D	L	ISOLATE RCS LETDOWN, CONTROL
RCS PRZR LEVEL		764 LOT 7			71C62-54114-1		A	100D	MS/C	RCP SEAL WATER INJECTION, PAM-
							A	100D	FW/C	MUST BE MONITORED TO ENSURE
							A	1MO	CV/C	PROPER RCS PRESS AND INVENTORY
							A	1MO	RH/C	CONTROL DURING EACH EVENT.

R

		R 1	R 2	R 5
PREPARER/DATE	A.W. Lewis 9/23/86	WCG 2-24-89	WCG 3-21-90	WCP 10-15-90
CHECKED/DATE	B.D. Meyer 9/23/86	HDR 3-3-89	HDR 3-21-90	EEM 10/16/90

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R5

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET ___ OF ___
			R ___ R ___
BINDER TITLE BARTON 764	COMPUTED /R1 WCJ	DATE 2-24-89	___ ___
LOT 7 AND 4	CHECKED /R1 JDR	DATE 3-3-89	___ ___

TAB A

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-3 for source of Category and Operating Time assignments.

3. ECN 5974 is relocating these transmitters. See Open Item No. 1.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 1	OF 1
BINDER TITLE BARTON 764	COMPUTED AHL	DATE 5-22-86	R	R
LOT 7 AND 4	CHECKED [illegible]	DATE 5/22/86		

TAB B - CHECKLIST FOR EVALUATION OF

ENVIRONMENTAL QUALIFICATION

INCLUDING SUMMARY AND CONCLUSION

TVA 19537 (OE-3-86)

EQP085.41

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 1 OF 24
			R 1 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86 awl 2-24-89	
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86 BDM 3-3-89	

A. DOCUMENTATION

Equipment Description: Refer to TAB A

Vendor/Manufacturer: Westinghouse/Barton

Equipment Model No.(s): 764 Lot 7

764 Lot 4

QUALIFICATION REPORTS

(1) Title/Number/Revision WCAP-8687, Supp. 2-EQTR-E03A, Revision 2* — RIMS NEB 840807 362 |R1 — DATE 3/83

(2) Title/Number/Revision WCAP-8587, Supp. 1-EQDP-ESE-3A, Revision 4 — RIMS NEB 840807 361 |R1 — DATE 11/83

(3) Title/Number/Revision WCAP-8587 - Methodology Revision 6 — RIMS NEB 840724 354, NEB 840724 353 — DATE 3/83

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) QRN 67142

(5) QRN 68859

(6) QRN 68872

(7) QRN 68188

(8) QRN 68284

(9) QRN 68873

*All references in TAB B are to this test report unless otherwise noted.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 1A OF 24 R 5 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86	WCT 10-15-90
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86	EEM 10/16/90

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(10) QRN 67149

(11) QRN 74904

(12) QRN 67151

(13) QRN 67150

(14) QRN 68857

(15) QRN 56177

(16) Auditable Link Document (B45 860521 351)

(17) Calculation EQP-02 (B71 860402 200)

(18) WBNNAL3-004 (B45 860205 235)

(19) WBNTSR-051 (B26 891129 202)

(20) Deleted

(21) Cat. and Oper. Time WBNOSG4-004 R11-System 1 (B18 900612 253)

(22) Cat. and Oper. Time WBNOSG4-005 R12-System 3 (B26 900824 201)

(23) Cat. and Oper. Time WBNOSG4-008 R16-System 30 (B26 900717 201)

(24) Cat. and Oper. Time WBNOSG4-014 R12-System 63 (B26 900713 212)

(25) Cat. and Oper. Time WBNOSG4-017 R11-System 68 (B18 900612 252)

(26) 1-LT-3-038 (B26 900809 405)

(27) 1-LT-63-180 (B18 900723 251)

(28) 1-LT-3-43 (B18 900825 255)

(29) Setpoint Methodology (B26 890515 928)**

(30) 1-LT-68-335 (B18 900918 254) |R5

(31) WAC-310
(31a) L-LS-63-180 (B26 900823 413)

**See Open Item No. 4

WBEP-0096Q

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 1B OF 24 R 3 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86 WCD 6-15-90	
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86 EEM 6/15/90	

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(32) WAC-311

(32) WAC- 16

(34) WAC-21

(35) Demonstrated Accuracy Calculation 1-PDT-30-42 (B18 900613 251) R3

(36) WAC-23

(37) WAC-28

(38) WAC-26

(39) WAC-29

(40) WAC-27

(41) WAC-95

(42) WAC-72

(43) Spec. Sheets 01410 - (NEB 840302 352 and NEB 840302 353)

(44) Spec. 955270 Rev 2 - (B45 850423 359)

(45) Spec. 953328 Rev 3 - (B45 850508 351)

(46) TVA-85-176 - (B70 850925 006)

(47) WAT-D-6354 (NEB 850201 609)

(48) WAT-EQ-001 (B71 860225 001)

(49) WAT-EQ-010 (B71 860516 003)

(50) Manual No. 86A2 (B26 881208 351)

(51) Dwg. 8765D45, R8

(52) WCAP-8687, Supp. 2-E03A Addendum 1 (B45 851105 356)

R3

WBEP-0096Q

A. DOCUMENTATION

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(53) Environmental Data Drawing 47E235-42 R2
(including DCA-P04104-05-0, -P04104-02-1, and -P04104-03-0)

(54) Environmental Data Drawing 47E235-44 R1

(55) Environmental Data Drawing 47E235-45 R1
(including DCA-P04104-06-0)

(56) WCAP-8687 - Supp 2 - E21A R2 (B25 880812 006)

(57) Deleted. |R5

Note: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 2 OF 24 R 1 R	
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86 WCM 2-24-89		
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86 HDM 3-3-89		

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Relocate Transmitter (NCR WBNEEB6172) R1
2. SCR WBNEEB8575
3. Deleted
4. Demonstrated and Required Accuracy
5. NCR 6224

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 3 OF 24
BINDER TITLE BARTON 764 LOT 7 AND 4	COMPUTED ANL DATE 5/22/86	R	R
	CHECKED W.Hm DATE 5/22/86		

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974

IEEE 344-1975

TVA 19537 (OE-3-86) EQP085.41

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 4 OF 24
			R ___ R ___
BINDER TITLE BARTON 764	COMPUTED AHL	DATE 5/22/86	
LOT 7 AND 4	CHECKED WBJ	DATE 5/22/86	

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS

TVA 19537 (OE-3-86) EQP085.41

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification documentation identical to the plant equipment which requires qualification (Yes/No/NA)? Yes

		Plant Device	Qualification Document	Reference
(1)	Equipment Type	Transmitter	Transmitter	
(2)	Manufacturer	Barton	Barton	See Comments
(3)	Model Number(s)	764	764	
		Lot 7	Lot 7	
		Lot 4	Lot 4	
(4)	Serial Number(s)	See	550	Table 1
		TAB C	853	Page 22
		Section A	854	
(5)	Identify Component-Unique checksheet attached:		NA	

JUSTIFICATION/COMMENTS Section 2, page 2 of the test report (TAB D) identifies the tested units and to what baseline configuration they were built. Table 9, page 33 of the test report identifies that the Auditable Link Document formally compares the plant specific purchased units and their baseline configuration to the qualification test units. The Auditable Link Document is contained in TAB C, Section A (Traceability) along with Table 1, which shows the link from the equipment in the field to the test report. Other supporting documents are also included in this section. Transmitters 1-LT-63-180,-181,-182, and -183 are Barton Model 764 transmitters with Model 351 remote sensors. TAB C, Section J addresses the qualification of the sensors. R1

BINDER NO. WBNEQ-XMTR-001 PLANT WBN	UNIT(S) 1	SHEET 6 OF 24	R 5 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86 WCJ 10/15/90	
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86 BBM 10/16/90	

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA (R5)
External Process Connections	1/2" NPT/Female	Yes	Spec. 953328 Sec. 4.3.3, TAB E, Sec C
Electrical Connections Connections	Per Dwg. 8765D45	Yes	TAB I
Conduit Seals	Per Dwg. 8765D45	NA	Note 2 of Dwg TAB I - See Comments**
Connector Seals	Per Dwg. 8765D45	NA	See Comments**
Orientation	See comments***	Yes	
Physical Configuration	Per Dwg. 8765D45	Yes	TAB I
Other	See Comments*		

JUSTIFICATION/COMMENTS *Raychem splices are being qualified in binder WBNEQ-SPLC-001. **The Barton transmitters are supplied with a manufacturers seal (potting compound) which was tested and exposed to total LOCA/HELB environments as described in the test report. This information is contained in Westinghouse letter WAT-EQ-010 (WAT-D-6985) (B71 860516 003) which is in TAB E, Section H.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 7 OF 24 R ___ R ___
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 5/29/86	
LOT 7 AND 4	CHECKED WBK	DATE 5/29/86	

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	3.2 p.4
(b) Baseline performance measurements taken	Yes	3.2 p.4
(c) Equipment aged:		
Thermal	Yes	3.1.1 p.3
Radiation	Yes	3.1.2 & .3,p.3
Wear	Yes	3.1.1,p.3
(d) Vibration/seismic testing conducted	Yes	4.2.3,p.7
(e) Design basis event (DBE) exposure	Yes	5.4,p.14
(f) Post-DBE exposure	Yes	5.4,p.14
(g) Final inspection and disassembly	Yes	3.2, p.4

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes*

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes**
(Reference Table 2, 3, 4, and pages 23, 24, 25, and 26).

JUSTIFICATION/COMMENTS *O-rings and fill oil were replaced; see Sections 5.1 and 7.1.

**Calibration data and test equipment accuracies available for audit at Westinghouse.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 8 OF 24
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 5/22/86	R ___ R ___
LOT 7 AND 4	CHECKED WMKing	DATE 5/22/86	

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 3.1.1, p. 3).

JUSTIFICATION/COMMENTS ______________________

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	3.1.1,p.3
Radiation exposure	Yes	3.1.2&3,p.3
Vibration (non-seismic) aging	Yes	5.3.5,p.14*
Operational (electrical/mechanical/process) stress aging	Yes	5.1, p.9

JUSTIFICATION/COMMENTS *See WCAP-8587, Appendix B, Item 17 P.B-7 in Tab E, Section D for further justification.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS This is addressed in Appendix B of WCAP-8587 (#21,P.B-8), Tab E, Section D.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 3.1.1, p. 3).

JUSTIFICATION/COMMENTS ______________________

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: See Comments*).

JUSTIFICATION/COMMENTS *See Appendix D, Section 3, page D-5 of WCAP-8587 in Tab E, Sect. D. This is not for transmitters only - applies to all Westinghouse NSSS.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See App. B, Section 7, p. B-2 and App. D, Sect. 3, p. D-5 of WCAP-8587 in Tab E, Section D.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 5.1, p. 9).

Parameter	Plant Maximum Normal	Test	Equivalent
	Fan RM 1 - 101°F		
	Fan RM 2 - 100°F		
	Acc RM 3 - 92°F		
	Acc RM 4 - 95°F		
Temperature	IIR = 75°F, Ann. = 110°F	125° C	104°F
Time	40 Years	1673 Hrs	10 Years

JUSTIFICATION/COMMENTS *See Tab C, Section B for plant temperature calculation (EQP-02) supporting these temperatures.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 5.1, p. 9).

JUSTIFICATION/COMMENTS ____________

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes* (Reference 5.1, p. 9).

JUSTIFICATION/COMMENTS *Test report used a conservative activation energy of .5eV; see Appendix D, Sect. 3, p. D-5 of WCAP-8587 in Tab E, Section D.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1		SHEET 10	OF 24		
BINDER TITLE BARTON 764		COMPUTED AWL	DATE 5/23/86	R	R		
LOT 7 AND 4		CHECKED WK	DATE 5/29/86				

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ________).

JUSTIFICATION/COMMENTS ________

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference 7.1, p. 17).

JUSTIFICATION/COMMENTS ________

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 5.2, p. 10).

JUSTIFICATION/COMMENTS ________

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference See Comments).

JUSTIFICATION/COMMENTS App. C of WCAP-8587 in Tab E, Sec. D

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes* (Reference 3.1.2, p. 3 and 5.2, p. 10).

JUSTIFICATION/COMMENTS *The basis was further identified in Section 6.7.1 (p. 6-3) and 6.7.4 (pages 6-6 through 6-9) of WCAP-8587 in Tab E, Section D.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (Yes/No/NA)? Yes (Reference: 5.2, p. 10 and 3.1.3, p. 3).

Plant normal ambient radiation dose (rd)	$2x10^7$ (40 years-Gamma)
Test exposure dose (rd)	$6.8x10^7$
Test exposure dose rate (rd/hr)	2.0 to 3.0 M Rd/hr
Test exposure source type (e.g., Co-60 gamma)	Co-60 Gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program[1] Yes* (Reference: See Comments). R1

JUSTIFICATION/COMMENTS *See App. B Item 17, p. B-7 of WCAP-8587 in TAB E, Section D.

(b) Was the basis for vibration aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: See Comments).

JUSTIFICATION/COMMENTS *See App. B Item 20, p. B8 of WCAP-8587 in TAB E, Section D.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation adressed in the qualification program (Yes/No/NA)? Yes (Reference: See Comments).

JUSTIFICATION/COMMENTS Section 5.0 - Test procedure addresses the fact that operational stresses were induced in the qualification program, page 9.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the Binder. R1

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: See Comments).

JUSTIFICATION/COMMENTS See App. B - Subprogram A, Section 13-15, page B-6 of WCAP-8587 in TAB E, Section D.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes
(Reference: 7.5, page 20).

Qualified life (Document in QMDS)
IIR=26.4 yrs.; Ann.=8.2 yrs.;
Fan Rm. 1=10.9 yrs.; Fan Rm. 2=11.2 yrs.
Acc Rm. 3=14.6 yrs.; Acc Rm. 4=12.8 yrs.

JUSTIFICATION/COMMENTS See TAB C, Section B for Qualified Life Calculations.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes
(Reference: 7.5, page 20).

R1

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 13 OF 24 R 1 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 5-22-86 wcn 2-24-89	
LOT 7 AND 4	CHECKED WBK	DATE 5-22-86 ~~TOR~~ 3-3-89	

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis).

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	EPT/O-rings			.92eV	5.1, p.10
(b)	Silicone 550/Fill Oil			.92eV	5.1, p.10
(c)	Silicone 702/Fill Oil (Capillary)			.92eV	TAB D,5.1 p.D-146 R1
(d)					
(e)					

JUSTIFICATION/COMMENTS At the conclusion of the aging testing, it was determined that the internal O-rings failed because the aging temperature selected was too high for the internal O-rings material to survive the aging time. The O-rings and fill oil were replaced and aged for 350 hours at 125°C based on an activation energy of .92eV based on the O-ring manufacturer. The aging calculation is in TAB C, Section B.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 14 OF 24
BINDER TITLE BARTON 764	COMPUTED AWR	DATE 9/23/86	R ___ R ___
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86	

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 3.2, page 4).

Identify Acceptance Criteria: Refer to Section 3.2 of the report, pages 4 and 5.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 3.2, p. 4, Tbls. 5,6,7,8,&11).

Identify baseline and functional testing: See Section 6.0, page 6-1 and Section 6.8, page 6-9 on WCAP-8587 in Tab E, Section D.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 5.0, pages 10-14).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: ________).

JUSTIFICATION/COMMENTS See Comments on 5c

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	See Comments 5(b)	
Load	See Comments 5(b)	
Frequency	NA	
Accuracy	See TAB C, Section F	TAB C, Pgs. C-462 & C-463 R4
Other(s)		

JUSTIFICATION/COMMENTS

(b)

Parameter	Specific Accident Conditions	Reference
Voltage	See Comments	
Load	See Comments	
Frequency	NA	
Accuracy	See TAB C, Section F	TAB C, Pgs. C-462 & C-463 R4
Other(s)		

JUSTIFICATION/COMMENTS Voltage and load are accounted for in the design process and will not vary during accident conditions since they are powered from regulated power.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (c)

Parameter	Demonstrated Conditions	Reference
Voltage	15-52V DC 1V	1.1.1 of ESE-3A
Load	10-50 MA	1.1.3 of ESE-3A
Frequency	NA	1.1.2 of ESE-3A
Accuracy	See TAB C, Section F	TAB C, Pgs. C-462 & C-463
Other(s)		

R4

JUSTIFICATION/COMMENTS Electrical characteristics are contained in EQDP-ESE-3A and Specification 953328. Vendor submits to Westinghouse for approval the verification of electrical characteristics to Spec. 953328. Verification of electrical characteristics on file at Westinghouse to be audited. Spec. 953328 contained in TAB E, Section C; EQDP-ESE-3A is contained in TAB D, Section D-1.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 16 OF 24

R 1 R

BINDER TITLE BARTON 764 COMPUTED AWL DATE 5-22-86 WCR 2-24-89

LOT 7 AND 4 CHECKED WBK DATE 5-22-86 WBK 3-3-89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 16A for Transmitters Operating Environment - Normal & Abnormal

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	Sheet 16A	(a) Temperature (°F)	Sheet 16A
(b) Pressure (psig)	Sheet 16A	(b) Pressure (psig)	Sheet 16A
(c) Humidity (%)	Sheet 16A	(c) Humidity (%)	Sheet 16A
(d) Radiation (rd)	Sheet 16A	(d) Radiation (rd)	Sheet 16A

(3) Process Interfaces: The transmitters are connected by impulse lines to the process systems which they are monitoring and are located in instrument racks away from the process system so that they should not see any significant effect due to the process.

(4) State anticipated occurrence frequency and duration of abnormal conditions: These conditions could exist for up to eight hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327	Accident type L, HELB	
(b) Pressure (psig)	11.2	Accident type L	R1
(c) Humidity (%)	100	Accident type L, HELB	
(d) Radiation (rd)	4.7×10^8 (beta)** 3.3×10^7 (gamma)*	Accident type L	
(e) Spray Type	2000 ppm Boron pH 8.3	Accident type L, HELB	R1

*Radiation level based on OE Calculation WBNNAL3-004 contained in TAB C, Section C, Subsection A. Page 3 of Calculation. R1

**Radiation level based on Environmental Data Drawing 47E235-42 and -45. R1

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 16A OF 24
			R 1 R 2
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86	WCG 2-24-89 WCG 3-21-90
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86	HDR 3-3-89 HDR 3-21-90

K. REQUIRED OPERATING ENVIRONMENT (reference also to TAB C, section B) | R2

Reference Environmental Drawing No. 47E235-42, Lower Containment

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	120	(a) Temperature (°F)	130
(b) Pressure (psig)	0.3	(b) Pressure (psig)	0.3
(c) Humidity (%)	80	(c) Humidity (%)	100
(d) Radiation (rd)	2×10^7	(d) Radiation (rd)	NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-45, IIR-Incore Instrument Room

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	75	(a) Temperature (°F)	120
(b) Pressure (psig)	0.3	(b) Pressure (psig)	0.3
(c) Humidity (%)	60	(c) Humidity (%)	90
(d) Radiation (rd)	3.5×10^5	(d) Radiation (rd)	NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-44, Annulus

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	110	(a) Temperature (°F)	120
(b) Pressure (psig)	ATM(-)	(b) Pressure (psig)	ATM(-)
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	1×10^6	(d) Radiation (rd)	NA

BINDER NO. WBNEQ-XMTR-001 PLANT WBN	UNIT(S) 1	SHEET 17 OF 24	
		R 1 R	
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86 wcr 2-24-89	
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86 BDM 3-3-89	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): See page 17B and the Environmental Drawings listed in Section A of this TAB R1

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference: Environmental Drawings 47E235-42, -44 and -45). R1

(7) Subject to submergence (Yes/No/NA)? No (Reference: (See TAB A for elevation and Sheet 17A) *See Open Item No. 1). R1

Identify initiation time and duration of submergence: Na

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes (Reference: 47E235-42, -44, -45).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: R1

1.87×10^6 rads

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See TAB B, Section A	

R1

K. REQUIRED OPERATING ENVIRONMENT (Continued)

(7) Comments: TAB A contains the exact elevation of the transmitters (from the field verification sheets contained in TAB F) which can then be compared to the following flood level:

1. IIR - elevation 717.7 ft. (47E235-45)
2. FAN ROOM 1 - 717.7 ft. (47E235-42)
3. FAN ROOM 2 - 717.7 ft. (47E235-42) R1
4. ACC. ROOM 3 - 717.7 ft. (47E235-42)
5. ACC. ROOM 4 - 717.7 ft. (47E235-42)
6. ANNULUS - NA

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1	SHEET 1 OF 1	R	R
BINDER TITLE BARTON 764	COMPUTED/R1 wcs DATE 2-24-89		
LOT 7 AND 4	CHECKED/R1 HOR DATE 3-3-89		

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Pages B-24 thru B-26 were deleted per revision 1 .

LOWER CONTAINMENT AND INSTRUMENT ROOM (IIR)

Chemical Spray: The chemical composition of the containment spray was based on the following solutions which result in the most severe conditions:

1. Ice Condenser - Quantity of Ice - 2.7195×10^6 - Boron Concentration 1800 PPM B added as $Na_2B_4O_7 10H_2O$.

2. Boron Injection Tank - Volume - 900 GAL - Boron Concentration 2100 PPM B in the form of H_3BO_3.

3. Cold Leg Injection Accumulators (4 Tanks) - Volume - 10,098 FT^3- Boron Concentration: 200o PPM B in the form of H_3BO_3.

4. Upper Head Injection - Volume - 1800 FT^3 - Boron Concentration: 2100 PPM B in the form of H_3BO_3.

5. Refueling Water Storage Tank - Volume - 375,000 GAL - Boron Concentration: 2100 PPM B in the form of H_3BO_3.

6. Reactor Coolant System - Volume - 12,145 FT^3 - Maximum Boron Concentration: 2100 PPM B in the form of H_3BO_3.

Results: The solutions stated above yield a resulting concentration of .19 Molar H_3BO_3 resulting in a pH of 8.3 at 25°C.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 18 OF 24
R 1 R

BINDER TITLE BARTON 764 COMPUTED AWL DATE 5-22-86 vcr 2-24-89

LOT 7 AND 4 CHECKED WBK DATE 5-22-86 Hon 3-3-89

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time	100 Days	15 Days	Fig 2, p 38 See TAB C, Sect G for Comparison	R1
Temperature (°F)	327	420	Fig 2, p 38	
Pressure (psig)	11.2	57.6	Fig 2, p 38 Table 1 of EQDP-3A	R1
Relative Humidity (%)	100	100	Fig 2, p 38 Table 1 of EQDP-3A	
Chemical Spray*	See TAB C Section I	See Table 1 of EQDP-ESE-3A	p 15, TAB D	
Radiation (rd)**	5.49×10^7 (gamma + beta)***	6.8×10^7 (gamma + beta)	6.2, p 15 TAB E, Section G Spec. 955270, p 6	R1
Submergence	NA	NA	See Section K(7), p 17 and 17A1	R1

*Includes spray concentration, flowrate, density, duration, and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type.
***See TAB C, Section C. R1

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See TAB C Section H
Pressure	Yes	Fig 2, p 38
Relative Humidity	Yes	TAB D, Table 1 EQDP-ESE-3A, p 15
Chemical Spray	Yes	TAB C, Section H
Submergence	NA	

JUSTIFICATION/COMMENTS

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA	
Temperature: +15 degrees F	+ 15°F	Yes	
Pressure: +10% but no more than 10 psig	+ 10%	Yes	
Radiation: +10% of accident dose	+ 10%	Yes	
Time: +10% (or 1 hour + operating time per NUREG-0588)	+ 10%	Yes	
Voltage: ±10% of rated value	*	No	R1
Frequency: ±5% of rated value		NA	R1
Environmental Transient: the initial transient and the peak temperature applied twice	Same	Yes	
Vibration: +10% added to acceleration	** + 10%	Yes	R1

JUSTIFICATION/COMMENTS

* Voltage must not exceed 52VDC ± 1VDC - See Note 4 of drawing 8765D45 in TAB I. R1

**See Seismic Section 5.3.5. R1

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 20 OF 24		R	R	
BINDER TITLE BARTON 764		COMPUTED AWL	DATE 5/22/86				
LOT 7 AND 4		CHECKED [illegible]	DATE 5/22/86				

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference Refer to Tab A).

JUSTIFICATION/COMMENTS

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference 7.4, p.18, Table 8, p. 32).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference 7.4, p. 18).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Tab C, Section B which demonstrates that the transmitter operates for the required time interval.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Sheet 20A.

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 20A OF 24 R 1 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 5-22-86 wcn 2-24-89	
LOT 7 AND 4	CHECKED WBK	DATE 5-22-86 ~~[illegible]~~ 3-3-89	

M. OPERABILITY TEST RESULTS (Continued)

(5) JUSTIFICATION/COMMENTS

See Appendix A and Sections 7.1 thru 7.4 on pages 17 thru 21 of test report (TAB D) for a discussion of the anomalies and their resolution. We concur with the resolution for the O-rings and erratic behavior during HELB because:

1. The cover O-rings are beings replaced per Westinghouse recommendation as noted in the QMDS in TAB G.

2. The erratic behavior observed during HELB testing has been corrected in the Lot 7 and 4 model by a manufacturing change to build the transmitters with the soldered connection.

R1

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1		SHEET 21	OF 24		
				R	R		
BINDER TITLE BARTON 764		COMPUTED AWL	DATE 5/22/86				
LOT 7 AND 4		CHECKED [illegible]	DATE 5/22/86				

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	No
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	No*

*See Section H (5b)

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 23 OF 24 R ___ R ___
BINDER TITLE BARTON 764		COMPUTED [illegible]	DATE 5/22/86
LOT 7 AND 4		CHECKED [illegible]	DATE 5/22/86

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes**
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

**See Tab C, Section H.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN	UNIT(S) 1	SHEET 24 OF 24	R 1 R
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 9-23-86	3-3-89
LOT 7 AND 4	CHECKED BDM	DATE 9-23-86	3-3-89

O. SUMMARY OF REVIEW (Continued)

Yes/No/NA

(15) Criteria regarding functional testing satisfied? Yes

(a) Does the test plan/report specify an acceptance criteria for equipment performed? Yes

(b) Was an initial base line test done to establish required performance characteristics? Yes

(c) Has the test analyis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured? Yes

(16) Criteria regarding instrument accuracy satisfied? Open Item No. 4 |R1

(17) Test duration margin (1 hour + function time) satisfied? Yes

(a) Is the minimum specified operating time at least 1 hour? Yes*

(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided? Yes ** |R1

(18) Criteria regarding synergistic effects satisfied? Yes

(19) Criteria regarding margins satisfied? Yes

(20) Maintenance and surveillance requirements adequately identified? Yes

P. DISCUSSION

* A few of the transmitters have a minimum specified operating time of five minutes.

** See Section 7.1.6 of WCAP-8587 in TAB E, Section D for justification.

PLUSEQ/96.41

ER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1		SHEET 1 OF	R	R
BINDER TITLE BARTON 763		COMPUTED AWL	DATE 4/23/86			
LOT 7		CHECKED CAB	DATE 4/23/86			

XMTR-004

Tab A - Identification of Equipment

Comprising the Equipment Type

PRINT DATE: 01/11/89

BINDER NO. : WBNEQ-XMTR-
MANUFACTURER : BARTON

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT DEVICE ID NO. / MODEL NUMBER	AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PT -001-0009A -D	1-PT -001-0009A -D		729'	A02	A	1000	MS/V	INITIATES FEEDWATER ISOL
SG2 MAIN STEAM HDR PRESS	763 LOT 7		71C62-54114-1		A	1000	FW/V	AND SAFETY INJECTION; PAM
WBN-1-PT -001-0009B -E	1-PT -001-0009B -E		729'	A02	A	1000	MS/V	INITIATES FEEDWATER ISOL
SG2 MAIN STEAM HDR PRESS	763 LOT 7		71C63-54114-1		A	1000	FW/V	AND SAFETY INJECTION; PAM
WBN-1-PT -001-0020A -D	1-PT -001-0020A -D		729'	A02	A	1000	MS/V	INITIATES FEEDWATER ISOL
SG3 MAIN STEAM HDR PRESS	763 LOT 7		71C62-54114-1		A	1000	FW/V	AND SAFETY INJECTION; PAM
WBN-1-PT -001-0020B -E	1-PT -001-0020B -E		729'	A02	A	1000	MS/V	INITIATES FEEDWATER ISOL
SG3 MAIN STEAM HDR PRESS	763 LOT 7		71C62-54114-1		A	1000	FW/V	AND SAFETY INJECTION; PAM
WBN-1-PT -068-0063 -D	1-PT -068-0063 -D		713'	A06	A	1000	L	PAM
LOOP 1 HOT LEG PRESS	763 LOT 7		71C62-54114-1		A	1MO	AF	
					A	1MO	AB	
					A	1MO	RH/A	
					A	1MO	CV/A	

		R1	R	R
PREPARER/DATE	AWL 9/23/86	[illegible]		
CHECKED/DATE	BDM 9/24/86	[illegible] 1-20-89		

PAGE A-2

R1

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NUMBER / DESCRIPTION	UNIT	DEVICE ID NO. / MODEL NUMBER	LOCATION: AZMITH	LOCATION: ELEV(1) / CONTRACT	LOCATION: RM/RAD	CAT (2)	OPER TIME	EVENT	SAFETY FUNCTION
WBN-1-PT -068-0322 -G	1-PT	-068-0322 -G	077	731' 8"	IIR	A	5MIN	L	TRIP FUNCTION FOR BOTH HIGH
RCS PRZR PRESS		763 LOT 7		71C62-54114-1		A	5MIN	MS/C	AND LOW PRESSURIZER PRESSURE
						A	5MIN	FW/C	
						A	5MIN	CV/C	
						C	-NA-	RH/C	
WBN-1-PT -068-0323 -F	1-PT	-063-0323 -F	120	732'10"	IIR	A	5MIN	L	TRIP FUNCTION FOR BOTH HIGH
RCS PRZR PRESS		763 LOT 7		71C62-54114-1		A	5MIN	MS/C	AND LOW PRESSURIZER PRESSURE
						A	5MIN	FW/C	
						A	5MIN	CV/C	
						C	-NA-	RH/C	
WBN-1-PT -068-0334 -E	1-PT	-068-0334 -E	092	734'10"	IIR	A	5MIN	L	TRIP FUNCTION FOR BOTH HIGH
RCS PRZR PRESS		763 LOT 7		71C62-54114-1		A	5MIN	MS/C	AND LOW PRESSURIZER PRESSURE
						A	5MIN	FW/C	
						A	5MIN	CV/C	
						C	-NA-	RH/C	
WBN-1-PT -068-0340 -D	1-PT	-068-0340 -D	097	735'	IIR	A	5MIN	L	TRIP FUNCTION FOR BOTH HIGH
RCS PRZR PRESS		763 LOT 7		71C62-54114-1		A	5MIN	MS/C	AND LOW PRESSURIZER PRESSURE
						A	5MIN	FW/C	
						A	5MIN	CV/C	
						C	-NA-	RH/C	

PAGE A-3

R1

		R 1	R	R
PREPARER/DATE	AWL 9/23/86	[illegible]		
CHECKED/DATE	BDM 9/24/86	[illegible] 1-20-89		

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1
BINDER TITLE BARTON 763 LOT 7	COMPUTED /R1 [illegible] DATE 1-20-89	R	R
	CHECKED /R1 [illegible] DATE 1-20-89		

NOTES

1. Elevations shown are Actual elevations for equipment located in the Reactor Building and Floor elevations for equipment located outside the Reactor Building. Actual elevations for all equipment are documented in TAB F.

2. See Page B-1 for source of Category and Operating Time assignments.

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1				
BINDER TITLE BARTON 763		COMPUTED AWL	DATE 4/23/86	R		R	
LOT 7		CHECKED SR	DATE 4/23/86				

Tab B - Checklist for Evaluation of

Environmental Qualification

Including Summary and Conclusion

EQP055.27

TVA

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 24

R 1 R

BINDER TITLE BARTON 763 LOT 7 COMPUTED AWL DATE 9/23/86 [illegible] 1-20-89

CHECKED BDM DATE 9/24/86 [illegible] 1-20-89

A. DOCUMENTATION

Equipment Description Pressure Transmitter

Vendor/Manufacturer Westinghouse/Barton

Equipment Model No.(s) 763 Lot 7

763 Lot 2 Upgrade

QUALIFICATION REPORTS

(1) Title/Number/Revision WCAP-8687, Supp. RIMS NEB 840807 359

2-EQTR-E01A, Revision 2 *. DATE March, 1983

(2) Title/Number/Revision WCAP-8587, Supp. RIMS NEB 840807 355

1-EQDP-ESE-1A, Revision 4. DATE March, 1983

NEB 840724 353

(3) Title/Number/Revision WCAP-8587 Revision 6 RIMS NEB 840724 354

"Methodology". DATE March, 1983

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) ORN 74911

(5) ORN 74962

(6) ORN 68872

(7) ORN 43423

(8) Auditable Link Document (B45 860521 351)

(9) WAC-33

(10) WAC-32

(11) WAC-34 R1

* All references referred to in TAB B are to this test report (TAB D) unless otherwise noted. Page numbers referenced are page numbers of the test report and not of the binder. R1

BINDER NO. WBNEQ-XMTR-004 PLANT WBN	UNIT(S) 1	SHEET 1A OF 24	R 4 R
BINDER TITLE BARTON 763 LOT 7	COMPUTED AWL	DATE 9/23/86 WCN 9-26-90	
	CHECKED BDM	DATE 9/24/86 EEM 9/27/90	

A. DOCUMENTATION (Continued)

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(12) Deleted

(13) Deleted

(14) Deleted

(15) Deleted

(16) Category and Operating Time WBNOSG4-017 - System 68 R11 (B18 900612 252)

(17) Category and Operating Time WBNOSG4-004 - System 1 R11 (B18 900612 253)

(18) ESI Calculation (1-PT-1-2A) - B18 900830 254 R4

(19) OE Calculation (1-PT-68-70) - (B18 900801 251)

(20) Deleted

(21) Setpoint Methodology Study (B26 890515 928)

(22) Barton Upgrade Package (B70 851024 001)

(23) WAC-354 R4

(24) WAC-312

(25) WAC-35

(26) TI-ANL-198 (B45 851001 236)

(27) Deleted

(28) Deleted

(29) Spec. Sheet No. 01010

(30) Spec. 955270 (B45 850423 359)

(31) Spec. 953328 (B45 850508 351)

(32) WAT-D-6467 (B45 850321 600)

R4

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 1B OF 24
R 1 R

BINDER TITLE BARTON 763 LOT 7 COMPUTED AWL DATE 9/23/86 [illegible] 1-20-89

CHECKED BDM DATE 9/24/86 [illegible] 1-20-89

A. DOCUMENTATION (Continued)

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(33) WAT (EQ)-001 (B71 860225 001)

(34) TVA-86-620 (B45 860804 612)

(35) Manual No. 87F1 (B45 850426 352)

(36) Dwg. 8765D46 Revision 5 R1

(37) Deleted R1

(38) WAT (EQ)-010 (B71 860516 003)

(39) Environmental Drawing No. 47E235-45 R1

(40) Environmental Drawing No. 47E235-56 R1 R1

(41) Environmental Drawing No. 47E235-76 R3

R1

NOTE: Documents listed above are used throughout this binder for equipment qualification. The revision levels and Records & Information Management System (RIMS) numbers, as listed above, need not be repeated in other sections of the binder. This listing includes only those documents which are essential to qualification and accordingly should not be considered a complete listing of binder references. R1

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified (Pending Resolution of Open Item)

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. SCR WBNEEB 8575 & ECN 6119 and 5974

2. Deleted

3. Deleted

4. Deleted

5. Valve Vault Flooding (SCR WBNEEB 8584)

6. Deleted | R4

COMMENTS/RECOMMENDATIONS

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Page B-6 was delcted per revision 2.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS ___

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974

IEEE 344-1975

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X** Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS **The lot 2 baseline configuration has been compared with the lot 4 and lot 7 baseline configuration and differences noted. The baseline comparison showed only revision level differences (not affecting qualification) of some piece parts and a solder modification. The Barton upgrade package is contained in TAB C, Section G.

BINDER NO. WBNEQ-XMTR-004	**PLANT** WBN	**UNIT(S)** 1	**SHEET** 5 **OF** 24				
BINDER TITLE BARTON 763		**COMPUTED** AWL	**DATE** 4/23/86	**R**	**R**		
LOT 7		**CHECKED** SRL	**DATE** 4/24/86				

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Transmitter	Transmitter	
(2) Manufacturer	Barton	Barton	2.0 pg. 2
(3) Model Number(s)	763 Lot 7	763 Lot 7	See Tab C
	763 Lot 2		See Tab C
	Upgrade		Sect. G
(4) Serial Number(s)	See Tab C	001	Table 1
	Section A	485	Page 23
		471	

(5) Identify Component-Unique checksheet attached:

JUSTIFICATION/COMMENTS Lot 2 and Lot 7 transmitters can be differentiated by the Baseline Design Document to which they were built as shown in Tab C, Section G.

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the qualification documentation and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report	
Mounting Bolts	N/A	N/A	N/A	R4
External Process Connections	1/2" NPT FEMALE	Yes	SPEC 953328 Sect. 4.3.3 TAB E	
Electrical Connections	PER DWG 8765 D46	Yes	TAB I	
Conduit Seals	PER DWG 8765 D46	N/A	Note 2 of DWG ** 8765 D46 - TAB I See Comments	
Connector Seals	PER DWG 8765 D46	N/A	See Comments**	
Orientation	Horizontal	Yes	Instr. Manual Sect. 3 TAB H	
Physical Configuration	DWG 8765 D46	Yes	TAB I	
Other	See Comments*			

JUSTIFICATION/COMMENTS - *The panels each transmitter is installed in are tabulated in TAB C, Section D. Raychem splices will be qualified by binder WBNEQ-SPLC-001. **The Barton transmitters are supplied with a manufacturer seal (potting compound) which was tested and exposed to total HELB environment as described in test report. This information is contained in Westinghouse letter WAT-EQ-010 (WAT-D-6985) (B71 860516 003) which is in TAB E, Section H. R4

BINDER NO. WBNEQ-XMTR-004	**PLANT** WBN	**UNIT(S)** 1	**SHEET** 7 **OF** 24		
BINDER TITLE BARTON 763	**COMPUTED** ANL	**DATE** 4/23/86	**R**	**R**	
LOT 7	**CHECKED** SP	**DATE** 4/23/86			

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	3.2 Pg. 4
(b) Baseline performance measurements taken	Yes	3.2 Pg. 4
(c) Equipment aged:		
Thermal	Yes	3.1.1 Pg.3
Radiation	Yes	3.1.2 and 3.1.3 Pg. 3
Wear	Yes	3.1.1 Pg. 3
(d) Vibration/seismic testing conducted	Yes	3.1.4 Pg. 4
(e) Design basis event (DBE) exposure	Yes	3.1.5 Pg. 4
(f) Post-DBE exposure	Yes	3.1.5 Pg. 4
(g) Final inspection and disassembly	Yes	2.8 & 2.9 Pg.11 of *** EQDP-ESE-1A (Tab D)

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes*

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes**
(Reference Tables 2, 3, and 4).

JUSTIFICATION/COMMENTS *O-rings were replaced, see Sections 5.1 and 7.1 Page 10 and 18. **Calibration data and test equipment accuracies available for audit at Westinghouse. *** This section identifies the test sequences which the transmitters were subjected to. Test sequences are as specified in IEEE 323-1974. Since no exceptions were taken it is assumed that final inspection and disassembly were performed.

BINDER NO. WBNEQ-XMTR-004	**PLANT** WBN	**UNIT(S)** 1		**SHEET** 8 **OF** 24			
BINDER TITLE BARTON 763		**COMPUTED** AWR	**DATE** 4/23/86	**R**		**R**	
LOT 7		**CHECKED** SJD	**DATE** 4/27/86				

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 3.1.1 Page 3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	3.1.1 Pg.3
Radiation exposure	Yes	3.1.2 & 3 Pg.3 Pg. 3
Vibration (non-seismic) aging	Yes*	5.3.5 Pg.14
Operational (electrical/mechanical/process) stress aging	Yes	3.1.1 Pg. 3

JUSTIFICATION/COMMENTS *See WCAP-8587 - App. B Item 17 P. B-7 in Tab E, Section D for further justification.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS Section 21 (P. B8) - Appendix B of WCAP-8587 in Tab E Section D

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 5.1 Page 9).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes* (Reference: 5.1, page 9*).

JUSTIFICATION/COMMENTS *See Appendix D, Section 3, pg D-5 of WCAP-8587 in Tab E, Section D. This is for generic Westinghouse NSSS equipment.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference ________).

JUSTIFICATION/COMMENTS See WCAP-8587, Appendix B, Section 7, page B-2 in Tab E, Section D.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 5.1, page 9).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	IIR=75°F, PENT. RM (A6)= 104°F NSVVR(A2)=130°F	125°C	104°F
Time	40 years	1673hrs	10 yrs

JUSTIFICATION/COMMENTS See Tab C, Section B.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 5.1, page 9).

JUSTIFICATION/COMMENTS ________

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes * (Reference 5.1, page 9).

JUSTIFICATION/COMMENTS * Test report used a conservative activation energy of .5eV (see Appendix D, Section 3, page D-5 of WCAP-8587 in Tab E, Section D).

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 10 OF 24
			R 1 R
BINDER TITLE BARTON 763 LOT 7	COMPUTED AWL	DATE 9/23/86	
	CHECKED BDM	DATE 9/24/86 1-20-89	

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (Yes/No/NA)? NA (Reference:).

JUSTIFICATION/COMMENTS Regression lines were not used.

(h) Was the equipment operated during the thermal aging (Yes/No/NA)? Yes (Reference: 5.1, page 9).

JUSTIFICATION/COMMENTS

(5) Radiation Aging Exposure:

(a) Was radiation aging exposure considered in the qualification program[1] (Yes/No/NA)? Yes (Reference: 5.2, page 11). R1

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (Yes/No/NA)? No (Reference: NA).

JUSTIFICATION/COMMENTS Not required. Assembled device irradiated to required dose.

(c) Was the basis for radiation aging exposure identified in the qualification program (Yes/No/NA)? Yes (Reference: 5.2, page 11).

JUSTIFICATION/COMMENTS See WCAP-8587 for further basis (Sections 6.7.1, pg 6-3, and 6.7.4, pg 6-4) in TAB E, Section D.

[1] Qualification program refers to the test report and any supplemental documentation including TVA analyses in TAB C of the binder. R1

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 5.2, pg 11/3.1.3, pg 3).

Plant normal ambient radiation dose (rd)	2×10^7 (40 years)
Test exposure dose (rd)	6.8×10^7
Test exposure dose rate (rd/hr)	2.0 to 3.0 M
Test exposure source type (e.g., Co-60 gamma)	Co-60 gamma

JUSTIFICATION/COMMENTS ______

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Appendix B, item 17, pg B-7 of WCAP-8587, Tab E. Also see 5.3.5, pg 14.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? Yes*
(Reference 5.3.5, pg 14).

JUSTIFICATION/COMMENTS *See Appendix B, items 17 and 20, pgs B-7 and B-8 of WCAP-8587, Tab E, Section D.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes
(Reference See Comments).

JUSTIFICATION/COMMENTS Section 5.1, pg 9. Test Procedure addresses the fact that operational stresses were induced in the qualification program.

H. AGING (Continued)

(7) (b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (Yes/No/NA)? Yes (Reference: See Comments).

JUSTIFICATION/COMMENTS See Appendix B, Subprogram A, Section 13-15, pg B-6 of WCAP-8587, TAB E, Section D.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (Yes/No/NA)? Yes (Reference: 7.5, pg 21).

Qualified life (Document in QMDS) IIR-26.4 yrs, PENT. Rm(A6)=9.9 yrs. NSVVR(A2) = 4.4 yrs.

JUSTIFICATION/COMMENTS See TAB C, Section B, and TAB G.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (Yes/No/NA)? Yes (Reference: 7.5, pg 22).

|R1

JUSTIFICATION/COMMENTS Although not a replacement part, the potentiometer (Lot 2) is recommended to be exercised at all calibration cycles. - See QMDS in TAB G.

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 13 OF 24

BINDER TITLE BARTON 763 COMPUTED ANL DATE 5/9/86 R ___ R ___

LOT 7 CHECKED SF DATE 5/15/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	EPT/O-rings			.92eV	5.1, p 10
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS At the conclusion of the aging testing, it was determined that the O-rings failed due to high aging temperature. The O-rings were replaced and aged for 14 hours at 125°C based on an activation energy of .92eV. This 14 hours simulated 2 years of service for the O-rings. See Section 7.1 on page 18 of test report in Tab D, Section A. All other components were conservatively assigned an activation energy of .5eV.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 3.2, pg 4).

Identify Acceptance Criteria: Refer to Section 3.2 of the test report.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 3.2, pg 4/Table 5, 6, 7, 8, and 11.).

Identify baseline and functional testing: See Section 6.0, pg 6-1 and Section 6.8, pg 6.9 on WCAP-8587 in Tab E, Section D.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Section 5.0, pgs 9-15).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (Yes/No/NA)? Yes (Reference: ____________).

JUSTIFICATION/COMMENTS See comment under Section 5(b).

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Plant Normal Conditions	Reference
Voltage	15-30.5VDC	See Comments for 5(b)
Load	10-50 MA	See Comments for 5(b)
Frequency	NA	See Comments for 5(b)
Accuracy	See TAB C, Section F See Open Item #6	See Comments for 5(b)
Other(s)		

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(b)

Parameter	Specific Accident Conditions	Reference R1
Voltage	NA	See Comment
Load	NA	
Frequency	NA	
Accuracy	See TAB C, Section F See Open Item 6	
Other(s)		

JUSTIFICATION/COMMENTS

Voltage, load, and frequency are accounted for in the design process and will not vary during accident conditions since these transmitters are powered from regulated power supplies with fixed loads, and connected with qualified cable. The only electrical characteristics on which qualification is based is accuracy. Variations in the power supply are accounted for in the loop accuracy calculations.

(c)

Parameter	Demonstrated Conditions	Reference R1
Voltage	15-52 VDC	Sect. 1.1.1 of ESE-1A
Load	10-50 MA	Sect. 1.1.3 of ESE-1A
Frequency	NA	Sect. 1.1.2 of ESE-1A
Accuracy	See TAB C, Section F See Open Item 6	
Other(s)		

JUSTIFICATION/COMMENTS

Electrical characteristics are contained in EQDP-ESE-1A and specification 953328. Vendor submits to Westinghouse for approval the verification of electrical characteristics to specification 953328. Verification of electrical characteristics is on file at Westinghouse and can be audited. Specification 953328 is contained in TAB E, Section C, and EQDP-ESE-1A is contained in TAB D, Section B.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Normal & Abnormal: See Sheet A
Accident: 47E235-45 Instrument Room |R1

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	See Sheet 16A	(a) Temperature (°F)	See Sheet 16A
(b) Pressure (psig)	See Sheet 16A	(b) Pressure (psig)	See Sheet 16A
(c) Humidity (%)	See Sheet 16A	(c) Humidity (%)	See Sheet 16A
(d) Radiation (rd)	See Sheet 16A	(d) Radiation (rd)	See Sheet 16A

(3) Process Interfaces: The transmitters are connected by impluse lines to the process systems which they are monitoring and are located in instrument racks away from the process system so that they should not see any signigicant effect due to process temperature.

(4) State anticipated occurrence frequency and duration of abnormal conditions: 1% of the plant life and could exist up to 8 hours per excursion.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327	Accident type	L
(b) Pressure (psig)	11.2	Accident type	L |R1
(c) Humidity (%)	100	Accident type	L
(d) Radiation (rd)	1×10^7 (Gamma) 4.7×10^8 (Beta)	Accident type	L |R1
(e) Spray Type	2000 ppm Boron pH 8.2	Accident type	L

R1

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 16A OF 24

R 1 R

BINDER TITLE BARTON 763 LOT 7 COMPUTED AWL DATE 9/23/86

CHECKED BDM DATE 9/24/86 1-20-89

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-56, 713-RM-A6 Penetration Room |R1

(1) Normal Max		(2) Abnormal Max		
(a) Temperature (°F)	104	(a) Temperature (°F)	110	
(b) Pressure (psig)	ATM(-)	(b) Pressure (psig)	ATM(-)	R1
(c) Humidity (%)	80	(c) Humidity (%)	90	
(d) Radiation (rd)	2.2×10^6	(d) Radiation (rd)	NA	R1

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-45 Instrument Room |R1

(1) Normal Max		(2) Abnormal Max		
(a) Temperature (°F)	75	(a) Temperature (°F)	120	
(b) Pressure (psig)	0.3	(b) Pressure (psig)	0.3	R1
(c) Humidity (%)	60	(c) Humidity (%)	90	
(d) Radiation (rd)	3.5×10^5	(d) Radiation (rd)	NA	

|R1

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-76, 729-RM A2 NSVVR |R1

(1) Normal Max		(2) Abnormal Max		
(a) Temperature (°F)	130	(a) Temperature (°F)	140	
(b) Pressure (psig)	ATM(-)	(b) Pressure (psig)	ATM(-)	R1
(c) Humidity (%)	50	(c) Humidity (%)	100	
(d) Radiation (rd)	1.8×10^3	(d) Radiation (rd)	NA	R1

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.): See pages 17A, B, C, D, E, F and G.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (Yes/No/NA)? Yes (Reference:

Environmental drawings 47E235-45, -56 and -76; notes 5, 16 and 16 respectively.). R1

(7) Subject to submergence (Yes/No/NA)? Yes (Reference: Sheet 17A and Open Item). R1

Identify initiation time and duration of submergence: NA - See Sheet 17A and Open Item

(8) Is the equipment subject to a beta radiation contribution to the total accident dose (Yes/No/NA)? Yes
(Reference: 47E235-45).

If yes, identify the fraction of the unattenuated free field beta dose to be added to the total dose and justify: See TAB C, Section C R1

(9) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Section A this TAB	

R1

K. REQUIRED OPERATING ENVIRONMENT (Continued)

(7) Comments: TAB F contains the exact elevation of the transmitters (field verification) which can then be compared to the following flood level:

1. IIR - elevation - 717.7 ft. (47E235-45, note 5)

2. North Steam Valve Vault Room (A2) - 731.5 ft. (47E235-76, note 62) R3 wcg 4/9/90

3. Penetration Room (A6) - 713 ft. 1 inch (47E235-56, Table 1).

Transmitters 1-PT-1-9A and 1-PT-1-20A presently will be flooded, but SCRWBNEEB 8584 has been written against the flooding in the Valve Vault Room. Corrective action will be assigned to the SCR to resolve the problem (i.e., ECN issued to move transmitters above the flood level).

ID#	ACTUAL ELEV	FLOOD ELEV
1-PT-1-9A	731'2"	731.5' *
1-PT-1-9B	733'5"	731.5'
1-PT-1-20A	731'4"	731.5' *
1-PT-1-20B	733'5"	731.5'
1-PT-68-63	717'6"	713.1'
1-PT-68-322	731'8"	717.7'
1-PT-68-323	732'10"	717.7'
1-PT-68-334	734'11"	717.7'
1-PT-68-340	735	717.7'

* See open item #5

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Pages B-25 thru B-31 were deleted per revision 1.

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 18 OF 24 R 1 R
BINDER TITLE BARTON 763 LOT 7	COMPUTED AWL	DATE 9/23/86	1-20-89
	CHECKED BDM	DATE 9/24/86	1-20-89

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference	
Operating Time	100 Days	15 Days	See TAB C Sect. H for Comp	
Temperature (°F)	327, 535****	420	3.1.5 pg. 4	
Pressure (psig)	11.2	57.6	Figure 2 Page 38	R1
Relative Humidity (%)	100	100	Tbl 1, Pg. 16 EQDP-TAB D Sect. B	
Chemical Spray*	2000 ppm pH 8.2	2500 ppm pH 10.7	Tbl 1, Pg. 16 EQDP-TAB D Sect. B	
Radiation (rd)**	1.035×10^7*** 4.7×10^8 (BETA)***	6.8×10^7 9×10^8	6.2, Pg. 16 TAB C, Sect. C	R1
Submergence	See Sheet 17A	See Sheet 17A		

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***Based on information contained in section K; accident - 1×10^7, normal - 3.5×10^5. R1

****The temperature resulting from a Main Steam Line Break in the Steam Valve Vault Room is 535°F.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference	
Temperature	Yes[1]	Fig. 2 Pg. 38	
Pressure	Yes	Fig. 2 Pg. 38	
Relative Humidity	Yes	Tbl 1, Pg. 2 EQDP-ESE-1A	
Chemical Spray	Yes	TAB C Section K	
Submergence	See Sheet 17A		R1

JUSTIFICATION/COMMENTS [1] QE Calculation TI-ANL-198 (TAB C, Section I) establishes that the peak temperature the insulated transmitter will see is 258.6°F. R1

PAGE B-32 R1

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, Yes/No/NA).

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA	
Temperature: +15 degrees F	> +15°F	Yes	
Pressure: +10% but no more than 10 psig	> +10%	Yes	
Radiation: +10% of accident dose	> +10%	Yes	
Time: +10% (or 1 hour + operating time per NUREG-0588)	> +10%	Yes	
Voltage: ±10% of rated value		No*	R1
Frequency: ±5% of rated value	NA	NA	R1
Environmental Transient: the initial transient and the peak temperature applied twice	Same	Yes	
Vibration: +10% added to acceleration	> +10%	Yes*	

JUSTIFICATION/COMMENTS * Voltage must not exceed 30.5VDC + 1VDC - See Note 4 on Dwg. 8765 D46 in TAB I. R1

* See Section 5.3.5 on page 14.

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1		SHEET 20	OF 24		
BINDER TITLE BARTON 763		COMPUTED RHK	DATE 5/9/86	R		R	
LOT 7		CHECKED SH	DATE 5/15/86				

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See Tab A).

JUSTIFICATION/COMMENTS NA

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Section 7.4 Page 20).

JUSTIFICATION/COMMENTS NA

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Section 7.4 Page 20).

JUSTIFICATION/COMMENTS NA

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference 7.4 Page 20).

JUSTIFICATION/COMMENTS See Tab C Section H

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference See Comments).

JUSTIFICATION/COMMENTS See Sheet 20A.

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 20A OF 24
			R 2 R
BINDER TITLE BARTON 763 LOT 7	COMPUTED AWL	DATE 5/26/86	
	CHECKED SRP/DLK	DATE 5/20/86	

M. OPERABILITY TEST RESULTS (Continued)

(5) JUSTIFICATION/COMMENTS See Appendix A and Sections 7.1 thru 7.4 on pages 18 thru 21 of test report (TAB D) for a discussion of the anomalies and their resolution. We concur with the resolution for the O-rings and erratic behavior during HELB because:

1. The cover O-rings are being replaced per Westinghouse recommendation as noted in the QMDS in TAB G.
2. The erratic behavior has been corrected in the Lot 7 model by a manufacturing change to build the transmitters with the soldered connection.

R2

PLUSEQ/236.4

BINDER NO. WBNEQ-XMTR-004	**PLANT** WBN	**UNIT(S)** 1	**SHEET** 21 **OF** 24				
BINDER TITLE BARTON 763	**COMPUTED** ANL	**DATE** 4/23/86	**R**	**R**			
LOT 7	**CHECKED** SH	**DATE** 4/23/86					

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

EQP055.27

TVA

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 22 OF 24				
BINDER TITLE BARTON 763		COMPUTED AWL	DATE 4/23/86	R	R		
LOT 7		CHECKED SMF	DATE 4/23/86				

O. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	No
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	No*

*See Section H (5b)

EQP055.27

TVA

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes**
(11) Criteria regarding submergence satisfied?	Open Item Sheet 5
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes*
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

*See specification 955270 (Tab E, Section B) section 6.0 page 6 and Westinghouse letter WAT(EQ)-001 (Tab E, Section F). See Also TAB C, Section C.

**Due to the test chamber configuration being small, the flow rate is considered adequate in regard to the plant's requirements.

BINDER NO. WBNEQ-XMTR-004	PLANT WBN	UNIT(S) 1	SHEET 24 OF 24
			R 1 R
BINDER TITLE BARTON 763 LOT 7	COMPUTED AWL	DATE 9/23/86 1-26-89	
	CHECKED BDM	DATE 9/24/86 1-26-89	

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test analyis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Open Item #6 R1
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	No
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	Yes *
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

* See Section 7.1.6 of WCAP-8587 contained in TAB E, Section D.