TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

January 4, 1980

Director of Nuclear Reactor Regulation
Attention: Mr. L. S. Rubenstein, Acting Chief
Light Water Reactors Branch No. 4
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Rubenstein:

In the Matter of the Application of) Docket Nos. 50-327
Tennessee Valley Authority) 50-328

Enclosed are our responses to the Instrument and Control Systems Branch questions transmitted by your letter to H. G. Parris dated December 3, 1979. These responses will be incorporated into the Sequoyah Nuclear Plant Final Safety Analysis Report by Amendment 64. If you have any questions, please get in touch with D. L. Lambert at FTS 854-2581.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

ENCLOSURE

RESPONSE TO INSTRUMENT AND CONTROL SYSTEMS BRANCH QUESTIONS

I. Seismic Qualification of Westinghouse Supplied Class 1E Equipment

We found the response to Question 7.60, particularly Table Q7.60-1 unacceptable as follows:

1. Specify the lot number for the Barton 763 and 764 Transmitters.

2. You state in Table Q7.60-1 that the qualification of ASCO solenoid valves is given in a letter to Westinghouse PWR-SD. Provide for our review a copy of this letter. Should it not contain information on monitoring of the equipment's operation during and after the test and the test results, you must provide this information.

3. The Safeguards Actuation Racks were omitted from the table. Provide information in the table showing their seismic qualification or justify and provide bases for not providing this information.

4. Provide more complete identification of the Safeguards Test Cabinet. State if it is the model described in Westinghouse reference drawing number 1054E95. If not, provide the drawing number and complete information on its seismic qualification testing.

5. Verify, by note or otherwise, in the table that the Limitorque valve motor operators supplied by Westinghouse are the same as those supplied by TVA. If they differ, identify the differences and show that the differences do not affect the seismic qualification. Also revise note b to reference the latest seismic test reports (Lockheed 3521-4811 dated June 17, 1974, and Aero Nav 5720 dated January 6, 1975) furnished for our evaluation.

6. Identify the pump motors (Centrifugal Charging, Safety Injection, and Residual Heat Removal) and for each motor type provide a copy of the seismic qualification report for our review.

7. The Containment Spray pump motors were omitted from the table. Identify them and furnish for our review a copy of the seismic qualification report for these motors.

Response

1. Lot number of Barton 763 and 764 Transmitters for Sequoyah unit 1:

Barton 763: Pzr. Press., Wide Range: Lot 1
Pzr. Press., Trans. (4): Lot 1

Barton 764: Main Steam Flow, D/P: Lot 2
S/G Level, Narrow Range: Lot 2
Pzr. Level, D/P: Lot 1
SIS Autoswitchover D/P: Lot 1

2. The requested information on qualification of ASCO solenoid valves is attached.

3. Refer to revised Table Q7.60-1.

4. The drawing number for the Safeguards Test Cabinet supplied for Sequoyah is 1057E21. Westinghouse has performed a review of the design changes and determined that they do not affect the qualification reported in WCAP-7817 and Supplement 7.

5. Refer to revised Table Q7.60-1.

6. Westinghouse is obtaining the required documentation which will be provided as soon as it is available.

7. TVA has contacted the motor manufacturer and will supply this information as soon as it is available.

Table Q 7.60-1

WESTINGHOUSE NSSS SUPPLIED 1E SAFETY-RELATED ELECTRICAL EQUIPMENT
(SEQUOYAH - IN-CONTAINMENT)

CATEGORY	EQUIPMENT	MODEL	FUNCTION(S) PERFORMED	QUAL. REFERENCE IEEE-323-1971	QUAL. REFERENCE IEEE-344-1971
Instrumentation	Narrow Range RTD's	Rosemount[ ] (16)	RCS By-Pass Loop Coolant Temperature Detection	WCAP 9157	WCAP 8234 A
	Wide Range RTD's	Rosemount[ ] (8)	RCS Main Loop Coolant Temperature Detection	WCAP 9157	W Test Report 11/7
	Differential Pressure Transmitters	Barton[ ] (23)	Monitor: Pressurizer Level Steam Gen. Level Steam Flow	NS-TMA-1950	NS-TMA-1950
		Foxboro[ ] (12)	RC Flow	(e)	WCAP 7817 & 8541
	Pressure Transmitters	Barton[ ] (6)	Monitor Pressurizer Pressure RCS Pressure	NS-TMA-1950	NS-TMA-1950
	Power Range Neutron Detector	Westinghouse	Provide Feedback on Neutron Flux Density	(e)	W Test Report 1/79
Heaters	Hydrogen Recombiner	Westinghouse	Maintain Safe Containment Hydrogen Concentration	WCAP 7820 Supp. 1-4	WCAP 7820 Supp. 1-4
Valve Operators	Gate Valve Motor Operators	Limitorque (6)	Activate Safety Related Motor Operated Gate Valves	WCAP 7744 NS-CE-692 NS-CE-756	b
	Globe Valve Solenoid Air Operators	ASCO (10)	Regulated Air Supply to Air Operated Safety Related Globe Valves	NS-CE-755	c

Revised by Amendment 61
May 25, 1979

Table Q 7.60-1 (Continued)

WESTINGHOUSE NSSS SUPPLIED 1E SAFETY-RELATED ELECTRICAL EQUIPMENT
(SEQUOYAH - IN-CONTAINMENT)

CATEGORY	EQUIPMENT	MODEL	FUNCTION(S) PERFORMED	QUAL. REFERENCE IEEE-323-1971	QUAL. REFERENCE IEEE-344-1971
	Diaphram Valve Solenoid Air Operators	ASCO (3)	Regulate Air Supply to Air Operated Safety Related Diaphram Valves	NS-CE-755	c
	Gate Valve Solenoid Air Operators	ASCO (2)	Regulate Air Supply to Air Operated Safety Related Gate Valves	NS-CE-755	c
Instrumentation	Pressure Transmitter	Foxboro ["OUT"] (18)	Monitor: Steam Pressure Containment Pressure 1st Stage Turbine Pressure	e	WCAP 7817 & Supp. 8 WCAP 2541
	Differential Pressure Transmittal	Foxboro [. .] (8)	Monitor Feed Water Flow Rate	e	WCAP 7817 WCAP 8541
Panel Mounted Logic and Switchgear Equipment	Hydrogen Recombiner Control Panel	Westinghouse	Control of Hydrogen Recombiner	e	WCAP 7820 & Supp. 7
	Process Control Cabinets	Foxboro	Monitor Operating Parameters, Initiate Reactor Trip and Safeguards Actuation Signals	e	WCAP 7817
	Solid State Protection System	Westinghouse	Initiate Reactor Protection Functions	e	WCAP 7817 Supp. 2 & 3
	Nuclear Protection System	Westinghouse	Initiate Indicating Control, and Alarm Signals for Reactor Control and Protection	e	WCAP 7817 Supp. 2 WCAP 8830
	Reactor Trip Switchgear	Westinghouse Type DB		e	WCAP 7817 Supp. 6

Revised by Amendment 62

Table Q 7.60-1 (Continued)

WESTINGHOUSE NSSS SUPPLIED 1E SAFETY-RELATED ELECTRICAL EQUIPMENT
(SEQUOYAH -OUT-CONTAINMENT)

CATEGORY	EQUIPMENT	MODEL	FUNCTION(S) PERFORMED	QUAL. REFERENCE IEEE-323-1971	QUAL. REFERENCE IEEE-344-1971
	Safeguards Test Cabinet	Westinghouse	Verify Safeguards Integrity	e	WCAP 7817 Supp. 7
	Safeguards Actuation Cabinet	W	Initiate Reactor Protection Functions	e	WCAP-7817 & Supp. 2
Valve Operators	Globe Valve Motor Operators	Limitorque (6)	Actuate Safety Related Motor Operated Globe Valves	e	b
	Gate Valve Motor Operators	Limitorque (40)	Actuate Safety Related Motor Operated Gate Valves	e	b
	Diaphram Valve Solenoid Air Operators	ASCO (7)	Regulate Air Supply to Air Operated Diaphram Valves	e	c
	Glove Valve Solenoid Air Operators	ASCO (9)	Regulate Air Supply to Air Operated Gate Valves	e	c
Pump Motors	Centrifugal Charging (Hi-Head S.I.)	Westinghouse (2)	Charge RC Pumps, Emergency Care Cooling	e	d
	Safety Injection	Westinghouse (2)	Emergency Care Cooling	e	d
	Residual Heat Removal (Low Head S.I.)	Westinghouse (2)	Supply Constant Flow Through Residual Heat Exchangers, Emergency Care Cooling	e	d

a. Numbers in parentheses indicate the number of that item supplied by Westinghouse (if greater than 1).
b. Seismic tests performed for Limitorque documented by Lockheed Report 3521-4811 (5/17/74) and Aero Nav Report 5720 (1/6/75). The Limitorque valve motor operators supplied by Westinghouse are the same as those supplied by TVA.
c. Seismic testing was performed by ASCO, a letter summarizing the results has been provided to Westinghouse PWR-SD.
d. Seismic analysis of the pump motor structural assembly to demonstrate structural integrity was conducted by the vendor. A copy of the reports is retained by Westinghouse PWR-SD.
e. There is no change in the environment due to any accident for which protective function is required.

AUTOMATIC SWITCH COMPANY
VALVE DEPARTMENT

SHEET 1 OF 13

ENGINEERING REPORT

DISTRIBUTED TO:	QTY.
Valve Sales –	
Valve Service –	
Valve Engrg.–	

SEISMIC TEST REPORT FOR
WALDRON INDUSTRIES (AWV)
P.O. W-1210
ATTENTION: B.H. Sellers, P.A.

LWO 3159 S.O. 46595E

REPORT NO. 144
ENGRG. JOB 67134
PROJECT NO. 1602B (Ref)
ASSIGNED TO E.K. Plaut
DATE 1/16/78

SUBJECT OF THIS REPORT: HV200-921-2RF, 120/60

I. INTRODUCTION:

An ASCO valve HV200-921-2RF, 120/60, containing Buna N gaskets and seats, was functionally and seismic tested per requirements of Waldron Industries (Division of American Warming and Ventilating, Inc.) P.O. W-1210 according to TVA 34-820197, Supplemental Requirements, June 30, 1976 Page 5, Para 9A, and TVA 34-820197 Appendix B, Page 23, Para 4.1.2.3: "Assuming a valve whose lowest natural frequency exceeds 33 Hz", and sub-para (a): "the seismic loading shall be that which results from input accelerations of 3g horizontal and 2g vertical". These values were applied simultaneously resulting in 3.6g at 34° inclination of the normally vertical solenoid axis, when tested in accordance with Seismic Test Procedure TP-1-024, Item 1, attached.

II. RESULTS:

Energized, the valve had zero leakage (for all positions) to 40 cps (12.3g), the limit tested. De-energized, the valve showed no leakage over the allowable 1cc/min. above 34 cps (8.9g), when tested at inlet pressures of 150 and 1/4 psi. Cylinder tank pressure through 40 cps remained at zero when de-energized and at inlet pressure when energized. Functionally, therefore, the valve is satisfactory up to the 12.3g tested.

III. CONCLUSIONS:

The valve, HV200-921-2RF, 120/60 is satisfactory for use in a seismic environment up to 8.9g under ASCO static leakage requirements. Functionally the valve is satisfactory up to the 12.3g tested.

90022264

TVA FEB 1 1978
PURCHASING AWARD
CONTRACT NO. 77K34-82497-3
BY: D Ambra

FOR APPROVAL
JAN 30 1978
AMERICAN WARMING AND VENTILATING INC

APPROVED
This approval does not relieve the contractor from any part of his responsibility for the correctness of design, details and dimensions.
TENNESSEE VALLEY AUTHORITY
Date MAR 1 1978
(MECH ENGG BR) By: D. R. PATTERSON
Ans'd By Ltr #

VE 2253 R1

Automatic Switch Co.
VALVE ENGINEERING DEPT.

		ISSUED BY: E.K. PLAUT	NO. TP-1-024 (2)
		APP'D: R Powell	CHANGE LETTER: -
		DATE ISSUED: 4/9/76	PAGE 1 OF 3

SEISMIC TEST PROCEDURE:
ASCO IN-HOUSE CAPABILITY

1. PURPOSE: To qualify a valve or other component for structural integrity and operational functioning during and after a seismic disturbance.

2. SCOPE: To assure satisfactory operation of the valve at minimum and maximum rating under test conditions, while vibrating the parts at frequencies and displacements specified, within the range of the equipment available. Basic parameters tested will be physical damage, excessive seat or external leakage, cycling ability, locating of resonant frequencies, durability at resonant frequencies or at the highest frequency required, and effect of orientation with respect to shaker motion. Additionally, if leakage is encountered on 3-way and 4-way valves in excess of ASCO standard allowable rates, the change in pressure at the cylinder port(s) will be reported. After seismic shaking the valve is functionally tested and inspected for damage.

3. SUBJECT:

Item	Engrg. Job	Project	LWO	Report No.	Customer	Shop Order
(1)	67134		3159	144	WALDRON IND.	46595E
(2)	"		"	156	"	46596E

Item	Catalog Number	Parts List & (Change Ltr.)	Electr.	Form	Assembly Procedure	Test Procedure	Rated Press. Min.	Rated Press. Max.
(1)	HVA-302-21-RRE	HVA-302-121 (A)	120/60 Hz	F	N.A.	TP-330C	0	150
(2)	HVA-302-22-RRE	HVA-302-300 (-)	120 VDC	F	"	TP-330	0	300

4. EQUIPMENT:
A. The seismic vibration simulator was manufactured by All American Tool and Manufacturing Company, Model Number 100HA-D.
B. The machine has a total load capacity of 100 pounds at 10g.
C. It has a displacement from zero to .150 inches, which is infinitely adjustable. Table travel is horizontal, with sinusoidal motion and acceleration.
D. The frequency range is 9 to 60 hertz.
E. $g = .0511\ Df^2$, where g = acceleration, D = Displacement and f = frequency.

5. ASSEMBLY: The valve shall be assembled per the above ASCO Assembly Procedure.

6. FUNCTIONAL TESTS: The valve shall be functionally tested per the above ASCO Test Procedure. Included shall be:
A. A check for solenoid noise at full line voltage.
B. A check of valve operation at minimum and maximum pressure at test voltage or current.
C. A check for internal leakage at minimum and 10% over maximum pressure.

(1) SEC A-2 ACTIVITY 1

5. FUNCTIONAL TESTS: (Continued

D. A Check for external leakage per the test procedure.

E. Record the above test results, gage and instrument calibration information, such that they are available to the customer.

7. MOUNTING: The test valve shall be rigidly mounted to the vibration table. For testing simultaneously in horizontal and vertical directions relative to the "valve installed position", mount the valve with the core tube at an angle θ from the installed position, in a vertical plane defined by the shaker motion:

$\theta = \tan^{-1} \varepsilon_v/\varepsilon_h = 2/3 = .667 = 33.7^\circ$

where $\varepsilon_h = 3$ = horizontal acceleration, in multiples of 386 in/sec.^{2}

$\varepsilon_v = 2$ = vertical acceleration, in multiples of 386 in/sec.^{2}

(2)

Unless the second orientation is not required because of symmetry, rotate the valve about its normal vertical (core tube) axis by 90° for the two orientations of vibration at a resultant g-loading:

$$\varepsilon = \sqrt{(\varepsilon_h)^2 + (\varepsilon_v)^2} = \sqrt{3^2+2^2} = 3.69$$

8. SEISMIC TESTS:

A. A frequency search shall be performed @ D.A. .15-.05IN. double amplitude in the 9-35 hertz range. The valve shall be tested with the solenoid de-energized and energized at test voltage, for maximum and minimum design pressures, AT A SEARCH SPEED NO GREATER THAN 1 OCT./MIN., FOR 2 CYCLES 9-35-9

B. Dwell tests shall be run at the maximum *g-level (at minimum and maximum pressure) for a minimum of 30 seconds at each resonant frequency (indicated by seat leakage) found in 'A'. If none is found, the dwell test shall be performed at the highest frequency for which the valve is to be qualified. Cycle the valve several times at the same points.

C. During and after the testing indicated in Paragraphs 8A and 8B, sufficient monitoring equipment shall be used to indicate and record any valve malfunction, such as excessive seat leakage, structural failure, broken or loosened parts, improper operation, etc. Calibration information of the equipment shall be recorded.

D. Leak testing shall be performed during sweep and dwell tests, at maximum and minimum pressure, energized and de-energized.

* The maximum g-level for the dwell tests is that g-level, above which failure occurs for the particular orientation and pressure.

9. POST-SEISMIC TESTS: After the seismic testing has been completed, the valve shall again be tested in accordance with Paragraph 6 to assure that the valve is still functioning properly.

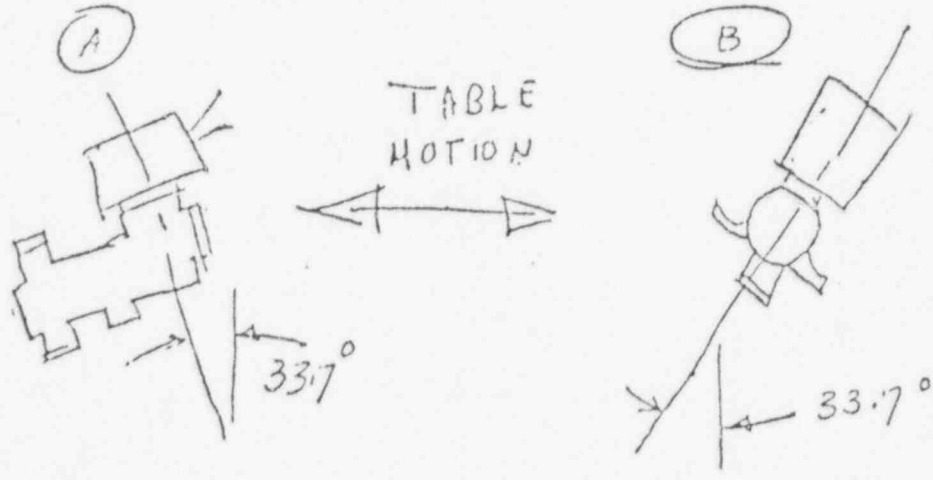
The valve shall be disassembled and thorought examined after completion of tests. Any physical damage or failure to function properly shall be recorded in the test report.

10. REPORT: A formal report shall be furnished to the customer at the completion of the above tests, in accordance with IEEE Standard 344.

NOTE

~~① = CUSTOMER PRESSURE IS 125 PSIG HOLD TEST AT THIS PRESSURE IN ADDITION TO NORMAL MAX. RATED PRESSURE.~~ E.K.P.

② MOUNTING AS BELOW:



90022267

AUTOMATIC SWITCH COMPANY
Valve Engineering Laboratory

SEISMIC SUMMARY REPORT #144

Valve No. HV 200-921-2RF, 120/60
Form F
Position A + B
Angle 34°

Test Stroke

Work Order: 3159.
Project:
Technician: G. FREISHMAN
Medium: FILTERED AIR

Core 222-345-1 Coil HV101L-005-1

Springs 20-932	Nomin 120/60 Volts Current	Mode of Operation	Variable Leakage	Cyl. Tank Pressure	Inlet Pressure (psi)	Variable Leakage G	Displacement	Date	Remarks
Position A	102/60	DEENERGIZED	37v 7 1cc/min	Tank 70~ ZERO	150	10.5	.150	2/21/77	10-37v NO LEAKAGE
	↓	ENERGIZED	10-40v ZERO	150	↓	12.3	↓	↓	HELD FOR 30 SEC AT 40v THEN OPERATED VALVE NO FAILURE
	↓	DEENERGIZED	34v 7 1cc/min	ZERO	1/4 PSI	8.9	↓	↓	10-34v NO LEAKAGE
	↓	ENERGIZED	10-40v ZERO	1/4 PSI	↓	12.3	↓	↓	HELD FOR 30 SEC AT 40v THEN OPERATED NO FAILURE
Position B	102/60	DEENERGIZED	36v 7 1cc/min	ZERO	150	9.9	.150	2/21/77	10-36v NO LEAKAGE
	↓	ENERGIZED	10-40v ZERO	150	↓	12.3	↓	↓	HELD FOR 30 SEC AT 40v THEN OPERATED VALVE NO FAILURE
	↓	DEENERGIZED	34v 7 1cc/min	ZERO	1/4 PSI	8.9	↓	↓	10-34v NO LEAKAGE
	↓	ENERGIZED	10-40v ZERO	1/4 PSI	↓	12.3	↓	↓	HELD FOR 30 SEC AT 40v THEN OPERATED VALVE NO FAILURE

Automatic Switch Co. VALVE ENGINEERING DEPT.	DRW ☒ CONT ☐ AL ☒ AM ☒ CH ☒ CA ☐ AV ☒ ☐ ☐ ☐ ☐ ☐	ISSUED BY J. Fitzsimmons APP. BY [signature] DATE ISSUED 11/1/62	NO. 8300, 8302, TP-8315 CHANGE LETTER F PAGE 1 OF 2
TITLE TEST PROCEDURE: BULLETIN 8300, 8302, 8315			

DESCRIPTION: 3-Way lever operated solenoid valve. Resilient and metal seating.

GENERAL:
1. Check general construction and appearance of valve.
2. Check nameplate data for conformance to shop order specifications.

TEST MEDIUM:
1. Air
2. Mentor Oil if shop order specifies oil only.

TEST FIXTURES: TA-981-11448 P37 Valves
AT-8300C-F-1
TJ-537-9075
TA-905-9984 P38 Valves
TJ-905-10168

TEST VOLTAGE AND CURRENT:
1. All D.C. valves are to be tested using the test current listed under the specified voltage on Data Sheet No. 26.
2. All A.C. valves are to be tested using the test voltage listed on Test Procedure TP-1-003.

EXTERNAL LEAKAGE: Test for external leakage as follows:

(a) Brush seamtest solution around all joints.

(b) Pressurize valve to 1 1/2 times maximum operating pressure. Any bubbling or foaming, unless otherwise stated, is reason for rejection (Ref. TP-1-009)

NOTE: To avoid seat leakage or noise caused by the possible presence of dirt or loose chips, blow air at maximum pressure at which valve will operate thru the valve before proceeding with tests below.

SEAT LEAKAGE (HIGH PRESSURE): Check valve for seat leakage at maximum operating pressure. Allowable leakage:

Resilient Seats - Buna 'N' - 0
Cast Urethane - 50 cc/min.

Metal Seats - 1.5 SCFH

Oil tested valves must be dripless.

NOISE TEST: During the operational tests, check valve for noise. Any chattering or rattling in excess of normal A.C. hum is reason for rejection. Valve should be tested at test voltage first, but voltage may be increased to full line voltage if necessary to pass the Noise Test Only. (Ref. TP-1-015)

Automatic Switch Co. VALVE ENGINEERING DEPT.	DEW ☐ CONT ☐ AL ☐ AM ☐ EN ☐ EA ☐ AV ☐ ☐ ☐ ☐ ☐ ☐	ISSUED BY J. Fitzsimmons APP. BY DATE ISSUED 11/1/62	NO. 8300, 8302, TP-8315 CHANGE LETTER F PAGE 2 OF 2
TITLE TEST PROCEDURE: BULLETIN 8300, 8302, 8315			

OPERATIONAL TESTS:

1. Operate valve at least 10 times at maximum operating pressure.
2. Operate valve from maximum operating pressure down to minimum operating pressure. Valve must operate perfectly at test voltage or current.

SEAT LEAKAGE (LOW PRESSURE):

Check seat leakage at 10 psi. Allowable leakage:

Resilient Seats - Buna 'N' - 0
Cast Urethane - 50 cc/min.

Metal Seats - 1.5 SCFH

Oil tested valves must be dripless.

COIL TESTS:

1. A.C.--Energize solenoid and check milliampere reading. Value should agree with that shown on Data Sheet No. 24.
2. D.C.--Energize solenoid and check voltage reading. Value should agree with that indicated per note 2 on Data Sheet No. 26.

PREPARATION FOR SHIPMENT:

Seal all pipe connections with plastic thread protectors and hank coil leads around bonnet.

CORRECTIVE ACTION RECORD:

Maintain Test Log (Form 1109) on all large production runs.

ERV -76010 (F) Revised - 1/16/76 - P.W.C.
ERV -66986 (E) Revised - 5/17/73 - J.C.F.
ERV- 66736 (D) Revised & Retyped - 4/23/73 - J.C.F.

AUTOMATIC SWITCH COMPANY
VALVE ENGINEERING DEPARTMENT

L.W.O. 3159

PRE AND POST SEISMIC TESTS OF HV200-921-2RF

Project or 1602B
Eng. Job 62134

Ref. Test Procedure Bulletin TP- 8300 8302 8315

S.O. No. 4659

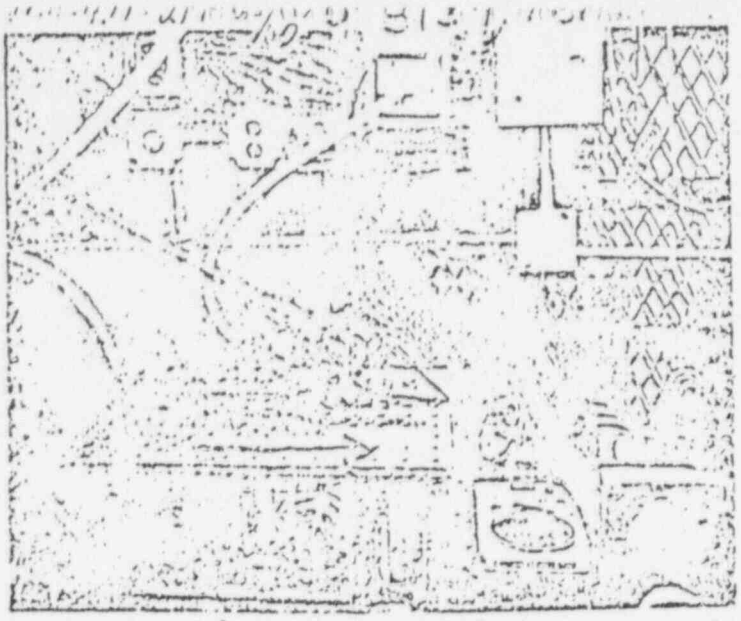
Report 144

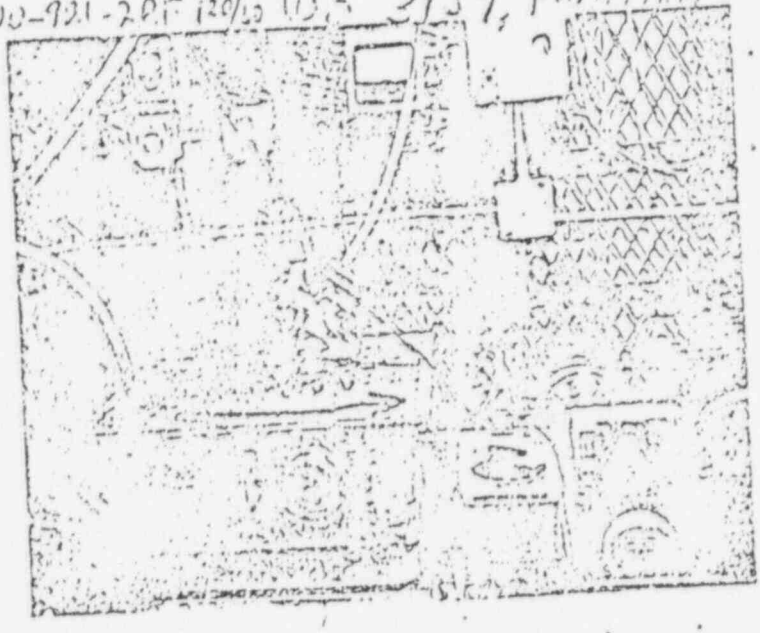
			PRE-SEISMIC	POST-SEISMIC
APPEARANCE			OK	OK
TEST MEDIUM			AIR	AIR
COIL EXCITATION	AC: Volts 102/60 DC: Amps X		OK	OK
COIL CONFIRMATION CHECK	AC: Amps .25 DC: Volts X		OK	OK
COIL DIELECTRIC TEST @ _____			—	—
EXTERNAL LEAKAGE @ 225 PSI			0	0
SEAT LEAKAGE	HIGH PRESSURE @ 150 PSI	ENERG.	0	0
		DE-EN.	0	0
	LOW PRESSURE @ 10 PSI	ENERG.	0	0
		DE-EN.	0	0
NOISE TEST			OK	OK
OPERATIONAL TEST 10 TIMES @ 150 PSI			OK	OK
FROM 150 TO 1/4 PSI			OK	OK

DATE 8-31-72

TECHNICIAN G. FLEISHMAN

90022271





AUTOMATIC SWITCH COMPANY
Valve Engineering Laboratory

INSTRUMENTATION CALIBRATION

Customer Waldron Inc. Date 8-31-77

Assembly Dwg. 200-971 thru 201-300 Chg. Ltr. A - Work Order 3159

Catalog HV 200-971 thru PF-201-300-IRF Shop Order

Instrument Serial No.	Manufacturer Model No.	Range	Calibration Date	Calibration Due Date
VLADC-5-3	Weston	0-5 Amps	6-23-77	10-15-77
VLVAC-300-12	Weston	0-300 VAC	6-22-77	10-15-77
VLPG 600-1	Helicoid	0-600 psi	6-6-77	10-6-77
VLPG 600-1	Helicoid	0-600 psi	5-19-77	10-1-77
VLPG 30-16	Helicoid	0-30 psi	5-18-77	10-1-77
VLFCC 200-1	Dwyer	0-200 cc/min	10-19-76	10-20-77
VLFP 200-4	Dwyer	0-200 GPH	10-19-76	10-20-77

Technician [signature]

90022273

PURCHASE ORDER

ORIG

WALDRON INDUSTRIES, INC.

DIV. AMERICAN WARMING AND VENTILATING, INC.

1017 SUMMIT STREET P.O. BOX 1717, CENTRAL STA.
TOLEDO, OHIO 43603
PHONE 419-243-7151 TELEX - 286-442

PURCHASE ORDER NO. W-1210

TAG NO. QW/20180/

T. V. A.

C46

PURCHASE ORDER NO. & TAG NO. MUST APPEAR ON ALL INVOICES, PACKAGES AND SHIPPING PAPERS

DATE	SHIP VIA	DEST WAY	WHEN SHIP	TERMS	F.O.B.	TAXABLE	EXEMPT	EXEMPTION CERTIFICATE BELOW
7/5/77			9/2/77	USUAL			X	

VENDOR

Automatic Switch
Hanover St.
Florhan Pk, N. J. 07932

SHIP TO

SHIP

WALDRON IND. INC.
335 WATER ST.
WALDRON, MICH. 49288

34-112-4838 LICENSE NO. STATE SALES TAX

QUANTITY	PLEASE ENTER OUR ORDER FOR THE FOLLOWING	UNIT PRICE	TOTAL PRICE
14	Asco Solenoid Valves HV200-921-2RF 8300 C61FR 120/1/60		
20	Asco Solenoid Valves HV200-1200-1RF 8300 C58FR 120 VDC		
	Valves shall be supplied in accord. W/page 5 Par. 9(a) of T. V. A. supplemental requirements.		
	Please supply seismic certification in accordance w/appendix B of T. V. A. spec. 34-820197 and supplemental requirements pages 1 thru 5 herewith attached.		
	POOR ORIGINAL		

SEE REVERSE SIDE OF ABOVE ORDER FOR ADDITIONAL TERMS AND CONDITIONS OF PURCHASE AND ACCEPTANCE SUBJECT TO SAME.

FILL IN INFORMATION BELOW ON ACKN. COPY & RETURN TO US

AUTHORIZED SIGNATURE

BUYER

SHIPMENT OF ALL ITEMS WILL BE MADE

DATE

VIA

DATE ACCEPTED

VENDOR

SIGNED VENDOR'S AUTHORIZED REP

BLANKET CERTIFICATE OF EXEMPTION - Above Company hereby certifies that the articles of tangible personal property purchased from the vendor shown on face hereof from the first date of this current year shall be purchased to use or consume the thing transferred directly in the production of tangible personal property for sale by manufacturing or processing. This certificate shall continue in force until revoked and shall be considered a part of each order given to the above named vendor unless the order specifies otherwise. Signed: Above Company. By: Buyer, see above. Title: Buyer. Address: See above. Dated: See above. Company License, if any: See above.

90022274

PURCHASE ORDER

WALDRON INDUSTRIES, INC.

DIV. AMERICAN WARMING AND VENTILATING, INC.
1017 SUMMIT STREET P.O. BOX 1717, CENTRAL STA.
TOLEDO, OHIO 43603
PHONE 419-243-7151 TELEX - 286-442

C46

PURCHASE ORDER NO. W- 1210
TAG NO. QW/90180/3
T. V. A.

PURCHASE ORDER NO. & TAG NO. MUST APPEAR ON ALL INVOICES, PACKAGES AND SHIPPING PAPERS

DATE	SHIP VIA	DEST WAY	WHEN SHIP	TERMS	F.O.B.	TAXABLE	EXEMPT SEE CERTIFICATE BELOW
7/5/77			9/2/77	USUAL			X

VENDOR

Automatic Switch
Hanover St.
Florhan Pk, N. J. 07932

SHIP TO

SHIP

WALDRON IND. INC.
335 WATER ST.
WALDRON, MICH. 49288

34-112-4838 LICENSE NO. STATE SALES TAX

QUANTITY	PLEASE ENTER OUR ORDER FOR THE FOLLOWING	UNIT PRICE	TOTAL PRICE
14	Asco Solenoid Valves HV200-921-2 PF 8300 C61FR 120/1/60		
20	Asco Solenoid Valves HV200-1200-1RF 8300 C58FR 120 VDC		
	Valves shall be supplied in accord. W/page 5 Par. 9(a) of T. V. A. supplemental requirements.		
	Please supply seismic certification in accordance w/appendix B of T. V. A. spec. 34-820197 and supplemental requirements pages 1 thru 5 herewith attached.		17

SEE REVERSE SIDE FOR ADDITIONAL TERMS AND CONDITIONS OF THIS ORDER

FILL IN INFORMATION BELOW ON ACKN. COPY & RETURN TO US

AUTHORIZED SIGNATURE
BUYER B. H. Sellers

SHIPMENT OF ALL ITEMS WILL BE MADE
DATE
VIA

DATE ACCEPTED

VENDOR

SIGNED VENDOR'S AUTHORIZED REP.

TAX EXEMPT CERTIFICATE OF EXEMPTION - Above Company hereby certifies that the articles of tangible personal property purchased from the vendor shown on face hereof on or after the first date of this current year shall be purchased to use or consume the thing transferred directly in the production of tangible personal property for sale by manufacturing, processing. This certificate shall continue in force until revoked and shall be considered a part of each order given to the above named vendor unless the order specifies otherwise. Signed: Above Company. By: Buyer, see above. Title: Buyer. Address: See above. Date: See above. Company License, if any: See above.

90022275

Automatic Switch Co.

FLORHAM PARK, N.J. 07932 • D-U-N-S 00-214-1776

SHOP ORDER V10 — SO 46595E-96

CUST. ORDER	OR REQ'N. NO.	CONSIGNEE ORDER NO.	DEPT.	DATE ENTERED	P.	WITH S.O. NO	ACCOUNT	BR	REP	CL		GD.	REP. CD.	REP.
W 1210			V	07/11/77		46595E-96	52128	01	13	1		2		

MARK: QW/90180/3
T.V.A.

FP100

VIA BEST WAY COLLECT - UNLESS SPECIFIED

C PREPAID | NC

TRH — SEE OFFI

APPROXIMATE SHIPPING DATE DURING WEEK OF: 8/26

734

SHIP TO
WALDRON INDUSTRIES INC 4

335 WATER STREET
WALDRON MI 49288

F.O.B. FLORHAM PARK, N.J. UNLESS SPECIFIED

BACK ORDERED ITEMS WILL BE SHIPPED DURING WEEK ENDING:

CUST. ORDER NO. OR REQ'N. NO.: W 1210

CONSIGNEE ORDER NO.

SOLD TO
WALDRON INDUSTRIES INC

P O BOX 1717 CENTRAL STA
TOLEDO OH 43603

SPECIAL INSTRUCTIONS: FURNISH SEISMIC CERTIF.

CUSTOMER REQUIRES: SHIP AT ONCE UNLESS INSTRUCTED — BY 09/02/77 X

8/20

JOB INVOICE INSTRUCTIONS: B/L | P/L | SPD FR

PACK WITH I & M NO: V5851 NI017

CO ITEM NO.	QUANTITY ORDERED	CATALOG NUMBER	PIPE SIZE	ORIF SIZE	CODE V	CODE G	VOLTAGE AND SERVICE	QUANTITY SHIPPED (IF PARTIAL)	UNIT PRICE	PERCENT DISCOUNT	NET TO
1	14	HV200921 2 RF	1/4	1/4	11		120/60 AIR ~~250~~ 150 PSI		135.00	37	11
		CUSTOMER NOTE- ABOVE SUPERSEDES 8300C61 RF									

9/22/2006

200 921 f f

TP 8300

yellow copy

POOR ORIGINAL

SUB-TOTAL ▶ 1,1

SHIPPING AND/OR FWD. AGT. CHARGES | TOTAL AM

PARTIAL	ITEM NO.	QTY.	DATE SHIPPED	PIECES	CASES	GROSS WT.	PACKER	CARRIER - VIA	SHIPPING CHG.
C	1	14		1			0042		

II. Environmental Qualification of Westinghouse Supplied Class 1E Equipment

Your response to Question 7.60, particularly Table Q7.60-1 was incomplete in these respects.

1. The information contained in NS-CE-755 did not address the qualification of the ASCO 8300 series solenoid valves for use inside the containment. We require that:

   a. a test report showing these valves to be qualified for service in the worst case environment in the containment be provided for review, and

   b. these five items from I&E Bulletin 79-01A be complied with for all solenoid valves used in safety-related applications inside the containment.

      (1) The parts of the solenoid valve made of acetal plastic material should be replaced with similar parts made of metal which can be provided by ASCO.

      (2) The valve seals and gaskets which are made of Buna "N" material should be replaced with viton elastomers, considered by ASCO as suitable for the service intended.

      (3) Review and determine that the coils of the solenoid valves installed inside containment are Class "HT" or "HB" as required for high temperature environmental conditions.

      (4) Review and determine that the solenoid enclosures installed inside containment have at least a NEMA 4 enclosure rating.

      (5) Establish a preventive maintenance program to assure replacement of those valve parts identified above in the time period recommended in the appropriate ASCO valve bulletin.

   The acceptable alternative to the above program is to replace all the unqualified valves used in safety-related applications inside the containment with qualified valves, provide a copy of the environmental qualification report, and institute an appropriate preventive maintenance program similar to that identified by (b5) above. Provide a response showing how the requirements of this position will be met.

2. Foxboro E13DH differential pressure transmitters are located inside the containment to provide the low coolant flow trip. Provide information showing that these transmitters are environmentally qualified to conform to our position that safety-related equipment shall remain functional in the accident environment for a period of at least one hour in excess of the time assumed for its operation in the accident analysis.

3. The Safeguards Actuation Rack, Containment Air Return Fans, and Containment Spray Pump motor were omitted from Table Q7.60-1. Also the following listed equipment, located outside the containment, did not have any documentation listed in the table that presents the environmental specifications and shows that the equipment meets them. This equipment includes: (a) Foxboro E11 GM pressure transmitters, (b) Foxboro E13 DM differential pressure transmitters, (c) Hydrogen Recombiner control panel, (d) Foxboro Process Control Cabinets, (e) Westinghouse Solid-State Protection System, (f) Westinghouse Nuclear Protection System, (g) Reactor Trip Switchgear, (h) Safeguards Test Cabinet, (i) Valve Motor Operators, (j) ASCO solenoid valves, and (k) the Centrifugal Charging, Safety Injection, and Residual Heat Removal pump motors. Revise the table to provide references to documentation that shows the qualification of this equipment to survive and operate in its worst case environment.

Response

1. The environmental qualification of ASCO valves for Sequoyah will be addressed in response to L. S. Rubenstein's letter to H. G. Parris dated October 17, 1979. L. M. Mill's letter to L. S. Rubenstein dated November 13, 1979, provided a schedule for responding to the October 17, 1979, letter.

2. The reactor coolant flow transmitter (Foxboro E[illegible]H) is only required to perform a safety function for contained faul[illegible] There are no adverse environments present when this instrument must perform its safety function.

3. The Safeguards Actuation Cabinet was included in Table Q7.60-1 by the response to Question I(3) above. The remaining information requested will be provided in response to L. S. Rubenstein's letter to H. G. Parris dated October 17, 1979. L. M. Mill's letter to L. S. Rubenstein dated November 13, 1979, gave a schedule for responding to the October 17, 1979, letter.

III. Table 3.11-2 Concerns

Table 3.11-2 is incomplete and certain portions are unacceptable. The following additional information is required for us to complete our review.

1. In several places in Columns 7 and 8 of Table 3.11-2 the entry "NA" is given. This entry is unacceptable since the normal operation radiation dose rate and total integrated normal operation dose applies and should be given for each of the nonaccident conditions. Revise the table to include these values.

2. For the entries in Column 9 of Table 3.11-2 identify the time period over which the dose is integrated. It is not clear from the table if the integrated accident dose includes the "normal operation" integrated 40-year dose in addition to the integrated dose resulting only from the postulated accident. In some cases, the "normal operation" integrated 40-year dose amounts to as much as 50 percent of the indicated accident dose. Therefore, if the integrated accident dose does not include this "normal operation" 40-year dose you must justify that the equipment is qualified to function in the accident environment. Revise Table 3.11-2 address this concern and revise FSAR Section 3.11 to clarify and justify your response.

3. Table 3.11-2 does not consider the effects of a steamline or feedwater line break occurring in the Auxiliary Building near the penetrations or in the vicinity of the Auxiliary Building ventilation air intake which is located immediately above both the four main steamlines and the four main feedwater lines for each unit. Revise Table 3.11-2 to include consideration of these occurrences for safety-related equipment located in these areas. Table Q7.60-1 should also be revised to ensure that these occurrences have been considered in the reference to qualification documentation for safety-related equipment located in these areas.

Response

1. Table 3.11-2 has been modified to delete "NA" for normal operation radiation dose rate and total integrated normal operation dose for each nonaccident condition.

2. Section 3.11.2.1 has been modified in response to this question.

3. Doors A101 and A105 at the entrances to the main steam valve rooms have been designed to withstand the pressure resulting from a break in the main steam or feedwater lines in those rooms. Therefore, the affects of such a break would not be transmitted to the rest of the Auxiliary Building.

   Temperature sensors are provided in the Auxiliary Building ventilation air intakes to initiate closure of isolation dampers upon high temperatures resulting from an MSLB in the vicinity of the air intakes. FSAR Section 6.2.3 has been revised to describe this feature.

TABLE 3.11-2

SUMMARY OF OPERATIONAL ENVIRONMENTAL CONDITIONS

Plant Location	Building Location(s)	Operational Condition	Pressure Extreme (psia)	Peak Temp (F)	Peak Humidity (%)	Normal Dose Rate (mrad/hr)	Integrated 40 Yr Dose (RADS)	Integrated Accid. Dose (RADS)	Analytical Reference In FSAR
Outside	-	2	ATM	97	100	<1.0	<5 x 10^2	NA	Sect 2.3
		3	11.4	NA	NA	NA<1.0	NA<5X10^2	NA	Sect 3.3
Containment Vessel	Upper Compartment	1	ATM	85	98	10^3	5 x 10^5	NA	Sect 9.4.8
		5	26.4	170	100	NA 10^3	NA 5X10^5	5X10^8	Sect 6.2.1
		6	18.8	140	100	NA 10^3	NA 5X10^5	NA	Sect Q6.56
	Ice Condenser Compartment	1	ATM	15	100	5 x 10^4	2 x 10^7	NA	Sect 6.5
		5	26.2	170	100	NA 5X10^4	NA 2X10^7	3X10^8	Sect 6.5
	Lower Compartment	1	ATM	120	98	5 x 10^4	2 x 10^7	NA	Sect 9.4.8
		5	26.4	244	100	NA 5X10^4	NA 2X10^7	5X10^8	Sect 6.2.1
		6	18.8	327	100	NA 5X10^4	NA 2X10^7	NA	Sect Q6.56
	All Compartments	4	13.9	NA	NA	NA 5X10^4	NA 2X10^7	NA	Sect 6.2.6
Shield Bldg.	Annulus	1	ATM*	120	98	5 x 10^4	2 x 10^7	NA	Sect 6.2.3
		3	ATM	NA	NA	NA 5X10^4	NA 2X10^7	NA	Sect 3.3
		4	12.4	NA	NA	NA 5X10^4	NA 2X10^7	NA	Sect 6.2.6
		5	ATM*	150	100	NA 5X10^4	NA 2X10^7	~~5X~~ 10^8	Sect 6.2.3
Auxiliary Bldg.	General Spaces	1	ATM*	104	98	1.0	5 x 10^2	NA	Sect 9.4.2
		5	ATM*	115	100	NA 1.0	NA [redacted]10^6	10^4	Sect 6.2.3
	Individually Cooled Rooms	1	ATM**	104	98	2 x 10^3	10^6	NA	Sect 9.4.2
		5	ATM**	110	100	NA 2X10^3	NA 5X10^2	10^7	Sect 9.4.2
	Board Rooms, Aux. Control	1	ATM**	75	50	1.0	5 x 10^2	NA	Sect 9.4.2
	Room, Mech. Equip. Rooms	5	ATM**	86	50	NA 1.0	NA 5X10^2	10^3	Sect 9.4.2
	Reactor Aux. Board Rooms,	1	ATM**	104	98	1.0	5 x 10^2	NA	Sect 9.4.2
	Battery Rooms	5	ATM**	104	90	NA 1.0	NA 5X10^2	10^3	Sect 9.4.2
	Shutdown Board	1	ATM	104	98	1.0	5 x 10^2	NA	Sect 9.4.2
	Transformer Rooms	5	ATM	104	80	NA 1.0	NA 5X10^2	10^3	Sect 9.4.2
Control Bldg.	Main Control Room,	1	ATM*	75	50	0.5	2 x 10^2	NA	Sect 6.4
	Mechanical Equipment Rooms	5	ATM**	75	50	NA 0.5	NA 2X10^2	10^2	Sect 15.5.3
	Aux. Instr. & Computer Rooms	1	ATM**	75	50	1.0	5 x 10^2	NA	Sect 9.4.1
	Communication Room, Battery Rooms	5	ATM**	75	50	NA<1.0	NA 5X10^2	10^3	Sect 9.4.1
Diesel Generator Bldg.	Diesel Generator Rooms,	1	ATM	100	98	<1.0	<5 x 10^2	NA	Sect. 9.4.5
	Diesel Aux. Board Rooms	3	11.4	NA	NA	NA<1.0	NA<5X10^2	<10^3	Sect 3.3
		5	ATM	104	90	NA<1.0	NA<5X10^2	10^3	Sect 9.4.5

NOTES:

A. Operational Condition Definitions:
   1 - Normal Average Day
   2 - Hot Day, River Cooling Water at 83 F
   3 - Tornado (Sudden Pressure Drop of 3.0 psi)
   4 - Erroneous containment Spray Initiation Accident
   5 - Loss-of-Coolant Accident, Hot Day, River Cooling Water at 83 F
   6 - Main Steam Line Break (worst case small break)

B. ATM indicates a pressure equal to atmospheric pressure will be present. Normal atmospheric pressure at the Sequoyah Nuclear Plant site is 14.4 psia.

C. ATM* indicates a pressure slightly below atmospheric.

D. ATM** indicates a pressure slightly above atmospheric

E. All dose rates and integrated doses shown are upper limits for the summation of the gamma and beta contributions.

F. NA - Not applicable for this operating condition.

3.11 ENVIRONMENTAL DESIGN OF MECHANICAL AND ELECTRICAL EQUIPMENT

Information showing that safety related mechanical and electrical equipment is capable of functioning properly in the worst possible local environments at the Sequoyah Nuclear Plant is presented. A listing of the safety related equipment that must function to properly mitigate accidents is provided first. Following this is a summary of the worst-case local environmental conditions that are possible at plant locations containing Reactor Protection System (RPS) and engineered safety feature (ESF) equipment. Accompanying this summary of worst-case local environments are references to the analyses that defined these circumstances. Environmental design criteria utilized for the RPS and ESF equipment are then given. Policies employed for assuring that properly qualified equipment was installed to perform these safety related functions are next defined and a summary of the environmental testing performed to qualify these items along with a list of test result documentation is given. Following this is an evaluation of the environmental effects that would follow a loss of a plant ventilation system when it is being used for cooling RPS or ESF equipment.

3.11.1 EQUIPMENT IDENTIFICATION

Safety related mechanical and electrical equipment that must function to properly mitigate accident effects are listed in Table 3.11-1.

3.11.2 QUALIFICATION TESTS AND ANALYSES

Qualification tests and analyses were conducted to assure that engineered safety feature equipment capabilities are compatible with their particular operating environments. Initially, environmental design criteria were obtained from analyses of specific situations that could occur at specific plant locations containing RPS or ESF equipment. These findings then became a basis for ESF system design component selection and component qualification.

3.11.2.1 Environmental Design Criteria

Two different approaches were followed in establishing environmental design criteria for RPS and ESF equipment. One of these included a survey of the environmental qualifications of available components suitable for use in such systems, the selection of appropriate environmental design limits and the sizing of environmental control equipment to maintain acceptable conditions for the RPS and ESF equipment during the worst possible set of circumstances. The other approach utilized to establish environmental design criteria began with a series of analyses of various plant operations, accident condition and naturally occuring outside environment extremes and concluded with a review of the analytical results and adoption of the worst case situation as the environmental design criteria for ESF equipment installed at that particular plant location

A summary of the results obtained in these environmental analyses at plant locations containing ESF equipment is given in Table 3.11-2. References to specific analyses performed to establish pressure and temperature criteria are also given in the table. The radiological criteria shown are those for containment air and are upper limits for the summation of the gamma and beta contribution. The largest accident dose data assume a duration of accident conditions of 30 days. No attempt was made to combine the expected 40-year integrated dose with the accident dose. In those cases where the calculated accident dose is large, the 40-year dose is only

a small fraction of the accident dose, in cases where the 40-year dose is a significant fraction of the accident dose the latter is so small that the inherent radiation hardness of equipment exceeds the combined total.

the amount of air drawn from this enclosed volume in a manner to keep the pressure at this desired negative value. This is done with a modulating damper that is controlled by the differential pressure transmitter to adjust the amount of outside air introduced into the duct network just upstream of the constant capacity fan described above. Such action will bring in sufficient outside air to keep the fan flow rate at its rated flow at all times. It will also draw enough air from the Auxiliary Building Secondary Containment Enclosure to establish and keep the desired negative pressure level.

The controls for the Auxiliary Building Gas Treatment System were designed to provide two basic control modes. One control mode has both air cleanup units in operation simultaneously. The second control mode has either one of the air cleanup units in operation and the other in a state in which it can automatically come into operation in the event the operating unit fails. A low flow signal from the operating unit is utilized in this control mode to make this failure determination. This operational redundancy is achieved with spatially separated power and control circuitry having different independent power sources to prevent a loss of function from any single system component failure. The term "train A" is used to identify one complete set full capacity equipment and the term "train B" is used to identify the other set of full capacity equipment. Power for both equipment trains is supplied by the Emergency Power System.

Operation of the Auxiliary Building Gas Treatment System begins automatically upon receipt of a:

1. Phase A containment isolation signal from either reactor unit, or a

2. High radiation signal from the fuel handling area radiation monitors, or a

3. High radiation signal from the auxiliary building exhaust vent monitors.

4. High temperature signal from the Auxiliary Building main air intakes. (To close isolation dampers and prevent entrance of steam to the Auxiliary Building as a result of an MSLB in the vicinity of the Auxiliary Building air intake.)

A capability is also provided to start both trains with a hand switch in the main control room. Another adjustment capability provided in the hand switch in the main control room will change the operating mode to the single train operation with the redundant train in a standby status. Employment of this operating mode is expected after the first 30 minutes of operation. In this instance the main control room operator has the capability to select either unit to remain in operation.

6.2.3.2.4 Ice Condenser General Description

The function of the post LOCA iodine removal served by the Ice Condenser is accomplished by chemically controlling the alkaline ice to a pH range of 8.5 to 9.5. This is accomplished by adding sodium tetraborate to the Grade A feedwater in the solution of $Na_2B_4O_7 \cdot 10H_2O$ with 2000 $\pm$ 100 ppm of Boron prior to ice basket loading. During the accident, the melting ice provides a medium for removal of iodine from the containment atmosphere and fixation in solution.

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IV. Table 3.11-3 Concerns

Table 3.11-3 is incomplete and portions of it remain unacceptable. The following additional information is required for us to complete our review.

1. On page 3.11-6 the listing of components for the Reactor Protection System contains these omissions: (a) containment pressure, (b) low head flow, (c) accumulator level, (d) steam generator level, and (e) UHI accumulator level instrumentation. Revise the table to include these parameters or justify their omission.

2. On page 3.11-6 the total radiation dose of 2.1×10^7 Rads appears to be that listed in Table 3.11-2 for the 40-year normal operation dose. Provide the basis for this number and revise the column headed "comments" for the Reactor Protection System entry to show that this safety-related equipment will remain functional in the accident environment for a period of at least one hour in excess of the time assumed for its operation in the accident analysis.

3. On page 3.11-6a for the Containment Spray System, the piping, heat exchangers, valves, and pump and motor are all located in Auxiliary Building cooled rooms but three different values (115°, 150°, 104°) of temperature are given. Provide the basis for these values. Also the spray header and nozzles are in the upper compartment of the containment and have a design temperature of 190°F. The Containment Air Return Fan is also located in the same upper compartment but its rating is 250°F. Provide the basis for these values.

4. On page 3.11-7 for each of the total radiation dose entries provide the bases on which this total dose was computed.

5. On page 3.11-7 for the Containment Isolation System entries further identify the containment location as either upper or lower compartment. If the equipment item is used in both compartments, confirm that the design conditions envelope the most severe service conditions.

6. On page 3.11-7, for the airlocks and equipment hatch entries: (a) Explain why a 700° peak design temperature is used for the airlocks, but only a 220°F peak design temperature is used for the equipment hatch. (b) Your inclusion of only the airlocks and equipment hatch appears inadequate since our requirements are that the containment retain its integrity for at least 30 days after the accident. Revise this entry to consider the need for a higher radiation qualification dose that should include the 30-day accident dose in addition to the accident and "normal" 40-year doses.

7. On pages 3.11-7, 8, and 9 for those entries where the symbol "c" is used in the "peak design temperature" and "peak design humidity" columns provide the values of these parameters that are used in the equipment specifications.

8. On page 3.11-9 specify the value to which the humidity is regulated for those entries where the symbol "d" appears.

9. On page 3.11-9a for the equipment in the Auxiliary Feedwater System furnish the expected dose rate and total dose. For the instrumentation and controls located inside the containment state whether they are located in the upper or lower compartment. State also if the specified total radiation dose contains the "normal" 40-year dose as well as the postulated accident dose. For those instruments used for post-accident monitoring the specified dose should contain the post-accident period dose. Justify any exceptions to these recommendations.

Response

1. Containment pressure and steam generator level instrumentation have been added to Table 3.11-3. The other items are not safety related.

2. The governing dose is that to the containment pressure monitors which must be operational for three months. These sensors are physically located in the annulus rather than in the containment. The integrated 3-month dose was derived from an interpolation between the 1-month and 1-year gamma dose. The similarity of this value to the 40-year integrated dose from normal operating is fortuitous.

3. The peak design temperature listed for the containment spray system piping and heat exchangers was incorrectly shown as 115°F. It should be 190°F. This temperature is the maximum process fluid temperature, which is greater than the ambient temperature. The peak design temperature shown for the valves and pump and motor are the ambient temperatures listed in the equipment specifications. Temperatures listed in equipment specifications may be greater than the expected ambient conditions and will not necessarily be the same for different types of equipment. In some cases, conservatively high temperatures may be listed in the specifications to ensure additional margin in the design.

   The peak design temperature listed for the containment spray header and nozzles was incorrectly shown as 190°F. That temperature was intended to represent the maximum process fluid temperature for this part of the system, 115°F, which is less than the maximum upper compartment temperature of 170°F. In this case the components are insensitive to the temperatures expected in the upper compartment. They are constructed of type 304 stainless steel. Peak design temperature for these components has been changed in Table 3.11-3 to the expected upper compartment peak temperature of 170°F.

The peak design temperature listed for the air return fans is that temperature to which the vendor generically qualifies fans for this type of service. It is recognized that the peak temperature expected in the upper compartment is significantly less than that temperature to which the fans are qualified. The conservative design of this equipment should only enhance the safety margin provided in the overall design.

4. The hydrogen recombiner total dose requirement is composed of 40 percent of the free-field 30-day beta dose (~/.3 x 10^8 Rad) and the external 30-day gamma dose (~5.4 x 10^7 Rad) for a total of about 2.0 x 10^8 Rad. The estimate of 40 percent of the free-field 30-day beta dose is based on the dimensions of the hydrogen recombiner and the range of 2 MeV betas.

   Total radiation doses given for the components of the containment isolation system should be 10^8 Rads. These doses are based on the highest expected 1-year gamma dose inside containment (7.2 x 10^7 Rad in upper compartment). TVA is presently evaluating the beta dose to sensitive parts of these components and expects to show that it will be small. It has been determined that the possible maximum dose, gamma plus beta, from six months' operation at 5 percent of rated power will be at least a factor of ten less than the estimated free-field dose. Since the equipment is qualified to 10^8 Rads, operation at 5 percent of rated power for six months will not result in possibly unacceptable doses.

5. Table 3.11-3 has been modified to distinguish between upper and lower compartment. Design conditions envelope the most severe service conditions, as can be seen by comparing Tables 3.11-2 and 3.11-3.

6.a. & b. The peak design temperature and total radiation dose were taken from the original equipment specifications. However, subsequent design changes have resulted in a change of equipment. Table 3.11-3 has been revised to reflect the specifications to which installed equipment was bought.

   As stated in our response to item 4, the dose should be 10^8 Rads. Beta dose to the seals of airlocks and equipment hatch is negligible since the seals are protected by the massive hatch covers. The maximum free-field 30-day total gamma dose of 1 x 10^7 Rads is well below the seal qualification of 10^8 Rads, even without considering the photon attenuation in the hatch covers.

7. Table 3.11-3 has been modified in response to this question.

8. Table 3.11-3 has been modified in response to this question.

9. The radiation dose shown is sufficient to cover the higher estimated 30-day accident gamma dose inside containment and the expected 40-year dose because of normal operation. Table 3.11-3 has been changed to specify upper or lower compartment.

Revised by Amendment

TABLE 3.11-3

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Reactor Protection System	Instr for pressurizer pressure & level, high head flow, accumulator pressure & sump level	Containment lower compartment	74.7	327	100	5×10^6	2.1×10^7	Pressurizer pressure required for 0.5 hour, pressurizer level 0.5 hr, high head flow 5 min. accumulator pressure 5 min, containment sump 3 hrs, containment pressure 3 months.
	Containment pressure Instrumentation for UV & UF	Annulus Auxiliary building	ATM ATM	180 104	100 95	5×10^4 *	1×10^7 *	
	Instrumentation for low feed-water control	Auxiliary building	ATM	140	98	*	*	
	SSPS	Aux. Inst. room	ATM	120	95	*	*	
	Foxboro Racks	Aux. Inst. room	ATM	120	95	*	*	
	Panels	Main control room	ATM	120	95	*	*	
Ice Condenser	Ice bskt, ice bskt support structure, ice compartment door & door jambs	Containment ice condenser compartment	27.8	250	100	10^6	1.2×10^7	Door rates are for seals

Revised by Amendment

TABLE 3.11-3

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Containment Air Return Fan	Fan & motor assy, backflow damper ducting & power & cont circuitry	Containment upper compartment	26.7	250	100	Note E	10^8	250 F for first hour of LOCA, & 170 F & 100% humidity for 1 yr
Containment Spray System	Piping, heat exch	Aux bldg cooled room	ATM	190	100	*	*	Maximum process fluid temperature listed.
	Valves	Aux bldg cooled room	ATM	150	100	*	*	
	Pump & Motor	Aux bldg cooled room	ATM	104	100	*	*	
	Spray header and nozzles	Containment upper compartment	26.7	170	100	**	**	
Emergency Power System	Diesel Generator and auxiliaries	Diesel Generator building	ATM	110	90	*	*	
	Shutdown transformers, 6.9 Kv shutdown boards, 480 Kv Shutdown boards, 480 Kv MOV boards, 480 Kv Vent boards	Auxiliary building	ATM	104	95	*	*	

Revised by Amendment

TABLE 3.11-3 (Continued)

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Hydrogen Recombiner	Heater element	Containment upper compartment	75	300	100	5×10^6	2×10^8	Withstand water spray with 2500 ppm boric acid & sodium hydroxide giving a pH of 10.5 for 3 months
Containment Isolation System	Sensors, monitors	Primary containment upper & lower compartments	26.7	327	100	5×10^6	1.3×10^8	
	Elec cables & penetrations	Primary containment upper & lower compartments	26.7	327	100	E	10^8	
	Mech penetrations	Primary containment upper & lower compartments	26.7	327	100	**	**	
	Isolation valve operators	Primary containment upper & lower compartments	26.7	327	100	5×10^6	2×10^8	
	Fuel transfer canal valves	Primary containment upper & lower compartments & aux bldg	32.1	180	100	**	**	
	Airlocks	Primary containment upper & lower compartments	26.7	327	100	E	1×10^8	Seals are the limiting component
	Equipment hatch	Primary containment upper & lower compartments	26.7	327	100	E	1×10^8	

Revised by Amendment

TABLE 3.11-3 (Continued)

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Emergency Core Cooling System	Accumulators	Containment lower compartment	60	327	100	**	**	
	Containment piping		26.7					
	Pump & motor assy	Aux bldg	ATM	104	90	E	10^7	
	Tanks, pipes, & heat exchangers	Aux bldg general spaces	ATM	104	90	*	*	
	Motor operated valves	Aux bldg cooled rooms	ATM	120	90	**	**	
	Other valves		ATM	150	90	**	**	
ERCW	Pumps & valves	Outside	ATM	108	100	*	*	Required function in water spray
	Pumps, valves, & heat exchanger	Aux bldg individually cooled room	ATM	104	90	*	*	

Revised by Amendment

TABLE 3.11-3 (Continued)

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Component Cooling Water System	Pump & motor assy valves	Aux bldg general spaces	ATM	104	90	*	*	
	Heat exchangers, surge tank, and pipes	Aux bldg general spaces	ATM	104	90	*	*	
Emergency Gas Treatment System	Air cleanup units:	Aux bldg individually cooled rooms	See next 5 items					
	Fans & motors		ATM	104	90	4.2×10^4	3×10^7	
	Filters & adsorbers		ATM	170	70	1.3×10^5	10^8	
	Elec Heaters		ATM	170	100	E	10^8	
	Valves & dampers		ATM	170	100	E	3×10^7	
	Instru & controls		ATM	120	90	**	**	
Aux Bldg Gas Trtmn System	Air cleanup units:	Aux bldg individually cooled rooms	See next 4 items					
	Fans & motors		ATM	104	90	**	**	
	Filters & absorbers		ATM	250	70	1.3×10^5	10^8	
	Dampers		ATM	104	90	**	**	
	Instru & controls		ATM	120	90	**	**	

Revised by Amendment

TABLE 3.11-3 (Continued)

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Auxiliary Feedwater System	Valves	Aux. Bldg.	ATM	120	100		*	
	Motors, Assoc. Pumps	Aux. Bldg. (Gen. Spaces)	ATM	120	100		*	
	Turbine, Assoc. Pump	Aux. Bldg. (Gen. Spaces)	ATM	120	100		*	
	Instr. and Controls	Aux. Bldg. (Gen. Spaces)	ATM	120	100		*	
	Steam Generator Level	Reactor Containment Lower compartment	26.7	327	100	E	$1x10^8$	30 day accident dose

TABLE 3.11-3 (Continued)

Revised by Amendment

ENVIRONMENTAL DESIGN CRITERIA FOR ESF SYSTEM EQUIPMENT

ESF System	Essential Components	Plant Location	Peak Dsgn Press. (PSIA)	Peak Dsgn Temp (°F)	Peak Dsgn Humidity (%)	Radiation Intensity (Rads/Hr)	Total Radiation (rads)	Comments
Aux Bldg Isolation Equipment	Instrumentation Airlocks, penetration seals	Aux bldg general spaces	ATM	120	90	**	**	
			ATM(B)	120	90	**	**	
Aux Bldg Ventilation System	Fans, motors, ducts, dampers, air-conditioning units	Aux bldg shutdown board room	ATM	104	90	*	*	
Control Bldg Ventilation System	Fans, motors, ducts, dampers, air-conditioning units	Control bldg mech equipment room	ATM	104	90	*	*	
Control Bldg Ventilation System	Filters & adsorbers	Control bldg mech equip room	ATM	250	70	**	**	

Notes:

A. Temperature limit shown is for the first hour of the LOCA. After one hour, the design temperature reduces to 220°F for the remainder of the accident.

B. Designed to withstand a 3 psi pressure differential acting from inside to outside.

C. Equipment of this type is uneffected by the types of environmental conditions calculated to be present in the area where the requirement is located.

D. Humidity is sufficiently regulated as not to effect equipment operation.

E. Not specified. Integrated dose is controlling.

* Equipment does not see doses high enough to impair operability.

** Equipment not sensitive to dose.