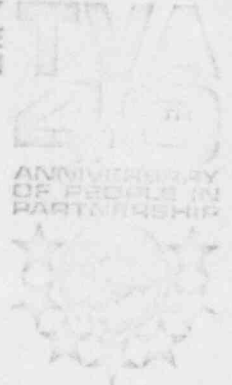


TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE
37401

June 3, 1974

Mr. Voss A. Moore, Assistant Director
for Light Water Reactors, Group 2
Directorate of Licensing
Office of Regulation
U.S. Atomic Energy Commission
Washington, DC 20545



Dear Mr. Moore:

In the Matter of
Tennessee Valley Authority

) Docket Nos. 50-259
) 50-260
50-296

Your letter dated May 17, 1974, concerning the 600 psig ASA-rated one-inch Hancock valves at the Browns Ferry Nuclear Plant required a final report on the survey and recertification results of the unit 2 valves before the scheduled date for fuel loading of unit 2.

Forty copies of that report are submitted herewith.

Very truly yours,

J. E. Gilleland

J. E. Gilleland
Assistant to the Manager of Power

Enclosure (40)
CC (Enclosure):

Mr. R. R. Barris
General Electric Company
332 Georgia Avenue
Chattanooga, Tennessee 37402

Mr. K. L. Sessions
General Electric Company
9040 Executive Park Drive
Knoxville, Tennessee 37919

Mr. R. B. Beers
TVA Projects
General Electric Company
Atomic Power Equipment Department
San Jose, California 95125

8305050052 740612
PDR ADOCK 05000259
S PDR

Handwritten:
50-259/260/
50-296

4913

COPY SENT REGION *II*

REPORT NO.:

REPORT DATE: MAY 31, 1974

FACILITY: BROWNS FERRY NUCLEAR PLANT UNITS 1 AND 2

SUBJECT: FINAL REPORT ON HANCOCK 600 POUND STAINLESS STEEL VALVES
INSTALLED IN BROWNS FERRY NUCLEAR PLANT UNITS 1 AND 2

Introduction

TVA Abnormal Occurrence Report No. BFAO-7427W describes the occurrence and corrective action taken concerning the fifty-eight Hancock one-inch, 600-pound forged stainless steel globe valves installed in high pressure systems in Unit 1. This report includes a survey of 50 percent of the affected valves with tag numbers 47W600-18 in Unit 2, and a survey of 50 percent of the affected valves with tag numbers 47W600-19 in Units 1 and 2. In addition, enclosed is the vendor certification that these valves are suitable for service conditions of 1326 psi at 562° F.

Tabulation of Valves

Submitted in Appendix A of this report is a tabulation of the Unit 2 valves with tag numbers 47W600-18 that are subjected to design conditions exceeding their primary pressure-temperature rating. Appendix B lists the Unit 1 and Unit 2 valves with tag numbers 47W600-19 that are subjected to design conditions exceeding their primary pressure-temperature ratings. Those valves marked by an asterisk have been measured for wall thickness verification.

Wall Thickness Measurements

Minimum valve wall measurements have been performed on 50 percent of the valves with tag numbers 47W600-18 in Unit 2, and 50 percent of the valves with tag numbers 47W600-19 on Units 1 and 2.

A description and tabulation of the wall thickness measurements is presented in Appendix C of this report. Based on the sampling of the Unit 1 valves in TVA Abnormal Occurrence Report No. BFAO-7427W, only two measurements were taken on the Unit 2 valves with tag numbers 47W600-18. Measurements were taken at all four locations on the Units 1 and 2 valves with tag numbers 47W600-19.

The minimum wall thicknesses of the valves with tag numbers 47W600-18 were equal to or greater than 0.280 inch. Assuming 0.015 inch as an absolute maximum depth of marking, the minimum wall thickness is

$$0.280 - 0.015 = 0.265"$$

which is in excess of the calculated required minimum wall thickness of $t_m = 0.243"$ (reference sheet 2 of Appendix D, TVA Report BFAO-7427W).

The minimum wall thicknesses of the valves with tag numbers 47W600-19 were equal to or greater than 0.268 inch. Again assuming 0.015 inch as an absolute maximum depth of marking, the minimum wall thickness is

$$0.268 - 0.015 = 0.253"$$

which exceeds the required minimum wall thickness of 0.23 inch for a 3/4 inch 900 pound valve (reference Table NB-3542-1, ASME Section III).

Vendor Certification

In accordance with the written request from the AEC, enclosed in Appendix D is the vendor certification that the valves in question are suitable for the design conditions of 1326 psi at 562° F which represents the most severe service conditions in which these valves are placed. The vendor calculations have been verified by TVA (reference Appendix C of TVA Report No. BFAO-7427W).

Conclusions

Based on the data presented in this report and the calculations presented in TVA Report No. BFAO-7427W, TVA takes the position that these valves are fully qualified for the higher design conditions. We request acceptance of this position by the AEC. We recommend that this deficiency be closed for Units 1 and 2. Unit 3 report will be submitted by June 15, 1974.

Appendix A

Tabulation of Valves with
Tag Nos. 47W600-18 in Unit 2.

Valves indicated by Asterick
have been measured for wall thickness.

System	Valve Number	Use	Service	Flow Medium	Feet From Pipe Tap	Temp. At Location	Design Conditions
Core Spray	75-222A X-27C	Penetration Isol.	Dead End	Water		Room	1250 psi @ 575 F
Y	75-211A X-27D						
Recirc	68-205A X-49A						1326 psi @ 562 F
*	68-207A X-30E						
	68-209A X-49B						
	68-211A X-30F						
*	68-212A X-39F						
*	68-210A X-47D						
	68-209A X-54E						
*	68-206A X-49C						
	68-214A X-33B						
*	68-200A X-32A						
Y	68-201A X-32B	Y	Y	Y		Y	Y

System	Valve Number	Use	Service	Flow Medium	Feet From Pipe Tap	Temp. At Location	Design Conditions
Recirc*	68-224A X-32D	Penetration Isol.	Dead End	Water		Room	1326 psi @ 562 F
	* 68-223A X-32C						
	* 68-221A X-33D						
	68-204A X-27A						1250 psi @ 575 F
	68-202A X-52 F						
	68-203A X-27B						
	68-231 X-27A	High Point Vent			10 ft.	200 F	
	68-232 X-27A						
	68-241 X-32 A				10 ft		1326 psi @ 562 F
	68-242 X-32A						
	68-243 X-32B				10 ft.		
	68-244 X-32B						
	68-245 X-32C				10 ft		

Sheet 2 of 5

Appendix A

System	Valve Number	Use	Service	Flow Medium	Feet From Pipe Tap	Temp. At Location	Design Conditions
Recirc	68-246 X-32C	High Point Vent	Dead End	Water		200 F	1326 psi @ 562 F
	68-247 X-32D				10 ft.		
	68-248 X-32D						
	68-249 X-33A				29 ft.		
	68-250 X-33A						
	68-253 X-33C				40 ft.		
	68-254 X-33C						
	68-257 X-71				65 ft.		
*	68-264 X-40A-A	Penetration Isol.				Room	
*	68-265 X-40A-B						
*	68-266 X-40A-C						
*	68-267 X-40A-D						
Y	68-268 X-40A-E	Y	Y	Y		Y	Y

System	Valve Number	Use	Service	Flow Medium	Feet. From Pipe Tap	Temp. At Location	Design Conditions
Recirc *	68-269 X-40A-F	Penetration Isol.	Dead End	Water		Room	1326 psi @ 562 F
*	68-270 X-40B-A						
*	68-271 X-40B-B						
*	68-272 X-40B-C						
*	68-273 X-40B-D						
	68-274 X-40B-E						
*	68-275 X-40B-F						
*	68-276 X-40C-A						
*	68-277 X-40C-B						
*	68-278 X-40C-C						
*	68-279 X-40C-D						
	68-280 X-40C-E						
*	68-281 X-40C-F						
Y			Y	Y		Y	Y

[illegible]

Appendix B

Tabulation of Valves with Tag

Nos. 47W600-19 - Units 1 and 2

Valves indicated by asterick have
been measured for wall thickness

Unit 1 Valves

System	Valve Number	USE	Service	Flow Medium	Feet from Pipe Tap	Temp. at Location	Design Conditions
Recirc	*43-815A X-41	Sampling	Dead End	Water		200 F	1326 psi @ 562 F
	*43-815B X-41	Y					
	43-599 X-41	Penetration Isol.	Y	Y	65 ft	Y	Y

Unit 2 Valves

System	Valve Number	USE	Service	Flow Medium	Feet from Pipe Tap	Temp. at Location	Design Conditions
Recirc	*43-815A X-41	Sampling	Dead End	Water		200 F	1326 psi @ 562 F
	*43-815B X-41	Y					
	43-599 X-41	Penetration Isol.			65 ft.		
	43-812A X-41	Sample & Test					
	43-812B X-41	Y	Y	Y		Y	Y

Appendix C

Description and Tabulation of
Valve Wall Measurements

5-9-74

TENNESSEE VALLEY AUTHORITY

THICKNESS MEASUREMENT RECORD
ULTRASONIC METHOD

Part identification

INST. VALVE 5500W-18

Manufacturer

DRESSER

Reference code or standard

G-29 P.S.S.M.-1.1(b)

Minimum design thickness

Body

Weld End

(b) Material type (CS, SS, etc.) & P No.

SS

Product form (casting, forging, etc.)

FORGED

Equipment make and model

KRAUTKRAMER D-METER

Probe type and size

KMR-4, 1/8" dia.

Frequency

4 MHz

Calibration step thickness range

.200" thru .400

Couplant type

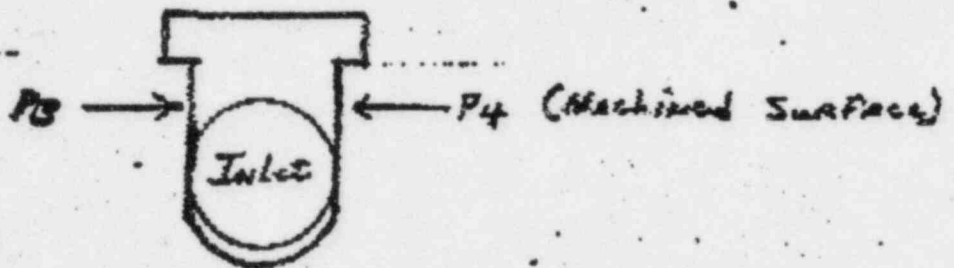
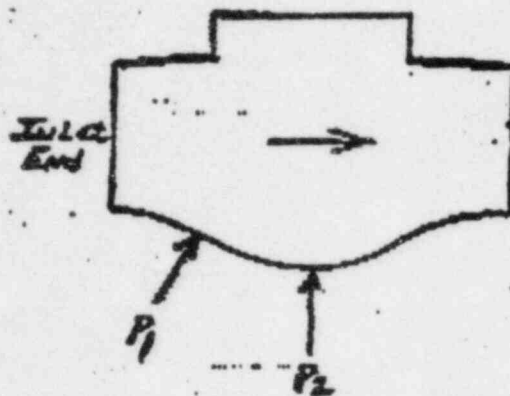
KRAUTKRAMER PASTE

Special equipment attachments

NONE

Measurement location:

		Valves			Pumps			Pipe
		Body	Neck	Weld End	Body	Neck	Weld End	
0°	1							
	2							
90°	1							
	2							
180°	1							
	2							
270°	1							



	Acc	UT	CORR. FACTOR
P_1	.384	10.1 MM = .398"	.965
P_2	.330	9.1 MM = .359"	.919
P_3	.320	8.9 MM = .351"	.912
P_4	.292	8.4 MM = .327"	.888

Valve Identification

Unit 2
Valves -
Tag Nos.
47W600-18

X-40A-A	68-264
X-40A-B	68-265
X-40A-C	68-266
X-40A-D	68-267
X-40A-F	68-269
X-40B-A	68-270
X-40B-B	68-271
X-40B-C	68-272
X-40B-D	68-273
X-40B-F	68-275
X-40C-A	68-276
X-40C-B	68-277
X-40C-C	68-278
X-40C-D	68-279
X-40C-F	68-281
X-40D-A	68-282
X-40D-C	68-284
X-40D-D	68-285
X-40D-F	68-287

Jet Pump Instr DR. Nozzle 68-288
Jet Pump Instr DR. Nozzle 68-289

X-33D	68-221A
X-49A	68-205A
X-49C	68-206A
X-49D	68-210A
X-32D	68-224A
X-32C	68-223A
X-30E	68-207A
X-32A	68-200A
X-34F	68-212A

Reading	Corr.	Reading	Corr.
9.5	.344	9.5	.332
9.5	.344	8.9	.311
9.7	.351	9.2	.322
9.5	.344	9.1	.318
9.7	.351	9.3	.325
9.8	.355	8.9	.311
10.1	.366	9.6	.336
9.2	.333	9.1	.318
9.5	.344	9.0	.315
10.1	.366	9.3	.325
9.3	.335	8.0	.220
9.8	.355	9.2	.322
9.9	.358	10.0	.350
9.2	.333	9.3	.325
9.7	.351	8.3	.290
9.5	.344	8.9	.311
9.3	.335	9.0	.315
9.3	.335	8.8	.308
9.5	.344	8.7	.304
9.5	.344	8.3	.290
9.5	.344	8.4	.294
10.1	.366	8.8	.308
9.3	.335	9.7	.339
9.4	.340	9.2	.322
9.8	.355	8.7	.304
9.5	.344	8.9	.311
9.6	.348	8.5	.297
9.2	.333	8.7	.304
9.5	.344	9.4	.329
9.5	.344	9.5	.332

Valve Identification

Valve Identification			P1 (corr)	P2 (Corr)	P3 (Corr)	P4 (Corr)
Unit 1 - Tag Nos. 47W600-12	43-815A	X-41	.406"	.272"	.319"	.292"
	43-815B	X-41	Obstructed	.268	.315	.288
Unit 2 - Tag Nos. 47W600-12	43-815A	X-41	.450	.280	.288	.283
	43-815B	X-41	.453	.292	.292	.275
	43-599	X-41				

Appendix D

Vendor Certification

DRESSER

DRESSER INDUSTRIAL VALVE & INSTRUMENT DIVISION

DRESSER INDUSTRIES, INC.

P. O. BOX 1430

ALEXANDRIA, LOUISIANA 71301

May 16, 1974

Mr. Mark Bressler
Tennessee Valley Authority
204 Union Building
Knoxville, Tenn. 37902

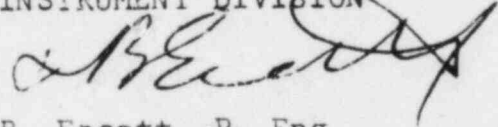
SUBJECT: TVA Contract #68C37-91062, Dresser Order #40-93228-0

Dear Sir:

For, and on behalf of Dresser Industrial Valve & Instrument Division, I certify that the 1" 5500W Hancock Forged Stainless Steel Globe Valves supplied on the subject contract are suitable for services at the operating pressure of 1326 psi at 562°F. This statement is substantiated by the calculations attached hereto together with the verification of actual min. wall dimensions taken on sample valves.

Yours very truly,

DRESSER INDUSTRIAL VALVE
& INSTRUMENT DIVISION



K. B. Eacott, P. Eng.
Manager
Product Engineering

KBL/ba
Attachments

cc: L. J. Doyle
D. Olano
Y. S. Lai

DRESSER

DRESSER INDUSTRIAL VALVE & INSTRUMENT DIVISION
PRODUCT ENGINEERING DEPARTMENT

DRESSER 1"-5500W VALVE

PER TABLE NB-3542-1, FOR 900 lb VALVE

$$d_m = 1" \rightarrow t_m = 0.28"$$

MEASURED WALL THICKNESSES AS SHOWN IN FIG. 1 ARE ALL EXCEEDING $t_m = 0.28"$. HENCE, VALVE BODY PRESSURE RATING EXCEEDS 900 lb.

PER TABLE NB-3531-5, FOR 900 lb, 316 S.S., WELDING END VALVE, ALLOWABLE DESIGN PRESSURE AT 600°F IS 1510 PSIG WHICH IS HIGHER THAN ACTUAL DESIGN CONDITION

BONNET-BODY JOINT -

BOLTING: 4 - $\frac{1}{2}" \phi$ ($A_b = 0.126 \text{ in}^2$)

GASKET: $1 \frac{9}{16} \times 1 \frac{31}{32}$ FLEXITALLIC $\begin{cases} G = 1.7656" \\ b = 0.1015" \end{cases}$

STEM THRUST = 1,801. lbs

DRESSER

DRESSER INDUSTRIAL VALVE & INSTRUMENT DIVISION
PRODUCT ENGINEERING DEPARTMENT

$$\begin{aligned} W_{m1} &= (0.785 G^2 P + 6.28 b G m P) + (1801) \\ &= [0.785 (1.7656^2) (1326) + 6.28 (.1015) (1.7656) (3) (1326)] + [1801] \\ &= 9523 \text{ lbs} \end{aligned}$$

$$\text{BOLT STRESS} = \frac{9523}{4(.126)} = 18,895 \text{ psi}$$

PER TABLE I-7.3, FOR SA193-B7, $S = 25,000 \text{ psi}$ AT 600°F

BONNET DIMENSIONS IS SHOWN IN FIG. 2. CONSERVATIVELY
ASSUME THE BONNET BEING A BOLTED FLANGE OF FOLLOWING
DIMENSIONS (PER SECTION VIII, APPENDIX II):

$$A = 2.938"$$

$$B = 0.753"$$

$$C = 2.625"$$

$$g_o = 0.36"$$

$$t = 0.5"$$

$$G = 1.7656$$

$$b = 0.1015$$

$$m = 3.0$$

BY

DATE

CHK

DATE

REV.

NO

DATE

SECTION

PAGE 2 OF

DRESSER

DRESSER INDUSTRIAL VALVE & INSTRUMENT DIVISION

PRODUCT ENGINEERING DEPARTMENT

THE STRESSES IN BONNET UNDER 1,326 psi PRESSURE PER
ASME CODE FLANGE DESIGN PROCEDURES :

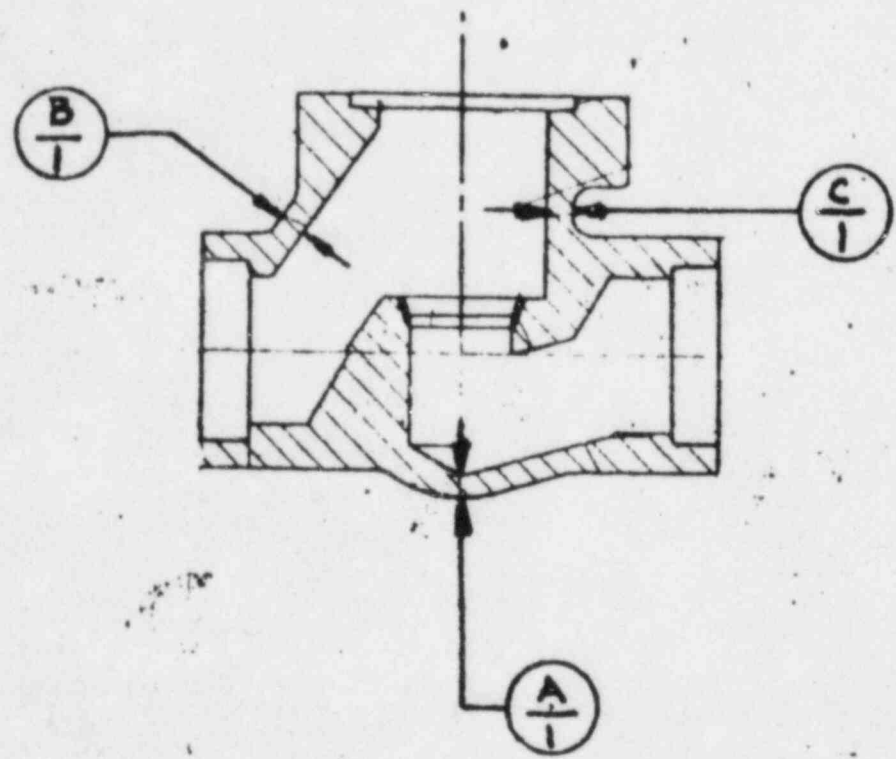
$$S_H = 11,819 \text{ psi} < 1.5S = 25,500 \text{ psi}$$

$$S_R = 19,569 \text{ psi} < 1.5S = 25,500 \text{ psi}$$

$$S_T = 10,511 \text{ psi} < 1.5S = 25,500 \text{ psi}$$

FOR SA-182 GRADE 316, ALLOWABLE S AT 600°F IS 17,000 psi.

DIMENSIONAL EXAMINATION		
	VALVE 1	VALVE 2
$\frac{A}{T}$.330	.330
$\frac{B}{T}$.500	.460
$\frac{C}{T}$.720	.730



1" 5500W BODY

FIGURE 1

BONNET FOR GLOBE VALVES

DIMENSIONAL EXAMINATION

TYPE 5500

A-.360

A-.365

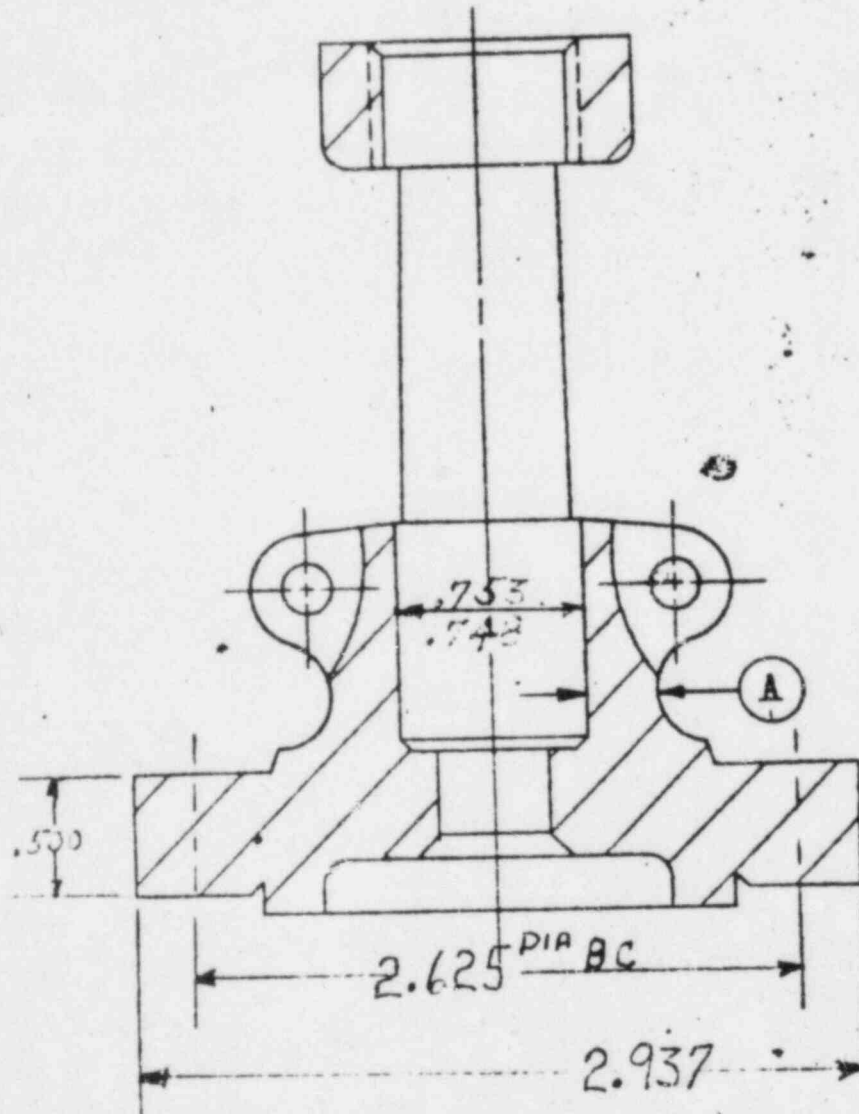


FIG. 2