



March 30, 1976

Mr. John G. Davis, Acting Director  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Mr. Davis:

BROWNS FERRY NUCLEAR PLANT UNITS 2 AND 3 - POTENTIAL DESIGN  
DEFICIENCY IN VALVE YOKE TO MOTOR MOUNT WELD

Initial report of the subject potential deficiency was made on May 14, 1974, and was followed by our June 14, July 15, August 12, September 13, 1974, January 15, 1975, March 3, and March 17, 1975, letters, J. E. Gilleland to Donald F. Knuth. Because the yoke to motor base welds of FCV-74-58 in unit 1 failed, similar valves (FCV's 74-58 and 74-72) in units 2 and 3 may be subject to the same type of failure.

The enclosed eighth interim report (Enclosure 1) summarizes the Southwest Research Institute technical report (Enclosure 2) referred to in the fifth interim report. Enclosure 2 identifies the fix to be used to alleviate the vibrations which were studied. A final report will be prepared and submitted shortly after evaluation of test results.

Very truly yours,

J. E. Gilleland  
Assistant Manager of Power

Enclosures

CC (Enclosures):

Mr. Norman C. Moseley, Director  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Region II - Suite 818  
230 Peachtree Street, NW.  
Atlanta, Georgia 30303

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ENCLOSURE 1  
BROWNS FERRY NUCLEAR PLANT UNITS 2 AND 3

POTENTIAL FOR FAILURE OF THE WELD BETWEEN THE YOKE AND MOTOR MOUNTING  
PLATE FOR FLOW CONTROL VALVES (FCV'S) 74-58 AND 74-72

DDN 191

EIGHTH INTERIM REPORT

On May 14, 1974, an initial report regarding the subject deficiency was made by telecon to W. S. Little, AEC-DRO Inspector, Region II. The report was made by L. D. Weber and J. A. Raulston in compliance with paragraph 50.55(e) of 10CFR50. There have been seven interim reports previous to this report. These were dated June 14, 1974; July 15, 1974; August 12, 1974; September 13, 1974; January 15, 1975; March 3, 1975; and March 17, 1975. The initial report was made because the weld between the yoke and motor mounting plate of FCV 74-58 (4-inch globe valve) in the RHR test return line torus spray connection failed in Unit 1. Since the Unit 1 failure appeared to be vibration related, the corresponding valves and valves in close proximity, such as FCV 74-59 (12-inch globe valve), in Units 2 and 3 were assumed to be subject to a similar type of potential failure.

Southwest Research Institute (SwRI), under contract to TVA, was retained to investigate this problem. It has completed and reported on the initial phase of testing and evaluation of the RHR system test return lines for potential vibration induced component failures. The SwRI report (Enclosure 2) also includes the results of a field evaluation of the core spray (CS) system test return line. The CS evaluation was conducted as a result of undesirable vibrations observed during operation of the system.

For the CS system test return line, SwRI recommended the optimum solution of a self-drag valve in lieu of the 10-inch globe valve FCV 75-22 (and FCV 75-50). However, an alternate solution was developed using a downstream orifice plate installed inside the torus and increasing the diameter of the existing upstream orifice. The objective is to take most of the system pressure

drop at a point where the cavitation energy can be dissipated in the suppression pool instead of in the piping. The orifice also provides a significant back pressure on the 10-inch globe valve which helps to reduce the cavitation and associated vibration to an acceptable level. This alternate solution was found acceptable (see SwRI report, pages 23 through 25) and has been implemented on all units.

For the RHR system test return lines, SwRI recommended the installation of self-drag valves in lieu of FCV 74-59 and FCV 74-73 (12-inch globe valves). An alternate solution similar to that developed for the core spray test return line was thought to be unsatisfactory since the flow objective of 20,000 gpm could not be attained. Test results indicated that the large pressure drop associated with the 12-inch globe valve in the 18-inch line precluded any reasonable chance of making the core spray type of fix work. Unit 3 testing confirmed that the RHR system is capable of delivering very large flows with the 12-inch globe valve removed and the upstream gate valve used for throttling (see SwRI report, page 25).

TVA performed two additional RHR system tests on Unit 3 in an effort to find an acceptable alternate solution. The additional tests confirmed that the 12-inch globe valve has an abnormally high pressure drop even with under-the-seat flow (which is the manufacturer's normal flow direction). The abnormal pressure drop is believed to be due to excessive turbulence and a large unrecovered velocity head downstream of the valve. The testing did show that improving flow conditions downstream of the 12-inch globe valve through the addition of a flow orifice in the torus did reduce the pressure

drop across the valve. The results of these additional tests are included for your information.

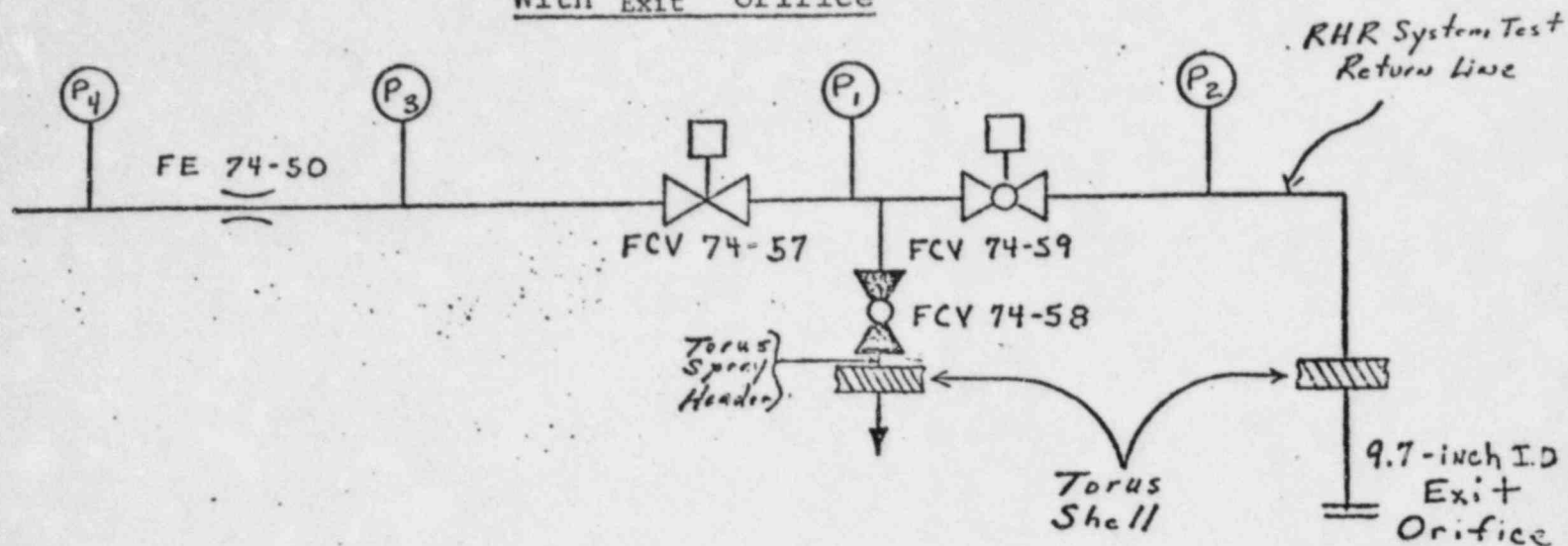
At the request of TVA, the General Electric Company re-evaluated the RHR pump flow requirements in the containment cooling mode of operation. The analysis confirmed that a reduction of RHR pump flow from 10,000 gpm to 8,000 gpm (per pump) would not affect the temperature response of the containment from that reported in the FSAR. This reduction in flow rate will allow the addition of a downstream orifice inside the torus similar to that used to fix the core spray test return line. This alternate solution is now being implemented on all units. Confirmatory testing will be conducted and evaluated upon completion of the modification. The results will be included in a final report.

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BROWNS FERRY NUCLEAR PLANT UNIT 3

RHR TEST RETURN LINE

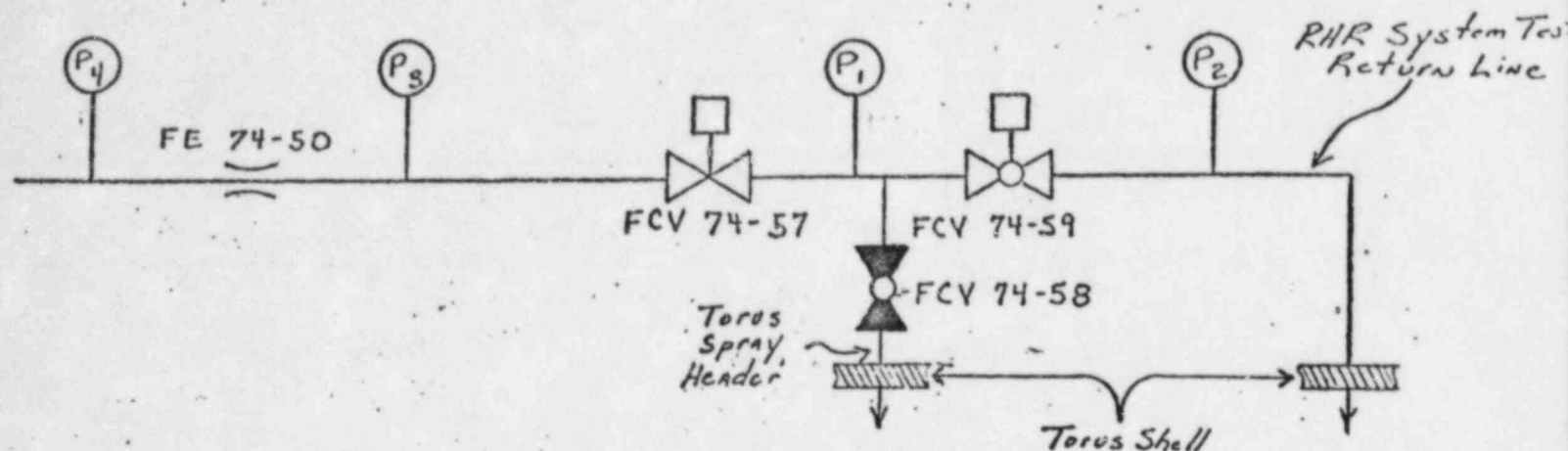
With Exit Orifice



<u>Flow</u> (gpm)	<u>P<sub>1</sub></u> (psig)	<u>P<sub>2</sub></u> (psig)	<u>P<sub>3</sub></u> (psig)	<u>P<sub>4</sub></u> (psig)	<u>I<sub>m</sub> (motor current)</u> (amps)
<i>RHR Pump 3A RUNNING</i>					
3000	315	0	320	340	160
4000	310	0	310	330	170
5000	305	0	310	330	172
6000	290	0	295	320	195
7000	275	5	285	300	190
8000	260	10	265	280	200
9000	235	20	245	260	205
10,000	210	25	220	235	215
11,000	180	30	195	210	220
12,000	150	40	160	175	240
2,300 (VWO)	130	40	150	150	240



<u>Flow</u> <u>(gpm)</u>	<u>P<sub>1</sub></u> <u>(psig)</u>	<u>P<sub>2</sub></u> <u>(psig)</u>	<u>P<sub>3</sub></u> <u>(psig)</u>	<u>P<sub>4</sub></u> <u>(psig)</u>	<u>I<sub>m</sub></u> <u>(amps)</u>
RHR Pumps 3A and 3C Running					
12000	290	38	310		
14000	275	58	295	310	190/190
16000	—	75	277	290	190/200
17500(vwio)	—	90	258	275	200/210
12000 ( Pump Suction: A - 5 psig , C - 6 psig				185/190)	

Without Exit Orifice

<u>Flow</u> <u>(gpm)</u>	<u>P<sub>1</sub></u> <u>(psig)</u>	<u>P<sub>2</sub></u> <u>(psig)</u>	<u>P<sub>3</sub></u> <u>(psig)</u>	<u>P<sub>4</sub></u> <u>(psig)</u>	<u>I<sub>m</sub> (meter current)</u> <u>(amps)</u>
<u>RHR Pump 3A only</u>					
3,000	315		320	340	160
4,000	310		315	335	163
5,000	305		310	330	170
6,000	295		300	325	180
7,000	280		290	310	190
8,000	265		270	290	199
9,000	240		245	267	209
10,000	215		220	240	217
11,000	190		190	215	224
12,000	165		165	195	229

<u>RHR Pumps 3A and 3C Runnings</u>					<u>A</u>	<u>C</u>
10,000				230	220	
12,500	280		285	325	175	180
14,000	275		280	315	185	188
16,000	260		265	290	195	199
17,000	240			285	200	205
18,000	235			275	201	208
19,000	230			270	205	210
20,000	220			260	210	215

FROM:

TENNESSEE VALLEY AUTHORITY

DATE OF DOCUMENT:

9/13/74

DATE RECEIVED

9/18/74

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41935

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ORIG.:

CC:

OTHER:

X

ACTION NECESSARY

☐

CONCURRENCE

☐

DATE ANSWERED:

NO ACTION NECESSARY

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COMMENT

☐

BY:

CLASSIF:

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POST OFFICE

REG. NO.:

FILE CODE:

DESCRIPTION: (Must Be Unclassified)

POTENTIAL DESIGN DEFICIENCY IN VALVE  
YOKE TO MOTOR MOUNT WELD.

REFERRED TO

DATE

RECEIVED BY

DATE

GOWER

ENCLOSURES:

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DR Central Files

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*9/23*

U.S. ATOMIC ENERGY COMMISSION

MAIL CONTROL FORM FORM AEC-3266  
(8-60)