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

December 6, 1983

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

Please refer to your letter to H. G. Parris dated October 5, 1982 which requested that TVA provide additional information in response to item 6 of NUREG-0737, Item II.E.4.2 concerning containment purge and vent valve operability assurance. Enclosed is the information requested. Included is the purge valve vendor's (Posi-Seal International) operability analysis report. Addendum A of the Posi-Seal report includes information regarding hydrodynamic torque test data and the derivations of hydrodynamic torque equations and curves which Posi-Seal considers proprietary.

Pursuant to 10 CFR 2.790(b), we request that Addendum A of the enclosed report be withheld in whole from public disclosure. Enclosed is Posi-Seal's affidavit dated October 28, 1983 for withholding this information from public disclosure.

If you have any questions concerning this matter, please get in touch with D. B. Ellis at FTS 858-2681.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 6th day of Dec., 1983
Paulette N. White
Notary Public
My Commission Expires 9-5-84

Enclosures
cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

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ENCLOSURE

WATTS BAR NUCLEAR PLANT
ITEM 6 OF NUREG-0737, ITEM II.E.4.2
CONTAINMENT PURGE AND VENT VALVE OPERABILITY
ADDITIONAL INFORMATION

Question 1

Analysis, where used to determine operability of purge and vent butterfly valves, should be supported by tests which established torque coefficients of the valve at various angles. As torque coefficients to determine dynamic torques in butterfly valves are dependent on disc shape, aspect ratio, angle of closure, flow direction, and approach flow, these things should be accurately represented during tests. Specifically, piping installations (upstream and downstream of the valve) during the test should be representative of the worst case of the actual field installations. Model or prototype tests may be used if the valve and installations are accurately represented and the results are conservatively scaled to the proper size. Supply a copy of the test report or a detailed description of the test performed for review by the staff. The test report or description should include as a minimum:

A. A sketch of the test set up (including upstream and downstream piping and inlet and outlet nozzle configurations).

B. A description of the test valve and justification that the valve is representative of the inservice valve.

C. A description of the test procedure including:

   i. flow medium used
   ii. minimum pressure maintained through the full valve stroke from open to close.

D. Piping flow resistances differences between the test valve and the actual installation.

E. Sample calculation of how dynamic torques are calculated for the inservice valve using test data.

Response

A. See Appendix 1, Addendum A, Figure No. 2.

B. A description of the test valves is given in Appendix 1, Addendum A. As stated in Addendum A, the 8- and 12-inch valves were actually tested at the test site. The 24-inch valve data is based on extrapolated test data, for which the values are given in enclosures 5 and 6 of Appendix 1. The valves all have the same geometry and disc type.

C. See Appendix 1, Addendum A.

D. See Appendix 1, Addendum B.

E. See Appendix 1, pages 9-19.

NOTE: Questions 2-10 apply to inservice valves.

Question 2

Provide the following information for each valve type/size.

Valve

A. Size
B. I.D. numbers (tag number)
C. Model number
D. Pressure rating
E. Inside or outside containment
F. Standards and codes designed to

Operator

G. Manufacturer
H. Model number
I. Style
J. Type (air/spring, air/air, motor, air/spring-with-air-assist, etc.)
K. Standards and codes designed to

Solenoids

L. Manufacturer
M. Model number
N. Type (3-way, 9-way)
O. Inside or outside containment

Response

The Watts Bar containment purge isolation valves are of three sizes: 24-, 12-, and 8-inch valves. These valves have been pressure rated to 130 lb/in^2 and may be either inside or outside of the primary containment. The manufacturer for the purge valve operator is Matryx. The valve and operator are designed and manufactured in accordance with the ASME B and PV Code, Section III, Subsection ND 1974 ED Class 2. The operator types are air-open/spring-closed. The solenoids are ASCO HV202.303-1, 3-way solenoids which may be located either inside or outside the primary containment. The following tabulation lists the model, valve tag Nos. and operator model No.:

Valve Size	Valve Model No.	Valve Tag Nos.	Matryx Operator Model No.
8"	1144	30-40 30-37	26061-SR60
12"	1144	30-19 30-20 30-58 30-59	26062-SR60

D. See Appendix 1, Addendum B.

E. See Appendix 1, pages 9-19.

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Valve Size	Valve Model No.	Valve Tag Nos.	Matryx Operator Model No.
24"	1134	30-7 30-8 30-9 30-10 30-14 30-15 30-16 30-17 30-50 30-51 30-52 30-53 30-56 30-57	33082-SR60

Question 3

Describe how static pressure loads on the disc and seismic loads on the valve assembly are combined with the torque loads in the stress analysis.

Response

See Appendix 1, pages 40-47.

Question 4

Provide a stress report or a tabulation which includes the following information for each valve type/size.

A. Valve parts analyzed
B. Loads or load combinations used (torsional, bending, etc.)
C. Stress allowables vs. calculated stresses
D. Codes/standards used to determine allowable stresses for each part (include percentage of yield/ultimate strength used i.e., shear stress = .4 Sy). Upset and Faulted stress allowables should not be used unless operability under combined load conditions is verified by test.

Response

A. See Appendix 1, page 7.

B. See Appendix 1, pages 40-47.

C. See Appendix 1, page 7.

D. See Appendix 1, Addendum B, page 3.

Question 5

Describe how the valve integrity in the closed position is assured under accident loads.

Response

The design specification requires the valve to be suitable for design conditions of 15 lb/in^2d at 250°F. The valves were subjected to various tests by the manufacturer as follows:

Body Hydro - 425 lb/in^2g
Seat Leak - 15 lb/in^2g (air)
Disc Hydro - 275 lb/in^2g

Additionally, Posi-Seal's letter dated June 21, 1976, attached, states that the valves are actually rated at 130 lb/in^2g at 250°F. Watts Bar peak containment design pressure is 15 lb/in^2g. These test conditions will bound all anticipated accident conditions.

Question 6

Is there sufficient torque margin available from the operator to overcome the combined torques developed that tend to oppose valve closure as the valve closes? What is the minimum margin and at what angle does this minimum occur?

Response

See Appendix 1, Enclosure 2, page 1.

Question 7

Is the torque/load rating of the operator exceeded by the absolute value of combined valve torque/load developed? Where rating is dependent on disc angle indicate the minimum margin and angle.

Response

See Appendix 1, pages 5-6.

Question 8

If air is used to assist in closing the valve, the worst case (with or without available air) should be used for the analysis unless the air supply system is environmentally and seismically qualified and the air supply inventory is periodically checked for leak rates and inventory. If credit is to be taken for air assist in closing, a description of the air supply system should be provided and a description of the periodic maintenance and inspection, as well as qualification of the air supply should also be provided.

Response

The Watts Bar containment purge isolation valves do <u>not</u> use air to assist in closure.

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Response

The Watts Bar containment purge isolation valves do not use air to assist in closure.

Question 9

What margins are available on actual versus allowable loads to account for increased torques on the valve from the shaft in-plane with elbow non-uniform approach flow. (Should be provided if torques are based on straight pipe flow-testing.)

Response

Appendix 1, Addendum B provides the detailed analysis which accounts for the increased torque due to the valve shaft lying out-of-plane with upstream elbows. Physical limitations prevented rotation of many of the 24-inch valves such that the valve shaft is in-plane with upstream elbows. Based upon the results presented in Appendix 1, the containment isolation valves will be configured as follows:

A. The 8- and 12-inch purge valves have no flow changes upstream of the valve and will be operated fully open with the seal retaining ring downstream of the LOCA flow.

B. The 24-inch purge valves will be restricted to 70° open (90° being fully open) irrespective of valve orientation. This restriction ensures that the valve components will not be overstressed for any LOCA condition.

Question 10

The following questions apply to specific valve types only and need to be answered only where applicable. If not applicable, state so.

A. Torque Due to Containment Backpressure Effect (TCB)

For those air operated valves located inside containment, is the operator design of a type that can be affected by the containment pressure rise (backpressure effect) i.e., where the containment pressure acts to reduce the operator torque capability due to TCB. Discuss the operator design with respect to the air vent and bleed. Show how TCB was calculated (if applicable).

B. Where air operator valve assemblies use accumulators as the fail safe feature, describe the accumulator air system configuration and its operation. Discuss active electrical components in the accumulator system, and the basis used to determine their qualification for the environmental conditions experienced. Is this system seismically designed? How is the allowable leakage from the accumulators determined and monitored?

C. For valve assemblies requiring a seal pressurization system (inflatable main seal), describe the air pressurization system configuration and operation including means used to determine their qualification for the environmental condition experienced. Is this system seismically designed?

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D. Where electric motor operators are used to close the valve has the minimum available voltage to the electric operator under both normal or emergency modes been determined and specified to the operator manufacturer to assure the adequacy of the operator to stroke the valve at accident conditions with these lower limit voltages available? Does this reduced voltage operation result in any significant change in stroke timing? Describe the emergency mode power source used.

E. Where electric motor and air operator units are equipped with handwheels, does their design provide for automatic re-engagement of the motor operator following the handwheel mode of operation? If not, what steps are taken to preclude the possibility of the valve being left in the handwheel mode following some maintenance, test etc., type operation?

F. For electric motor operated valves have the torques developed during operation been found to be less than the torque limiting settings?

Response

A. The purge valve actuator requires a minimum line pressure of 60 lb/in^2 to operate. The maximum containment back pressure is so low that the air flow through the solenoid remains choked until valve closure. Because of this, the valve closure time is unaffected by the Watts Bar containment pressure.

B.-F. These questions are not applicable to TVA's purge valves at Watts Bar.

D. Where electric motor operators are used to close the valve has the minimum available voltage to the electric operator under both normal or emergency modes been determined and specified to the operator manufacturer to assure the adequacy of the operator to stroke the valve at accident conditions with these lower limit voltages available? Does this reduced voltage operation result in any significant change in stroke timing? Describe the emergency mode power source used.

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