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NOV 17 1983

Dr. Thomas E. Murley
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
RHR SYSTEM THROTTLING VALVES F017A AND F017B
ER 100450/100508 FILE 821-10 Docket Nos. 50-387
PLA-1928 and 50-388

References: (1) PLA-977 dated 12/14/81
(2) PLA-1045 dated 3/26/82
(3) PLA-1583 (LER 83-034) dated 3/18/83
(4) PLA-1653 (LER 83-056) dated 5/6/83
(5) PLA-1742 (LER 83-091) dated 7/8/83
(6) IE Information Notice 83-55 dated 8/22/83

Dear Dr. Murley:

This letter and its attachment serve to provide the Commission with revised information concerning a deficiency involving the RHR system throttling valves at SSES. This deficiency was originally reported by telephone to Mr. E. C. McCabe of NRC Region I on November 12, 1981 by Mr. A. R. Sabol of PP&L. Reports pursuant to 10CFR50.55(e) were provided in References (1) and (2).

Very truly yours,

N. W. Curtis
Vice President-Engineering & Construction-Nuclear

Attachment

A627

Copy to:
Mr. Richard C. DeYoung (15)
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Records Center
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REVISED
REPORT ON DESIGN DEFICIENCIES FOR RESIDUAL HEAT REMOVAL SYSTEM THROTTLING VALVES

Subject:

Anchor/Darling Valve Co. globe valves used in throttling service within the RHR System (F017A and F017B) on Susquehanna Units 1 and 2.

Description:

During start-up testing of the Residual Heat Removal System (RHR) on Unit 1, a problem was identified with the throttling characteristics of several Anchor/Darling globe valves. It was found that the valves either cavitated or were very difficult to throttle within the ranges required. Reference (2) provided a final 10CFR50.55(e) report regarding these valves.

Reference (2) described two phases of corrective actions - an interim phase and a final phase. At the conclusion of this report is a summary of interim modifications and the final corrective actions discussed in Reference (2).

In the past year several incidents have occurred during Unit 1 operation which have caused us to reevaluate the final corrective actions identified in Reference (2) for the F017A & B valves. No significant problems were encountered with the other throttling valves in the RHR system. The remainder of this report provides updated and revised information regarding the F017A and B valves.

When operating in the Shutdown Cooling Mode in February of 1983, excessive vibration was detected in the vicinity of valve F017B. Upon inspection, the valve was found to have lost its packing, the valve position indicator had vibrated off, and the adjacent saddle-type hanger had broken welds. This condition was reported in Reference (3). In June of 1983, it was discovered that the valve disc had separated from the valve stem. The tack welds securing the valve disc to the skirt nut were broken which allowed the disc to "work off" the valve stem. This occurrence was reported in Reference (5).

Cause:

An investigation of the piping support failure and the broken tack welds between the skirt nut and valve disc revealed that both had been the result of operating F017B at a throttled condition of approximately 4500 gallons per minute for approximately 120 hours (20 intermittent, 100 continuous). The modified discs installed as an interim modification provided the required throttling capability, but they introduced cavitation and the resultant vibration at very low flows. Welds on the corresponding pipe support in RHR loop "A" were found to have small (i.e. less that 1/8 inch) cracks in the welded areas of the support.

Analysis of Safety Implications:

Valves F017A and B are located in the LPCI injection lines attached to the reactor recirculation loops. They are used for LPCI injection and for shutdown cooling (Note: shutdown cooling is not a design basis accident mode). During LPCI injection, the valves are full open and remain full open until the shutdown cooling mode is required. During the shutdown cooling mode, one valve must be throttled to control the rate of cooling. However, throttling at very low flows causes vibration. If the vibration is allowed to continue, the pipe supports and ultimately the piping and valve itself can be damaged. This piping and/or valve damage could impair operation in the LPCI mode.

Corrective Action:

As an interim measure to prevent reoccurrence of the support damage and valve tack weld damage, administrative controls have been placed on the throttling operation of F017A and B while in the shutdown cooling mode. An operating procedure now in place on Unit 1 allows throttling with F017A and B only at system flowrates greater than 10,000 GPM (with a tolerance of -250 GPM) or with head spray in operation 10,000 GPM (with a tolerance of -500 GPM). This has effectively eliminated the vibration problem and these controls will remain in effect until the final corrective action is completed. These administrative controls and operating restrictions are also in place for Unit 2.

In addition to the operating limits, the following actions have been or will be taken prior to Unit 2 fuel load:

(1) The damaged pipe hangers on Unit 1 valves F017A & B were repaired in such a way as to increase their factor of safety over the original design (under PP&L NCR's 83-114, 116, 119 and PMR 83-169).

(2) The orientation and arrangement of the pipe hangers on Unit 2 is different from that on Unit 1. The suitability of the Unit 2 pipe hangers will be reviewed and action taken if necessary.

(3) The Unit 1 F017B valve tack welds between the skirt nut and the valve disc were increased in size to approximately 1/4 inch welds, 2 inches long in four places (under WA-S-34528).

(4) Tack weld buildup similar to that done on the Unit 1 F017B valve will be done on the Unit 1 F017A valve (under WA-S-34740) during the upcoming Unit 1/Unit 2 tie-in outage.

(5) Tack weld buildup similar to that done on the Unit 1 F017B valve will be done on the Unit 2 F017A & B valves (under WA-U-34091 & WA-U-34092).

The above modifications and operating limits should assure proper functioning of the valves and system integrity until a permanent modification can be installed. An engineering evaluation is underway to determine a course of

action which will enable operation of the F017 valves in the shutdown cooling mode without adverse vibration and cavitation at lower flow rates. The engineering work for Unit 1 is expected to be completed for this modification by February 1984 at which time the final corrective action and target dates for completion will be reported. It is expected that identical modifications will be made on Unit 2.

Conclusion:

The Anchor/Darling Valve Company globe valves installed in the RHR system have had problems with cavitation which could damage the valves or the adjacent piping supports. Only the F017 valves continue to be of some concern. An investigation performed by Anchor/Darling Valve Co. and PP&L has determined that F017A and B are acceptable for use as-is until a permanent modification can be installed. An inspection of valve F017B internals (the valve in which the tack welds separated) revealed no cavitation damage, wire-drawing or any other damage except for the separation of the tack welds. In addition to preventing valve damage, the present flowrate limits essentially eliminate valve cavitation and the resultant vibration. Therefore, the interim measures as described above are adequate until permanent modifications can be implemented.

Summary of Modifications Discussed in
Reference (2)

	Interim Modification	Final Modification
F017A&B	Replace valve discs with discs specifically designed for the throttling conditions.	Inspect valves during 1st Refueling Outage for cavitation erosion and replace if necessary.
F024A&B	Use as is based upon recommendation of Anchor/ Darling Valve Co.	Remove valves during 1st Refueling Outage and reverse them to achieve higher pressure drop across valve. Replace discs with discs of better design.
F040	Remove and reorient valve in line to achieve higher pressure drop across valve. Replace disc with disc of better design.	No final modifications needed.