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February 8, 1996

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Docket Nos.: 50-424
50-425

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
GENERIC LETTER 95-07
PRESSURE LOCKING AND THERMAL BINDING
180-DAY SUBMITTAL

The U. S. Nuclear Regulatory Commission (NRC) issued Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves" on August 17, 1995. The letter requested that licensees identify any safety-related power-operated gate valves which may be susceptible to either pressure locking or thermal binding and that licensees perform additional analyses and take appropriate actions, as required, to ensure that susceptible valves are capable of performing their design-basis function. Georgia Power Company has completed the engineering evaluations requested in the generic letter for the Vogtle Electric Generating Plant (VEGP). The enclosed document summarizes the results of those evaluations.

As a result of this review, it was determined that a number of valves may be susceptible to pressure locking and/or thermal binding. Operability determinations were performed for those valves which may be susceptible to ensure that the valves will be capable of performing their design-basis functions in their current configurations. In addition, a total of 16 valves were identified for modifications to provide additional assurance that the valves will be capable of performing their design functions in the future. The valves to be modified, the associated modifications, and an implementation schedule are outlined in the enclosure.

A056

Should you require any additional information regarding this response, please contact my office.

Sincerely,

C. K. McCoy

C. K. McCoy

CKM/HET/het

Enclosure

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Vogtle Electric Generating Plant

Generic Letter 95-07
Pressure Locking and Thermal Binding

180 Day Response

February 1996

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1.0 INTRODUCTION

The U. S. Nuclear Regulatory Commission (NRC) issued Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves" on August 17, 1995. The letter requests that licensees identify any safety-related power-operated gate valves which may be susceptible to either pressure locking or thermal binding and that licensees perform additional analyses and take appropriate actions, as required, to ensure that susceptible valves are capable of performing their design-basis function. Georgia Power Company has completed the engineering evaluations requested in the generic letter for the Vogtle Electric Generating Plant (VEGP) and this document summarizes the results of those evaluations and identifies actions which will be performed to provide additional assurance that safety-related power-operated gate valves will be capable of performing their design-basis function.

The initial step in performing this evaluation was the development of a list of all safety-related power-operated gate valves in service at VEGP. The list of valves was developed based on a review of P&IDs, applicable FSAR tables, Generic Letter 89-10 documentation and the Inservice Test Program. A total of 190 valves were identified for further evaluation in conjunction with this review.

Following a determination of the scope of valves covered by the generic letter a screening criteria was developed to identify valves which were potentially susceptible to pressure locking and/or thermal binding. The objective of this step was to eliminate valves which were not susceptible to these phenomenon and to concentrate the remaining efforts on the valves which were determined to be potentially susceptible.

The valves which were determined to be potentially susceptible based on the screening process were evaluated in detail. In cases where the detailed evaluations concluded that pressure locking or thermal binding could occur, operability determinations were performed to ensure that valves were capable of performing their design-basis function, and corrective actions were identified to provide additional assurance that the valves would be capable of performing their design functions in the future.

2.0 SCREENING EVALUATION

Criteria were developed to support the initial screening of the 190 valves covered by the generic letter for potential susceptibility to pressure locking and/or thermal binding. The objective of the screening process was not to identify valves which were susceptible, but rather, to eliminate valves which were clearly not susceptible. Valves which were not screened out in this process were considered to be potentially susceptible and required a detailed engineering evaluation.

Figure 2-1 outlines the flowchart which was utilized in performing the preliminary screening. The criteria which was identified for use in this screening process is relatively simple and straight forward. Criteria B-1 and B-2 are the basic criteria aimed at determining if the valve is associated with a water or steam system and if the valve has an active safety function to open. Following the basic criteria the flowchart splits to address thermal binding and pressure locking independently.

It should be noted that valves which do not have an active safety function to open were determined to be not susceptible to pressure locking and/or thermal binding when performing their safety function based on criteria B-2. However, normally open valves which have an open safety function were evaluated further to ensure that surveillance testing related activities would not introduce potential susceptibility for valves which are considered to be operable during testing. There were no surveillance test scenarios identified for normally open valves which resulted in potential susceptibility.

Criteria TB-1, TB-2 and TB-3 screen the valves for susceptibility to thermal binding. For the purposes of this evaluation, a valve was considered not susceptible to thermal binding if the valve was not exposed to a process fluid temperature exceeding 200° F. In addition, a flexible wedge gate valve was considered not susceptible if the maximum temperature decrease following closure and prior to opening did not exceed 100° F. It should be noted that there were no solid wedge gate valves identified in conjunction with these reviews. These quantitative screening criteria were developed in conjunction with the Westinghouse Owners Group (WOG) Pressure Locking and Thermal Binding Task Team. The basis for this criteria is documented in Westinghouse letter ESBU/WOG-95-387, dated December 6, 1995.

Criteria PL-1, TPL-1 and HPL-1 screen the valves for susceptibility to pressure locking. There were no quantitative criteria utilized in screening the valves for this phenomenon. For a valve to be excluded from susceptibility to thermally induced pressure locking it must be determined that the valve will not be required to open following a rapid increase in valve temperature due to process fluid or environmental conditions. Normal ambient temperature changes were not considered relative to this phenomenon. For a valve to be excluded from susceptibility to hydraulic pressure locking, it must be determined that the valve will not be required to open following a rapid depressurization upstream or downstream of the valve. Although no specific minimum pressure was established relative to this review, in general, pressures below approximately 100 psig were not considered significant relative to hydraulic pressure locking.

Table 2-1 identifies the 190 valves screened in conjunction with this review and the criterion for eliminating the valves which were determined to be not susceptible to pressure locking and/or thermal binding. The pressure locking and thermal binding fields are shaded for valves which were eliminated as a result of the basic criterion B-1 or B-2. Valves which were not eliminated by the basic criteria were evaluated further and blank fields under the pressure locking and/or thermal binding columns indicate potential susceptibility. Valves which were not eliminated from susceptibility in conjunction with this screening process were considered to be potentially susceptible to pressure locking and/or thermal binding, and detailed evaluations were performed for these valves.

Figure 2-1
Pressure Locking and Thermal Binding Screening Evaluation Flowchart

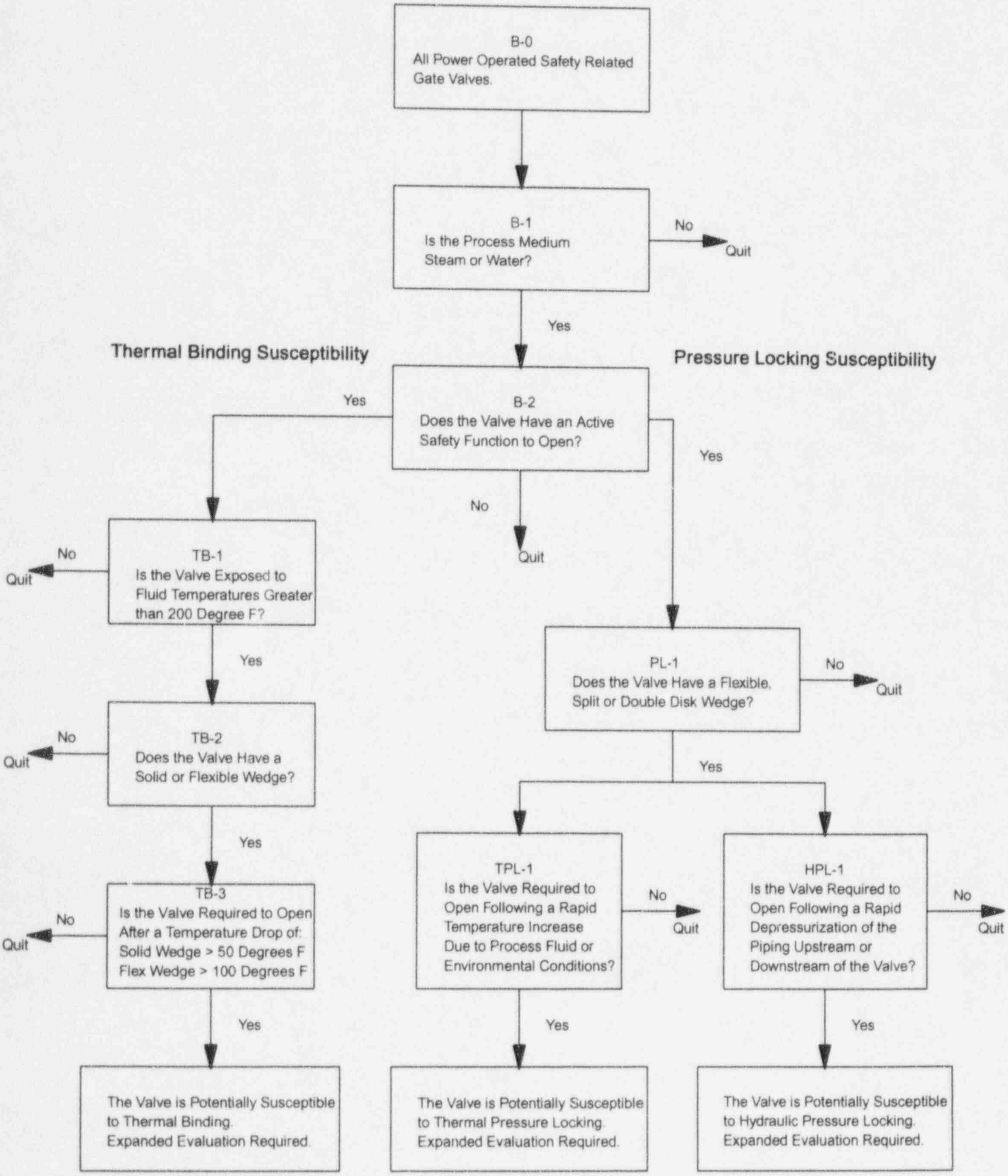

Table 2-1
Pressure Locking and Thermal Binding
Screening Evaluation Summary

Tag No.	Valve Description	Screened Out By Criterion:			
		Basic	Pressure Locking		Therm. Bind.
			Hydraulic	Thermal	
1FV-0610	RHR Pump 1 Miniflow				TB-3
1FV-0611	RHR Pump 2 Miniflow				TB-3
1HV-0780	Normal Containment Sump Pump Discharge	B-2			
1HV-0781	Normal Containment Sump Pump Discharge	B-2			
1HV-10957	Sludge Mixing Isolation to RWST	B-2			
1HV-10958	Sludge Mixing Isolation to RWST	B-2			
1HV-12975	Containment Air Radiation Monitor Inlet	B-1, B-2			
1HV-12976	Containment Air Radiation Monitor Inlet	B-1, B-2			
1HV-15196	Feedwater Bypass Isolation to SG	B-2			
1HV-15197	Feedwater Bypass Isolation to SG	B-2			
1HV-15198	Feedwater Bypass Isolation to SG	B-2			
1HV-15199	Feedwater Bypass Isolation to SG	B-2			
1HV-19051	Thermal Barrier Supply Isolation	B-2			
1HV-19053	Thermal Barrier Supply Isolation	B-2			
1HV-19055	Thermal Barrier Supply Isolation	B-2			
1HV-19057	Thermal Barrier Supply Isolation	B-2			
1HV-2041	Thermal Barrier Return Isolation	B-2			
1HV-27901	Fire Protection Header Cont. Isolation Pen 40	B-2			
1HV-3006A	Main Steam Isolation Valve	B-2			
1HV-3006B	Main Steam Isolation Valve	B-2			
1HV-3009	Steam to AFW Pump Turbine	B-2			
1HV-3016A	Main Steam Isolation Valve	B-2			
1HV-3016B	Main Steam Isolation Valve	B-2			
1HV-3019	Steam to AFW Pump Turbine	B-2			
1HV-3026A	Main Steam Isolation Valve	B-2			
1HV-3026B	Main Steam Isolation Valve	B-2			
1HV-3036A	Main Steam Isolation Valve	B-2			
1HV-3036B	Main Steam Isolation Valve	B-2			
1HV-5106	Steam to AFW Pump Turbine			TPL-1	
1HV-5227	SG Feedwater Isolation	B-2			
1HV-5228	SG Feedwater Isolation	B-2			
1HV-5229	SG Feedwater Isolation	B-2			
1HV-5230	SG Feedwater Isolation	B-2			
1HV-8000A	Pressurizer PORV Isolation		HPL-1	TPL-1	
1HV-8000B	Pressurizer PORV Isolation		HPL-1	TPL-1	
1HV-8105	Charging Pump to RCS Isolation	B-2			
1HV-8106	Charging Pump to RCS Isolation	B-2			
1HV-8146	Charging Pump to RCS Isolation	B-2			
1HV-8147	Charging Pump to RCS Isolation	B-2			
1HV-8438	Charging Pump B Discharge Isolation	B-2			
1HV-8471A	Charging Pump A Suction Isolation	B-2			

Tag No.	Valve Description	Screened Out By Criterion:			
		Basic	Pressure Locking		Therm. Bind.
			Hydraulic	Thermal	
1HV-8471B	Charging Pump B Suction Isolation	B-2			
1HV-8485A	Charging Pump A Discharge Isolation	B-2			
1HV-8485B	Charging Pump B Discharge Isolation	B-2			
1HV-8701A	RHR Loop 1 Suction Isolation				
1HV-8701B	RHR Loop 1 Suction Isolation				
1HV-8702A	RHR Loop 4 Suction Isolation				
1HV-8702B	RHR Loop 4 Suction Isolation				
1HV-8716A	RHR to RCS Hot Leg Isolation				TB-3
1HV-8716B	RHR to RCS Hot Leg Isolation				TB-3
1HV-8801A	Boron Injection Tank Discharge Isolation				TB-3
1HV-8801B	Boron Injection Tank Discharge Isolation				TB-3
1HV-8802A	SI Pump to RCS Hot Leg Isolation				TB-3
1HV-8802B	SI Pump to RCS Hot Leg Isolation				TB-3
1HV-8803A	Boron Injection Tank Inlet Isolation	B-2			
1HV-8803B	Boron Injection Tank Inlet Isolation	B-2			
1HV-8804A	RHR Htx Train A to Charging Pumps		HPL-1	TPL-1	TB-3
1HV-8804B	RHR Htx Train B to SI Pumps		HPL-1	TPL-1	TB-3
1HV-8806	RWST to SI Pump Suction Isolation	B-2			
1HV-8807A	RHR to SI Pump Suction Isolation		HPL-1	TPL-1	TB-3
1HV-8807B	RHR to SI Pump Suction Isolation		HPL-1	TPL-1	TB-3
1HV-8808A	Accumulator Isolation Loop No 1	B-2			
1HV-8808B	Accumulator Isolation Loop No 2	B-2			
1HV-8808C	Accumulator Isolation Loop No 3	B-2			
1HV-8808D	Accumulator Isolation Loop No 4	B-2			
1HV-8809A	RHR to RCS Cold Leg Isolation	B-2			
1HV-8809B	RHR to RCS Cold Leg Isolation	B-2			
1HV-8811A	Containment Sump To RHR Pump Isolation				TB-3
1HV-8811B	Containment Sump To RHR Pump Isolation				TB-3
1HV-8812A	RWST to RHR Pump Isolation	B-2			
1HV-8812B	RWST to RHR Pump Isolation	B-2			
1HV-8821A	SI Pump to RCS Cold Leg Isolation	B-2			
1HV-8821B	SI Pump to RCS Cold Leg Isolation	B-2			
1HV-8835	SI Pump to RCS Cold Leg Isolation	B-2			
1HV-8840	RHR to RCS Hot Leg Isolation				TB-3
1HV-8923A	SI Pump Suction Isolation	B-2			
1HV-8923B	SI Pump Suction Isolation	B-2			
1HV-8924	RHR to SI Pump Suction Isolation	B-2			
1HV-8994A	Spray Additive Tank Outlet Isolation		HPL-1	TPL-1	TB-1
1HV-8994B	Spray Additive Tank Outlet Isolation		HPL-1	TPL-1	TB-1
1HV-9001A	Containment Spray Pump Discharge Isolation				TB-3
1HV-9001B	Containment Spray Pump Discharge Isolation				TB-3
1HV-9002A	Containment Spray Sump Suction Isolation		HPL-1		TB-3
1HV-9002B	Containment Spray Sump Suction Isolation		HPL-1		TB-3
1HV-9003A	Containment Spray Sump Suction Isolation		HPL-1	TPL-1	TB-3
1HV-9003B	Containment Spray Sump Suction Isolation		HPL-1	TPL-1	TB-3
1HV-9017A	RWST to Containment Spray Suction Isolation	B-2			

Tag No.	Valve Description	Screened Out By Criterion:			
		Basic	Pressure Locking		Therm. Bind.
			Hydraulic	Thermal	
1HV-9017B	RWST to Containment Spray Suction Isolation	B-2			
1HV-9380A	Containment Atmosphere Service Air	B-1			
1HV-9380B	Containment Atmosphere Service Air	B-1			
1HV-9385	Service Air CIV Pen 80	B-1, B-2			
1LV-0112B	Volume Control Tank Outlet Isolation	B-2			
1LV-0112C	Volume Control Tank Outlet Isolation	B-2			
1LV-0112D	RWST to Charging Pump Suction Isolation		HPL-1	TPL-1	TB-3
1LV-0112E	RWST to Charging Pump Suction Isolation		HPL-1	TPL-1	TB-3
2FV-0610	RHR Pump 1 Miniflow				TB-3
2FV-0611	RHR Pump 2 Miniflow				TB-3
2HV-0780	Normal Containment Sump Pump Discharge	B-2			
2HV-0781	Normal Containment Sump Pump Discharge	B-2			
2HV-10957	Sludge Mixing Isolation to RWST	B-2			
2HV-10958	Sludge Mixing Isolation to RWST	B-2			
2HV-12975	Containment Air Radiation Monitor Inlet	B-1, B-2			
2HV-12976	Containment Air Radiation Monitor Inlet	B-1, B-2			
2HV-15196	Feedwater Bypass Isolation to SG	B-2			
2HV-15197	Feedwater Bypass Isolation to SG	B-2			
2HV-15198	Feedwater Bypass Isolation to SG	B-2			
2HV-15199	Feedwater Bypass Isolation to SG	B-2			
2HV-19051	Thermal Barrier Supply Isolation	B-2			
2HV-19053	Thermal Barrier Supply Isolation	B-2			
2HV-19055	Thermal Barrier Supply Isolation	B-2			
2HV-19057	Thermal Barrier Supply Isolation	B-2			
2HV-2041	Thermal Barrier Return Isolation	B-2			
2HV-27901	Fire Protection Header Cont. Isolation Pen 40	B-2			
2HV-3006A	Main Steam Isolation Valve	B-2			
2HV-3006B	Main Steam Isolation Valve	B-2			
2HV-3009	Steam to AFW Pump Turbine	B-2			
2HV-3016A	Main Steam Isolation Valve	B-2			
2HV-3016B	Main Steam Isolation Valve	B-2			
2HV-3019	Steam to AFW Pump Turbine	B-2			
2HV-3026A	Main Steam Isolation Valve	B-2			
2HV-3026B	Main Steam Isolation Valve	B-2			
2HV-3036A	Main Steam Isolation Valve	B-2			
2HV-3036B	Main Steam Isolation Valve	B-2			
2HV-5106	Steam to AFW Pump Turbine			TPL-1	
2HV-5227	SG Feedwater Isolation	B-2			
2HV-5228	SG Feedwater Isolation	B-2			
2HV-5229	SG Feedwater Isolation	B-2			
2HV-5230	SG Feedwater Isolation	B-2			
2HV-8000A	Pressurizer PORV Isolation		HPL-1	TPL-1	
2HV-8000B	Pressurizer PORV Isolation		HPL-1	TPL-1	
2HV-8105	Charging Pump to RCS Isolation	B-2			
2HV-8106	Charging Pump to RCS Isolation	B-2			
2HV-8146	Charging Pump to RCS Isolation	B-2			

Tag No.	Valve Description	Screened Out By Criterion:			
		Basic	Pressure Locking		Therm. Bind.
			Hydraulic	Thermal	
2HV-8147	Charging Pump to RCS Isolation	B-2			
2HV-8438	Charging Pump B Discharge Isolation	B-2			
2HV-8471A	Charging Pump A Suction Isolation	B-2			
2HV-8471B	Charging Pump B Suction Isolation	B-2			
2HV-8485A	Charging Pump A Discharge Isolation	B-2			
2HV-8485B	Charging Pump B Discharge Isolation	B-2			
2HV-8701A	RHR Loop 1 Suction Isolation				
2HV-8701B	RHR Loop 1 Suction Isolation				
2HV-8702A	RHR Loop 4 Suction Isolation				
2HV-8702B	RHR Loop 4 Suction Isolation				
2HV-8716A	RHR to RCS Hot Leg Isolation				TB-3
2HV-8716B	RHR to RCS Hot Leg Isolation				TB-3
2HV-8801A	Boron Injection Tank Discharge Isolation				TB-3
2HV-8801B	Boron Injection Tank Discharge Isolation				TB-3
2HV-8802A	SI Pump to RCS Hot Leg Isolation				TB-3
2HV-8802B	SI Pump to RCS Hot Leg Isolation				TB-3
2HV-8804A	RHR Htx Train A to Charging Pumps		HPL-1	TPL-1	TB-3
2HV-8804B	RHR Htx Train B to SI Pumps		HPL-1	TPL-1	TB-3
2HV-8806	RWST to SI Pump Suction Isolation	B-2			
2HV-8807A	RHR to SI Pump Suction Isolation		HPL-1	TPL-1	TB-3
2HV-8807B	RHR to SI Pump Suction Isolation		HPL-1	TPL-1	TB-3
2HV-8808A	Accumulator Isolation Loop No 1	B-2			
2HV-8808B	Accumulator Isolation Loop No 2	B-2			
2HV-8808C	Accumulator Isolation Loop No 3	B-2			
2HV-8808D	Accumulator Isolation Loop No 4	B-2			
2HV-8809A	RHR to RCS Cold Leg Isolation	B-2			
2HV-8809B	RHR to RCS Cold Leg Isolation	B-2			
2HV-8811A	Containment Sump To RHR Pump Isolation				TB-3
2HV-8811B	Containment Sump To RHR Pump Isolation				TB-3
2HV-8812A	RWST to RHR Pump Isolation	B-2			
2HV-8812B	RWST to RHR Pump Isolation	B-2			
2HV-8821A	SI Pump to RCS Cold Leg Isolation	B-2			
2HV-8821B	SI Pump to RCS Cold Leg Isolation	B-2			
2HV-8835	SI Pump to RCS Cold Leg Isolation	B-2			
2HV-8840	RHR to RCS Hot Leg Isolation				TB-3
2HV-8923A	SI Pump Suction Isolation	B-2			
2HV-8923B	SI Pump Suction Isolation	B-2			
2HV-8924	RHR to SI Pump Suction Isolation	B-2			
2HV-8994A	Spray Additive Tank Outlet Isolation		HPL-1	TPL-1	TB-1
2HV-8994B	Spray Additive Tank Outlet Isolation		HPL-1	TPL-1	TB-1
2HV-9001A	Containment Spray Pump Discharge Isolation				TB-3
2HV-9001B	Containment Spray Pump Discharge Isolation				TB-3
2HV-9002A	Containment Spray Sump Suction Isolation		HPL-1		TB-3
2HV-9002B	Containment Spray Sump Suction Isolation		HPL-1		TB-3
2HV-9003A	Containment Spray Sump Suction Isolation		HPL-1	TPL-1	TB-3
2HV-9003B	Containment Spray Sump Suction Isolation		HPL-1	TPL-1	TB-3

Tag No.	Valve Description	Screened Out By Criterion:			
		Basic	Pressure Locking		Therm. Bind.
			Hydraulic	Thermal	
2HV-9017A	RWST to Containment Spray Suction Isolation	B-2			
2HV-9017B	RWST to Containment Spray Suction Isolation	B-2			
2HV-9380A	Containment Atmosphere Service Air	B-1			
2HV-9380B	Containment Atmosphere Service Air	B-1			
2HV-9385	Service Air CIV Pen 80	B-1, B-2			
2LV-0112B	Volume Control Tank Outlet Isolation	B-2			
2LV-0112C	Volume Control Tank Outlet Isolation	B-2			
2LV-0112D	RWST to Charging Pump Suction Isolation		HPL-1	TPL-1	TB-3
2LV-0112E	RWST to Charging Pump Suction Isolation		HPL-1	TPL-1	TB-3
AHV-19722	Electric Steam Boiler Isolation	B-2			
AHV-19723	Electric Steam Boiler Isolation	B-2			

3.0 POTENTIALLY SUSCEPTIBLE VALVE EVALUATIONS

A total of 44 valves were identified as being potentially susceptible to pressure locking and/or thermal binding in conjunction with the screening process discussed in Section 2 of this document. These valves represent 12 different applications as identified in Table 3-1.

Table 3-1
Potentially Susceptible Valves

Tag No.	Description	Susceptibility
1/2HV-0610 & 1/2HV-0611	RHR Pump Miniflow	HPL, TPL, TB
1/2HV-5106	TDAFW Steam Admission	HPL, TB
1/2HV-8000A/B	PORV Block Valve	TB
1/2HV-8701A/B	RHR Loop Suction	HPL, TPL, TB
1/2HV-8702A/B	RHR Loop Suction	HPL, TPL, TB
1/2HV-8716A/B	RHR to RCS Hot-Leg Isol.	HPL, TPL
1/2HV-8801A/B	BIT Discharge	HPL, TPL
1/2HV-8802A/B	SI to RCS Hot-Leg Isol.	HPL, TPL
1/2HV-8811A/B	RHR Cont. Sump Suction	HPL, TPL
1/2HV-8840	RHR to RCS Hot-Leg Isol.	HPL, TPL
1/2HV-9001A/B	Cont. Spray Discharge	HPL, TPL
1/2HV-9002A/B	Cont. Spray Sump Suction	TPL

Detailed evaluations were performed for each of the valves identified in Table 3-1. For valves which were determined to be susceptible to pressure locking and/or thermal binding, operability determinations were performed to ensure that the valves would be capable of performing their design-basis functions in their current configurations. Finally, corrective actions were identified for susceptible valves to provide additional assurance that the valves would be capable of performing their design functions in the future.

Thermally induced pressure locking is caused by an increase in valve body temperature which causes a subsequent increase in the temperature of any fluid trapped in the bonnet area of the valve. Assuming the bonnet area is water solid and that the valve seats and packing are leak tight, the temperature increase can result in an increase in the pressure of the fluid trapped inside the valve. Testing performed by Commonwealth Edison has indicated, however, that for this phenomenon to occur the rate of heat addition must be sufficient to cause pressure to increase faster that the decay rate due to seat and/or packing leakage. Normal ambient temperature swings are not sufficient to cause this phenomenon nor are the relatively moderate ambient temperature increases experienced by many valves under accident conditions. For a valve to be considered potentially susceptible to thermally induced pressure locking, the valve must experience a substantial heatup over a relatively short period of time. Examples of credible scenarios for thermally induced pressure locking would be steam impingement on the valve body or a sudden increase in process fluid temperature at the valve.

Hydraulic pressure locking can occur when the upstream or downstream side of a valve disk experiences a rapid depressurization prior to being required to open. The system pressure acting on the valve disk can deflect the disk away from the valve seat, thereby allowing process fluid to enter the bonnet area of the valve. When the system pressure is suddenly removed the disk can reseat, trapping high pressure fluid in the bonnet area. It should be noted that a rapid decay of system pressure is required to cause this phenomena. In cases where system pressure decreases slowly, the valve disk will not suddenly reseat and in those cases, bonnet pressure will tend to track system pressure. At some point, the system pressure will have decreased sufficiently to allow the disk to reseat, but this pressure will be lower than the maximum system pressure which must be considered in the case of a rapid depressurization. In addition, the bonnet will not remain pressurized indefinitely following a hydraulic pressure lock scenario. Valves are not completely leak tight, and a relatively small amount of leakage will relieve the bonnet pressure. Testing performed by Commonwealth Edison suggests that a pressure decay rate of 10 psi/min is conservative with respect to evaluating valves for potential pressure locking.

Thermal binding occurs when a valve is closed hot and is subsequently cooled prior to re-opening. Flexible wedge gate valves which are operated in systems in which the process fluid temperature may exceed 200° F, and which may be required to open after undergoing a cooldown of at least 100° F, were considered potentially susceptible based on the screening criteria. It should be noted that all of the valves evaluated in conjunction with this review were flexible wedge gate valves which are generally considered to be less susceptible to thermal binding than solid wedge gate valves. Valves are most susceptible to thermal binding while in the process of cooling when thermal gradients exist across the various valve components. The additional loads associated with thermal binding are lower after the cooldown is complete and the valve components have reached an equilibrium temperature.

3.1 RHR Pump Mini-Flow Valves

Description

Valves 1/2HV-0610 and 1/2HV-0611 are 3 inch, 2035 lb, Westinghouse flexible wedge gate valves. The valves are normally open to provide RHR pump miniflow. The valves have a safety function to close when RHR pump flow increases above a setpoint and to re-open when RHR pump flow decreases below a setpoint. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking as well as thermal binding.

Thermally Induced Pressure Locking

In conjunction with a LOCA, the ambient temperatures in the rooms in which these valves are located are bounded by the normal operating temperatures. The normal ambient temperatures are not sufficient to present concerns relative to thermally induced pressure locking.

These valves are normally open, and close when RHR pump flow exceeds the pumps minimum flow requirements. In conjunction with a LOCA scenario, the pump suctions would initially be aligned to the RWST and the temperature of the water could be as low as 44° F. When the RWST is exhausted the pump suctions would be re-aligned to the containment sumps and when recirculation begins the initial fluid temperature at the heat exchanger outlets would be approximately 180° F. These valves are located in close proximity to the main RHR heat exchanger discharge piping and would be expected to heatup in conjunction with the transfer to recirculation. Therefore, thermally induced pressure locking must be considered if the valves are required to re-open in conjunction with the transfer to hot leg recirculation.

The scenario associated with transferring to hot-leg recirculation was evaluated with respect to the potential for thermally induced pressure locking. It was determined that when the transfer to hot-leg recirculation is made, RHR flow may be reduced to the point that these valves will receive a signal to open. However, although the opening setpoint may be reached, the flow during this evolution will not be reduced below the RHR pump's minimum flow requirements. Therefore, although the valve may be susceptible to thermally induced pressure locking at this point, the valves are not required to open to protect the RHR pumps. However, assuming the valves received a signal to open, and failed to open due to thermally induced pressure locking, the valves would not be available subsequent to the event.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermal pressure locking with respect to performing their design-basis function which is to provide RHR pump minimum flow protection. However, the potential exists for the valves to receive an open signal in conjunction with the transfer to hot-leg recirculation, and at this point the valves may be susceptible to thermally induced pressure locking. In addition, certain operating evolutions associated with the shutdown cooling mode of RHR system operation may expose the valves to conditions conducive to thermally induced pressure locking.

Hydraulic Pressure Locking

In conjunction with a LOCA, these valves are initially exposed to RHR pump discharge pressure which in this case would be equivalent to the RHR pump developed head plus the elevation head in the RWST. This pressure would gradually trend down as the RWST is depleted and the pump suctions are re-aligned to the containment sumps to initiate cold-leg recirculation. This pressure transient would be relatively slow and would not be expected to cause hydraulic pressure locking.

In conjunction with the shutdown cooling mode of RHR system operation, normal evolutions such as switching trains of RHR or an RHR pump trip may expose these valves to conditions conducive to hydraulic pressure locking.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermal pressure locking with respect to performing their design-basis function, which is to provide RHR pump minimum flow protection. However, certain operating evolutions associated with the shutdown cooling mode of RHR system operation may expose the valves to conditions conducive to hydraulic pressure locking.

Thermal Binding

In conjunction with the shutdown cooling mode of RHR system operation, these valves may be exposed to temperatures as high as 350° F when RHR system operation is initiated. The RHR system temperatures will decrease substantially in conjunction with the cooldown of the RCS and the miniflow valves will typically remain closed during this process. If the valves are required to open at this point, they may be at a substantially lower temperature than when closed.

Based on the results of this evaluation, it was concluded that these valves may be susceptible to thermal binding in conjunction with the shutdown cooling mode of RHR system operation.

Corrective Actions

These valves will not adversely impact the operation of the RHR system during accident scenarios. The valves may be susceptible to pressure locking and/or thermal binding while the system is operated in the shutdown cooling mode. However, the RHR systems have been operated extensively in this mode and these valves have operated satisfactorily.

To provide additional assurance that these valves will be capable of providing reliable minimum flow protection for the RHR pumps, the control schemes for these valves will be revised. The valves will be controlled in the closing direction by the limit switch, with the limit switch set to prevent hard wedging. These valves are not required to be leak tight and setting the valves up in this manner will preclude both pressure locking and thermal binding.

3.2 Turbine Driven Auxiliary Feedwater (AFW) Pump Steam Admission Valves

Description

Valves 1/2HV-5106 are 4 inch, 900 lb Anchor-Darling flexible wedge gate valves. The valves are normally closed and have a safety function to open to admit steam to the AFW pump turbine. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic pressure locking and thermal binding.

Hydraulic Pressure Locking

The upstream side of these valves are exposed to normal secondary system pressure, and the valves may be required to operate after a reduction in secondary system pressure. Should high pressure steam become trapped in the bonnet of these valves the reduction in secondary system pressure and temperature would cool the valves and cause the steam trapped in the bonnets to condense, thereby relieving the pressure. In addition, the valve stems are installed in a vertical orientation and the valves are not located at a low point in the system. Any condensation would flow back into the valve rather than collecting in the bonnet area.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

Thermal Binding

The turbine-driven AFW system is tested on a quarterly basis and this valve is closed at a secondary system temperature of 545° F. The valves may subsequently be required to open at temperatures as low as 350° F to assist in a plant cooldown. The valve is of the flexible wedge design and utilizes a carbon steel material in both the valve body and disk. The valve design, and the fact that both the disk and body are manufactured from similar materials, minimize the risk of thermal binding. In addition, the valve body and connecting piping are insulated which minimizes the temperature differential between the valve body and disk. Finally, the valve vendor, Anchor-Darling, indicated that thermal binding would not be a problem for this valve unless steam temperatures decreased by 200° to 300° F.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermal binding.

3.3 Pressurizer Power-Operated Relief Valve (PORV) Block Valves

Description

Valves 1/2HV-8000 are 3 inch, 2035 lb Westinghouse flexible wedge gate valves. The valves are normally open and have a safety function to close to isolate a leaking or stuck open PORV. In the event that the valves are closed, the valves are required to open to mitigate a steam generator tube rupture. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to thermal binding.

Thermal Binding

During power operation these valves are exposed to steam at a temperature of approximately 653° F. If a valve is closed to isolate a leaking PORV, the valve will continue to be exposed to this temperature as long as the unit remains in power operation. In the event of a SGTR event, the Emergency Operating Procedures (EOPs) require that the position of the block valves be verified. If the block valves are not closed to isolate an excessively leaking or stuck open PORV, the EOP directs the operator to open at least one PORV block valve. This step ensures that a flowpath will be available later in the event should a PORV be required for RCS pressure reduction.

Based on the results of this evaluation, it was concluded that these valves would not be susceptible to thermal binding in conjunction with responding to a SGTR. In addition, these valves are of the flexible wedge design with a stainless steel valve body and disk. The valves are also equipped with Limitorque SB operators with compensator spring packs. The valve design and the utilization of an operator with spring compensation minimize the possibility of thermal binding.

3.4 RHR Loop Suction Isolation Valves (Pump Side)

Description

Valves 1/2HV-8701A and 1/2HV-8702A are 12 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when aligning the RHR system for safety grade cold shutdown. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking as well as thermal binding.

Thermally Induced Pressure Locking

These valves are not required to operate in response to a LOCA and are exposed to a maximum ambient temperature of 120° F during normal operation. This ambient temperature is not sufficient to present concerns relative to thermally induced pressure locking.

These valves are closed in conjunction with a unit start-up when the RCS temperature is less than 350° F. The valves are separated from the RCS by approximately sixty feet of insulated piping and the 1/2HV-8701B or 1/2HV-8702B valve. As the RCS temperature is increased to normal operating conditions these valves may experience some temperature increase, however, the heatup will not be as significant as that which would occur on the 1/2HV-8701B and 1/2HV-8702B valves. The increase in RCS temperature, and any subsequent heatup of these valves, would occur over a period of hours and would not be at a sufficient rate to cause thermally induced pressure locking.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

Assuming the check valve bypass around the 1/2HV-8701B or 1/2HV-8702B valve leaks, these valves would be exposed to RCS pressure during normal unit operation. The valves are not opened in conjunction with a unit shutdown until RCS pressure has decreased to a maximum of 425 psig. The decrease in RCS pressure associated with a normal unit shutdown is gradual and takes place over a period of hours rather than the sudden decrease associated with a LOCA. In conjunction with the shutdown cooling mode of operation, the upstream disk of these valves would not be exposed to a rapid pressure decrease which would cause the disk to suddenly reseat, trapping pressure in the bonnet. Rather, the reduction in pressure would occur slowly and the bonnet pressure would be expected to track the actual RCS pressure as the cooldown progressed. In addition, if the upstream side of the disk did reseat at some point as RCS pressure was being reduced, the bonnet pressure would have sufficient time to decay prior to opening these valves. This scenario is a normal sequence of events for a unit shutdown and these valves have been operated successfully under these conditions on numerous occasions.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

Thermal Binding

These valves are normally closed at approximately 350° F in conjunction with a unit start-up and are normally opened at approximately 350° F in conjunction with a shutdown. Therefore, the initial operation of the RHR system does not present any concerns relative to thermal binding. Switching trains of RHR, following initial RHR system operation, could require the valves in the train being placed in service to open at temperatures substantially lower than 350° F. However, RHR trains are switched routinely during refueling outages and no problems have been experienced with respect to thermal binding.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermal binding. In addition, the existing Limitorque SMB operators currently installed on these valves will be modified to the SB configuration in conjunction with Generic Letter 89-10 modifications being implemented during the 1996 refueling outages. These modifications will provide additional assurance that these valves will not be susceptible to thermal binding.

3.5 RHR Loop Suction Isolation Valves (RCS Side)

Description

Valves 1/2HV-8701B and 1/2HV-8702B are 12 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when aligning the RHR system for safety grade cold shutdown. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking as well as thermal binding.

Thermally Induced Pressure Locking

These valves are not required to operate in response to a LOCA and are exposed to a maximum ambient temperature of 120° F during normal operation. This ambient temperature is not sufficient to present concerns relative to thermally induced pressure locking.

These valves are closed in conjunction with a unit start-up when the RCS temperature is less than 350° F. The valves are connected to the RCS by approximately twenty feet of insulated piping and as the RCS temperature is increased to normal operating conditions, the temperature on the upstream side of these valves is expected to track RCS temperature. The increase in RCS temperature, and the subsequent heatup of these valves, occurs over a period of hours. While the rate of heatup may be sufficient to cause an increase in bonnet pressure, the overall length of time associated with this evolution will allow pressure to decay before it can become significant. In addition, the RCS must cooldown to less than 365° F prior to opening these valves which provides additional time for the bonnet pressure to decay.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

These valves are exposed to RCS pressure during normal unit operation and are not opened in conjunction with a unit shutdown until RCS pressure has decreased to a maximum of 425 psig. The decrease in RCS pressure associated with a normal unit shutdown is gradual and takes place over a period of hours rather than the sudden decrease associated with a LOCA. In conjunction with the shutdown cooling mode of operation, the upstream disk of these valves would not be exposed to a rapid pressure decrease which would cause the disk to suddenly reseat, trapping pressure in the bonnet. Rather, the reduction in pressure would occur slowly and the bonnet pressure would be expected to track the actual RCS pressure as the cooldown progresses. In addition, if the upstream side of the disk did reseat at some point as RCS pressure was being reduced, the bonnet pressure would have sufficient time to decay prior to opening these valves. This scenario is a normal sequence of events for a unit shutdown and these valves have been operated under these conditions on numerous occasions without difficulty.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

Thermal Binding

These valves are normally closed at approximately 350° F in conjunction with a unit start-up and are normally opened at approximately 350° F in conjunction with a shutdown. Therefore, the initial operation of the RHR system does not present any concerns relative to thermal binding. Switching trains of RHR, following initial RHR system operation, could require the valves in the train being placed in service to open at temperatures substantially lower than 350° F. However, RHR trains are switched routinely during refueling outages and no problems have been experienced with respect to thermal binding.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermal binding. In addition, the existing Limitorque SMB operators currently installed on these valves will be modified to the SB configuration in conjunction with Generic Letter 89-10 modifications being implemented during the 1996 refueling outages. These modifications will provide additional assurance that these valves will not be susceptible to thermal binding.

3.6 RHR to RCS Hot-Leg Isolation Valves

Description

Valves 1/2HV-8716A/B are 8 inch, 316 lb Westinghouse flexible wedge gate valves. The valves are normally open to crosstie the two trains of the RHR system. The valves have a safety function to close when transferring to cold-leg recirculation and to open when transferring to hot-leg recirculation. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Discussion

These valves were previously modified by drilling a hole in the upstream side of the disk. Since this modification precludes the possibility of pressure locking, no further evaluations were required.

3.7 Boron Injection Tank Discharge Isolation Valves

Description

Valves 1/2HV-8801A/B are 4 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open on an SI signal to provide a flow path from the CCPs to the RCS cold-legs. The valves also have a safety function to open to provide an emergency boration flowpath if the normal charging path is not available. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Thermally Induced Pressure Locking

In conjunction with a LOCA, the ambient temperature in the rooms in which these valves are located may rise to a maximum temperature of 145° F due to the recirculation of containment sump fluids in adjacent piping. However, the temperature rise due to the recirculation of hot fluids from the sumps will not begin until after these valves have been opened.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

These valves are separated from the RCS by two check valves and assuming the check valves leak, the downstream side of the disc could be exposed to RCS pressure. In the event of a LOCA, RCS pressure would decrease allowing the downstream side of the disc to reseat trapping high pressure fluid in the bonnet. However, concurrent with RCS pressure acting on the downstream side of the disk, CCP discharge pressure acts on the upstream side of the disk. Since CCP pressure is higher than RCS pressure, the CCP pressure becomes the relevant force with respect to pressure locking. If the CCPs remain in operation and are pressurizing the upstream side of the disk in conjunction with the SI signal, pressure locking is not a concern for these valves. However, if a loss of offsite power (LOSP) occurs prior to the SI signal, pressure locking must be considered since the CCPs will trip, thereby depressurizing the piping upstream of these valves.

In the event of a LOSP, the CCPs and the 1/2HV-8801A/B valves receive simultaneous signals to start and open, respectively. The CCPs come up to speed in approximately 3 seconds, thereby pressurizing the upstream side of the disk on the 1/2HV-8801A/B valves and releasing any pressure trapped in the bonnet. In the event that sufficient pressure was trapped in the bonnet to prevent the operator from opening the valve, the motor would experience a locked rotor condition for approximately 3 seconds, at which time the bonnet pressure would be released. The operator motors are capable of surviving a locked rotor condition for 3 seconds without incurring damage.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

3.8 SI Pump to RCS Hot-Leg Isolation Valves

Description

Valves 1/2HV-8802A/B are 4 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when transferring to hot leg recirculation to provide a flowpath between the SI pump discharge and the hot-legs. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Thermally Induced Pressure Locking

In conjunction with a LOCA, the ambient temperature in the rooms in which these valves are located may rise to a maximum temperature of 135° F due to the recirculation of containment sump fluids in adjacent piping. This ambient temperature is marginally higher than the maximum temperatures experienced during normal operation but would not be sufficient to provide a heat-up rate capable of causing thermally induced pressure locking.

The piping upstream of these valves is connected to the cold-leg recirculation piping which will be circulating hot containment sump fluids prior to transferring to hot-leg recirculation. However, approximately 200 feet of piping separate these valves from the cold-leg injection flowpath, and a substantial heat up of the valve body due to recirculation fluids would not occur in the eleven hours prior to transferring to hot-leg recirculation.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

These valves are separated from the RCS by two check valves and assuming the check valves leak, the downstream side of the disc could be exposed to RCS pressure. In the event of a LOCA, RCS pressure would decrease allowing the downstream side of the disc to reseat, potentially trapping high pressure fluid in the bonnet. However, since the transfer to hot-leg recirculation does not occur for approximately eleven hours following the initiation of the event, there would be sufficient time for the bonnet pressure to decay prior to opening the valve.

During cold-leg recirculation the upstream side of the disc is exposed to SI pump discharge pressure. When the transfer to hot-leg recirculation is made, the SI pumps are tripped prior to opening these valves. When the SI pumps are tripped the pressure in the SI pump discharge piping will decrease, allowing the upstream side of the disc to reseat, potentially trapping high pressure fluid in the bonnet. Since the valve is required to open shortly after tripping the pump, there may not be sufficient time for the bonnet pressure to decay prior to opening this valve.

Based on the results of this evaluation, it was concluded that these valves may be susceptible to hydraulic pressure locking in conjunction with the sequence of events associated with transferring to hot-leg recirculation.

Corrective Actions

The scenario associated with tripping the SI pumps prior to opening these valves was evaluated utilizing methodology developed by Commonwealth Edison and obtained in conjunction with the Westinghouse Owners Group (WOG) Pressure Locking and Thermal Binding Task Team. The evaluation indicated that the valves have sufficient margin to perform their design-basis function in conjunction with the aforementioned pressure locking induced loads.

To provide additional assurance that these valves will be capable of performing their design-basis function, the valves will be modified by drilling a 1/8 inch hole in the downstream side of the disk.

3.9 RHR Pump Containment Sump Suction Isolation Valves

Description

Valves 1/2HV-8811A/B are 14 inch, 316 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when transferring to cold leg recirculation to provide a flowpath between the containment sumps and the suction to the RHR pumps. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Thermally Induced Pressure Locking

In conjunction with a LOCA, the ambient temperature in the rooms in which these valves are located may rise to a maximum temperature of 135° F. However, the temperature rise is due to the recirculation of hot fluids from the sumps which will not begin until after these valves have been opened.

The piping upstream of these valves is connected to the containment sumps which would be exposed to hot water in the event of a LOCA. The heat input from the flow of hot water into the containment sumps may be sufficient to cause the valve body to heat-up prior to opening these valves to initiate cold-leg recirculation.

Based on the results of this evaluation, it was concluded that these valves may be susceptible to thermally induced pressure locking due to hot water entering the sumps in conjunction with a LOCA.

Hydraulic Pressure Locking

These valves are separated from the RHR suction piping by a single check valve and assuming this check valve leaks, the downstream disks of these valves could be exposed to pressures as high as 450 psig when the RHR system is in service with the loop suction valves open. When the RHR system is secured and the loop suction valves are closed, the pressure in the RHR suction piping will decrease allowing the downstream disk to reseat, potentially trapping high pressure fluid in the bonnet. However, this situation only occurs in conjunction with an RCS heatup or cooldown and any pressure which becomes trapped in the bonnet will decay prior to power operation.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

Corrective Actions

The scenario associated with hot water entering the sumps following a LOCA was evaluated in detail to determine if the valves would be capable of performing their design-basis function. The valves are located at an elevation approximately six feet below their respective sumps and are separated from the sumps by approximately thirty feet of piping which is filled with cool water prior to start-up. This arrangement is not conducive to the rapid transfer of heat from the sump to the valve body. Therefore, it was concluded that a significant heatup of the valve body would not occur prior to opening these valves in conjunction with the transfer to cold-leg recirculation.

To provide additional assurance that these valves will be capable of performing their design-basis function, the valves will be modified by drilling a 1/8 inch hole in the upstream side of the disk.

3.10 RHR to RCS Hot-Leg Isolation Valve

Description

Valves 1/2HV-8840 are 12 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when transferring to hot leg recirculation to provide a flowpath between the discharge of the RHR pumps and the hot legs. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Thermally Induced Pressure Locking

In conjunction with a LOCA, the ambient temperature in the rooms in which these valves are located may rise to a maximum temperature of 145° F due to the recirculation of containment sump fluids in adjacent piping. This ambient temperature is marginally higher than the maximum temperatures experienced during normal operation but would not be sufficient to provide a heat-up rate capable of causing thermally induced pressure locking .

The piping upstream of these valves is connected to the cold-leg recirculation piping which will be circulating hot containment sump fluids prior to transferring to hot-leg recirculation. However, this valve is isolated from the discharge of the RHR pumps by the 1/2HV-8716A/B valves which are closed during cold-leg recirculation. Therefore, a substantial heat up of the valve body due to recirculation fluids would not occur in the eleven hours prior to transferring to hot-leg recirculation.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

These valves are separated from the RCS by two check valves and assuming the check valves leak, the downstream side of the disc could be exposed to RCS pressure. In the event of a LOCA, RCS pressure would decrease allowing the downstream side of the disc to reseat, potentially trapping high pressure fluid in the bonnet. However, since the transfer to hot-leg recirculation does not occur for approximately eleven hours following the initiation of the event, there would be sufficient time for the bonnet pressure to decay prior to opening the valve.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

3.11 Containment Spray Pump Discharge Isolation Valves

Description

Valves 1/2HV-9001A/B are 8 inch, 316 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open on a high containment pressure signal to establish a flowpath between the discharge of the containment spray pumps and the spray header. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Thermally Induced Pressure Locking

In conjunction with a LOCA the ambient temperature in the rooms in which these valves are located may rise to a maximum temperature of 145° F. However, the temperature rise due to the recirculation of hot fluids from the sumps will not begin until after these valves have been opened.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

The Containment Spray Pumps are tested on a quarterly basis and the upstream side of the disks on the discharge valves are exposed to the pump discharge pressure of 248 psig. Upon completion of the test, the containment spray pump is tripped causing pressure in the containment spray pump discharge piping to decrease allowing the upstream side of the disk to reseat, potentially trapping high pressure fluid in the bonnet.

In the event of an accident the containment spray pump and the discharge valve receive simultaneous signals to start and open respectively. The containment spray pumps come up to speed in approximately 1.5 seconds, thereby pressurizing the upstream side of the disk on the discharge valve and releasing any pressure trapped in the bonnet. In the event that sufficient pressure was trapped in the bonnet to prevent the operator from opening the valve, the motor would experience a locked rotor condition for approximately 1.5 seconds, at which time the bonnet pressure would be released. The operator motors are capable of surviving a locked rotor condition for 1.5 seconds without incurring damage. Therefore, it was concluded that these valves would be capable of performing their design-basis function.

3.12 Containment Spray Pump Sump Suction Isolation Valves

Description

Valves 1/2HV-9002A/B are 10 inch, 150 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when transferring to recirculation to provide a flowpath between the containment sumps and the suction to the containment spray pumps. The valves were screened in accordance with the criteria outlined in Section 2 of this document and were determined to be potentially susceptible to hydraulic and thermally induced pressure locking.

Thermally Induced Pressure Locking

In conjunction with a LOCA, the ambient temperature in the rooms in which these valves are located may rise to a maximum temperature of 135° F. However, the temperature rise is due to the recirculation of hot fluids from the sumps which will not begin until after these valves have been opened.

The piping upstream of these valves is connected to the containment sumps which would be exposed to hot water in the event of a LOCA. The heat input from the flow of hot water into the containment sumps may be sufficient to cause the valve body to heat-up prior to opening these valves to initiate cold-leg recirculation.

Based on the results of this evaluation, it was concluded that these valves may be susceptible to thermally induced pressure locking due to hot water entering the sumps in conjunction with a LOCA.

Corrective Actions

The scenario associated with hot water entering the sumps following a LOCA was evaluated in detail to determine if the valves would be capable of performing their design-basis function. The valves are located at an elevation approximately six feet below their respective sumps and are separated from the sumps by approximately twenty feet of piping which is filled with cool water prior to start-up. This arrangement is not conducive to the rapid transfer of heat from the sump to the valve body. Therefore, it was concluded that a significant heatup of the valve body would not occur prior to opening these valves in conjunction with the transfer to cold-leg recirculation.

To provide additional assurance that these valves will be capable of performing their design-basis function, the valves will be modified by drilling a 1/8 inch hole in the upstream side of the disk.

4.0 MODIFICATIONS

As a result of the reviews performed in conjunction with Generic Letter 95-07, a total of 16 valves were identified for modifications to provide additional assurance that the valves will be capable of performing their design-basis functions. Table 4-1 identifies the valves to be modified, the respective modifications and the implementation schedule.

Table 4-1
Generic Letter 95-07 Modifications

Tag No.	Modification	Schedule
1HV-0610	Revise Control Logic	1R7
1HV-0611	Revise Control Logic	1R7
1HV-8802A	Drill 1/8" Hole in Disk	1R6
1HV-8802B	Drill 1/8" Hole in Disk	1R6
1HV-8811A	Drill 1/8" Hole in Disk	1R6
1HV-8811B	Drill 1/8" Hole in Disk	1R6
1HV-9002A	Drill 1/8" Hole in Disk	1R6
1HV-9002B	Drill 1/8" Hole in Disk	1R6
2HV-0610	Revise Control Logic	2R5
2HV-0611	Revise Control Logic	2R5
2HV-8802A	Drill 1/8" Hole in Disk	2R5
2HV-8802B	Drill 1/8" Hole in Disk	2R5
2HV-8811A	Drill 1/8" Hole in Disk	2R5
2HV-8811B	Drill 1/8" Hole in Disk	2R5
2HV-9002A	Drill 1/8" Hole in Disk	2R5
2HV-9002B	Drill 1/8" Hole in Disk	2R5