WOLF CREEK
NUCLEAR OPERATING CORPORATION

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U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555

Reference: Letter ET 95-0111 dated October 11, 1995 from R. C. Hagan to USNRC
Subject: Docket No. 50-482: 180 Day Response to Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power Operated Gate Valves"

Gentlemen:

The attachments to this letter provide Wolf Creek Nuclear Operating Corporation's 180 day response to Generic Letter 95-07. This information is being provided in accordance with the reporting requirements of the Generic Letter.

If you have any questions concerning this matter, please contact me at (316) 364-8831 extension 4450 or Mr. Richard D. Flannigan at extension 4500.

Very truly yours,

Otto L. Maynard

OLM/jra

Attachments:
I. General Information, and Summary
II. Preliminary Evaluation for Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves
III. Results of the Initial Screening Evaluation of Motor Operated Gate Valves
IV. Summaries of Detailed Evaluations of Potentially Susceptible Valves

cc: L. J. Callan (NRC), w/a
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COUNTY OF COFFEY)

Otto L. Maynard, of lawful age, being first duly sworn upon oath says that he is Vice President Plant Operations of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the content thereof; that he has executed that same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By O. L. Maynard
Otto L. Maynard
Vice President
Plant Operations

SUBSCRIBED and sworn to before me this 14TH day of FEB, 1996.

Mary E. Gifford.
Notary Public

MARY E. GIFFORD
Notary Public - State of Kansas
My Appt. Expires 12/09/1999

Expiration Date 12/09/1999

WOLF CREEK GENERATING STATION
GENERAL INFORMATION, AND SUMMARY OF THE EVALUATION AND RESOLUTION OF PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES

PURPOSE

The purpose of this document is to provide the results of the Wolf Creek Nuclear Operating Corporation (WCNOC) evaluation to satisfy the requirements of NRC Generic Letter 95-07 "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Valves." The evaluation consists of two parts: (1) a preliminary screening to identify those valves which are potentially susceptible to the pressure locking and thermal binding phenomena, and (2) detailed evaluations of those valves which are potentially susceptible to determine if corrective action is necessary, and to establish the corrective action to be taken.

SCOPE

The subject evaluation includes 83 motor operated and 8 hydraulically operated gate valves. Attachment III contains a list of the valves included in the evaluation. Pressure locking and thermal binding only affect gate valves and only when the valves are closed and required to open.

PRELIMINARY SCREENING TO ELIMINATE NON-APPLICABLE VALVES

Preliminary screening evaluations have been performed on safety-related gate valves at the Wolf Creek Generating Station (WCGS) to determine the potential susceptibility to pressure locking and thermal binding, and to determine whether pressure locking or thermal binding can possibly affect their safety function.

The initial pressure locking and thermal binding study was completed in December 1994 to the requirements of Generic Letter 89-10 Supplement 6 guidelines. The results of this preliminary evaluation served as the basis for WCNOC's initial Generic Letter 95-07 submittal, dated October 11, 1995, from R. C. Hagan to USNRC (letter ET 95-0111). This submittal identified 13 valves that are potentially susceptible to pressure locking and/or thermal binding, and whose failure to open could have an adverse impact on plant safety. Attachment II to this document summarizes the criteria used to screen the valves. Attachment III provides a listing of the valves included in the screening evaluation and indicates the valves that are potentially susceptible to pressure locking or thermal binding and therefore must be evaluated in greater detail.

The initial screening evaluation was recently reviewed to ensure that it reflects current guidance in Generic Letter 95-07. In this supplementary review the list of valves to be evaluated was increased by eight valves to include valves that are power operated, but do not have motor operators. Four additional motor-operated valves were also included. None of the twelve additional valves were determined to represent a safety risk due to pressure locking or thermal binding. The valves that have been added meet the criteria outlined in 1c and 1d of Attachment II.

DETAILED EVALUATIONS OF POTENTIALLY SUSCEPTIBLE VALVES

Following the preliminary screening, the 13 valves identified as being potentially susceptible to pressure locking or thermal binding were evaluated in greater detail to determine whether they can be operated safely in their current configuration and whether corrective action is required. The following table summarizes the results of these detailed evaluations and the corrective actions that have been or will be taken. More complete summaries of the detailed evaluations are provided in Attachment IV.

In some cases, analyses were performed to confirm that the operator has sufficient capability to overcome the effects of pressure locking. These analyses were performed using a calculation methodology developed by Commonwealth Edison and considered to be the acceptable industry approach.

CORRECTIVE ACTIONS FOR POTENTIALLY SUSCEPTIBLE VALVES

All corrective actions will be implemented prior to restart from the current refueling outage. At that time all susceptible valves, except three, will also have the long term resolution completed. The remaining three valves are awaiting NRC approval of the Westinghouse Owners Group (WOG) initiative to eliminate hot leg recirculation. When approved, the initiative will provide justification to no longer require these valves to perform the safety related opening function during hot leg recirculation which creates the conditions for pressure locking.

Summary of Potentially Susceptible Valves

Valve ID # and Description	Susceptibility Evaluation Summary	Corrective Action Summary
BBPV8702A & B **EJHV8701A & B** Residual Heat Removal System Suction from RCS Hot Leg Isolation	The preliminary screening indicated that these valves should be evaluated for susceptibility to both pressure locking and thermal binding. Thermal Binding: The detailed evaluation indicated that there is one condition that could cause thermal binding of these valves when cooling the RCS fluid. Pressure Locking: The detailed evaluation also indicated that there is one condition that could cause thermally induced pressure locking during plant heat-up.	Pressure Locking : These valves are normally open during heat-up evolutions. A caution will be added to the appropriate procedures prior to the restart from the current refueling outage to assure these valves remain open during heat-up to prevent thermally induced pressure locking. Thermal Binding: Corrective action will be been taken prior to the restart from the current refueling outage by revising the appropriate procedures to caution operators to not close the valves while hot, during cooldown without cycling before exposure to a 100°F temperature differential.
EJFCV0610 & 0611 Residual Heat Removal Pump Minimum Flow Recirculation Valves	The preliminary screening indicated that these valves should be evaluated for susceptibility to thermal binding The detailed evaluation indicated that there is a susceptibility to thermal binding.	One of these valves has been modified and the other will be modified prior to restart from the current refueling outage to be limit close controlled and soft seated to prevent thermal binding.
EJHV8811A & B Residual Heat Removal System Suction from Containment Recirculation Sump Isolation	The preliminary screening indicated that these valves should be evaluated for susceptibility to thermally induced pressure locking and thermal binding. The detailed evaluation indicated that thermal binding cannot occur in these valves, but that there is a susceptibility to thermally induced pressure locking under Loss of Coolant Accident (LOCA) conditions.	These valves will be modified during the current refueling outage to add an air reservoir to the bonnet to limit the pressure to that which can be accommodated by the motor operator.

Summary of Potentially Susceptible Valves (cont.)

Valve ID # and Description	Susceptibility Evaluation Summary	Corrective Action Summary
EJHV8840 Residual Heat Removal System to Hot Leg Recirculation Isolation	The preliminary screening showed that this valve should be evaluated for susceptibility to pressure locking. The detailed evaluation indicated that this valve is susceptible to pressure locking due to RCS check valve leakage.	Corrective actions will be taken prior to the restart from the current refueling outage to administratively control the downstream piping header pressure to acceptable levels. Long term corrective action depends on the resolution of the WOG initiative to eliminate the function for hot leg recirculation. If approved, no further action is required. If not, alternate long term corrective actions will be evaluated at that time.
EMHV8802A & B Safety Injection Pump Discharge to RCS Hot Leg Isolation	The preliminary screening showed that this valve should be evaluated for susceptibility to pressure locking. The detailed evaluation indicated that these valves are susceptible to pressure locking due to RCS check valve leakage and safety injection pump pressure entrapment.	Calculations demonstrate that the valves are capable of overcoming the effects of pressure locking. Long term corrective action depends on the resolution of the WOG initiative to eliminate the function for hot leg recirculation. If approved, no further action is required. If not, alternate long term corrective actions will be evaluated at that time.
ENHV0001 & 0007 Containment Spray Pump Suction from Containment Recirculation Sump Isolation	The preliminary screening indicated that these valves should be evaluated for susceptibility to thermally induced pressure locking and thermal binding. The detailed evaluation indicated that thermal binding cannot occur in these valves, but that there is a susceptibility to thermally induced pressure locking under LOCA conditions.	These valves will be modified during the current refueling outage to add an air reservoir to the bonnet to limit the pressure to that which can be accommodated by the motor operator.

PRELIMINARY EVALUATION FOR PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES

The preliminary screening evaluation was performed using the following criteria.

1. Initial Screening for Applicability
   The first step in the screening process was to exclude valves from consideration for which pressure locking or thermal binding cannot occur or does not pose a significant risk to safety if it does occur. These valves include:

   a. All valves that are not gate valves are excluded because pressure locking and thermal binding have been phenomena exhibited only in gate valves.

   b. All valves that are non-safety-related are excluded because malfunction of these valves does not pose a risk to nuclear safety.

   c. All valves that are safety-related solely because they are part of the pressure boundary are excluded because pressure locking and thermal binding do not pose risks to the pressure boundary. This includes valves that are normally open, with their safety position being open, or normally closed with their safety position being closed. Mispositioning was not considered to be a common mode failure.

   d. All valves whose only safety function is to close are excluded because pressure locking and thermal binding only affect the opening function. However, if a normally open valve may be closed as part of plant maintenance, testing or other unusual circumstances, and then is required to open for safety-related reasons, such valves were not excluded from consideration.

   e. All valves that are of the double disk, or parallel slide, design can be excluded with regard to thermal binding, but not pressure locking. This is because double disk valves have cams that bring the disks together when the stem is withdrawn, thus eliminating binding, and parallel seat valves have sufficient clearance to prevent thermal expansion binding.

2. Screening for Pressure Locking and Thermal Binding
   Valves that were not excluded in the initial screening were screened for potential susceptibility to pressure locking and thermal binding. This was a three step process.

   a. First, it is confirmed that the valves meet one of the following three conditions:

      * there is a required safety function for the valve to open from the closed position, or

      * emergency procedures require the valve to be opened from the closed position, or

      * the valve can be closed for maintenance or operational reasons and is required to be reopened during normal or emergency plant operation.

b. Valves are potentially susceptible to pressure locking if condition "a" is met, and the valve design is such that the bonnet can be at a higher pressure than the two legs under normal or accident conditions due to 1) rapid system depressurization, or 2) temperature increases induced by plant operation.

c. Valves are potentially susceptible to thermal binding if condition "a" is met and 1) the valve can be in the full closed position with the temperature more than 60°F above ambient, and 2) the valve has a wedge type disk.

Note: Initial screening stated that valve temperature differences greater than 60°F above ambient were susceptible to thermal binding. The subsequent Westinghouse Owners Group analysis shows that a 100°F temperature difference is acceptable for valves with flexible wedges and, that the likelihood of the thermal binding occurs at temperatures above 200°F.

Attachment III is a listing of all the motor operated gate valves included in the initial evaluation with a listing of the additional valves added during the recent review. This table indicates the valves that are potentially susceptible to pressure locking or thermal binding and therefore, required detailed evaluation. The net result of the screenings performed are that 13 valves have been found to be susceptible to pressure locking and thermal binding.

Results of Screening Evaluation of Motor Operated Gate Valves

Valve ID Number	Valve Description	Valve Type*	Pressure Locking Evaluation Required	Thermal Binding Evaluation Required
ALHV00034	CST TO MD AUX FW PUMP "B" ISO	GATE, FW		
ALHV00035	CST TO MD AUX FW PUMP "A" ISO	GATE, FW		
ALHV00036	CST TO TD AUX FW PUMP ISO	GATE, FW		
BBHV0013	RCP "A" THERMAL BARR CCW RETURN ISO	GATE, FW		
BBHV0014	RCP "B" THERMAL BARR CCW RETURN ISO	GATE, FW		
BBHV0015	RCP "C" THERMAL BARR CCW RETURN ISO	GATE, FW		
BBHV0016	RCP "D" THERMAL BARR CCW RETURN ISO	GATE, FW		
BBHV8000A	PZR PORV BBPCV0455A INLET ISO	GATE, FW		
BBHV8000B	PZR PORV BBPCV0456A INLET ISO	GATE, FW		
BBHV8037A	PRT TO CTMT NORMAL SUMP ISO	GATE, FW		
BBHV8037B	PRT TO CTMT NORMAL SUMP ISO	GATE, FW		
BBPV8702A	RCS HL 1 TO RHR PUMP "A" SUCTION ISO	GATE, FW	Yes	Yes
BBPV8702B	RCS HL 4 TO RHR PUMP "B" SUCTION ISO	GATE, FW	Yes	Yes
BGHV8105	CHARGING PUMPS TO REGEN HX/CONT ISO	GATE, FW		
BGHV8106	CHARGING PUMPS TO REGEN HX/CONT ISO	GATE, FW		
BGLCV0112B	VCT LOW LEVEL ISO ON BG020HCB-4	GATE, FW		
BGLCV0112C	VCT LOW LEVEL ISO ON BG020HCB-4	GATE, FW		
BNHV0003	RWST SUPPLY TO CTMT SPRAY PUMP "B"	GATE, FW		
BNHV0004	RWST SUPPLY TO CTMT SPRAY PUMP "A"	GATE, FW		
BNHV8806A	RWST TO SI PUMP "A" SUCTION ISO	GATE, FW		
BNHV8806B	RWST TO SAFETY INJ PUMP SUCTION	GATE, FW		
BNHV8812A	RWST TO RHR PMP "A" SUCTION ISO	GATE, FW		
BNHV8812B	RWST TO RHR PMP "B" SUCTION ISO	GATE, FW		
BNLCV0112D	RWST TO CCP "A" SUCTION ISO	GATE, FW		
BNLCV0112E	RWST TO CCP "B" SUCTION ISO	GATE, FW		
EFHV0091	ESW SCREEN "A" SPRAY	GATE, FW		
EFHV0092	ESW SCREEN "B" SPRAY	GATE, FW		
EFHV0097	ESW PUMP "A" DISCHARGE AIR RELEASE	GATE, FW		
EFHV0098	ESW PUMP "B" DISCHARGE AIR RELEASE	GATE, FW		
EFPDV0019	ESW SELF-CLEANING STRAINER "A" TRASH	GATE, FW		
EFPDV0020	ESW SELF-CLEANING STRAINER "B" TRASH	GATE, FW		
EGHV0058	CCW TO RCS ISO	GATE, DD		
EGHV0059	CCW RETURN FROM RCS ISO	GATE, DD		
EGHV0060	CCW RETURN FROM RCS ISO	GATE, DD		
EGHV0061	CCW RETURN FROM RCP THERM BARRIERS ISO	GATE, PS		
EGHV0062	CCW RETURN FROM RCP THERM BARRIERS ISO	GATE, PS		
EGHV0071	CCW TO RCS ISO	GATE, FW		

* DD = Double Disk, FW = Flexible Wedge, and PS = Parallel Slide

Results of Screening Evaluation of Motor Operated Gate Valves (cont.)

Valve ID Number	Valve Description	Valve Type*	Pressure Locking Evaluation Required	Thermal Binding Evaluation Required
EGHV0126	CCW SUPPLY TO CONTAINMENT/EGHV0071 BYPASS	GATE, FW		
EGHV0127	CCW SUPPLY TO CONTAINMENT/EGHV0058 BYPASS	GATE, DD		
EGHV0130	CCW RETURN FROM RCS/EGHV0060 BYPASS	GATE, DD		
EGHV0131	CCW RETURN FROM RCS/EGHV0059 BYPASS	GATE, DD		
EGHV0132	THERMAL BARRIERS/EGHV0062 BYPASS	GATE, PS		
EGHV0133	THERMAL BARRIERS/EGHV0061 BYPASS	GATE, PS		
EJFCV0610	RHR PUMP "A" MINIFLOW CONTROL	GATE, FW		Yes
EJFCV0611	RHR PUMP "B" MINIFLOW CONTROL	GATE, FW		Yes
EJHV8701A	RCS HL 1 TO RHR PUMP "A" SUCTION ISO	GATE, FW	Yes	Yes
EJHV8701B	RCS HL 4 TO RHR PUMP "B" SUCTION ISO	GATE, FW	Yes	Yes
EJHV8716A	RHR "A" TO SIS HOT LEG RECIRC LOOPS 2 & 3 ISO	GATE, FW		
EJHV8716B	RHR "B" TO SIS HOT LEG RECIRC LOOPS 2 & 3 ISO	GATE, FW		
EJHV8804A	RHR "A" TO CVCS CCP ISO	GATE, FW		
EJHV8804B	RHR "B" SUPPLY TO SI PUMP SUCTION ISO	GATE, FW		
EJHV8809A	RHR "A" TO ACCUM INJ LOOPS 1 & 2 ISO	GATE, FW		
EJHV8809B	RHR "B" TO ACCUM INJ LOOPS 3 & 4 ISO	GATE, FW		
EJHV8811A	CTMT RECIRC SUMP TO RHR PUMP "A" SUCTION ISO	GATE, FW	Yes	Yes
EJHV8811B	CTMT RECIRC SUMP TO RHR PUMP "B" SUCTION ISO	GATE, FW	Yes	Yes
EJHV8840	RHR/SI TO HOT LEGS 2 & 3 RECIRC ISO	GATE, FW	Yes	
EMHV8801A	BIT OUTLET ISO	GATE, FW		
EMHV8801B	BIT OUTLET ISO	GATE, FW		
EMHV8802A	SI PUMP "A" DISCHARGE TO HOT LEGS 2 & 3 ISO	GATE, FW	Yes	
EMHV8802B	SI PUMP "B" DISCHARGE TO HOT LEGS 1 & 4 ISO	GATE, FW	Yes	
EMHV8803A	CHARGING PUMP DISCH HDR TO BIT ISO	GATE, FW		
EMHV8803B	CHARGING PUMP DISCH HDR TO BIT ISO	GATE, FW		
EMHV8807A	RHR HX A/CVCS TO SI PUMP A&B SUCTION	GATE, FW		
EMHV8807B	RHR HX A/CVCS TO SI PUMP A&B SUCTION	GATE, FW		
EMHV8821A	TO ACCUMULATOR INJECTION ISO	GATE, FW		
EMHV8821B	TO ACCUMULATOR INJECTION ISO	GATE, FW		
EMHV8835	ACCUMULATOR INJECTION COLD LEG ISO	GATE, FW		
EMHV8923A	SI PUMP "A" SUCTION ISO	GATE, FW		
EMHV8923B	SI PUMP "B" SUCTION ISO	GATE, FW		

* DD = Double Disk, FW = Flexible Wedge, and PS = Parallel Slide

Results of Screening Evaluation of Motor Operated Gate Valves (cont.)

Valve ID Number	Valve Description	Valve Type*	Pressure Locking Evaluation Required	Thermal Binding Evaluation Required
ENHV0001	TO CONTAINMENT SPRAY PUMP "A" ISO	GATE, FW	Yes	Yes
ENHV0006	CONTAINMENT SPRAY PUMP "A" DISCHARGE ISO	GATE, FW		
ENHV0007	TO CONTAINMENT SPRAY PUMP "B" ISO	GATE, FW	Yes	Yes
ENHV0012	CONTAINMENT SPRAY PUMP "B" DISCHARGE ISO	GATE, FW		
ENHV0015	SPRAY ADDITIVE EDUCTOR "A" ISO	GATE, FW		
ENHV0016	SPRAY ADDITIVE EDUCTOR "B" ISO	GATE, FW		
KCHV0253	FIRE PROTECTION CONTAINMENT ISO	GATE, PS		
LFFV0095	CONTAINMENT NORMAL SUMP DISCHARGE ISO	GATE, FW		
LFHV0105	AUX BUILDING SUMP PUMP DISCHARGE ISO	GATE, FW		
LFHV0106	AUX BUILDING SUMP PUMP DISCHARGE ISO	GATE, FW		
Additional Valves Added to the Initial Screening				
Motor Operated				
EPHV8808A	SI ACC TANK A OUTLET ISO	GATE, FW		
EPHV8808B	SI ACC TANK B OUTLET ISO	GATE, FW		
EPHV8808C	SI ACC TANK C OUTLET ISO	GATE, FW		
EPHV8808D	SI ACC TANK D OUTLET ISO	GATE, FW		
Hyd. Operated				
ABHV0011	SG "D" MAIN STEAM LINE ISO	GATE, DD		
ABHV0014	SG "A" MAIN STEAM LINE ISO	GATE, DD		
ABHV0017	SG "B" MAIN STEAM LINE ISO	GATE, DD		
ABHV0020	SG "C" MAIN STEAM LINE ISO	GATE, DD		
AEFV0039	SG "A" FW SUPPLY ISO	GATE, DD		
AEFV0040	SG "B" FW SUPPLY ISO	GATE, DD		
AEFV0041	SG "C" FW SUPPLY ISO	GATE, DD		
AEFV0042	SG "D" FW SUPPLY ISO	GATE, DD		

* DD = Double Disk, FW = Flexible Wedge, and PS = Parallel Slide

SUMMARIES OF DETAILED EVALUATIONS OF POTENTIALLY SUSCEPTIBLE VALVES

BBPV8702A & B, RHR System Suction from RCS Hot Leg Isolation
EJHV8701A & B, RHR System Suction from RCS Hot Leg Isolation

Description

BBPV8702A & B and EJHV8701A & B are 12 inch, 1525 psi Westinghouse flexible wedge gate valves in the suction lines from the RCS hot legs that lead to the RHR pump suctions. Valves BBPV8702 and EJHV8701 are in series; the BBPV8702 valve being closest to the RCS. The valves are located inside containment and each is equipped with an SMB-2-80 Limitorque motor operator. These valves are remotely operated from the control room. Normal containment temperature is never greater than 120°F when these valves are required to operate. These valves are not used to mitigate the effects of a LOCA but are used after a steamline break in containment. The valve bonnets are insulted and not exposed to active steam heating.

Valve Functions

The valves in these lines are closed during normal power operation with power removed from BBPV8702A & B. These valves are not required to bring the plant to a safe shutdown condition. They are opened after the plant is cooled down to approximately 350°F, as part of establishing RHR circulation for further cooldown to cold shutdown and also provide cooling during refueling or during plant maintenance.

Evaluation for Thermal Binding

Thermal binding could occur in these valves if a valve is closed after operating at 350°F during RHR cooling and then desired to be opened again at a lower temperature. To avoid this unlikely situation, procedure changes will be made to caution the operators about closing these valves after hot system fluids have flowed through them. These changes ensure that the valves, which have flexible wedges, are not subjected to more than a 100°F temperature decrease in the continuous closed position. Analyses provided by the Westinghouse Owners Group show that a 100°F temperature change is acceptable for valves with flexible wedges and that the likelihood of thermal binding occurs at temperatures above 200°F.

Evaluation for Pressure Locking

Pressure locking is not a concern for these valves because they do not have to operate following a Loss of Coolant Accident (LOCA) depressurization. Operation following a steam line break accident is not required until eight hours after the accident and no rapid depressurization of the primary system occurs.

Thermally induced pressure locking is a possibility for these valves under conditions where the valves are closed cold and are then heated up by conduction from the RCS. To avoid this unlikely condition, procedure changes will be made to caution the operators about having one of these valves closed during plant heat up evolutions.

EJFCV0610 & 0611, RHR Pump Minimum Flow Recirculation Valves

Description

EJFCV0610 and 0611 are 3 inch, 2035 psi flexible wedge Westinghouse gate valves. They are used to ensure a minimum flow rate through the RHR pumps. They have SMB-000-10 Limitorque motor operators. The valves are located in the RHR pump room that is cooled by a safety-related room cooler.

Valve Functions

These valves are open during normal plant operation. They provide protection to the RHR pump by ensuring that the RHR pump discharge flow is greater than the minimum pump requirements. They automatically open when the flow drops below approximately 800 gpm and automatically close when the RHR discharge flow reaches approximately 1,600 gpm. If the valve fails to close for any reason, flow to the RCS is diminished. The minimum flow to the RCS is still ensured by the redundant system. If the valve were to fail to open for any reason, the RHR pump could be damaged as a result of too low a flow rate. The safety function to guard against for pressure locking and thermal binding effects is failure to open.

Evaluation for Thermal Binding

These valves can open and close automatically during operation of the RHR pumps if flow adjustments are made, mispositioning a valve in the pump flow path is considered or RCS pressure increases unexpectedly. These pump flow fluctuations can cause thermal transients on this valve as it automatically cycles. Exposure to adverse thermal transient conditions is considered more likely during plant heat-up than cooldown. A design change has been issued to limit close, rather than torque close these valves. The design change will stop the operator on a limit switch control (soft seat) when the disk is approximately 1/2 inch from the fully seated position. One valve has been modified and the other will be modified during the current refueling outage. This change will preclude thermal binding.

Evaluation for Pressure Locking

There is no concern for pressure locking of these valves.

EJHV8811A & B, Residual Heat Removal System Suction from Containment Recirculation Sump Isolation

Description

EJHV8811A & B are 14 inch, 316 psi flexible wedge Westinghouse gate valves that provide isolation between the containment building sump and the RHR pumps. These valves are located in the auxiliary building pipe chase and are encapsulated. The valves are not exposed to significant ambient temperature changes. The valves have SB-1-60 Limitorque motor operators.

Valve Functions

These valves are closed during normal operation. They are opened on a safety injection signal coincident with a refueling water storage tank (RWST) low-low level signal to supply water to the RHR pumps when switching from the injection to recirculation mode of operation. They are stroke tested during cold operating modes.

Evaluation for Thermal Binding

These valves are not closed in a hot condition and are not susceptible to thermal binding. Stroke testing is restricted to cold operating modes.

Evaluation for Pressure Locking

Pressure locking of these valves could possibly occur under two scenarios.

a. Water can fill the bonnets of these valves from either the static head of the RWST or from the RHR system. Following a LOCA, elevated temperature water can enter the sump pipes causing the valves to heat up, thereby causing thermally induced pressure locking.

b. There is a potential for the valves to pressure lock by thermal effects during a normal plant shutdown (closed loop). Because the subject valves are connected to the RHR pipe by approximately a 10 foot long horizontal run, the valves can be heated to 350°F by water flowing through the RHR pipe early in the cooldown (closed loop). This could cause thermally induced pressure locking of the valves. However, this condition occurs when RHR containment sump recirculation is not required (open loop). This condition can be detected during stroke testing which is done at temperatures less than 200°F. Accordingly, this would not pose a safety risk because closed loop RHR operation, not open loop, is required at this time.

Corrective action has been taken, and further action is planned, to ensure that these valves will not pressure lock. These corrective actions are as follows:

1. A temporary modification was made to fill the containment sumps with water. If the sumps are already filled with cold water prior to a LOCA, hot water produced during the LOCA cannot enter the pipes and heat the valves to the point where pressure locking occurs.

2. These valves will be modified during the current refueling outage to add air reservoirs to the tops of the valve bonnets. The air reservoirs will be sized to ensure that enough air is trapped in the bonnet to keep the bonnet pressures within the capability of the motor operators to open the valves.

EJHV8840, Residual Heat Removal to Hot Leg Recirculation Isolation

Description

EJHV8840 is a 10 inch, 1525 psi flexible wedge Westinghouse gate valve that is normally closed with power locked out. It is installed in the RHR system and isolates the hot leg injection line from the RHR heat exchanger discharge headers. It is located outside containment in the pipe penetration room where it is not subject to significant ambient temperature changes based on actual 1988 test data. The valve has a SBD-3-150 Limitorque motor operator.

Valve Functions

This valve remains closed during normal operation. It is opened and closed for stroke testing during refueling outages and opened to permit hot leg recirculation 10 hours after a LOCA.

Evaluation for Thermal Binding

This valve is not susceptible to thermal binding.

Evaluation for Pressure Locking

There is one scenario in which the valve could potentially be susceptible to pressure locking. This valve is normally closed and is isolated from the RCS by two check valves in series. Because check valves are subject to leakage there is potential for the downstream side of this valve to become pressurized to the RCS pressure of 2,235 psi and if leakage past the downstream seat were to occur with the bonnet water solid, pressure of 2,235 psi can exist in the bonnet. Following a LOCA, the downstream side of the valve would be depressurized resulting in pressure entrapment. The upstream side of the valve would be at a relatively low pressure.

To limit the potential to pressure lock these valves to an acceptable level, the pressure on the down stream side of the valves will be administratively controlled and monitored. If there is indication of RCS pressures, the pressure in this location will be relieved to an acceptable level.

Long range plans are being made to eliminate the hot leg recirculation safety function of this valve through a Westinghouse initiative.

EMHV8802A & B, Safety Injection Pump Discharge to RCS Hot Leg Isolation

Description

EMHV8802A & B are 4 inch, 1525 psi flexible wedge Westinghouse gate valves that are normally closed. They are part of the RCS boundary and isolate the discharge of the safety injection pumps from the RCS hot legs. They are located in the piping penetration room adjacent to containment. These valves are not subject to significant ambient temperature changes. The valves have SBD-00-15 Limitorque motor-operators.

Valve Functions

These valves are closed during normal operation with power locked out. They are opened and closed quarterly during testing and are opened to permit hot leg recirculation 10 hours after a LOCA.

Evaluation for Thermal Binding

These valves are not subject to thermal binding.

Evaluation for Pressure Locking

There are two scenarios in which these valves could potentially be susceptible to pressure locking. Each valve is normally closed and is isolated from the RCS by two check valves in series leading to two RCS hot legs. Because check valves are subject to leakage, there is potential for the downstream side of this valve to become pressurized to the RCS pressure of 2,235 psi and for leakage past the seat to fill the valve bonnet to this pressure. Following a large break LOCA, the downstream sides of the valves would be rapidly depressurized leading to pressure locking. In the second scenario, the bonnet could be filled with water at the safety injection pump pressure of approximately 1,700 psi in the interval when switching from cold to hot leg recirculation. Both of these scenarios could result in pressure locking if the operator is not capable of overcoming this bonnet pressure. However, pressure locking does not pose a safety risk for these valves because analyses show that the operators are capable of opening these valves with the bonnet at pressures greater than RCS pressure.

In the longer term, plans are being made to eliminate the hot leg recirculation safety function of this valve through a Westinghouse initiative.

ENHV0001 & 0007, Containment Spray Pump Suction from Containment Recirculation Sump Isolation

Description

ENHV0001 and 0007 are 12 inch, 150 psi flexible wedge Anchor Darling gate valves that are normally closed. They isolate the suction of the containment spray pumps from the containment sump. They are located in the auxiliary building pipe chase and are encapsulated valves that are not exposed to significant ambient temperature changes. The valves have SMB-00-15 Limitorque motor operators.

Valve Functions

These valves are closed during normal operation. They are opened on a RWST low-low level to supply water to the containment spray pumps when the plant is switched from the injection mode to the recirculation mode.

Evaluation for Thermal Binding

These valves are not closed in a hot condition and are not susceptible to thermal binding.

Evaluation for Pressure Locking

Pressure locking of these valves could possibly occur under the following scenario. During operation, the downstream sides of these valves and their bonnets could become filled with water from the RWST as a result of leakage past the check valves. Following a LOCA, elevated temperature water can enter the sump pipes causing the valves to heat up, thereby causing thermally induced pressure locking.

Corrective action has been implemented, and further action is planned, to ensure that these valves will not pressure lock. These corrective actions are as follows:

1. A temporary modification was made to fill the containment sumps with water. If the sumps are already filled with cold water prior to a LOCA, hot water produced during the LOCA cannot enter the pipes and heat the valves to the point where pressure locking occurs.

2. These valves will be modified during the current refueling outage to add air reservoirs to the tops of the valve bonnets. The air reservoirs will be sized to ensure that enough air is trapped in the bonnet to keep the bonnet pressures within the capability of the motor operators to open the valves.