Commonwealth Edison Company
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ComEd

February 13, 1995

U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attention: Document Control Desk

Subject: Braidwood Station Units 1 and 2
Byron Station Units 1 and 2
Dresden Station Units 2, and 3
LaSalle County Station Units 1 and 2
Quad Cities Station Units 1 and 2
Zion Station Units 1 and 2

Commonwealth Edison Company (ComEd) 180 Day Response to NRC Generic Letter (GL), GL 95-07, "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES", dated August 17, 1995.

NRC Dockets 50-454 and 50-455
NRC Dockets 50-456 and 50-457
NRC Dockets 50-237 and 50-249
NRC Dockets 50-373 and 50-374
NRC Dockets 50-254 and 50-265
NRC Dockets 50-295 and 50-304

Reference: (1) NRC Generic Letter 95-07, "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES" dated August 17, 1995

(2) Commonwealth Edison Company's 60 day response to NRC Generic Letter 95-07, dated October 13, 1995

In Reference (1), the NRC staff requested licensees to report the status of actions taken to address GL 95-07. Reference (2) provided ComEd's 60 day response to Generic Letter 95-07. In that letter ComEd indicated that it would comply with the requested actions and submit the requested information as required by the Generic Letter. Enclosed is ComEd's 180 day response to the Generic Letter which includes a summary of the review, valves which were found to be potentially susceptible to either pressure locking and/or thermal binding and a summary of the evaluation.

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It should be noted that Attachment E for Quad Cities includes detailed information utilized to satisfy the requirements of GL 95-07. Included within Attachment E for Quad Cities are function and susceptibility review worksheets for the associated valves. Also included within Attachment E for Quad Cities are the calculations used to support Quad Cities' evaluations and the methodology used for identifying valves susceptible to pressure locking or thermal binding. Although not included herein, these calculations are representative of those used at ComEd to address GL 95-07 concerns.

Please direct any questions concerning this response to this office.

Sincerely,

Peter L. Piet
Nuclear Licensing Administrator

Attachments:
A - Byron/Braidwood Station 180 Day Response
B - Zion Station 180 Day Response
C - LaSalle Station 180 Day Response
D - Dresden Station 180 Day Response
E - Quad Cities Station 180 Day Response

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180-DAY RESPONSE TO GL 95-07 ATTACHMENT A

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ATTACHMENT A

BYRON/BRAIDWOOD STATION
180-DAY RESPONSE TO GL 95-07

Enclosure

Review of the Pressure Locking and Thermal Binding (PL/TB) phenomenon at Braidwood and Byron Stations was initially conducted as a result of industry correspondence issued prior to issuance of Generic Letter 89-10. This review was performed in the 1985/1986 time frame. However, the documentation was insufficient to determine how this review was performed and what criteria was used for determining susceptibility. As a result of Generic Letter 89-10, the PL/TB issue was again reviewed. During this review, all GL 89-10 Motor Operated Valves were included in the scope. As a result of issuance of Generic Letter 95-07, the scope of review was expanded to include all safety related power operated gate valves.

The review of the PL/TB issue was performed using a group of qualified personnel from both Braidwood and Byron Stations using the PL/TB screening criteria developed by LaSalle Station. The screening criteria is listed in Attachment A. This screening criteria has overall exclusion criteria for elimination of valves from consideration. All Byron and Braidwood safety related power operated valves (air operated, motor operated, solenoid operated, and hydraulically operated) were reviewed against the exclusion criteria in Attachment A. Most Byron and Braidwood valves were excluded from further review based on this evaluation. Attachment B lists those valves that were not excluded. This table provides the Equipment Part Number (EPN), valve function, safety significance, summary of susceptibility, and whether an operability review was required.

For the valves listed as potentially susceptible to PL/TB, a more detailed review was performed considering operating temperatures, operating history, and design basis requirements. A summary of this review is included in Attachment C. Some valves required an operability review due to the complexity of the analysis. This operability review was completed and found all valves operable. Several valves are being considered for additional actions to increase design margin, as summarized in Attachment C.

ATTACHMENT A

Susceptibility Evaluation Criteria
Pressure Locking and Thermal Binding Review

Overall Evaluation Exclusion Criteria:

1. All valve designs with the exception of gate valves have been excluded (i.e; globe, butterfly)

2. All valves which have a passive safety classification have been excluded.

3. All non-safety related valves have been excluded.

Thermal Binding Exclusion Criteria:

Valves that have double-disc or parallel-seat design can be excluded from the evaluation due to not being susceptible to this phenomenon.

Thermal Binding Evaluation Criteria:

If the answers to any part of Question 1, Question 2 and Question 3 below are all yes the valve should be considered potentially susceptible to thermal binding.

1a. Is the required safety function of the valve to open from the full closed position under normal or accident conditions? (Yes/No)

1b. Even though the safety function of the valve is in the closed position, does the Emergency Operating procedures require the valve to be reopened from the closed position? (Yes/No)

1c. Can the valve be closed for maintenance or operational reasons and reopened during normal unit operation? (Yes/No)

2. Is the valve placed in the full closed position with process fluid temperatures above normal room temperature? (Yes/No)

3. Is the valve disc a wedge design (solid, split, flexible)? (Yes/No)

Pressure Locking Exclusion Criteria:

Valves that have been installed in systems with a process fluid containing compressible gases or fluid/gas mixture other than steam providing the system is not initially filled with water were excluded.

Pressure Locking Evaluation Criteria:

If the answers to any part of Question 1, Question 2 and Question 3 below are all yes the valve should be considered potentially susceptible to pressure locking.

1a. Is the required safety function of the valve to open from the full closed position under normal or accident conditions? (Yes/No)

1b. Even though the safety function of the valve is in the closed position, does the Emergency Operating procedures require the valve to be reopened from the closed position? (Yes/No)

1c. Can the valve be closed for maintenance or operational reasons and reopened during normal unit operation? (Yes/No)

2. Is the valve susceptible to allowing fluid to enter the bonnet cavity including the area between the disc halves during valve cycling or due to differential pressure across the valve seats in the closed position? (Yes/No)

   Note: Steam systems with isolated flow may condense allowing fluid to enter the bonnet cavity depending on the system and valve configuration.

3. Is the valve bonnet cavity susceptible to a higher differential pressure than both valve seats under normal or accident conditions due to temperature increases or instantaneous system pressure drops in the upstream and/or downstream piping? (Yes/No)

ATTACHMENT B
PRESSURE LOCKING AND THERMAL BINDING REVIEW

EPN	VALVE FUNCTION	PRA RANK	POTENTIALLY SUSCEPTIBLE TB	POTENTIALLY SUSCEPTIBLE PL	OPERABILITY REVIEW REQUIRED
1(2)AF006A/B	ESW TO AFW SUCTION	LOW	N	N	N
1(2)AF017A/B	ESW TO AFW SUCTION	LOW	N	N	N
1(2)CC685	CCW THERMAL BAR ISOLATION	LOW	Y	N	N
1(2)CC9412A/B	CCW FROM RHR HEAT EXCH ISOL	HIGH	Y	N	N
1(2)CC9413A/B	CCW TO RCP ISOLATION	LOW	Y	N	N
1(2)CC9414	CCW FROM RCP ISOLATION	LOW	Y	N	N
1(2)CC9415	CCW TO UNIT EQUIPMENT	LOW	N	N	N
1(2)CC9416	CCW FROM RCP ISOLATION	LOW	Y	Y	N
1(2)CC9438	CCW FROM RCP THERM BARR RETURN	LOW	Y	Y	N
1(2)CC9473A/B	CCW CROSSTIE ISOLATION	LOW	N	N	N
1(2)CS001A/B	CONTAINMENT SPRAY PUMP RWST SUCTION	MEDIUM	N	N	N
1(2)CS007A/B	CONTAINMENT SPRAY PUMP DISCH ISOL	MEDIUM	N	Y	Y
1(2)CS009A/B	CONTAINMENT SPRAY PUMP SUMP SUCT	MEDIUM	N	Y	N
1(2)CS019A/B	CS PUMP FROM SPRAY ADDITIVE TK SUCTION	MEDIUM	N	N	N
1(2)CV112B/C	CV PUMP VCT SUCTION ISOL	HIGH	Y	N	N
1(2)CV112D/E	CV PUMP RWST SUCITON ISOL	HIGH	N	N	N
1(2)CV8105	CV PUMP DISCH HEADER ISOL	MEDIUM	Y	N	N
1(2)CV8106	CV PUMP DISCH HEADER ISOL	MEDIUM	Y	N	N
1(2)CV8804A	RHR HX TO CV PUMP SUCTION ISOL	HIGH	N	Y	Y
1(2)FW009A-D	MAIN FEEDWATER ISOLATION	Note 1	Y	Y	N
1(2)FW039A-D	FEEDWATER PREHEATER BYPASS	Note 1	Y	Y	N
1(2)MS001A-D	MAIN STEAM ISOLATION	Note 1	N	N	N
1(2)RH610	RHR PUMP MINIFLOW ISOL	LOW	Y	Y	N
1(2)RH611	RHR PUMP MINIFLOW ISOL	LOW	Y	Y	N
1(2)RH8701A	RHR PUMP FROM RCS SUCTION ISOL	MEDIUM	Y	Y	N
1(2)RH8701B	RHR PUMP FROM RCS SUCTION ISOL	MEDIUM	Y	Y	N
1(2)RH8702A	RHR PUMP FROM RCS SUCTION ISOL	MEDIUM	Y	Y	N
1(2)RH8702B	RHR PUMP FROM RCS SUCTION ISOL	MEDIUM	Y	Y	N
1(2)RH8716A/B	RHR HEADER CROSSTIE ISOL	MEDIUM	Y	Y	Y
1(2)RY8000A/B	PRESSURIZER PORV ISOLATION	HIGH	Y	Y	Y
1(2)SI8801A/B	CV PUMP TO COLD LEG ISOLATION	HIGH	Y	Y	Y
1(2)SI8802A/B	SI PUMP TO HOT LEG ISOLATION	MEDIUM	Y	Y	Y
1(2)SI8804B	RHR HX TO SI PUMP SUCTION ISOL	HIGH	N	Y	N
1(2)SI8806	SI PUMP RWST SUCTION ISOL	LOW	N	N	N
1(2)SI8807A/B	CV PUMP TO SI PUMP CROSSTIE ISOL	LOW	N	N	N
1(2)SI8809A/B	RHR TO RCS COLD LEGS ISOLATION	MEDIUM	Y	N	N
1(2)SI8811A/B	CONTAINMENT SUMP SUCTION	HIGH	N	Y	Y
1(2)SI8812A/B	RHR TO RWST SUCTION ISOLATION	MEDIUM	N	Y	Y
1(2)SI8821A/B	SI PUMP CROSSTIE HEADER ISOL	LOW	Y	N	N
1(2)SI8835	SI PUMP TO COLD LEG HEADER ISOL	LOW	Y	N	N
1(2)SI8840	RHR PUMP TO HOT LEG HEADER ISOL	LOW	Y	Y	Y
1(2)SI8923A/B	SI PUMP SUCTION ISOLATION	LO-LO	N	N	N
1(2)SI8924	CV PUMP TO SI PUMP CROSSTIE	LO-LO	N	N	N
0SX063A/B (Bwd)	MCR CHILLER SX INLET ISOLATION	Note 1	N	N	N
1(2)SX173	AFW PUMP SX INLET ISOLATION	Note 1	N	N	N
1(2)SX178	AFW PUMP SX OUTLET ISOLATION	Note 1	Y	N	N
1(2)WO006A/B	RCFC CHILL WATER CONT ISOL	LOW	N	N	N
1(2)WO020A/B	RCFC CHILL WATER CONT ISOL	LOW	N	N	N
1(2)WO056A/B	RCFC CHILL WATER CONT ISOL	LOW	N	Y	N

Note 1 - PRA not ranked with GL 89-10 valves

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ATTACHMENT C

Potentially Susceptible Valve Evaluation Summary

1(2)CC9412A & B, Component Cooling Water from Residual Heat Removal (RHR) Heat Exchanger Isolation

These valves are normally closed and are manually opened from the Control Room during shutdown cooling operations and during establishment of post Loss of Coolant Accident (LOCA) cold leg recirculation alignment. These valves were evaluated as potentially susceptible to thermal binding after being closed subsequent to RHR shutdown cooling operations.

Resolution: The differential temperature experienced by these valves after cooling is approximately 45°F. This relatively low temperature differential is not expected to cause thermal binding in accordance with ComEd testing and industry data. These are flex wedge gate valves which are less susceptible to this phenomenon. No failures indicative of thermal binding have occurred.

1(2)CC9413A & B, Component Cooling Water to RCP Isolation
1(2)CC9414A & B, Component Cooling Water from RCP Isolation

These valves are in the Component Cooling Water supply to and return from the Reactor Coolant Pumps. The valves close automatically on a containment isolation signal. Component Cooling Water temperatures could be elevated prior to closure, and thus, the valves were evaluated as being potentially susceptible to thermal binding.

Resolution: The differential temperature experienced by these valves after cooling is approximately 45°F. This relatively low temperature differential is not expected to cause thermal binding in accordance with ComEd testing and industry data. These are flex wedge gate valves which are less susceptible to this phenomenon. No failures indicative of thermal binding have occurred.

1(2)CC9416, Component Cooling Water from RCP Isolation
1(2)CC9438, Component Cooling Water from RCP Thermal Barrier

These valves are in the Component Cooling Water return from the Reactor Coolant Pumps. The valves are normally open and close automatically on a containment isolation signal. Component Cooling Water temperatures could be elevated prior to closure, and thus, the valves were evaluated as being potentially susceptible to thermal binding. These valve are located in containment and may experience elevated temperature during accident conditions. Therefore, these valves were evaluated as being potentially susceptible to pressure locking.

Resolution: The differential temperature experienced by these valves after cooling is approximately 45°F. This relatively low temperature differential is not expected to cause thermal binding in accordance with ComEd testing and industry data. These are flex wedge gate valves which are less susceptible to this phenomenon. These valves are not required to be reopened for any design basis safety function. Therefore, pressure locking is not a safety concern. No failures indicative of pressure locking or thermal binding have occurred.

1(2)CC685, Component Cooling Water RCP Thermal Barrier Isolation

These valves are normally open and automatically close on a containment isolation or high flow signal due to a thermal barrier leak. Component cooling water temperatures could be elevated prior to closure due to normal system temperatures and/or a thermal barrier leak. The valves were evaluated as being potentially susceptible to thermal binding.

Resolution: The differential temperature experienced by these valves after cooling is approximately 45°F. A thermal barrier leak would require the valve to remain closed. This relatively low temperature differential is not expected to cause thermal binding in accordance with ComEd testing and industry data. These are flex wedge gate valves which are less susceptible to this phenomenon. No failures indicative of thermal binding have occurred.

1(2)CS007A & B, Containment Spray Pump Discharge Isolation

These valves are normally closed and open automatically on a containment spray actuation. The valves were evaluated as being potentially susceptible to pressure locking during surveillance testing of the containment spray pump when high pressure fluid from the discharge of the containment spray pump pressure could remain trapped in the bonnet after pump shutdown. Pressure decay may not occur prior to declaring the train operable.

Resolution: An operability assessment has been completed for these valves which concludes that the valves remain operable. Procedure changes have been initiated to ensure these valves are stroked subsequent to operation of the pump on recirculation back to the Refueling Water Storage Tank (RWST). This will ensure that the valves will not be returned to service prior to the pressure being relieved from the valve.

1(2)CS009A & B, Containment Spray Pump Sump Suction

These valves are normally closed and are manually opened from the Control Room during transfer from the injection to cold leg recirculation phase of Emergency Core Cooling (ECCS). The valves are potentially susceptible to pressure locking due to heating from connected RHR piping during shutdown cooling operations and sump suction piping during transfer to cold leg recirculation phase of ECCS prior to being opened.

Resolution: Temperature monitoring during RHR operation confirmed that heating of these valves due to connected piping does not occur. Because of the location of these valves, heat transfer from the recirculated water would have to occur through approximately nine feet of piping prior to heating these valves. If containment spray were required, the valve realignment sequence would open these valves shortly (<30 minutes) after opening of the recirculation sump valves. There would be insufficient time to cause heating of the bonnet fluid and, therefore, pressure locking is not expected to occur.

1(2)CV112B & C, Charging Pump Suction from VCT Isolation

These valves are normally open and automatically close on a safety injection, flux doubling or Volume Control Tank (VCT) low level signal. Higher than ambient temperature water would be flowing through this valve prior to closure. As such, these valves were evaluated as being susceptible to thermal binding.

Resolution: The temperature change after closing and cooling of these valves is not expected to be greater than 40°F. This temperature differential is not expected to cause thermal binding in accordance with ComEd testing and industry data. These are flex wedge gate valves which are less susceptible to this phenomenon. No failures indicative of thermal binding have occurred.

1(2)CV8105/8106, Charging Pump Discharge Header Isolation

These valves are normally open and automatically close on a safety injection signal. These valves may experience a normal system operating temperature of 90-110°F at the time they are closed. Therefore, they were evaluated as potentially susceptible to thermal binding.

Resolution: The temperature change after closing and cooling of these valves is not expected to be greater than 35°F. This temperature differential is not expected to cause thermal binding in accordance with ComEd testing and industry data. These are flex wedge gate valves which are less susceptible to this phenomenon. No failures indicative of thermal binding have occurred.

1(2)CV8804A, Residual Heat Removal to Charging Pump Suction Isolation

The valves are normally closed and manually opened from the Control Room during the transfer from injection to cold leg recirculation. The valves are in piping connected to RHR pump discharge piping and are susceptible to pressure locking due to potential heating during mode 4 operation when A-train of RHR is being utilized for shutdown cooling. After a mode 4 LOCA, these valves may have to open if transfer to cold leg recirculation is required.

Resolution: Susceptibility during a mode 4 LOCA was determined to be outside the design basis and, therefore, outside the scope of GL 95-07. An operability assessment has been completed for these valves which concludes that the valves remain operable and no operability issue exists. No further actions are required for these valves.

1(2)FW009A-D, Main Feedwater Isolation

These valves are closed until the reactor reaches 20 percent power (during power ascension) at which time they are opened and remain open. The valves are reclosed during power reduction at 20 percent and remain closed. These valves automatically close on a feedwater isolation signal. The valves are susceptible to thermal binding after being closed during power reduction and cool during plant shutdown. They are susceptible to pressure locking prior to being opened when system temperatures are elevated.

Resolution: This valve is subject to the above conditions each time the plant increases or decreases in power. This valve is not required to open for any design basis safety function, therefore, the pressure locking and thermal binding phenomenon is not a safety concern.

1(2)FW039A-D, Feedwater Preheater Bypass

These valves are open until the reactor reaches 20 percent power (during power ascension) and then closed. The valves are reopened at 80 percent power and remain open. During power reduction the valves are closed at 80 percent power and reopened at 20 percent power. The valves are potentially susceptible to thermal binding during closure and reopening at lower system temperatures. The valves are potentially susceptible to pressure locking during power increases when they are closed and reopened at an elevated system temperature.

Resolution: This valve is subject to the above conditions each time the plant increases or decreases in power. This valve is not required to open for any design basis safety function event, therefore, the pressure locking and thermal binding phenomenon is not a safety concern.

1(2)RH610/611, Residual Heat Removal Pump Miniflow Isolation

These valves are normally open and automatically close on an increasing RHR pump flow rate of 1400 gpm. During RHR System Operation, (less than or equal to 350°F) the RHR pump is placed in operation on miniflow and the discharge flow is slowly increased. During this operation, the valves may be heated to a temperature of ≤350°F and then closed as flow is increased through the system. 1(2)RH610/611 cool as system temperature is lowered to shutdown conditions, or from ambient air, as RHR flow is directed to the RCS. During decreasing system flow, the miniflow valve would be required to open. Pressure locking could occur due to heat transfer through the water in the piping when the 1(2)RH610/611 valve is closed and the system temperature is increased.

Resolution: The 1(2)RH610/611 valves are normally open to provide a miniflow path for the RHR pumps. During startup of an RHR pump, these valves would remain open until sufficient injection or shutdown cooling flow was achieved. After closure of these valves on increasing flow, opening of the valves would not be required until system flows are decreased. If thermal binding or pressure locking were to occur, it would be identified during system flow decrease from the RHR pump, when RHR is no longer required for operations. In this situation, the applicable RHR pump could continue to be operated safely in the injection or shutdown cooling mode with increased flow, or shut down, until the miniflow valve could be manually opened locally via the handwheel. The thermal overloads are sized to prevent damage to the motor under a stall condition. Therefore, thermal binding and pressure locking of this valve is not a safety concern. In 1987, a failure to open occurred while securing the RHR system at Braidwood which was attributed to thermal binding. No failures have occurred since that date which are indicative of PL/TB. This is believed to be due to proper valve setup via VOTES testing.

1(2)RH8701/8702A & B, Residual Heat Removal from Reactor Coolant System (RCS) Suction Isolation

These valves are closed during normal plant operation and opened in mode 4 for shutdown cooling operations. These valves are located in containment and may experience elevated temperature during normal, shutdown cooling, and accident conditions. They are also subject to rapid depressurization as would occur in a LOCA.

Resolution: The temperature differential experienced by these valves is not expected to be greater than 250°F. This temperature differential is not expected to cause thermal binding based on ComEd testing. Thermal binding tests conducted by ComEd, although on a slightly smaller valve and lower pressure class, indicated a binding effect which is less than 30 percent of the excess motor gearing capability of these valves. The outboard isolation valves would be opened at the same or lower system temperature then which they were closed and, as such, pressure locking would not be a concern. The inboard valves could be closed at a lower system temperature than when they are opened. This is not a concern due to RCS communication with the bonnet at RCS pressures. The valves are not required to open under adverse containment temperatures or under a LOCA (sudden depressurization). These valves are not required to open to mitigate any design basis accident. No occurrences of pressure locking or thermal binding have occurred.

1(2)RH8716A & B, Residual Heat Removal Crosstie Isolation

These valves are normally open and one of the 1(2)RH8716 valves must be closed in mode 4. Under accident conditions the valves are manually closed from the Control Room during transfer from the injection to cold leg recirculation phase of ECCS. The 1(2)RH8716A valve is required to reopen for hot leg recirculation. During the hot leg recirculation phase of ECCS the valves are subject to elevated system temperatures prior to being closed for the transfer back to cold leg recirculation. The 1(2)RH8716A would be required to reopen during transfer back to hot leg recirculation and thus would be potentially susceptible to thermal binding. During the recirculation phase, these valves would be susceptible to thermally induced pressure locking due to elevated system temperatures from connected piping. This situation can also occur during mode 4, when RHR is being used for shutdown cooling operations.

Resolution: The temperature change after closing and cooling of these valves during the transfer from cold to hot leg recirculation is not expected to be greater than 112°F. This temperature differential is not expected to cause thermal binding in accordance with ComEd testing. These are flex wedge gate valves which are less susceptible to this phenomenon. The 1(2)RH8716B valve was evaluated and determined not to be susceptible to thermally induced pressure locking due to the length of piping between the heat source and the valve. An operability assessment has been completed for these valves which concludes that the valves remain operable and no operability issue exists. Corrective actions will be performed in accordance with this operability assessment. Susceptibility during a mode 4 LOCA was determined to be outside the design basis and, therefore, outside the scope of GL 95-07.

1(2)RY8000A & B, Pressurizer PORV Isolation

These valves are normally open, however, both may be closed to isolate a leaking Pressurizer Power Operated Relief Valve (PORV) during normal plant operation in accordance with the Technical Specifications. One of the two isolation valves may be required to reopen, in accordance with the Emergency Operating Procedures (EOPs). These valves would potentially be required to open at a lower RCS pressure and temperature and as such are potentially susceptible to pressure locking and thermal binding.

Resolution: If the 1(2)RY8000A/B valves are closed to isolate a leaking PORV the piping configuration is such that very little cooling of the valve body would take place. The valves are located less than 5 feet from a vertical section of pressurizer piping containing steam. Under the above scenario, the PORV isolation valve would be required to be opened within approximately 1 hour from the initiating event, which would initiate cooling and depressurization of the RCS and these valves. Within this time period the 1(2)RY8000A/B valve is not expected to cool such that thermal binding would be a concern. These valves are normally opened after plant cooldown, however, thermal binding is not a safety concern in this mode. Calculation BRW 95-111 demonstrates that these valves have adequate margin to overcome pressure locking effects during the depressurization scenario above. An operability assessment has been completed for these valves which concludes that the valves remain operable and no operability issue exists.

1(2)SI8801A & B, Charging Pump to RCS Cold Legs Isolation

These valves are normally closed and automatically open on a safety injection signal. These valves remain open during the injection, cold leg recirculation and hot leg recirculation phases of ECCS. The valves would be subject to elevated system temperatures prior to being closed for system realignment. The potential for thermal binding would occur during reopening of these valves. The valves are subject to Charging pump pressure during normal plant operation and a pump shutdown as could occur in a Loss of Off-site Power would create the possibility for pressure locking.

Resolution: The relatively low system temperature differential (<112°F) which would be experienced by these valves is not expected to cause thermal binding in accordance with ComEd testing. Reclosing and opening this valve subsequent to the recirculation phase of ECCS is not required. If a Loss of Off-site power were to occur coincident with a safety injection signal the valves and the charging pumps would lose power. Upon startup of the Diesel Generators and closing of the output breaker the charging pump and the SI8801 valves would be powered at essentially the same time. Therefore, as the valve starts to open the pump will come up to speed and the pump discharge pressure would eliminate the pressure locking concern for this valve. An operability assessment has been completed for these valves which concludes that the valves remain operable and no operability issue exists.

1(2)SI8802A & B, Safety Injection Pump to RCS Hot Leg Isolation

These valves are normally closed and are manually opened from the Control Room during the transfer from the cold leg to hot leg recirculation phase of ECCS. During the hot leg recirculation phase of ECCS the valves are subject to elevated system temperatures prior to being closed for the transfer back to cold leg recirculation. The valves would be required to reopen during transfer back to hot leg recirculation and thus would be potentially susceptible to thermal binding. These valves are also subject to bonnet pressurization from RCS check valve leakage during normal operation after which a sudden RCS depressurization (LOCA) would create the potential for pressure locking. They are also subject to bonnet pressurization due to pump discharge pressure during surveillance and accident operations.

Resolution: The relatively low system temperature differential (<112°F) which would be experienced by these valves is not expected to cause thermal binding. Hot leg recirculation is not initiated until 8.5 hours after a LOCA. As specified in calculation BRW 96-015 this time period exceeds that required to depressurize the valve bonnet based on ComEd testing of a similar pressure class and size valve. Calculation BRW 96-015 also demonstrates that these valves have margin to overcome pressure locking effects for the scenarios in which Safety Injection pump discharge pressure causes a pressure locking concern. Based on this information, pressure locking is not expected to occur. An operability assessment has been completed for these valves, which concludes that the valves remain operable and no operability issue exists.

1(2)SI8804B, Residual Heat Removal Pump to SI Pump Suction Isolation

The valves are normally closed and manually opened from the Control Room during the transfer from injection to cold leg recirculation. The valves are in piping connected to RHR pump discharge piping and are potentially susceptible to pressure locking due to heating during mode 4 operation when B-train of RHR is being utilized for shutdown cooling and during the transfer to the cold leg recirculation phase of ECCS after a LOCA.

Resolution: These valves are located approximately 70 pipe diameters away from connected RHR discharge piping. Heat transfer through this length of piping is not likely and, therefore, pressure locking is not expected to occur.

1(2)SI8809A & B, Residual Heat Removal Pump to RCS Hot Leg Isolation

These valves are normally open and are manually closed from the Control Room during transfer from the cold leg to hot leg recirculation phase of ECCS. These valves are subject to elevated system temperatures during the recirculation phase prior to being closed. The valves would be subject to thermal binding during transfer back to cold leg recirculation.

Resolution: The temperature change after closing and cooling of these valves during the transfer from cold to hot leg recirculation is not expected to be greater than 112°F. This temperature differential is not expected to cause thermal binding in accordance with ComEd testing. These are flex wedge gate valves which are less susceptible to this phenomenon.

1(2)SI8811A & B, Containment Sump Suction Isolation

These valves are normally closed and automatically open on a RWST low-low level coincident with a safety injection signal. They are subject to thermally induced pressure locking during a LOCA when high temperature water enters the sump and during mode 4 when RHR is being used for shutdown cooling. They are also subject to bonnet pressurization during shutdown cooling operations if a sudden depressurization were to occur as with a LOCA.

Resolution: Calculation BRW 96-021 demonstrates that these valves have adequate margin to overcome pressure locking effects during each of the scenarios in which these valves are susceptible to this phenomenon. An operability assessment has been completed for these valves which concludes that the valves remain operable and no operability issue exists. To restore design margin a design change has been initiated for these valves with installation scheduled for Braidwood during refueling outages A1R06(1997)/A2R05(1996) and for Byron during B1R07(1996)/B2R06(1996).

1(2)SI8812A & B, Residual Heat Removal to RWST Suction Isolation

The valves are normally open and are manually closed from the Control Room during transfer from the injection to cold leg recirculation phase of ECCS. This valve is closed on the RHR train in shutdown cooling in mode 4. In accordance with Technical Specification 3.5.3 in mode 4 the valve in the operable train of RHR is required to be capable of being manually opened such that the RHR pump can take suction from the RWST. In mode 4 when the RHR train is being used for shutdown cooling (350°F) the 1(2)SI8812A/B valves are subject to elevated temperatures from the connected RHR suction piping.

Resolution: Susceptibility during a mode 4 LOCA was determined to be outside the design basis and, therefore, outside the scope of GL 95-07. An operability assessment has been completed for these valves, which concludes that the valves remain operable and no operability issue exists. Corrective actions will be performed in accordance with this operability assessment.

1(2)SI8821A & B, Safety Injection Pump Crosstie Isolation

The valves are normally open and are manually closed from the Control Room during transfer from cold leg to hot leg recirculation phase of ECCS. The valves are subject to elevated system temperatures during the recirculation phase prior to being closed. The valves would be required to reopen during transfer back to cold leg recirculation at a lower system temperature and as such would be potentially susceptible to thermal binding.

Resolution: The temperature change after closing and cooling of these valves during the transfer from cold to hot leg recirculation is not expected to be greater than 112°F. This temperature differential is not expected to cause thermal binding in accordance with ComEd testing. These are flex wedge gate valves which are less susceptible to this phenomenon.

1(2)SI8835, Safety Injection Pump to RCS Cold Legs Isolation

These valves are normally open and are closed during the transfer from cold leg to hot leg recirculation. The valves are subject to elevated system temperatures during the recirculation phase prior to being closed. The valves would be required to reopen during transfer back to cold leg recirculation at a lower system temperature and as such would be potentially susceptible to thermal binding.

Resolution: The temperature change after closing and cooling of these valves is not expected to be greater than 112°F. This temperature differential is not expected to cause thermal binding in accordance with ComEd testing. These are flex wedge gate valves which are less susceptible to this phenomenon.

1(2)SI8840, Residual Heat Removal to RCS Hot Legs Isolation

These valves are normally closed and are opened during transfer from cold leg to hot leg recirculation phase of ECCS. During the hot leg recirculation phase of ECCS the valves are subject to elevated system temperatures prior to being closed for cold leg recirculation. The valves would be required to reopen during transfer back to hot leg recirculation and thus would be potentially susceptible to thermal binding. These valves are also subject to bonnet pressurization from RCS check valve leakage during normal operation after which a sudden RCS depressurization (LOCA) would create the potential for pressure locking.

Resolution: The relatively low system temperature differential (<112°F) which would be experienced by these valves is not expected to cause thermal binding. Hot leg recirculation is not initiated until 8.5 hours after a LOCA. Based on ComEd testing, this time period exceeds that required to depressurize the valve bonnet. Based on this information, pressure locking is not expected to occur. An operability assessment has been completed for these valves, which concludes that the valves remain operable and no operability issue exists.

1(2)SX178, AFW Pump Essential Service Water Outlet Isolation

These valves are normally closed and automatically open during starting of the auxiliary feedwater pump for cooling. The water flowing through this valve is at a higher than ambient temperature due to being heated by equipment. This valve is closed after shutdown of the pump and, therefore, was evaluated as being potentially susceptible to thermal binding.

Resolution: The temperature change after closing and cooling of these valves is not expected to be greater than 50°F. This temperature differential is not expected to cause thermal binding based on ComEd testing and industry data. No failures indicative of thermal binding have occurred.

1(2)WO056A & B, Reactor Containment Fan Cooler Chilled Water Containment Isolation

These valves are in the Chilled Water return from the Reactor Containment Fan Coolers. The valves close automatically on a containment isolation signal. These valve are located in containment and may experience elevated temperatures during accident conditions. Therefore, these valves were evaluated as being potentially susceptible to pressure locking.

Resolution: These valves are not required to be opened for any design basis safety function. Therefore, pressure locking is not a safety concern.

General Comments

ComEd testing referred to in the preceding discussion included pressure locking and thermal binding tests performed on the following:

1. A 4 inch Westinghouse flex wedge gate valve tested in accordance with test procedure dated 09/12/95 Revision 0, Westinghouse Valve Pressure Locking Special Test Procedure.

2. A 10 inch Borg Warner flex wedge gate valve tested in accordance with test procedure PL/TB-2 dated 11/28/95 Revision 0, Pressure Locking Special test Procedure.

Industry data refers to Westinghouse letter dated 12/06/95 (ESBU/WOG-95-387), regarding generic screening criteria developed as part of the WOG program to address pressure locking and thermal binding.

Temperature monitoring referred to in the preceding discussion was performed in accordance with a special procedure, review dated 02/17/95, Temperature Gathering Procedure for Determining Bonnet Heatup During Mode 4 Operations for Valves CS009, RH8716 and SI8812.

The operability assessment referred to in the preceding discussion was documented in Braidwood PIF# 45620195022600 and Byron PIF# 454200950003.

ATTACHMENT B

ZION STATION
180-DAY RESPONSE TO GL 95-07

Introduction

During original design, conditions where motor operated valves (MOV) may be required to open against excessive pressures were considered. As a result, the design of certain MOVs included pressure equalization lines with manual isolation valves. Procedural reviews to assure that the equalization line isolation valves remain in the open position during normal system lineup have been completed. The following 25 valves are equipped with this feature installed, preventing pressure locking from occurring:

1(2)MOV-SI8804A and B	1(2)MOV-RH8700A and B
1(2)MOV-SI8811A and B	1(2)MOV-RH8701 and 02
1(2)MOV-SI8812B	1(2)MOV-RH8716A, B, and C
1MOV-SI8812A	

Screening Process

An expert panel comprised of individuals from Modification Design Engineering (MDE), Site Support Engineering (SSE), and Operations convened in August of 1994 to determine which MOVs are potentially susceptible to pressure locking and/or thermal binding. These results have been reconciled with the reviews conducted at Byron and Braidwood Stations for consistency. As a result of this reconciliation process, some valves were added to the list developed during the initial screening of consideration for potential susceptibility and additional evaluation was conducted for others. The 90 day screening evaluation further changed the original list of potentially susceptible valves resulting in the following list:

Valve	Press. Lock	Therm. Bind.	PRA Group
1(2)CC9412A, B	Yes	Yes	High
1(2)CS0003, 05, 07	Yes	No	Low Low
1(2)CS0049, 50	Yes	No	Medium
1(2)FW0016, 17, 18, 19	Yes	Yes	Medium
1(2)MS0005, 06, 11	Yes	Yes	Low
1(2)RC8000A, B	Yes	Yes	High
1(2)SI8803A, B	Yes	No	High
1(2)SI8809A, B	No	Yes	Medium
1(2)SI9011A, B	Yes	No	Medium
2SI8812A	Yes	No	Low Low
1(2)CC9438	Yes	No	Low
1(2)RH9000	Yes	No	Low

The screening criteria applied to MOVs consisted of the following questions:

Part A (thermal binding):

1a) Is the required safety function of the valve to open from the full closed position under normal or accident conditions?

1b) Even though the safety function of the valve is in the closed position, do the Emergency Operating Procedures require the valve to be reopened from the closed position?

1c) Can the valve be closed for maintenance or operational reasons and reopened during normal unit operation?

2) Is the valve placed in the full closed position with temperatures above normal room

temperature?

3) Is the valve disc a wedge design (solid, split, flexible)?

Part B (pressure locking):

1a) Is the required safety function of the valve to open from the full closed position under normal or accident conditions?

1b) Even though the safety function of the valve is in the closed position, do the Emergency Operating Procedures require the valve to be reopened from the closed position?

1c) Can the valve be closed for maintenance or operational reasons and reopened during normal unit operation?

2) Is the valve susceptible to allowing fluid to enter the bonnet cavity including the area between the disc halves during valve cycling or due to differential pressure across the valve seats in the closed position?

3) Is the valve bonnet cavity susceptible to a higher differential pressure than both valve seats under normal or accident conditions due to temperature increases or instantaneous system pressure drops in the upstream and/or downstream piping?

If the answers to any part of question one and the remaining questions in Part A were yes, then the valve was considered potentially susceptible to thermal binding and identified as requiring additional evaluation. If the answers to any part of question one and the remaining questions in Part B were yes, then the valves were considered potentially susceptible to pressure locking. The screening applied to other power-operated valves was similar.

In the Zion Station 90 day response, the failure history for each valve was reviewed to determine if failures have taken place which are indicative of valve pressure locking or thermal binding. This survey used a failure database which was initiated in 1989. The database was established as part of the Generic Letter 89-10 MOV program to track failures. This review did not indicate any instances of pressure locking or thermal binding.

The following sections describe the previously listed valves which may be susceptible to pressure locking or thermal binding. Listed with the valves are the Generic Letter 89-10 PRA rankings to show relative safety significance for the valves and descriptions of the conditions under which the subject phenomenon may occur. The summary of this document describes which valves are to be considered for design changes or other corrective actions to prevent pressure locking and/or thermal binding.

Valve Specific Discussions

A.	**Valve Designation:**	**1(2)CC9412A, B**
	Valve Description:	**Residual Heat Removal Heat Exchanger Component Cooling Outlet Isolation**
	PRA Rank:	**HIGH**

For these valves, heating of bonnet fluid could occur if Residual Heat Removal (RHR) is not isolated through the RHR heat exchanger when the valve is closed. Rapid pressure drop which would be significant enough to cause pressure locking is not credible in the Component Cooling (CC) system. The scenario developed by the expert panel hinges on the inability to isolate the RHR side of the heat exchanger, and fluid in the valve bonnet expanding due to the "boiler effect" potentially resulting in thermally induced pressure locking or thermal binding.

On a safety injection (SI) signal, the RHR pumps would operate at minimum flow and could potentially heat up the CC side of the RHR heat exchanger until, the RHR pumps are stopped, the CC9412A & B valves are opened or Reactor Water Storage Tank (RWST) water is pumped through the system. For this type of scenario, calculation 22S-B-005M-044 shows that the largest contributor to the potential temperature rise experienced by these CC valves is the initial temperature gradient between the RHR and CC sides of the RHR heat exchanger. This calculation includes RHR pump heat and heat transfer was modeled for 30 minutes after which time it is assumed that operators would mitigate the situation. It further concludes that due to the length of pipe between the valves and the heat exchanger, the CC9412 valves are unlikely to experience the same temperature rise as the CC side of the RHR heat exchanger which was 20 degrees F for an initial 20 degrees F temperature gradient. The CC valve temperature rise is below the level of concern for thermally induced pressure locking.

The normal at power operating position of these valves is closed. The safety function of the valves is to open to provide CC flow to the RHR Heat Exchangers following accidents requiring safety injection and long term recirculation cooling using the RHR Heat Exchangers. For normal operating evolutions such as plant cooldown, the valves are opened prior to RHR being initiated while they are still relatively cool. For plant heat up, the CC9412 valves are closed after RHR decreases in temperature and RHR has been isolated. Therefore, the valves will not be closed hot and allowed to cool during either of these normal operating scenarios. By definition, pressure locking and thermal binding phenomena do not affect valve closure.

The valves are called out in the following Periodic Tests (PT) for RHR system tests (PT-2J-A-ST, PT-2J-A-ST-RT, PT-2J-ST). In all three cases, the CC9412 valves are opened prior to RHR pump start and the RHR pump is stopped prior to closing the valves. Therefore, the valves are not susceptible to the postulated scenario during these tests.

Conclusion: Valve design and application make the MOV potentially susceptible to thermally induced pressure locking. The scenarios described for this MOV are expected to occur under normal operating or accident conditions. However, thermally induced pressure locking and thermal binding is not a safety concern since these valves are opened prior to RHR increasing in temperature. Furthermore, the CC valve temperature rise predicted in Calculation 22S-B-005M-044 is below the level of concern for thermally induced pressure locking. An initial operability assessment has been completed for these valves (#9504437) which concludes that the valves remain operable and no operability issue exists.

B. **Valve Designation:** **1(2)CC9438**
Valve Description: **Reactor Coolant Pump Thermal Barrier Isolation**
PRA Rank: **LOW**

Valve is open during normal operation and is closed due to a thermal barrier tube leak or tube rupture, which would require the valve to remain closed. During normal operation the cooling to the thermal barrier is not isolated until Reactor Coolant System (RCS) temperature is below 150 degrees F. CC temperature is approximately ambient when this evolution occurs. This precludes thermal binding.

Upon receipt of a Phase B containment isolation signal or high-high containment pressure isolation signal, these valves are closed. The valves remain closed until the post-LOCA recovery has been completed and plant start-up is initiated. There is no safety function for the valves to open. Furthermore, the valves are in EQ zone A12 and the expected post-LOCA temperature is only 130 degrees F, so thermal binding is not a concern.

Conclusion: Neither pressure locking nor thermal binding is a credible phenomenon.

C. **Valve Designation:** **1(2)CS0003, 05, 07**
Valve Description: **Containment Spray Pump Header Isolation**
PRA Rank: **LOW LOW**

These valves are normally open which is the safety position. The valves are closed for pump and valve testing or maintenance. This testing procedure requires the Containment Spray train being tested to be declared inoperable. In the restoration portion of the procedure, the valves are opened as part of a system realignment for normal operation. As recommended in the Zion Station 90 day response, a review of test procedures was conducted to identify potential revisions to minimize the possibility of failure due to pressure locking during testing and following maintenance. This review did not indicate any procedure changes are warranted.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking or thermal binding only during testing or maintenance. Pressure locking is credible during testing but is not a safety concern. An initial operability assessment has been completed for these valves (#9504436) which concludes that the valves remain operable and no operability issue exists.

D. **Valve Designation:** **1(2)CS0049, 50**
Valve Description: **RHR to CS Header Isolation**
PRA Rank: **MEDIUM**

During CS actuation, downstream pressure from the CS pump could remain trapped in the valve bonnet after the CS pump is stopped. During transfer to the recirculation mode with RHR spray required this pressure could be greater than the RHR pump pressure such that the valve is double seated. Additionally, pressure locking due to bonnet fluid heat-up is possible with the RHR system recirculating relatively hot fluid (approximately 150 degrees F) from the containment sump during the period that CS0049 and 50 are closed, prior to opening during alignment for RHR spray. Thermally induced pressure locking is unlikely as there will be a differential pressure across the valve when the RHR pump is running.

If the pump is not running, there will be no hot fluid to induce the "boiler effect." Also, one of the MOVs on each unit (CS0050) is far enough from the RHR flowpath that thermally induced pressure locking is not credible.

Calculation 22S-B-006M-051 was completed to determine the system conditions at the time the valve is required to operate. Downstream pressure from the CS pump could remain trapped in the valve bonnet after the CS pump is stopped. Using these system conditions, a thrust calculation was performed which shows that the MOVs (CS0049 & 50) are capable of opening under pressure locking conditions. This thrust calculation accounted for double seating in the differential pressure load but removed some excess conservatism from the nominal case. Although the valves remain operable, it would be prudent to modify these valves in order to mitigate a potential pressure locking condition. A design change to install pressure equalization lines has been approved by the Station's Technical Review Board (TRB) and will be reviewed by the Budget Review Committee (BRC) for inclusion in refueling outages Z1R15 (scheduled to begin in March of 1997) and Z2R15 (scheduled to begin in March of 1998). This design change will mitigate potential pressure locking concerns and allow demonstration of adequate actuator margin with a standard thrust calculation.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking. The scenario described for this MOV is expected to occur under normal operating or accident conditions. An initial operability assessment has been completed for these valves (#9504435) which concluded that the valves remain operable but an operability issue existed until formal calculations could be completed. The calculations listed above were completed to resolve the operability issue.

Action: Design change to be installed during Z1R15 and Z2R15 to mitigate potential pressure locking. (Pending approval by the BRC)

E. Valve Designation: 1(2)FW0016, 17, 18, 19
Valve Description: Feedwater Isolation
PRA Rank: MEDIUM

Safety function of the valve is to close to isolate normal feedwater (FW) supply and to open to initiate feedwater flow. During a normal shutdown, there is sufficient time between closing and reopening these MOVs to allow any pressure trapped in the bonnet to decay. If there is an SI signal, the valves close and are either re-opened with the FW pump running or after sufficient time has passed for pressure to decay prior to re-opening as in the case of unit start up. These MOVs are not susceptible to pressure locking.

These MOVs are susceptible to thermal binding during normal plant operation. They are closed at an elevated temperature when shutting down and opened at low temperature during startup but opening at this time is not a safety function.

Conclusion: Pressure locking is not a credible phenomenon. These MOVs are susceptible to thermal binding during normal plant operation but it is not a safety concern. An initial operability assessment has been completed for these valves (#9504431) which concludes that the valves remain operable and no operability issue exists.

F. Valve Designation: 1(2)MS0005, 06, 11
Valve Description: Auxiliary Feedwater Pump Steam Supply Isolation
PRA Rank: LOW

Valves are normally open which is the safety position. The valves are closed for pump and valve testing or maintenance. This testing procedure requires the Auxiliary Feedwater (AFW) train to be declared inoperable. In the restoration portion of the procedure, the valves are opened as part of a system realignment for normal operation. Valves are closed with faulted steam generator condition and not required to be re-opened in this event. As recommended in the 90 day response, a review of test procedures was conducted to identify potential revisions to minimize the possibility of failure due to pressure locking during testing and following maintenance. This review did not indicate any procedure changes are warranted.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking or thermal binding only during testing or maintenance. Pressure locking is credible but is not a safety concern. Thermal binding is possible during testing and maintenance but is not a safety concern. An initial operability assessment has been completed for these valves (#9504440) which concludes that the valves remain operable and no operability issue exists.

G. Valve Designation: 1(2)RC8000A, B
Valve Description: Pressurizer PORV Block Valve
PRA Rank: HIGH

These valves are normally open but can be closed during normal operation in order to isolate a leaking PORV. If closed, the valve would be required to be reopened in the event of a Steam Generator Tube Rupture (SGTR) if pressurizer spray is not available to depressurize the RCS. The valve is located in close proximity to the pressurizer and has direct exposure to the pressurizer steam space. The bonnet will be steam filled and it is unlikely that upon cooling the steam will condense to the extent that the bonnet will become completely filled with trapped liquid. Additionally, with no means to increase temperature in the valve bonnet, thermally induced pressure locking is not credible. Regarding a SGTR scenario, the valves will be opened as quickly as possible after event initiation prior to a significant valve cooldown. Thus, the valves are not susceptible to pressure locking or thermal binding in this scenario.

Opening the block valve and the PORV immediately following a rapid depressurization of the RCS (such as a Large Break LOCA) is considered to be unnecessary. Emergency procedures direct the operators to open this valve for a natural circulation cooldown following a reactor trip or safety injection. However, in the procedures the valves are not required to be open if they are closed to isolate a leaking PORV.

Regarding thermal binding, the MOV can be closed at RCS operating temperature to isolate a leaking PORV, and reopened during plant cooldown. This is a controlled evolution and years of industry operating experience has not shown problems with thermal binding in this scenario. Aside from the above scenarios, the valves are not required to perform a safety function prior to implementing low temperature overpressurization protection. Furthermore, the valves are required to open prior to implementing low temperature overpressurization protection.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking and thermal binding. The scenarios described for this MOV are expected to occur under normal operating or accident conditions. Pressure locking is not a credible phenomenon for the described scenario. Thermal binding is a credible phenomenon only during plant cooldown however, procedures require the valves to be opened prior to implementing low temperature overpressurization protection. An initial operability assessment has been completed for these valves (#9504441) which concludes that the valves remain operable and no operability issue exists.

H. Valve Designation: 1(2)RH9000
Valve Description: RHR Discharge to Hot Leg Isolation
PRA Rank: LOW

This normally closed deenergized valve provides isolation between the discharge side of the RHR pumps and the RCS hot legs. This flow path is only used for hot leg recirculation.

RCS backleakage during normal operation could allow this valve bonnet to pressurize. However, the flow path contains 2 check valves and a pressure relief valve (1(2)RH8709) set at 600 psig which would limit the RH9000 bonnet pressurization.

Switchover to simultaneous hot and cold recirculation is performed according to procedure ES 1.4. This procedure is entered only from procedure E-1 after a minimum of 12 hours into the event and cold leg recirculation is established. Based on ComEd testing which indicates a depressurization rate of 2 psi/minute is reasonable, there is ample time for the RH9000 bonnet pressure to equalize with the relatively low post LOCA RHR/RCS system pressure. The RHR pumps are not shut down as part of the realignment process which aids in opening the valve. The SI8809A,B valves will be closed during cold leg recirculation and simultaneous hot and cold leg recirculation. Closing SI8809A & B and leaving the RHR pumps running creates a relatively high differential pressure across RH9000. This differential pressure (RHR pump head vs. post LOCA RCS pressure) ensures that the valve is single seated, which is its design condition, and assists the valve in opening.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking. The scenario described for this MOV is expected to occur under accident conditions. Although RH9000 is susceptible to pressure locking caused by rapid depressurization of the RCS early in the LOCA event, there is sufficient time for pressure decay and the valve will not be called upon to open until the pressure locking condition no longer exists. Therefore, no further action is required for this valve with respect to pressure locking. Thermal binding is not a credible phenomenon. An initial operability assessment has been completed for these valves (#9504434) which concludes that the valves remain operable and no operability issue exists.

I. Valve Designation: 1(2)SI8803A, B
Valve Description: High Head SI Header Isolation
PRA Rank: HIGH

Rapid RCS depressurization during a LOCA concurrent with a loss of offsite power (LOOP) could cause valve bonnet pressure to become trapped when the centrifugal charging pumps trip. Bonnet pressure is postulated to equal the discharge pressure of the charging pump for this scenario. This condition could persist until the charging pumps are sequenced onto the emergency diesel generator.

Calculation 22S-B-005M-161 was completed to determine the fluid system conditions at the time the valve is required to operate. Calculation 22S-B-005E-195 was prepared to determine the corresponding MOV motor terminal voltage. Using these system conditions, a thrust calculation was performed which shows that the MOVs are capable of opening under pressure locking conditions. This thrust calculation accounted for double seating in the differential pressure load but removed some excess conservatism from the nominal case. Although the valves remain operable, it would be prudent to modify these valves in order to mitigate a potential pressure locking condition. A design change to install pressure equalization lines has been approved. This design change will mitigate potential pressure locking concerns and allow demonstration of adequate actuator margin with a standard thrust calculation.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking. The scenario described for this MOV is expected to occur under normal operating or accident conditions. An initial operability assessment has been completed for these valves (#9500529) which concluded that the valves remain operable but an operability issue existed until formal calculations and a design change could be completed. The calculations listed above were completed to resolve the interim operability issue. A design change to mitigate pressure locking has been approved. The Unit 1 change has been installed and the Unit 2 change is scheduled for refueling outage Z2R14 (scheduled to begin in September of 1996).

Action: Install a design change during Z2R14 to mitigate potential pressure locking.

J. Valve Designation: 1(2)SI8809A, B
Valve Description: RHR to RCS Cold Leg Isolation
PRA Rank: MEDIUM

The valves are normally open and receive a confirmatory signal on safety injection. The operating conditions for which these valves were identified as susceptible to thermal binding postulates the reactor in the post-LOCA recirculation mode with RHR supplied containment spray required. At least one of these valves is closed when containment sump water is recirculated through RHR to containment spray. With the RHR system recirculating relatively hot (approximately 150 degrees F) fluid from the containment sump, thermal binding due to valve heating could occur during this period. However, the valves are not required to be re-opened in this event.

During testing, the valves either remain open or are closed and then reopened prior to proceeding to the next step. This ensures that at least one train of RHR would be available during these tests.

Conclusion: Thermal binding is a credible phenomenon but is not a safety concern. An initial operability assessment has been completed for these valves (#9504438) which concludes that the valves remain operable and no operability issue exists.

K. Valve Designation: 1(2)SI9011A, B
Valve Description: SI Pump Discharge to RCS Hot Leg
PRA Rank: MEDIUM

The phenomenon which can cause pressure locking of these valves postulates that leaking RCS pressure isolation check valves cause the water in the normally closed valve bonnet to pressurize. A rapid depressurization of the RCS as might occur during a LOCA would cause this water to be trapped in the bonnet. Stopping the SI pumps during the transfer from cold leg to hot leg recirculation could also cause a sudden pressure drop on one side of these valves. .Pressure locking due to bonnet heating could also occur during the period 1(2)SI9011A/B are closed during cold leg recirculation (the source of the heated water) prior to opening during alignment of SI for hot leg recirculation.

Calculation 22S-B-005M-162 was completed to determine the system conditions at the time the valve is required to operate. Using these system conditions, a thrust calculation was performed which shows that the MOVs are capable of opening under pressure locking conditions. This thrust calculation used a doubled valve factor to account for double seating but removed some excess conservatism from the nominal case. Although the valves remain operable, it would be prudent to modify these valves in order to mitigate a potential pressure locking condition. A design change to install a new motor actuator has been approved by the Station's TRB and will be reviewed by the BRC for inclusion in Z1R15 and Z2R15. This design change will mitigate potential pressure locking concerns and allow demonstration of adequate actuator margin with a standard thrust calculation.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking. The scenario described for this MOV is expected to occur under normal operating or accident conditions. Pressure locking is a safety concern. A design change to install pressure equalization lines was approved on 12/21/94 for these valves. However, the scope of the design change was reviewed to address safety analysis issues. An initial operability assessment has been completed for these valves (#9500530) which indicates that the valves will remain operable but an operability issue exists until a motor actuator design change can be implemented at which time the operability issue will be resolved. The calculations listed above were completed to resolve the interim operability issue.

Action: Design change to be installed during Z1R15 and Z2R15 to mitigate potential pressure locking. (Pending approval by the BRC)

L. Valve Designation: **2SI8812A**
Valve Description: **RWST to RHR Pump Suction Isolation**
PRA Rank: **LOW LOW**

This normally deenergized open valve provides the flowpath between the RWST and the RHR pumps during the Emergency Core Cooling System (ECCS) injection phase in conjunction with 2SI8812B. The safety position is open but the valve can be closed during valve testing or maintenance and then re-opened. These valves are not required to be closed in order to go to cold leg recirculation or simultaneous hot and cold leg recirculation. However, the valves would be closed and called upon to open under three different operating scenarios.

1) Normal Cooldown: When the RCS is below 350 degrees F and 400 psig, the RHR system will be placed in service for shutdown cooling. These valves are normally re-energized and closed for shutdown cooling. They will open upon receiving an "S" signal. After the primary system has cooled sufficiently, the valves will be opened to flood the reactor cavity for refueling. No failures indicative of pressure locking or thermal binding have been observed for this common evolution. Based on this, the valves are not considered susceptible to thermally induced pressure locking under this scenario.

2) Loss of RHR Shutdown Cooling: AOP 6.3 provides guidance to the operators on how to react to a loss of RHR shutdown cooling during a normal cooldown. The 2SI8812A valve would be closed for normal cooldown and called upon to be opened in the event of a loss of RHR cooling.

3) Hot Shutdown LOCA with the Accumulators Isolated: AOP 1.6 provides guidance to the operators on how to react to a hot shutdown LOCA with the accumulators isolated during a normal cooldown. Similar to the loss of RHR event, the 2SI8812A valve would be closed for normal cooldown and called upon to be opened in the event of a hot shutdown LOCA with the accumulators isolated.

It is not anticipated that 2SI8812A will experience thermally induced pressure locking even during a loss of RHR shutdown cooling with the RCS at 350 degrees F. The length of pipe between the RHR flowpath and the valve will limit the temperature that the valve experiences. The 2SI8958 check valve will also provide a thermal barrier.

The limiting scenario for a system pressure lock condition would be a hot shutdown LOCA. This would result in a rapid depressurization of the downstream side of 2SI8812A. The prevailing system pressure at the valve would be trapped in the bonnet resulting in a pressure lock condition. The bonnet pressure could be as high as approximately 400 psig which is the maximum allowed RCS hot leg pressure prior to going on RHR shutdown cooling.

ATTACHMENT 1

An initial operability assessment has been completed for this valve (#9504439) which concludes that the valve remains operable and no operability issue exists because the valve does not have a required safety function in mode 4 (hot shutdown). However, the risk of pressure locking during a hot shutdown LOCA can be minimized by requiring the valve to remain open when entering the RHR shutdown cooling mode. The pressure boundary between the RWST and RHR pump suction would be maintained by 2SI8812B which is not susceptible to pressure locking because it is equipped with a bonnet pressure equalization line. A design change to mitigate the potential pressure locking situation has been approved by TRB and will be reviewed by BRC for inclustion in Z2R15.

Conclusion: Valve design and application make the MOV potentially susceptible to pressure locking or thermal binding during testing or maintenance. The valve is also potentially susceptible to pressure locking during a hot shutdown LOCA scenario. Pressure locking is not a safety concern for these scenarios because the valve is either reopened as part of the post-test realignment or there is no required safety function (mode 4).

Action: Design change to be installed during Z2R15 to mitigate pressure locking. (Pending approval by BRC).

ATTACHMENT 1

SUMMARY

Initial operability assessments have been completed for all potentially susceptible valves identified within 90 days of Generic Letter 95-07 to document the basis for operability of these valves. Although some operability issues exist, all the valves reviewed are operable and no Technical Specification actions are required.

Valves SI8803A and B and SI9011A and B are potentially susceptible to pressure locking and design changes have been proposed and approved. For SI 8803A and B, the Unit 1 change has been installed. The Unit 2 change is scheduled for Z2R14. For SI9011A and B, the scope of the design change is being reviewed to address safety analysis issues. The design change will be proposed for Z1R15 and Z2R15. Valves 1(2)CS0049 & 50 are potentially susceptible to pressure locking. Formal calculations to resolve interim operability issues have been completed for all of these valves. A design change to mitigate pressure locking for 1(2)CS0049 & 50 has been scoped for inclusion in Z1R15 and Z2R15. Valve 2SI8812A is potentially susceptible to pressure locking and a design change to mitigate pressure locking has been scoped for inclusion in Z2R15.

Regarding thermal binding, all of the MOVs considered remain capable of performing their intended safety functions. No operability issues exist and no design changes or compensatory actions are required to address thermal binding.

Status Summary

Valve	Status
CC9412A, B	no operability issue - no further action
CC9438	no operability issue - no further action
CS0003, 05, 07	no operability issue - no further action
CS0049 & 50	operability issue - scope design change for Z1R15 and Z2R15
FW0016, 17, 18, 19	no operability issue - no further action
MS0005, 06, 11	no operability issue - no further action
RC8000A, B	no operability issue - no further action
RH9000	no operability issue - no further action
SI8803A, B	operability issue - design change approved (U1: installed, U2: scheduled for Z2R14)
SI8809A, B	no operability issue - no further action
SI9011A, B	operability issue - design change approved (U1 & U2: rescoping for inclusion in Z1R15 and Z2R15)
2SI8812A	no operability issue - scope design change for Z2R15

Proposed design changes must be approved by Zion Station's Technical Review Board and Business Review Committee. The proposed design changes listed above will be implemented pending approval of these organizations. The NRC will be notifed if these planned design changes or schedules are impacted by the design change approval process.

ATTACHMENT 2

Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves Other Than MOVs

Introduction

A search was conducted on the Plant Data and Information System (PDIS) to generate a list of all safety related non-MOV power operated valves for Zion station. Thus, all non-safety related valves have been excluded from consideration. This list of approximately 517 valves was sorted by body type and all valve designs (ball, butterfly, check, globe, angle, 3-way, 4-way, diaphragm) except gate valves have been excluded. For valves which did not have the body type listed in the database, the piping and instrumentation diagrams (P&IDs), vendor drawings and other reference material was reviewed to further eliminate any remaining non-gate valves. Some valves listed in the database had been deleted per a referenced Design Change Request (DCR) and were eliminated from consideration. Information on the remaining valves in the database list was then researched in order to determine if the following general exclusion criteria for pressure locking and thermal binding could be applied in a similar manner as the MOV screening process.

Thermal Binding General Exclusion Criteria:
1) Double-disk or parallel seat designs are not considered susceptible.
2) Systems with operating temperatures comparable to normal ambient temperatures are not considered susceptible.

Pressure Locking General Exclusion Criteria:
1) Valves in systems with a process fluid containing compressible gasses other than steam are not susceptible.
2) Solid wedge designs are not susceptible.

Valve sizes less than or equal to 1.5 inches were eliminated from pressure locking consideration because they are typically a solid wedge design. Also, valves in non-cooling air and nitrogen systems were eliminated from pressure locking consideration. For the remaining valves, an evaluation of the anticipated operating temperatures of each system and application was performed (discussed below) to determine the potential susceptibility to thermal binding.

Discussion by System

(DG) DG Lube Oil (M-530-10):
The following 5 valves are in the DG Lube Oil system (0PRV-DG0039, 1(2)PRV-DG0065, 1(2)PRV-DG0066). These valves have been excluded from being potentially susceptible to pressure locking due to their size (less than 1.5"). Gate valves of this size are typically a solid wedge design which is not susceptible to PL.

When considering thermal binding, a discussion of the expected operating conditions is necessary. The design temperature range of the DG Lube Oil system is 32 degrees F to 180 degrees F. However, the normal operating temperature range for this system is 120 degrees F to 170 degrees F (DG DBD, p5-76). The DG Lube Oil system will only experience a 50 degrees F temperature range during normal operation. A 50 degrees F temperature range is not sufficient to cause thermal binding. Therefore, the DG Lube Oil system valves listed above are not considered susceptible to thermal binding.

ATTACHMENT 2

(SW) Service Water System (M-32, M-34):
The following 8 valves are in the SW system (0SOV-SW1614, 1615, 1629, 1630, 1631, 1632, 1761, 1762) These valves are normally open throttle valves which control the inlet flow to various safety related heat exchangers. These valves have been excluded from being potentially susceptible to pressure locking due to their size (less than 1.5"). Gate valves of this size are typically of the solid wedge design which is not susceptible to pressure locking. The allowed operating temperature of the SW flow through these heat exchanger inlet valves is in the range of 32 degrees F to 80 degrees F. With this operating range, the valves are not susceptible to thermal binding.

(NT) Nitrogen System (M-73):
The following 8 valves are in the Nitrogen System (1(2)PRV-NT0511, 513, 515, 517)). This system is a gaseous non-cooling system and is therefore not considered susceptible to pressure locking. According to Piping Design Table Y1 the maximum piping design temperature is 150 degrees F but the normal system operating temperature is ambient. The maximum suction temperature of the Nitrogen gas compressor is 70 degrees F. The maximum LOCA environmental temperature for EQ zones containing portions of the NT system is typically 115 degrees F. This temperature range is not sufficient to cause thermal binding. Therefore, the NT system valves listed above are not considered susceptible to thermal binding.

(PP) Penetration Pressurization (M-73):
The following 21 valves are in the PP system (0SOV-PP02, 1(2)PRV-PP209, 211, 213, 215, 1(2)PRV-PP0730, 731, 732, 733, 1SOV-PP0802, 803, 1(2)SOV-PP25). This system is a gaseous non-cooling system and is therefore not considered susceptible to pressure locking. The PP system is normally supplied by IA or SA (as a back-up to IA, See System description Vol. VI, CH 33). Both the IA and SA compressors send compressed air to an aftercooler which is designed to return the air to normal ambient temperatures (no more than 40 F above lake temperature) following compression. The maximum compressor outlet temperature is in the range of 120 degrees F to 140 degrees F with normal operation at approximately 100 degrees F. The design temperature of the IA and SA receivers is 150 degrees F. Downstream of the IA compressor is a compressed gas dryer train which has a normal operating temperature of approximately 20 to 25 degrees F above the aftercooler discharge temperature. The normal SA system temperature is 110 degrees F. The minimum temperature of the IA and SA systems is limited by the capability of the SW cooled aftercoolers to remove heat. Based on minimum SW inlet temperature the minimum IA/SA aftercooler temperature would be approximately 70 degrees F. The temperature ranges discussed above are not sufficient to cause thermal binding. Therefore, the PP system valves listed are not susceptible to thermal binding.

(DW) Demineralized Flushing Water (M-69):
The following valve is in the DW system (0PCV-DW0200). This valve has been excluded from being potentially susceptible to pressure locking due to its size (1.5"). Gate valves of this size and smaller are typically of the solid wedge design which is not susceptible to PL. The piping design table (AB) for the potion of the DW system that contains this valve has a design temperature of 150 degrees F. The DW system normally operates at ambient temperatures This temperature range is not sufficient to cause thermal binding. Therefore, the DW system valve listed above is not considered susceptible to thermal binding.

ATTACHMENT 2

Summary
The results of this evaluation indicate that there are no non-MOV power-operated valves that are considered potentially susceptible to pressure locking or thermal binding at Zion Station.

ATTACHMENT C

LASALLE COUNTY STATION 180-DAY RESPONSE TO GL 95-07

ATTACHMENT A

SUSCEPTIBILITY EVALUATION CRITERIA

Thermal Binding/Pressure Locking Conditions

Evaluation Exclusion Criteria:

1. With the exception of gate valves, all of the remaining valve designs have been excluded from the evaluation of thermal binding and pressure locking conditions.

2. All Non-Safety Related gate valves have been excluded with the exception of those non-safety related gate valves in systems maintained as Safety Related.

3. Valves which have a Passive Safety Classification.

4. Valves that only have a safety function to close.

Thermal Binding Exclusion Criteria:

1. Valves that are placed in the full closed position, with the valve at or below normal room temperature.

2. Valves that have double-disc or parallel-seat design.

Part A: Thermal Binding Evaluation

1. Is the required Safety Function of the valve to open from the full closed position under normal or accident conditions: (YES/NO)

2. Is the valve placed in the full closed position with temperatures above normal room temperature? (YES/NO)

3. Is the valve disc a wedge design (solid, split, flexible)? (YES/NO)

NOTE: If the answers to question one, two and three in Part A are yes, the valve should be considered susceptible to thermal binding.

ATTACHMENT A

SUSCEPTIBILITY EVALUATION CRITERIA

Thermal Binding/Pressure Locking Conditions

Pressure Locking Exclusion Criteria:

1. Valves that have been installed in systems with a process media containing compressible gases or fluid/gas mixtures other than steam providing the system is not initially filled with water.

Part B: Pressure Locking

1. Is the required Safety Function of the valve to open from the full closed position under normal or accident conditions? (YES/NO)

2. Is the valve susceptible to allowing fluid to enter the bonnet cavity including the area between the disc halves during valve cycling or due to differential pressure across the valve seats in the closed position? (YES/NO)

NOTE: Steam systems with isolated flow may condense allowing fluid to enter the bonnet cavity depending on the system and valve configuration.

3. Is the valve bonnet cavity susceptible to pressurization greater than system pressure due to temperature increases or instantaneous system pressure drops in the upstream and/or downstream piping? (YES/NO)

NOTE: If the answers to question one, two and three in Part B are yes, the valve should be considered susceptible to pressure locking.

ATTACHMENT A

SCREENING CRITERIA BASIS

1. UFSAR 1.2.4.1 Definitions:

   a. Active Component: A safety related component characterized by an automatically initiated change of state or discernible mechanical action in response to an imposed demand.

   b. Passive Component: A safety related component characterized by no change of state nor mechanical motion.

2. Environmental Qualification List Definitions: (Sargent & Lundy Project Instruction PI-LSNS-44, Rev. 7)

   a. Active Component: Component must perform a mechanical motion or change of state in order to accomplish its safety-related function(s).

   b. Passive Component: Component must retain its structural and pressure integrity but is not required to remain functional (i.e., component is not required to perform a mechanical motion or to change state in order to accomplish its safety function.

ATTACHMENT B

SAFETY RELATED GATE VALVE LIST

EPN	ACTIVE PASSIVE	THERMAL BINDING 1	2	3	PRESSURE LOCKING 1	2	3	**ENVIR ZONE
1(2)B21-F011A/B	P							
1(2)B21-F016	A	N	Y	Y	N	Y	Y	H2A
1(2)B21-F019	A	N	Y	Y	N	Y	Y	H5C
1(2)B21-F065A/B	A	N	Y	Y	N	Y	Y	H5C
1(2)B21-F067A/B/C/D	A	N	Y	N	N	Y	Y	H5C
1(2)B21-F508A/B	P							
1(2)B33-F023A/B	*P	N	Y	Y	N	Y	Y	H2A
1(2)B33-F067A/B	*P	N	Y	N	N	Y	Y	H2A
1(2)CB007	*P	N	Y	Y	N	Y	Y	
1(2)C11D001101	P							
1(2)C11D001102	P							
1(2)C11D001112	P							
0(1,2)DG001	P							
0(1,2)DG003	P							
0(1,2)DG004	P							
0(1,2)DG005	P							
0(1,2)DG007	P							
1(2)DG008	P							
0DG009	P							
1(2)DG011	P							
1(2)DG017	P							
1(2)DG019	P							
1(2)DG023	P							
1(2)DG032	P							
0(1,2)DO009	P							
1(2)DO016	P							
1(2)DG017	P							
1(2)DG019	P							
0DO021	P							
1(2)E12-F003A/B	A	N	N	Y	N	Y	Y	H6
1(2)E12-F004A/B/C	A	N	N	Y	N	Y	Y	H5E
1(2)E12-F006A/B	#A	Y	Y	Y	Y	Y	Y	H6
1(2)E12-F007	P							
1(2)E12-F008	#A	Y	Y	Y	Y	Y	Y	H5B
1(2)E12-F009	#A	Y	Y	Y	Y	Y	Y	H2A
1(2)E12-F011A/B	*P	N	Y	Y	N	Y	Y	H6
1(2)E12-F014A/B	P							
1(2)E12-F016A/B	#A	Y	N	Y	Y	Y	Y	H4A
1(2)E12-F017A/B	#A	Y	N	Y	Y	Y	Y	H4A
1(2)E12-F018A/B/C	P							
1(2)E12-F020	P							
1(2)E12-F026A/B	*P	N	N	Y	N	Y	Y	H6

ATTACHMENT B

SAFETY RELATED GATE VALVE LIST

EPN	ACTIVE PASSIVE	THERMAL BINDING 1	2	3	PRESSURE LOCKING** 1	2	3	ENVIR ZONE
1(2)E12-F027A/B	A	Y	N	Y	Y	Y	Y	H6
1(2)E12-F042A/B/C	A	Y	N	Y	Y	Y	Y	H4A
1(2)E12-F047A/B	A	N	N	Y	N	Y	Y	H6
1(2)E12-F049A/B	A	N	Y	Y	N	Y	Y	H6
1(2)E12-F063A/B/C	P							
1(2)E12-F064A/B/C	A	N	Y	Y	N	Y	Y	H6
1(2)E12-F067	P							
1(2)E12-F068A/B	A	Y	N	Y	Y	Y	Y	H5E
1(2)E12-F071A/B	P							
1(2)E12-F072A/B/C	P							
1(2)E12-F086	P							
1(2)E12-F090A/B	P							
1(2)E12-F092A/B/C	P							
1(2)E12-F093	A	N	N	Y	N	Y	Y	H6
1(2)E12-F094	A	N	N	Y	N	Y	Y	H6
1(2)E12-F098A/B/C	P							
1(2)E12-F302	P							
1(2)E12-F303	P							
1E12-F328B	P							
1(2)E12-F330A/B/C/D	P							
1(2)E12-F332A/B/C/D	P							
1(2)E12-F336A/B	P							
1(2)E12-F341	P							
1(2)E12-F402	P							
2E12-F428A/B	P							
2E12-F429A/B	P							
1(2)E21-F001	A	N	N	Y	N	Y	Y	H5E
1(2)E21-F004	P							
1(2)E21-F005	A	Y	N	Y	Y	Y	Y	H4A
1(2)E21-F008	P							
1(2)E21-F011	A	N	Y	Y	N	Y	Y	H5A
1(2)E21-F051	P							
1(2)E21-F052	P							
1(2)E22-F003	P							
1(2)E22-F004	A	Y	N	N	Y	Y	Y	H4A
1(2)E22-F012	A	Y	Y	N	Y	Y	Y	H6
1(2)E22-F015	A	N	N	N	N	Y	Y	H5E
1(2)E22-F019	P							
1(2)E22-F026	P							
1(2)E22-F031	P							
1(2)E22-F038	P							
1(2)E22-F310	P							

ATTACHMENT B

SAFETY RELATED GATE VALVE LIST

EPN	ACTIVE PASSIVE	THERMAL BINDING 1	2	3	PRESSURE LOCKING 1	2	3	**ENVIR ZONE
1(2)E22-F311	P							
1(2)E22-F312	P							
1(2)E22-F313	P							
1(2)E22-F315	P							
1(2)E22-F316	P							
1(2)E22-F319	P							
1(2)E22-F325	P							
1(2)E32-F001A/E/J/N	A	Y	N	Y	Y	Y	Y	H5C
1(2)E32-F002A/E/J/N	A	Y	N	Y	Y	Y	Y	H5C
1(2)E32-F006	A	Y	N	Y	Y	Y	Y	H5C
1(2)E32-F007	A	Y	N	Y	Y	Y	Y	H5C
1(2)E32-F008	A	Y	N	N	Y	N	Y	H5C
1(2)E32-F009	A	Y	N	N	Y	N	Y	H5C
1(2)E51-F008	A	N	Y	N	N	Y	Y	H5B
1(2)E51-F009	P							
1(2)E51-F010	A	N	N	Y	N	Y	Y	H5A
1(2)E51-F012	P							
1(2)E51-F013	A	Y	N	Y	Y	Y	Y	H4A
1(2)E51-F016	P							
1(2)E51-F031	A	Y	N	Y	Y	Y	Y	H5E
1(2)E51-F059	A	N	N	Y	N	Y	Y	H5A
1(2)E51-F063	A	N	Y	N	N	Y	Y	H2A
1(2)E51-F064	*P	N	Y	Y	N	Y	Y	H5B
1(2)E51-F068	A	N	Y	Y	N	N	Y	H5E
1(2)E51-F356	P							
2E51-F357	P							
1(2)E51-F362	P							
1(2)E51-F363	P							
1(2)FC040A/B	P							
1(2)FC042A/B	P							
1(2)FC045A/B	P							
1(2)FC047A/B	P							
1(2)FC086	P							
1(2)FC115	P							
1(2)FC139A/B	P							
1(2)FC140	P							
1(2)FW013	*P	N	Y	Y	N	Y	Y	
1(2)G33-F001	A	N	Y	N	N	Y	Y	H2A
1(2)G33-F004	A	N	Y	N	N	Y	Y	H5D
1(2)G33-F040	A	N	Y	Y	N	Y	Y	H5C
1(2)G33-F100	P							
1(2)G33-F101	*P	N	Y	Y	N	Y	Y	H2A
1(2)G33-F106	P							
1(2)HG001A/B	A	Y	N	Y	Y	N	Y	H4A

ATTACHMENT B

SAFETY RELATED GATE VALVE LIST

EPN	ACTIVE PASSIVE	THERMAL BINDING 1	2	3	PRESSURE LOCKING 1	2	3	**ENVIR ZONE
1(2)HG003	A	N	N	Y	N	N	Y	H4A
1(2)HG005A/B	A	Y	N	Y	Y	N	Y	H5E
1(2)HG006A/B	A	Y	N	Y	Y	N	Y	H5E
1(2)HG009	A	Y	N	Y	Y	N	Y	H4A
1(2)MC027	P							
1(2)MC033	P							
1(2)SA042	P							
1(2)SA046	P							
0VC025A/B/C/D	P							
1(2)VG008	P							
1(2)VG009	P							
1(2)VG010	P							
1(2)VG011	P							
1(2)VG012	P							
1(2)VG013	P							
1(2)VG014	P							
1(2)VG015	P							
1(2)VP053A/B	A	N	N	Y	N	Y	Y	H4A
1(2)VP063A/B	A	N	N	Y	N	Y	Y	H4A
1(2)WR029	A	N	N	Y	N	Y	Y	H4A
1(2)WR040	A	N	N	Y	N	Y	Y	H4A
1(2)WR179	A	N	N	Y	N	Y	Y	H2A
1(2)WR180	A	N	N	Y	N	Y	Y	H2A

*NOTE: These valves were evaluated as identified by previous reviews for Thermal Binding or Hydraulic Locking and/or SIL 368.

#NOTE: These valves were included due to the primary Emergency Operating Procedures (EOP) functions to open even though they have no safety function to open.

** Environmental zones are as defined in the UFSAR and specific temperatures ranges were extracted from the UFSAR.

Summary of Attachment B Screening
for Hydraulic Locking

The following valves screened as potentially susceptible to hydraulic locking and required further analysis as documented in Attachment C:

1(2)E12-F006 A/B
1(2)E12-F008
1(2)E12-F009
1(2)E12-F016 A/B
1(2)E12-F017 A/B
1(2)E12-F027 A/B
1(2)E12-F068 A/B
1(2)E22-F012
1(2)E32-F001 A/E/J/N
1(2) E32-F002 A/E/J/N
1(2)E32-F003N
1(2)E32-F006
1(2)E32-F007
1(2)E32-F031
1(2)E12-F042 A/B/C
1(2)E21-F005
1(2)E22-F004
1(2)E51-F013

Summary of Attachment B Screening
for Thermal Binding

The following valves screened as potenitally susceptible to thermal binding and required further analysis as documented in Attachment E:

1(2)E12-F006 A/B
1(2)E12-F009
1(2)E12-F008

ATTACHMENT C

HYDRAULIC LOCKING VALVE FINAL REVIEW

1(2)E12-F006A/B

If either valve 1(2)E12-F006A or B does not open the associated loop of shutdown cooling mode of RHR will not function. The shutdown cooling function is described in the UFSAR, however the function is not considered a safety design basis for RHR. The analysis concluded that alternative long term decay heat removal methods provided the safety design. The method of using ADS valves and the ECCS injection path is single failure proof and independent of these valves. Therefore, as stated in the UFSAR, for all design basis accidents decay heat can be removed without RHR shutdown cooling. There is no safety design basis for RHR shutdown cooling.

Valves 1(2)E12-F006A/B are the shutdown cooling suction valves for each RHR loop. The valves are located in the associated RHR pump corner room in EQ zone H6. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance or when securing shutdown cooling and the time the valves use is demanded post accident. The expected lowest cycling temperature would be 65 ^{o}F and the maximum UFSAR accident ambient temperature for the zone would be 148 ^{o}F. There are no high energy lines in the pump rooms. The areas are served by independent safety related ventilation cooling systems. A single event is unlikely to effect both areas ambient temperature significantly. The method for heatup of the area is operation of the RHR pump with high water temperatures (either shutdown cooling or suppression pool cooling). The most limiting case (higher water temperatures) is shutdown cooling. However the 1(2)E12-F006A/B valve is already open when this mode is initiated. Therefore a significant ambient temperature rise would not occur until the valve is already open and pressure locking is not a concern.

ATTACHMENT C

1(2)E12-F008

If Valve 1(2)E12-F008 does not open the entire shutdown cooling mode of RHR will not function. The shutdown cooling function is described in the UFSAR, however the function is not considered a safety design basis for RHR. The UFSAR concluded that alternative long term decay heat removal methods provided the safety design. The method of using ADS valves and the ECCS injection path is single failure proof and independent of these valves. Therefore, as stated in the UFSAR, for all design basis accidents decay heat can be removed without RHR shutdown cooling. There is no safety design basis for RHR shutdown cooling.

Valve 1(2)E12-F008 is the common shutdown cooling suction outboard containment isolation valve. 1(2)E12-F008 valve is located in the reactor building outside the drywell in EQ zone H5. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance or when securing shutdown cooling and the time the valves use is demanded. The expected lowest cycling temperature would be 90 °F and the maximum accident ambient temperature would be 212 °F per the UFSAR. The method of heating this area is a HELB; the RCIC steam line. A break of this RCIC line is limited by automatic redundant isolation valves, therefore limiting the heatup. Operation of this valve to initiate shutdown cooling would however occur after the reactor pressure vessel pressure is reduced and cooled down. This would occur at some later time after the initial external heatup allowing for temperature equalization, reducing the likelihood of pressure locking.

ATTACHMENT C

1(2)E12-F009

If Valve 1(2)E12-F009 does not open the entire shutdown cooling mode of RHR will not function. The shutdown cooling function is described in the UFSAR, however the function is not considered a safety design basis for RHR. The UFSAR concluded that alternative long term decay heat removal methods provided the safety design. The method of using ADS valves and the ECCS injection path is single failure proof and independent of these valves. Therefore, as stated in the UFSAR, for all design basis accidents decay heat can be removed without RHR shutdown cooling. There is no safety design basis for RHR shutdown cooling.

Valve 1(2)E12-F009 is the common shutdown cooling suction inboard containment isolation valve. Valve 1(2)E12-F009 is located in the drywell in EQ zone H2. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance or when securing shutdown cooling and the time the valves use is demanded. Pressure locking may also occur due to rapid RPV depressurization. The expected lowest cycling temperature would be 90 ^{o}F and the maximum accident ambient temperature would be 340 ^{o}F per the UFSAR. The method of heating this area is a LOCA. Operation of this valve to initiate shutdown cooling would however occur after the reactor pressure vessel pressure is reduced and cooled down. This would occur at some later time after the initial external heatup allowing for temperature equalization. The 1(2)E12-F009 valve has been modified with a larger operator.

ATTACHMENT C

1(2)E12-F016A/B and 1(2)E12-F017A/B

If either 1(2)E12-F016A/B or 1(2)E12-F017A/B valve does not open, the drywell spray mode of RHR will not function. The drywell spray function is described in the UFSAR, however no credit is taken for the function (DBA i.e., LOCA, Etc.) in the analysis. The analysis includes both the containment design pressure which will not be exceeded without drywell spray and the offsite doses (10CFR100) which will not be exceeded without the use of drywell spray. The containment leakage pressure (Pa of 39.6 psig) assumes that drywell spray is not used. Therefore, as stated in the UFSAR, the design of the containment will not be exceeded for all design basis accidents. There is no safety design basis for drywell spray.

Valves 1(2)E12-F016A/B and 1(2)E12-F017A/B which are the drywell spray valves are located in the reactor building outside the drywell in EQ zone H4 The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance testing (The only normal use of the valves) and the time the valves use is demanded. The expected lowest cycling temperature would be 65° F and the maximum accident ambient temperature would be 145 °F per UFSAR Table 3.11-6. The method of heating this area is a HELB. The same design conditions exist for both sets of valves, therefore effecting both drywell spray loops. However the valves are physically separated on different sides of the drywell and would actually have different conditions. In any case there would be a delay between a HELB close to one set of valves effecting the second set. The HE lines in the area are the RCIC steam line, CRD insert and withdrawal lines, RPV instrument lines and the RWCU suction line. The closest lines are small (CRD and instrument) and leakage from a failed line is not expected to increase the ambient temperature greatly due to the large air volume in the vicinity of the spray valves.The RCIC and RWCU lines would automatically isolate on a line break limiting the amount of steam leaked into the area. In addition a line break outside the drywell is not credible concurrent with a large LOCA inside the drywell which is the mechanism for the potential need for drywell spray (i.e. containment pressure exceeding the design basis). Therefore pressure locking of these valves when required is not credible.

ATTACHMENT C

1(2)E12-F027A/B

Valve 1(2)E12-F027A/B is the wetwell spray valves for each RHR loop. The wetwell spray function is described in the UFSAR, and with the drywell floor bypass leakage less than the design value of 0.03 ft^2 (A/ÖK) there is no need to use wetwell spray for break sizes greater than 0.4 ft^2. The transient for small breaks proceeds slowly and the operator has time to react. The Tech Spec surveillance limit is 10% of the 0.03 ft^2 (A/ÖK) limit further lengthening the reaction time.The valves are located in the associated RHR heat exchanger room in EQ zone H6. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance and the time the valves use is demanded. The expected lowest cycling temperature would be 65 °F and the maximum accident ambient temperature would be 148 °F per the UFSAR. There are no high energy lines in the heat exchanger room. The method for heatup of the area is operation of the RHR pump with high water temperatures (either shutdown cooling or suppression pool cooling). The only scenario which wetwell spray is required to operate is a small line break inside the drywell which slowly pressurizes the drywell and suppression chamber. In this case the suppression pool temperature will not rise significantly before the operator initiates wetwell spray per the EOPs. In this case the ambient temperature near the 1(2)E12-F027A/B valves will not increase prior to opening the valves and therefore pressure locking is not a concern. The areas are served by independent safety related ventilation cooling systems. A single event is unlikely to effect both areas ambient temperature significantly.

Due to the relative importance of these valves in the station's emergency operating procedures they will be modified to ensure pressure locking can not occur. The modification of these valves has been scheduled to be implemented during L1R08 and L2R08.

ATTACHMENT C

1(2)E12-F068A

If 1(2)E12-F068A valve does not open the A RHR service water containment cooling and shutdown cooling modes of RHR will not function. The containment cooling function is considered a safety design basis for RHR. Valve 1(2)E12-F068A is the A RHR service water heat exchanger outlet valve. The valve is normally closed. Valve 1(2)E12-F0068A is located in the reactor building raceway basement in EQ zone H5. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance or when securing RHR service water and the time the valves use is demanded. The expected lowest cycling temperature would be 50 °F and the maximum accident ambient temperature would be 212 °F per the UFSAR. The method of heating this area is a HELB. The only HE line in the area is the RCIC steam line. A break of this RCIC line is limited by automatic redundant isolation valves. The 1(2)E12-F068A valve is located in the low point of a 20 inch pipe with long pipe runs on both sides. The downstream side pipe goes underground. Any steam in the area will be provided a large heat sink for absorbing the steam leaked into the area. Steam impingement directly on the valve is unlikely. Therefore significant temperature rise of the valve bonnet is not credible.

The existing LaSalle Line break analysis shows that the temperature in this room increases from 104 to 208 F within a few minutes. The line is also isolated within a few minutes. Based on Enginering judgement the room would take about twenty five minutes to drop to 163F and then condensation of the steam in the room would drop the temperature to 120 in another 5 minutes. From this we would judge that the room would go from 104 degrees to 208 and back down to about 120 F within an hour.

Valve E12-F068A would be filled with service water at a temperature of not more than 104 F. Since water transfers heat better than air does, the temperature in the valve bonnet would tend to remain at the 104 F water temperature rather than the transient air temperature. Because of the relatively short time that the room would be at elevated temperatures, the fact that the peak temperature difference in the room would be about 100 F and the fact that the valve bonnet would tend to remain at the water temperature anyway, we do not believe that this valve would experience pressure locking due to the room temperature transient from a HELB outside containment.

Due to the importance of this valve it will be modified to prevent it from being pressure locked. The modification of this valve has been scheduled to be implemented during L1R07 and L2R07.

1(2)E12-F068B

If 1(2)E12-F068B valve does not open the B RHR service water containment cooling and shutdown cooling modes of RHR will not function. The containment cooling function is considered a safety design basis for RHR. Valve 1(2)E12-F068B is the B RHR service water heat exchanger outlet valve. The valve is normally closed. Valve 1(2)E12-F0068B is located in the reactor RHR pump corner room in EQ zone H6. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance or when securing RHR service water and the time the valves use is demanded. The expected lowest cycling temperature would be 50 °F and the maximum accident ambient temperature would be 148 °F per the UFSAR. There are no HE line in the area. The method for heatup of the area is operation of the B RHR pump with high water temperatures (either shutdown cooling or suppression pool cooling). Prior to initiation of either of these modes the RHR service water system is started, opening valve 1(2)E12-F068B. Therefore significant temperature rise of the valve bonnet is not credible prior to the valve being opened.

Due to the importance of this valve it will be modified to prevent it from being pressure locked. The modification of this valve has been scheduled to be implemented during L1R07 and L2R07.

ATTACHMENT C

1(2)E22-F012

Valve 1(2)E22-F012 is the HPCS pump minimum flow valve. The valve is normally closed. Valve 1(2)E22-F012 is located in the reactor building HPCS pump corner room in EQ zone H6. The postulated method of pressure locking is external heating due to ambient temperature increases from the time of valve cycling for surveillance and the time the valve's use is demanded. The expected lowest cycling temperature would be 65 ^{o}F and the maximum accident ambient temperature would be 148 ^{o}F per the UFSAR. There are no HE line in the area. The method for heatup of the area is operation of the HPCS pump with high water temperatures. The valve opens when the HPCS pump starts and the pump flow does not increase above 1000 gpm. This would occur only with high reactor pressures which would indicate that suppression pool temperature has not increased significantly. The valve would also open when the injection valve closed on high RPV level. In this case the safety function of HPCS has been accomplished and the operators are trained to secure ECCS pumps which are on min. flow. Therefore significant temperature rise of the valve bonnet is not credible prior to the valve being opened.

1(2)E32-F001A/E/J/N

The Inboard MSIV-LCS Inboard Inlet Stop Valves are closed during unit operations and are required to open to place MSIV-LC on line. The Inboard MSIV-LCS Inboard Inlet Stop valves were field walked to determine if water could collect in the valves and eventually cause a hydraulic lock. This walkdown determined that there is no possibility that water can condense and collect in the valves. The valves are in a relative high point in the system and any water condensation would drain away from the valves back into the Main Steam Lines.

MSIV-LCS is only used following a LOCA. Per FSAR 15.6.5.5.b, MSIV-LCS is estimated to be required 2 hours after the accident. Additionally, room temperature should be near the normal operating temperature(~ 100·F) or less since a LOCA has occurred in the DW and all high energy systems have been isolated. Steam trapped in the bonnet will condense prior to system demand and these valves will not be susceptible to pressure locking. Chron # 215865 supports this conclusion.

Also, the MSIV-LCS is scheduled to be deleted during the upcoming refuel outages on Unit 1 (Jan. '96) and Unit 2 (Sept. '96).

1(2)E32-F002A/E/J/N

The Inboard MSIV-LCS Outboard Inlet Stop Valves are closed during unit operations and are required to open to place MSIV-LC on line. The Inboard MSIV-LCS Outboard Inlet Stop valves were field walked to determine if water could collect in the valves and eventually cause a hydraulic lock. This walkdown determined that there is no possibility that water can condense and collect in the valves. The Inboard MSIV-LCS Outboard Inlet Stop valves are downstream of the Inboard MSIV-LCS Inboard Inlet Stop valves and therefore water will not condense and fill the valves. The valves are isolated from reactor pressure and even if small leakage did collect in the valves since they don't experience high pressure they can not lock do to a rapid depressurization of the system. Ambient temperature increase will not cause them to lock since the area would cool when these valves are called upon to operate after a MSIV Isolation. Pressure locking of these valves is not a credible event.

MSIV-LCS is only used following a LOCA. Per FSAR 15.6.5.5.b, MSIV-LCS is estimated to be required 2 hours after the accident. Additionally, room temperature should be near the normal operating temperature(~ 100·F) or less since a LOCA has occurred in the DW and all high energy systems have been isolated. Steam trapped in the bonnet will condense prior to system demand and these valves will not be susceptible to pressure locking. Chron # 215865 supports this conclusion. Also, the MSIV-LCS is scheduled to be deleted during the upcoming refuel outages on Unit 1 (Jan. '96) and Unit 2 (Sept. '96).

ATTACHMENT C

1(2)E32-F003N

The Inboard MSIV-LCS Blowdown to the MST Stop Valve is closed during unit operations and is required to open to place MSIV-LC on line. The Inboard MSIV-LCS Blowdown to the MST Stop Valve was field walked to determine if water could collect in the valve and eventually cause a hydraulic lock. This walkdown determined that there is no possibility that water can condense and collect in the valve. The valve is in a relative high point in the system and any water condensation would drain away from the valve back into the Main Steam Lines.

MSIV-LCS is only used following a LOCA. Per FSAR 15.6.5.5.b, MSIV-LCS is estimated to be required 2 hours after the accident. Additionally, room temperature should be near the normal operating temperature(~ 100·F) or less since a LOCA has occurred in the DW and all high energy systems have been isolated. Steam trapped in the bonnet will condense prior to system demand and these valves will not be susceptible to pressure locking. Chron # 215865 supports this conclusion. Also, the MSIV-LCS is scheduled to be deleted during the upcoming refuel outages on Unit 1 (Jan. '96) and Unit 2 (Sept. '96).

ATTACHMENT C

1(2)E32-F006

The Outboard MSIV-LCS Inboard Inlet Stop Valve is closed during unit operations and is required to open to place MSIV-LC on line. The Outboard MSIV-LCS Inboard Inlet Stop valve is susceptible to having water enter the bonnet cavity based on the Steam Valve Screening performed on the valve.

A calculation (NED-M-MSD-194) was performed to show there was adequate motor gearing capacity (MGC) to open these valves. The MGC to required thrust margin was 70% for the 1E32-F006 and 30% for the 2E32-F006. MSIV-LCS is only used following a LOCA. Per FSAR 15.6.5.5b, MSIV-LCS is estimated to be required 2 hours after the accident. Additionally, room temperature should be near the normal operating temperature (~ 100·F) or less since a LOCA has occurred in the DW and all high energy systems have been isolated. Therefore, any water trapped in the bonnet will not expand due to high area temperature. In fact, the bonnet pressure will be less than the pressure assumed in the calculation because some cooling will have occurred during the 2 hrs. following the LOCA.

In summary, even though the 1(2)E32-F006 is susceptible to pressure locking, this phenomena, will not prevent valve operation. Additionally, the MSIV-LCS will be deleted during the upcoming outages.

ATTACHMENT C

1(2)E32-F007

The Outboard MSIV-LCS Outboard Inlet Stop Valve is closed during unit operations and is required to open to place MSIV-LC on line. The Outboard MSIV-LCS Outboard Inlet Stop valve was field walked to determine if water could collect in the valve and eventually cause a hydraulic lock. This walkdown determined that there is no possibility that water can condense and collect in the valve. The Outboard MSIV-LCS Outboard Inlet Stop valve is downstream of the Outboard MSIV-LCS Inboard Inlet Stop valve and therefore water will not condense and fill the valve. The valve is isolated from reactor pressure and even if small leakage did collect in the valve since it doesn't experience high pressure it can not lock due to a rapid depressurization of the system. Ambient temperature increase will not cause it to lock since the area would cool when the valve is called upon to operate after a MSIV Isolation. Pressure locking of this valve is not a credible event.

MSIV-LCS is only used following a LOCA. Per FSAR 15.6.5.5.b, MSIV-LCS is estimated to be required 2 hours after the accident. Additionally, room temperature should be near the normal operating temperature(~ 100·F) or less since a LOCA has occurred in the DW and all high energy systems have been isolated. Steam trapped in the bonnet will condense prior to system demand and these valves will not be susceptible to pressure locking. Chron # 215865 supports this conclusion. Also, the MSIV-LCS is scheduled to be deleted during the upcoming refuel outages on Unit 1 (Jan. '96) and Unit 2 (Sept. '96).

1(2)E51-F031

Valve 1(2)E51-F031 is the RCIC pump suppression pool suction valve. The valve is normally closed, but opens when the CY tank level becomes low. Valve 1(2)E51-F031 is located in the reactor raceway basement in EQ zone H5. The postulated method of external heating due to ambient temperature increases from the time of valve cycling for surveillance and the time the valve's use is demanded. The expected lowest cycling temperature would be 65 °F and the maximum accident ambient temperature would be 212 °F per the UFSAR. The method of heating this area is a HELB. The only HE line in the area is the RCIC steam line. If the RCIC steam line fails, the RCIC system will not function and therefore this valve is not required to open.

Hydraulic locking of this valve due to normal RCIC operation and heat up of the Suppression Pool is not credible because the piping configuration does not allow the valve to be heated significantly. The RCIC Pool suction piping flows downward away from a potentially hot suppression pool source. Convective heat transfer will not occur under these conditions. This leaves conductive heat transfer as the primary mechanism and the volume of water in the piping system will absorb the heat without significant temperature rise.

Due to the importance of this valve it will be modified to prevent it from being pressure locked. The modification of this valve has been scheduled to be implemented during L1R08 and L2R08.

1(2)E12-F042 A/B/C

The safety function of these valves is to open from the full closed position. All six valves have been modified by drilling small holes in the reactor side disc to prevent hydraulic locking.

1(2)E21-F005

The safety function of this valve is to open from the full closed position. Both Units valves have been modified by drilling small holes in the reactor side disc to prevent hydraulic locking.

1(2)E22-F004

The safety function of this valve is to open from the full closed position. Both Units valves have been modified by drilling small holes in the reactor side disc to prevent hydraulic locking.

1(2)E51-F013

ATTACHMENT C

The safety function of these valves is to open from the full closed position. Both Units valves have been modified by drilling small holes in the reactor side disc to prevent hydraulic locking.

ATTACHMENT D

VALVES SUSCEPTIBLE TO HYDRAULIC LOCKING AND THEIR DISPOSITION

The following safety related gate valves were determined to be susceptible to becoming Hydraulically Locked when required to open to complete their safety function:

1. 1(2)E12-F042A/B/C LPCI Injection Valve

2. 1(2)E21-F005 LPCS Injection Valve

3. 1(2)E22-F004 HPCS Injection Valve

4. 1(2)E51-F013 RCIC Injection Valve

The above mentioned valves have all been modified by drilling holes in the reactor side disc's to prevent the possibility of them becoming Hydraulically Locked.

The following are susceptible to hydraulic lock but will not be modified. An analysis has shown these valves will perform their function if a hydraulic lock occurs. Also, this system is scheduled to be deleted in the L1RO7 (January, 1996) and L2RO7 (September, 1996) refuel outages.

1. 1(2)E32-F006 Outboard MSIV-LCS Inboard Inlet Stop Valve.

The following valves have been determined not to be susceptible to becoming Hydraulically Locked however, they will be modified to prevent the possibility due to their relative safety importance:

1. 1(2)E12-F027A/B Suppression Pool Spray Isolation Valve (L1R08 and L2R08)

2. 1(2)E12-F068A/B RHR HX Service Water Isolation Valve (L1R07 and L2R07)

3. 1(2)E51-F031 RCIC Suppression Pool Suction Isolation Valve (L1R08 and L2R08)

ATTACHMENT E

THERMAL BINDING VALVE FINAL REVIEW

1(2)E12-F006A/B

If either valve 1(2)E12-F006A or B does not open the associated loop of shutdown cooling mode of RHR will not function. The shutdown cooling function is described in the UFSAR, however the function is not considered a safety design basis for RHR. The analysis concluded that alternative long term decay heat removal methods provided the safety design. The method of using ADS valves and the ECCS injection path is single failure proof and independent of these valves. Therefore, as stated in the UFSAR, for all design basis accidents decay heat can be removed without RHR shutdown cooling. There is no safety design basis for RHR shutdown cooling.

The postulated method of thermally binding valves 1(2)E12-F006A/B is internal cooling due to system temperature decreases from the time of valve closure for surveillance testing or when securing shutdown cooling and the time the valves use is demanded. The expected highest closure temperature would be 340°F (if shutdown cooling was secured immediately after startup while in hot shutdown). The system temperature would be approximately 100°F when the 1(2)E12-F006A/B valves were required to be opened. The conditions of the system during startup would not be more severe during accidents than during normal shutdown. 1(2)E12-F006A/B valves could be opened at a temperature significantly below that where they were last closed. This is not the usual method of securing shutdown cooling. Shutdown cooling is usually secured at approximately 150°F. Historically the 1(2)E12-F006A/B valves have not thermally bound even when shutdown cooling was secured from hot shutdown conditions. Access to the reactor building is required to initiate shutdown cooling due to the power being off for valve 1(2)E12-F008. If either valve did thermally bind local actions could be taken to open the valve manually.

ATTACHMENT E

1(2)E12-F009

If valve 1(2)E12-F009 does not open the entire shutdown cooling mode of RHR will not function. The shutdown cooling function is described in the UFSAR, however the function is not considered a safety design basis for RHR. The analysis concluded that alternative long term decay heat removal methods provided the safety design. The method of using ADS valves and the ECCS injection path is single failure proof and independent of these valves. Therefore, as stated in the UFSAR, for all design basis accidents decay heat can be removed without RHR shutdown cooling. There is no safety design basis for RHR shutdown cooling.

The postulated method of thermally binding valve 1(2)E12-F009 is internal cooling due to system temperature decreases from the time of valve closure for surveillance testing or when securing shutdown cooling and the time the valves use is demanded. The expected highest closure temperature would be 340°F (if shutdown cooling was secured immediately after startup while in hot shutdown). The system temperature would be approximately 350°F when the 1(2)E12-F009 valve was required to be opened. The conditions of the system during startup would not be more severe during accidents than during normal shutdown conditions (i.e. RPV water temperature would be the same). The 1(2)E12-F009 valve would not be opened at a temperature significantly below that where they were last closed. This is not the usual method of securing shutdown cooling. Shutdown cooling is usually secured at approximately 150°F. The 1(2)E12-F009 valve has been modified with a larger operator due to previous thermal binding events. This valve is not expected to thermally bind and has not thermally Bound since the new operator was installed.

ATTACHMENT E

1(2)E12-F008

If valve 1(2)E12-F008 does not open the entire shutdown cooling mode of RHR will not function. The shutdown cooling function is described in the UFSAR, however the function is not considered a safety design basis for RHR. The analysis concluded that alternative long term decay heat removal methods provided the safety design. The method of using ADS valves and the ECCS injection path is single failure proof and independent of these valves. Therefore, as stated in the UFSAR, for all design basis accidents decay heat can be removed without RHR shutdown cooling. There is no safety design basis for RHR shutdown cooling.

The postulated method of thermally binding valve 1(2)E12-F008 is internal cooling due to system temperature decreases from the time of valve closure for surveillance testing or when securing shutdown cooling and the time the valves use is demanded. The system temperature would be approximately 100°F when the 1(2)E12-F008 valve was required to be opened. The conditions of the system during startup would not be more severe during accidents than during normal shutdown. The 1(2)E12-F008 valve could be opened at a temperature significantly below that where they were last closed. This is not the usual method of securing shutdown cooling. Shutdown cooling is usually secured at approximately 150°F. Historically the 1(2)E12-F008 has not thermally bound even when shutdown cooling was secured from hot shutdown conditions. Access to the reactor building is required to initiate shutdown cooling due to the power being off for valve 1(2)E12-F008. If the 1(2)E12-F008 valve did thermally bind local actions could be taken to open the valve manually.

ATTACHMENT F

Valves Susceptible To Thermal Binding And Their Disposition

There were no safety related gate valves determined to be susceptible to becoming Thermally Bound when required to open to complete their safety function

ATTACHMENT D

DRESDEN STATION
180-DAY RESPONSE TO GL 95-07

ATTACHMENT 1

DRESDEN STATION 180 DAY RESPONSE TO GENERIC LETTER 95-07
Gate Valves With A Safety Related Function To Open that are Susceptible to Pressure Locking and Thermal Binding

The following safety related valves, that are required to open to perform a safety related function, have been determined to be susceptible to pressure locking and/or thermal binding.

I. PRESSURE LOCKING

1. 2(3)-1402-25A/B: Core Spray Inboard Injection Isolation Valves
2. 2(3)-1501-22A/B: LPCI Inboard Injection Isolation Valves

The scenario that produces pressure locking in the normally closed LPCI and Core Spray injection valves assumes that the downstream injection check valves are not leak tight. As a result, the disk on the reactor side of the ECCS injection isolation valves will be subjected to reactor pressure during power operations. Reactor pressure will deflect this disk allowing the valve bonnet and the area between the disks to pressurize.

If a large break LOCA rapidly depressurizes the reactor, high pressure could be trapped inside the valve exerting an outward force on both valve disks. This pressure locking scenario would increase the force required to open the valve.

ACTIONS TAKEN TO RESOLVE PRESSURE LOCKING

Complete.

In order to eliminate the potential for pressure locking, a 1/4 inch hole was drilled in the disk on the high pressure side of these flex-wedge gate valves (the reactor side). The purpose of this hole is to assure that the pressure in the bonnet and the area between the disks will remain equal to the pressure in the downstream piping. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

3. 2(3)-2301-8: HPCI Injection Isolation Valves

The scenario that produces thermally induced pressure locking in these normally closed HPCI injection isolation valves assumes that the valves reach room temperature during an outage. During the unit start-up the feedwater temperature increases. The feedwater piping conducts heat from the feedwater line, through the HPCI discharge check valve, to the HPCI Injection Isolation valve (2301-8). The increase in temperature of the water, assumed to be trapped in the bonnet, creates pressure locking.

RESOLUTION TO PRESSURE LOCKING ISSUE

The Dresden HPCI injection isolation valves have experience this operating scenario with every unit startup and it has never resulted in pressure locking of the 2301-8 valves. The HPCI injection isolation valves are equipped with 150 ft-lb motors that have considerable thrust capability. A pressure locking calculation was performed showing the actuator is capable of overcoming the additional pressure locking forces with a design margin of 33%.

RECOMMENDED CORRECTIVE ACTIONS

Item 237-104-95-00700 Item 4

In order to eliminate the potential for pressure locking, Dresden Station intends to drill a 1/4 inch hole in the disk on the feedwater side of these flex-wedge gate valves (feedwater side) the next time maintenance is performed on the internals of this valve.

The purpose of this hole is to assure that the pressure in the bonnet and the area between the disks will remain equal to the pressure in the downstream piping eliminating the potential for temperature induced pressure locking. The pressure locking calculations showing the capability of the actuators justifies this schedule.

II. THERMAL BINDING

1. 2(3)-1301-3: Isolation Condenser Condensate Return Outboard Isolation Valve

The scenario that produces thermal binding in these normally closed Isolation Condenser condensate return valves assumes that the configuration of the piping allows the temperature of the valve body to drop below 212 degrees F during normal power operations.

If the Isolation Condenser is initiated, the temperature of the valves will equalize with the condensed steam returning to the reactor. This condensate can be as high as 561 degrees F.

These valves are insulated. After the Isolation Condenser system is returned to the stand-by condition, the temperature of the 1301-3 valve will decrease slowly. A decrease in valve temperature greater than 200 degrees F is assumed to produce thermal binding which increases the force required to open the valve.

RESOLUTION TO THERMAL BINDING ISSUE

The Isolation Condenser is used during reactor isolation events. These events will produce a SCRAM resulting in a termination of power operations. Therefore, under design basis conditions, there would be no need to re-open the 1301-3 valve after the Isolation Condenser system operation. During a unit startup, the Isolation Condenser outboard condensate return valve (1301-3) is opened and the inboard valve is closed (1301-4), therefore, the current procedures assure the valve is not thermally bound prior to power operations.

The only time the reactor remains at power after the Isolation Condenser system operates is during the 5 year Isolation Condenser test. These valves have always cycled during the quarterly surveillance following this test. Therefore, the cool down rate has been shown to be too slow to induce thermal binding.

RECOMMENDED CORRECTIVE ACTIONS

None.

ATTACHMENT 2

DRESDEN STATION 180 DAY RESPONSE TO GENERIC LETTER 95-07
Gate Valves With No Safety Related Function To Open that are Susceptible to Pressure Locking and Thermal Binding

The following safety related valves, that are not required to open to perform a safety related function, have been determined to be susceptible to pressure locking and/or thermal binding.

I. PRESSURE LOCKING

1. 2(3)-0202-4A/B Reactor Recirculation Pump Suction Isolation Valves
2. 2(3)-0202-5A/B Reactor Recirculation Pump Discharge Isolation valves

The scenario that produces pressure locking in these normally open valves assumes that a recirculation pump develops a seal leak that requires these valves to be closed. The pump depressurizes resulting in a high differential pressure across one disk. If a LOCA were to occur during this event, both valves would pressure lock.

RECOMMENDED CORRECTIVE ACTIONS

None.

The recirculation pump discharge valve is required to close during a design basis LOCA. There is no safety related function to open either valve. In the event of a recirculation pump develops a leak that requires these valves to be closed, the unit would be required to shutdown. Under these conditions, there would be no attempt to open these valves during power operations.

In order for pressure locking to occur in gate valves, the valves must be leak tight. These 28" gate valves are not required to be leak tight. Pressure locking is not considered to be a concern for these valves.

3. 2(3)-205-24 Head Spray Containment Isolation Valves

The Head Spray System at Dresden is supplied by the non-safety related CRD pumps. The Head Spray containment isolation valves are closed during normal power operations and all design basis accidents.

The scenario that produces pressure locking in these normally closed valves assumes the Head Spray system is being used as an alternate water source during a reactor transient event. The reactor is rapidly depressurized concurrent with a loss of the CRD pumps. This scenario would be governed by the Emergency Operating Procedures (EOPs) and is beyond the design basis of the plant.

RECOMMENDED CORRECTIVE ACTIONS

Complete.

The Head Spray containment isolation valves were replaced during D3R13 and D2R14 with Anchor/Darling double disk gate valves. These valves were procured with a hole drilled in one of the two disks. The disks were installed with the hole toward the reactor side. The CRD side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

4. 3-220-1 & 2 Main Steam Line Drain Isolation Valves

The Main Steam line drains at Dresden are closed during power operations and all design basis accidents. The valves can be utilized to equalize the pressure between the MSIVs if an attempt is made to open the MSIVs after a Group I Isolation event.

The scenario that produces pressure locking in these normally closed valves assumes the vessel is rapidly depressurized and the main steam line drain valves are to be used to equalize the pressure between the MSIVs. This scenario would be governed by the Emergency Operating Procedures (EOPs) and is beyond the design basis of the plant.

RECOMMENDED CORRECTIVE ACTIONS

Complete.

The Unit 3 Main Steam Line Drain valves were replaced with an Anchor/Darling double disk gate valves during D3R13. These valves were procured with a hole drilled in one of the two disks. The disks were installed with the hole toward the reactor side. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements. The Unit 2 Main Steam Line Drain containment isolation valves are globe valves. Globe valves are not susceptible to pressure locking.

5. 2-1001-1A/B Shut-Down Cooling (SDC) Supply Inboard Isolation Valves
6. 3-1001-1A/B Shut-Down Cooling (SDC) Supply Inboard Isolation Valves

The SDC containment isolation valves are interlocked closed when the vessel temperature is above 350 degrees F and receive a signal to close when reactor water level is below eight inches (Group III). The SDC system is not used during any design basis accidents. Therefore, the valves are closed during normal power operations and all design basis accidents. The valves are open to initiate SDC during shutdown conditions.

The scenario that produces pressure locking in these normally closed valves assumes the vessel is rapidly depressurized and the SDC system is initiated immediately. This scenario would be governed by the Emergency Operating Procedures (EOPs) and is beyond the design basis of the plant.

RECOMMENDED CORRECTIVE ACTIONS FOR THE 2-1001A/B

Complete.

The 2-1001-1A/B containment isolation valves were replaced during D2R14 with Anchor/Darling double disk gate valves. These valves were procured with a hole drilled in one of the two disks. The disks were installed with the hole toward the reactor side. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

RECOMMENDED CORECTIVE ACTIONS FOR THE 3-1001-1A/B

Item 237-104-95-00700 Item 4

In the event that maintenance is performed on the internals of these valves, then a 1/4 inch hole shall be drilled in the disk that will be installed on the reactor side of the valve. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

7. 2-1201-1 Reactor Water Clean-Up (RWCU) Supply Isolation Valve
8. 3-1201-1 Reactor Water Clean-Up (RWCU) supply Isolation Valve

The RWCU containment isolation valves are normally open during power operations. They are required to close during a Group III Isolation which occurs when the reactor water level drops below plus eight inches (+8"). There is no safety related function to open these valves.

The scenario that produces pressure locking in these valves assumes the 1201-1 valve closes on a low water level event, the vessel rapidly depressurizes, then an attempt is made to re-open the valves. This scenario would be governed by the Emergency Operating Procedures (EOPs) and is beyond the design basis of the plant.

The scenario that produces thermally induced pressure locking assumes the 1201-1 valve is at room temperature following an outage. The RWCU inboard containment isolation bypass line is opened, causing the heat up the 1201-1 valve. The increase in temperature of the water, assumed to be trapped in the bonnet, creates pressure locking.

There is no safety related function to open this valve.

RECOMMENDED CORRECTIVE ACTIONS FOR THE 2-1201-1

Item 237-104-95-00700 Item 4

In the event that maintenance is performed on the internals of these valves, then a 1/4 inch hole shall be drilled in the disk that will be installed on the reactor side of the valve. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

RECOMMENDED CORRECTIVE ACTIONS FOR THE 3-1201-1

Complete.

The 3-1201-1 containment isolation valves were replaced during D3R13 with Anchor/Darling double disk gate valves. These valves were procured with a hole drilled in one of the two disks. The disk were installed with the hole toward the reactor side. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

9. 2(3)-1402-24A/B Core Spray Inboard Injection Isolation

In the normal Core Spray system alignment, the outboard containment isolation valves are closed and the inboard containment isolation valves are open. The pressure locking evaluation has concluded that the normally closed outboard isolation valve is susceptible to pressure locking (see Attachment 1) while the normally open inboard containment isolation valve is not susceptible to pressure locking.

If the Core Spray system was in an abnormal alignment where the outboard containment isolation valve was open and the inboard containment isolation valve was closed, the inboard isolation valve would then be susceptible to pressure locking.

The Dresden Operating Procedures (DOP) precludes operating in this abnormal alignment.

RECOMMENDED CORRECTIVE ACTIONS

Item 237-104-95-00700 Item 4

In the event that maintenance is performed on the internals of these valves, then a 1/4 inch hole shall be drilled in the disk that will be installed on the reactor side of the valve. The low pressure side disk will continue to provide containment isolation in accordance with 10 CFR 50 Appendix J requirements.

II. THERMAL BINDING

1. 2(3)-0202-4A/B Reactor Recirculation Pump Suction Isolation Valves
2. 2(3)-0202-5A/B Reactor Recirculation Pump Discharge Isolation Valves

The scenario that produces thermal binding in these normally open valves assumes a pump seal leak that requires these valves to be closed. The unit is shutdown and the valves are allowed to cool.

RECOMMENDED CORRECTIVE ACTIONS

None.

The recirculation pump discharge valve is required to close during a design basis LOCA. There is no safety related function to open either valve.

In the event of a pump seal leak that was large enough to warrant the closure of these valves, the unit would be required to shutdown. Cycling the valves during this scenario may complicate the pump seal failure problem.

3. 2-1201-1 & 2 Reactor Water Clean-Up (RWCU) Supply Isolation

The RWCU containment isolation valves are normally open during power operations. They are required to close during a Group III Isolation which occurs when the reactor water level drops below plus eight inches (+8"). There is no safety related function to open these valves.

The scenario that produces thermal binding in these valves assumes the valves close on a low water level event, then the reactor is quickly brought to a cold shutdown condition.

RECOMMENDED CORRECTIVE ACTIONS

None.

Re-establishing RWCU flow is a non-safety related function.

4. 2(3)-1301-1&2 Isolation Condenser Steam supply Isolation Valves
5. 2(3)-1301-4 Isolation Condenser Condensate Return Isolation Valves
6. 2(3)-2301-4&5 Isolation Condenser Steam Supply Isolation Valves

The normally open HPCI steam supply and Isolation Condenser containment isolation valves may be closed to perform maintenance on the Isolation Condenser system during power operations. If the duration of the maintenance activity is long enough (greater than 8 hours), the valves may cool enough to create a thermal binding condition. The system would be considered inoperable until these valves have been re-opened.

RECOMMENDED CORRECTIVE ACTION

None.

The valves would be out-of-service closed and the system would be declared inoperable. The valves have to be open prior to declaring the system operable.

7. 2(3)-3206A/B Feedwater Isolation Valve

The Feedwater isolation valves are normally open during power operations. These have no safety related function to open or close. These valves are closed as the feedwater regulation valves are closed to assure there is no flow in the line.

The scenario that produces thermal binding assumes the valves are closed during a normal unit shutdown when the valves are at the temperature of the "C" feedwater heaters. The valves are allowed to cool and required to open during a unit start-up.

RECOMMENDED CORRECTIVE ACTIONS

Item 237-104-95-00700 Item 5

Cycle the feedwater isolation valves prior to starting the feedwater pumps during a unit start-up.

ATTACHMENT E

QUAD CITIES STATION
180-DAY RESPONSE TO GL 95-07

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	Corrective Actions and Completion Schedule For GL 95-07 Susceptible Valves			
Valve EPN P&ID	Susceptibility	Corrective Action	Completion Schedule	Justification
1-1001-29A M-39 SH. 1	Pressure Locking	Drill Hole In Disc	Refuel Outage Q1R14, Starts 2/10/95	Calculation QDC-1000-M-0076, Rev. 0
1-1001-29B M-39 SH. 1	Pressure Locking	Drill Hole In Disc	Refuel Outage Q1R14, Starts 2/10/95	Calculation QDC-1000-M-0077, Rev. 0
1-1402-25A M-36	Pressure Locking	Drill Hole In Disc	Refuel Outage Q1R14, Starts 2/10/95	Calculation QDC-1000-M-0080, Rev. 0
1-1402-25B M-36	Pressure Locking	Drill Hole In Disc	Refuel Outage Q1R14, Starts 2/10/95	Calculation QDC-1000-M-0081, Rev. 0
1-2301-8 M-46 SH. 1	Pressure Locking	Drill Hole In Disc	Refuel Outage Q1R14, Starts 2/10/95	Calculation QDC-1000-M-0082, Rev. 0
1-1301-49 M-50 SH. 1	Pressure Locking	Drill Hole In Disc	Refuel Outage Q1R14, Starts 2/10/95	Calculation QDC-1000-M-0079, Rev. 0
2-1001-29A M-81 SH. 1	Pressure Locking	Drill Hole In Disc	Refuel Outage Q2R14	Calculation QDC-1000-M-0078, Rev. 0
2-1001-29B M-81 SH. 1	Pressure Locking	Drill Hole In Disc	Completed Q2R13	N/A
2-1402-25A M-78	Pressure Locking	Drill Hole In Disc	Completed Q2R13	N/A
2-1402-25B M-78	Pressure Locking	Drill Hole In Disc	Completed Q2R13	N/A
2-2301-8 M-87 SH. 1	Pressure Locking	Drill Hole In Disc	Completed Q2R13	N/A
2-1301-49 M-89 SH. 1	Pressure Locking	Drill Hole In Disc	Completed Q2R13	N/A

GENERIC LETTER 95-07
PRESSURE LOCKING AND THERMAL BINDING
SUSCEPTIBILITY EVALUATION

Revision 0
November 9, 1995

ComEd
Quad Cities Station

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1.0 PURPOSE

The purpose of this evaluation is to perform a review of all Safety Related, power operated gate valves at the Quad Cities Station and determine their susceptibility to the Pressure Locking/Thermal Binding (PLTB) phenomenon. Globe, butterfly, and plug valves were not evaluated.

This evaluation was prepared in response to NRC Generic Letter 95-07: Pressure Locking and Thermal Binding of Safety-Related Power Operated Gate Valves, dated August 17, 1995.

2.0 BACKGROUND

Disk binding of power operated gate valves caused power operated valve failures. PLTB can cause a power operated valves to fail to open resulting in the inability of the associated safety train or system to perform its safety function. This can result in failure modes that render redundant trains of certain safety related systems incapable of performing their safety functions. These failures may go undetected during normal operating cycles or surveillance testing.

Pressure locking occurs in flexible wedge and double disk gate valves when fluid becomes pressurized within the valve bonnet. The operator may not be capable of overcoming the additional forces.

Plant operating conditions that can contribute to pressure locking are leakage from a high pressure system, past a check valve and wedge and into the valve's bonnet area and the pressurization of fluid in a bonnet caused by heat-up of the bonnet and the subsequent thermal expansion. Flexible wedge, double disc, and parallel sliding gate valves are susceptible to pressure locking. Solid wedge gates are not susceptible. Compressed air systems are not susceptible to thermal bonnet pressurization.

Thermal binding can be caused if a valve is closed when it is hot and allowed to cool. Because of the different expansion and contraction characteristics of the valve and disk, mechanical interference occurs. This interference may be significant enough to prevent the valve from opening by exceeding the limitations of the actuator. Solid wedge valves are most susceptible to thermal binding. Parallel sliding disk gate valves are not generally considered susceptible to thermal binding because the wedging forces are released when the valve is opened.

3.0 ASSUMPTIONS/ENGINEERING JUDGMENT

Assumptions and Engineering judgment applied are provided in Attachment 4 and each for the capability calculations provided in Attachment 3.

3.1 Unverified Assumptions

3.1.1 The valve temperature for 1-1402-25A/B is less than 185F. Preliminary evaluations and inspections indicate the valve temperature is approximately 150F.

3.1.2 2-1001-3 & 4 are plug valves based on a review of the applicable P&ID's.

3.1.3 The valve temperature for 1-2301-8 is less than 250F. The heat source is the feedwater line which has an operating temperature of 340F.

4.0 METHODOLOGY

The guideline in Attachment 4 provides the methodology used for identifying valves susceptible to pressure locking or thermal binding.

For susceptible valves with no previous modifications installed to mitigate the pressure locking phenomenon, a calculation was performed to determine if the actuator has sufficient capability. The forces considered were the pressure locking component, the static unseating force, the piston effect and the reverse piston effect. The total forces were compared to the motor gearing capability and structural limits of each valve to determine if each actuator has acceptable margin. The calculations provided in Attachment 3 provide the specific methodology and basis.

Two methods were employed to predict MOV capability. Method 1, which is preferred, used thrust data measured during differential pressure testing to determine an open valve factor and the latest static test data to determine static pullout thrusts. Motor gearing capacity was then determined using the standard Limitorque equation. Method 2 utilized MOV motor efficiency measured during static tests to determine the required torque under pullout conditions. Motor gearing capacity was then determined using MOV WP-125. The acceptable motor/gearing capability margin is 20% for method 1 and 40% for method 2. The acceptable structural limit margin is 15%.

5.0 EVALUATION

5.1 Scope

All power operated safety related gate valves are listed in Table 1. These valves were identified using the P&ID's, safety related Q-List, and Design Basis documents.

5.2 Function

Only valves with active or inactive open safety functions will be evaluated for susceptibility. The results of the functional reviews are provided in Attachment 2 for each power operated gate valve

5.3 Susceptible Valves

Each valve with an active function has been evaluated in accordance with attachment 4. The results of the susceptibility review are provided in Attachment 2. This review identified 12 valves as susceptible to pressure locking. No valves were found to be susceptible to thermal binding.

5.3.1 Unit 1 RHR System LPCI Injection Valves

These flex wedge gate valves could be pressure locked after a LOCA due to the sudden reactor depressurization. These valves would be opened with reactor pressure in the bonnet and lower pressures on both disk faces. A hole has been drilled in the 2-1001-29B. The following calculations (Attachment 3) were performed and demonstrate MOV capability under the pressure lock conditions:

MOV 1-1001-29A - Calculation QDC-1000-M-0076, Rev. 0
MOV 1-1001-29B - Calculation QDC-1000-M-0077, Rev. 0
MOV 2-1001-29A - Calculation QDC-1000-M-0078, Rev. 0

A schedule for drilling a hole in each disk will be established based on importance and margin.

5.3.2 RCIC System Injection Outboard Isolation Valves

These flex wedge gate valves could be pressure locked after a loss of feedwater due to the sudden line depressurization. These valves would be opened with feedwater line pressure in the bonnet and lower pressures on both disk faces. The 2-1301-49 disk has a hole drilled in the feedwater side disk. Calculation QDC-1000-M-0079, Rev. 0 (Attachment 3) was performed for the MOV 1-1301-49 and demonstrates MOV capability under the pressure lock conditions:

A schedule for drilling a hole in the disk will be established based on importance and margin.

5.3.3 Core Spray System LPCS Injection Valves

These flex wedge gate valves could be pressure locked after a LOCA due to the sudden reactor depressurization. These valves would be opened with reactor pressure in the bonnet and lower pressures on both disk faces. Holes have been drilled in the MOV 2-1001-25A&B. The following calculations (Attachment 3) were performed and demonstrate MOV capability under the pressure lock conditions:

MOV 1-1402-25A - Calculation QDC-1000-M-0080, Rev. 0
MOV 1-1402-25B - Calculation QDC-1000-M-0081, Rev. 0

A schedule for drilling a hole in each disk will be established based on importance and margin.

5.3.4 HPCI System Injection Outboard Isolation Valves

These flex wedge gate valves could be pressure locked after a loss of feedwater due to the sudden line depressurization. These valves would be opened with feedwater line pressure in the bonnet and lower pressures on both disk faces. The 2-2301-8 disk has a hole drilled in the feedwater side disk. Calculation QDC-1000-M-0082, Rev. 0 (Attachment 3) was performed for the MOV 1-2301-8 and demonstrates MOV capability under the pressure lock conditions:

A schedule for drilling a hole in the disk will be established based on importance and margin.

6.0 CONCLUSION

All safety related power operated gate valves have been evaluated for susceptibility to pressure locking and thermal binding. Twelve valves were identified as susceptible. Based on the calculations provided herein and the modifications completed to date these twelve have sufficient capability to perform their open design basis function. Corrective actions include drilling holes in the disks of the 1001-29A&B, 1402-25A&B, 1301-49, and 2301-8 valves. Table 1 summarizes the results of this review. The 2-1001-29A valve should be statically diagnostic tested in the upcoming Unit 1 outage to validate the pullout thrust used in the applicable capability calculation.

MOV capability margins for each of the valves that do not have the disk relief hole are as follows:

Valve No.	Limit	Margin
1-1402-25A	Structural	21%
1-1402-25B	Structural	25%
1-1001-29A	Structural	63%
1-1001-29B	Structural	123%
2-1001-29A	Structural	28%
1-2301-8	Structural	18%
1-1301-49	MGC	49%

7.0 REFERENCES

6.1 Generic Letter 95-07
6.2 MOV 1-1402-25A - Calculation QDC-1000-M-0080, Rev. 0
6.3 MOV 1-1402-25B - Calculation QDC-1000-M-0081, Rev. 0
6.4 MOV 1-1001-29A - Calculation QDC-1000-M-0076, Rev. 0
6.5 MOV 1-1001-29B - Calculation QDC-1000-M-0077, Rev. 0
6.6 MOV 2-1001-29A - Calculation QDC-1000-M-0078, Rev. 0
6.7 MOV 1-2301-8 - QDC-1000-M-0082
6.8 MOV 1-1301-49 - QDC-1000-M-0079
6.9 Quad Cities Station UFSAR
6.10 Piping and Instrumentation Diagrams
6.11 Master Equipment List
6.12 Total Job Management System (TJM)

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-1001-185A	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-185B	This RHR Heat-Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-186A	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-186B	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-187A	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-187B	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-18A	The RHR Pump minimum flow valve is a 3" solid wedge gate valve.	Yes	No	No
1(2)-1001-18B	The RHR Pump minimum flow valve is a 3" solid wedge gate valve.	Yes	No	No
1(2)-1001-19A	The RHR cross-tie valve is an 18" solid wedge gate valve.	No	No	No
1(2)-1001-19B	The RHR cross-tie valve is an 18" solid wedge gate valve.	No	No	No
1(2)-1001-20	This RHR cross header drain valve is a 3" solid wedge gate valve.	No	No	No
1(2)-1001-21	This RHR cross header drain valve is a 3" solid wedge gate valve.	No	No	No
1(2)-1001-23A	The outboard drywell spray valve is a 10" solid wedge gate valve.	Yes	No	No
1(2)-1001-23B	The outboard drywell spray valve is a 10" solid wedge gate valve.	Yes	No	No

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-1001-26A	The inboard drywell spray valve is a 10" solid wedge gate valve.	Yes	No	No
1(2)-1001-26B	The inboard drywell spray valve is a 10" solid wedge gate valve.	Yes	No	No
1(2)-1001-29A	The inboard LPCI injection valve is a 16" flex wedge gate valve.	Yes	No	Yes
1(2)-1001-29B	The inboard LPCI injection valve is a 16" flex wedge gate valve.	Yes	No	Yes
1(2)-1001-34A	The suppression pool cooling isolation valve is a 16" flex wedge gate valve.	Yes	No	No
1(2)-1001-34B	The suppression pool cooling isolation valve is a 16" flex wedge gate valve.	Yes	No	No
1(2)-1001-43A	The shutdown cooling suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-43B	The shutdown cooling suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-43C	The shutdown cooling suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-43D	The shutdown cooling suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-47	The shutdown cooling outboard suction isolation valve is a 20" flex wedge gate valve.	No	No	No
1(2)-1001-4A	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-4B	This RHR Heat Exchanger service water flow reversal valve is a 12" flex wedge gate valve.	No	No	No
1(2)-1001-50	The shutdown cooling inboard suction isolation valve is a 20" flex wedge gate valve.	No	No	No

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-1001-7A	The LPCI suppression pool suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-7B	The LPCI suppression pool suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-7C	The LPCI suppression pool suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1001-7D	The LPCI suppression pool suction valve is a 14" solid wedge gate valve.	No	No	No
1(2)-1201-2	The RWCU inboard containment isolation valve is a 6" parallel disc gate valve.	No	No	No
1(2)-1201-5	The RWCU outboard containment isolation valve is a 6" parallel disc gate valve.	No	No	No
1(2)-1301-16	The RCIC inboard steam supply isolation valve is a 3" flex wedge gate valve.	No	No	No
1(2)-1301-17	The RCIC outboard steam supply isolation valve is a 3" flex wedge gate valve.	No	No	No
1(2)-1301-22	This RCIC pump suction valve is a 6" solid wedge gate valve.	No	No	No
1(2)-1301-25	This RCIC pump suction valve is a 6" solid wedge gate valve.	No	No	No
1(2)-1301-26	This RCIC pump suction valve is a 6" solid wedge gate valve.	No	No	No
1(2)-1301-48	This RCIC injection valve is a 4" flex wedge gate valve.	No	No	No
1(2)-1301-49	This RCIC injection valve is a 4" flex wedge gate valve.	Yes	No	Yes
1(2)-1402-24A	The core spray outboard injection valve is a 10" flex wedge gate valve.	No	No	No

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-1402-24B	The core spray outboard injection valve is a 10" flex wedge gate valve.	No	No	No
1(2)-1402-25A	The core spray inboard injection valve is a 10" flex wedge gate valve.	Yes	No	Yes
1(2)-1402-25B	The core spray inboard injection valve is a 10" flex wedge gate valve.	Yes	No	Yes
1(2)-1402-3A	The core spray suction valve is an 18" solid wedge gate valve.	No	No	No
1(2)-1402-3B	The core spray suction valve is an 18" solid wedge gate valve.	No	No	No
1(2)-202-4A	The reactor recirculation pump suction valve is a 28" split flex wedge gate valve.	No	No	No
1(2)-202-4B	The reactor recirculation pump suction valve is a 28" split flex wedge gate valve.	No	No	No
1(2)-202-5A	The reactor recirculation pump discharge valve is a 28" split flex wedge gate valve.	No	No	No
1(2)-202-5B	The reactor recirculation pump discharge valve is a 28" split flex wedge gate valve.	No	No	No
1(2)-202-6A	The reactor recirculation equalizer loop valve is a 22" flex wedge gate valve.	No	No	No
1(2)-202-6B	The reactor recirculation equalizer loop valve is a 22" flex wedge gate valve.	No	No	No
1(2)-202-9A	The reactor recirculation equalizer loop valve is a 2" flex wedge gate valve.	No	No	No
1(2)-202-9B	The reactor recirculation equalizer loop valve is a 2" flex wedge gate valve.	No	No	No
1(2)-220-1	The main steam line drain inboard isolation valve is a 3" parallel disc gate valve.	No	No	No

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-220-2	The main steam line drain outboard isolation valve is a 3" parallel disc gate valve.	No	No	No
1(2)-2301-15	The HPCI downstream test bypass valve is a 12" flex wedge gate valve.	No	No	No
1(2)-2301-3	The HPCI turbine steam supply valve is a 10" flex wedge gate valve.	Yes	No	No
1(2)-2301-35	The HPCI outboard suppression pool suction valve is a 16" solid wedge gate valve.	Yes	No	No
1(2)-2301-36	The HPCI inboard suppression pool suction valve is a 16" solid wedge gate valve.	Yes	No	No
1(2)-2301-4	The HPCI steam supply inboard isolation valve is a 10" flex wedge gate valve.	No	No	No
1(2)-2301-48	The HPCI cooling water return to pump valve is a 4" solid wedge gate valve.	No	No	No
1(2)-2301-49	The HPCI cooling water return to CCST valve is a 4" flex wedge gate valve.	No	No	No
1(2)-2301-5	The HPCI steam supply outboard isolation valve is a 10" flex wedge gate valve.	No	No	No
1(2)-2301-6	The HPCI condensate storage tank (CCST) suction valve is a 16" solid wedge gate valve.	Yes	No	No
1(2)-2301-8	The HPCI injection valve is a 14" flex wedge gate valve.	Yes	No	Yes
1(2)-2301-9	The HPCI pump maintenance isolation valve is normally open in the standby line-up.	No	No	No
1(2)-2399-40	The HPCI vacuum breaker isolation valve is a 4" flex wedge gate valve.	No	No	No
1(2)-2399-41	The HPCI vacuum breaker isolation valve is a 4" flex wedge gate valve.	No	No	No

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-3702	The RBCCW containment supply outboard isolation valve is an 8" solid wedge gate valve.	No	No	No
1(2)-3703	The RBCCW containment return outboard isolation valve is an 8" solid wedge gate valve.	No	No	No
1(2)-3706	The RBCCW containment return inboard isolation valve is an 8" solid wedge gate valve.	No	No	No
1(2)-302-21A	The Scram Discharge Volume inboard vent valve is a 1" solid wedge gate valve.	No	No	No
1(2)-302-21B	The Scram Discharge Volume inboard vent valve is a 1" solid wedge gate valve.	No	No	No
1(2)-302-21C	The Scram Discharge Volume inboard vent valve is a 1" solid wedge gate valve.	No	No	No
1(2)-302-21D	The Scram Discharge Volume inboard vent valve is a 1" solid wedge gate valve.	No	No	No
1(2)-1601-55	The Nitrogen purge to containment isolation valve is a 4" solid wedge gate valve.	No	No	No
1(2)-2001-15	Drywell equipment drain sump inboard isolation is a 3" solid wedge gate valve.	No	No	No
1(2)-2001-16	Header isolation Drywell sample discharge to waste collection tank	No	No	No
1(2)-4720	Drywell pneumatic upstream inlet AO gate valve is a 1" gate valve.	No	No	No
1(2)-4721	Drywell pneumatic downstream inlet AO gate valve is a 1" gate valve.	No	No	No
1/2-5741-319A	The Control Room HVAC "B" train refrigeration condensing unit RHRSW supply valve is a 2.5" gate valve.	No	No	No
1/2-5741-319B	The Control Room HVAC "B" train refrigeration condensing unit service water supply valve is a 3" flex wedge gate valve.	No	No	No

Quad Cities Staion Units 1 and 2

Table 1
Pressure Locking/Thermal Binding Suceptibility Results

Valve Number	Valve Type	Open Safety Function	Thermal Binding	Pressure Locking
1(2)-8941-705	ESS fill discharge to HRSS is a Kerotest y-pattern globe. Update MEL which states this vakve is a gate.	No	No	No

QUAD CITIES STATION

ATTACHMENT 1

PRESSURE LOCKING AND THERMAL BINDING FUNCTIONAL REVIEW WORKSHEETS

Valve Number: 1(2)-1001-185A

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number:	1(2)-1001-185B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number:	1(2)-1001-186A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number:	1(2)-1001-186B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number:	1(2)-1001-187A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number:	1(2)-1001-187B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number: 1(2)-1001-18A

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:	☐	☒

G1: The RHR Pump minimum flow valve has a safety function to open whenever RHR pump flow is low.

G2: The RHR Pump minimum flow valve has a safety function to open whenever RHR pump flow is low.

G3: The RHR Pump minimum flow valve has a safety function to open whenever RHR pump flow is low. During surveilance testing this valve will close when sufficient RHR pump flow is detected and has to open when flow is low.

Valve Number:	1(2)-1001-18B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☒

G1: The RHR Pump minimum flow valve has a safety function to open whenever RHR pump flow is low.

G2: The RHR Pump minimum flow valve has a safety function to open whenever RHR pump flow is low.

G3: The RHR Pump minimum flow valve has a safety function to open whenever RHR pump flow is low. During surveilance testing this valve will close when sufficient RHR pump flow is detected and has to open when flow is low.

Valve Number:	1(2)-1001-19A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RHR cross-tie valve is normally open in the standby line-up. When LPCI is initiated this valve is interlocked open. The function of this valve to close would be to separate the RHR loops to simultaneously run LPCI and suppression pool/containment cooling.

G2: The RHR cross-tie valve may have to be open and/or closed during execution of the EOP's to ensure core cooling.

G3: The RHR cross-tie valve is normally open in the standby line-up. When LPCI is initiated this valve is interlocked open. This valve is normally not stroke time surveilance tested during unit operations. This is because any time either RHR cross-tie valve is closed LPCI is inoperable.

Valve Number:	1(2)-1001-19B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RHR cross-tie valve is normally open in the standby line-up. When LPCI is initiated this valve is interlocked open. The function of this valve to close would be to separate the RHR loops to simultaneously run LPCI and suppression pool/containment cooling.

G2: The RHR cross-tie valve may have to be open and/or closed during execution of the EOP's to ensure core cooling.

G3: The RHR cross-tie valve is normally open in the standby line-up. When LPCI is initiated this valve is interlocked open. This valve is normally not stroke time surveilance tested during unit operations. This is because any time either RHR cross-tie valve is closed LPCI is inoperable.

Valve Number:	1(2)-1001-20	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR cross header drain valve is normally closed. The function of this valve is to open to drain water from the suppression pool to radwaste.

G2: QGA 200 Block requires use of various procedures for lowering torus level if greater than +2". These procedures require this valve to open and close.

G3: This RHR cross header drain valve is normally closed.

Valve Number: 1(2)-1001-21

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: This RHR cross header drain valve is normally closed. The function of this valve is to open to drain water from the suppression pool to radwaste.

G2: QGA 200 Block requires use of various procedures for lowering torus level if greater than +2". These procedures require this valve to open and close.

G3: This RHR cross header drain valve is normally closed.

Valve Number:	1(2)-1001-23A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The outboard drywell spray valve is normally closed. The safety functions of this valve are to open for drywell spray and to close for containment isolation and drywell spray termination.

G2: QGA 200 Block requires the valve to open to spray the drywell. Normal standby position of this valve is closed.

G3: The outboard drywell spray valve is normally closed.

Valve Number:	1(2)-1001-23B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The outboard drywell spray valve is normally closed. The safety functions of this valve are to open for drywell spray and to close for containment isolation and drywell spray termination.

G2: QGA 200 Block requires the valve to open to spray the drywell. Normal standby position of this valve is closed.

G3: The outboard drywell spray valve is normally closed.

Valve Number:	1(2)-1001-26A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The inboard drywell spray valve is normally closed. The safety functions of this valve are to open for drywell spray and to close for containment isolation and drywell spray termination.

G2: QGA 200 Block requires the valve to open to spray the drywell. Normal standby position of this valve is closed.

G3: The inboard drywell spray valve is normally closed.

Valve Number:	1(2)-1001-26B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The inboard drywell spray valve is normally closed. The safety functions of this valve are to open for drywell spray and to close for containment isolation and drywell spray termination.

G2: QGA 200 Block requires the valve to open to spray the drywell. Normal standby position of this valve is closed.

G3: The inboard drywell spray valve is normally closed.

Valve Number:	1(2)-1001-29A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☒

G1: The inboard LPCI injection valve is normally in the closed position. The valve has a safety related function to open for LPCI injection or shutdown cooling and close for containment isolation.

G2: Several QGA procedures call out LPCI injection as a source of make up water to the reactor vessel. The valve is required to open if the associated loop is desired as the injection flowpath.

G3: The inboard LPCI injection valve is normally in the closed position.

Valve Number:	1(2)-1001-29B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☒

G1: The inboard LPCI injection valve is normally in the closed position. The valve has a safety related function to open for LPCI injection or shutdown cooling and close for containment isolation.

G2: Several QGA procedures call out LPCI injection as a source of make up water to the reactor vessel. The valve is required to open if the associated loop is desired as the injection flowpath.

G3: The inboard LPCI injection valve is normally in the closed position.

Valve Number:	1(2)-1001-34A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The suppression pool cooling isolation valve is normally closed. The valve has a safety function to open for suppression pool cooling/spray, and to close for termination of suppression pool coolimg/spray and containment isolation.

G2: QGA 200 Block procedures call out the use of RHR in the torus cooling and/or torus spray mode. The valve is required to open. The normal stanby line-up position is closed.

G3: The suppression pool cooling isolation valve is normally closed. Surveilance procedures open this valve and then close it. QCOS 1000-3

Valve Number: 1(2)-1001-34B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The suppression pool cooling isolation valve is normally closed. The valve has a safety function to open for suppression pool cooling/spray, and to close for termination of suppression pool coolimg/spray and containment isolation.

G2: QGA 200 Block procedures call out the use of RHR in the torus cooling and/or torus spray mode. The valve is required to open. The normal stanby line-up position is closed.

G3: The suppression pool cooling isolation valve is normally closed. Surveilance procedures open this valve and then close it. QCOS 1000-3

Valve Number:	1(2)-1001-43A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The shutdown cooling suction valve is normally in the closed position. The normal operating mode related function of this valve is to open to initiate shutdown cooling. This valve is not required to open as a safety related function. The shutdown cooling mode of RHR is intended for use after a normal reactor depressurization utilizing the main condenser.

G2: QGA's direct placing shutdown cooling in operation after the reactor has been depressurized to less than the shutdown cooling interlock. In order to use this valve's associated RHR pump for shutdown cooling this valve must be opened.

G3: The shutdown cooling suction valve is normally in the closed position. This valve is not opened for surveilance procedures except when the unit is in cold shutdown. QCOS 1000-7

Valve Number: 1(2)-1001-43B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☒	☐
G2 Is the valve required to open from fully closed by the EOP's:	☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The shutdown cooling suction valve is normally in the closed position. The normal operating mode related function of this valve is to open to initiate shutdown cooling. This valve is not required to open as a safety related function. The shutdown cooling mode of RHR is intended for use after a normal reactor depressurization utilizing the main condenser.

G2: QGA's direct placing shutdown cooling in operation after the reactor has been depressurized to less than the shutdown cooling interlock. In order to use this valve's associated RHR pump for shutdown cooling this valve must be opened.

G3: The shutdown cooling suction valve is normally in the closed position. This valve is not opened for surveilance procedures except when the unit is in cold shutdown. QCOS 1000-7

Valve Number: 1(2)-1001-43C

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☒	☐
G2 Is the valve required to open from fully closed by the EOP's:	☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The shutdown cooling suction valve is normally in the closed position. The normal operating mode related function of this valve is to open to initiate shutdown cooling. This valve is not required to open as a safety related function. The shutdown cooling mode of RHR is intended for use after a normal reactor depressurization utilizing the main condenser.

G2: QGA's direct placing shutdown cooling in operation after the reactor has been depressurized to less than the shutdown cooling interlock. In order to use this valve's associated RHR pump for shutdown cooling this valve must be opened.

G3: The shutdown cooling suction valve is normally in the closed position. This valve is not opened for surveilance procedures except when the unit is in cold shutdown. QCOS 1000-7

Valve Number:	1(2)-1001-43D	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The shutdown cooling suction valve is normally in the closed position. The normal operating mode related function of this valve is to open to initiate shutdown cooling. This valve is not required to open as a safety related function. The shutdown cooling mode of RHR is intended for use after a normal reactor depressurization utilizing the main condenser.

G2: QGA's direct placing shutdown cooling in operation after the reactor has been depressurized to less than the shutdown cooling interlock. In order to use this valve's associated RHR pump for shutdown cooling this valve must be opened.

G3: The shutdown cooling suction valve is normally in the closed position. This valve is not opened for surveilance procedures except when the unit is in cold shutdown. QCOS 1000-7

Valve Number:	1(2)-1001-47	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The shutdown cooling outboard suction isolation valve is normally in the closed position. The normal operating mode related function of this valve is to open to initiate shutdown cooling. This valve is not required to open as a safety related function. The shutdown cooling mode of RHR is intended for use after a normal reactor depressurization utilizing the main condenser. This valve has a safety related function to close for containment isolation.

G2: QGA's direct placing shutdown cooling in operation after the reactor has been depressurized to less than the shutdown cooling interlock. This valve must open to run shutdown cooling.

G3: The shutdown cooling outboard suction isolation valve is normally in the closed position. This valve is not opened for surveilance procedures except when the unit is in cold shutdown.

Valve Number:	1(2)-1001-4A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing.
QCOS 1000-4

Valve Number:	1(2)-1001-4B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The function of the valve is to open or close to reverse service water flow through the RHR Heat Exchanger.

G2: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is not required to change position by the EOP's.

G3: This RHR Heat Exchanger service water flow reversal valve is normally in the open or closed position. The valve is opened and closed quarterly during surveilance testing. QCOS 1000-4

Valve Number:	1(2)-1001-50	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The shutdown cooling inboard suction isolation valve is normally in the closed position. The normal operating mode related function of this valve is to open to initiate shutdown cooling. This valve is not required to open as a safety related function. The shutdown cooling mode of RHR is intended for use after a normal reactor depressurization utilizing the main condenser. This valve has a safety related function to close for containment isolation.

G2: QGA's direct placing shutdown cooling in operation after the reactor has been depressurized to less than the shutdown cooling interlock. This valve must open to run shutdown cooling.

G3: The shutdown cooling inboard suction isolation valve is normally in the closed position. This valve is not opened for surveilance procedures except when the unit is in cold shutdown.

Valve Number:	1(2)-1001-7A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The LPCI suppression pool suction valve is open in the standby line-up. The valve is closed prior to running shutdown cooling to prevent draining the reactor to the torus.

G2: The LPCI suppression pool suction valve is shut during shutdown cooling operation or for stroke time surveilance testing. The normal standby position is open. QGA's direct LPCI injection and if the valve's associated RHR pump is to be used with suction from the torus the valve must be open.

G3: The LPCI suppression pool suction valve is stroke tested closed and opened monthly for surveilance testing. During this surveilance there is no flow, temperature changes, or pressure changes that could cause pressure locking or thermal binding. QCOS 1000-3

Valve Number:	1(2)-1001-7B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The LPCI suppression pool suction valve is open in the standby line-up. The valve is closed prior to running shutdown cooling to prevent draining the reactor to the torus.

G2: The LPCI suppression pool suction valve is shut during shutdown cooling operation or for stroke time surveilance testing. The normal standby position is open. QGA's direct LPCI injection and if the valve's associated RHR pump is to be used with suction from the torus the valve must be open.

G3: The LPCI suppression pool suction valve is stroke tested closed and opened monthly for surveilance testing. During this surveilance there is no flow, temperature changes, or pressure changes that could cause pressure locking or thermal binding. QCOS 1000-3

Valve Number:	1(2)-1001-7C	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The LPCI suppression pool suction valve is open in the standby line-up. The valve is closed prior to running shutdown cooling to prevent draining the reactor to the torus.

G2: The LPCI suppression pool suction valve is shut during shutdown cooling operation or for stroke time surveilance testing. The normal standby position is open. QGA's direct LPCI injection and if the valve's associated RHR pump is to be used with suction from the torus the valve must be open.

G3: The LPCI suppression pool suction valve is stroke tested closed and opened monthly for surveilance testing. During this surveilance there is no flow, temperature changes, or pressure changes that could cause pressure locking or thermal binding. QCOS 1000-3

Valve Number:	1(2)-1001-7D	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The LPCI suppression pool suction valve is open in the standby line-up. The valve is closed prior to running shutdown cooling to prevent draining the reactor to the torus.

G2: The LPCI suppression pool suction valve is shut during shutdown cooling operation or for stroke time surveilance testing. The normal standby position is open. QGA's direct LPCI injection and if the valve's associated RHR pump is to be used with suction from the torus the valve must be open.

G3: The LPCI suppression pool suction valve is stroke tested closed and opened monthly for surveilance testing. During this surveilance there is no flow, temperature changes, or pressure changes that could cause pressure locking or thermal binding. QCOS 1000-3

Valve Number:	1(2)-1201-2	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RWCU inboard containment isolation valve is open for normal operations. This valve does not have a safety function to open and has a safety function to close for containment isolation.

G2: QGA's direct use of RWCU as an alternate pressure control system as well as an alternate means of injecting boron into the reactor. This valve is required to be open for these purposes.

G3: The RWCU inboard containment isolation valve is open for normal operations. The valve is stroke timed close quarterly with no safety function to open.

Valve Number:	1(2)-1201-5	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RWCU outboard containment isolation valve is open for normal operations. This valve does not have a safety function to open and has a safety function to close for containment isolation.

G2: QGA's direct use of RWCU as an alternate pressure control system as well as an alternate means of injecting boron into the reactor. This valve is required to be open for these purposes.

G3: The RWCU outboard containment isolation valve is open for normal operations. The valve is stroke timed close quarterly with no safety function to open.

Valve Number:	1(2)-1301-16	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RCIC inboard steam supply isolation valve is normally open in the standby line-up. The valve has a safety function to close to provide primary containment isolation.

G2: RCIC is listed as a make-up source of water to the reactor vessel. It is also listed as a pressure control system. The valve must be in the open position for RCIC to function. The RCIC steam line is also listed as a vent path for the vessel when drywell flooding is in progress.

G3: The RCIC inboard steam supply isolation valve is normally open in the standby line-up. The valve is closed and opened quarterly for stroke time surveilance testing. QCOS 1300-6

Valve Number:	1(2)-1301-17	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RCIC outboard steam supply isolation valve is normally open in the standby line-up. The valve has a safety function to close to provide primary containment isolation.

G2: RCIC is listed as a make-up source of water to the reactor vessel. It is also listed as a pressure control system. The valve must be in the open position for RCIC to function. The RCIC steam line is also listed as a vent path for the vessel when drywell flooding is in progress.

G3: The RCIC outboard steam supply isolation valve is normally open in the standby line-up. The valve is closed and opened quarterly for stroke time surveilance testing. QCOS 1300-6

Valve Number:	1(2)-1301-22	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RCIC pump suction from the CCST isolation valve is normally open in the standby line-up. The valve will automatically close on low CCST level or high Suppression Pool level.

G2: RCIC is listed as an injection source in the QGA's. The preferred suction source is the CCST. A high level signal in the torus would cause the RCIC suction to swap to the torus. If the CCST is available it is directed to re-align the RCIC suction to the CCST via this valve.

G3: The RCIC pump suction from the CCST isolation valve is normally open and is closed and reopened quarterly during surveilance testing. QCOS 1300-6

Valve Number:	1(2)-1301-25	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RCIC pump suction from the suppression pool isolation valve has a function to open from the fully closed position on high suppression pool level or low CCST level. This function is automatically initiated. This valve is normally closed in the standby line-up. This valve is given a low importance in the PRA study because it does not have to open for RCIC to function. The RCIC system is normally lined up to take a suction from the CCST.

G2: RCIC is listed as an injection source in the QGA's. The suppression pool is an alternate suction source for RCIC. On low CCST level or high suppression pool level this valve would be called upon to open.

G3: The RCIC pump suction from the suppression pool isolation valve is normally closed and is opened and closed quarterly for surveilance stroke testing. QCOS 1300-6

Valve Number:	1(2)-1301-26	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The RCIC pump suction from the suppression pool isolation valve has a function to open from the fully closed position on high suppression pool level or low CCST level. This function is automatically initiated. This valve is normally closed in the standby line-up. This valve is given a low importance in the PRA study because it does not have to open for RCIC to function. The RCIC system is normally lined up to take a suction from the CCST.

G2: RCIC is listed as an injection source in the QGA's. The suppression pool is an alternate suction source for RCIC. On low CCST level or high suppression pool level this valve would be called upon to open.

G3: The RCIC pump suction from the suppression pool isolation valve is normally closed and is opened and closed quarterly for surveilance stroke testing. QCOS 1300-6

Valve Number:	1(2)-1301-48	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RCIC Injection valve is normally open in the standby line-up. In the event that the valve is closed for stroke testing it will get an automatic open signal on low reactor water level. The valve is intended to be open to provide make up water to the reactor vessel in the event the reactor becomes isolated and feedwater flow is lost. During these conditions the vessel is at normal pressure.

G2: RCIC is listed as an injection source to the reactor vessel in the QGA's. This valve must be open for RCIC to inject. This valve is normally open in the standby line-up.

G3: During system operation surveilance testing when injecting to the vessel or discharging to the CCST the valve is always open. This valve is stroked quarterly for stroke time surveilance testing. QCOS 1300-6

Valve Number:	1(2)-1301-49	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The RCIC Injection valve has a function to open from the normal full closed position when reactor level is low-low. This is automatically initiated. The valve is intended to open to provide make up water to the reactor vessel in the event the reactor becomes isolated and feedwater flow is lost. During these conditions the vessel is at normal pressure. The system is not intended to provide water to the vessel in the event of a large LOCA which would cause a sudden depressurization. If the reactor suddenly depressurizes the driving force for the RCIC turbine is lost and when steam line pressure is low the steam is isolated from the system. For the liscensing bases of the facility this valve does not have a safety function to open. Due to the importance of this valve in the PRA study Quad Cities is evaluating it as if it was safety related.

G2: RCIC is listed as an injection source to the reactor vessel in the QGA's. This valve must be open for RCIC to inject. This valve is normally open in the standby line-up.

G3: The RCIC injection valve is normally closed when RCIC is in the standby line-up. It is opened during the vessel injection surveilance and then returned to the closed position. This valve is opened and closed quarterly for stroke time surveilance testing. QCOS 1300-6

Valve Number:	1(2)-1402-24A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The core spray outboard injection valve is normally open in the standby line-up. The safety related function of this valve is to close for containment isolation.

G2: Core Spray is an injection source listed in the QGA's. This valve would be required to be opened if closed to inject using the associated loop of core spray. The normal standby position of this valve is open.

G3: The core spray outboard injection valve is normally open in the standby line-up. It is closed monthly for the core spray motor operated valve surveilance. During this test the valve is only closed for as long as it takes to close and then open the inboard injection valve. The quarterly pump flow rate surveilance test does not close this valve.

Valve Number:	1(2)-1402-24B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The core spray outboard injection valve is normally open in the standby line-up. The safety related function of this valve is to close for containment isolation.

G2: Core Spray is an injection source listed in the QGA's. This valve would be required to be opened if closed to inject using the associated loop of core spray. The normal standby position of this valve is open.

G3: The core spray outboard injection valve is normally open in the standby line-up. It is closed monthly for the core spray motor operated valve surveilance. During this test the valve is only closed for as long as it takes to close and then open the inboard injection valve. The quarterly pump flow rate surveilance test does not close this valve.

Valve Number:	1(2)-1402-25A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The core spray inboard injection valve is normally closed in the standby line-up. The safety related functions of this valve are to open for core spray injection and to close for containment isolation.

G2: Core Spray is an injection source listed in the QGA's. This valve must open to inject using the associated loop of core spray.

G3: The core spray inboard injection valve is normally closed in the standby line-up. It is opened monthly for the core spray motor operated valve surveilance. The quarterly pump flow rate surveilance test does not open this valve.

Valve Number:	1(2)-1402-25B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The core spray inboard injection valve is normally closed in the standby line-up. The safety related functions of this valve are to open for core spray injection and to close for containment isolation.

G2: Core Spray is an injection source listed in the QGA's. This valve must open to inject using the associated loop of core spray.

G3: The core spray inboard injection valve is normally closed in the standby line-up. It is opened monthly for the core spray motor operated valve surveilance. The quarterly pump flow rate surveilance test does not open this valve.

Valve Number:	1(2)-1402-3A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The core spray suction valve is normally open in the standby line-up. The valve gets an automatic open signal for ECCS initiation.

G2: The core spray suction valve is normally open in the standby line-up. There are scenarios where core spray may take a suction from the CCST. If core spray suction from the torus is subsequently required this valve would have to open.

G3: The core spray suction valve is normally open. The valve is stroked close and then open monthly for surveilance testing. QCOS 1400-2

Valve Number: 1(2)-1402-3B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☒	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:	☐	☐

G1: The core spray suction valve is normally open in the standby line-up. The valve gets an automatic open signal for ECCS initiation.

G2: The core spray suction valve is normally open in the standby line-up. There are scenarios where core spray may take a suction from the CCST. If core spray suction from the torus is subsequently required this valve would have to open.

G3: The core spray suction valve is normally open. The valve is stroked close and then open monthly for surveilance testing. QCOS 1400-2

Valve Number:	1(2)-1601-55	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The Nitrogen purge to containment isolation valve is normally open and does not have a safety function to open. The valve has a safety function to close for containment isolation.

G2: The Nitrogen purge to containment isolation valve is not required to change position by the EOP's.

G3: The Nitrogen purge to containment isolation valve is stroke time and fail safe tested quarterly.

Valve Number:	1(2)-2001-15	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: Drywell equipment drain sump inboard isolation is normally closed and has a safety function to close for containment isolation.

G2: Drywell equipment drain sump inboard isolation is not required to change position by the EOP's.

G3: Drywell equipment drain sump inboard isolation is stroke time and fail safe tested quarterly.

Valve Number: 1(2)-2001-16

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: Drywell equipment drain sump outboard isolation is normally closed and has a safety function to close for containment isolation.

G2: Drywell equipment drain sump outboard isolation is not required to change position by the EOP's.

G3: Drywell equipment drain sump outboard isolation is stroke time and fail safe tested quarterly.

Valve Number:	1(2)-202-4A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The reactor recirculation pump suction valve is open during normal operations. This valve has no safety function to open.

G2: The reactor recirculation pump suction valve is open during normal operations. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation pump suction valve is open during normal operations. The valve is not closed during normal plant operation for surveilances. During cold shutdown the valve is stroke timed by surveilance procedures.

Valve Number: 1(2)-202-4B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The reactor recirculation pump suction valve is open during normal operations. This valve has no safety function to open.

G2: The reactor recirculation pump suction valve is open during normal operations. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation pump suction valve is open during normal operations. The valve is not closed during normal plant operation for surveilances. During cold shutdown the valve is stroke timed by surveilance procedures.

Valve Number:	1(2)-202-5A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The reactor recirculation pump discharge valve is open during normal operations. This valve has no safety function to open and a safety function to close on the good loop during LPCI.

G2: The reactor recirculation pump discharge valve is open during normal operations. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation pump discharge valve is open during normal operations. The valve is not closed during normal plant operation for surveilances. During cold shutdown the valve is stroke timed by surveilance procedures.

Valve Number: 1(2)-202-5B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The reactor recirculation pump discharge valve is open during normal operations. This valve has no safety function to open and a safety function to close on the good loop during LPCI.

G2: The reactor recirculation pump discharge valve is open during normal operations. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation pump discharge valve is open during normal operations. The valve is not closed during normal plant operation for surveilances. During cold shutdown the valve is stroke timed by surveilance procedures.

Valve Number: 1(2)-202-6A

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:	☐	☐

G1: The reactor recirculation equalizer loop valve is closed during normal operations. This valve has no safety function to open.

G2: The reactor recirculation equalizer loop valve is closed during normal operations. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation equalizer loop valve is closed during normal operations. The valve is not opened during normal plant operation for surveilances.

Valve Number: 1(2)-202-6B

NonSRLDB | SRLDB

G1 Is the function of the valve to open under normal or accident conditions: ☐ ☐

G2 Is the valve required to open from fully closed by the EOP's: ☐ ☐

G3 Is the valve closed for system operation surveilance testing with a safety function to reopen: ☐ ☐

G1: The reactor recirculation equalizer loop valve is closed during normal operations. This valve has no safety function to open.

G2: The reactor recirculation equalizer loop valve is closed during normal operations. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation equalizer loop valve is closed during normal operations. The valve is not opened during normal plant operation for surveilances.

Valve Number:	1(2)-202-9A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The reactor recirculation equalizer loop bypass valve is open or closed during normal operations. Either the "A" or the "B" valve is open with the other one closed. This line-up does not allow flow through the recirculation equalizer line and it prevents over pressurizing the line in between the equalizer loop valves. This valve has no safety function to open.

G2: The reactor recirculation equalizer loop bypass valve is open or closed during normal operations. Either the "A" or the "B" valve is open with the other one closed. This line-up does not allow flow through the recirculation equalizer line and it prevents over pressurizing the line in between the equalizer loop valves. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation equalizer loop bypass valve is open or closed during normal operations. Either the "A" or the "B" valve is open with the other one closed. This line-up does not allow flow through the recirculation equalizer line and it prevents over pressurizing the line in between the equalizer loop valves. The valve is not opened during normal plant operation for surveilances.

Valve Number:	1(2)-202-9B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The reactor recirculation equalizer loop bypass valve is open or closed during normal operations. Either the "A" or the "B" valve is open with the other one closed. This line-up does not allow flow through the recirculation equalizer line and it prevents over pressurizing the line in between the equalizer loop valves. This valve has no safety function to open.

G2: The reactor recirculation equalizer loop bypass valve is open or closed during normal operations. Either the "A" or the "B" valve is open with the other one closed. This line-up does not allow flow through the recirculation equalizer line and it prevents over pressurizing the line in between the equalizer loop valves. The valve is not required to open from the fully closed position by the EOP's.

G3: The reactor recirculation equalizer loop bypass valve is open or closed during normal operations. Either the "A" or the "B" valve is open with the other one closed. This line-up does not allow flow through the recirculation equalizer line and it prevents over pressurizing the line in between the equalizer loop valves. The valve is not opened during normal plant operation for surveilances.

Valve Number:	1(2)-220-1	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

G1: The main steam line drain inboard isolation valve is normally closed during unit operations. The valve does not have a safety function to open and has a safety function to close for primary containment isolation.

G2: The QGA's direct the use of main steam line drains as an alternate pressure control system. The main steam line drains are also used when recovering from a group 1 isolation.

G3: The main steam line drain inboard isolation valve is normally closed during unit operations. The valve is opened and stroke timed close quarterly.

Valve Number: 1(2)-220-2

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The main steam line drain outboard isolation valve is normally closed during unit operations. The valve does not have a safety function to open and has a safety function to close for primary containment isolation.

G2: The QGA's direct the use of main steam line drains as an alternate pressure control system. The main steam line drains are also used when recovering from a group 1 isolation.

G3: The main steam line drain outboard isolation valve is normally closed during unit operations. The valve is opened and stroke timed close quarterly.

Valve Number:	1(2)-2301-15	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI downstream test bypass valve is normally closed. The valve does not have a safety function to open and has a function to close if open when HPCI is initiated.

G2: HPCI is listed as an alternate pressure control system in the QGA's. This valve provides a flowpath for HPCI (and) RCIC during pressure control modes.

G3: The HPCI downstream test bypass valve is normally closed. The valve is opened during HPCI system flow testing and closed when testing is complete.

Valve Number:	1(2)-2301-3	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI turbine steam supply valve is normally closed in the standby line-up. The valve has a safety function to open when HPCI is initiated.

G2: The HPCI turbine steam supply valve is required to open fully in the QGA's for reactor level and/or pressure control.

G3: The HPCI turbine steam supply valve is normally closed in the standby line-up. The valve is opened and closed for stroke testing and when the HPCI pump is flow tested.

Valve Number:	1(2)-2301-35	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI outboard suppression pool suction valve can be open or closed in a standby line-up depending on whether suction is desired from the suppression pool or the CCST. When HPCI is lined up to take a suction from the suppression pool the valve is open and when HPCI is lined up to take a suction from the CCST the valve is closed. When the valve is closed it has a safety function to open on high suppression pool level or low CCST level. The valve has a safety function to close for containment isolation.

G2: HPCI is listed as an injection source in the QGA's. The torus is an alternate suction for the HPCI system.

G3: The HPCI outboard suppression pool suction valve can be open or closed in a standby line-up depending on whether suction is desired from the suppression pool or the CCST. If the valve is open when the standby line-up is to take a suction from the suppression pool the valve is closed and then opened quarterly for surveilance testing.

Valve Number: 1(2)-2301-36

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:	☐	☐

G1: The HPCI inboard suppression pool suction valve can be open or closed in a standby line-up depending on whether suction is desired from the suppression pool or the CCST. When HPCI is lined up to take a suction from the suppression pool the valve is open and when HPCI is lined up to take a suction from the CCST the valve is closed. When the valve is closed it has a safety function to open on high suppression pool level or low CCST level. The valve has a safety function to close for containment isolation.

G2: HPCI is listed as an injection source in the QGA's. The torus is an alternate suction for the HPCI system.

G3: The HPCI inboard suppression pool suction valve can be open or closed in a standby line-up depending on whether suction is desired from the suppression pool or the CCST. If the valve is open when the standby line-up is to take a suction from the suppression pool the valve is closed and then opened quarterly for surveilance testing.

Valve Number:	1(2)-2301-4	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI steam supply inboard isolation valve is normally open in the standby line-up. The valve has a safety function to close for containment isolation.

G2: HPCI is both an injection system and pressure control system in the QGA's. This valve is required to be open for HPCI operation. The normal standby position of this valve is open.

G3: The HPCI steam supply inboard isolation valve is normally open in the standby line-up. The valve is closed quarterly for stroke time surveilance testing. When the valve is closed during this test the HPCI system is declared inoperable and does not have a safety function to open.

Valve Number:	1(2)-2301-48	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☒

G1: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve does not have a safety function to close. This valve returns the cooling water that flows through the lube oil cooler and gland seal leakoff condensate to the HPCI booster pump.

G2: HPCI is both an injection system and pressure control system in the QGA's. This valve is required to be open for HPCI operation. The normal standby position of this valve is open.

G3: The HPCI cooling water return to pump valve is closed quarterly for stroke time testing and it is closed when starting the HPCI pump for flow testing. If the valve is closed it will get an open signal when HPCI is initiated.

Valve Number: 1(2)-2301-49

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The HPCI cooling water return to CCST valve is normally closed in the standby line-up. The valve does not have a safety function to open. This valve returns the cooling water that flows through the lube oil cooler and gland seal leakoff condensate to the CCST when HPCI is being tested.

G2: The valve is not required to be opened by the QGA's.

G3: The HPCI cooling water return to CCST valve is opened and closed quarterly for stroke testing. The valve is opened prior to running HPCI flow testing. The valve is closed when the HPCI pump is running with flow to the CCST.

Valve Number:	1(2)-2301-5	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI steam supply outboard isolation valve is normally open in the standby line-up. The valve has a safety function to close for containment isolation.

G2: HPCI is both an injection system and pressure control system in the QGA's. This valve is required to be open for HPCI operation. The normal standby position of this valve is open.

G3: The HPCI steam supply outboard isolation valve is normally open in the standby line-up. The valve is closed quarterly for stroke time surveilance testing. When the valve is closed during this test the HPCI system is declared inoperable and does not have a safety function to open.

Valve Number:	1(2)-2301-6	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI condensate storage tank (CCST) suction valve can be open or closed in a standby line-up depending on whether suction is desired from the suppression pool or the CCST. When HPCI is lined up to take a suction from the CCST the valve is open and when HPCI is lined up to take a suction from the suppression pool the valve is closed. When the valve is closed it has a safety function to open if suction is transfered from the suppression pool to the CCST.

G2: HPCI is listed as an injection source in the QGA's. The preferred suction is the CCST. If a high torus level occurs the suction swaps to the torus. Procedures direct restoring CCST suction if available.

G3: The HPCI condensate storage tank (CCST) suction valve can be open or closed in a standby line-up depending on whether suction is desired from the suppression pool or the CCST. If the valve is open when the standby line-up is to take a suction from the CCST the valve is closed and then opened quarterly for surveilance testing.

Valve Number:	1(2)-2301-8	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI injection valve is normally closed in the standby line-up. The valve has a safety function to open when HPCI is initiated and closes when the HPCI turbine trips. The valve is intended to provide make up water to the reactor in the event the reactor feedwater is lost. During this condition the vessel is at normal pressure. The system is not intended to provide water to the reactor vessel in the event of a large break LOCA which would cause sudden depressurization of the vessel.

G2: HPCI is both an injection system and pressure control system in the QGA's. This valve is required to be open for HPCI operation.

G3: The HPCI injection valve is normally closed in the standby line-up. The valve is stroke timed open and close quarterly during surveilance testing. QCOS 2300-6

Valve Number:	1(2)-2301-9	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI pump maintenance isolation valve is normally open in the standby line-up.

G2: HPCI is both an injection system and pressure control system in the QGA's. This valve is required to be open for HPCI operation. The normal standby position of this valve is open.

G3: The HPCI pump maintenance isolation valve is normally open in the standby line-up. The valve is closed during stroke time surveilance testing and then reopened quarterly. QCOS 2300-6

Valve Number:	1(2)-2399-40	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The HPCI vacuum breaker isolation valve is normally open in the standby line-up. The valve only has a safety function to close on indication of a large line break LOCA in the drywell.

G2: The HPCI vacuum breaker isolation valve is normally open in the standby line-up. There is no function to open this valve by the EOP's.

G3: The HPCI vacuum breaker isolation valve is normally open in the standby line-up. The valve is closed and reopened quarterly for stroke time testing. QCOS 2300-6

Valve Number: 1(2)-2399-41

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The HPCI vacuum breaker isolation valve is normally open in the standby line-up. The valve only has a safety function to close on indication of a large line break LOCA in the drywell.

G2: The HPCI vacuum breaker isolation valve is normally open in the standby line-up. There is no function to open this valve by the EOP's.

G3: The HPCI vacuum breaker isolation valve is normally open in the standby line-up. The valve is closed and reopened quarterly for stroke time testing. QCOS 2300-6

Valve Number:	1(2)-302-21A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The SDV inboard vent AOV is normally open and fails closed on a loss of air. This valve is required to close for primary containment isolation.

G2: The EOP's require this valve to open from full closed to vent off the Scram Discharge Volume during an ATWS.

G3: This valve is closed and opened quarterly for stroke time surveilance testing.
QCOS 300-11

Valve Number:	1(2)-302-21B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The SDV outboard vent AOV is normally open and fails closed on a loss of air. This valve is required to close for primary containment isolation.

G2: The EOP's require this valve to open from full closed to vent off the Scram Discharge Volume during an ATWS.

G3: This valve is closed and opened quarterly for stroke time surveilance testing.
QCOS 300-11

Valve Number: 1(2)-302-21C

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☐
G2 Is the valve required to open from fully closed by the EOP's:	☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

G1: The SDV inboard vent AOV is normally open and fails closed on a loss of air. This valve is required to close for primary containment isolation.

G2: The EOP's require this valve to open from full closed to vent off the Scram Discharge Volume during an ATWS.

G3: This valve is closed and opened quarterly for stroke time surveilance testing.
QCOS 300-11

Valve Number:	1(2)-302-21D	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The SDV outboard vent AOV is normally open and fails closed on a loss of air. This valve is required to close for primary containment isolation.

G2: The EOP's require this valve to open from full closed to vent off the Scram Discharge Volume during an ATWS.

G3: This valve is closed and opened quarterly for stroke time surveilance testing.
QCOS 300-11

Valve Number:	1(2)-3702	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RBCCW containment supply outboard isolation valve is normally open. The valve only has a safety function to close for a RBCCW line break inside containment.

G2: The RBCCW containment supply outboard isolation valve is normally open. The valve does not have a function to open by the EOP's.

G3: The RBCCW containment supply outboard isolation valve is normally open. The valve is not closed for surveilance testing because this would isolate cooling water to the reactor recirculation pumps requiring unit shutdown.

Valve Number:	1(2)-3703	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RBCCW containment return outboard isolation valve is normally open. The valve only has a safety function to close for a RBCCW line break inside containment.

G2: The RBCCW containment return outboard isolation valve is normally open. The valve does not have a function to open by the EOP's.

G3: The RBCCW containment return outboard isolation valve is normally open. The valve is not closed for surveilance testing because this would isolate cooling water to the reactor recirculation pumps requiring unit shutdown.

Valve Number:	1(2)-3706	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The RBCCW containment return inboard isolation valve is normally open. The valve only has a safety function to close for a RBCCW line break inside containment.

G2: The RBCCW containment return inboard isolation valve is normally open. The valve does not have a function to open by the EOP's.

G3: The RBCCW containment return inboard isolation valve is normally open. The valve is not closed for surveilance testing because this would isolate cooling water to the reactor recirculation pumps requiring unit shutdown.

Valve Number:	1(2)-4720	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: Drywell pneumatic upstream inlet AO gate valve is normally open and recieves a Group 2 Isolation signal to close.

G2: Drywell pneumatic upstream inlet AO gate valve is closed for containment isolation and fails closed if air pressure is lost. The valve does not have to open by the EOP's.

G3: Drywell pneumatic upstream inlet AO gate valve is stroke timed and fail safe tested quarterly.

Valve Number: 1(2)-4721		NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: Drywell pneumatic downstream inlet AO gate valve is normally open and recieves a Group 2 Isolation signal to close.

G2: Drywell pneumatic downstream inlet AO gate valve is closed for containment isolation and fails closed if air pressure is lost. The valve does not have to open by the EOP's.

G3: Drywell pneumatic downstream inlet AO gate valve is stroke timed and fail safe tested quarterly.

Valve Number:	1(2)-8941-705	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: ESS fill discharge to HRSS is a Kerotest y-pattern globe. Update MEL which states this valve is a gate.

G2:

G3:

Valve Number:	1/2-5741-319A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☒	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The Control Room HVAC "B" train refrigeration condensing unit RHRSW supply valve is normally closed and fails open on a loss of air.

G2: The Control Room HVAC "B" train refrigeration condensing unit RHRSW supply valve is not required to change position by the EOP's.

G3: The Control Room HVAC "B" train refrigeration condensing unit RHRSW supply valve is fail safe tested quarterly.

Valve Number:	1/2-5741-319B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☐	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

G1: The Control Room HVAC "B" train refrigeration condensing unit service water supply valve is normally open and fails closed on a loss of air. This valve does not have an open safety function.

G2: The Control Room HVAC "B" train refrigeration condensing unit service water supply valve is not required to change position by the EOP's.

G3: The Control Room HVAC "B" train refrigeration condensing unit service water supply valve is fail safe tested quarterly.

QUAD CITIES STATION

ATTACHMENT 2

PRESSURE LOCKING AND THERMAL BINDING SUSCEPTIBILITY REVIEW WORKSHEETS

Valve Number: 1(2)-1001-18A

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☒

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The RHR Pump minimum flow valve is a 3" solid wedge gate valve.

T2: The RHR Pump minimum flow valve may close at an elevated temperature during accident conditions. The maximum temperature would be the maximum suppression pool temperature. During LPCI mode suppression pool/containment cooling is interlocked out. For LPCI mode the maximum expected suppression pool temperature is 170 degrees. During LPCI the valve would open on initiation and close as soon as RHR pump flow is established and then remain closed. For suppression pool/containment cooling mode the RHR pump may be started and stopped repeatedly. This mode would most likely be used after a small break LOCA where the maximum expected suppression pool temperature is 140 degrees fahrenheit. This valve is located above the torusl with an environmental temperature of approximately (100 degrees fahrenheit).

T3: The RHR Pump minimum flow valve is normally closed cool. During the suppression pool cooling mode of operation the valve will close at whatever temperature the suppression pool is originally at and then cool down. The valve requires flow to be heated so if it is closed cool it will not heat up and recool prior to opening.

T4: The RHR Pump minimum flow valve is normally closed cool. During the suppression pool cooling mode of operation the valve will close suppression pool temperature and then cool down. The valve requires flow to be heated so if it is closed cool it will not heat up prior to opening.

Valve Number: 1(2)-1001-18A

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The RHR Pump minimum flow valve is a 3" solid wedge gate valve.

P2: The RHR Pump minimum flow valve's process fluid is water.

P3: The RHR Pump minimum flow valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The RHR Pump minimum flow valve is normally closed cool. This valve has to open to allow higher system operating temperatures to reach it therefore it always opens cool and then heats up. The minimum flow flowpath is isolated when in the shutdown cooling mode so the valve will never close or open at shutdown cooling elevated temperatures.

P5: The RHR Pump minimum flow valve is never exposed to a high system pressure or a sudden depressurization.

P6: The RHR Pump minimum flow valve is normally closed cool. This valve may have to open when ambient temperatures are higher. This would increase the pressure in the bonnet area if the rate of pressure increase is greater than the rate of pressure decay due to leakage from the bonnet area. This may produce pressure locking. Due to the solid wedge design this valve is not susceptible to pressure locking.

Valve Number: 1(2)-1001-18A

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number: 1(2)-1001-18B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:	☐	☒

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The RHR Pump minimum flow valve is a 3" solid wedge gate valve.

T2: The RHR Pump minimum flow valve may close at an elevated temperature during accident conditions. The maximum temperature would be the maximum suppression pool temperature. During LPCI mode suppression pool/containment cooling is interlocked out. For LPCI mode the maximum expected suppression pool temperature is 170 degrees. During LPCI the valve would open on initiation and close as soon as RHR pump flow is established and then remain closed. For suppression pool/containment cooling mode the RHR pump may be started and stopped repeatedly. This mode would most likely be used after a small break LOCA where the maximum expected suppression pool temperature is 140 degrees fahrenheit. This valve is located above the torusl with an environmental temperature of approximately (100 degrees fahrenheit).

T3: The RHR Pump minimum flow valve is normally closed cool. During the suppression pool cooling mode of operation the valve will close at whatever temperature the suppression pool is originally at and then cool down. The valve requires flow to be heated so if it is closed cool it will not heat up and recool prior to opening.

T4: The RHR Pump minimum flow valve is normally closed cool. During the suppression pool cooling mode of operation the valve will close suppression pool temperature and then cool down. The valve requires flow to be heated so if it is closed cool it will not heat up prior to opening.

Valve Number: 1(2)-1001-18B

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The RHR Pump minimum flow valve is a 3" solid wedge gate valve.

P2: The RHR Pump minimum flow valve's process fluid is water.

P3: The RHR Pump minimum flow valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The RHR Pump minimum flow valve is normally closed cool. This valve has to open to allow higher system operating temperatures to reach it therefore it always opens cool and then heats up. The minimum flow flowpath is isolated when in the shutdown cooling mode so the valve will never close or open at shutdown cooling elevated temperatures.

P5: The RHR Pump minimum flow valve is never exposed to a high system pressure or a sudden depressurization.

P6: The RHR Pump minimum flow valve is normally closed cool. This valve may have to open when ambient temperatures are higher. This would increase the pressure in the bonnet area if the rate of pressure increase is greater than the rate of pressure decay due to leakage from the bonnet area. This may produce pressure locking. Due to the solid wedge design this valve is not susceptible to pressure locking.

Valve Number: 1(2)-1001-18B

S1 Is there an undrained leg of piping between the valve and an unisolated steam source:

S2 Is the valve located below the source of steam:

S3 Is the valve subject to heating after it has been exposed to water prior to opening:

S1:

S2:

S3:

Valve Number:	1(2)-1001-23A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The outboard drywell spray valve is a 10" solid wedge gate valve.

T2: Initially the outboard drywell spray valve is closed at ambient temperature. When drywell spray is initiated the valve is subjected to suppression pool water temperature after exiting the RHR heat exchanger. If the RHR service water pumps are not running the valve may be subjected to process fluid temperatures up to 170 degrees which is the maximum expected suppression pool temperature. The valve may be required to cycle several times during an accident. This valve is insulated and is not likely to cool down significantly prior to reopening during subsequent drywell spray evolutions.

T3: Initially the outboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve. This valve isolated from the drywell by the inboard valve. This valve is insulated.

T4: Initially the outboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve. This valve isolated from the drywell by the inboard valve. This valve is insulated.

Valve Number: 1(2)-1001-23A

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The outboard drywell spray valve is a 10" solid wedge gate valve.

P2: The outboard drywell spray valve's process fluid is water.

P3: The outboard drywell spray valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: Initially the outboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

P5: The outboard drywell spray valve is never exposed to a high system pressure or a sudden depressurization.

P6: The outboard drywell spray valve is normally closed cool. This valve may have to open when ambient temperatures are higher. The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking. In addition, due to the solid wedge design this valve is not susceptible to pressure locking.

Valve Number: 1(2)-1001-23A

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1001-23B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The outboard drywell spray valve is a 10" solid wedge gate valve.

T2: Initially the outboard drywell spray valve is closed at ambient temperature. When drywell spray is initiated the valve is subjected to suppression pool water temperature after exiting the RHR heat exchanger. If the RHR service water pumps are not running the valve may be subjected to process fluid temperatures up to 170 degrees which is the maximum expected suppression pool temperature. The valve may be required to cycle several times during an accident. This valve is insulated and is not likely to cool down significantly prior to reopening during subsequent drywell spray evolutions.

T3: Initially the outboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve. This valve isolated from the drywell by the inboard valve. This valve is insulated.

T4: Initially the outboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve. This valve isolated from the drywell by the inboard valve. This valve is insulated.

Valve Number: 1(2)-1001-23B

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1	Is the valve of a solid wedge design:	☒
P2	Does the valve contain compressible gas and can not be filled with liquid:	☐
P3	Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4	Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5	Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6	Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The outboard drywell spray valve is a 10" solid wedge gate valve.

P2: The outboard drywell spray valve's process fluid is water.

P3: The outboard drywell spray valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: Initially the outboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

P5: The outboard drywell spray valve is never exposed to a high system pressure or a sudden depressurization.

P6: The outboard drywell spray valve is normally closed cool. This valve may have to open when ambient temperatures are higher. The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking. In addition, due to the solid wedge design this valve is not susceptible to pressure locking.

Valve Number: 1(2)-1001-23B

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1001-26A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The inboard drywell spray valve is a 10" solid wedge gate valve.

T2: Initially the inboard drywell spray valve is closed at ambient temperature. When drywell spray is initiated the valve is subjected to suppression pool water temperature after exiting the RHR heat exchanger. If the RHR service water pumps are not running the valve may be subjected to process fluid temperatures up to 170 degrees which is the maximum expected suppression pool temperature. The valve may be required to cycle several times during an accident. This valve is insulated and is not likely to cool down significantly prior to reopening during subsequent drywell spray evolutions.

T3: Initially the inboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated by process fluid flow through the valve which would require it to be open before any heating. The valve may be subjected to some heating from the drywell through the spray header during an accident. Heating by steam or air in this manner would not be sufficient to thermally bind the valve.

T4: Initially the inboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it could be heated without flow through the valve. This valve could be exposed to drywell temperature on one disk face. This valve is insulated. Heating by steam or air in this manner would not be sufficient to thermally bind the valve.

Valve Number: 1(2)-1001-26A

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The inboard drywell spray valve is a 10" solid wedge gate valve.

P2: The inboard drywell spray valve's process fluid is water.

P3: The inboard drywell spray valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: Initially the inboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it could be heated without flow through the valve. This valve could be exposed to drywell temperature on one disk face. This valve is insulated. However, due to the solid wedge design this valve is not susceptible to pressure locking.

P5: The inboard drywell spray valve is never exposed to a high system pressure or a sudden depressurization.

P6: The inboard drywell spray valve is normally closed cool. This valve may have to open when ambient temperatures are higher. The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking. In addition, due to the solid wedge design this valve is not susceptible to pressure locking.

Valve Number: 1(2)-1001-26A

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1001-26B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The inboard drywell spray valve is a 10" solid wedge gate valve.

T2: Initially the inboard drywell spray valve is closed at ambient temperature. When drywell spray is initiated the valve is subjected to suppression pool water temperature after exiting the RHR heat exchanger. If the RHR service water pumps are not running the valve may be subjected to process fluid temperatures up to 170 degrees which is the maximum expected suppression pool temperature. The valve may be required to cycle several times during an accident. This valve is insulated and is not likely to cool down significantly prior to reopening during subsequent drywell spray evolutions.

T3: Initially the inboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it is not heated by process fluid flow through the valve which would require it to be open before any heating. The valve may be subjected to some heating from the drywell through the spray header during an accident. Heating by steam or air in this manner would not be sufficient to thermally bind the valve.

T4: Initially the inboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it could be heated without flow through the valve. This valve could be exposed to drywell temperature on one disk face. This valve is insulated. Heating by steam or air in this manner would not be sufficient to thermally bind the valve.

Valve Number: 1(2)-1001-26B

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The inboard drywell spray valve is a 10" solid wedge gate valve.

P2: The inboard drywell spray valve's process fluid is water.

P3: The inboard drywell spray valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: Initially the inboard drywell spray valve is closed at ambient temperature. The valve is located in the system where it could be heated without flow through the valve. This valve could be exposed to drywell temperature on one disk face. This valve is insulated. However, due to the solid wedge design this valve is not susceptible to pressure locking.

P5: The inboard drywell spray valve is never exposed to a high system pressure or a sudden depressurization.

P6: The inboard drywell spray valve is normally closed cool. This valve may have to open when ambient temperatures are higher. The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking. In addition, due to the solid wedge design this valve is not susceptible to pressure locking.

Valve Number: 1(2)-1001-26B

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number: 1(2)-1001-29A

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☒

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☒
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The inboard LPCI injection valve is a 16" flex wedge gate valve.

T2: During LPCI mode of operation the inboard LPCI injection valve has water from the suppression pool flowing through it and during the shutdown cooling mode water exiting the RHR heat exchanger flows through it. During the LPCI mode the maximum suppression pool temperature is 170 degrees. The normal operating shutdown cooling mode subjects the valve to water at a temperature greater than 150 degrees above ambient when this mode is first initiated. If shutdown cooling is shifted from the loop this valve is in to the other loop or secured shortly after starting shutdown cooling the valve may close at an elevated temperature. This valve is opened and closed monthly by surveilance testing and history shows it does not thermally bind.

T3: The inboard LPCI injection valve is normally closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

T4: The inboard LPCI injection valve is normally closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

Valve Number: 1(2)-1001-29A

PRESSURE LOCK EVALUATION

Results (Yes/No): ☒

P1 Is the valve of a solid wedge design:	☐
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☒
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The inboard LPCI injection valve is a 16" flex wedge gate valve.

P2: The inboard LPCI injection valve's process fluid is water.

P3: The inboard LPCI injection valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The inboard LPCI injection valve is normally closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

P5: The inboard LPCI injection valve is subjected to reactor pressure if the check valve located between it and the vessel leaks by. In the case of a LOCA the valve could experience a sudden depressurization and be susceptible to pressure locking.

P6: The inboard LPCI injection valve is normally closed at ambient temperature. This valve may have to open when ambient temperatures are higher. The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking.

Valve Number: 1(2)-1001-29A

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1001-29B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☒

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☒
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The inboard LPCI injection valve is a 16" flex wedge gate valve.

T2: During LPCI mode of operation the inboard LPCI injection valve has water from the suppression pool flowing through it and during the shutdown cooling mode water exiting the RHR heat exchanger flows through it. During the LPCI mode the maximum suppression pool temperature is 170 degrees. The normal operating shutdown cooling mode subjects the valve to water at a temperature greater than 150 degrees above ambient when this mode is first initiated. If shutdown cooling is shifted from the loop this valve is in to the other loop or secured shortly after starting shutdown cooling the valve may close at an elevated temperature. This valve is opened and closed monthly by surveilance testing and history shows it does not thermally bind.

T3: The inboard LPCI injection valve is normally closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

T4: The inboard LPCI injection valve is normally closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

Valve Number: 1(2)-1001-29B

PRESSURE LOCK EVALUATION

Results (Yes/No): ☒

P1 Is the valve of a solid wedge design:	☐
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☒
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The inboard LPCI injection valve is a 16" flex wedge gate valve.

P2: The inboard LPCI injection valve's process fluid is water.

P3: The inboard LPCI injection valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The inboard LPCI injection valve is normally closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

P5: The inboard LPCI injection valve is subjected to reactor pressure if the check valve located between it and the vessel leaks by. In the case of a LOCA the valve could experience a sudden depressurization and be susceptible to pressure locking.

P6: The inboard LPCI injection valve is normally closed at ambient temperature. This valve may have to open when ambient temperatures are higher. The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking.

Valve Number: 1(2)-1001-29B

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1001-34A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The suppression pool cooling isolation valve is a 16" flex wedge gate valve.

T2: Initially the suppression pool cooling isolation valve is closed at ambient temperature. When suppression pool cooling/spray is initiated the valve is subjected to suppression pool water temperature after exiting the RHR heat exchanger. The maximum expected suppression pool temperature is 140 degrees. This valve is located above the torus with and environmental temperature of approximately 100 degrees

T3: Initially the suppression pool cooling isolation valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

T4: Initially the suppression pool cooling isolation valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

Valve Number:	1(2)-1001-34A

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☐
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The suppression pool cooling isolation valve is a 16" flex wedge gate valve.

P2: The suppression pool cooling isolation valve's process fluid is water.

P3: The suppression pool cooling isolation valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The suppression pool cooling isolation valve is initially closed at ambient temperature. The valve is isolated from the torus by the 1001-36A valve and the colum of water between these two valves.

P5: The suppression pool cooling isolation valve is never exposed to a high system pressure or a sudden depressurization.

P6: The suppression pool cooling isolation valve is normally closed cool. This valve may have to open when ambient temperatures are higher. The valve body is insulated and therefore not subjected to a rapid temperature transient.

Valve Number: 1(2)-1001-34A

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1001-34B	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveillance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The suppression pool cooling isolation valve is a 16" flex wedge gate valve.

T2: Initially the suppression pool cooling isolation valve is closed at ambient temperature. When suppression pool cooling/spray is initiated the valve is subjected to suppression pool water temperature after exiting the RHR heat exchanger. The maximum expected suppression pool temperature is 140 degrees. This valve is located above the torus with and environmental temperature of approximately 100 degrees

T3: Initially the suppression pool cooling isolation valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

T4: Initially the suppression pool cooling isolation valve is closed at ambient temperature. The valve is located in the system where it is not heated without flow through the valve which requires it to be open before any heating.

Valve Number: 1(2)-1001-34B

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

- P1 Is the valve of a solid wedge design: ☐
- P2 Does the valve contain compressible gas and can not be filled with liquid: ☐
- P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S) ☒
- P4 Is the valve closed cold and opened from full closed at a higher process temperature: ☐
- P5 Is the valve subjected to high system pressure and opened after sudden depressurization: ☐
- P6 Is the valve closed cold and opened from full closed at a higher ambient temperature: ☒

P1: The suppression pool cooling isolation valve is a 16" flex wedge gate valve.

P2: The suppression pool cooling isolation valve's process fluid is water.

P3: The suppression pool cooling isolation valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The suppression pool cooling isolation valve is initially closed at ambient temperature. The valve is isolated from the torus by the 1001-36A valve and the colum of water between these two valves.

P5: The suppression pool cooling isolation valve is never exposed to a high system pressure or a sudden depressurization.

P6: The suppression pool cooling isolation valve is normally closed cool. This valve may have to open when ambient temperatures are higher. The valve body is insulated and therefore not subjected to a rapid temperature transient.

Valve Number: 1(2)-1001-34B

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-1301-49	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☒

T1: This RCIC injection valve is a 4" flex wedge gate valve.

T2: Normally the RCIC injection valve is closed either at ambient temperature or after running the RCIC injection test where the process fluid is water from the CCST or the Suppression Pool which is cool. During an accident where the RCIC system is being started and stopped automatically depending on vessel level the valve could see water at an elevated temperature from the supression pool. When the system is operating during injection and gets a signal to stop the valve remains open.

T3: Normally the RCIC injection valve is closed either at ambient temperature or after running the RCIC injection test where the process fluid is water from the CCST or the Suppression Pool which is cool. Due to the valve's proximity to the feedwater and Reactor Water Cleanup lines the valve increases in temperature during normal plant operations from conduction. The valve is then always opened at this elevated temperature prior to cooling down.

T4: Normally the RCIC injection valve is closed either at ambient temperature or after running the RCIC injection test where the process fluid is water from the CCST or the Suppression Pool which is cool. Due to the valve's proximity to the feedwater and Reactor Water Cleanup lines the valve increases in temperature during normal plant operations from conduction. The valve is then always opened at this elevated temperature prior to cooling down. Quad Cities Station runs surveilances where RCIC injects to the vessel through this valve in this scenario and has never experienced thermal binding.

Valve Number: 1(2)-1301-49

PRESSURE LOCK EVALUATION

Results (Yes/No): ☒

P1 Is the valve of a solid wedge design:	☐
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☒
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☒
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☒

P1: The RCIC injection valve is a flex wedge design.

P2: The RCIC injection valve's process fluid is water.

P3: The RCIC injection valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: Normally the RCIC injection valve is closed either at ambient temperature or after running the RCIC injection test where the process fluid is water from the CCST or the Suppression Pool which is cool. Due to the valve's proximity to the feedwater and Reactor Water Cleanup lines the valve increases in temperature and pressure during normal plant operations. Feedwater pressure will force hot fluid into the bonnet at the feedwater pressure. Quad Cities Station runs surveilances where RCIC injects to the vessel through this valve in this scenario and has never experienced pressure locking.

P5: The RCIC injection valve is normally closed. Assuming leakage past the downstream check valve (1-1301-50) the valve is subjected to feedwater system pressure. During a LOCA with loss of offsite power where feedwater is lost the valve would see a sudden depressurization on the downstream side. The valve would open prior to achieving full pump pressure. Therefore the upstream and downstream pressure are both low and the bonnet cavity is pressurized.

P6: The valve body and bonnet area are insulated which prevents sufficient conductance of heat into the valve from external sources to cause pressure locking.

Valve Number: 1(2)-1301-49

S1 Is there an undrained leg of piping between the valve and an unisolated steam source:

S2 Is the valve located below the source of steam:

S3 Is the valve subject to heating after it has been exposed to water prior to opening:

S1:

S2:

S3:

Valve Number:	1(2)-1402-25A	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The core spray inboard injection valve is a 10" flex wedge gate valve.

T2: The core spray inboard injection valve is normally closed. The valve is normally closed at ambient temperature or after surveilance testing it is closed at a slightly elevated temperature due to conductive/convective heating when the unit is operating. When the unit is operating this slightly elevated temperature is steady state with no cooling. During an accident the process fluid is water from the suppression pool with a maximum temperature of 170 degrees.

T3: The core spray inboard injection valve is normally closed. The valve is normally closed at ambient temperature or after surveilance testing it is closed at a slightly elevated temperature due to conductive/convective heating when the unit is operating. When the unit is operating this slightly elevated temperature is steady state with no cooling before opening.

T4: The core spray inboard injection valve is normally closed. The valve is normally closed at ambient temperature or after surveilance testing it is closed at a slightly elevated temperature due to conductive/convective heating when the unit is operating. When the unit is operating this slightly elevated temperature is steady state with no cooling before opening. This temperture transient is not considered sufficient to cause thermal binding. This valve has opened successfully under the above conditions during the monthly surveilance.

Valve Number: 1(2)-1402-25A

PRESSURE LOCK EVALUATION

Results (Yes/No): ☒

P1 Is the valve of a solid wedge design:	☐
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☒
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☒
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☐

P1: The core spray inboard injection valve is a 10" flex wedge gate valve.

P2: The core spray inboard injection valve's process fluid is water.

P3: The core spray inboard injection valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The core spray inboard injection valve is normally closed. If the valve is closed at ambient temperature and the unit is started up the temperature and pressure will gradually increase to a slightly elevated steady state temperature and reactor pressure. Because the temperature increase to a slightly elevated steady state temperature is gradual any pressure increase due to it is gradual and has sufficient time equalize with system pressure. This valve has operated successfully during the monthly surveilance.

P5: The core spray inboard injection valve is normally closed. When the unit is operating the valve will be subjected to reactor pressure assuming the testable check valve leaks by. During a LOCA the valve may experience a sudden depressurization.

P6: The core spray inboard injection valve is normally closed. In the event of a LOCA the valve would acuate to the safety function open position before any external heating could cause a pressure buildup in the bonnet cavity.

Valve Number: 1(2)-1402-25A

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number: 1(2)-1402-25B

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The core spray inboard injection valve is a 10" flex wedge gate valve.

T2: The core spray inboard injection valve is normally closed. The valve is normally closed at ambient temperature or after surveilance testing it is closed at a slightly elevated temperature due to conductive/convective heating when the unit is operating. When the unit is operating this slightly elevated temperature is steady state with no cooling. During an accident the process fluid is water from the suppression pool with a maximum temperature of 170 degrees.

T3: The core spray inboard injection valve is normally closed. The valve is normally closed at ambient temperature or after surveilance testing it is closed at a slightly elevated temperature due to conductive/convective heating when the unit is operating. When the unit is operating this slightly elevated temperature is steady state with no cooling before opening.

T4: The core spray inboard injection valve is normally closed. The valve is normally closed at ambient temperature or after surveilance testing it is closed at a slightly elevated temperature due to conductive/convective heating when the unit is operating. When the unit is operating this slightly elevated temperature is steady state with no cooling before opening. This temperture transient is not considered sufficient to cause thermal binding. This valve has opened successfully under the above conditions during the monthly surveilance.

Valve Number: 1(2)-1402-25B

PRESSURE LOCK EVALUATION

Results (Yes/No): ☒

- P1 Is the valve of a solid wedge design: ☐
- P2 Does the valve contain compressible gas and can not be filled with liquid: ☐
- P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S) ☒
- P4 Is the valve closed cold and opened from full closed at a higher process temperature: ☒
- P5 Is the valve subjected to high system pressure and opened after sudden depressurization: ☒
- P6 Is the valve closed cold and opened from full closed at a higher ambient temperature: ☐

P1: The core spray inboard injection valve is a 10" flex wedge gate valve.

P2: The core spray inboard injection valve's process fluid is water.

P3: The core spray inboard injection valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The core spray inboard injection valve is normally closed. If the valve is closed at ambient temperature and the unit is started up the temperature and pressure will gradually increase to a slightly elevated steady state temperature and reactor pressure. Because the temperature increase to a slightly elevated steady state temperature is gradual any pressure increase due to it is gradual and has sufficient time equalize with system pressure. This valve has operated successfully during the monthly surveilance.

P5: The core spray inboard injection valve is normally closed. When the unit is operating the valve will be subjected to reactor pressure assuming the testable check valve leaks by. During a LOCA the valve may experience a sudden depressurization.

P6: The core spray inboard injection valve is normally closed. In the event of a LOCA the valve would acuate to the safety function open position before any external heating could cause a pressure buildup in the bonnet cavity.

Valve Number:	1(2)-1402-25B

S1 Is there an undrained leg of piping between the valve and an unisolated steam source:

S2 Is the valve located below the source of steam:

S3 Is the valve subject to heating after it has been exposed to water prior to opening:

S1:

S2:

S3:

Valve Number:	1(2)-2301-3	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		[ ]	[X]
G2 Is the valve required to open from fully closed by the EOP's:		[ ]	[X]
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		[ ]	[ ]

THERMAL BINDING EVALUATION

Results (Yes/No): [ ]

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	[X]
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	[ ]
T3 Is the valve closed cool but later heated and then recooled prior to opening:	[ ]
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	[ ]

T1: The HPCI turbine steam supply valve is a 10" flex wedge gate valve.

T2: The HPCI turbine steam supply valve is normally closed in the standby line-up. In the standby line-up the valve is subjected to steam and is always hot. The valve is closed hot after stroke testing or HPCI flow testing and does not cool prior to opening when HPCI is initiated. After unit shutdown or when HPCI is isolated for maintenance during unit operation the valve may cool prior to opening. In these cases HPCI is tested during start up (low and high pressure testing) and after maintenance to declare the system operable. Because of this the valve is always closed hot and remains hot prior to an initiation signal.

T3: The HPCI turbine steam supply valve is normally closed in the standby line-up. In the standby line-up the valve is subjected to steam and is always hot. The valve is closed hot after stroke testing or HPCI flow testing and does not cool prior to opening when HPCI is initiated. After unit shutdown or when HPCI is isolated for maintenance during unit operation the valve may cool prior to opening. In these cases HPCI is tested during start up (low and high pressure testing) and after maintenance to declare the system operable. Because of this the valve is always closed hot and remains hot prior to an initiation signal.

T4: The HPCI turbine steam supply valve is normally closed in the standby line-up. In the standby line-up the valve is subjected to steam and is always hot. The valve is closed hot after stroke testing or HPCI flow testing and does not cool prior to opening when HPCI is initiated. After unit shutdown or when HPCI is isolated for maintenance during unit operation the valve may cool prior to opening. In these cases HPCI is tested during start up (low and high pressure testing) and after maintenance to declare the system operable. Because of this the valve is always closed hot and remains hot prior to an initiation signal.

Valve Number: 1(2)-2301-3

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design: ☐

P2 Does the valve contain compressible gas and can not be filled with liquid: ☐

P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S) ☐

P4 Is the valve closed cold and opened from full closed at a higher process temperature: ☐

P5 Is the valve subjected to high system pressure and opened after sudden depressurization: ☐

P6 Is the valve closed cold and opened from full closed at a higher ambient temperature: ☐

P1: The HPCI turbine steam supply valve is a 10" flex wedge gate valve.

P2: The HPCI turbine steam supply valve's process fluid is steam.

P3: The HPCI turbine steam supply valve's process fluid is steam. To allow for rapid starting of the HPCI turbine the steam supply line from the reactor to the valve is kept warm and pressurized with steam. Part of this system includes drain pots that drain condesate from the line which prevents the bonnet cavity of this valve from being filled with water. The valve orientation prevents water condensation in the bonnet.

P4: The HPCI turbine steam supply valve is normally closed in the standby line-up. In the standby line-up the valve is subjected to steam and is always hot. The valve is closed hot after stroke testing or HPCI flow testing and does not cool prior to opening when HPCI is initiated. After unit shutdown or when HPCI is isolated for maintenance during unit operation the valve may cool prior to opening. In these cases HPCI is tested during start up (low and high pressure testing) and after maintenance to declare the system operable. Because of this the valve is always closed hot and remains hot prior to an initiation signal.

P5: The HPCI turbine steam supply valve is subjected to high system pressure. The valve does not have to open after a sudden depressurization.

P6: The HPCI turbine steam supply valve is subjected to high system temperature. Due to testing the valve is always closed at a high temperature prior to an initiation signal. The valve is not subjected to a high ambient temperature.

Valve Number:	1(2)-2301-3

S1	Is there an undrained leg of piping between the valve and an unisolated steam source:	☐
S2	Is the valve located below the source of steam:	☒
S3	Is the valve subject to heating after it has been exposed to water prior to opening:	☐

S1: The HPCI turbine steam supply valve is not located in an undrained leg of piping. There are drain pots/ steam traps that keep the line drained of condensate.

S2: The HPCI turbine steam supply valve is located below the source of steam. It is located in the HPCI room which is well below the reactor main steam line.

S3: The HPCI turbine steam supply valve is not located in an undrained leg of piping. There are drain pots/ steam traps that keep the line drained of condensate.

Valve Number:	1(2)-2301-35	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The HPCI outboard suppression pool suction valve is a 16" solid wedge gate valve.

T2: The HPCI outboard suppression pool suction valve is normally closed at ambient temperature. If this valve is open when HPCI suction is lined up to the suppression pool the process fluid is suppression pool water with a maximum temperature of 140 degrees. This temperature is based on the maximum expected temperature following a LOCA while the reactor is still at pressure which requires HPCI to be operating. If this valve is closed at this elevated temperature during an accident it would be for containment isolation or when terminating HPCI operation. The valve would then not be required to open again.

T3: The HPCI outboard suppression pool suction valve is normally closed at ambient temperature. When closed this valve is isolated from the suppression pool by the HPCI inboard suppression pool suction valve. This prevents any heating and subsequent cooling prior to opening the valve.

T4: The HPCI outboard suppression pool suction valve is normally closed at ambient temperature. When closed this valve is isolated from the suppression pool by the HPCI inboard suppression pool suction valve. This prevents any heating prior to opening the valve.

Valve Number: 1(2)-2301-35

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

- P1 Is the valve of a solid wedge design: ☒
- P2 Does the valve contain compressible gas and can not be filled with liquid: ☐
- P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S) ☒
- P4 Is the valve closed cold and opened from full closed at a higher process temperature: ☐
- P5 Is the valve subjected to high system pressure and opened after sudden depressurization: ☐
- P6 Is the valve closed cold and opened from full closed at a higher ambient temperature: ☐

P1: The HPCI outboard suppression pool suction valve is a 16" solid wedge gate valve.

P2: The HPCI outboard suppression pool suction valve's process fluid is water.

P3: The HPCI outboard suppression pool suction valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The HPCI outboard suppression pool suction valve is normally closed at ambient temperature. When closed this valve is isolated from the suppression pool by the HPCI inboard suppression pool suction valve. This prevents any heating prior to opening the valve.

P5: The HPCI outboard suppression pool suction valve is not subjected to high system pressure or sudden depressurization.

P6: The HPCI outboard suppression pool suction valve is normally closed at ambient temperature. The valve is located in the HPCI room and is not subjected to high ambient temperatures unless there is a steam leak or line break in the room. In the event of a steam leak or line break in the room it would be caused by the HPCI system and the system would be shut down so the valve would not be required to open. This valve is a solid wedge design.

Valve Number: 1(2)-2301-35

S1 Is there an undrained leg of piping between the valve and an unisolated steam source:

S2 Is the valve located below the source of steam:

S3 Is the valve subject to heating after it has been exposed to water prior to opening:

S1:

S2:

S3:

Valve Number: 1(2)-2301-36

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☒

T1: The HPCI inboard suppression pool suction valve is a 16" solid wedge gate valve.

T2: The HPCI inboard suppression pool suction valve is normally closed at ambient temperature. If this valve is open when HPCI suction is lined up to the suppression pool the process fluid is suppression pool water with a maximum temperature of 140 degrees. This temperature is based on the maximum expected temperature following a LOCA while the reactor is still at pressure which requires HPCI to be operating. If this valve is closed at this elevated temperature during an accident it would be for containment isolation or when terminating HPCI operation. The valve would then not be required to open again.

T3: The HPCI inboard suppression pool suction valve is normally closed at ambient temperature. When closed this valve is subjected to a temperature less than 140 degrees through conductive/convective heating from the suppression pool during an accident. The valve would not cool from this elevated temperature prior to opening.

T4: The HPCI inboard suppression pool suction valve is normally closed at ambient temperature. This valve is located below the torus and is insulated by a column of water. The temperature at the valve will not change appreciably.

Valve Number: 1(2)-2301-36

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☒
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☐

P1: The HPCI inboard suppression pool suction valve is a 16" solid wedge gate valve.

P2: The HPCI inboard suppression pool suction valve's process fluid is water.

P3: The HPCI inboard suppression pool suction valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The HPCI inboard suppression pool suction valve is normally closed at ambient temperature. When closed this valve is subjected to a temperature less than 140 degrees through conductive/convective heating from the suppression pool during an accident. Solid wedge gate valves are not susceptible to pressure locking.

P5: The HPCI inboard suppression pool suction valve is not subjected to high system pressure or sudden depressurization.

P6: The HPCI inboard suppression pool suction valve is normally closed at ambient temperature. The valve is located in the HPCI room and is not subjected to high ambient temperatures unless there is a steam leak or line break in the room. In the event of a steam leak or line break in the room it would be caused by the HPCI system and the system would be shut down so the valve would not be required to open. The HPCI system isolates when the area temperature reaches 170 degrees. Solid wedge gate valves are not susceptible to pressure locking.

Valve Number:	1(2)-2301-36

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

Valve Number:	1(2)-2301-48	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☐
G2 Is the valve required to open from fully closed by the EOP's:		☒	☐
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☒

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The HPCI cooling water return to pump valve is a 4" solid wedge gate valve.

T2: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve is normally subjected to CCST water or suppression pool water at a temperature slightly higher than ambient due to heat from cooling the lube oil and condensate from gland seal steam. The valve is not closed with a high process fluid temperature.

T3: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve is normally subjected to CCST water or suppression pool water at a temperature slightly higher than ambient due to heat from cooling the lube oil and condensate from gland seal steam. The valve is not heated and recooled prior to opening.

T4: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve is normally subjected to CCST water or suppression pool water at a temperature slightly higher than ambient due to heat from cooling the lube oil and condensate from gland seal steam. The valve is not subjected to differential heating prior to opening.

Valve Number: 1(2)-2301-48

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

- P1 Is the valve of a solid wedge design: ☒
- P2 Does the valve contain compressible gas and can not be filled with liquid: ☐
- P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S) ☒
- P4 Is the valve closed cold and opened from full closed at a higher process temperature: ☐
- P5 Is the valve subjected to high system pressure and opened after sudden depressurization: ☐
- P6 Is the valve closed cold and opened from full closed at a higher ambient temperature: ☐

P1: The HPCI cooling water return to pump valve is a 4" solid wedge gate valve.

P2: The HPCI cooling water return to pump valve's process fluid is water.

P3: The HPCI cooling water return to pump valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve is normally subjected to CCST water or suppression pool water at a temperature slightly higher than ambient due to heat from cooling the lube oil and condensate from gland seal steam. The valve is not closed at a higher process temperature.

P5: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve is not subject to high pressure or sudden depressurization.

P6: The HPCI cooling water return to pump valve is normally open in the standby line-up. The valve is not opened from fully closed at a high ambient temperature.

Valve Number: 1(2)-2301-48

S1 Is there an undrained leg of piping between the valve and an unisolated steam source:

S2 Is the valve located below the source of steam:

S3 Is the valve subject to heating after it has been exposed to water prior to opening:

S1:

S2:

S3:

Valve Number: 1(2)-2301-6

	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:	☐	☒
G2 Is the valve required to open from fully closed by the EOP's:	☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:	☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☐

T1: The HPCI condensate storage tank (CCST) suction valve is a 16" solid wedge gate valve

T2: The HPCI condensate storage tank (CCST) suction valve is normally closed at ambient temperature. The valve's process fluid is water from the CCST which is at ambient temperature or below depending on the time of year. The valve is not closed at an elevated temperature.

T3: The HPCI condensate storage tank (CCST) suction valve is normally closed at ambient temperature. The valve's process fluid is water from the CCST which is at ambient temperature or below depending on the time of year. The valve is not closed at an elevated temperature.

T4: The HPCI condensate storage tank (CCST) suction valve is normally closed at ambient temperature. The valve's process fluid is water from the CCST which is at ambient temperature or below depending on the time of year. The valve is not closed at an elevated temperature.

Valve Number: 1(2)-2301-6

PRESSURE LOCK EVALUATION

Results (Yes/No): ☐

P1 Is the valve of a solid wedge design:	☒
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☐
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☐
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☐

P1: The HPCI condensate storage tank (CCST) suction valve is a 16" solid wedge gate valve.

P2: The HPCI condensate storage tank (CCST) suction valve's process fluid is water.

P3: The HPCI condensate storage tank (CCST) suction valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: The HPCI condensate storage tank (CCST) suction valve is normally closed at ambient temperature. The valve's process fluid is water from the CCST which is at ambient temperature or below depending on the time of year. The valve is not closed at an elevated temperature.

P5: The HPCI condensate storage tank (CCST) suction valve is not subjected to high system pressure or sudden depressurization.

P6: The HPCI condensate storage tank (CCST) suction valve is normally closed at ambient temperature. The valve is located in the HPCI room and is not subjected to high ambient temperatures unless there is a steam leak or line break in the room. In the event of a steam leak or line break in the room it would be caused by the HPCI system and the system would be shut down so the valve would not be required to open. The HPCI system isolates when the area temperature reaches 170 degrees.

Valve Number: 1(2)-2301-6

S1 Is there an undrained leg of piping between the valve and an unisolated steam source:

S2 Is the valve located below the source of steam:

S3 Is the valve subject to heating after it has been exposed to water prior to opening:

S1:

S2:

S3:

Valve Number:	1(2)-2301-8	NonSRLDB	SRLDB
G1 Is the function of the valve to open under normal or accident conditions:		☐	☒
G2 Is the valve required to open from fully closed by the EOP's:		☐	☒
G3 Is the valve closed for system operation surveilance testing with a safety function to reopen:		☐	☐

THERMAL BINDING EVALUATION

Results (Yes/No): ☐

T1 Is the valve a wedge type gate? (solid, flex, double disc, or split wedge):	☒
T2 Is the valve closed with a hot process fluid then opened after the valve has cooled:	☐
T3 Is the valve closed cool but later heated and then recooled prior to opening:	☐
T4 Is the valve closed cool but later subjected to process fluid differential heating prior to opening:	☒

T1: The HPCI injection valve is a 14" flex wedge gate valve.

T2: The HPCI injection valve is normally closed in the standby line-up. The valve is normally closed cool when the unit is shut down. This valve does not see flow through it during surveilance testing. The process fluid for this valve is water from the CCST or suppression pool. The water from the CCST is cool and the water from the suppression pool has a maximum expected temperature of 140 degrees. These temperatures are not high enough to cause thermal binding after the valve cools.

T3: The HPCI injection valve is normally closed in the standby line-up. The valve is normally closed cool when the unit is shut down. This valve does not see flow through it during surveilance testing. After the unit is started up this valve heats up due to conductive/convective heating from the proximity to the feedwater line. The valve does not cool down again until the unit is shut down so it does not cool prior to opening.

T4: The HPCI injection valve is normally closed in the standby line-up. The valve is normally closed cool when the unit is shut down. This valve does not see flow through it during surveilance testing. After the unit is started up this valve heats up due to conductive/convective heating from the proximity to the feedwater line. This heat up prior to opening does not cause thermal binding in the valve. The valve is opened quarterly for stroke testing so it is shown to open after heating. The initial stroke test after unit start up opens and closes the valve at the elevated temperature.

Valve Number: 1(2)-2301-8

PRESSURE LOCK EVALUATION

Results (Yes/No): ☒

P1 Is the valve of a solid wedge design:	☐
P2 Does the valve contain compressible gas and can not be filled with liquid:	☐
P3 Is the valve susceptible to fluid entering the bonnet cavity: (For steam valves do section S)	☒
P4 Is the valve closed cold and opened from full closed at a higher process temperature:	☒
P5 Is the valve subjected to high system pressure and opened after sudden depressurization:	☒
P6 Is the valve closed cold and opened from full closed at a higher ambient temperature:	☐

P1: The HPCI injection valve is a 14" flex wedge gate valve.

P2: The HPCI injection valve's process fluid is water.

P3: The HPCI injection valve is in a water filled system so the bonnet cavity is assumed to be filled with water.

P4: If the valve is closed at ambient temperature and the unit is started up the temperature and pressure will gradually increase to an elevated steady state temperature and reactor pressure, concurrently. The valve is opened quarterly for stroke testing so it is shown to open after heating. The initial stroke test after unit start up opens and closes the valve at the elevated temperature.

P5: The HPCI injection valve is subjected to reactor feedwater pressure assuming the HPCI discharge check valve leaks by. If reactor feedwater is lost and the reactor feedwater check valves leak by the valve could see a sudden depressurization.

P6: The elevated valve temperature eliminates any possible heat transfer from ambient.

Valve Number: 1(2)-2301-8

S1 Is there an undrained leg of piping between the valve and an unisolated steam source: ☐

S2 Is the valve located below the source of steam: ☐

S3 Is the valve subject to heating after it has been exposed to water prior to opening: ☐

S1:

S2:

S3:

QUAD CITIES STATION

ATTACHMENT 3

PRESSURE LOCKING AND THERMAL BINDING CALCULATIONS