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February 13, 1996

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
US Nuclear Regulatory Commission
Mail Station PI-137
Washington, D.C. 20555

SUBJECT: 10 CFR 50.54 (f) Notification in Response to NRC Generic Letter 95-07: Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves

Pursuant to 10 CFR 50.54 (f), this letter shall serve as Consolidated Edison's (Con Edison) 180 day written response to the subject generic letter.

Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related, Power-Operated Gate Valves," dated August 17, 1995, requires nuclear utilities to address the susceptibility of Safety-Related Power-Operated Gate Valves to Pressure Locking and Thermal Binding and to evaluate these valves for operability.

Con Edison's previous evaluations on the issue of Pressure Locking and Thermal Binding for Safety-Related Power-Operated Gate Valves at Indian Point Unit No.2 are as follows:

a) "Evaluation of G/L 89-10 MOVs for Pressure Locking and Thermal Binding (Calc. No. MEX-00131-00)," dated April 1995. This was reviewed in US NRC IE Inspection Report 95-04, dated 5/4/95.

b) "Evaluation of G/L 95-07 AOVs for Pressure Locking and Thermal Binding," dated November 1995. This was submitted on November 15, 1995.

Con Edison reviewed the above listed evaluations and determined that they are consistent with the most recent information obtained from the NRC Region I public workshop on November 2, 1995 and the Westinghouse Owners Group - Pressure Locking and Thermal Binding Task Team Meeting on January 4-5, 1996.

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As a result of these reviews, Con Edison maintains that all Safety-Related Power-Operated Gate Valves at Indian Point 2 can satisfactorily perform their required function and will not prevent the plant from achieving safe shutdown. The thrust margins shown for these valves are considerable; the smallest actuator thrust margin computed for any of the valves was 40%.

The enclosed attachments contain excerpts from the above listed evaluations that:

a) summarize the screening criteria used to determine which valves would be susceptible to Pressure Locking and Thermal Binding.

b) provide a list of all valves evaluated for Pressure Locking and Thermal Binding.

c) document the method used for determining valve operability.

Further details, tables and references can be found in the full documents. Should you or your staff have any concerns regarding this matter, please contact Mr. Charles W. Jackson, Manager, Nuclear Safety & Licensing.

Very truly yours,

for S. E. Quinn

Subscribed and sworn to
before me this 13th day
of February 1996.

Notary Public

Karen L. Lancaster

KAREN L. LANCASTER
Notary Public, State of New York
No. 60-4643659
Qualified In Westchester County
Term Expires 9/30/97

attachment 1

ATTACHMENT 1 CLARIFICATION NOTES

1) Section 1.0 - thermal insulation was added to valves 731 ,889A, 889B, 1802A, and 1802B during the 1991 Refueling Outage.

2) Section 1.0 - the 52 power operated gate valves includes 50 MOVs and 2 AOVs.

3) Section 3.1 - the 132 MOVs included in the G/L 89-10 Program Plan contains motor operated gate, butterfly, and globe valves. 50 MOVs are gate valves. See Appendix A, Table A-1 of Con Edison's report titled, "Evaluation of G/L 89-10 MOVs for Pressure Locking and Thermal Binding (Cal. No. MEX-00131-00), for the complete list of 132 MOVs.

4) Section 3.4.4 - "...this report...," refers to Con Edison's document titled, "Evaluation of G/L 89-10 MOVs for Pressure Locking and Thermal Binding (Calc. No. MEX-00131-00).

INDIAN POINT UNIT NO. 2

EVALUATION OF G/L 89-10 MOVs

FOR

PRESSURE LOCKING AND THERMAL BINDING

April, 1995

Prepared by

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EXECUTIVE SUMMARY

This evaluation was performed to determine if Indian Point Unit No. 2 Motor Operated Valves are susceptible to Pressure Locking and/or Thermal Binding. The evaluation was done by the Mechanical Projects and Programs Section of Nuclear Power Engineering, with assistance from Nuclear Safety and Licensing, System Engineering, B&W Nuclear Technologies, Altran, and Tenera LP. The results were reviewed and concurred by Nuclear Safety and Licensing.

The results of the evaluation identified that potential Pressure Locking and Thermal Binding conditions will not prevent the plant from achieving safe shutdown, as all valves evaluated remain operable. This conclusion is based on valve design, plant valve configuration during normal, accident and post accident operating modes, and sufficient actuator thrust to open the valve. The valve thrust calculations show that for the most limiting valve, there is a 40% actuator thrust margin available for opening. The details of the system and valve evaluations considered are documented in this report.

1.0 BACKGROUND

In response to INPO SOER 84-7, Con Edison commissioned Tenera LP to evaluate 52 power operated gate valves which were selected by Con Edison for susceptibility to the Pressure Locking and/or Thermal Binding (PLTB) phenomena (see Reference No. 3). This effort preceded Generic Letter (G/L) 89-10 and was performed and completed in 1991, independent of the 89-10 effort. The Tenera evaluation included the 50 gate valves that are part of the 89-10 MOV program (see Reference No. 20). The Tenera evaluation concluded that thermal insulation needed to be added to valves 731, 889A, 889B, 1802A and 1802B to prevent overpressurization of the valve bonnet due to Thermal Induced Pressure Locking. Modification package MMS-91-06338-M was prepared to implement the addition of thermal insulation under Project Number 06338-91 in the 1991 Refueling Outage. The Tenera evaluation however did not assess the ability of the actuator to reposition a potentially pressure locked or thermally bound valve. To assure that the Indian Point Unit No. 2 Plant MOVs are protected from the Pressure Locking and Thermal Binding phenomena, a second evaluation was conducted on all the valves under the Indian Point Station G/L 89-10 MOV Program Plan. This second evaluation made use of the Tenera LP Report (see Reference No. 3), the current Indian Point Station G/L 89-10 MOV Program Plan (see Reference No. 20), the Altran MOV Thrust Calculations (see Reference No. 16), B&W MOVE Program (see Reference No. 19), and the B&W MOV Differential Pressure Calculations (see Reference No. 15). This evaluation focuses on the ability of the actuator to reposition a potentially susceptible MOV.

2.0 PURPOSE

The purpose of this evaluation is to determine the number of MOVs in the G/L 89-10 Program that are potentially susceptible to PLTB. A four step screening process was used to identify those valves. For those MOVs that are potentially susceptible, an evaluation will be presented taking advantage of all previous MOV evaluations to the extent practical. All G/L 89-10 MOVs that are potentially susceptible will be dispositioned by using the following methods:

- Providing a technical basis demonstrating that PLTB will not occur because the actuator is capable of providing sufficient thrust to open the valve without damaging the valve or actuator.

- Providing either written administrative controls or a valve modification to prevent PLTB from occurring if the actuator is not capable of providing sufficient thrust to overcome PLTB.

3.0 SCREENING

3.1 FIRST SCREENING - G/L 89-10 Program Plan

There are presently 132 MOVs included in the G/L 89-10 population (per the G/L 89-10 MOV Program Plan). See Appendix A, Table A-1 for list of the 132 MOVs included in the first screening.

3.2 SECOND SCREENING - Motor Operated Gate Valves

PLTB phenomena applies to gate valves (per INPO SOER 84-7 and USNRC-NUREG-1275, see Reference No. 2). Within the Indian Point Station G/L 89-10 Program Plan population there are 50 motor operated gate valves (see Appendix A, Table A-2).

Tag numbers for motor operated gate valves are as follows:

205	746	850B	883	894B	222
747	851A	885A	894C	333	769
851B	885B	894D	535	784	866A
887A	2-21	536	786	866B	887B
2-22	730	789	866C	888A	625
731	797	866D	888B	112C	744
822A	869A	889A	1802A	745A	822B
869B	889B	1802B	745B	1810A	882
894A	1810				

3.3 THIRD SCREENING - Gate Valves Required to Open Under Accident Conditions

Gate valves are subject to PLTB when in the closed position. It is therefore necessary to review the above 50 gate valves to determine the normal position of the valve and whether it would be closed, and subsequently required to open at any time to mitigate the consequences of an accident. To determine this, the B&W Differential Pressure Calculations (see Reference No. 15) prepared to support the G/L 89-10 effort were reviewed for these 50 valves. The differential pressure calculations identify the valves' normal position and the scenarios (if any) for which the valves may be required to close and subsequently reopen. The results of this review is shown on Appendix A, Table A-2. Table A-2 divides the 50 gate valves into two categories, those subject to PLTB and those that are not. There are 23 valves that are susceptible to possible PLTB and require further analysis.

The tag numbers for these motor operated valves are:

333	822A	822B	885A	885B
889A	889B	535	536	866A
866B	866C	866D	746	747
1802A	1802B	730	731	888A
888B	744	LCV-112C		

The other 27 valves are normally in the open position and either remain open or once closed, do not have a safety function to reopen for any accident condition.

3.4 FOURTH SCREENING - Design Analysis for MOVs Susceptible to PLTB

3.4.1 Types of Gate Valves and their Susceptibility to either Pressure Locking or Thermal Binding

PLTB predominately occurs only to a particular type of gate valve. As described in NUREG 1275 (see Reference No.2), gate valves may be susceptible to either phenomena, based on its application as well as its design. There are several types of gate valves; solid wedge, flexible wedge, split wedge, and double disc parallel seat. Split wedge and double disc parallel seat gate valves are potentially subject to Pressure Locking but generally not susceptible to Thermal Binding. These valve types will be subject to Pressure Locking because the space between the discs on a parallel seat (between the disc segments on a split wedge) are open to the bonnet. Should the bonnet become pressurized, this pressure will be trapped between the discs (or disc segments). If the pressure between the seats is greater than the actuators capability, the valve will be pressure locked. In addition, a temperature increase of the trapped fluid will cause a increase in the bonnet cavity pressure due to thermal expansion of the fluid, this will further increase the Pressure Locking forces. This same design feature of the parallel seat and split wedge designs that make them potentially susceptible to Pressure Locking render both relatively immune to Thermal Binding. This is because the mechanism between the two discs allows the discs to collapse inward toward each other as the stem rises thus breaking the thermal pinch. The lack of significant restraint in the split wedge and double disc parallel seat designs makes them relatively immune to Thermal Binding.

For solid type wedge gate valves, the cooldown and shrinkage of the valve body relative to the disc, creates a pinching action on the disc. This makes the solid wedge design inherently susceptible to

Thermal Binding as it offers no flexibility against the pinching action associated with a cooling valve body. The solid wedge however is inherently immune to the Pressure Locking phenomena as there is no space between the disc that could become pressurized resulting in excessive disc/seat contact force and excessive actuator thrust requirements. The flexible wedge design is considered much more tolerant of Thermal Binding than the solid wedge due to the increased flexibility of the disc. The flexible wedge is susceptible to some pressure locking forces due to a space in the center of the disc that is open to the bonnet which can be pressurized by the trapped fluid.

Using the above design evaluation, Valve Manufacturer Drawings were reviewed to characterize the valve type used. From the gate valve type used, it was determined which valves are subject to Pressure Locking and which valves are subject to Thermal Binding.

The Results are as follows:

Solid Wedge - 822A, 822B
Flexible Wedge - 535, 536
Double Disc Parallel Seat - 730, 731, 744, 746, 747, 885A, 885B, 888A, 888B, 1802A, 1802B
Double Disc Split Wedge - 333, 866A, 866B, 866C, 866D, 889A, 889B, LCV-112C

(Note: the double disc split wedge is similar to the double disc parallel seat except that the seating surfaces are angled slightly rather than parallel)

Based on the preceding discussion, the solid wedge gate and flexible wedge gate valves are evaluated for Thermal Binding (4 valves). The flexible wedge, double disc parallel seat and split wedge are evaluated for Pressure Locking (21 valves). Refer to section 4.0 for the MOVs Functional Evaluation.

3.4.2 <u>Pressure Locking Evaluation Methodology</u>

Two types of Pressure Locking will be considered; Pressure Induced Pressure Locking and Thermal Induced Pressure Locking. Pressure Induced Pressure Locking is caused by a decrease in the line pressure that initially pressurized the bonnet. Thermal Induced Pressure Locking occurs where heat transfer from the ambient (or a local heat source) increases the pressure of the fluid trapped in the bonnet, this increases the pressure between the discs to a pressure greater than line pressure.

The ability to open under Pressure Induced Pressure Locking forces can be calculated using Equation 1:

$$\text{Thrust} = \{ (P_b-P_u) + (P_b-P_d) \} \{S_a\} \{V_f\} - (St_a)(P_b) + P_L \qquad \text{(Equation 1)}$$

P_b = Pressure in valve bonnet
P_u = Pressure upstream of valve
P_d = Pressure downstream of valve
S_a = Valve seat area
V_f = Valve friction factor
St_a = Stem area
P_L = Packing load

Equation 1 was derived from a similar EPRI equation used to calculate the force required to overcome seat frictional resistance in a double seated gate valve. The EPRI equation can be found in section 4.2.9 of EPRI NP-6516, "Guide for the Application and Use of Valves in Power Plant Systems" (see Reference No. 6). The EPRI equation was modified to include the upward pressure force on the valve seat area and the downward resistance force of the valve packing.

Solving for P_b to determine the maximum bonnet pressure that a MOV can open against:

$$P_b = \frac{\text{Thrust} + S_a V_f (P_u + P_d) - P_L}{(2 S_a V_f - St_a)} \qquad \text{(Equation 2)}$$

The values obtained for this equation came from the following sources:

- The component characteristic values (valve seat area S_a, stem area St_a) were obtained from the B&W MOVE Program (see Reference No. 19)

- The packing load P_L was obtained from field testing (see Appendix A, Table A-4).

- For closing valves, the valve factor (V_f) is usually in the range of .5 and for the initial opening of valves, the valve friction factor is expected to be smaller. For initial opening of valves, the valve factor is caused by frictional contact forces and not liquid shear forces between the valve disc and seat. For Pressure Locking evaluations, the lower valve factor can be used because once the valve disc is unseated Pressure Locking is broken. During the 1993 and 1995 RFOs, dynamic testing was performed on both Anchor Darling and Aloyco Crane double disc gate valves as part of the G/L 89-10 Program. Opening stroke data was recorded and opening valve factors determined. From this test data, bounding valve factors were determined (See Appendix A, Exhibit A-1). To determine the sensitivity of the valve factor value on Pressure Locking, the maximum valve factor V_{fmax}, was calculated for the maximum value before the onset of Pressure Locking for all vulnerable MOVs.

- The system conditions for each valve prior to and during an accident were used to determine the valve upstream and downstream pressures of the valves. For the valve maximum bonnet pressure it was assumed that the maximum system pressures would leak past the seat into the bonnet cavity and remain trapped. The maximum bonnet pressure, P_{max}, is the sum of bonnet in-leakage (P_m) plus the bonnet heat-up (P_h). It was also assumed in this evaluation that there is no pressure leakage past two check valves and a closed gate valve or one closed gate valves into the next valve bonnet.

- The thrust available to overcome the forces created by PLTB for each valve was obtained using the lowest thrust value of the following three valve components.

  ◊ The valve mechanical weak link (WL_v)
  ◊ The operator mechanical weak link (WL_o)
  ◊ The maximum motor capacity (T_m)

  The valve mechanical weak link value was obtained from the Altran Weak Link Analysis(see Reference Nos. 16 and 17). It is the maximum one time opening thrust that will not cause any mechanical damage to the valve components.

  The operator mechanical weak link value (operator thrust rating) was derived from published Limitorque data and increased as necessary by the Kalsi Report, "Thrust Rating Increase of Limitorque Actuators," Document Nos. 1707C Rev. 0 and 1799C Rev. 0 (see Reference Nos. 7 and 8). These numbers were placed in the MOVE program to obtain the motor operator weak link thrust forces.

The maximum motor capacity can be affected by various sets of conditions. The following are some of these conditions.

1. The voltage available at the motor
2. The ambient temperature at the motor
3. The normal name plate conditions
4. The locked rotor conditions

The maximum torque output of the motor was used for this evaluation. Using the B&W MOVE Program, these torques were converted to a thrust output based on gear ratios, stem geometry, and stem coefficient (actual field test data was available for Stem Coefficient (C_f), however a higher value of .15 was used for conservatism). Each motor torque was evaluated under locked rotor conditions, ambient temperature derating, and the expected under voltage. The motor torque value was then converted to a motor thrust and compared to the allowable valve weak link thrust and allowable operator weak link thrust. The lowest thrust value was selected for the final evaluation.

Voltage Considerations

For cases where offsite power is available, bus voltage was taken at the initiation of the accident for the lowest voltage for which the vital buses would remain connected by the offsite supply under SI conditions (438 volts). For valves that are required to operate at switchover to recirculation (3.4 hours) it is assumed that bus voltage has fully recovered to normal bus voltage values. Loss of offsite power cases assume full voltage available from the Emergency Diesel Generators (EDGs) and the three dedicated gas turbines at backup.

3.4.3 Analysis of Results of Pressure Locking

Two ratios were used to determine if there is sufficient actuator thrust force to open the valve under the highest developed trapped bonnet fluid pressure.

One ratio is P_b/P_{max}, which is the calculated maximum valve bonnet pressure that the actuator can open against divided by the maximum valve bonnet pressure due to in-leakage and bonnet heat-up (actual system conditions). Equation 2 can be used to establish the maximum bonnet pressure that the valve will stroke against for a given actuator capability. This can be compared to the bonnet pressure (P_{max}) expected due to mass (P_m) and heat addition (P_h). P_{max} is determined from the system conditions that leave the bonnet pressurized (i.e. mass addition). For valves located inside the containment building that are required to stroke in a post-accident environment , heating of the trapped bonnet fluid is also considered.

The other ratio T_a/T_r is the maximum available actuator thrust from the MOV divided by the calculated thrust required to open against the maximum valve bonnet pressure due to in leakage and bonnet heat-up (actual system conditions). See Appendix A, Table A-3 for results.

If P_b/P_{max} and $T_a/T_r > 1.0$ there is sufficient actuator force to open the valve under the highest developed bonnet pressure, therefore Pressure Induced Pressure Locking cannot occur.

If P_b/P_{max} and $T_a/T_r < 1.0$ there is insufficient actuator force to open the valve under the highest developed bonnet pressure, therefore Pressure Induced Pressure Locking can occur.

3.4.4 Thermal Binding Evaluation and Results

As previously noted, the solid and flexible wedge type gate valves are susceptible to thermal binding. These valves were evaluated functionally to determine if they would be exposed to thermal gradients that will subject them to Thermal Binding forces. In this report it was determined that there will not be any significant temperature buildup in the valves at the time they are in a closed position to the time the valve would receive a open signal.

3.4.5 Additional PLTB Effects due to Elevated Containment Temperatures

During a LOCA, containment temperature and pressure will rise. The temperature rise can have additional PLTB effects on MOVs in containment. Bonnet Pressurization, Motor Thrust Reduction or Valve Stem Growth can occur. These effects are described in the next section. For accident analysis, containment elevated temperature is a function of time and the size and type of accident. The large break LOCA was selected for valves that actuate early to maximize the dp across the valve. The small break LOCA was selected for valves that actuate at switchover to recirculation. To determine the containment temperatures, Westinghouse performed a Transient Analysis of containment temperature versus time for a 4" Small Break LOCA. The 4 inch break was selected to maximize the bonnet heating effect. Each valve in containment was evaluated for these scenarios and the bounding worst case was chosen for the analysis. For cases were it was not obvious as to which scenario was the worst, several detailed analysis were performed.

- Bonnet Pressurization

  A rise in containment temperature can heat-up the trapped fluid in the valve bonnet and increase the bonnet pressure. This is accounted for as P_h. Only valves located in containment that do not open immediately on a SI signal are exposed to this phenomena. The elevated containment temperature will increase the pressure locking effect in the valve. The exposed valve will not heatup quickly because they are insulated. The bonnet fluid will reach a temperature that is dependent on insulation thickness, average containment temperature, and the time of heat exposure. To determine the conservative case, several scenarios need to be evaluated for each valve. Large LOCAs will generate a higher peak containment temperature than a small LOCA but the containment temperature will decline quicker because of the use of containment spray. Small LOCAs will create a lower peak containment temperature but the elevated containment will cool down much slower due to the predominant use of Fan Coolers instead of containment spray. For valves that are expected to open several hours after an accident, such as those valves used in the alignment for the recirculation system, the small break LOCA case in bounding. The bonnet will soak up more heat and create a higher bonnet pressure than the large LOCA scenario.

  To determine the amount of bonnet heatup, a finite element analysis was performed for specific valves (see Reference No. 3). To determine the specific value of bonnet heatup temperature, the maximum expected time of valve operation was determined. The maximum time was selected because it would allow the longest bonnet exposure to temperature and create the highest bonnet pressures. The bounding case selected is a 4" small break LOCA. A maximum recirculation switchover time of 3.4 hours after the accident is used. This is calculated by assuming five fan coolers in operation with no containment spray, full level of RWST and 4" RCS break. This calculated time was the used to determine the final bonnet fluid temperature in the valve using the finite element analysis results. The thermal analysis is conservative because a peak containment temperature of ~260 degrees Fahrenheit was used.

The actual plant containment temperature profile for a LOCA is a lower value. To calculate the increasing bonnet pressure P_h, NUREG-1275 Volume 9 was used. An increase of 33 psig per degree F was used to calculate the thermal induced bonnet pressure increase, Ph, for bonnet fluid temperatures in the 100 degree Fahrenheit range.

- Motor Thrust Reduction

During a LOCA, the MOV motors, located inside of containment, can be exposed to elevated thermal conditions. These motor will experience a current/torque reduction at elevated environmental temperatures above 104 deg F (see Limitorque Reply to "Potential 10 CFR 21 Condition for Reliance 3 Phase L.C. Actuator Motor," dated May 13, 1993 and Limitorque Technical Update - 93-03, dated September, 1993). The motor torque reduction will reduce the available thrust from the motor. Table A-6 Thermal Induced Motor Starting Torque Reduction shows the % torque reduction and the corresponding reduced torque value for a given elevated containment temperature. This torque value was placed into the MOVE program to determine the maximum motor capacity with thermal reductions due to containment heat-up, T_{mt}. This is a conservative thrust value because the thermal reduction causes a reduced current demand which will allow the motor terminal voltage to increase, thus increasing the motor torque again for cases of degraded bus voltage. This torque increase was not calculated and included in the Tmt value, therefore a slight increase in thrust values is expected and was not accounted for.

- Valve Stem Growth

The third effect of containment heat-up occurs at the valve stem. For valves in the normally closed position, the valve stem is rigidly restrained between the operator gearing and valve disc. Ambient heating can cause the entire valve to heat-up to a higher temperature. The result will expand the valve stem and body. For valves that have different valve stem and body materials with different coefficients of expansion, there may be an additional wedging force generated. Since the valve stem is restrained between two points, the thermal increase due to the difference in material expansions, will cause the stem to push down on the disc with a greater force and wedge the disc in tighter to the seat. The force generated is distributed between the operator gearing and seat. The consequences of valve stem growth to the required opening thrust are not the same for different gate valve designs. Solid and flexible wedge gate valves require a greater actuator thrust force to open the valve when stem growth forces occur. Double disc parallel seat and split wedge gate valves also subject to valve stem growth forces. However, when a MOV open signal is received, the locking gears will release and the discs will collapse inward releasing the stem growth forces. Therefore, stem growth forces is not a concern for double disc parallel seat and split wedge valves. Based on the above evaluation, the only solid and flex wedge valves in this category are 822A, 822B, 883, 535 and 536. These valve were reviewed for susceptibility to stem growth forces. It is concluded that these valves are either not required to open for an accident, have no safety related function, or receive an immediate signal to open after a LOCA (insufficient time for heat absorption).

The following section includes an individual evaluation for each of the 24 MOVs that are subject to potential PLTB. Each valve evaluation includes a system flow diagram and a valve manufacturer drawing. For those valves found subject to Pressure Locking, there is a diagram illustrating the valve normal operating conditions and valve opening conditions. In addition, the flow diagrams for these valves also illustrate the source for valve bonnet pressurization (bonnet pressurization path shown in red). All valve evaluations are based in part on "design" assumptions used for the G/L 89-10 Program Plan (modified as required for the particular transients considered for this evaluation) and also reflect more recent field test data.

TABLE A-2

GATE VALVE

THERMAL BINDING AND PRESSURE LOCKING RESULTS TABLE

Vlv Tag	System	Function	Manufacturer	Size	VALVE POSITIONS Norm Op	Loca Inj	Loca Recir	Post Accd	PLTB	Gate type	COMMENTS
822A	CCW	CCW outlet isolation for 22 rhr hx	Aloyco/ Crane	12	cls	open	open	open	YES	solid wdge	Opens on an SI signal.
822B	CCW	CCW outlet isolation for 21 rhr hx	Aloyco/ Crane	12	cls	open	open	open	YES	solid wdge	Opens on an SI signal.
333	CVCS	Boric Acid Feed line 208 to chrg pmp suction	Aloyco/ Crane	2	Cls	open/cls	cls	cls	YES	split wdge	One of 3 potential emergency paths
LCV 112C	CVCS	VCT drain discharge valve	Aloyco/ Crane	4	open/cls	open/cls	cls	cls	YES	split wdge	Normally open but may close auto on low VCT level then reopen for CVCS makeup.
535	RCS	Block vlv - Press relief line train B	West/Velan	3	open/cls	cls	cls	cls	YES	flex wedge	If avail can be used for bleed and feed recovery option
536	RCS	Block vlv - Press relief line train A	West/Velan	3	open/cls	cls	cls	cls	YES	flex wedge	If avail can be used for bleed and feed recovery option
730	RHR	RHR pmp suct secondary hotleg isolation from loop 2	Copes Vulcan	14	cls	cls	cls	open	YES	dbl disc-//	Req to be open for recov loss of second coolant or small break loss of coolant
731	RHR	RHR pmp suction primary hotleg isolation from loop 2	Copes Vulcan	14	cls	cls	cls	open	YES	dbl disc-//	Req to be open for recov loss of second coolant or small break loss of coolant
744	RHR	RHR pmp disch to RHR Htx isolation vlv	Anchor Darling	12x10x12	open	open	open/cls	open/cls	YES	dbl disc-//	operator action closes vlv
746	RHR	RHR htx 22 outlet stop	Anchor Darling	8	cls	open/cls	open	open	YES	dbl disc-//	Opens auto on SI signal
747	RHR	RHR htx 21 outlet stop	Anchor Darling	8	cls	open/cls	open	open	YES	dbl disc-//	Opens auto on SI signal
885A	RHR	RHR pump suction from cont. sump	Anchor Darling	14x12x14	cls	cls	open/cls	open/cls	YES	dbl disc-//	Normally closed, open for recirc from containment sump.
885B	RHR	RHR pump suction from cont. sump	Anchor Darling	14x12x14	cls	cls	open/cls	open/cls	YES	dbl disc-//	Normally closed, open for recirc from containment sump
1802A	RHR	Recir pump discharge isolation vlv	Anchor Darling	10	cls	cls	open/cls	open/cls	YES	dbl disc-//	Normally closed, opens for recirulation phase.
1802B	RHR	Recir pump discharge isolation vlv	Anchor Darling	10	cls	cls	open/cls	open/cls	YES	dbl disc-//	Normally closed, opens for recirulation phase.
866A	SI	Stop vlv for spray pmp 21 discharge	Aloyco/ Crane	8x6x8	cls	open/cls	cls	cls	YES	split wdge	Normally closed, open for containment spray on HI Containment Pressure.
866B	SI	Stop vlv for spray pmp 21 discharge	Aloyco/ Crane	8x6x8	cls	open/cls	cls	cls	YES	split wdge	Normally closed, open for containment spray on HI Containment Pressure.
866C	SI	Stop vlv for spray pmp 22 discharge	Aloyco/ Crane	8x6x8	cls	open/cls	cls	cls	YES	split wdge	Normally closed, open for containment spray on HI Containment Pressure.
866D	SI	Stop vlv for spray pmp 22 discharge	Aloyco/ Crane	8x6x8	cls	open/cls	cls	cls	YES	split wdge	Normally closed, open for containment spray on HI Containment Pressure.
888A	SI	SI pump Suct from RHR Htx 21 & 22	Anchor Darling	6x4x6	cls	cls	open/cls	open/cls	YES	dbl disc-//	Normally closed, open to feed SI pump hdr if low head pumps cannot provide adequate flow.
888B	SI	SI pump Suct from RHR Htx 21 & 22	Anchor Darling	6x4x6	cls	cls	open/cls	open cls	YES	dbl disc-//	Normally closed, open to feed SI pump hdr if low head pumps cannot provide adequate flow.
889A	SI	CB Spray hdr 1-3 supply from RHR Hx 22	Aloyco/ Crane	8x6x8	cls	cls	open/cls	cls	YES	split wdge	Valve may need to be opened in LOCA during cont temp excursion in recirc phase.
889B	SI	CB Spray hdr 1-3 supply from RHR Hx 21	Aloyco/ Crane	8x6x8	cls	cls	open/cls	cls	YES	split wdge	Valve may need to be opened in LOCA during cont temp excursion in recirc phase.
769	CCW	Cont Isolation vlv CCW inlet - Rcp, RV support blk	Aloyco/ Crane	6	open	open/cls	cls	cls	NO	wedge	Closes on phase B isolation
797	CCW	Cont Isolation vlv CCW inlet - Rcp, RV support blk	Anchor Darling	6	open	open/cls	cls	cls	NO	dbl disc-//	Closes on phase B isolation
784	CCW	Cont isolation - RCP bearing cooler CCW return	Anchor Darling	6	open	open/cls	cls	cls	NO	dbl disc-//	Closes on phase B isolation
786	CCW	Cont isolation - RCP bearing cooler CCW return	Aloyco/ Crane	6	open	open/cls	cls	cls	NO	wedge	Closes on phase B isolation
789	CCW	Cont iso - RCP thermal barrier CCW return	Aloyco/ Crane	3	open	open/cls	cls	cls	NO	solid wdge	Closes on phase B isolation
883	RHR	RHR pump return to RWST	Velan	8	cls	cls	cls	cls	NO	solid wdge	Normally closed, opened to fill RWST from RCS, used for RHR pump quarterly test.
887A	SI	SI pump 22 suction from SI pmp common suct hdr	Aloyco/ Crane	6	open	open	open/cls	cls	NO	split wdge	Normally open, closed for passive failure of suction header.
887B	SI	SI pump 22 suction from SI pmp common suct hdr	Aloyco/ Crane	6	open	open	open/cls	cls	NO	split wdge	Normally open, closed for passive failure of suction header.
FCV 625	CCW	RCP Thermal Barrier CCW return header	Anchor Darling	3	open	open/cls	cls	cls	NO	dbl disc-//	Normally opened, closes on Phase B containment isolation.
205	CVCS	Cont iso - vlv for charging pmp flow to line 19	Velan	3	open	open/cls	cls	cls	NO	gate	Vlv remains open for emerg boration, closes by operator action
222	CVCS	Cont isol - Excess letdown & RCP Seal wtr return line	Aloyco/ Crane	4	open	open/cls	cls	cls	NO	split wdge	Closes on Phase B isolation or manual
BFD 2-21	Blr FW	FWS BFP 21 discharge	Powell	20x18x20	open	open/cls	cls	cls	NO	solid wdge	Normally open, closes on SI/plant trip.
BFD 2-22	Blr FW	FWS BFP 22 discharge	Powell	20x18x20	open	open/cls	cls	cls	NO	solid wdge	Normally open, closes on SI/plant trip.
745A	RHR	RHR Htx 22 inlet isolation	Aloyco/ Crane	8x6x8	open	open	open	open	NO	split wdge	Operator action closes vlv
745B	RHR	RHR Htx 22 inlet isolation stop vlv	Aloyco/ Crane	8x6x8	open	open	open	open	NO	split wdge	Operator action closes vlv
882	RHR	RHR pump suction from RWST	Anchor Darling	12x10x12	open	open	open/cls	cls	NO	dbl disc-//	Valve closes on operator action
850A	SI	SI pump 21 discharge	Anchor Darling	4	open	open	open/cls	cls	NO	dbl disc-//	Normally opened, closed for low head recirculation
850B	SI	SI pump 23 discharge	Anchor Darling	4	open	open	open/cls	cls	NO	dbl disc-//	Normally opened, closed for low head recirculation
851A	SI	SI pump 22 discharge - pmp 21 SI hdr isolation	Anchor Darling	4	open	open/cls	open/cls	cls	NO	dbl disc-//	Normally open, manually closed for SI hdr isolation if SI pmp 21/23 fail to operate
851B	SI	SI pump 22 discharge - pmp 23 SI hdr isolation	Anchor Darling	4	open	open/cls	open/cls	cls	NO	dbl disc-//	Normally open, manually closed for SI hdr isolation if SI pmp 21/23 fail to operate
869A	SI	cont iso 21 spray pmp discharge to spray hdr	Aloyco/ Crane	8	open	open	open/cls	cls	NO	gate	closes via operator action
869B	SI	cont iso 22 spray pmp discharge to spray hdr	Aloyco/ Crane	8	open	open	open/cls	cls	NO	gate	closes via operator action
894A	SI	accumulator 21 discharge to loop 1 cold leg	Anchor Darling	10x8x10	open	open	open	open/cls	NO	gate	Valve not req for post accident operation closed to depressurize to CSD & remains closed
894B	SI	accumulator 22 discharge to loop 2 cold leg	Anchor Darling	10x8x10	open	open	open	open/cls	NO	gate	Valve not req for post accident operation closed to depressurize to CSD & remains closed
894C	SI	accumulator 23 discharge to loop 3 cold leg	Anchor Darling	10x8x10	open	open	open	open/cls	NO	gate	Valve not req for post accident operation closed to depressurize to CSD & remains closed
894D	SI	accumulator 24 discharge to loop 4 cold leg	Anchor Darling	10x8x10	open	open	open	open/cls	NO	gate	Valve not req for post accident operation closed to depressurize to CSD & remains closed
1810	SI	Refueling wtr to SI pump suction	Aloyco/ Crane	8	open	open/cls	cls	cls	NO	split wdge	Normally opened, closes by operator action during for recirculation phase.

Key: PLTB = Pressure locking & Thermal binding

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attachment 2

INDIAN POINT UNIT NO. 2

EVALUATION OF G/L 95-07 AOVs

FOR

PRESSURE LOCKING AND THERMAL BINDING

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1.0 PURPOSE

In response to Generic Letter 95-07, Con Edison performed a screening of all air operated valves (AOVs) at IP2. A computer database search was performed on plant valve records. All Class A AOVs were queried from the Power Plant Maintenance Information System (PPMIS) database, which compiled a list of 261 valves. The PPMIS system and vendor drawings were used to further categorize the valves into gate, globe, butterfly, diaphragm or check valves. The list was further screened for air operated gate valves only. After this screening was performed only two valves remained, PCV-1310A and PCV-1310B. These two valves were evaluated in greater detail and found not to be susceptible to PLTB.

2.0 EVALUATION METHODOLOGY

The purpose of this evaluation is to determine the number of safety related air operated gate valves potentially susceptible to PLTB. A three step screening process was used to identify those valves. The following methods of evaluation and acceptance are to be used for those AOVs that are found to be potentially susceptible to PLTB:

- Identify valves that are normally open and required to close for a test or surveillance. These valves may be susceptible to PLTB when called upon to reopen after the test or surveillance. Valves can be eliminated from further evaluation if they are on a train/system that is covered in the Plant Technical Specifications. This is because Technical Specifications place the plant in a Limiting Condition for Operation and a PLTB condition will be treated as any other mechanical failure of the train/system. Thus, Technical Specifications will require placing the plant in hot shutdown if the valve remains inoperable after a defined time limit.

- Provide a technical basis demonstrating that PLTB will not occur because the actuator is capable of providing sufficient thrust to open the valve without damaging the valve or actuator.

- Provide either written administrative controls or a valve modification to prevent PLTB from occurring if the actuator is not capable of providing sufficient thrust to overcome PLTB.

3.0 SCREENING

3.1 FIRST SCREENING - Air Operated Valves

The first screening used a computer database system to identify the type of valves in the Plant. This search identified 261 Class A air operated valves in the system.

3.2 SECOND SCREENING - Air Operated Gate Valves

These valves were further sorted into gate valves using the PPMIS system and vendor valve drawings. It is known that the PLTB phenomena applies to only gate valves (per INPO SOER 84-7 and USNRC-NUREG-1275, see Reference No. 2). This sort reduced the list to 2 gate valves, PCV-1310A and PCV-1310B.

3.3 THIRD SCREENING - Air Operated Gate Valves Susceptible to PLTB

The listed gate valves are subject to PLTB only when in the closed position. It is therefore necessary to review the above two gate valves to determine the normal position of the valve and whether it would be closed, and subsequently required to open at any time to mitigate the consequences of an accident.

There are two valves, PCV-1310A and PCV-1310B, that are susceptible to possible PLTB and require further analysis.

4.0 AOVs Functional Evaluation

4.1 AOVs PCV-1310A, PCV-1310B

Valve Description

Valves PCV-1310A and PCV-1310B are 4 inch double disc, parallel seat air operated valves manufactured by WKM (model OPG Pow-R-Seal with operator model 1305-SP by Saf-T-Gard) and are located in the Auxiliary Feedwater System. These valves function to isolate steam to the turbine driven auxiliary feedwater (AFW) pump in the event that the steam line were to rupture inside the AFW room. These valves are normally in the open position and may be susceptible to PLTB when they are closed during a quarterly surveillance test. These valves are eliminated from further evaluation because they are in a system that is covered by Plant

Technical Specifications. Technical Specifications place the plant in a Limiting Condition for Operation during the surveillance test. The Plant Technical Specifications require the return of the system to full operability within 72 hours. Any inoperable component on the system that delays its return will require that the reactor be placed in hot shutdown within the next 12 hours (see IP2 Technical Specifications section 3.4). A PLTB valve constitutes an inoperable component and is covered under our existing Technical Specifications. Thus, further evaluation is not required. Nevertheless, if valves PCV-1310A and PCV-1310B were closed, either intentionally or inadvertantly, plant procedures direct that a bypass valve be opened to equalize pressure upstream and downstream of the valve prior to opening. This pressure equalization would preclude a PLTB condition from preventing valve opening.