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 SORESEN, G. C. Washington Public Power Supply System
 RECIP. NAME RECIPIENT AFFILIATION
 MARTIN, J. B. Region 5, Ofc of the Director

SUBJECT: Forwards final response to IE Bulletin 85-003 per 861001
 ltr. Responses to Items a through e have been changed to
 reflect addition of & uses of MOVATS, Inc test equipment.

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CERTIFIED NO.

R267 165 403

Washington Public Power Supply System

3000 George Washington Way P.O. Box 968 Richland, Washington 99352-0968 (509)372-5000

December 18, 1987
G02-87-290

Docket No. 50-397

Mr. J. B. Martin, Region Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Dear Mr. Martin:

Subject: NUCLEAR PLANT NO. 2
FINAL RESPONSE TO IEB 85-03

Reference: Letter, G02-86-943, GC Sorensen (SS) to
JB Martin (NRC), "Response to IEB 85-03",
dated October 1, 1986

The reference provided interim responses to items a through e of the subject IE Bulletin and committed to a final report to address item f. Accordingly the attached report and enclosures are submitted to close the commitment. It should be noted that the responses to items a through e have been changed to reflect the addition of and uses of MOVATS Inc. test equipment at WNP-2 and the expansion of the program since the reference submittal.

Should you have any questions, please contact Mr. P. L. Powell, Manager, WNP-2 Licensing.

Very truly yours,



G. C. Sorensen, Manager
Regulatory Programs

PLP/bk
Attachments

cc: RB Samworth - NRC
NS Reynolds - BCP&R
DL Williams - BPA/399
GW Knighton - NRC
NRC Site Inspector - 901A

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STATE OF WASHINGTON)
)
COUNTY OF BENTON)

Subject: Final Response IEB 85-03

I, G. C. SORENSEN, being dully sworn, subscribe to and say that I am the Manager, Regulatory Programs, for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information and belief the statements made in it are true.

DATE 17 DEC, 1987

G. C. Sorensen
G. C. SORENSEN, Manager
Regulatory Programs

On this day personally appeared before me G. C. SORENSEN to me known to be the individual who executed the foregoing instrument and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 17th day of December, 1987.

S. R. Michaels
Notary Public in and for the
State of Washington

Residing at Portland, WA

NUCLEAR PLANT NO. 2
RESPONSE TO
IEB 85-03

Item a. Review and document design basis...

This task was completed by the BWR Owner's Group (BWROG) and documented by Report NEDC-31322, "BWR Owner's Group Report on Operation Design Basis of Selected Safety-Related Motor Operated Valves." This report was transmitted to Mr. J.M. Taylor, Director, Office of Inspection and Enforcement, NRC, by Letter No. BWROG-8645, dated September 2, 1986. This report was reviewed by the Supply System and the WNP-2 plant specific values are delineated on Enclosure 1. It should be noted that even though portions of the WNP-2 RCIC system are no longer considered safety-related (i.e., WNP-2 does not take credit for the RCIC system in its safety analysis) the system is still included in this response for information purposes. The overall RCIC system, except for the insulation valves, is not safety related. Enclosure 2 contains an in-depth review and discussion of the design parameters for each valve. (No change from the referenced submittal.)

Item b. Establish switch settings...

At WNP-2 safety related valves, which have to open, have the open torque switch jumpered (hard-wired) and the opening circuit provided with a series limit switch to stop travel at 100% open. For valves which have to close, the torque switch is bypassed by a geared limit switch which remains closed throughout most of the valve's stroke (95% - 99%) and opens just before the valve reaches the fully closed (seated) position. WNP-2 Plant Maintenance has obtained diagnostic/test equipment for motor-operated valves from MOVATS, Inc. This equipment is capable of providing signature data to verify that the valve torque switches and limit switches are properly set. This verification will reduce the chance for error and will assure proper operation under all conditions. The MOVATS equipment was used in testing valves associated with the High Pressure Core Spray (HPCS) and Reactor Core Isolation Cooling (RCIC) systems in response to IE Bulletin No. 85-03. Torque switch settings, fuse and overload sizes for each of the above values was reviewed for accuracy by the Supply system.

Item c. Demonstrate valve operability...

The valves listed on the Valve Data Summary (Enclosure 1) are periodically checked for proper operation by Surveillance Procedures 7.4.5.1.11, HPCS System Operability Test, and 7.4.7.3.3, RCIC Operability Test. The main result of the valve cycling is to record the opening and closing times. The calculated maximum opening and closing differential pressures along with the approximate differential pressures to which these valves are being subjected, during surveillance testing, are listed on Enclosure 1, Valve Data Summary. Since the valve differential pressures encountered during surveillance testing do not approach the calculated values, the Supply System reviewed preoperational static testing, did additional flow testing during the last refueling outage where practical, and utilized the MOVATS diagnostic/test equipment to verify the subject valves met target thrust values established by the MOVATS correlation. This correlation, the review and testing implemented to meet the requirements of the Bulletin are discussed in the attached Enclosure 2.

Item d. Prepare Procedures...

Plant Procedure 1.4.13, Plant Motor Operated Valve (MOV) Design Documentation, is a new procedure generated to provide the instructions for preparation, control and revision of motor operated valve master data sheets. These data sheets provide the setpoint data to ensure that each safety related valve's switch settings and parameters are controlled. Existing Plant Procedure 10.25.74, Testing of Motor Operated Valve Motors and Controls has been revised to incorporate the MOVATS equipment, the new MOV master data sheets and the maintenance program changes brought about the new procedure (PPM 1.4.13).

Item e. Schedule for Completion...

The Supply System considers this report as the completion of the response to IE Bulletin 85-03. Enclosure 2 lists valve overthrust problems which will be resolved before or during the next refueling outage (2nd Quarter of 1988). Justification for continued operation is included therein.

Item f. Provide a Written Report on Completion...

Enclosure 2 provides the requested written report.

ENCLOSURE NO. 1
VALVE DATA SUMMARY

Page 1 of 4

<u>BWROG</u> <u>Valve No</u> <u>(Note 1)</u>	<u>WNP-2</u> <u>Valve No.</u>	<u>Size/Type</u>	<u>Manufacturer</u>	<u>Valve Oper</u> <u>Valve Oper</u> <u>Model</u>	<u>Valve Description</u>	<u>Diff Press</u> <u>Opening</u> <u>(PSID</u> <u>(Note 10)</u>	<u>Diff Press</u> <u>Closing</u> <u>(PSID)</u> <u>(Note 10)</u>	<u>Torque SW</u> <u>Settings</u> <u>Open/Close</u> <u>(Note 11)</u>	<u>Limit SW</u> <u>Setting</u>	<u>Design Spec</u> <u>Pressure</u> <u>(PSID)</u>	<u>Surveil.</u> <u>Pressure</u> <u>(PSIG)</u>
3	HPCS-V-1	14"/GATE	Anchor Darling	SMB-000-25	HPCS-P-1 Suction Supply from Condensate Storage Tank (CST)	(Note 2)	19.0	1.0/1.0	(Note 3)	150	15
1	HPCS-V-4	12"/GATE	Anchor Darling	SMB-4-200	HPCS-P-1 Discharge to Reactor Vessel	1450.0	1565.0	3.0/2.0	(Note 3)	1500	200
5	HPCS-V-10	10"/GLOBE	Anchor Darling	SMB-3-150	Test bypass from HPCS-P-1 to Condensate Storage Tank	(Note 2)	1237.0	2.25/2.25	(Note 6)	1500 (Note 8)	200
6	HPCS-V-11	10"/GLOBE	Anchor Darling	SMB-3-150	Test bypass from HPCS-P-1 to CST	(Note 2)	1237.0	2.25/2.25	(Note 6)	1500 (Note 8)	200
2	HPCS-V-12	4"/GATE	Anchor Darling	SB-0-25	HPCS-P-1 minimum flow valve	1483.0	1522.0	1.5/1.5	(Note 3)	1500	200
4	HPCS-V-15	18"/GATE	Anchor Darling	SMB-2-60	HPCS-P-1 Suction Supply from Suppression Pool	51.4	62.8	1.75/2.0	(Note 3)	150	10
7	HPCS-V-23	12"/GLOBE	Anchor Darling	SMB-4-150	Test bypass from HPCS-P-1 to Suppression Pool	(Note 2)	1217.0	2.0/2.0	(Note 6)	1500 (Note 8)	200

ENCLOSURE NO. 1
VALVE DATA SUMMARY

Page 2 of 4

BWROG Valve No (Note 1)	WHP-2 Valve No.	Size/Type	Manufacturer	Valve Oper Valve Oper Model	Valve Description	Diff Press Opening (PSID) (Note 10)	Diff Press Closing (PSID) (Note 10)	Torque SW Settings Open/Close (Note 11)	Limit SW Setting	Design Spec Pressure (PSID)	Surveill. Pressure (PSIG)
III.	RCIC-V-8	4"/GATE	Borg-Warner	SMB-00-7.5	Outboard Containment Isolation on Steam Supply to RCIC turbine	(Note 2)	1150.0	NA/1.5	(Note 4)	1337	0
3	RCIC-V-10	8"/GATE	Velan	SMB-00-15	RCIC Pump Suction Supply from Condensate Storage Tank (CST)	(Note 2)	63.5	1.0/1.0	(Note 4)	125	20
1	RCIC-V-13	6"/GATE	Velan	SMB-0-40	RCIC Pump Discharge to Reactor Vessel	1224.0	63.0	NA/2.25	(Note 4)	1350	0
2	RCIC-V-19	2"/GLOBE	Borg-Warner	SMB-00-10	RCIC-P-1 Minimum Flow Valve	1261.0	1451.0	3.0/3.0	(Note 4)	1500	1020
5	RCIC-V-22	6"/GLOBE	Anchor Darling	SMB-2-60	Test bypass from RCIC Pump (RCIC-P-1) to CST	(Note 2)	333.0	2.5/2.5	(Note 4)	1325 (Note 8)	1020
4	RCIC-V-31	8"/GATE	Borg-Warner	SMB-00-15	Pump RCIC-P-1 Suction Supply from Suppression Pool	51.5	53.0	2.5/2.5	(Note 4)	125	10
1	RCIC-V-45	4"/GLOBE	Anchor Darling	SMB-0-15	RCIC Turbine Steam Supply Admission Valve	1150.0	1150.0	NA/2.5	(Note 5)	920-1020	920-1020
9	RCIC-V-46	2"/GLOBE	Borg-Warner	SMB-000-5	RCIC lube oil cooler-cooling water supply valve	1280.0	1293.0	4.0/3.0	(Note 5)	1500	1020
6	RCIC-V-59	6"/GATE	Velan	SMB-0-40	Test bypass from RCIC-P-1 to CST	(Note 2)	(Note 2)	4.25/3.75	(Note 7)	1300	0

ENCLOSURE NO. 1
VALVE DATA SUMMARY

Page 3 of 4

<u>BWROG</u> <u>Valve No</u> <u>(Note 1)</u>	<u>WNP-2</u> <u>Valve No.</u>	<u>Size/Type</u>	<u>Manufacturer</u>	<u>Valve Oper</u> <u>Valve Oper</u> <u>Model</u>	<u>Valve Description</u>	<u>Diff Press</u> <u>Opening</u> <u>(PSID</u> <u>(Note 10)</u>	<u>Diff Press</u> <u>Closing</u> <u>(PSID)</u> <u>(Note 10)</u>	<u>Torque SW</u> <u>Settings</u> <u>Open/Close</u> <u>(Note 11)</u>	<u>Limit SW</u> <u>Setting</u>	<u>Design Spec</u> <u>Pressure</u> <u>(PSI)</u>	<u>Surveil.</u> <u>Pressure</u> <u>(PSIG)</u>
II	RCIC-V-63	10"/GATE	Velan	SMB-2-60	Inboard Containment Isolation on Steam Supply to RCIC Turbine	(Note 2)	1150.0	NA/3.5	(Note 9)	137	0
VI	RCIC-V-68	10"/GATE	Velan	SMB-0-15	RCIC Turbine Exhaust to Suppression Pool	25.0	44.0	1.5/2.5	(Note 4)	45	0
7	RCIC-V-69	1-1/2"/GATE	Borg-Warner	SMB-000-5	RCIC Vacuum Pump RCIC-P-2 Discharge to Suppression Pool	(Note 2)	48.0	1.0/1.0	(Note 4)	-	0
IV	RCIC-V-76	1"/GLOBE	Borg-Warner	SMB-000-5	RCIC Turbine Steam Supply Line Warm-up Valve	1150.0	1150.0	2.5/2.5	(Note 4)	1250	920-1020
X	RCIC-V-1	3"/GATE	Schutte-Koerting	SMB-000-5	RCIC Turbine Steam Trip-Throttle	(Note 12)	(Note 12)	1.0/3.0	(Note 5)	1250	0

ENCLOSURE 1
VALVE DATA SUMMARYNOTES

1. Valve designations as they appear in Report No: NEDC-31322, BWR Owner's Group Report on the Operational Design Basis of Selected Safety-Related Motor Operated Valves, dated September 1986.
2. No Safety Function in this direction, therefore no differential pressure is listed.
3. Opening torque switch is jumpered throughout travel. Closing torque switch is bypassed by Limit Switch No. 7* until the valve is approximately 95%-98% closed.
4. Opening torque switch is jumpered throughout travel. Closing torque switch is bypassed by Limit Switch No. 16* until valve is approximately 95%-99% closed.
5. Opening torque switch is jumpered throughout travel. Closing torque switch is bypassed by Limit Switch No. 1* until the valve is approximately 2%-10% closed.
6. Opening torque switch is bypassed by Limit Switch No. 5* until the valve is approximately 5% open. Closing torque switch is bypassed by Limit Switch No. 7* until the valve is approximately 95%-99% closed.
7. Opening torque switch is bypassed by Limit Switch No. 5* until the valve is approximately 5% open. Closing torque switch is bypassed by Limit Switch No. 16* until the valve is approximately 72% closed.
8. Valve capable of 2160 PSID actually supplied by the valve vendor.
9. To reduce closure time, this valve opens only 62.5% and the opening torque switch is jumpered throughout travel. Closing torque switch is bypassed by Limit Switch No. 16* until valve is 98% closed.
*Switch designation per Limitorque Standard Valve Operator Wiring Diagram.
10. Slight changes from the values provided in G02-86-943 dated October 1, 1986 represent refinement of calculations and incorporation of MOVATS testing.
11. Values as of Spring 1987 refueling/maintenance outage.
12. Turbine Trip and Throttle Valve not included in the analysis because the valve does not have a safety function and is spring-loaded to close.

ENCLOSURE 2

IE Bulletin 85-03 requested that plants holding operating licenses develop and implement a program to ensure that torque and bypass limit switch settings are selected, set and maintained properly for motor operated valves in the High Pressure Core Spray (HPCS) and Reactor Core Isolation Cooling (RCIC) systems. See Figures 4 through 6 for process diagrams of these systems. These switch settings must be high enough to accommodate the maximum differential pressure expected across these valves during normal and abnormal operating events in the design basis.

This response addresses action item f of the IE Bulletin which requested the submittal of a final written report upon completion of the program outlined in the Bulletin. Specifically, the report was to contain the following:

- 1.A verification of completion of the requested program.
- 2.A summary of the findings as to valve operability prior to any adjustment as a result of this bulletin.
- 3.A summary of data in accordance with the suggested data format shown in Table 2 of the Bulletin.

In WNP-2 letter G02-86-943, dated October 1, 1986, the Supply System responded to Bulletin action item e. The above action items, are addressed below.

WNP-2 PROGRAM DESCRIPTION

At WNP-2, safety related valves which have to open, have the open torque switch jumpered out of the opening circuit (hard-wired) and the opening circuit provided with a series limit switch to stop travel at approximately 100% open. Since the torque switch is jumpered, the valve will open, providing the motor was sized properly, even though the torque switch or the bypass limit switch may be improperly adjusted. For valves that have to close, the torque switch is in parallel with a geared limit switch which remains closed throughout most of the valve's stroke (~95%) and opens just before the valve reaches the fully closed (seated) position. Valve inertia and torque switch settings are then used to insure proper valve seating to meet leakage test criteria. The design differential pressures across the valves were delineated in the valve purchase specifications and were used by the valve manufacturers to establish the motor operator sizing requirements.

Although the torque switches for WNP-2 MOV's are not in use during the portion of the valve stroke where high delta pressure flow conditions exist (~0 to 20% open), an analysis of the required torque switch settings was conducted. Where possible, the torque switches were reset in both the open and close directions to insure

adequate torque to open or close the valve under its worst case delta pressure flow conditions. However, in some cases (see Table 2) the speed and subsequent inertia of certain valves was so great that setting the torque switch at the required setpoint resulted in seating thrusts in excess of the original valve and/or motor operator design limits. For these special cases, the valves and/or operator were evaluated for these higher loads and requalified for either full operating life or until the next planned outage where remedial action can be taken (e.g. upgraded valve components, replacement of the motor operator).

To determine the required opening and/or closing thrust loads, an evaluation was made to establish the maximum delta pressure required for each of the system valves in the RCIC and HPCS systems under normal and abnormal conditions (see Table 2). Utilizing the empirically derived correlations developed by MOVATS Inc. from valve test data, the opening and/or closing thrusts were then calculated for each of these valves at their design delta pressures. See Appendix A for outline of MOVATS correlations.

Motor operated valve (MOV) testing using the MOVATS equipment was conducted on all valves to establish a baseline thrust to torque switch setting correlation. For those valves falling within the MOVATS tested database, the torque switches were adjusted to produce thrusts that exceeded the required values by at least 15% to account for calibration and accuracy errors. Valves which either fell outside the MOVATS data base or where the required design thrust exceeded the valve and/or motor operator design limits were flow tested to determine the actual thrust loads. In all cases, the MOVATS baseline torque-to-thrust signatures were used to establish torque switch settings. A brief description of the MOVATS equipment is provided below to clarify how the equipment was used in the test program.

MOVATS EQUIPMENT DESCRIPTION

The basis for the MOVATS system is formulated on the concept that the greater the load (thrust) on the valve stem, the greater the movement of the worm within the operator itself (refer to Figure 1). The equipment designed and used by MOVATS provides a means to accurately measure the gear movement and correlate it to actual stem load during a valve stroke. To obtain this correlation, a linear differential transformer is mounted in what is called a Thrust Measuring Device or TMD (see Figure 2). To install the TMD on the motor operator, the spring pack dust cover is removed and the TMD mounted such that its plunger comes in contact with any part of the spring pack preload nut. With the TMD connected and its conditioned output connected to the recording system, any subsequent movement of the spring pack or worm, which is reflective of the stem load and operator output torque, will be translated into a voltage output of the TMD. Although knowledge of the dynamic movement of the spring pack throughout the valve cycle is sufficient to provide adequate information regarding the valve and operator mechanical condition, the movement of the spring pack can be further correlated to actual stem thrust. In order to calibrate the spring pack movement on Limitorque type operators to actual stem thrust, a calibrated load cell is mounted such that it is within close proximity of the valve stem. With the TMD installed

and monitoring spring pack position, the output of both the load cell and the TMD are connected to a two channel digital recording oscilloscope (see Figure 3 for MOVATS test equipment setup). The valve is then opened electrically. As the valve stem contacts the load cell, the stem load rises dramatically with a corresponding spring pack movement. The oscilloscope records the subsequent spring pack movement and applied stem load as a function of time. The resultant time history curves of the spring pack movement and stem load can now be directly correlated to produce what is termed the K-factor for the MOV. The K-factor is defined in units of pounds of stem thrust per inch of spring pack deflection. In the analysis of MOVATS signatures, it has proved helpful to express the K-factor in the units of stem thrust per volt of TMD output. These units can be read directly from the oscilloscope recordings.

Knowing the K-factor allows the user to determine the actual magnitude of the load being delivered to the valve stem at any time during the valve stroke. Similar techniques can also be used to determine stem load at various torque switch settings.

Finally, in addition to the above signatures, it is also possible to record the exact point and loading conditions in the valve stroke where the torque and limit switches actuate.

DESCRIPTION OF MOV TESTING

WNP2 conducted full flow testing on seven RCIC and HPCS valves. Where possible, the testing was performed at three pressure conditions in the required direction of safety for each valve. Two medium and one high pressure conditions were selected for each valve. During the flow tests, a TMD was connected to each valve to record spring pack deflection. Following completion of the tests, the TMD data was used to calculate the peak stem load delivered by the valve operator during the valve cycle. From this data, a correlation between stem load and delta pressure across each valve was developed. This correlation was then applied to the design delta pressure conditions for the valves and the resultant design stem thrust calculated. Note, for all cases the design delta pressure exceeded the maximum delta pressure that could be developed by the system under normal plant conditions. Consequently, the results of the tests had to be used to extrapolate the thrust loads that would be experienced under design loads. Once the design thrusts were established, a margin of at least 10% was added to the calculated values to account for accuracy and calibration errors.

AS FOUND OPERABILITY OF VALVES

All valves were considered operable in the as-found and as-left condition for opening direction requirements. Four valves had as-found torque switch settings below their design thrust values for the close direction. Confirmation of operability for these valves was not tested under full design delta pressure conditions. Consequently, with their as-found settings they may not have fully closed under worse case design conditions.

In addition, several thrust overload conditions were discovered during the test program. Specifically, ten valves and five operators had as-found and/or as-left seated thrust loads above

their original design. Each of these overload conditions has been evaluated and their continued operability established by analysis until at least the 1988 plant outage. Corrective actions for continued operation of these components beyond this time period are being identified and will be implemented as required.

The installed fuses/breakers and overload heaters have been reviewed for each valve motor operator and found to be adequate to provide the thrust/torque required to operate the valve under all its design operating conditions.

Table 1 summarizes the problems encountered during the test program for each valve. More specific discussion on valve operability is provided in Table 2.

APPENDIX A

MOVATS THRUST CORRELATION

SOLID AND FLEX-WEDGE GATE VALVES

SEAT (Friction) Load (SL)-	$0.3 \times \Delta P \times \text{Orifice Area}$
Wedging Load (WL)-	$0.75 \times \text{Seat Face Load}$
Piston Effect (PE)-	$\Delta P \times \text{Stem Cross Section Area}$
Scaling Constant (SC)-	1.3
Opening Thrust against ΔP =	$SC \times (SL+WL)$
Closing Thrust against ΔP =	$SC \times (SL+PE)$

STANDARD GLOBE VALVES

Seat Face (friction) Load (SL)-	$\Delta P \times \text{Orifice Area}$
Piston Effect (PE)-	$\Delta P \times \text{Stem Cross Section Area}$
Scaling Constant (SC)-	1.3
Opening Thrust against ΔP =	$SC \times SL$
Closing Thrust against ΔP =	$SC \times (SL+PE)$

FIGURE 1

INTERNAL ASSEMBLY

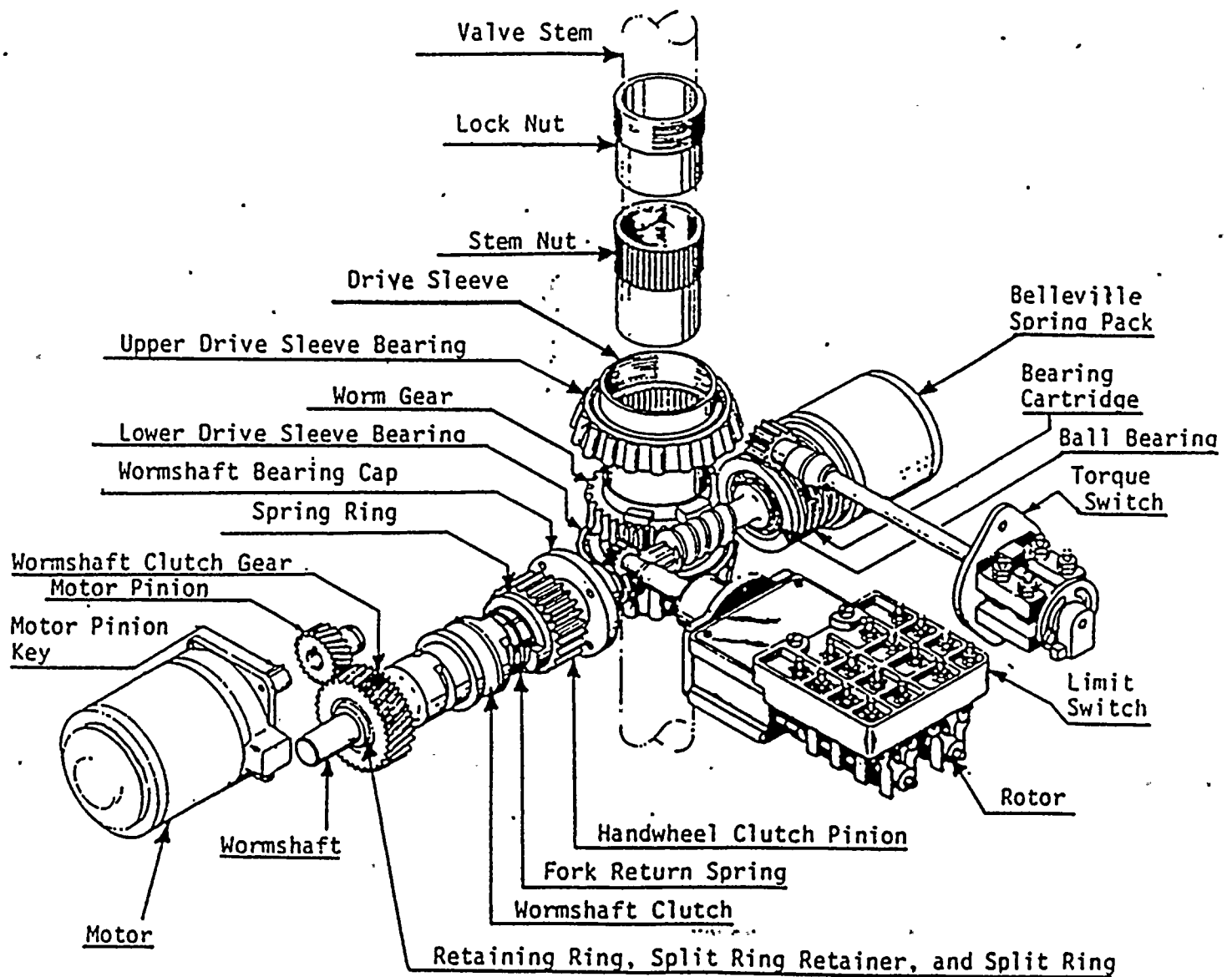
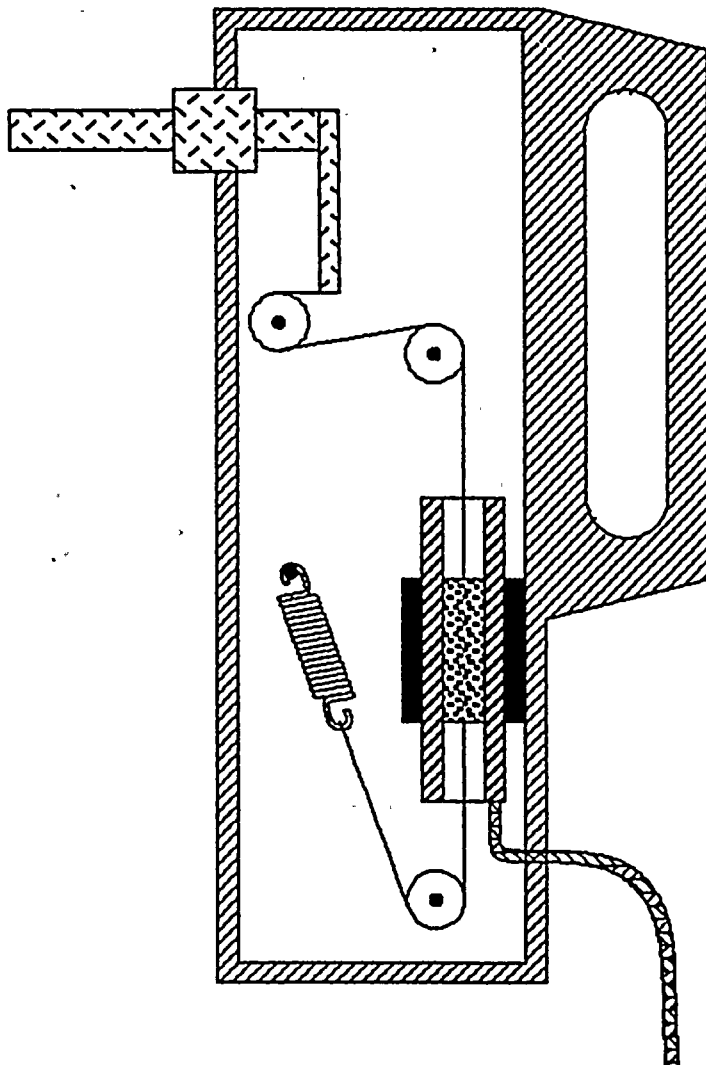


FIGURE 2



THRUST MEASURING DEVICE.
(TMD)

FIGURE 3

MOVATS EQUIPMENT SETUP FOR THRUST MEASUREMENT

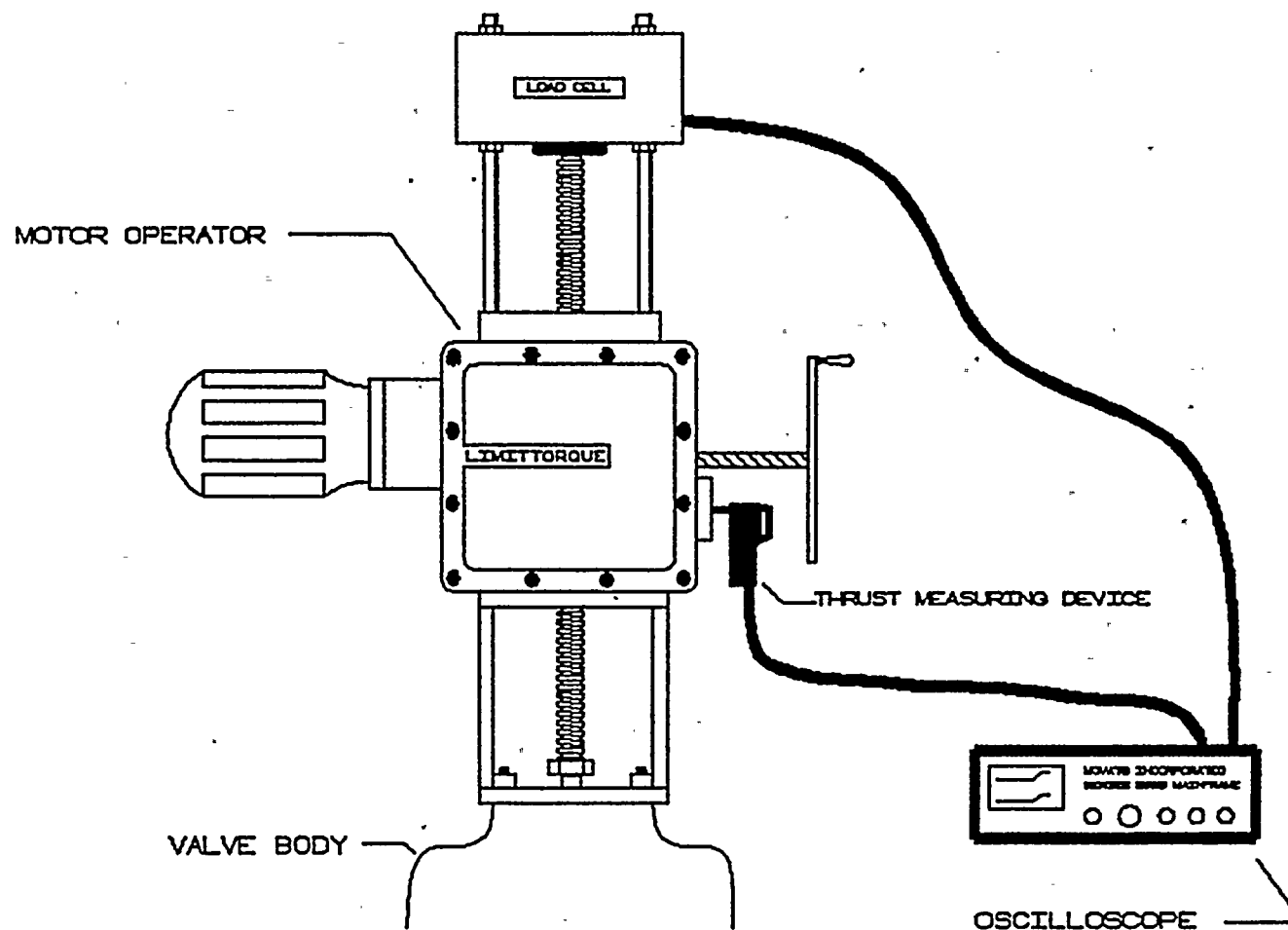


FIGURE 4
RCIC PROCESS DIAGRAM

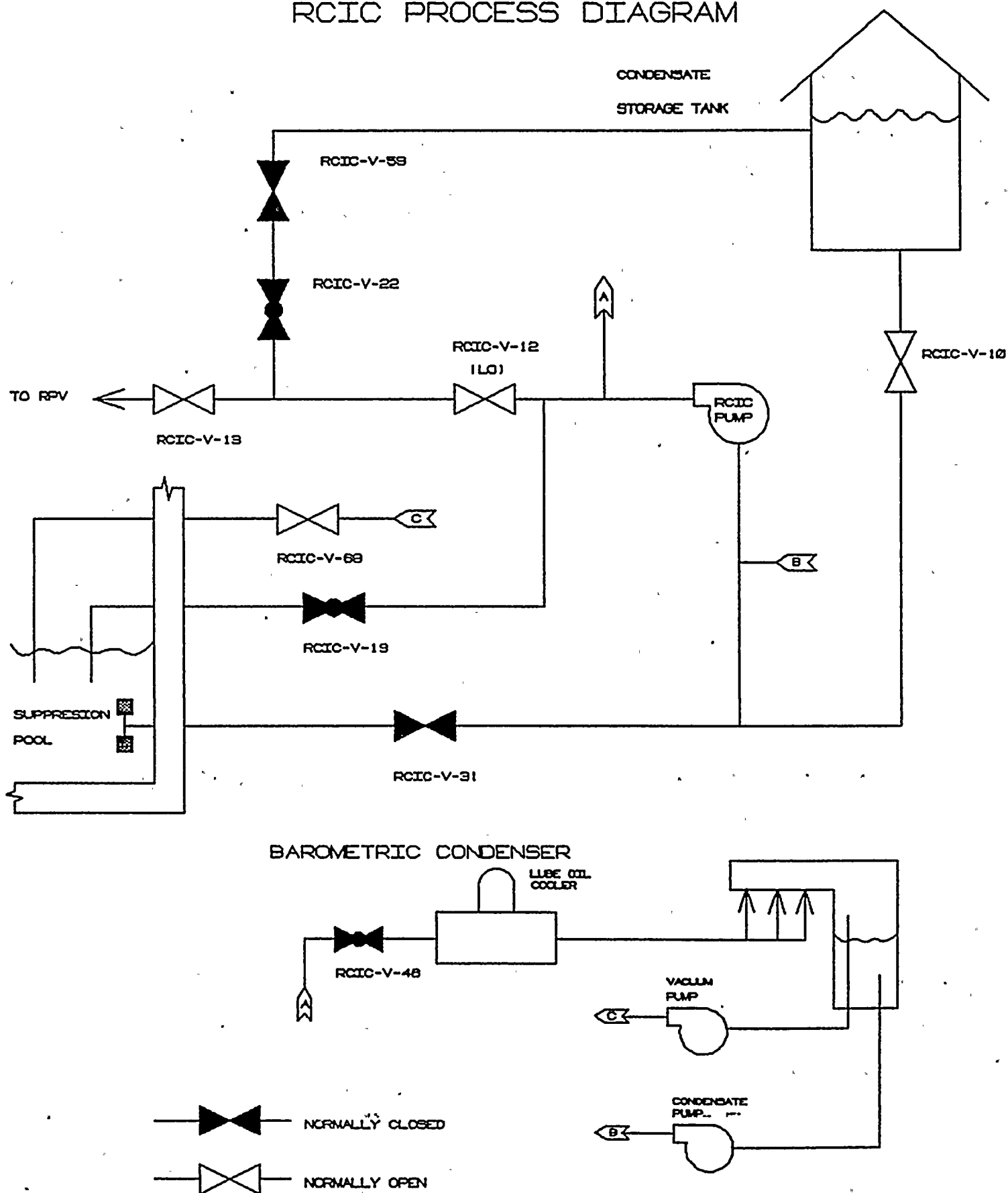


FIGURE 5
RCIC TURBINE STEAM SUPPLY

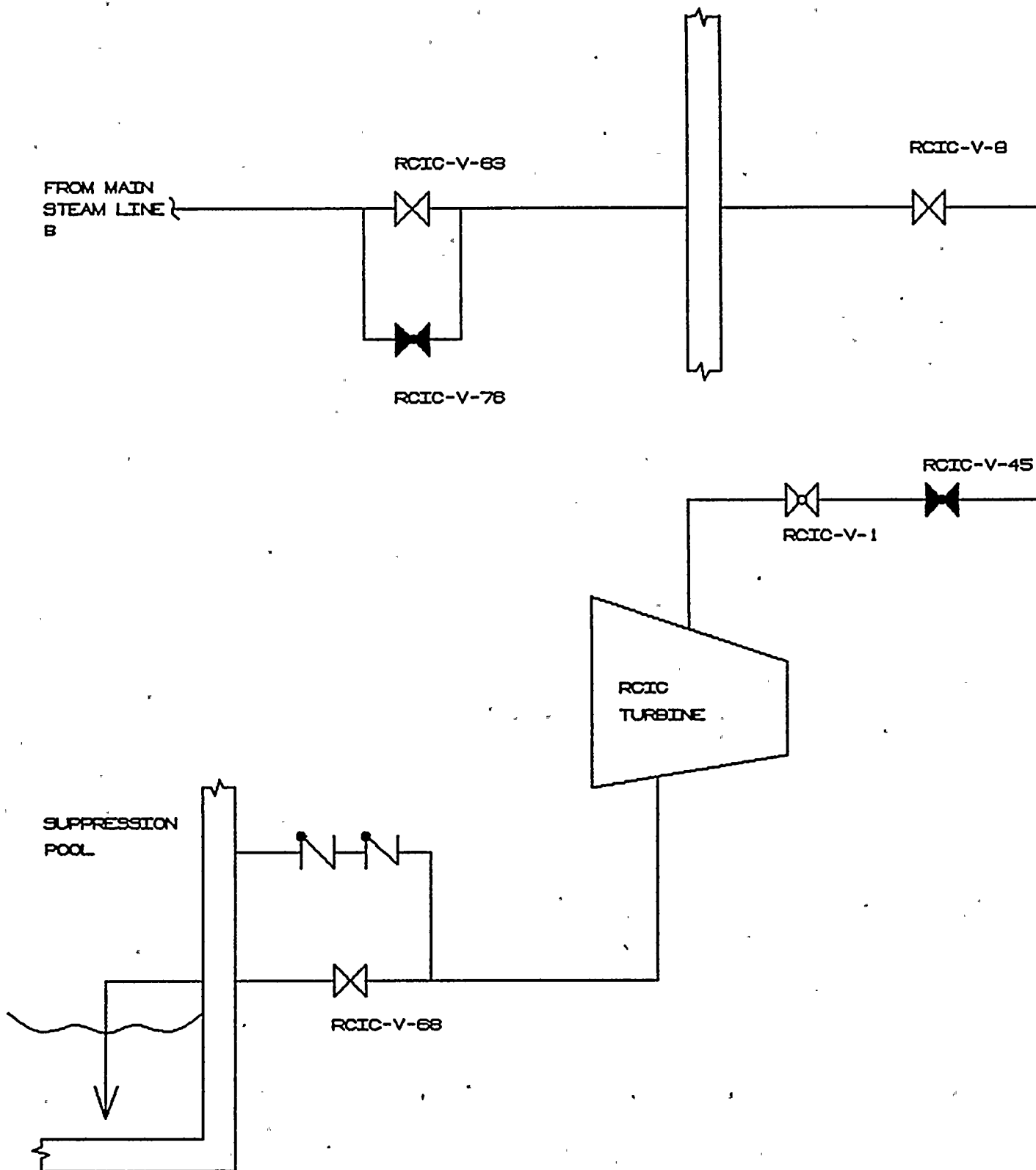


FIGURE 6
HPCS PROCESS DIAGRAM

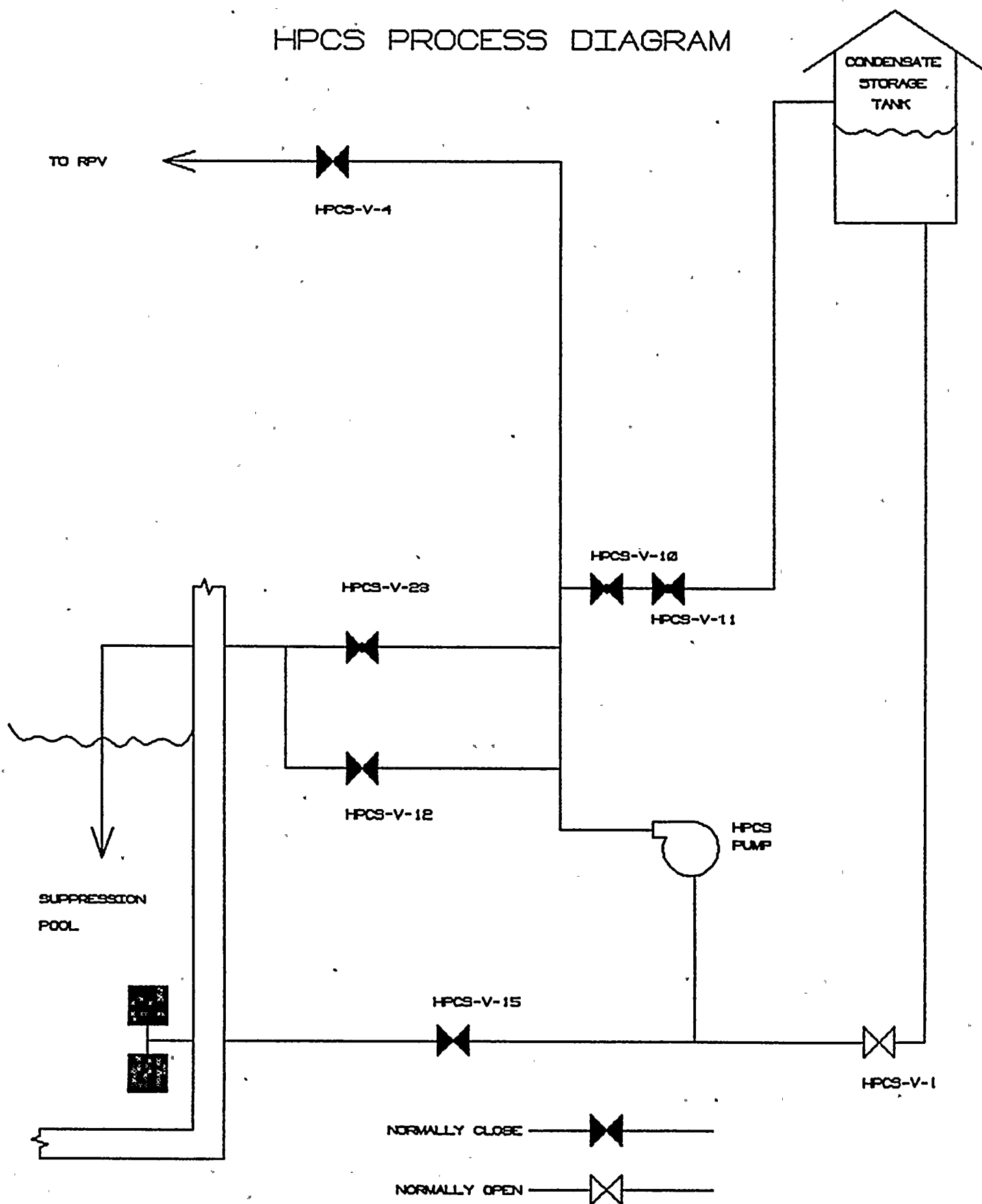


TABLE 2

HPCS-V-1

A. VALVE DATA

FUNCTION: HPCS-P-1 SUCTION FROM COND STORAGE TANK

SIZE (IN): 14"

TYPE: GATE

RATING (#): 150 #

MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-00-25/1750

RATED AMPS/VOLTS: 3.4/460

OL HEATER: C4.66A

FUSE(BKR): (42A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 9993 .

OPERATOR DESIGN THRUST LIMIT(lbs): 14000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 19.0

CLOSE DESIGN THRUST(lbs): 2859.0

CLOSE TS SET AS-FOUND(LBS): 2200.0

CLOSE TS SET AS-LEFT(lbs): 3160.0

SEATED THRUST AS-FOUND(LBS) 3980.0

SEATED THRUST AS-LEFT(LBS): 4880.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA

OPEN DESIGN THRUST(lbs): NA

OPEN TS SET AS-FOUND(LBS): 2200.0

OPEN TS SET AS-LEFT(lbs): 2200.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING HPCS-V-1

During preoperational testing, HPCS-V-1 was opened against differential pressure of 90 psid. This test demonstrated that the valve operator had adequate thrust to stroke the valve against 90 psid which is greater than the required differential pressure of 19 psid in the close direction. No additional differential testing of this valve was conducted during the recent test program. This valve is a suction supply to the HPCS pump and it was not practical to run a flow test with the opening and closing of this valve due to the potential for pump damage. Consequently, the initial 90 psid test coupled with the confirmation of available operator thrust was considered sufficient to demonstrate adequacy of the valve and operator.

E. AS FOUND VALVE OPERABILITY-HPCS-V-1

This valve must close against a design differential of 19 psid. Using the MOVATS correlation, a design thrust of 2859 lbs is required in the close direction. The close torque switch for this valve was found set at 2260 lbs, which was below the required value. Since no flow test could be conducted, as-found operability could not be confirmed. Based on the required thrust projected by the MOVATS correlation, the as-found torque switch setting may have been insufficient to totally close the valve after the bypass limit switch opened. The close bypass limit switch on this valve has been reset to 95% and the torque switch setting increased to 3160 lbs.

TABLE 2

HPCS-V-4

A. VALVE DATA

FUNCTION: HPCS-P-1 DISCHARGE TO REACTOR VESSEL

SIZE (IN): 12"

TYPE: GATE

RATING (#): 900 #

MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-4-200/3465

RATED AMPS/VOLTS: 35.1/460

OL HEATER: F56.7B

FUSE(BKR): (450A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 87130

OPERATOR DESIGN THRUST LIMIT(lbs): 250000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1565.0

CLOSE DESIGN THRUST(lbs): 80730.0

CLOSE TS SET AS-FOUND(LBS): NA

CLOSE TS SET AS-LEFT(lbs): 87800.0

SEATED THRUST AS-FOUND(LBS) 313500.0

SEATED THRUST AS-LEFT(LBS): 177643.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 1450.0

OPEN DESIGN THRUST(lbs): 71415.0

OPEN TS SET AS-FOUND(LBS): NA

OPEN TS SET AS-LEFT(lbs): 109700.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING-HPCS-V-4

During system preoperational testing, HPCS-V-4 was stroked open against a static differential pressure of 1500 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1500 psid which exceeds the design value of 1450 psid required for this valve in the open direction. However, additional flow tests for this valve were conducted during this test program because (1) there was no test data to verify the valve could close against it's design differential pressure of 1565 psid, (2) the valve fell outside the MOVATS test database, and, (3) normal thrust load correlations predicted required thrust loads greater than the design thrust limit of the valve.

Three full flow tests were conducted at pressures of 751 psid, 1191 psid and 1431 psid to establish the required thrust limit for this valve. The highest of these test conditions was conducted at system shutoff head which is the limiting condition for operation of this valve. Note, the design value for this valve is 1565 psid in the close direction. However, 125 psi of this total differential pressure is the result of fluid deceleration during valve closure. Consequently, the thrust data recorded from these tests is considered very representative of thrust expected under design differential conditions ($1565 - 125 = 1440$ psid versus 1431 psid). Verification of the developed thrust was accomplished by use of the MOVATS equipment.

E. AS-FOUND OPERABILITY-HPCS-V-4

HPCS-V-4 must close against a design differential pressure of 1565 psid and open against 1450 psid. The as-found thrust settings for this valve were not recorded. However, the torque switches for this valve were found to be 100% bypassed in both the open and close directions. Under these conditions, the valve's operator is capable of producing 313500 lbs (locked rotor) of thrust. This thrust greatly exceeds the required values of 80730 lbs to close and 71415 lbs to open the valve against it's design differential pressures. Consequently, the valve was considered operable in the as-found condition. The close limit switch on this valve was reset to 95% to allow closure on torque. In addition, the torque switches were lowered to 109700 lbs in the open direction and 87800 lbs in the close direction. Reducing these switch settings reduced the maximum thrust imposed on the valve during the close stroke.

The recorded as-found seated thrust for this valve was off scale high due to improper range of test equipment. Consequently, only an estimate of the total thrust is available. Test equipment indicated an as-found seating thrust of greater than 180000 lbs. Based on the as-found bypass limit switch setting in the close direction of ~100%, the upper limit for as-found thrust was

TABLE 2

considered bounded by the locked rotor condition for the operator of 313500 lbs. For conservatism, the valve and the operator were both evaluated at this maximum overload condition. A consultant, Kalsi Engineering, who specializes in the area of valve and operator design, was retained to evaluate these overload conditions. Considering the number of past cycles and cycles expected until the 1988 plant outage, the consultant's evaluations indicate that these thrust loads are within the valve and operator design capabilities. Non destructive examinations (NDE) were performed to ascertain if any degradations of the valve had occurred. No indication of valve damage was found. Continued evaluations are underway by the consultant to extend the design life of these components beyond the 1988 outage. Required corrective actions will be identified and implemented for this valve and its operator.

TABLE 2

HPCS-V-10

A. VALVE DATA

FUNCTION: TEST BYPASS FROM HPCS-P-1 TO COND STORAGE TANK

SIZE (IN): 10"
 TYPE: GATE
 RATING (#): 900 #
 MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
 MODEL NO./MOTOR RPM SMB-3-150/1655
 RATED AMPS/VOLTS: 14.5/460
 OL HEATER: C19.8B
 FUSE(BKR): (190A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 96140
 OPERATOR DESIGN THRUST LIMIT(lbs): 140000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1237.0
 CLOSE DESIGN THRUST(lbs): 74086.0
 CLOSE TS SET AS-FOUND(LBS): 80400.0
 CLOSE TS SET AS-LEFT(lbs): 85960.0
 SEATED THRUST AS-FOUND(LBS) 86000.0
 SEATED THRUST AS-LEFT(LBS): 92054.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA
 OPEN DESIGN THRUST(lbs): NA
 OPEN TS SET AS-FOUND(LBS): 41200.0
 OPEN TS SET AS-LEFT(lbs): 92800.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING OF HPCS-V-10

During system preoperational testing, HPCS-V-10 was stroked open against a static differential pressure of 1500 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1500 psid which closely approximates the design value of 1237 psid. However, additional flow tests for this valve were conducted during this test program because (1) the valve fell outside the MOVATS test database, and, (2) normal thrust load correlations predicted required thrust loads greater than the design thrust limit of the valve.

Three full flow tests were conducted at pressures of 783 psid, 1171 psid and 1476 psid to establish the required thrust limit for this valve. The highest of these test conditions was conducted at system shutoff head which is higher than the limiting condition for operation of this valve. Verification of the developed thrust was accomplished by use of the MOVATS equipment.

E.AS FOUND VALVE OPERABILITY-HPCS-V-10

HPCS-V-10 must close against a design differential pressure of 1237 psid. The as-found thrust setting of 80400 lbs for the valve was greater than the required value of 74086 lbs to close against this differential pressure. The torque switch was adjusted following MOVATS testing to 85950 lbs. The valve was considered operable in the as-found condition since it was stroked closed against pump shutoff head of approximately 1476 psid during the above described test program and prior to resetting of the torque switches.

TABLE 2

HPCS-V-11

A. VALVE DATA

FUNCTION: TEST BYPASS FROM HPCS-P-1 TO COND STORAGE TANK

SIZE (IN): 10"
 TYPE: GLOBE
 RATING (#): 900 #
 MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
 MODEL NO./MOTOR RPM SMB-3-150/1655
 RATED AMPS/VOLTS: 14.5/460
 OL HEATER: C19.8B
 FUSE(BKR): (190A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 96140
 OPERATOR DESIGN THRUST LIMIT(lbs): 140000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1237.0
 CLOSE DESIGN THRUST(lbs): 74086.0
 CLOSE TS SET AS-FOUND(LBS): 96200.0
 CLOSE TS SET AS-LEFT(lbs): 91200.0
 SEATED THRUST AS-FOUND(LBS) 105000.0
 SEATED THRUST AS-LEFT(LBS): 99333.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA
 OPEN DESIGN THRUST(lbs): NA
 OPEN TS SET AS-FOUND(LBS): 47000.0
 OPEN TS SET AS-LEFT(lbs): 95200.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING OF HPCS-V-11

During system preoperational testing, HPCS-V-11 was stroked open against a static differential pressure of 1500 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1500 psid which closely approximates the design value of 1237 psid. However, additional flow testing for this type valve was considered necessary because (1) the valve fell outside the MOVATS test database, and, (2) normal thrust load correlations predicted required thrust loads greater than the design thrust limit of the valve. Consequently, HPCS-V-10, which is identical to HPCS-V-11, was flow tested to establish the required thrust limit for the valve. See the discussion under HPCS-V-10 for a description of the flow tests.

E.AS FOUND VALVE OPERABILITY-HPCS-V-11

HPCS-V-11 must close against a design differential pressure of 1237 psid. The as-found thrust setting of 96200 lbs for the valve was greater than the required value of 74086 lbs to close against this differential pressure. However, the torque switch was reset to 91200 lbs to limit the thrust during closing. The valve was considered operable in the as-found condition since the as-found thrust was greater than the required.

As discussed above, the as-found thrust load for this valve in the close direction was 96200 lbs due to torque switch setting plus approximately 8000 lbs of inertial thrust due to valve/motor coast into the seat for a total seat thrust load of 104000 lbs. This as-found thrust load exceeded the design thrust load for the valve by approximately 10%. This overload condition has been evaluated and found to be within the design capability of the valve. The as-left thrust loading for this valve has been reduced to within the original design thrust load for this valve.

TABLE 2

HPCS-V-12

A. VALVE DATA

FUNCTION: HPCS-P-1 MINIMUM FLOW VALVE

SIZE (IN): 4"
TYPE: GATE
RATING (#): 900 #
MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
MODEL NO./MOTOR RPM SB-O-25/3400
RATED AMPS/VOLTS: 5.2/460
OL HEATER: C6.95A
FUSE(BKR): (68A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 16654
OPERATOR DESIGN THRUST LIMIT(lbs): 24000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1522.0
CLOSE DESIGN THRUST(lbs): 12097.0
CLOSE TS SET AS-FOUND(LBS): 8980.0
CLOSE TS SET AS-LEFT(lbs): 11800.0
SEATED THRUST AS-FOUND(LBS) 27800.0
SEATED THRUST AS-LEFT(LBS): 30803.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 1483.0
OPEN DESIGN THRUST(lbs): 14973.0
OPEN TS SET AS-FOUND(LBS): 6980.0
OPEN TS SET AS-LEFT(lbs): 15180.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING-HPCS-V-12

Flow testing for HPCS-V-12 was considered necessary because the valve falls outside the MOVATS database and the prediction of thrust loads by normal thrust correlations exceeds the design thrust limit of the valve and it's operator. Two full flow tests were conducted at pump discharge pressures of 886 psig and 1290 psig for this valve. The valve was stroked open and close during these tests. In addition, during testing of HPCS-V-10, HPCS-V-12 was verified capable of opening against a pump shutoff head of 1496 psig.

E. AS-FOUND OPERABILITY OF HPCS-V-12

The as-found thrust settings for HPCS-V-12 were 6980 lbs in the open direction and 8980 lbs in the close direction. During the flow testing described above, these settings were adequate to open and close the valve under all three differential pressure conditions including system shutoff head at 1496 psig. Consequently, this valve was considered operable in the as-found condition. The thrust data recorded during the flow tests indicated required thrusts far less than the current settings and much less than would be normally expected. Consequently, the validity of the thrust data was considered questionable and was not used to establish thrust settings required to operate the valve under it's required differential pressure conditions. Instead, the more conservative values predicted by the MOVATS correlation were used. These values are 14973 lbs in the open direction and 12097 lbs in close direction. Both values are significantly higher than the as-found settings. The open torque switch was adjusted to 15180 lbs to bound the required design of 14973 lbs. However, as discussed below, the close torque switch was left at 11800 lbs which is slightly below the required value of 12097 lbs.

The total as-found and as-left thrust loads for this valve in the close direction were 28000 and 30803 lbs, respectively. This seated thrust load is the result of valve inertia of approximately 19000 lbs which occurs after the torque switch trips the motor. These total thrust loads exceed the design thrust load for the valve by approximately 80% and the thrust rating of the operator by 25%. A review of the valve overload condition by WNP2 engineering staff has determined that the as-left seated thrust load (bounding condition) is within the design capability of the valve. A consultant, Kalsi Engineering, has been retained to evaluate the operator overload condition. Their preliminary report indicates that the load cycles under the as-found condition and the cycles expected in the as-left condition up to the 1988 plant outage are within the design capability of the operator. Work to extend the life of the operator beyond the 1988 outage is still underway. Any necessary corrective action to reduce the operator's overload or upgrade the operator will be taken following the completion of Kalsi Engineerings evaluation.

TABLE 2

The as-left close torque switch setting for this valve was 11800 lbs which is below the required value of 12097 lbs. Although this setting is below the required value, the 12097 lbs value contains a 15% margin above the value predicted by the MOVATS correlation. The 11800 lbs value still provides a margin of 12% which is considered adequate. The setting was not increased further due to the excessive seating load already being produced during valve closure.

TABLE 2

HPCS-V-15

A. VALVE DATA

FUNCTION: HPCS-P-1 SUCTION SUPPLY FROM SUPPRESSION POOL

SIZE (IN): 18"
 TYPE: GATE
 RATING (#): 150 #
 MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
 MODEL NO./MOTOR RPM SMB-2-60/3455
 RATED AMPS/VOLTS: 12/460
 OL HEATER: C16.3B
 FUSE(BKR): (146A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 13000
 OPERATOR DESIGN THRUST LIMIT(lbs): 70000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 62.8
 CLOSE DESIGN THRUST(lbs): 8716.0
 CLOSE TS SET AS-FOUND(LBS): 11200.0
 CLOSE TS SET AS-LEFT(lbs): 13020.0
 SEATED THRUST AS-FOUND(LBS) 29400.0
 SEATED THRUST AS-LEFT(LBS): 31400.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 51.4
 OPEN DESIGN THRUST(lbs): 11304.0
 OPEN TS SET AS-FOUND(LBS): 11120.0
 OPEN TS SET AS-LEFT(lbs): 13000.0

TABLE 2

D. DIFFERENTIAL TESTING OF HPCS-V-15

During preoperational testing, HPCS-V-15 was opened against differential pressure of 90 psid. This test demonstrated that the valve operator had adequate thrust to stroke the valve against 90 psid which is greater than the required differential pressure of 51.4 psid in the open direction and 61.1 in the close direction. No additional differential testing was conducted during the recent test program. This valve is a suction supply to the HPCS pump and it was not practical to run a flow test with the opening and closing of this valve due to the potential for pump damage. Consequently, the initial 90 psid test coupled with the confirmation of available operator thrust was considered sufficient to demonstrate adequacy of the valve and operator.

E. AS-FOUND OPERABILITY OF HPCS-V-15

The MOVATS correlation was used to establish the required thrust values for this valve. The correlation was considered conservative for this application based on test data taken on similar valves (HPCS-V-4 & 10) where the correlation predicted required thrust values 10 to 70% higher than measured during differential testing. For this valve, the correlation predicts a required thrust value of 11300 lbs in the open direction and 8716 lbs in the close direction. Inspection of the valve operator confirmed that the valve was opening on limit. In addition, MOVATS test equipment measured an available operator thrust in excess of 40000 lbs. Based on confirmation the valve opens on limit and the available thrust exceeds the projected required, this valve was considered operable in the as-found condition for the open direction. The as-found torque switch setting for the open direction for this valve was 11120 lbs. Following completion of the MOVATS testing of this valve, the adjusted open torque switch setting was 13000 lbs. This as-left setting complies with requirements of the Bulletin and provides backup against limit switch failure.

The close torque switch bypass for this valve was found set at 99% of travel. The close torque switch was set at 11200 lbs, which is above the projected required value of 8716 lbs. The bypass limit on this valve has been reset to 95% and the torque switch setting following balancing was adjusted to 13020 lbs.

The as-found/as-left seated thrust load for this valve in the close direction was 29400 lbs and 31400 lbs, respectively. Approximately 8000 lbs of this thrust is due to valve/motor coast into the seat. These seated thrust loads exceed the design thrust load for the valve. These overload conditions have been evaluated and found to be within the design capability of the valve.

TABLE 2

HPCS-V-23

A. VALVE DATA

FUNCTION: TEST BYPASS FROM HPCS-P-1 TO SUPPRESSION POOL

SIZE (IN): 12"
 TYPE: GLOBE
 RATING (#): 900 #
 MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
 MODEL NO./MOTOR RPM SMB-4-150/1655
 RATED AMPS/VOLTS: 14.5/460
 OL HEATER: C19.8B
 FUSE(BKR): (190A)

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 135300
 OPERATOR DESIGN THRUST LIMIT(lbs): 250000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1217.0
 CLOSE DESIGN THRUST(lbs): 100297.0
 CLOSE TS SET AS-FOUND(LBS): 200300.0
 CLOSE TS SET AS-LEFT(lbs): 128421.0
 SEATED THRUST AS-FOUND(LBS) 203000.0
 SEATED THRUST AS-LEFT(LBS): 131206.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA
 OPEN DESIGN THRUST(lbs): NA
 OPEN TS SET AS-FOUND(LBS): 263368.0
 OPEN TS. SET AS-LEFT(lbs): 128500.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING-HPCS-V-23

During system preoperational testing, HPCS-V-23 was stroked open against a static differential pressure of 1500 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1500 psid which exceeds the design value of 1217 psid. However, additional flow tests for this valve were conducted during this test program because (1) the valve fell outside the MOVATS test database, and, (2) normal thrust load correlations predicted required thrust loads greater than the design thrust limit of the valve.

Three full flow tests were conducted at pressures of 779 psid, 1116 psid and 1478 psid to establish the required thrust limit for this valve. The highest of these test conditions was conducted at system shutoff head which is greater than the limiting condition for operation of this valve. Verification of the developed thrust was accomplished by use of the MOVATS equipment.

E.AS FOUND VALVE OPERABILITY-HPCS-V-23

Based on test data, the thrust required to close this valve against a differential pressure of 1217 psid is 100297 lbs. The as-found close torque switch thrust setting of 200300 lbs for the valve was greater than the test projected value required to close it against this differential pressure. The torque switch was lowered to achieve this thrust during closing and reduce the maximum thrust imposed on the valve. The valve was considered operable in the as-found condition since it was stroked closed against pump shutoff head of approximately 1478 psid during the above described test program and prior to resetting of the torque switches.

The total as-found seated thrust load for this valve in the was 203000 lbs. This seated thrust load is the result of valve/motor inertia of approximately 3000 lbs occurred after the torque switch tripped the motor at 200300 lbs. This as-found thrust load exceeded the design thrust load for the valve by approximately 50%. This overload condition has been evaluated and found to be within the design capability of the valve. The as-left thrust loading for this valve has been reduced to within it's original design thrust load .

TABLE 2

RCIC-V-1

A. VALVE DATA

FUNCTION: RCIC TURBINE STEAM SUPPLY TRIP-THROTTLE

SIZE (IN): 3"

TYPE: GLOBE

RATING (#): 900 #

MANUFACTURER: SCHUTTE-KOERTING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-000-2/1900

RATED AMPS/VOLTS: 0.8/250

OL HEATER: G30T17

FUSE(BKR): 1.8A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): NA

OPERATOR DESIGN THRUST LIMIT(lbs): 8000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): NA

CLOSE DESIGN THRUST(lbs): NA

CLOSE TS SET AS-FOUND(LBS): NA

CLOSE TS SET AS-LEFT(lbs): NA

SEATED THRUST AS-FOUND(LBS) NA

SEATED THRUST AS-LEFT(LBS): NA

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA

OPEN DESIGN THRUST(lbs): NA

OPEN TS SET AS-FOUND(LBS): NA

OPEN TS SET AS-LEFT(lbs): NA

D. DIFFERENTIAL PRESSURE TESTING-RCIC-V-1

RCIC-V-1 is the turbine trip and throttle valve. During required operation, the differential pressure across this valve is negligible. The reason for this is that, prior to opening or resetting this valve following a turbine trip, the RCIC steam admission valve (RCIC-V-45) located upstream is first closed. This action resets the RCIC system startup logic. The RCIC turbine trip and throttle above seat drain, upstream of the valve, then vents any steam that is trapped between the trip/throttle valve and the steam admission valve. This venting reduces the upstream pressure across the valve to a negligible value prior to reopening. Consequently, no differential testing of this valve is required.

E. AS-FOUND OPERABILITY RCIC-V-1

Since this valve operates with no differential pressure across it, operability is demonstrated every time the valve is stroked. Inspection of the valve and its operator was conducted during the test program. Multiple valve strokes were also performed during the test program.

TABLE 2

RCIC-V-8

A. VALVE DATA

FUNCTION: OUTBOARD CONTAINMENT ISOL ON STEAM SUPPLY TO RCIC TURBINE

SIZE (IN): 4"
TYPE: GATE
RATING (#): 900 #
MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
MODEL NO./MOTOR RPM SMB-00-7.5/1900
RATED AMPS/VOLTS: 5.5/125
OL HEATER: G30T36
FUSE(BKR): 12A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 10900
OPERATOR DESIGN THRUST LIMIT(lbs): 14000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1150.0
CLOSE DESIGN THRUST(lbs): 8711.0
CLOSE TS SET AS-FOUND(LBS): 7201.0
CLOSE TS SET AS-LEFT(lbs): 9016.0
SEATED THRUST AS-FOUND(LBS) 7500.0
SEATED THRUST AS-LEFT(LBS): 9325.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA
OPEN DESIGN THRUST(lbs): NA
OPEN TS SET AS-FOUND(LBS): 4659.0
OPEN TS SET AS-LEFT(lbs): 10267.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-8

During system preoperational testing, RCIC-V-8 was stroked open against a static differential pressure of 1158 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1158 psid which exceeds the design value of 1150 psid required for this valve in the close direction.

No differential testing of this valve was conducted in the close direction since no practical method could be found to simulate the close function of this valve which is isolation of a steam line break outside of containment. In lieu of this testing, the MOVATS correlation was used to predict the thrust load required to close the valve against its design condition of 1150 psid.

E. AS-FOUND OPERABILITY RCIC-V-8

This valve must close against a design differential pressure of 1150 psig. Using the MOVATS correlation, a design thrust of 8711 lbs is required in the close direction.

The close torque switch bypass for this valve was found set at 92% of travel. The torque switch was set at 7200 lbs, which was below the projected required value of 8711 lbs. As stated above, the safety function for this valve in the close direction is isolation of steam line breaks. Since testing for this condition was not possible, operability could not be confirmed. Based on the thrust values projected by the MOVATS correlation, the as-found torque switch setting of 7200 lbs may have been insufficient to totally close the valve after the bypass limit switch opened at 92%. The bypass limit on this valve has been reset to 98% and the torque switch setting increased to 9000 lbs.

TABLE 2

RCIC-V-10

A. VALVE DATA

FUNCTION: RCIC PUMP SUCTION SUPPLY FROM COND STORAGE TANK

SIZE (IN): 8"

TYPE: GATE

RATING (#): 150 #

MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-00-15/1900

RATED AMPS/VOLTS: 9.8/125

OL HEATER: G30T40

FUSE(BKR): 15A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 33244

OPERATOR DESIGN THRUST LIMIT(lbs): 14000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 63.5
CLOSE DESIGN THRUST(lbs): 3121.0
CLOSE TS SET AS-FOUND(LBS): 11782.0
CLOSE TS SET AS-LEFT(lbs): 15540.0
SEATED THRUST AS-FOUND(LBS) 12400.0
SEATED THRUST AS-LEFT(LBS): 16213.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA
OPEN DESIGN THRUST(lbs): NA
OPEN TS SET AS-FOUND(LBS): 10769.0
OPEN TS SET AS-LEFT(lbs): 10769.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING-RCIC-V-10

No differential testing of this valve was conducted during the recent test program. This valve is a suction supply to the RCIC pump and it was not practical to run a flow test with the opening and closing of this valve due to the potential for pump damage. Consequently, use of the MOVATS thrust correlation coupled with verification of the valve operator's available thrust using the MOVATS test equipment was performed as an alternate. This approach was considered adequate since the required differential pressure under which this valve must close is only 63.5 psid.

E. AS-FOUND OPERABILITY RCIC-V-10

The MOVATS correlation was used to establish the required thrust values for this valve. The correlation predicts a required thrust value of 3121 lbs in the close direction. The as-found close thrust load for this valve was 11782 lbs. This as-found thrust is significantly greater than the required thrust. Consequently, this valve was considered operable in the as-found condition.

The torque switch on this valve was reduced to 7500 lbs to limit the thrust of the valve during seating. The total thrust of this valve including inertia effects approached the 14000 lb rating limit of the valve operator. No anomalies were discovered in the valve or its operator during testing.

TABLE 2

RCIC-V-13

A. VALVE DATA

FUNCTION: RCIC PUMP DISCHARGE TO REACTOR VESSEL

SIZE (IN): 6"
TYPE: GATE
RATING (#): 900 #
MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
MODEL NO./MOTOR RPM SMB-O-40/1900
RATED AMPS/VOLTS: 12/250
OL HEATER: G30T43
FUSE(BKR): 20A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 26101
OPERATOR DESIGN THRUST LIMIT(lbs): 24000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 63.0
CLOSE DESIGN THRUST(lbs): 3136.0
CLOSE TS SET AS-FOUND(LBS): 27935.0
CLOSE TS SET AS-LEFT(lbs): 20593.0
SEATED THRUST AS-FOUND(LBS) 40000.0
SEATED THRUST AS-LEFT(LBS): 32080.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 1224.0
OPEN DESIGN THRUST(lbs): 20844.0
OPEN TS SET AS-FOUND(LBS): 23427.0
OPEN TS SET AS-LEFT(lbs): 25960.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING RCIC-V-13

During system preoperational testing, RCIC-V-13 was stroked open against a static differential pressure of 1325 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1325 psid which exceeds the required design value of 1224 psid. However, additional flow testing for this type valve was considered necessary because the valve falls outside the MOVATS test database. Consequently, RCIC-V-59, which is identical to RCIC-V-13, was flow tested to establish the required thrust limit for the valve. RCIC-V-13 was not tested directly since it would have required injection of water into the reactor vessel when the reactor was at power and isolated from the main turbine.

Three full flow tests were conducted on RCIC-V-59 at valve differential pressures of 289 psid, 661 psid and 952 psid. Although no flow test was conducted at the peak design differential pressure of 1224 psid, the preoperational test against a differential pressure of 1325 psid was considered adequate demonstration of the ability of this valve to perform it's safety function. In the closing direction, this valve must close to provide it's containment isolation function. The differential pressure across the valve for this condition is 63 psid. Verification of the developed thrust was accomplished by use of the MOVATS equipment.

E.AS-FOUND OPERABILITY RCIC-V-13

As stated above, this valve must open against a design differential of 1224 psid and close against a design differential pressure of 63 psid. From flow testing, the thrust required to open the valve against 1224 psid is 20844 lbs and 3136 lbs to close against 63 psid.

Inspection of the valve operator confirmed that the valve was opening on limit. Also, MOVATS test equipment measured an available operator thrust in excess of 39000 lbs. Consequently, based on the the original static test against 1325 psid, confirmation the valve opens on limit and the fact that the available thrust exceeds the projected required, this valve was considered operable in the as-found condition in the open direction. However, to comply with the Bulletin the open torque switch was increased to provide backup against limit switch failure.

The close torque switch bypass for this valve was found set at 90% of travel. The close torque switch was set at 27935 lbs, which is significantly higher than the projected required value of 3200 lbs. Since the as-found torque switch setting exceeded the

TABLE 2

required thrust value, the valve was considered operable in the as-found condition. The bypass limit on this valve has been reset to 96% and the torque switch setting decreased to 20590 lbs. A review of the MOVATS measured thrust loads during valve closing indicate that the total seated thrust for this valve exceeds the design limit of both the valve and it's operator. Engineering review of the valve overload condition indicates that the applied thrust loads are still within the design capabilities of the valve. A preliminary review of the operator overload condition has been completed by Kalsi Engineering. Their review indicates that the duty cycles imposed on the operator to date and those expected up to the 1988 plant outage are within the design capability of the operator. Further review of the operator is underway by Kalsi Engineering to determine remaining operator life. Following completion of this review, required corrective action will identified and implemented.

TABLE 2

RCIC-V-19

A. VALVE DATA

FUNCTION: RCIC-P-1 MINIMUM FLOW VALVE

SIZE (IN): 2"
 TYPE: GLOBE
 RATING (#): 1500 #
 MANUFACTURER: BORG-WARNER

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
 MODEL NO./MOTOR RPM SMB-00-10/1900
 RATED AMPS/VOLTS: 3.4/240
 OL HEATER: G30T31
 FUSE(BKR): 6A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 12259
 OPERATOR DESIGN THRUST LIMIT(lbs): 14000

CLOSE DATA

OPEN DATA

CLOSE DESIGN DELTA-P(psid): 1451.0	OPEN DESIGN DELTA-P(psid): 1261.0
CLOSE DESIGN THRUST(lbs): 4571.0	OPEN DESIGN THRUST(lbs): 1419.0
CLOSE TS SET AS-FOUND(LBS): 4800.0	OPEN TS SET AS-FOUND(LBS): 4720.0
CLOSE TS SET AS-LEFT(lbs): 7405.0	OPEN TS SET AS-LEFT(lbs): 7200.0
SEATED THRUST AS-FOUND(LBS) 5800.0	
SEATED THRUST AS-LEFT(LBS): 8430.0	

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-19

During system preoperational testing, RCIC-V-19 was stroked open against a static differential pressure of 1325 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1325 psid which exceeds the required design value of 1261 psid. However, additional flow testing for this type valve was considered necessary because the prediction of thrust loads by normal thrust correlations exceeds the design thrust limit of the valve and it's operator.

Three full flow tests were conducted at valve differential pressures of 316 psid, 664 psid and 1019 psid. For opening, the preoperational test at 1325 psid which bounds the required of 1261 psid is considered adequate to demonstrate open capability. Although no flow test was conducted at the peak design differential pressure of 1451 psid it should be noted that 190 psi of this 1451 psid is the result of fluid deceleration during valve closure. Consequently, the peak test condition, which was conducted at a static condition of 1019 psid, was within 250 psi of the design differential pressure ($1451 - 190 = 1261$). Verification of the developed thrust was accomplished by use of the MOVATS equipment.

E. AS-FOUND OPERABILITY RCIC-V-19

Based on test data, a thrust of 1419 lbs is required to open the valve against a design differential of 1261 psid, and 4571 lbs to close it against a differential pressure of 1451 psid.

Inspection of the valve operator confirmed that the valve was opening on limit. Also, MOVATS test equipment measured an available operator thrust in excess of 13500 lbs. Based on the the original static test against 1325 psid, confirmation the valve opens on limit and the fact that available thrust exceeds the projected required value of 1419 lbs, this valve was considered operable in the as-found condition in the open direction. However, to comply with the Bulletin, the open torque switch was increased to provide backup against limit switch failure.

The close torque switch bypass for this valve was found set at 95% of travel. The close torque switch was set at 4800 lbs, which is higher than the projected required value of 4571 lbs. Since the as-found torque switch setting exceeded the required thrust value, the valve was considered operable in the as-found condition for the close direction. The bypass limit on this valve has been reset to 99% and the torque switch setting increased to 7405 lbs.

TABLE 2

RCIC-V-22

A. VALVE DATA

FUNCTION: TEST BYPASS FROM RCIC-P-1 TO CST

SIZE (IN): 6"

TYPE: GLOBE

RATING (#): 900 #

MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-02-60/1900

RATED AMPS/VOLTS: 12/240

OL HEATER: G30T43

FUSE(BKR): 25A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 54140

OPERATOR DESIGN THRUST LIMIT(lbs): 70000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 333.0

CLOSE DESIGN THRUST(lbs): 18163.0

CLOSE TS SET AS-FOUND(LBS): 30338.0

CLOSE TS SET AS-LEFT(lbs): 52400.0

SEATED THRUST AS-FOUND(LBS) 34400.0

SEATED THRUST AS-LEFT(LBS): 56400.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA

OPEN DESIGN THRUST(lbs): NA

OPEN TS SET AS-FOUND(LBS): 36562.0

OPEN TS SET AS-LEFT(lbs): 53800.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING RCIC-V-22

Flow testing for this valve was considered necessary because this valve type falls outside the MOVATS database. Three flow tests were conducted on this valve at differential pressures of 311 psid, 614 psid and 931 psid. The design differential pressure for this valve is 333 psid. The three tests conducted for this valve bounded this condition. Verification of the developed thrust was accomplished by use of the MOVATS equipment.

E.AS-FOUND OPERABILITY RCIC-V-22

Based on this test data, the required thrust value for closing this valve against 333 psid was determined to be 18163 lbs. Note, confirmation that this valve can close across its design differential of 333 psid is made every time the system's surveillance test is performed. The as-found CLOSE torque switch setting for this valve was 30338 lbs, which was significantly higher than the required value. Consequently this valve was considered operable in the as-found condition. The torque switch bypass for this valve was set to 95% and the torque switch set to 52400.

The as-left seated thrust load for this valve exceeds the design limit for the valve by approximately 5%. This overload condition has been evaluated and found to be within the design capability of the valve.

The installed overload heater and fuse sizes for this valve were reviewed and found to be acceptable.

TABLE 2

RCIC-V-31

A. VALVE DATA

FUNCTION: RCIC-P-1 SUCTION SUPPLY FROM SUPPRESSION POOL

SIZE (IN): 8"

TYPE: GATE

RATING (#): 150 #

MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-00-15/1900

RATED AMPS/VOLTS: 9.8/125

OL HEATER: G30T41

FUSE(BKR): 17.5A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 33244

OPERATOR DESIGN THRUST LIMIT(lbs): 14000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 53.0

CLOSE DESIGN THRUST(lbs): 2874.0

CLOSE TS SET AS-FOUND(LBS): 5221.0

CLOSE TS SET AS-LEFT(lbs): 4904.0

SEATED THRUST AS-FOUND(LBS) 6791.0

SEATED THRUST AS-LEFT(LBS): 6471.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 51.5

OPEN DESIGN THRUST(lbs): 3471.0

OPEN TS SET AS-FOUND(LBS): 5141.0

OPEN TS SET AS-LEFT(lbs): 5535.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING RCIC-V-31

No differential testing of this valve was conducted during the recent test program. This valve is a suction supply to the RCIC pump and it was not practical to run a flow test with the opening and closing of this valve due to the potential for pump damage. Consequently, use of the MOVATS thrust correlation coupled with verification of the valve operator's available thrust using the MOVATS test equipment was performed as an alternate. This approach was considered adequate since the required differential pressure under which this valve must operate is 51.5 psid in the open direction and 53.0 psid in the close direction.

E.AS-FOUND OPERABILITY RCIC-V-31

At the design differential stated above, the MOVATS correlation predicts a required design thrust of 3471 lbs in the open direction, and 2874 lbs in the close direction. Inspection of the valve operator confirmed that the valve was opening on limit. In addition, MOVATS test equipment measured an available operator thrust in excess of 6500 lbs. Based on confirmation the valve opens on limit and the available thrust exceeds the projected required, this valve was considered operable in the as-found condition for the open direction. The as-found torque switch setting for the open direction for this valve was 5141 lbs. Following completion of the MOVATS testing of this valve, the adjusted open torque switch setting was 5535 lbs. This as-left setting complies with requirements of the Bulletin and provides backup against limit switch failure.

The close torque switch bypass for this valve was found set at 94% of travel. The close torque switch was set at 5221 lbs, which is above the projected required value of 2875 lbs. The bypass limit on this valve has been reset to 99% and the torque switch setting adjusted to 4900 lbs.

TABLE 2

RCIC-V-45

A. VALVE DATA

FUNCTION: RCIC TURBINE STEAM SUPPLY ADMISSION VALVE

SIZE (IN): 4"

TYPE: GLOBE

RATING (#): 900 #

MANUFACTURER: ANCHOR DARLING

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-O-15/1900

RATED AMPS/VOLTS: 4.7/250

OL HEATER: G30T34

FUSE(BKR): 8.0A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 25043

OPERATOR DESIGN THRUST LIMIT(lbs): 24000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1150.0

CLOSE DESIGN THRUST(lbs): 22820.0

CLOSE TS SET AS-FOUND(LBS): 41830.0

CLOSE TS SET AS-LEFT(lbs): 24341.0

SEATED THRUST AS-FOUND(LBS) 43800.0

SEATED THRUST AS-LEFT(LBS): 25882.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 1150.0

OPEN DESIGN THRUST(lbs): 19777.0

OPEN TS SET AS-FOUND(LBS): 41160.0

OPEN TS SET AS-LEFT(lbs): 20500.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-45

During system preoperational testing, RCIC-V-45 was stroked open against a static differential pressure of 1158 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1158 psid which exceeds the design value of 1150 psid required for this valve in the open direction. This test was considered adequate for demonstrating the open function of the valve. No differential testing was conducted on this valve in the close direction since it was not possible to develop the required pressure conditions under which this valve must close. The valve has been closed during plant operation against a steam line pressure of approximately 1000 psig several times.

E. AS-FOUND OPERABILITY RCIC-V-45

This valve must both open and close against a design differential pressure of 1150 psig. Using the MOVATS correlation, a design thrust of 19777 lbs is required in the open direction, and 22820 lbs is required in the close direction. Inspection of the valve operator confirmed that the valve was opening on limit. MOVATS test equipment measured an available operator thrust in excess of 41000 lbs. Based on the the original static test against 1158 psid, confirmation the valve opens on limit and the fact that the available thrust exceeds the projected required, this valve was considered operable in the as-found condition.

The as-found close torque switch was set at 41830 lbs, which is significantly higher than the projected required value of 22820 lbs. Based on this as-found setting the valve was considered operable in the close direction. Following MOVATS testing of this valve, the torque switch setting on this valve was reduced to 24340 lbs. At the previous setting of 41830 lbs, the total seated thrust load seen by the valve during closing was approximately 43800 lbs. This thrust exceeds the design limit of both the valve and it's operator. This valve overload condition has been reviewed by engineering and was determined to be within the design capability of the valve. A preliminary review of the operator overload has been completed for WNP-2 by our consultant Kalsi Engineering. Their review indicates that the duty cycles imposed on the operator to date and those expected up to the 1988 plant outage are within the design capability of the operator. Further review of the operator is underway by Kalsi Engineering to determine remaining operator life. Following completion of this review, required corrective action will identified and implemented.

TABLE 2

RCIC-V-46

A. VALVE DATA

FUNCTION: RCIC LUBE OIL COOLER-COOLING WATER SUPPLY

SIZE (IN): 2"
TYPE: GLOBE
RATING (#): 1500 #
MANUFACTURER: BORG-WARNER

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
MODEL NO./MOTOR RPM SMB-000-5/1900
RATED AMPS/VOLTS: 3.8/120
OL HEATER: G30T32
FUSE(BKR): 8.0A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 12259
OPERATOR DESIGN THRUST LIMIT(lbs): 8000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1293.0
CLOSE DESIGN THRUST(lbs): 4843.0
CLOSE TS SET AS-FOUND(LBS): 7068.0
CLOSE TS SET AS-LEFT(lbs): 7492.0
SEATED THRUST AS-FOUND(LBS) 7400.0
SEATED THRUST AS-LEFT(LBS): 7802.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 1280.0
OPEN DESIGN THRUST(lbs): 1643.0
OPEN TS SET AS-FOUND(LBS): 3653.0
OPEN TS SET AS-LEFT(lbs): 7680.0

TABLE 2

D.DIFFERENTIAL PRESSURE TESTING RCIC-V-46

No flow testing at design conditions was performed with this valve. However, the tests performed with RCIC-V-19 are applicable to this valve. Both valves are 2" 1500 lb. class Borg-Warner globe valves and are identical except for stem size (RCIC-V-46 has a larger stem). In addition, this valve is cycled open and closed every time the RCIC turbine is started and stopped. Under these conditions, the valve sees a pump discharge pressure of approximately 1100 psid. Verification of thrust loads was accomplished using the MOVATS equipment.

E.AS-FOUND OPERABILITY RCIC-V-46

Based on RCIC-V-19 test results, a projected thrust of 1643 lbs is required to open the valve against a design differential of 1280 psid, and 4843 lbs is required to close it against a differential pressure of 1293 psid.

Inspection of the valve operator confirmed that the valve was opening on limit. Also, MOVATS test equipment measured an available operator thrust in excess of 7700 lbs. Based on the confirmation that the valve opens on limit and that the available thrust exceeds the projected required value of 1643 lbs, this valve was considered operable in the as-found condition in the open direction. During MOVATS testing of this valve, the torque switch for this valve was balanced resulting in an adjustment of the open torque switch from 3650 lbs (as-found) to 7680 lbs. This as-left open thrust is significantly higher than required and provides a backup against limit switch failure.

The as-found close torque switch setting for this valve was set at 7068 lbs, which is higher than the projected required value of 4843 lbs. Since the as-found torque switch setting exceeded the required thrust value, the valve was considered operable in the as-found condition for the close direction. The torque switch setting was adjusted to 7492 lbs during the MOVATS testing of this valve.

TABLE 2

RCIC-V-59

A. VALVE DATA

FUNCTION: TEST BYPASS FROM RCIC-P-1 TO CST

SIZE (IN): 6"
 TYPE: GATE
 RATING (#): 900 #
 MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
 MODEL NO./MOTOR RPM SMB-O-40/1900
 RATED AMPS/VOLTS: 12.0/240
 OL HEATER: G30T42
 FUSE(BKR): 17.5A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 26101
 OPERATOR DESIGN THRUST LIMIT(lbs): 24000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): NA
 CLOSE DESIGN THRUST(lbs): NA
 CLOSE TS SET AS-FOUND(LBS): 4200.0
 CLOSE TS SET AS-LEFT(lbs): 27180.0
 SEATED THRUST AS-FOUND(LBS) 7000.0
 SEATED THRUST AS-LEFT(LBS): 30502.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA
 OPEN DESIGN THRUST(lbs): NA
 OPEN TS SET AS-FOUND(LBS): 4200.0
 OPEN TS SET AS-LEFT(lbs): 34710.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-59

Three differential pressure tests were conducted with this valve as an alternative to testing RCIC-V-13. These valves are identical to each other in every aspect. Differential pressure testing of this valve for its opening and closing requirements was not required since this valve never operates with any differential pressure across it.

E. AS-FOUND OPERABILITY RCIC-V-59

RCIC-V-59 is a system test valve, which returns pump flow to the Condensate Storage Tank. By procedure this valve is never closed with any pump discharge pressure across it. Consequently, the valve must only demonstrate the ability to open and close. This function is demonstrated every time the system is tested. Based on this demonstrated ability, the valve was considered operable in the as-found condition.

As part of the test program, the torque switches were increased to their maximum settings and left in that position. Consequently, the as-left seated thrust for this valve exceeds both the valve and the operator's design limits. Both these conditions have been evaluated, and continued operability established until the 1988 plant outage. During the outage, the close torque will be reduced to within the design limits of the valve and operator.

TABLE 2

RCIC-V-63

A. VALVE DATA

FUNCTION: INBOARD CONTAINMENT ISOL ON STEAM SUPPLY TO RCIC TURBINE

SIZE (IN): 10"

TYPE: GATE

RATING (#): 900 #

MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-2-60/3390

RATED AMPS/VOLTS: 10.7/460

OL HEATER: G30T43

FUSE(BKR): 15A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 57782

OPERATOR DESIGN THRUST LIMIT(lbs): 70000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1150.0

CLOSE DESIGN THRUST(lbs): 36034.0

CLOSE TS SET AS-FOUND(LBS): 27200.0

CLOSE TS SET AS-LEFT(lbs): 37400.0

SEATED THRUST AS-FOUND(LBS) 35700.0

SEATED THRUST AS-LEFT(LBS): 45933.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA

OPEN DESIGN THRUST(lbs): NA

OPEN TS SET AS-FOUND(LBS): NA

OPEN TS SET AS-LEFT(lbs): 50000.0



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TABLE 2

D.DIFFERENTIAL PRESSURE TESTING RCIC-V-63

During system preoperational testing, RCIC-V-63 was stroked open against a static differential pressure of 1158 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1158 psid which exceeds the design value of 1150 psid required for this valve in the close direction.

No differential testing of this valve was conducted in the close direction since no practical method could be found to simulate the close function of this valve which is isolation of steam line breaks outside of containment. In lieu of this testing, the MOVATS correlation was used to predicted the thrust load required to close the valve against it's design condition of 1150 psid.

E.AS-FOUND OPERABILITY RCIC-V-63

Using the MOVATS correlation, a design thrust of 36034 lbs is required, to close this valve against a differential pressure of 1150 psid.

The close torque switch bypass for this valve was found set at 88% of travel. The torque switch was set at 27200 lbs, which was below the projected required value of 36034 lbs. As stated above, the safety function for this valve in the close direction is isolation of steam line breaks. Since testing for this condition was not possible, operability in the close direction could not be confirmed. However, the MOVATS correlation indicate that the as-found torque switch setting of 27200 lbs may have been insufficient to totally close the valve after the bypass limit switch opened at 88%. The bypass limit on this valve has been reset to 98% and the torque switch setting increased to 37400 lbs.

TABLE 2

RCIC-V-68

A. VALVE DATA

FUNCTION: RCIC TURBINE EXHAUST TO SUPPRESSION POOL

SIZE (IN): 10"

TYPE: GATE

RATING (#): 150 #

MANUFACTURER: VELAN

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-O-15/1900

RATED AMPS/VOLTS: 9.8/125

OL HEATER: G30T40

FUSE(BKR): 15A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 13372

OPERATOR DESIGN THRUST LIMIT(lbs): 24000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 44.0

CLOSE DESIGN THRUST(lbs): 3474.0

CLOSE TS SET AS-FOUND(LBS): 14400.0

CLOSE TS SET AS-LEFT(lbs): 13047.0

SEATED THRUST AS-FOUND(LBS) 16500.0

SEATED THRUST AS-LEFT(LBS): 14865.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 25.0

OPEN DESIGN THRUST(lbs): 3285.0

OPEN TS SET AS-FOUND(LBS): 5434.0

OPEN TS SET AS-LEFT(lbs): 4736.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-68

No differential testing of this valve was conducted during the recent test program. This valve is the steam exhaust for the RCIC turbine and it was not practical to run a flow test with the opening and closing of this valve due to the potential for turbine damage. Consequently, use of the MOVATS thrust correlation coupled with verification of available thrust using the MOVATS test equipment was performed as an alternate. This approach was considered adequate since the required differential pressure under which this valve must operate is 25 psid in the open direction and 44 psid in the close direction.

E. AS-FOUND OPERABILITY RCIC-V-68

Using the MOVATS correlation, a thrust of 3285 lbs is required to open this valve against a differential pressure of 25 psid and 3474 lbs is required to close the valve against 44 psid. Inspection of the valve operator confirmed that the valve was opening on limit. In addition, MOVATS test equipment measured an available operator thrust in excess of 15000 lbs. Based on confirmation the valve opens on limit and the available thrust exceeds the projected required, this valve was considered operable in the as-found condition for the open direction. The as-found torque switch setting for the open direction for this valve was 5435 lbs. Following completion of the MOVATS testing of this valve, the adjusted open torque switch setting was 4736 lbs. This as-left setting complies with requirements of the Bulletin and provides backup against limit switch failure.

The close torque switch bypass for this valve was found set at 99% of travel. The close torque switch was set at 14400 lbs, which is above the projected required value of 3474 lbs. The bypass limit on this valve has been left at 99% and the torque switch setting reduced to 13047 lbs.

TABLE 2

RCIC-V-69

A. VALVE DATA

FUNCTION: RCIC VACUUM PUMP RCIC-P-2 DISCHARGE TO SUPPRESSION POOL

SIZE (IN): 1-1/2"

TYPE: GLOBE

RATING (#): 1500 #

MANUFACTURER: BORG-WARNER

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE

MODEL NO./MOTOR RPM SMB-000-5/1900

RATED AMPS/VOLTS: 2.1/250

OL HEATER: G30T32

FUSE(BKR): 9.0A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 3732

OPERATOR DESIGN THRUST LIMIT(lbs): 8000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 48.0

CLOSE DESIGN THRUST(lbs): 980.0

CLOSE TS SET AS-FOUND(LBS): NA

CLOSE TS SET AS-LEFT(lbs): 1860.0

SEATED THRUST AS-FOUND(LBS) NA

SEATED THRUST AS-LEFT(LBS): 3453.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): NA

OPEN DESIGN THRUST(lbs): NA

OPEN TS SET AS-FOUND(LBS): NA

OPEN TS SET AS-LEFT(lbs): 1468.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-69

No differential testing of this valve was conducted during the recent test program. This valve is the vacuum exhaust for the RCIC turbine barometric condenser and it was not practical to run a flow test with the opening and closing of this valve due to the potential for turbine damage. Consequently, use of the MOVATS thrust correlation coupled with verification of available thrust using the MOVATS test equipment was performed as an alternate. This approach was considered adequate since the required differential pressure under which this valve must operate is 48.0 psid in the close direction.

E. AS-FOUND OPERABILITY RCIC-V-69

Using the MOVATS correlation, a thrust of 980 lbs is required to close the valve against a differential pressure of 48.0 psid. The close torque switch bypass for this valve was found set at 85% of travel. The close torque switch thrust setting was not recorded for this valve since the torque switch was broken. Consequently, operability of this valve was not established. The close bypass limit on this valve has been reset to 98% and the torque switch was replaced and the setting adjusted to 1860 lbs.

TABLE 2

RCIC-V-76

A. VALVE DATA

FUNCTION: RCIC TURBINE STEAM SUPPLY LINE WARM-UP VALVE

SIZE (IN): 1"
TYPE: GLOBE
RATING (#): 1500 #
MANUFACTURER: BORG-WARNER

B. OPERATOR DATA:

MANUFACTURER: LIMITORQUE
MODEL NO./MOTOR RPM SMB-000-5/1700
RATED AMPS/VOLTS: 0.75/480
OL HEATER: G30T17
FUSE(BKR): 1.125A

C. DESIGN DATA

VALVE DESIGN THRUST LIMIT(lbs): 12259
OPERATOR DESIGN THRUST LIMIT(lbs): 8000

CLOSE DATA

CLOSE DESIGN DELTA-P(psid): 1150.0
CLOSE DESIGN THRUST(lbs): 1738.0
CLOSE TS SET AS-FOUND(LBS): 4060.0
CLOSE TS SET AS-LEFT(lbs): 5755.0
SEATED THRUST AS-FOUND(LBS) 4700.0
SEATED THRUST AS-LEFT(LBS): 6432.0

OPEN DATA

OPEN DESIGN DELTA-P(psid): 1150.0
OPEN DESIGN THRUST(lbs): 1394.0
OPEN TS SET AS-FOUND(LBS): 4757.0
OPEN TS SET AS-LEFT(lbs): 5610.0

TABLE 2

D. DIFFERENTIAL PRESSURE TESTING RCIC-V-76

During system preoperational testing, RCIC-V-76 was stroked open against a static differential pressure of 1158 psid. This test demonstrated that the valve operator had adequate thrust available to stroke the valve against 1158 psid which exceeds the design value of 1150 psid required for this valve in the open direction.

No differential testing of this valve was conducted in the close direction since no practical method could be found to simulate the close function of this valve which is isolation of a steam line break outside of containment. In lieu of this testing, the MOVATS correlation was used to predicted the thrust load required to close the valve against it's design condition of 1150 psid.

E. AS-FOUND OPERABILITY RCIC-V-76

This valve must both open and close against a design differential pressure of 1150 psig. Using the MOVATS correlation, a design thrust of 1738 lbs is required in the open direction, and 1394 lbs is required in the close direction. Inspection of the valve operator confirmed that the valve was opening on limit. Also, the MOVATS test equipment measured an available operator thrust in excess of 6000 lbs. Based on the the original static test against 1158 psid, confirmation the valve opens on limit and the fact that the available thrust exceeds the projected required, this valve was considered operable in the as-found condition. However, to comply with the Bulletin the open torque switch was adjusted to 5610 lbs to provide backup against limit switch failure.

The close torque switch bypass for this valve was found set at 91% of travel. The torque switch was set at 4060 lbs, which was above the projected required value of 1738 lbs. Consequently, this valve was considered operable in the close direction. The bypass limit on this valve has been reset to 99% and the torque switch setting increased to 5755 lbs.