Attachment to WM 88-0008
January 14, 1988

FINAL REPORT ON NRC IE BULLETIN 85-03

WOLF CREEK GENERATING STATION

WOLF CREEK
NUCLEAR OPERATING CORPORATION

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Final Report For IE Bulletin 85-03

I. Introduction

On November 15, 1985, the Nuclear Regulatory Commission (NRC) issued IE Bulletin No. 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due To Improper Switch Settings". This Bulletin requested all holders of nuclear power reactor operating licenses and construction permits to develop and implement a program to ensure that switch settings on certain safety related motor-operated valves are selected, set, and maintained correctly to accommodate the maximum differential pressures expected on these valves during both normal and abnormal events within the design basis.

On May 14, 1986, a response was submitted to the NRC to address action item e of Bulletin 85-03 which required the licensee to submit a report to the NRC that: (1) reports the results of action item a. and (2) contains the program to accomplish action items b. through d. including a schedule for completion of the items. On August 29, 1986, in response to an NRC request, additional information was submitted to more clearly detail the program at Wolf Creek Generating Station (WCGS) to accomplish action items b. through d. of Bulletin 85-03. On June 5, 1987, Wolf Creek Nuclear Operating Corporation (WCNOC) provided an updated schedule in which the completion of the Bulletin 85-03 program was planned on November 15, 1987, with the final report being submitted within 60 days thereafter.

This final report for WCGS addresses Bulletin 85-03, action item f, which states:

> Provide a written report on completion of the above program. This report should provide (1) a verification of completion of the requested program, (2) a summary of the findings as to valve operability prior to any adjustments as a result of this bulletin, and (3) a summary of data in accordance with Table 2, Suggested Data Summary Format. The NRC staff intends to use this data to assist in the resclution of Generic Issue II.E.6.1. This report shall be submitted to the NRC within 60 days of completion of the program. Table 2 should be expanded, if appropriate, to include a summary of all data required to evaluate the response to this bulletin.

The requested program was completed at WCGS on November 15, 1987. Section II to this report describes the motor operated valve program which was used at WCGS to complete the actions of the bulletin. Section III of this report contains the summary as to valve operability prior to any adjustments as a result of the bulletin. Section IV provides the data summary in accordance with the suggested format.

II. Description of Bulletin 85-03 Motor Operated Valve Program at WCGS

The IE Bulletin 85-03 program is organized into four phases which correspond to action items a. b. c. and d. from Bulletin 85-03. These phases provide for: I) identification of valves to be included and verification of design basis for the operation of each valve (action item a.); II) development of policies and procedures for establishing correct switch settings (action item b.); III) switch adjustment, demonstration that the settings defined in Phase II above have been properly implemented, and demonstration that the valves will function properly under the maximum differential pressures expected on the valves during both normal and abnormal events within the design basis (action item c.); IV) preparation or revision of procedures for periodic testing and inspections to ensure that correct switch settings are determined and maintained throughout the life of the plant (action item d.).

Each phase of the program is described in the following paragraphs.

Phase I - Identification of valves to be included and verification of design basis for the operation of each valve.

The Wolf Creek Nuclear Operating Corporation (WCNOC) response to action item a. is based on methodology developed by the Westinghouse Owners Group (WOG) for member utilities (see WOG-86-168, Westinghouse Owners Group Safety-Related Motor-Operated Valve (MOV) Program Final Report, dated April 7, 1986 as amended by letter OG-87-21). This methodology is based on the SNUPPS design for the high pressure injection system and auxiliary feedwater system. The fluid systems evaluation was used to determine the maximum operating differential pressure for all system operating modes and design basis events. The maximum operating differential pressure represents the maximum pressure capability of the system equipment for the system operating modes and design basis events based on system design.

Attachment A, IE Bulletin 85-03 Valve Information, provides a list of the valves to be included and design information for operation of each valve. This information consists of:

A) MOV as listed by Wolf Creek Generating Station (WCGS)

B) Brief description of valve function.

C) Differential pressure for opening and closing as specified in the design equipment specification.

D) Maximum operating differential pressure for opening and closing as determined by the fluid systems evaluation.

E) A brief justification statement for the maximum operating differential pressures.

F) Results of a review to determine if Emergency Response Guidelines (ERGs) are consistent with the fluid systems operating assumptions.

Phase II - Development of policies and procedures for establishing correct switch settings.

This phase of the program defines the technical basis for establishing torque and limit switch setpoints. The technical basis for many of the setpoint policies to be used at WCGS have been developed in conjunction with MOVATS Incorporated. MOVATS utilized test results from many plants to establish and justify several alternate policies for torque, torque bypass, and limit switch setpoint adjustments. A description of the policies and technical basis is included as Attachment B, Switch Adjustment Policies and Justifications.

Listed below are the switches for which WCNOC determined that setpoint policies were required in response to Bulletin 85-03. Also, listed are the policies which were not included in Attachment B.

A) Open Torque Switch
 - See Attachment B

B) Open Limit Switch
 - See Attachment B

C) Close-to-Open Torque Bypass Limit Switch
 - See Attachment B

D) Open Indication Limit Switch
 - The policy to be utilized at WCGS for the open indication limit switch will be to have the open indication limit switch set at the same point as the open limit switch. Each of the valves included in the Bulletin has an open limit switch that will be set per Attachment B.

E) Close Torque Switch
 - See Attachment B

F) Close Limit Switch
 - See Attachment B

G) Open-to-Close Torque Bypass Limit Switch
 - See Attachment B

H) Close Indication Limit Switch
 - The policy to be utilized at WCGS is to have the close indication limit switch set at the same point as the close limit switch, if a close limit switch exists for the valve. If the valve is designed to close on torque (i.e. no close limit switch) the close indication limit switch is set at approximately 3% of valve travel from the fully closed position.

There is no case in which the close indication limit switch is set at the same position as the close-to-open torque bypass limit switch. This is possible for all the valves in the bulletin since they all have four limit switch rotors instead of only two.

I) Control of Butterfly Valves
- See Attachment B

To accomplish Phase II of the program, a review of the torque and limit switch configuration of each valve is performed. If this review indicates that the current design cannot meet the switch policies stated above, the design is to be modified to allow all switches affecting safety-related functions to be set per the above policies. Any necessary deviations from the above receive engineering review and approval.

When review of the design indicates switches not affecting safety-related functions cannot be set properly, design modification packages are developed and the new design implemented at the first available outage during which that the valve can be worked.

Phase III - Switch adjustment, demonstration that the settings defined in Phase II above have been properly implemented, and demonstration that the valves will function properly under the maximum differential pressures expected on the valves during both normal and abnormal events within the design bases.

This phase of the program begins with the actual adjustment of the switches using the policies established in Phase II. To facilitate measurement of such things as limit switch trip and thrust values of torque switch trip, which are needed in setting the switches, and to facilitate testing to prove operability, the MOVATS Signature Analysis Process is utilized. To aid in the evaluation of the program and due to the many advances in valve signature analysis over the last few years, Attachment C, Description of MOVATS' Signature Analysis Process, has been included. Additional information regarding the operation and principles of MOVATS may be found in the American Society of Mechanical Engineers paper 84-NE-16 "Early Diagnosis of Motor Operated Valve Mechanical and Electrical Degradations", 12th Inter-Ram Conference for the Electric Power Industry report entitled "Update on Field Signature Testing of Motor Operated Valve Mechanical and Electrical Degradations".

Utilizing the Control Switch Signature discussed in Attachment C, and handwheel turn measurements, all the limit switch setpoints discussed in Phase II are verified to be within correct relationship with regard to unseating thrusts and end of valve stroke.

Utilizing the Stem Thrust Signature and Control Switch Signature discussed in Attachment C, the actual thrust values measured by the thrust measuring device (TMD) at the open and close torque switch trip can be measured. These values can then be compared to the policies specified in Phase II and adjusted appropriately.

Therefore, to perform the switch adjustments and demonstrate that the settings defined in Phase II have been properly implemented, MOVATS Signature Analysis is performed locally at the valve in conjunction with switch adjustment. This initial MOVATS Signature Analysis consists of as-found stem thrust, motor load as measured by the TMD and control switch signatures, stem thrust signature calibration, and as-left stem thrust, motor load as measured by the TMD and control switch signatures.

The final part of Phase III is to demonstrate that the valves function properly under the maximum differential pressures expected on the valves during both normal and abnormal events within the design basis.

WCGS utilizes a test method developed by MOVATS which verifies the valves will function against differential pressure. This method breaks down the <u>total</u> thrust encountered during valve operation into two parts; thrust resulting from differential pressure, and thrust resulting from the valve itself (i.e., packing loads, friction, gear efficiency, etc.). Except for butterfly valves and valves with D.C. motors, the thrust resulting from the valve itself is measured and quantified using the MOVATS motor load device. For butterfly valves and valves with D.C. motors, vendor data is used since this device is not capable of measuring motor load for these valves. The thrust resulting from differential pressure alone added to the measured valve running thrust is compared to the thrust value at torque switch trip, in order to determine if the valve would operate under maximum differential pressure. Torque bypass limit switch settings are taken into account when making this determination.

To perform this calculation, MOVATS has developed equations for different types of valves. Examples of these equations are shown in Attachment B under II-A and II-E. These equations have been verified by actual test data (shown on Table 2 of Attachment B) to bound cracking, seating, and unseating thrusts. The calculated thrust values are verified to be less than the maximum allowable loading condition specified by the operator and valve supplier. Additional differential pressure testing is not needed to verify these equations unless one of the following conditions exist:

1) The industry data does not encompass the particular size of valve being evaluated.

2) The valve is of a unique or unusual design, such that the data base information would not apply.

3) Sufficient industry full or partial pressure test data is not available at the time of the plant test to validate the equation being used for thrust calculations. Sufficient test data to validate a given open or closed stem thrust equation is assumed if at least four (4) sets of pressure data exist for the same type and size of valve or sixteen (16) sets for the same type but various sizes.

As the valve degrades, the running thrust value (without differential pressure) will increase. As it increases, the total thrust value (after adding thrust resulting from differential pressure) also increases. To ensure that this total thrust does not get higher than the torque switch setting, the running thrust is periodically monitored.

Phase IV- Preparation or revision of procedures to ensure that correct switch settings are determined and maintained throughout the life of the plant.

A maintenace procedure has been written which defines the program for the motor operated valves within the scope of Bulletin 85-03. The maintenance program to ensure the performance of the thiry-four (34) Limitorque actuators is based on a three tier program of documentation, post-maintenance testing, and periodic testing.

The initial step of the maintenance program is based on WCNOC Total Plant Setpoint Document (TPSD) for control of the rotor switch settings. Torque switch settings in themselves have very little meaning due to the dependence on at least two independently adjustable springs. This condition results in each torque switch/spring pack assembly being viewed as an individual assembly with unique attributes. Torque switch settings will be given in the TPSD but they will only be valid if individually analyzed. Any torque switch replacements or torque switch spring pack modifications will require calibration of the torque switch by the use of local testing equipment.

The post-maintenance testing program on these particular actuators will include verification of torque switch thrusts as well as rotor switch settings for all activities which could significantly effect actuator output. (See below for a discussion of "significant activities").

Analysis techniques shall be instituted on the 34 actuators covered by Bulletin 85-03. The program will be predictive in nature. The program will supplement the current In-Service-Testing (IST) program but will not replace the stroke time program. The data obtained over the last year has shown that WCNOC is currently utilizing state-of-the-art analytical techniques on the actuators. This information provides the baseline of actuator performance which will form the foundation of the ongoing trending analysis in the future.

The input of Limitorque rotor switch and torque switch setpoints will be controlled in accordance with procedure ADM 05-102, "Setpoint Change Request". The WCNOC TPSD will contain all setpoints for the Bulletin 85-03 actuators.

The program to ensure operator reliability is based on the following criteria:

Nine (or) 25% of the thirty four (34) actuators will be analyzed during each refueling interval. The analysis work requests shall become a normal part of the ongoing Preventive Maintenance data base.

All future tests will utilize the analysis techniques used during the initial testing and the associated analysis calculations performed within the current work request program.

Intitial differential pressure tests (DPT) or calculated differential pressure test (DPC) values will be used to monitor and ensure acceptable performance. The DPT acceptance values are part of the initial adjustment work requests and are maintained on file.

The ongoing predictive program will be updated on a routine schedule. The following corrective maintenance activities shall require full retesting through the use of analytical equipment in addition to the current IST program requirements before restoring the valve to Operable:

Torque Switch Adjustment or Replacement - retesting is required to "calibrate" the torque switch to ensure that the required margin of safety is maintained.

Torque Switch Belleville Spring Assembly Rework, Removal, or Replacement - retesting is required since any modification to the spring pack significantly affects the operation of the torque switch assembly.

Compensator Spring Rework, Removal, or Replacement on Actuator Types SB and SBD - retesting is required since any modification to the spring pack significantly effects the output thrust of position closed valves.

The WCNOC Limitorque Actuator Predictive Maintenance program is based on proven analysis technique which will provide meaningful analytical data to ensure continued valve performance. The setpoints for the geared rotor switches have been recorded and tested. The compilation of these settings in the WCNOC TPSD, as well as the commitment to periodic testing and the definition of maintenance activities requiring retesting will provide an extremely high reliability factor which assures continued performance.

III. Summary of As Found Valve Operability Findings

The as found operability determination was made based upon a review of the safety function of the valve, extent of switch setting adjustments, MOVAT's test data, and past valve performance during surveillance testing and system actuations. These factors were reviewed for each valve in which significant switch setting adjustments were made and then a judgement was made as to whether or not the valve would have performed its specified safety function(s) in its as found configuration. This review resulted in the judgement that 32 of the 34 MOV's within the scope of Bulletin 85-03 at WCGS would have performed their specified safety function.

The as found operability review determined that 2 of the 34 MOV's may not have been able to perform their specified safety functions. However, this determination was based on analyses using MOVAT's equations and calculations that are very conservative. Since as found maximum differential pressure testing was not performed and these valves have proved their ability to function during surveillance testing performed at WCGS and actual system actuations prior to the initiation of the Bulletin 85-03 program, it could not be conclusively determined that these valves would or would not have performed their safety function.

IV. Summary Of Data For Bulletin 85-03

Attachment D to this report contains one data page for each valve tested in the Bulletin 85-03 program. This summary includes information on the valves, valve operators, maximum and test differential pressure values, switch settings prior to any adjustments, and final switch settings. The test method description/justification and as found valve operability sections are not included on the data sheets because they are discussed in Sections II and III, respectively, of this report.

ATTACHMENT A

IE BULLETIN 85-03 VALVE INFORMATION

ATTACHMENT A
IE BULLETIN 85-03 VALVE INFORMATION

WCGS Valve Number	MOV Description	Design (E-SPEC) ΔP(psig) Close	Design (E-SPEC) ΔP(psig) Open	Maximum Operating ΔP(psig) Close	Maximum Operating ΔP(psig) Open	Justification for Max Operating ΔP	ERG Confirmation of Operating Assumptions
BN-HV-8806 A&B	Safety Injection Pump Suction from RWST	200	200	200	50	Open - 2 Close -1	Yes
EM-HV-8923 A&B	Safety Injection Pump Suction from RWST	200	200	200	50	Open -2 Close - 3	Yes
BN-LCV-112 D&E	CVCS Pump Suction from RWST	200	200	200	50	Open - 4 Close - 4	Yes
BG-LCV-112 B&C	CVCS Pump Suction from VCT	100	200	100	100	Open - 5 Close - 5	Yes
EM-HV-8821 A&B	SI Pump Cross-Connect	1500	1500	1500	1500	Open - 15 Close - 14	Yes
EM-HV-8835	SI Pump Discharge Isolation	0	2750	0	1500	Open - 7 Close - 6	Yes
BG-HV-8105 BG-HV-8106	CVCS Normal Discharge Isolation	2750	2750	2750	2750	Open - 8 Close - 8	Yes
EM-HV-8803 A&B	BIT Inlet Isolation	0	2750	0	2750	Open - 9 Close - 6	Yes (See Footnote 1)
EM-HV-8801 A&B	BIT Outlet Isolation	0	2750	0	2750	Open - 9 Close - 6	Yes (See Footnote 1)

ATTACHMENT A
IE BULLETIN 85-03 VALVE INFORMATION

WCGS Valve Number	MOV Description	Design (E-SPEC) ΔP(psig) Close	Open	Maximum Operating ΔP(psig) Close	Open	Justification for Max Operating ΔP	ERG Confirmation of Operating Assumptions
BN-HV-8813 EM-HV-8814 A&B	SI Pump Miniflow	2750	2750	1500	1500	Open - 11 Close - 10	Yes
BG-HV-8110 BG-HV-8111	CVCS Pump Miniflow	2750	2750	2750	2750	Open - 13 Close - 12	Yes
FC-HV-312	Mechanical Trip and Throttle	1275	1275	1220	1220	Open - 16 Close - 16	Yes
AL-HV-34,35,36	Suction from CST - All Pumps	150	150	17	17	Open - 17 Close - 17	Yes
AL-HV-30,31 AL-HV-32,33	Suction from Essential Service Water	200	200	180	180	Open - 18 Close - 18	Yes
AL-HV-5,7,9,11	Motor-Driven Pump Discharge Flow Control	1800	1800	1645	1645	Open - 19 Close - 19	Yes

JUSTIFICATIONS

1. This valve must be able to close to isolate the Refueling Water Storage Tank (RWST) from the discharge of the RHR pumps during the recirculating mode of operation, as a precautionary measure in the event of backleakage through check valve 8926A (or B). For this scenario, the ΔP across 8806A (or B) could be as high as the RHR pump discharge head of ~200 psig.

2. This valve is normally open, and is closed only for stroke testing and/or pump isolation for maintenance. The valve must be able to open against a full RWST head of water. For WCGS, this is ~50 psig.

3. This valve must be capable of isolating (closing) one high head safety injection pump, given a passive failure in that train of ECCS. For this scenario, the ΔP across 8923A, B could be as high as the RHR pump discharge head of ~200 psig.

4. Same as 8806A, B (for both close and open), except these valves are in the suction of the centrifugal charging pumps and not the high head safety injection pumps.

5. These valves must close on an Safety injection ('S') signal; the maximum ΔP across the valve is defined by the volume control tank at its design pressure (relief valve setpoint) of 75 psig plus elevation head of the Volume Control Tank (VCT) above the valves. This is estimated to be 100 psig.

6. Valve is only closed when pump is not operating; no flow - no ΔP.

7. Pump testing on miniflow circuit, ΔP is determined by the miniflow head of the high head safety injection pump ~1500 psig.

8. These valves must be able to isolate the RCS from the Chemical and Volume Control System (CVCS), with a maximum possible ΔP of approximately the shutoff head of the centrifugal charging pumps.

9. Given a miniflow test of the centrifugal charging pumps, the Boron Injection Tank (BIT) isolation valves must be able to open with a ΔP approximately equal to the charging pump shutoff head.

10. Valves must close to isolate miniflow so that high pressure injection switchover to recirculation may proceed. In the worst case, the ΔP will be equal to the pump developed head on miniflow ~1500 psig.

11. Similar to 10, except valve must be able to open during miniflow testing of the high head safety injection pump.

12. Valves must close to ensure adequate high pressure injection flow (on "S" signal) against miniflow ΔP ~2750 psig.

13. Similar to 12, except valve must be able to open during miniflow testing.

14. Must be able to move to allow realignment to Emergency Core Cooling System to recirculation mode, and for ECCS train separation. Delta-P could be as high as 1500 psig (approximately equal to miniflow head of high head safety injection pump).

15. Must be able to open to allow train separation during the recirculation phase of ECCS operation. Delta-P same as closing.

16. Lowest steam generator safety valve set pressure plus 3 percent accumulation.

17. Static elevation head of the condensate storage tank.

18. Discharge head of the service water pumps at miniflow.

19. AFW Motor driven pump discharge pressure at miniflow.

FOOTNOTE 1

1. The Emergency Response Guidelines to terminate safety injection (isolate the BIT), and return to normal charging are performed with the centrifugal charging pumps operating. This termination method reduces net RCS makeup in a controlled manner and maintains continuous reactor coolant pump seal injection. Since the charging pumps are operating, the BIT isolation valves must close against a ΔP. This ΔP could be large for some Safety Injection termination scenarios (RCS could be as low as 200 psi - ΔP could be as high as 2500 psi).

ATTACHMENT B

SWITCH ADJUSTMENT POLICIES AND JUSTIFICATIONS

ATTACHMENT B

Switch Adjustment Policies
and Justifications

This phase of the program defines the technical basis for establishing torque and limit switch setpoints. A given control switch may be set to a number of possible positions. The most appropriate setting is selected and switch setting procedures revised after a review of the valve function, operator and valve design, and overall plant policies. The following are the setpoint methods and technical justifications that are considered for implementation during the control circuit review process.

II-A Open Torque Switch

The open torque switch acts to alert plant personnel of mechanical problems with the valve or operator. The torque switch also provides some element of protection if the open limit switch fails to open. Historical data has shown that open limit switch failures are extremely rare.

Typically, the open torque switch is set to actuate at a thrust value above the calculated unseating load (including maximum design differential pressure loads). During valve unseating, the initial load peak (cracking load) may be of a high enough level to cause the torque switch to trip. Because of this peak, the torque switch must be electrically bypassed during this phase of valve operation.

Alternate One is to eliminate the open torque switch from the control circuit. From a maintenance point of view, the "alerting" function of the open torque switch trip is not necessary if valve/operator condition is monitored using some other means to provide adequate indication of developing mechanical degradations.

As Alternate Two, the open torque switch is wired into the control circuit and set to trip at a value greater than the load calculated for valve unseating. To establish the torque switch setpoint, the opening thrust value for full differential pressure conditions must be established. MOVATS utilizes two equation forms for determining this thrust valve. The first form is a statistical method (least squares regression) with a 90% confidence level. The second equation form is explained below. The equations were developed by MOVATS and validated using full and partial pressure testing data. This validation process is considered accurate if pressure test data is provided for four valves of the same type and size or sixteen valves of the same type. The definition of "type" as used in this submittal includes but is not limited to valve manufacturer.

THRUST CALCULATION EQUATIONS

Solid and Flex-Wedge Gate Valves*

Seat (Friction) Load (SL) =	0.3 x Delta P x Orifice Area
Wedging Load (WL) =	0.75 x Seat Face Load
Scaling Constant (SC) =	1.3
Opening Thrust against Delta P =	SC (SL+WL)

Standard Globe Valves

Seat Face (Friction) Load (SL) =	Delta P x Orifice Area
Scaling Constant (SC) =	1.3
Opening Thrust against Delta P =	SC (SL)

*NOTE: These equations are not used if a careful review of valve drawings identifies unusual valve design features. In particular, the equations do not apply to double disk or parallel disk gate valves.

Unseating Thrust (Tu) = Running Load + Opening Thrust against Delta P

Running Load measured at point A on Figure 1.

Unseating Thrust (Tu) may also be determined through actual valve testing at differential pressure. Such tests are performed at differential pressures approximating those established as the maximum operating differential pressure; however, extrapolation techniques may be necessary when plant conditions do not allow such pressure to be achieved at the time of test and thrust calculation equations are not appropriate. The MOVATS equations are not appropriate for butterfly valves or valves with D.C. motors, and therefore, vendor information is used for required unseating thrust.

After the unseating thrust (Tu) has been determined, it is compared to the maximum allowable loading condition specified by the operator and valve suppliers. Valves which have the calculated unseating thrust (Tu) exceeding the maximum are evaluated on a case by case basis. Corrective action may include such things as operator replacement, full pressure testing, lowering of the ΔP requirement, or a vendor approved extension of the operator rating.

After an acceptable unseating thrust has been determined, the torque switch setting will be adjusted to some value above Tu. Typically, the minimum acceptable value is five percent added to all expected instrumentation and equipment variations. These variations are as follows:

Torque Switch Repeatability — ±10% (Thrust loads less than 4000 lbs)

±5% (Thrust loads greater than 4000 lbs)

MOVATS Instrumentation	Accuracy
50K Load Cell	±2% of load ±0.4% linearity
200K Load Cell	±1.9% of full scale
Nicolet Scope	±0.2% of Voltage Range (10V)
TMD Linearity	±0.6% of 10 Volt Scale

These tolerances are used in the following manner:

Measured minimum thrusts excluding torque switch trip thrusts are increased by a factor of 1.05.

Measured torque switch trip thrusts are multiplied by a factor of 1.10 or .90 for comparisons against maximum and minimum requirements respectively. These torque switch trip values are changed to 1.15 and .85 for trip points less than 4000 lbs thrust. In addition to the above tolerances, a five percent factor is added into each acceptance analysis.

In those cases where an engineering disposition is necessary to determine setting acceptability, actual instrumentation accuracies and torque switch repeatability factors may be used.

In Alternate Three, the torque switch is set above the maximum running load measured by the Thrust Measuring Device (TMD) with the torque switch bypass set in accordance with method 3) or 4) described under Section II-C. Torque switch trip points are established as follows based on the rationale described above for instrument and equipment variation:

For stem thrust loads less than 4,000 lbs,
1.20 (RL max) minimum setpoint setting

For stem thrust loads greater than 4,000 lbs,
1.15 (RL max) minimum setpoint setting
where RL max = maximum running load as measured by the TMD.

After the open torque switch has been set, the thrust at the actual trip setpint is verified to be less than the maximum allowable loading condition specified by the operator and valve suppliers.

Although all the alternatives discussed above are acceptable, a combination of alternatives 2 and 3 are being used to set the open torque switch at WCGS.

II-B Open Limit Switch

Typically, the open limit switch is set at approximately 90% of stroke from the close-to-open position. It is recognized that the amount of stem travel after limit switch trip is influenced by the inertia of the MOV assembly, valve design, and delay in motor contactor drop out after actuation of the open limit switch. Therefore, a specific setpoint for the open limit switch cannot be established. Instead, the following process is used:

For non Westinghouse gate valves, the limit switch is initially set for 90-92% of the full open stroke. The valve is then cycled open and allowed to trip electrically. Plant personnel then place the operator in manual and continue to open the valve using the handwheel. If the valve can be opened an additional amount past the trip and coast down position, the switch is set correctly. If the valve cannot be opened past the coast down position, it can be assumed that the valve has hit the backseat. In the unlikely event that the valve has inadvertently backseated, a MOVATS signature analysis test is conducted and the stem loading and subsequent stem stress levels are evaluated. The limit switch setting is then reduced in 2% increments and the valve is again cycled and checked until it is verified that the disc is not coasting into the backseat. For Westinghouse gate valves, the vendor instruction manual is used to set the open limit switch. These instructions include a check for inadvertent backseating.

II-C Close-to-Open Torque Bypass Limit Switch

The close-to-open torque bypass limit switch prevents torque switch actuation during the high loading condition normally experienced when the valve disc is "cracked" from its seat (Tc - see Figure 2). From a operational standpoint, many switch settings are acceptable, depending on operating and maintenance policies. Operator loading conditions during the opening cycle must be examined to understand technical justifications for each acceptable setting.

Figure 1 shows a typical stem thrust and control switch actuation signature for a valve going from the close-to-open position with zero differnential pressure across the valve. Figure 2 is the same basic signature modified to show bypass switch actuation at 5-10% of valve stroke (based on stem movement). Historically, it is believed that the 5-10% switch setting would encompass the initial valve unseating. After the valve began to pass fluid, the high loading conditions would decrease rapidly. This theory was generally accepted even though full pressure and flow data were not available to validate such an assumption.

Figure 3 depicts a thrust signature from the same valve shown in Figure 2. The changes in the signature characteristics result from differential pressure across the valve. With the typical bypass switch setting of 5-10% of stroke, it is clear that the torque switch may not be bypassed during the full unseating process. However, Figure 3 demonstrates that the "cracking load" (Tc) occurs early enough in the open cycle that the 5-10% bypass encompasses this loading condition.

Data from tests with full and partial differential pressure conditions (Table 1) indicates that the cracking load condition occurs at less than 1% of valve stroke for globe and gate valves, even though the loading condition during unseating does not begin to decrease until as much as 15% of stroke.

Based on analysis of test data, the following are acceptable settings for the close-to-open torque bypass limit switch.

1) 3-4% of total valve stroke as measured from the point of stem disc motion. The three percent value ensures that cracking has occurred at the time of switch actuation though unseating may not be complete. To use this setting, the open torque switch must be set in accordance with recommendations contained in Section II-A as Alternate Two.

2) 5-19% of stroke will provide some additional margin for added stem loads due to buildup of foreign materials on the valve seat. Bypass switch actuation will occur during or at the completion of valve unseating under differential pressure conditions. Again, Section II-A Alternate Two must be used to set the torque switch.

3) 20-25% of stroke will ensure that the entire unseating is bypassed. The advantages of this approach are the same as 1) and 2) above. In addition, the valve will perform its intended function even if the torque switch is set improperly.

4) 90-98% of stroke will have the same advantages as 1) through 3) above and will preclude stoppage of valve travel if large mechanical loads are encountered anytime during the opening stroke. 90-98% of stroke will still provide back up for the open limit switch.

5) 100% Bypass - With this option, the open torque switch is wired completely out of the opening circuit, thereby negating the need for the bypass switch (see II-A, Alternate One for guidance on this condition).

II-D <u>Open Indication Limit Switch</u>

See Phase II of Section II.

II-E Close Torque Switch

The closing torque switch ensures that sufficient loads are delivered to the valve stem to provide leak tight closure of the valve. Although certain types of valves and/or unusual closing requirements may dictate use of a limit switch for valve closure, the torque switch is the most common method for control during the closing stroke.

To establish the torque switch setpoint, the closing thrust value for full differential pressure conditions must be established. Again, MOVATS uses two equation forms to determine this thrust value-the statistical least squares regresion method with a 90% confidence level and the formula given below.

The equations were developed by MOVATS and validated using full and partial pressure testing data. The margins for operator, valve, and instrumentation variations (previously described) are applied to the closed torque switch setting. The MOVATS equations are not appropriate for butterfly valves and thus vendor data was used.

The following is an example of the equations for closing thrust.

THRUST CALCULATION EQUATIONS

Solid and Flex-Wedge Gate Valves*

Seat (Friction) Load (SL) =	0.3 x Delta P x Orifice Area
Wedging Load (WL) =	0.75 x Seat Face Load
Piston Effect (PE) =	Delta P x Stem Cross Section Area
Scaling Constant (SC) =	1.3
Closing Thrust against Delta P=	SC (SL+PE)

Standard Globe Valves

Seat Face (Friction) Load (SL) =	Delta P x Orifice Area
Piston Effect (PE) =	Delta P x Stem Cross Section Area
Scaling Constant (SC) =	1.3
Closing Thrust against Delta P =	SC (SL+PE)

*NOTE: These equations are not used if a careful review of valve drawings identified unusual valve design features. In particular, the equations do not apply to Westinghouse gate valves with pinned (hinged) disks.

As discussed in Phase III of Section II, the equations are not relied upon if sufficient industry full or partial pressure test data is not available at the time of the plant test to validate the equation being used for thrust calculations. The equations are considered accurate for a particular valve if pressure test data is provided by four valves of the same size and type or sixteen (16) valves of the same type.

When closing a valve, the final loading condition may be significantly higher than the closed torque switch trip setpoint. This difference is due to the inertia effects of the operator and valve assembly as well as variations in the motor contract drop-out time. Closing a valve without flow and pressure will result in the highest closure forces and the final forces must be evaluated against the operator and valve manufacturer's thrust limits.

II-F Close Limit Switch

For valves that are controlled using a limit switch during closure, the final closure forces must be examined closely. These forces can vary widely depending on inertia, contactor drop-out time and valve design. Signature analysis techniques are used to verify that the closure forces are acceptable when compared with operator and valve manufacturer's limits.

II-G Open-to-Close Torque Bypass Limit Switch

Typically, the open-to-close torque bypass limit switch is of no operational concern because large hammerblow loading conditions do not occur during the initial phases of the closing cycle. For this reason, no specific requirements are placed on this switch setting relative to the valve. Unless some other need is identified for positioning of this switch, the position that results from coast down of the motor after open limit switch actuation is accepted.

II-H Close Indication Limit Switch

See Phase II of Section II.

II-I Control of Butterfly Valves

The guidelines for setting butterfly valve limit switches (and torque switches, where applicable) are basically the same as previously discussed for other types of valves. There is one notable exception.

Due to the operational characteristics of different types of butterfly valves, increases in thrust requirements may appear as the valve travels towards its open position. This increase can typically occur during the first 60% of travel. At WCGS, the torque switch bypass settings have been established as 6[illegible]-98 percent in the open direction and 98-100 percent in the close direction.

FIGURE 1

TYPICAL STEM THRUST AND CONTROL SWITCH ACTUATION SIGNATURES

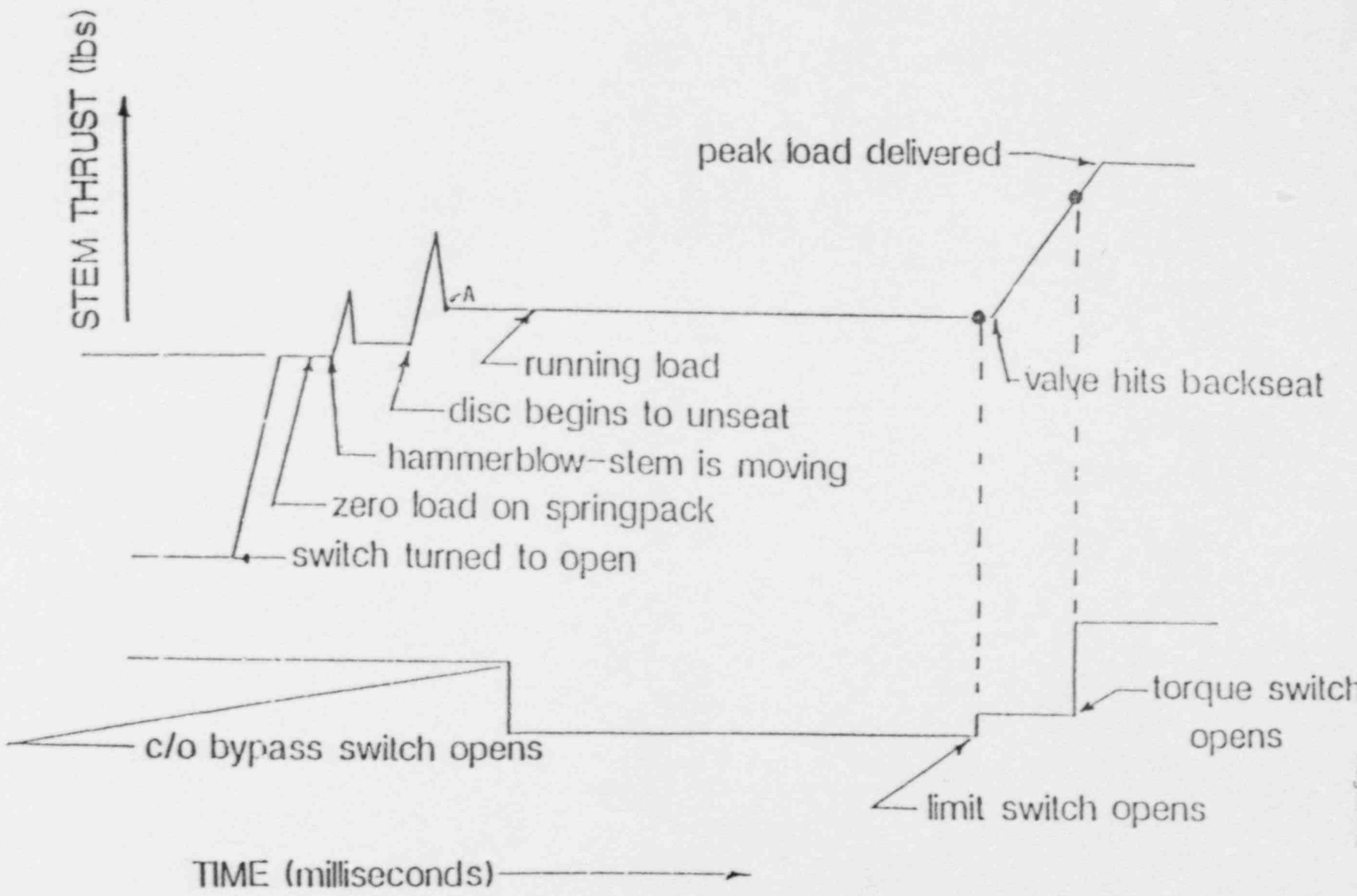
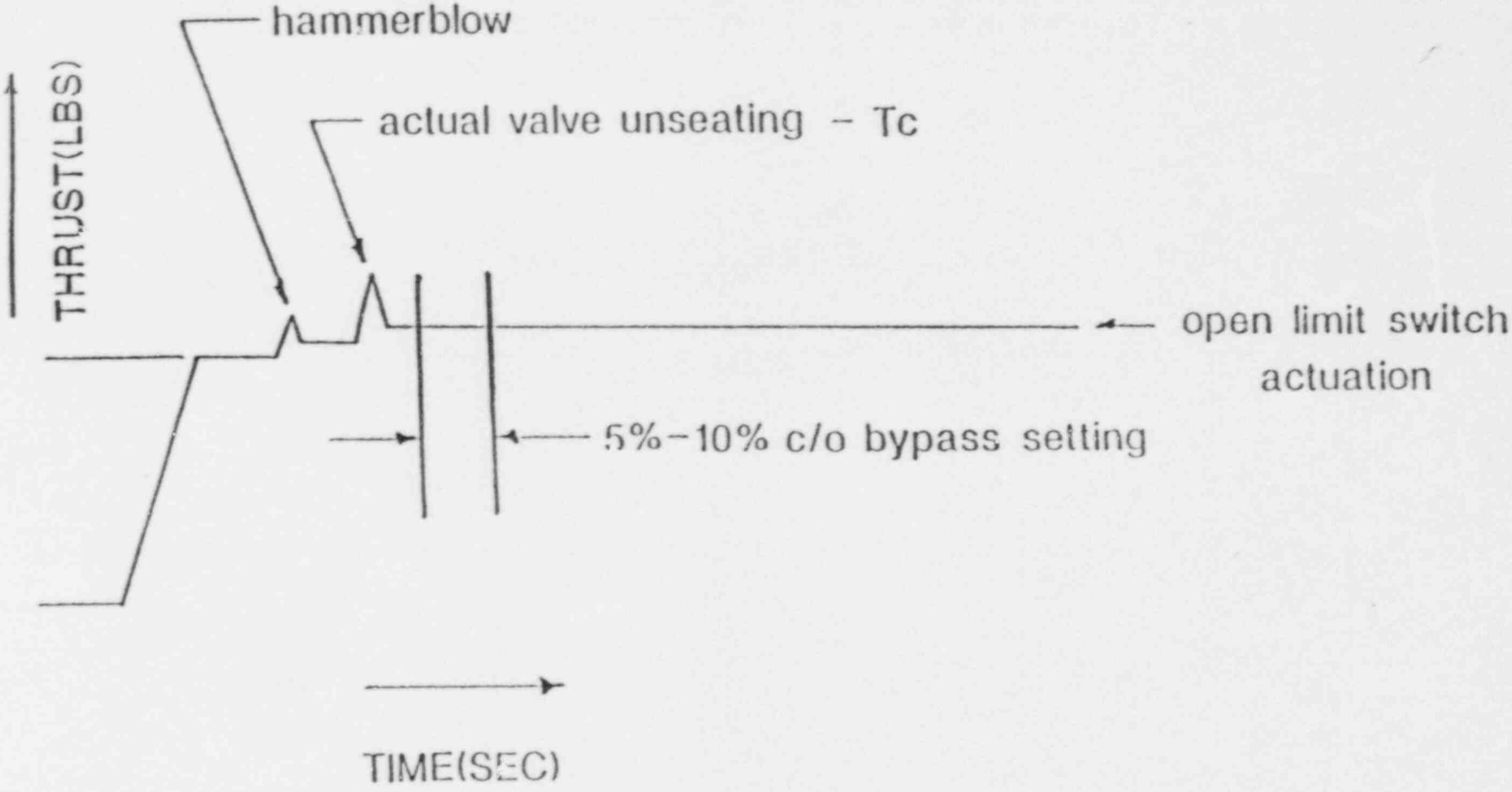


FIGURE 2

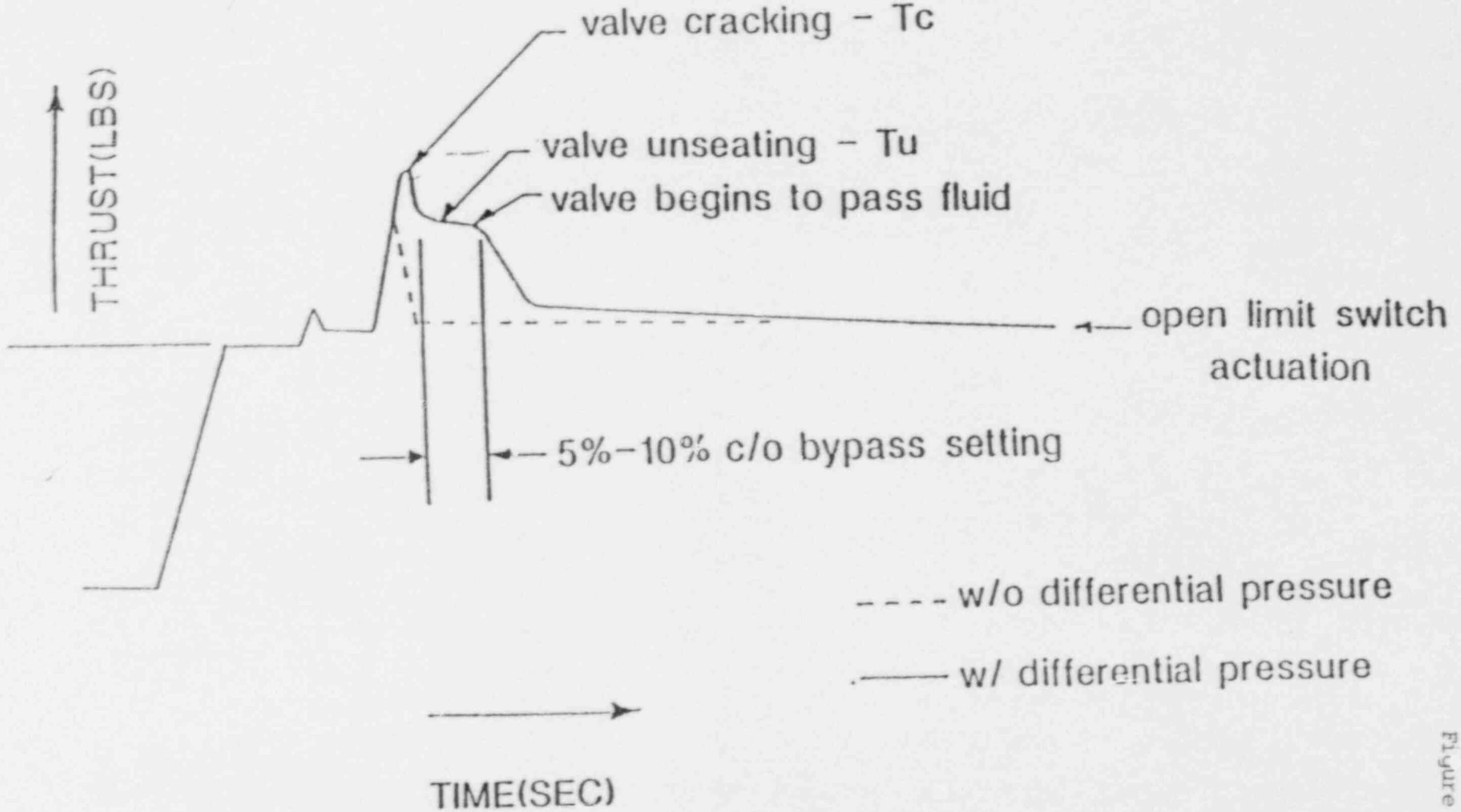


C/O STEM THRUST SIGNATURE

W/O DIFFERENTIAL PRESSURE

Attachment B
Figure 2

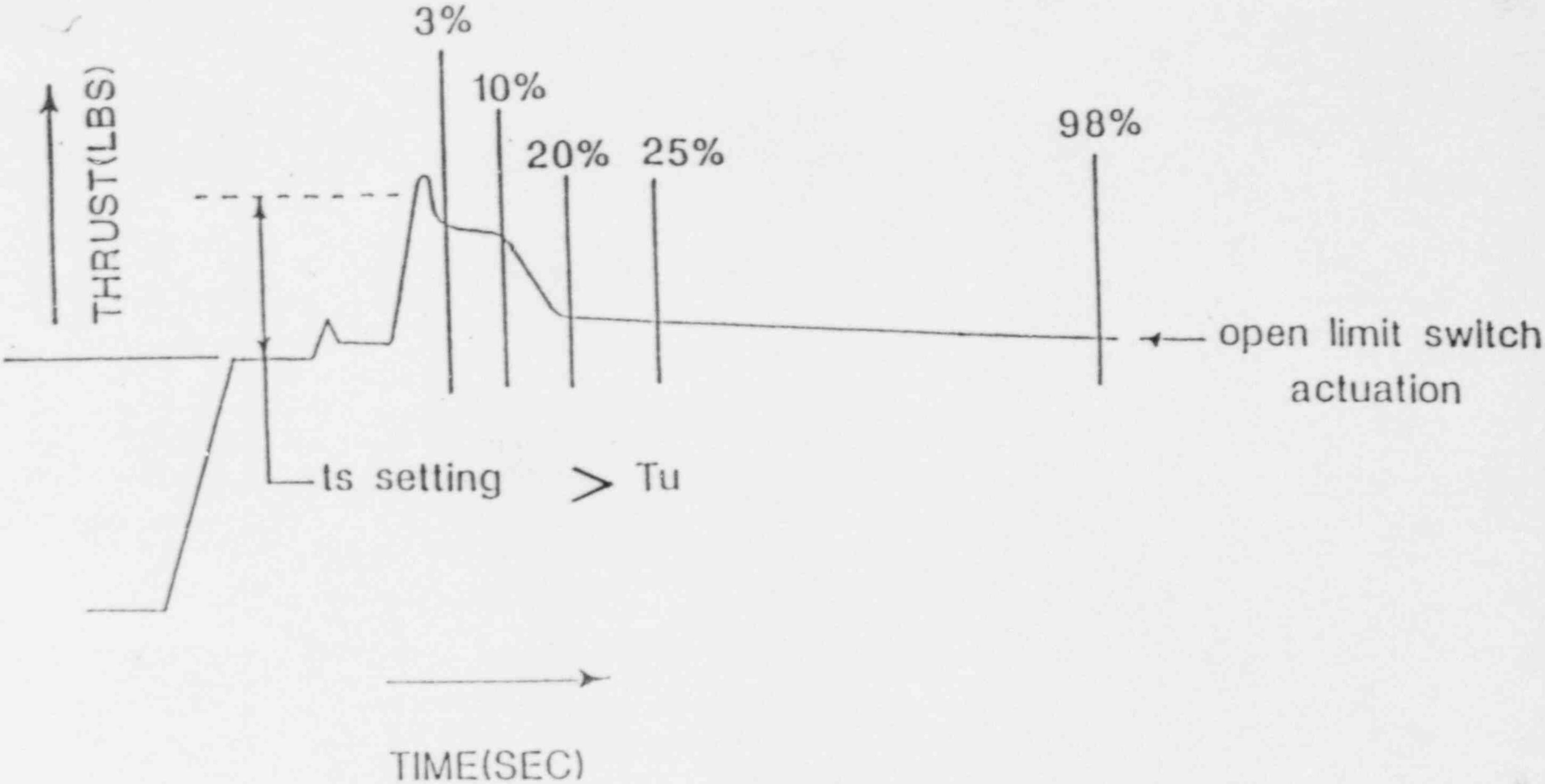
FIGURE 3



Attachment B
Figure 3

C/O STEM THRUST SIGNATURE

FIGURE 4



C/O STEM THRUST SIGNATURE

Attachment B
Figure 4

FIGURE 5

LOAD CELL SUPPORT PLATE DIAGRAM

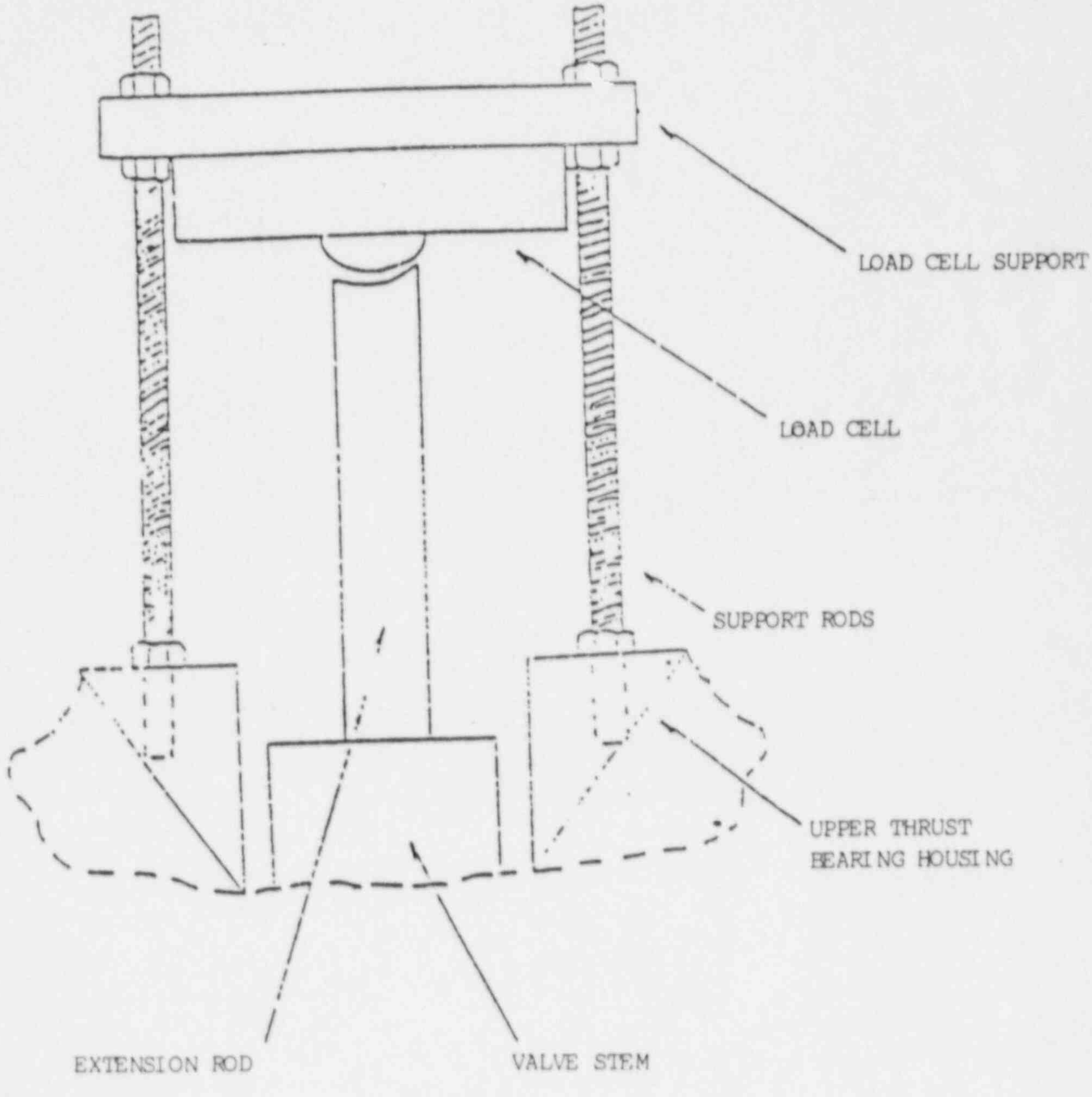
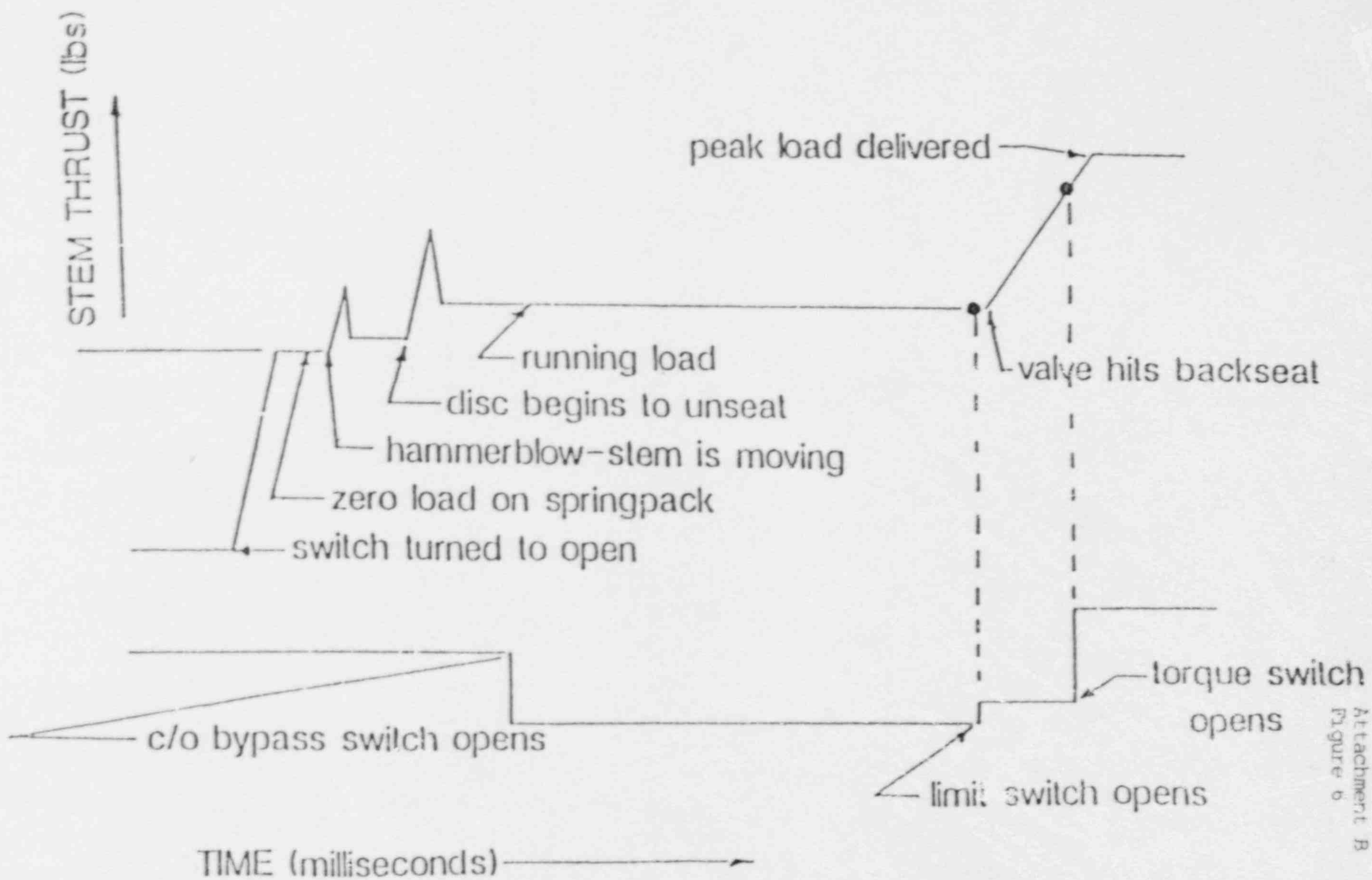


FIGURE 6

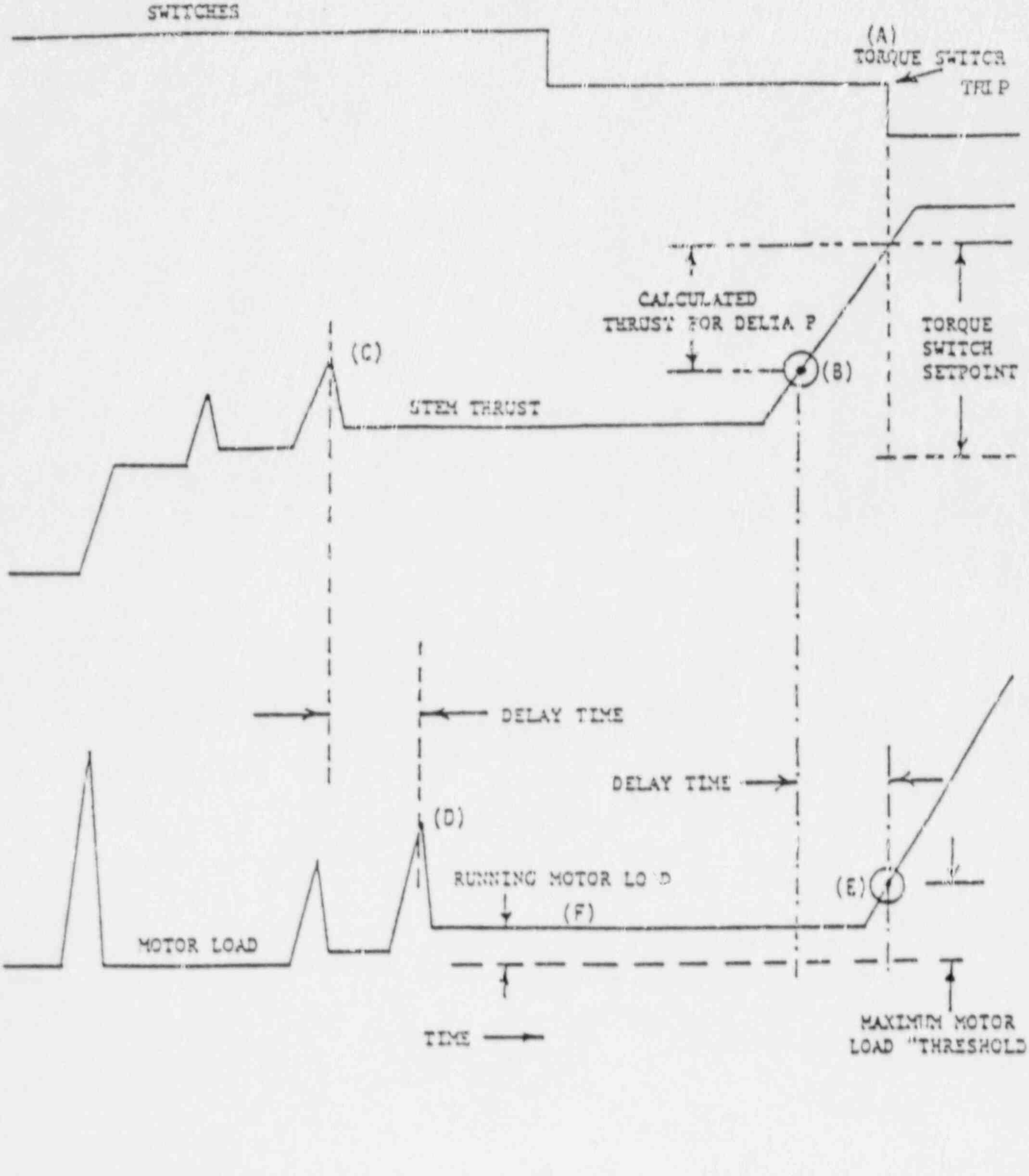
TYPICAL STEM THRUST AND CONTROL SWITCH ACTUATION SIGNATURES



Attachment B
Figure 6

FIGURE 7

DETERMINING DELAY TIME
AND
MOTOR LOAD THRESHOLD VALUE



Attachment B
Table 1

TABLE 1
CRACKING AND UNSEATING TIMES
AS PERCENT OF VALVE STROKE
(Arranged in Ascending Order)

NUMBER	CRACKING	UNSEATING w/DIFFERENTIAL PRESSURE
1	.10	.25
2	.12	.26
3	.13	.76
4	.13	1.05
5	.15	1.17
6	.15	1.32
7	.16	1.44
8	.19	2.21
9	.22	2.46
10	.22	4.78
11	.22	5.04
12	.27	5.22
13	.28	5.32
14	.29	5.7
15	.29	5.85
16	.33	7.5
17	.34	7.68
18	.36	7.89
19	.42	9.46
20	.46	9.53
21	.67	9.74
22	.68	10.8
23	.68	11.2

Attachment B
Table 2

MOVATS DIFFERENTIAL PRESSURE TEST DATA

LOG NO.	TYPE	OPER SIZE	DELTA P (PSIG)	STEM DIA. (IN)	ORIFICE	CALC OPEN	ACTUAL OPEN	CALC CLOSE	ACTUAL CLOSE	CRACK LOAD
1	FWG	000	1050	1.000	3.438	6652	4489	4873	ND	3500
2	FWG	00	54	1.887	13.250	5081	3455	3100	ND	2580
3	FWG	00	420	1.625	7.625	13089	11720	8612	ND	10174
5	FWG	000	100	1.125	5.761	1779	1688	1145	1014	ND
6	FWG	000	100	1.125	5.761	1779	1100	1145	1062	ND
7	FWG	1	650	2.000	8.000	22299	21250	15396	ND	ND
8	SWG	1	860	2.125	11.750	63645	41837	40333	ND	ND
9	SWG	1	935	2.125	11.750	69195	57702	43851	ND	ND
10	SWG	0	852	1.875	7.875	2[illegible]	20809	19242	ND	ND
11	SWG	1	850	2.125	11.750	6[illegible]905	45199	39864	ND	ND
12	SWG	1	850	2.125	11.750	62905	36476	39864	ND	ND
13	SWG	00	900	1.625	6.000	17367	8015	12350	ND	ND
14	SWG	00	900	1.625	6.000	17367	6100	12350	ND	ND
16	FWG	00	2400	1.125	2.000	5145	880	6042	ND	1255
17	FWG	1	300	2.000	17.000	46474	32800	27781	ND	32800
18	FWG	00	1050	1.500	5.761	18680	11257	13086	ND	11257
19	FWG	00	700	1.500	5.761	12453	7344	8724	ND	7344
20	FWC	00	1050	1.500	5.761	18680	10733	13086	ND	10733
21	FWG	4	1075	2.500	14.500	121153	90541	76090	ND	90541
22	FWG	1	1050	1.500	5.761	18680	15700	13086	ND	16200
23	FWG	1	750	1.500	5.761	13342	11820	9347	ND	14560*
24	FWG	1	1050	1.500	5.761	18680	12959	13086	ND	12959
25	FWG	1	1100	1.500	5.761	19569	13096	13709	ND	13096
26	FWG	00	900	1.500	5.761	16011	9656	11216	ND	9656
27	FWG	00	1050	1.500	5.761	18680	13584	13086	ND	13584
28	FWG	00	1275	1.500	5.761	22682	14148	15890	ND	14148

FWG - Flexible Wedge Gate Valves
SWG - Solid Wedge Gate Valves
ND - No Data Obtained

* Log. No. 23 and 162 are the same valve at different ΔP's. This valve's operation is suspect due to conditions it has been operated under.

TABLE 2
Sheet 1 of 3

LOG NO.	TYPE	OPER SIZE	DELTA P (PSIG)	STEM DIA. (IN)	ORIFICE	CALC OPEN	ACTUAL OPEN	CALC CLOSE	ACTUAL CLOSE	CRACK LOAD
29	FWG	0	100	1.5	10	5360	4661	3293	ND	4661
31	FWG	000	105	2.25	8.021	3621	3002	2612	ND	3002
32	FWG	1	361	2.0	8.125	12774	11379	8774	ND	11379
34	FWG	000	100	1.25	5.761	1779	1600	1176	ND	ND
43	FWG	00	2180	1.125	2	4674	3650	5488	ND	3650
70	FWG	000	151	1.25	10	8094	5126	4866	4450	4817
162	FWG	1	350	.5	5.761	6227	6040	4362	ND	10620 *
15	WFG	1	160	1.375	7.625	4986	3000	3158	5836	3025
91	WFG	00	2720	1.125	2.62	10008	7247	9234	11237	6833
92	WFG	00	2474	1.125	2.62	10100	6688	9319	10264	6688
96	WFG	000	2700	1.125	2.62	9935	8396	9166	ND	7577
97	WFG	00	2700	1.125	2.62	9935	10607	9166	ND	9100
98	WFG	00	2750	1.25	3.44	17444	5864	14355	10805	5540
99	WFG	00	2700	1.25	3.44	17127	4333	14094	6906	4267
100	WFG	00	2650	1.25	3.44	16810	4971	13833	ND	5116
103	WFG	00	2650	1.25	3.44	16810	7715	13833	11960	7715
104	WFG	00	2625	1.25	3.44	16651	4230	13703	10587	4230
105	WFG	00	1500	1.25	3.44	9515	4859	7830	10165	4859
106	WFG	00	1500	1.25	3.44	9515	7124	7830	7099	7124
109	WFG	00	1470	1.25	3.83	11559	6939	8950	12585	8750
110	WFG	00	1500	1.25	3.83	11795	6871	9133	14382	5699
111	WFG	00	1475	1.25	3.44	9536	4350	7700	7730	4350
35	GLB	EIM-EB00	1470	1.5	2.125	6777	5628	10154	6941	ND
37	GLB	00	1470	0.81	1.625	3963	2825	4948	1705	ND
40	GLB	00	1350	1.25	2.75	10424	9161	12578	10590	9030
50	GLB	000	1950	0.938	2	7964	1800	9715	ND	ND
51	GLB	00	1490	0.875	2	6085	3060	7250	ND	ND
83	GLB	00	1360	1.25	2.75	10501		12671	11417	ND

FWG - Flexible Wedge Gate Valves
WFG - Westinghouse Gate Valves with pinned stem-to-disk
GLB - Globe valves

TABLE 2
Sheet 2 of 3

* Log. No. 23 and 162 are the same valve at different ΔP's. This valve's operation is suspect due to conditions it has been operated under.

LOG NO.	TYPE	OPER SIZE	DELTA P (PSIG)	STEM DIA. (IN)	ORIFICE	CALC OPEN	ACTUAL OPEN	CALC CLOSE	ACTUAL CLOSE	CRACK LOAD
93	GLB	00	2725	1.125	1.875	9781	6000	13303	7845	6000
94	GLB	00	2750	1.125	1.875	9871	5420	13425	8241	5420
95	GLB	00	2560	1.125	1.875	9189	5000	12497	7580	5000
101	GLB	00	2750	1.125	1.875	9871	6851	13425	6891	6140
102	GLB	00	2710	1.125	1.875	9728	6184	13230	6636	6184

GLB - Globe valves

ATTACHMENT C

MOVAT'S SIGNATURE ANALYSIS PROCESS

ATTACHMENT C

To understand MOVAT'S Signature Analysis Process, operation of a Motor Operated Valve must first be understood. This attachment gives a brief description of this operation. The description given is for a general SMB Limitorque Operator and is taken from a training manual on MOV's. Refer to Figure 1 of this attachment.

The electric motor has a helical pinion mounted on its shaft extension. This pinion drives the worm shaft clutch gear which is engaged with the worm shaft clutch. This piece is splined to the worm shaft. The worm is splined to the worm shaft and when it is rotated it turns the worm gear. The worm gear has two lugs cast onto the top portion which engages the two lugs on the drive sleeve. These lugs are spaced so that when the worm gear begins to turn during motor operation there is a certain amount of lost motion before the lugs engage and cause the hammer blow effect within the operator.

As soon as the worm gear lugs engage, the drive sleeve being splined internally with the stem nut, causes the stem nut to rotate and open or close the threaded stem of the valve. The stem nut is threaded to fit the thread of any rising stem valve. In the case of non-rising stem valves or where the electric operator is mounted in tandem with an additional gear drive, the stem nut is merely bored and keyed to fit the shaft.

Sequence of typical gate valve closing (Refer to Figure 2):

1. Motor A transmits rotary torque through helical gearing B and then through second reduction worm C and worm gear D.

2. Worm gear drives stem nut E.

3. Rotation of threaded nut E creates linear motion of valve stem F and resultant movement of valve.

4. When valve closes, disc G is pressed into valve seat H; thus seating valve.

5. Since the valve is seated, disc G no longer can move in a downward direction. However, the motor drive still continues to rotate under increased load conditions.

6. Instead of the worm gear continuing to rotate, the worm C actually threads itself along the worm gear as the spring pack J is compressed. The worm rides on a precision spline which permits this axial movement.

7. Movement of the worm C trips Torque Switch K which breaks electrical motor circuit. The mechanical self-locking feature, inherent to the worm gear design, maintains valve seating force and assures a tight valve until the Limitorque operator is energized in "Open" direction.

With a basic understanding of the operation of a Motor Operated Valve (MOV), the operating principles of MOVAT'S Signature Analysis Process can now be explained. There are three signature traces which are utilized the most in setting up and testing the MOV. These are a stem thrust signature, control switch signature, and motor load signature. Each of these signatures is described below.

STEM THRUST SIGNATURE

The basis for the MOVAT'S stem thrust signature is the concept that the greater the load being delivered to the valve stem, the greater the movement of the worm within the operator itself. Therefore, if one could monitor accurately this movement, and correlate or calibrate this movement to actual stem load throughout a valve cycle, a dynamic measurement of the stem thrust load would be the result.

To obtain this parameter, a linear variable differential transformer is installed in a device called the "Thrust Measuring Device" (TMD). 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 now installed 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, 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 further be correlated to actual stem thrust.

In order to "calibrate" the spring pack movement on a Limitorque type of operator, to actual stem thrust, the first step is to position the valve in mid-stroke. Next, the upper bearing thrust cover bolts are removed, and a threaded rod installed in its place. Nuts on the threaded rod are then tightened on the housing cover to retain the cover plate. Once all of the upper housing bolts have been replaced with the threaded rods, a National Bureau of Standards (NBS) certified load cell is mounted such that it is within close proximity of the valve stem (see Attachment B, Figure 5). For those valves in which the stem does not rise completely out of the operator body, an extension piece is used. With the TMD installed and monitoring spring pack position, and the load cell output likewise connected to the portable two channel digital recording oscilloscope, the valve is opened electrically from either the motor control center or the control room. As the valve stem contacts the load cell, the stem load rises dramatically with a corresponding spring pack movement. The spring pack movement signature can now be directly correlated to the actual load signature. The resultant curve has a definite slope which is referred to as the K-factor of the spring pack and is represented in terms of pounds of stem thrust per inch of spring pack deflection. In the analysis of MOVAT'S signature it has proven to be more helpful to express the K-factor as pounds of stem thrust per volt of TMD output.

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

CONTROL SWITCH SIGNATURE

Actual field testing has shown that having the capability to determine the exact time and loading condition at which the control switches actuate is of paramount importance. This sub-system provides a single signature, simultaneously superimposed on the thrust signature, which reflects the exact point and loading condition, within the valve cycle, at which the various switches actuate.

To install the switch sensing circuit, operator control circuit leads are lifted from two of the motor operator terminals and MOVAT'S signal leads attached in series with the control circuit. After the leads have been connected and control power restored, the valve is still fully operational upon receipt of a Engineered Safety Features Actuation Signal, actuation from the control room or motor control cubicle. A schematic of the thrust and switch signatures is shown in Figure 6 of Attachment B.

Although field testing has shown that, for safety-related valves, quality control involvement is required and can be accommodated quite easily, an alternate technique was developed for monitoring of control switch positions without lifting of any control circuit leads. This is performed using the same circuit, however, voltage sensing downstream of selected switches is implemented instead of current sensing. Although using the voltage techniques precludes observation of the torque switch actuation during the initial valve loading condition, all other control switch actuation, including torque switch trip later during the valve cycle after the respective bypass switch has dropped out, is still readily available.

MOTOR LOAD SIGNATURES

Motor load is a measure of the motor input power that has been adjusted to compensate for efficiency losses in the motor. Changes in the motor load values can be related directly to changes in the operator output torque and stem thrust.

Motor load signatures are generally obtained by attaching voltage sensing leads to each phase of the power feed to the operator motor. A clamp on ammeter is also attached to one power phase. The measuring equipment can be installed at the operator or at the motor control center.

Motor load signatures are generally obtained and displayed with switch and/or stem thrust signatures. A typical set of these signatures are shown in Figure 7 of Attachment B.

Motor load signatures are used as follows (refer to Figure 7 of Attachment B):

1. The operator torque switch is set to produce the required stem thrust at torque switch trip (Point A in Figure 7 of attachment B).

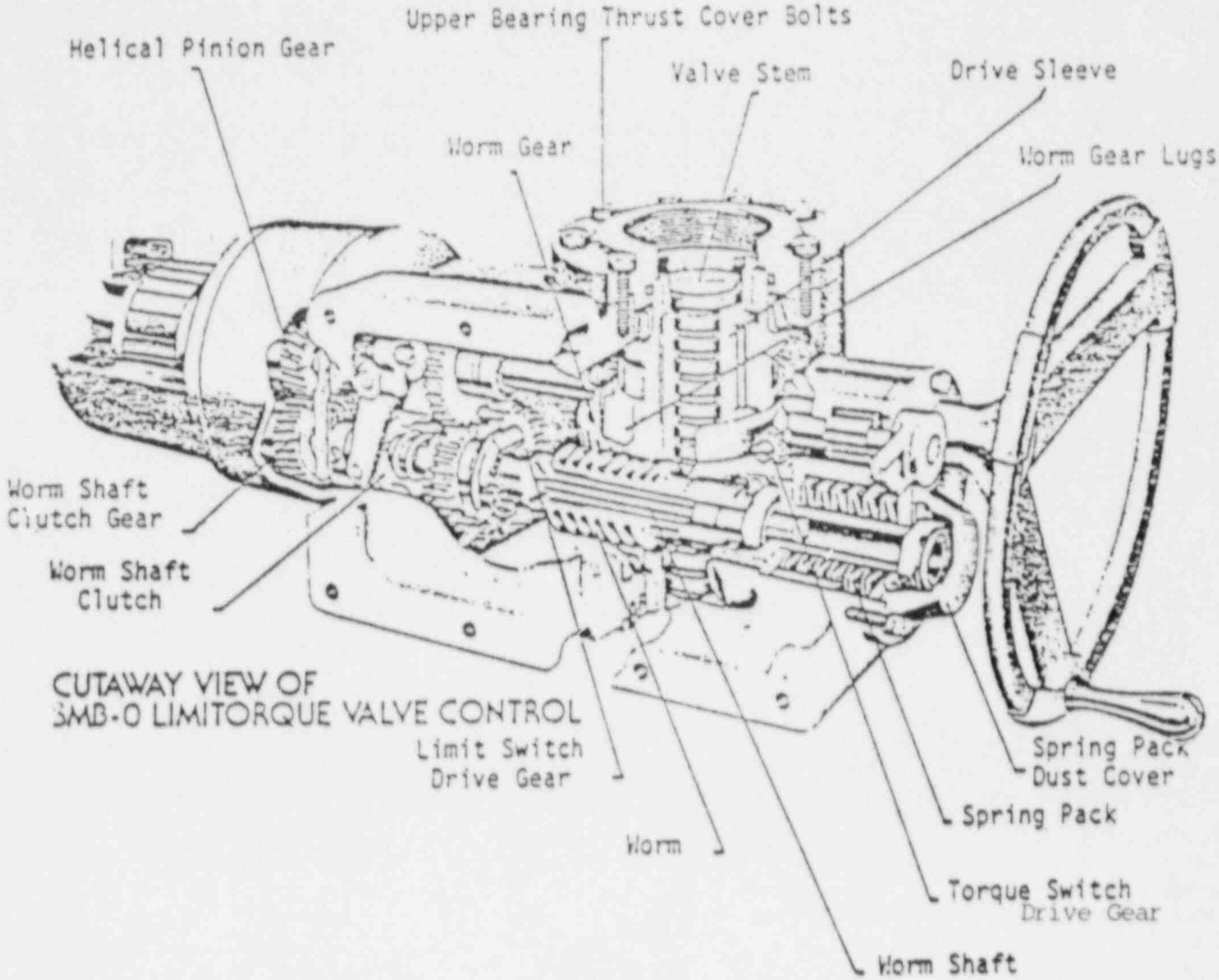
2. The stem thrust required to overcome differential pressure forces is calculated using empirically verified equations (see Attachment B), and the calculated thrust value is subtracted from the thrust at torque switch trip to obtain the "threshold" thrust value (Point B).

3. Motor load lags behind the associated mechanical load changes due to electrical characteristics of the motor, transmission time through the gearing, and delay time in the measurement circuitry. The lag ("delay time") is measured by comparing the unseating spike on the stem thrust signature (Point C) and the corresponding spike in the motor load signature (Point D).

4. The measured delay time is added to the time associated with the threshold thrust value (Point B) and the resulting time is applied to the motor load signature to determine the "motor load threshold" (Point E).

FIGURE 1

Attachment C
Figure 1



CUTAWAY VIEW OF
SMB-0 LIMITORQUE VALVE CONTROL

FIGURE 2

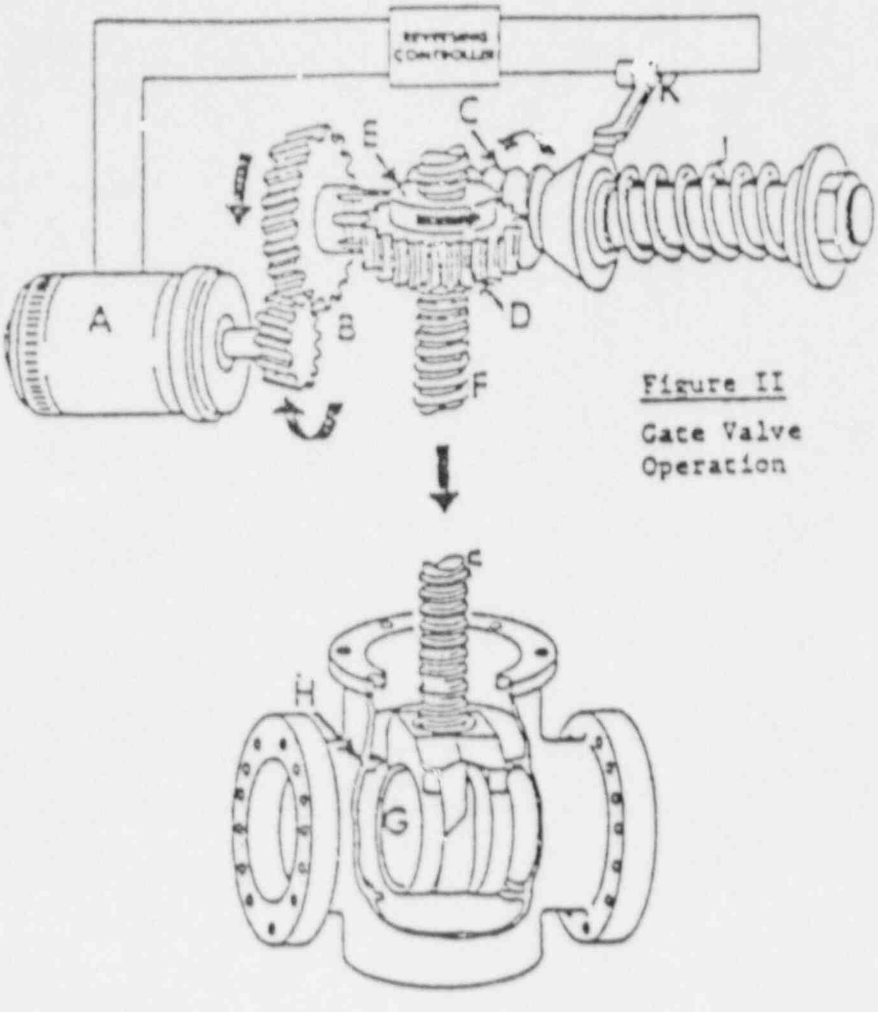


Figure II

Gate Valve Operation

ATTACHMENT D

SUMMARY OF DATA FOR IE BULLETIN 85-03

FOOTNOTES FOR IE BULLETIN 85-03 DATA TABLES

(1) Close limit switch settings marked NA have no limit set because they are controlled in the closed direction by the close torque switch.

(2) The rotor for this switch did not activate during the complete stroke of this valve therefore the setting is unknown.

(3) Close torque switch settings marked NA are done so because the valve is controlled by the limit switch in the closed direction.

(4) Switch setting in inches refers to stem nut deflection.

(5) This valve was administratively blocked closed and therefore these as found settings were unavailable.

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-5	MASONEILAN	GLOBE	90-207x1	4	900

VALVE FUNCTION

AFW MOTOR-DRIVEN PUMP DISCHARGE FLOW CONTROL

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	2100

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1800	1800	1645	1645	1600	1600

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.25	1.5	1.75	8%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA(1)	NA(1)	8%	10%	UNKNOWN(2)	24%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-7	MASONEILAN	GLOBE	90-207X1	4	900

VALVE FUNCTION

AFW MOTOR-DRIVEN PUMP DISCHARGE FLOW CONTROL

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	2100

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1800	1800	1645	1645	1600	1600

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.125	1.5	1.5	5%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	5%	10%	0%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-9	MASONEILAN	GLOBE	90-207X1	4	900

VALVE FUNCTION

AFW MOTOR-DRIVEN PUMP DISCHARGE FLOW CONTROL

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	2100

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1800	1800	1645	1645	1640	1640

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	1.0	2.0	1.0	1.5%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	1.5%	10%	0%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-11	MASONEILAN	GLOBE	90-207x1	4	900

VALVE FUNCTION

AFW MOTOR-DRIVEN PUMP DISCHARGE FLOW CONTROL

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	2100

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1800	1800	1645	1645	1640	1640

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.5	1.75	2.5	1.5	17%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	17%	10%	20%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-01

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-30	FISHER	BUTTERFLY	9221	6	150

VALVE FUNCTION

AFW MOTOR DRIVEN PUMP SUCTION FROM ESSENTIAL SERVICE WATER

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	180	180	164	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.0	1.5	1.0	6.4%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
5%	1%	6.4%	98%	5%	88%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-31	FISHER	BUTTERFLY	9221	6	150

VALVE FUNCTION

AFW MOTOR DRIVEN PUMP SUCTION FROM ESSENTIAL SERVICE WATER

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	180	180	0	162

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.5	1.5	1.5	2.7%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0.45%	1%	2.7%	98%	0.45%	88%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-32	FISHER	BUTTERFLY	9220	8	150

VALVE FUNCTION

AFW TURBINE DRIVEN PUMP SUCTION FROM ESSENTIAL SERVICE WATER

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	180	180	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.25	1.5	1.25	1.3%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0%	1%	1.3%	97%	0%	88%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-33	FISHER	BUTTERFLY	9220	8	150

VALVE FUNCTION

AFW TURBINE DRIVEN PUMP SUCTION FROM ESSENTIAL SERVICE WATER

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	180	180	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.5	1.5	1.5	1.25%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
4.9%	2%	1.25%	98%	4.9%	88%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-34	ANCHOR/DARLING	GATE	FLEX WEDGE	8	150

VALVE FUNCTION

SUCTION FROM CONDENSATE STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
150	150	17	17	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.1	1.5	1.5	1.5	0.9%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0.9%	25%	0.45%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-35	ANCHOR/DARLING	GATE	FLEX WEDGE	8	150

VALVE FUNCTION

SUCTION FROM CONDENSATE STORAGE TANK - ALL PUMPS

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
150	150	17	17	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	2.0	1.25	2.0	1.6%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	1.6%	25%	4%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
AL HV-36	ANCHOR/DARLING	GATE	FLEX WEDGE	10	150

VALVE FUNCTION

SUCTION FROM CONDENSATE STORAGE TANK - ALL PUMPS

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1750

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
150	150	17	17	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	1.75	1.25	1.75	0.75%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0.75%	25%	0.75%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
FC HV-312	TARGET ROCK	GLOBE	-	4	900

VALVE FUNCTION

MECHANICAL TRIP AND THROTTLE

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-000	1900

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1275	1275	1220	1220	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
3.75	3.0	2.0	2.25	1.7%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	1.7%	10%	10.3%	50%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BG LCV-112B	WESTINGHOUSE	GATE	4GM72FBA	4	150

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM PUMP SUCTION FROM THE VOLUME CONTROL TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) △ P		MAXIMUM OPERATING △ P		TEST △ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
100	200	100	100	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	1.5	1.25	2.0	0%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0%	10%	0%	28%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BG LCV-112C	WESTINGHOUSE	GATE	4GM72FBA	4	150

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM PUMP SUCTION FROM THE VOLUME CONTROL TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) △ P		MAXIMUM OPERATING △ P		TEST △ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
100	200	100	100	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.0	1.5	1.25	0%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0%	10%	0%	30%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BG HV-8105	WESTINGHOUSE	GATE	3GM78FNA	3	1525

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL DISCHARGE ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	2750	2750	2885	2885

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.25	2.0	NA(3)	NA(3)	5.8%	9%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.23"(4)	5.8%	9%	9%	28%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BG HV-8106	WESTINGHOUSE	GATE	3GM78FNA	3	1525

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL DISCHARGE ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	2750	2750	2845	2845

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	2.0	NA	NA	2.9%	9%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.20"	2.9%	9%	0%	29%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BG HV-8110	VELAN	GLOBE	2TM78FNA	2	1500

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM PUMP MINIFLOW

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	2750	2750	2592.5	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	1.0	1.25	1.0	7.7%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	7.7%	25%	15%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BG HV-8110	VELAN	GLOBE	2TM78FNA	2	1500

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM PUMP MINIFLOW

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	2750	2750	2625.5	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.5	1.0	1.5	1.0	24%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	24%	25%	8%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BN LCV-112D	WESTINGHOUSE	GATE	8GM72FBA	8	150

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM PUMP SUCTION FROM THE REFUELING WATER STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	200	50	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
3.0	3.0	NA	NA	6%	6.5%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.13"	5.5%	6.5%	0%	27%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BN LCV-112E	WESTINGHOUSE	GATE	8GM72FBA	8	150

VALVE FUNCTION

CHEMICAL AND VOLUME CONTROL SYSTEM PUMP SUCTION FROM THE REFUELING WATER STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	200	50	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
3.0	3.0	NA	NA	UNKNOWN(5)	6%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.013"	UNKNOWN(5)	6%	UNKNOWN(5)	27%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BN HV-8806A	WESTINGHOUSE	GATE	8GM72FBA	8	150

VALVE FUNCTION

SAFETY INJECTION PUMP SUCTION FROM THE REFUELING WATER STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	200	50	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
3.0	2.75	NA	NA	3.39%	6%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.1"	3.39%	6%	0.42%	26%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BN HV-8806B	WESTINGHOUSE	GATE	8GM72FBA	8	150

VALVE FUNCTION

SAFETY INJECTION PUMP SUCTION FROM THE REFUELING WATER STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	200	50	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.25	1.5	NA	NA	0.42%	6%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.1"	0.42%	5%	0%	26%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
BN HV-8813	VELAN	GLOBE	2TM78FNC	2	1500

VALVE FUNCTION

SAFETY INJECTION PUMP MINIFLOW

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	1500	1500	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	1.25	1.25	1.625	15.4%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	15.4%	25%	0%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8801A	WESTINGHOUSE	GATE	4GM78FNA	4	1525

VALVE FUNCTION

BORON INJECTION TANK OUTLET ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SDB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
0	2750	0	2750	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	1.75	NA	NA	0.71%	9%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.2"	0.71%	9%	28.6%	28%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8801B	WESTINGHOUSE	GATE	4GM78FNA	4	1525

VALVE FUNCTION

BORON INJECTION TANK OUTLET ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SDB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
0	2750	0	2750	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	2.0	2.0	2.0	0%	9.5%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.2"	0%	9.5%	0%	29%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8803A	WESTINGHOUSE	GATE	4GM78FNA	4	1525

VALVE FUNCTION

BORON INJECTION TANK OUTLET ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SDB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
0	2750	0	2750	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	1.75	NA	NA	1.43%	9%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.2"	1.43%	9%	22.85%	29%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8803B	WESTINGHOUSE	GATE	4GM78FNA	4	1525

VALVE FUNCTION

BORON INJECTION TANK OUTLET ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SDB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
0	2750	0	2750	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.25	2.25	2.25	2.25	8.6%	11%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.2"	8.6%	9%	58%	29%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8814A	VELAN	GLOBE	1.5TM78FNC	1.5	1500

VALVE FUNCTION

SAFETY INJECTION PUMP MINIFLOW

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	1500	1500	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	1.0	1.25	1.0	0%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0%	25%	0%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8814B	VELAN	GLOBE	1.5TM78FNC	1.5	1500

VALVE FUNCTION

SAFETY INJECTION PUMP MINIFLOW

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-00	1700

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
2750	2750	1500	1500	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
1.25	1.0	1.25	1.5	0%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0%	25%	0%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8835	WESTINGHOUSE	GATE	4GM78FNA	4	1525

VALVE FUNCTION

SAFETY INJECTION PUMP DISCHARGE ISOLATION

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SBD-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
0	2750	0	1500	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.5	1.5	2.5	1.25	0%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	0%	10%	0%	30%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8821A	WESTINGHOUSE	GATE	4GM77FHA	4	900

VALVE FUNCTION

SAFETY INJECTION PUMP CROSS-CONNECT

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1500	1500	1500	1500	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	1.75	NA	NA	2.9%	10%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.2"	2.9%	10%	0%	28%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8821B	WESTINGHOUSE	GATE	4GM77FHA	4	900

VALVE FUNCTION

SAFETY INJECTION PUMP CROSS-CONNECT

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SB-00	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
1500	1500	1500	1500	0	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.0	1.5	NA	NA	12%	11%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
0	0.22"	12%	10%	2.2%	30%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8923A	WESTINGHOUSE	GATE	6GM72FBA	6	150

VALVE FUNCTION

SAFETY INJECTION PUMP SUCTION FROM THE REFUELING WATER STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-000	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) ΔP		MAXIMUM OPERATING ΔP		TEST ΔP	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	200	50	196	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
4.0	2.5	1.0	1.5	4.3%	6%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
NA	NA	4.3%	25%	7.4%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT

DATA TABLE FOR IE BULLETIN 85-03

I. VALVE

COMPONENT ID	MANUFACTURER	TYPE	MODEL	SIZE (IN.)	RATING
EM HV-8923B	WESTINGHOUSE	GATE	6GM72FBA	6	150

VALVE FUNCTION

SAFETY INJECTION PUMP SUCTION FROM THE REFUELING WATER STORAGE TANK

II. VALVE OPERATOR

MANUFACTURER	MODEL	MOTOR RPM
LIMITORQUE	SMB-000	3400

III. DIFFERENTIAL PRESSURE

DESIGN (E-SPEC) Δ P		MAXIMUM OPERATING Δ P		TEST Δ P	
CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN
200	200	200	50	194	0

IV. SWITCH SETTINGS

OPEN TORQUE SWITCH		CLOSE TORQUE SWITCH		OPEN LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
2.5	3.0	2.25	3.0	6.45%	9%

CLOSE LIMIT SWITCH		OPEN-TO-CLOSE TORQUE BYPASS LIMIT SWITCH		CLOSE-TO-OPEN TORQUE BYPASS LIMIT SWITCH	
AS FOUND	FINAL	AS FOUND	FINAL	AS FOUND	FINAL
6.45%	25%	6.45%	9%	6.45%	25%

V. AS FOUND VALVE OPERABILITY

SEE SECTION III OF REPORT

VI. TEST METHOD DESCRIPTION/JUSTIFICATION

SEE SECTION II OF REPORT