October 9, 1986

Docket No. 50-410

APPLICANT: Niagara Mohawk Power Corporation

FACILITY: Nine Mile Point, Unit 2

SUBJECT: MEETING SUMMARY FOR SEPTEMBER 24, 1986, MEETING ON MAIN STEAM ISOLATION VALVES

On September 24, 1986, the staff met with representatives of Niagara Mohawk Power Corporation (NMPC) and their consultants from Stone and Webster Engineering Corporation (SWEC) to discuss problems with the main steam isolation valves (MSIVs) at Nine Mile Point, Unit 2 (NMP-2). In the last several months NMPC has discovered major problems with the MSIV actuator latching mechanism and galling of the valve ball.

On August 27, 1986, the staff met with NMPC to discuss the August 22, 1986, exemption request on the MSIV actuator problem. Subsequently, the exemption request for the actuators was revised and resubmitted on August 28, 1986. While the staff was in the process of reviewing the revised exemption request the MSIV actuators, NMPC identified an additional problem concerning the leakage rates of the MSIVs. In the process of performing some additional leak rate tests in late August 1986, NMPC discovered these valves were leaking at a rate significantly higher than during tests performed in spring of 1985, and spring of 1986. Upon disassembly, NMPC discovered galling of the tungsten carbide coating on the valve ball. When the ball was rotated during opening and closing of these valves, the galled tungsten carbide was passing over the stellite valve seats and scoring them. This scoring resulted in the much higher valve leakage rates.

NMPC then embarked on a testing program of these valves. The one successful test invloved a spare valve ball, a modified spring arrangement for the valve seat, and a modified valve operator which used hydraulics rather than a latching mechanism to hold the valve open. The valve was cycled 75 times. Leak tests were performed after 5, 15, 25, 35, 45, 55, 65 and 75 cycles. The leak rate for all tests was below the 6 SCFH allowable leakage rate.

At the time of the September 24, 1986, meeting, NMPC had scheduled additional testing with an MSIV with a "blended" ball (i.e., the galled surface had been machined to smooth out the rough edges), the new seat assembly, and a modified actuator. This test was completed on September 26, 1986. This valve assembly did not pass the leakage test after 2 cycles. After disassembly it was determined that the galling problems were continuing and that a blended ball was not acceptable.

NMPC has stated in discussions with the staff, that it is proceeding with removing the old tungsten carbide coating and recladding the valves. A revised exemption request was submitted October 2, 1986, and is under review. The complete report is scheduled for submittal October 10, 1986.

October 9, 1986

MEETING SUMMARY DISTRIBUTION

Docket No(s): 50-410
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ENCLOSURE 2

ATTENDEES

MSIV MEETING 9/ 24/ 86

NAME	ORGANIZATION
R. A. Cushman	NMPC
A. F. Zallnick	NMPC
C. E. Crocker	SWEC
C. D. Terry	NMPC
M. A. Durka	SWEC
M. A. Fachada	SWEC
E. R. Klein	NMPC
T. D. Fay	NMPC
D. L. Hill	NMPC
K. F. Roenick	NYS PSC
H. K. Shaw	NRC/DBL/EB
J. D. Page	NRC/NRR//DSRO/E1B
R. M. Bernero	NRC/DBL
E. G. Adensam	NRC/DBL
F. J. Witt	NRC/DBL/PSB
A. J. Fiorente	SWEC
J. Lombardo	NRC/DBL/EB
B. Miller	BNL
R. G. LaGrange	NRC/DBL/EB
B. Turovlin	NRC/DBL/EB
Jack Kudrick	NRC/DBL/PSB
Gus Lainas	NRC/DBL
T. J. Perkins	NMPC
C. Mangan	NMPC
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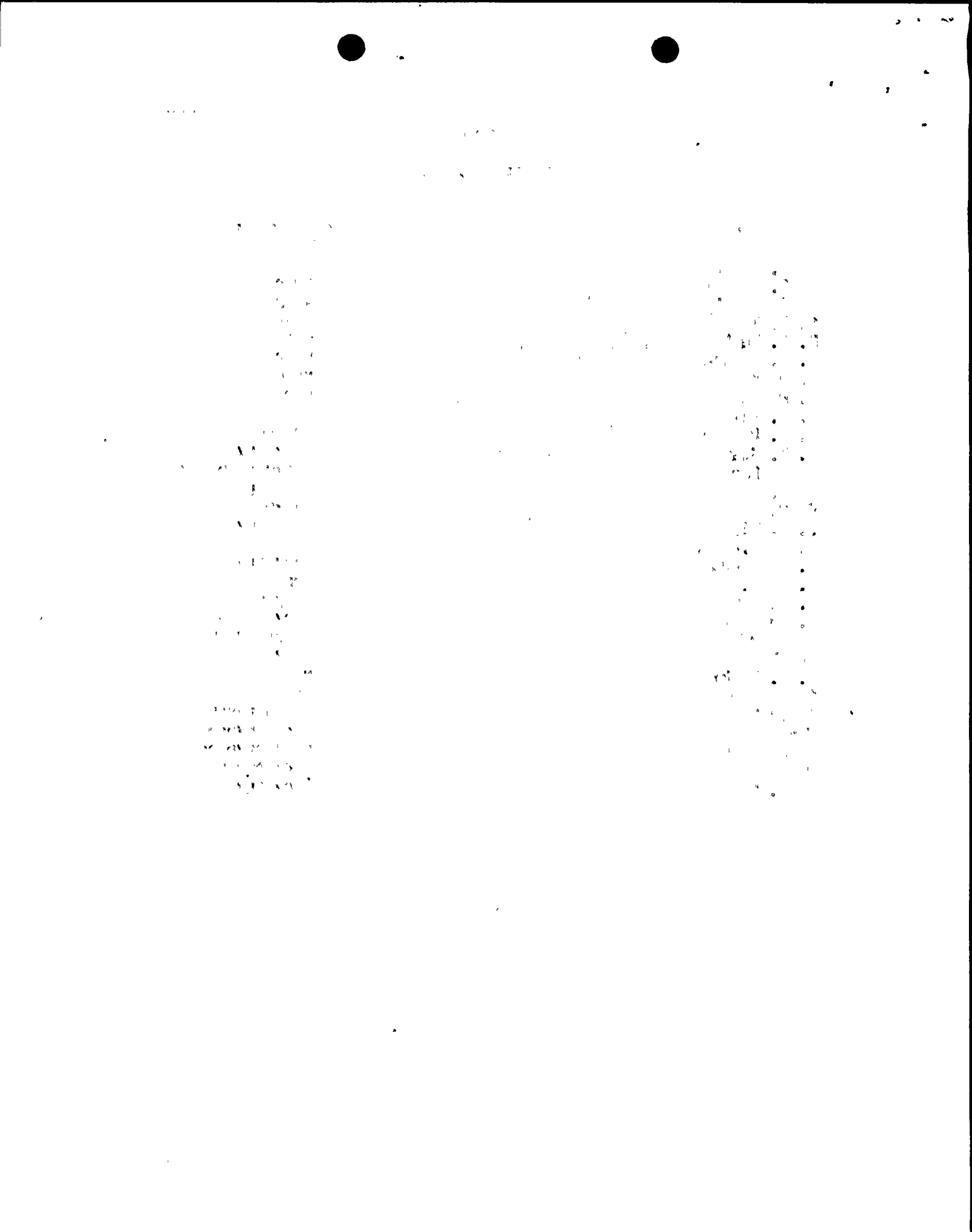
Wayne Hodges	NRC/DBL/RSB
Owen Rothberg	NRC/NRR/DSRO
H. F. Conrad	NRC/DBL/EB
R. A. Hermann	NRC/DBL/EB



The modified actuator design used a solenoid valve with a teflon seat. As teflon does not perform well in a radioactive environment, NMPC is looking for an alternate material for the valve seat.

NMPC is also developing a plan for additional long-term prototype testing of these valves.

Enclosure 1 contains a handout provided by NMPC of the slides used for their presentation.

Enclosure 2 contains a list of meeting attendees.

Mary F. Haughey, Project Manager
BWR Project Directorate No. 3
Division of BWR Licensing

Enclosure:
As stated

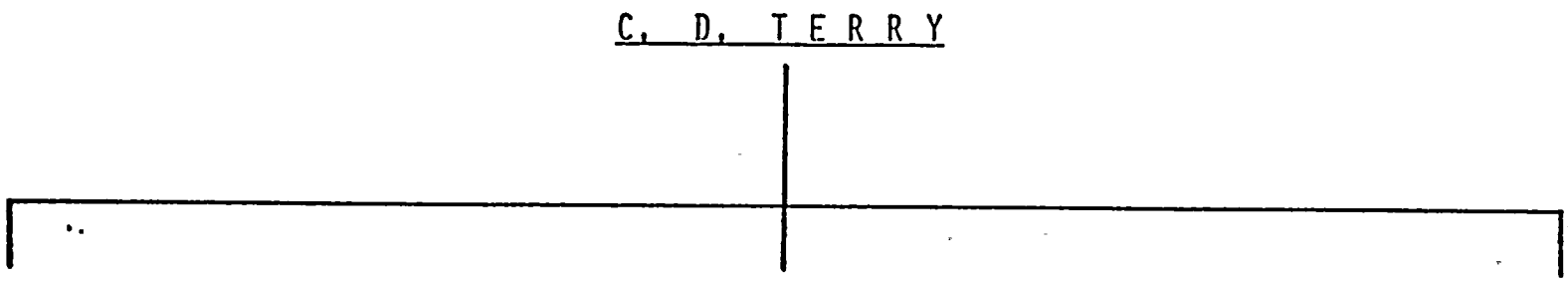
BWD-3:DBL
MHaughey/vag
10/9/86

D:BWD-3:DBL
EAdensam
10/9/86

NRC NMP2 MSIV MEETING

SEPTEMBER 24, 1986

- GENERAL OVERVIEW
- NIAGARA MOHAWK MANAGEMENT TEAM AND PROGRAMS
- TESTING/ROOT CAUSE ANALYSIS
- SEAT LEAKAGE
- ACTUATOR FUNCTION
- CONCLUSION



Valve Operability Programs:

- Seat Leakage
- Closure Time

Testing Programs:

- Prototype Tests
- Mechanical Latch

Contingency Programs:

- Y Pattern Valves
- Leakage Control System

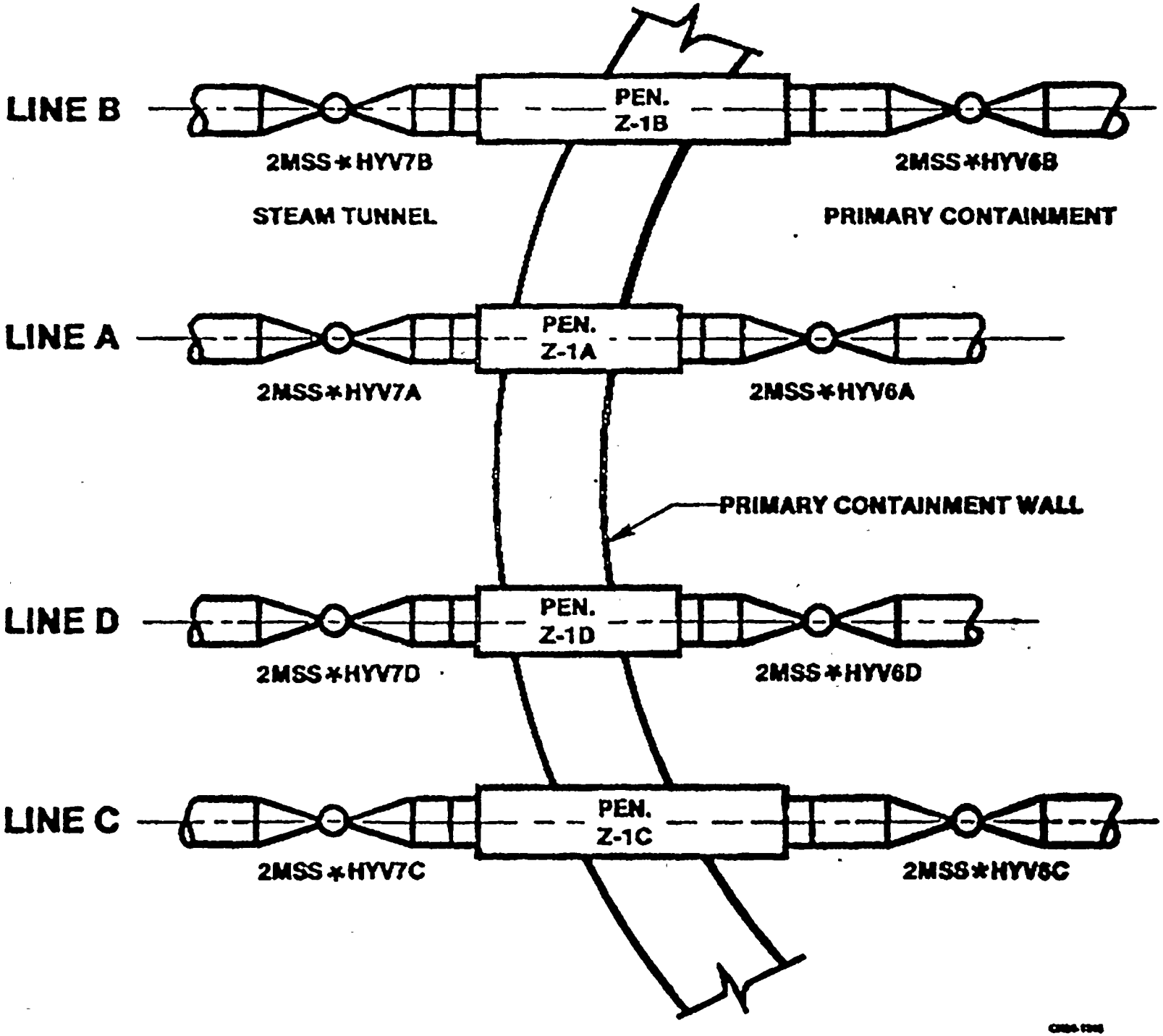
TESTING PROGRAMS

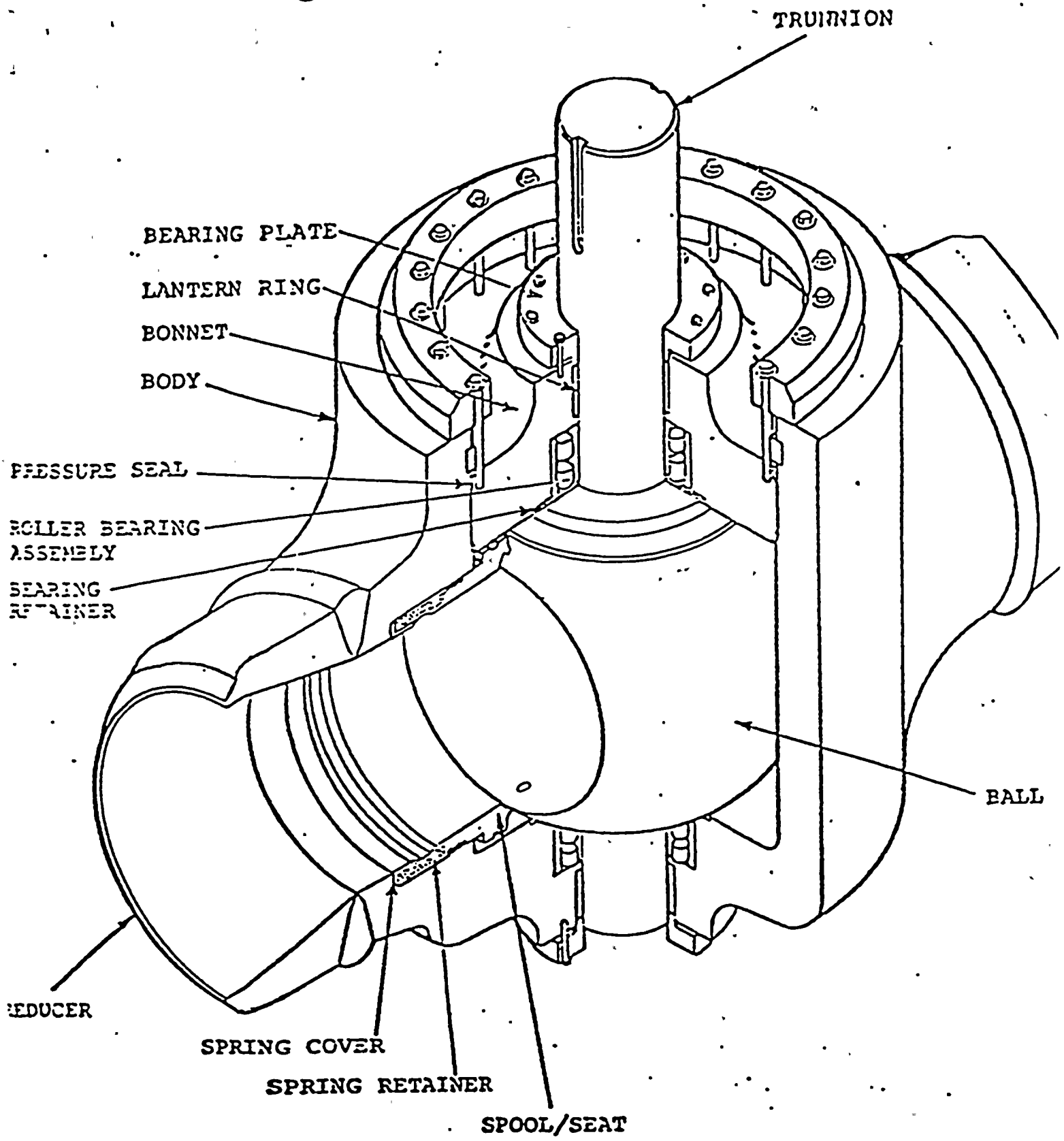
- THOROUGH ROOT CAUSE ANALYSIS OF LEAKAGE PROBLEMS
  - Dedicated Manager
  - Consultants - MPR, GE, W, CROSBY
  - Discussions with Other Users - Swiss and Beaver Valley
  - Prototype Test Setup Being Expedited

- DEVELOPMENT OF MECHANICAL LATCH FOR VALVE CLOSURE
  - Reduction of Inadvertent Actuations
  - Will Use Prototype Setup to Verify Operability

1) LEAKAGE

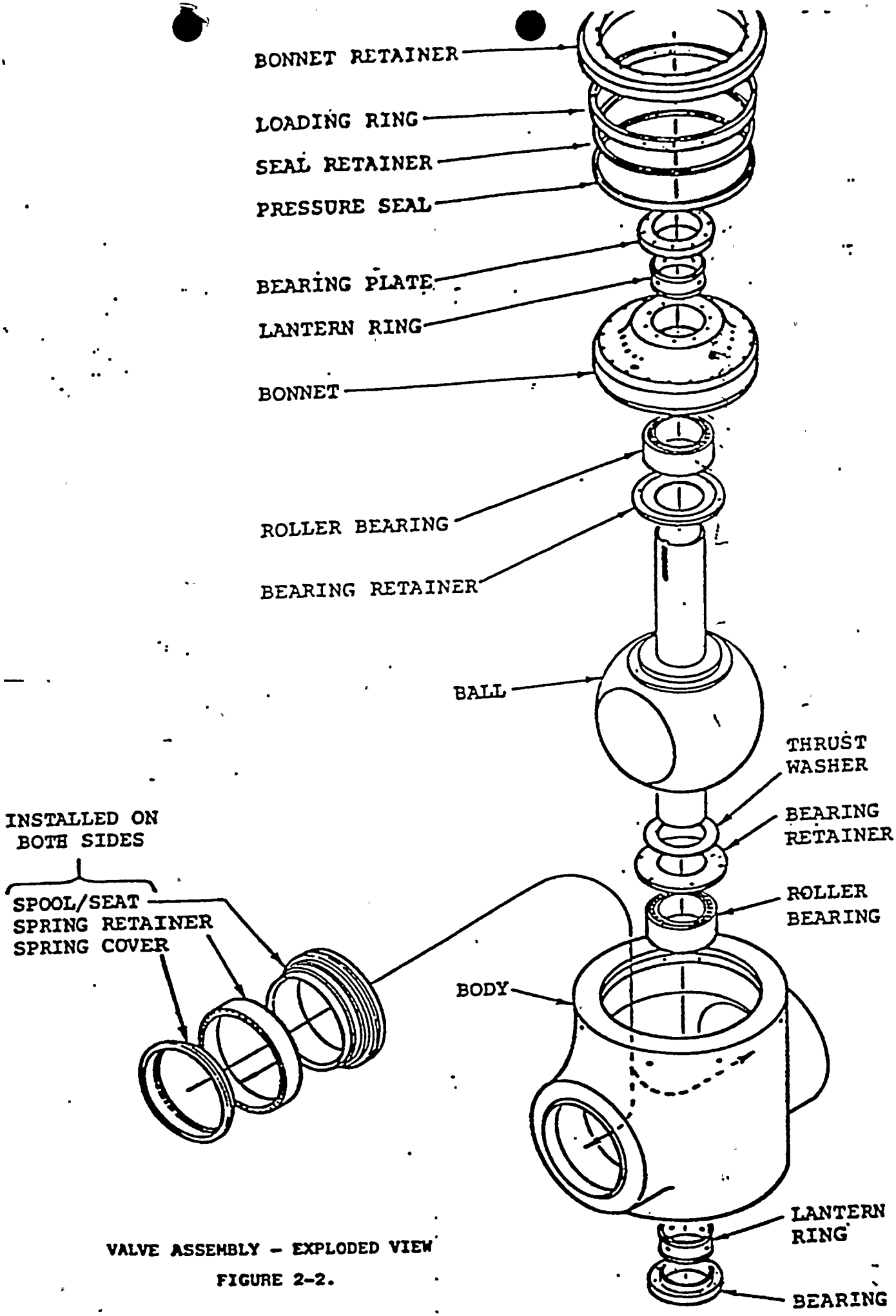
- ORIGINAL DESIGN
  - GENERAL DESCRIPTION
  - SEAL DESIGN
- PROBLEM DESCRIPTION
  - BALL CONDITION
  - BEARING PRESSURE ON BALL
  - LEAKAGE TEST RESULTS
- PROPOSED SOLUTION
  - OPTION 1 - REWORKED BALL
  - OPTION 2 - RECOATED BALL AND REVISED SPRINGS
- TEST RESULTS
  - TEST PROGRAM AND BASIS
  - OPTION 1 RESULTS
  - OPTION 2 RESULTS
- SCHEDULE


LINE B
PEN.
Z-1B
2MSS*HYV7B
2MSS*HYV6B
STEAM TUNNEL
PRIMARY CONTAINMENT
LINE A
PEN.
Z-1A
2MSS*HYV7A
2MSS*HYV6A
PRIMARY CONTAINMENT WALL
LINE D
PEN.
Z-1D
2MSS*HYV7D
2MSS*HYV6D
LINE C
PEN.
Z-1C
2MSS*HYV7C
2MSS*HYV6C



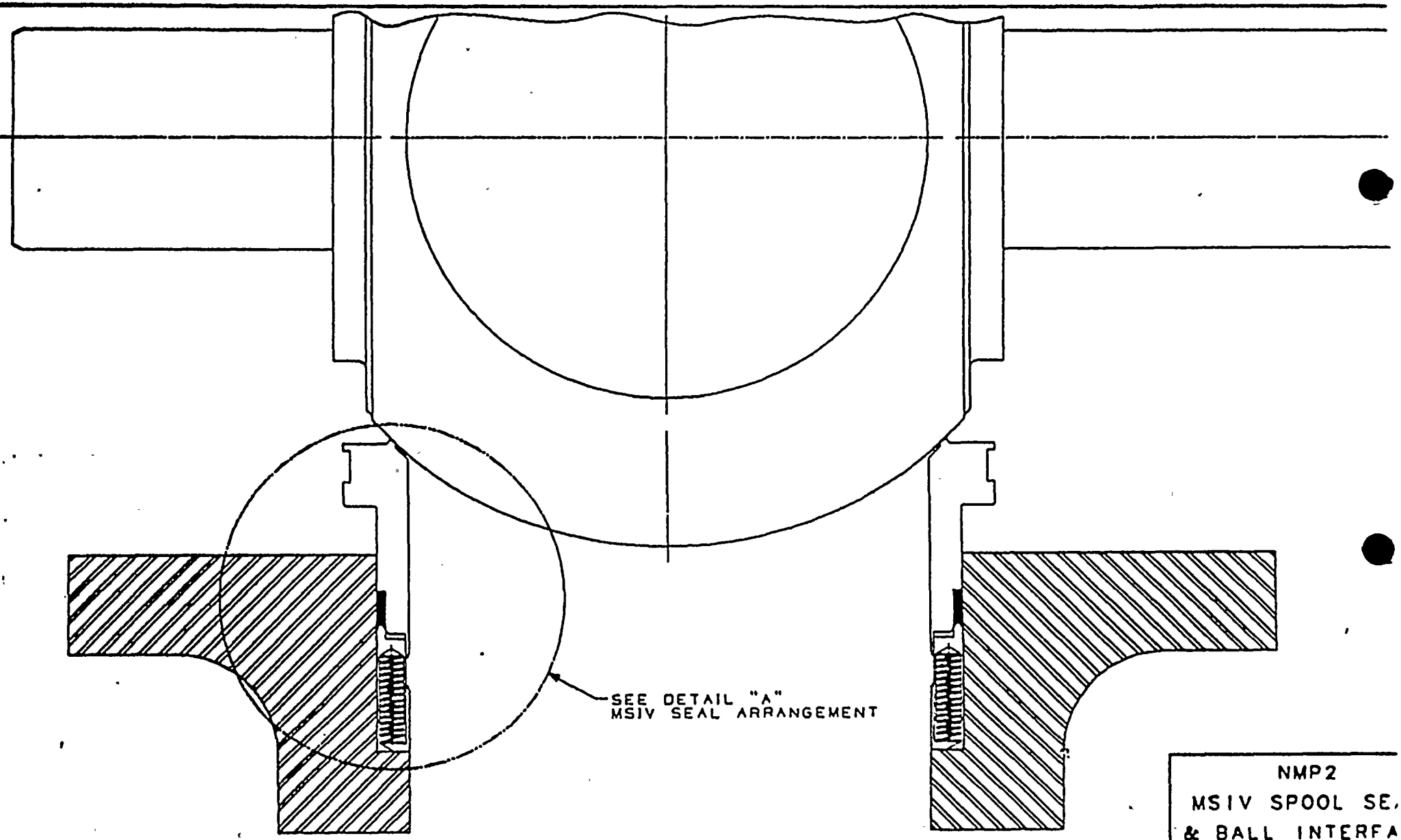
MAIN STEAM ISOLATION VALVE (MSIV)

FIGURE 2-1.



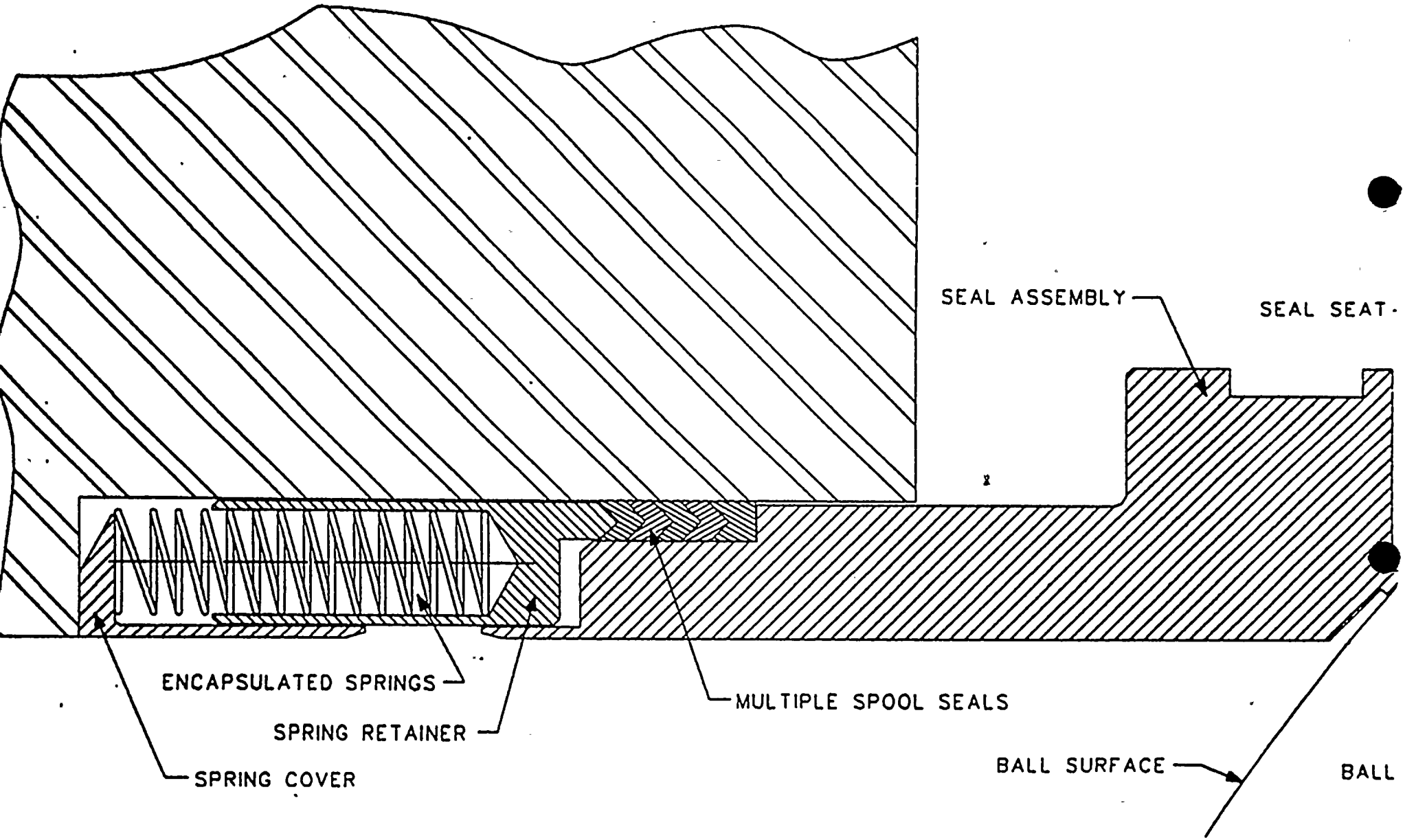
VALVE ASSEMBLY - EXPLODED VIEW

FIGURE 2-2.



NMP2
MSIV SPOOL SE
& BALL INTERFA

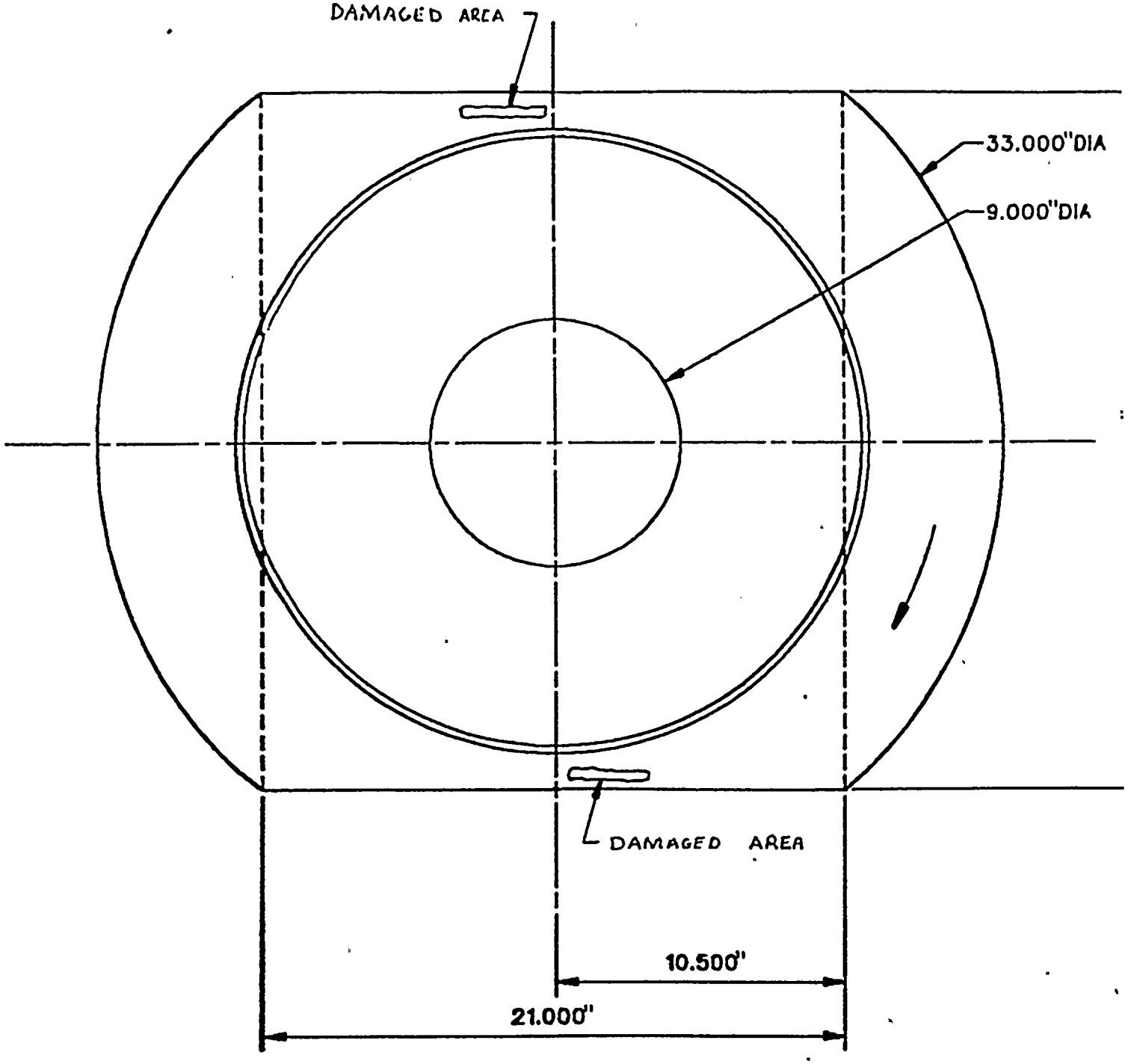
MSIV SEAL ARRANGEMENT
DETAIL "A"

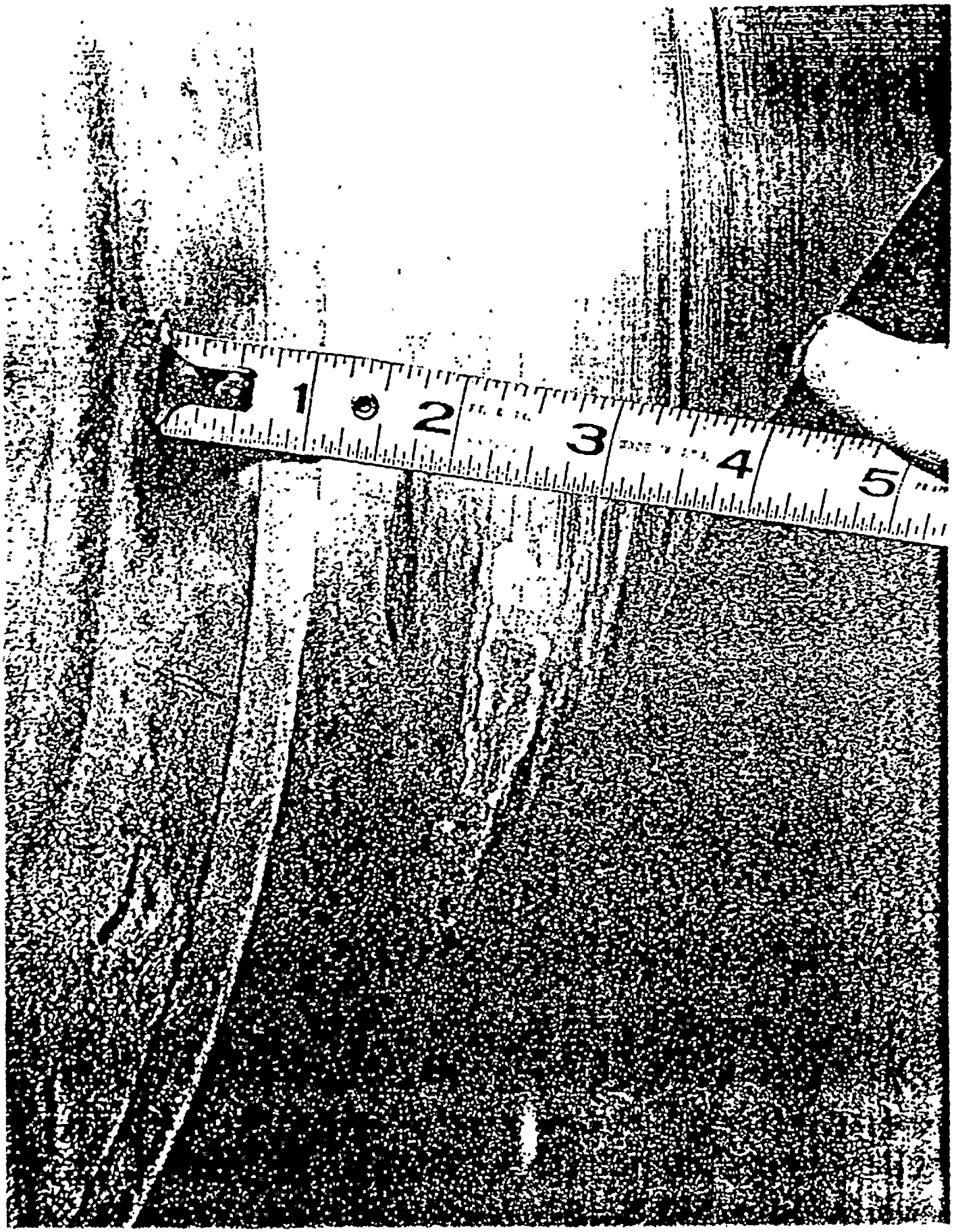


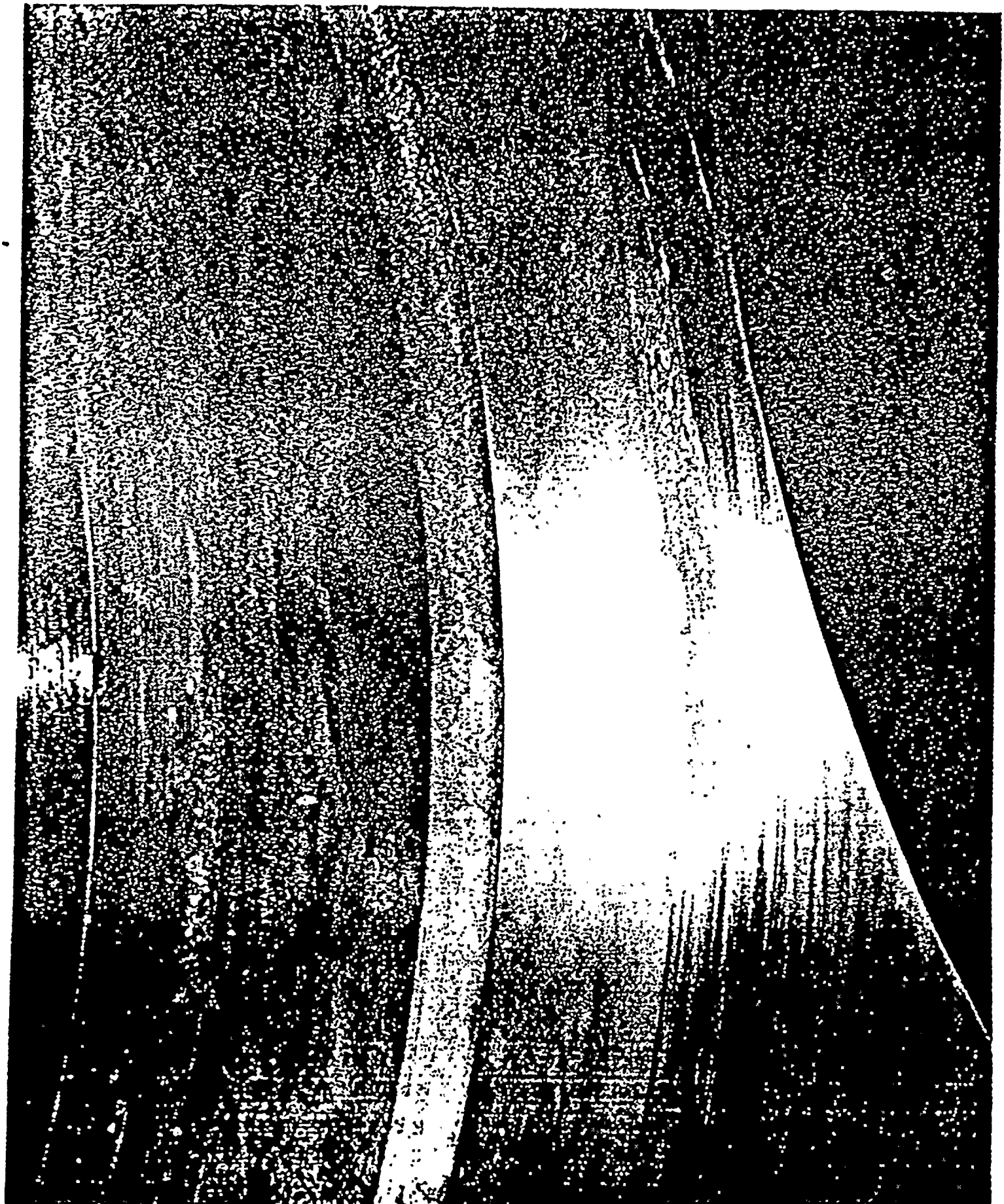
NMMSIVMD24

BALL CONDITION

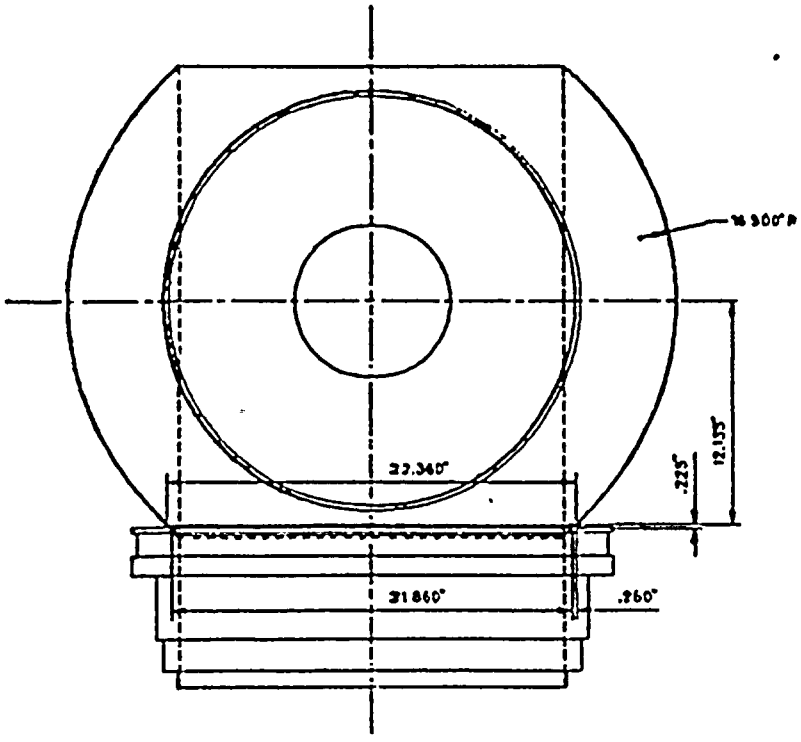
TOP VIEW



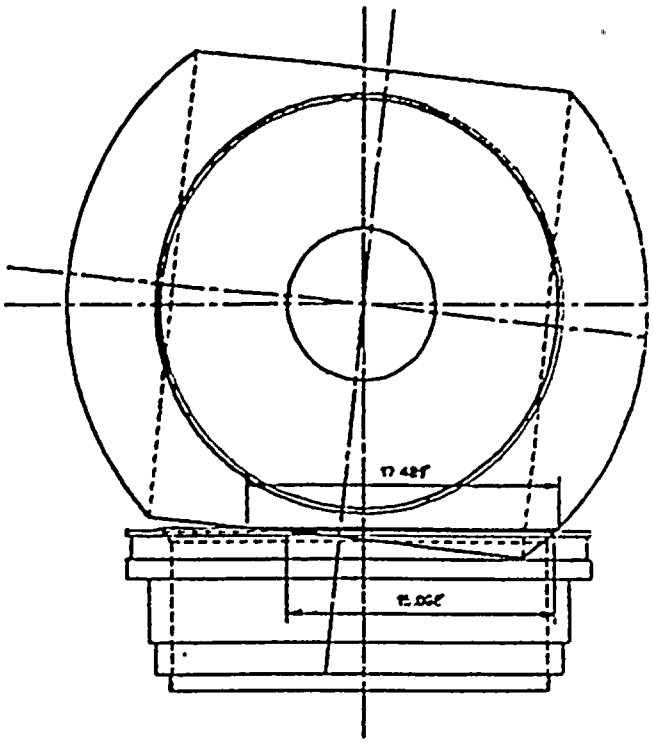

1
2
3
4
5



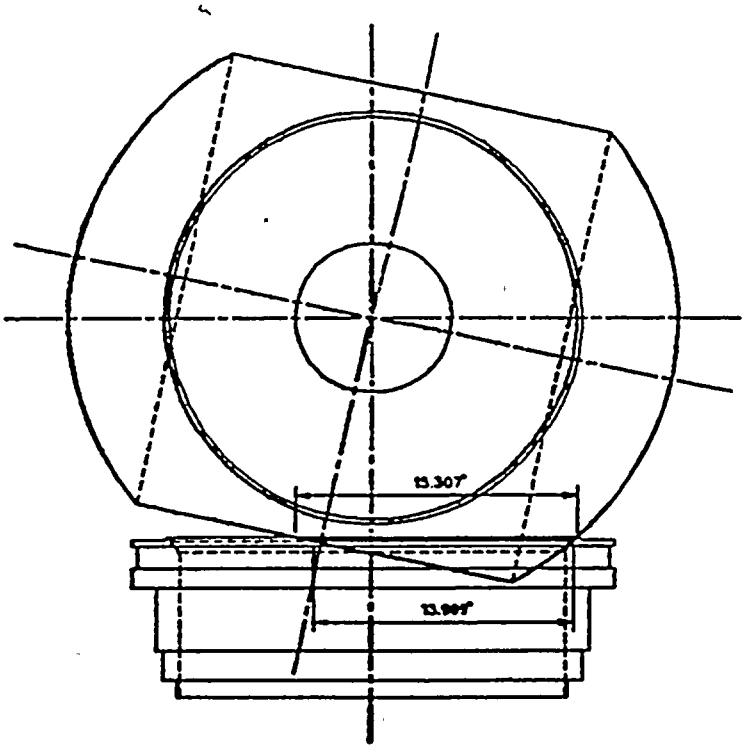
BALL TO SEAL CONTACT



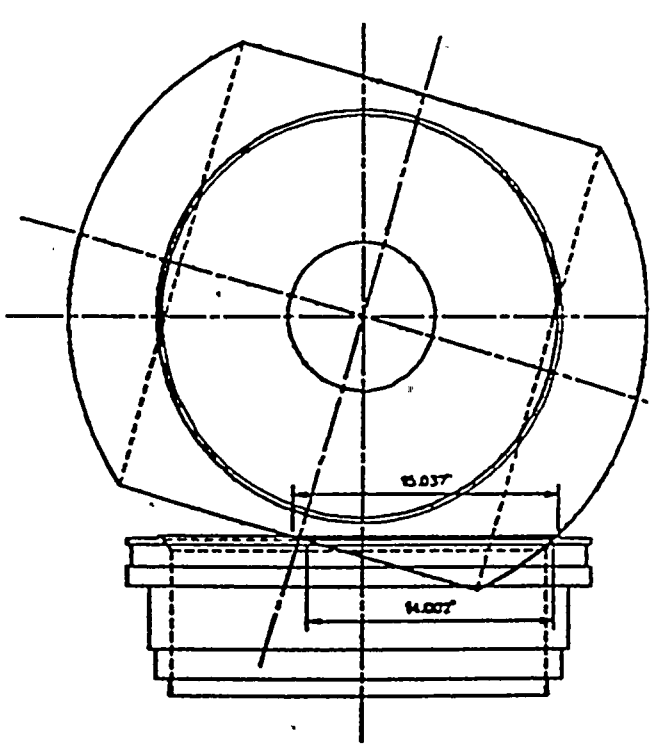
BALL VALVE OPEN



BALL VALVE AT 6°

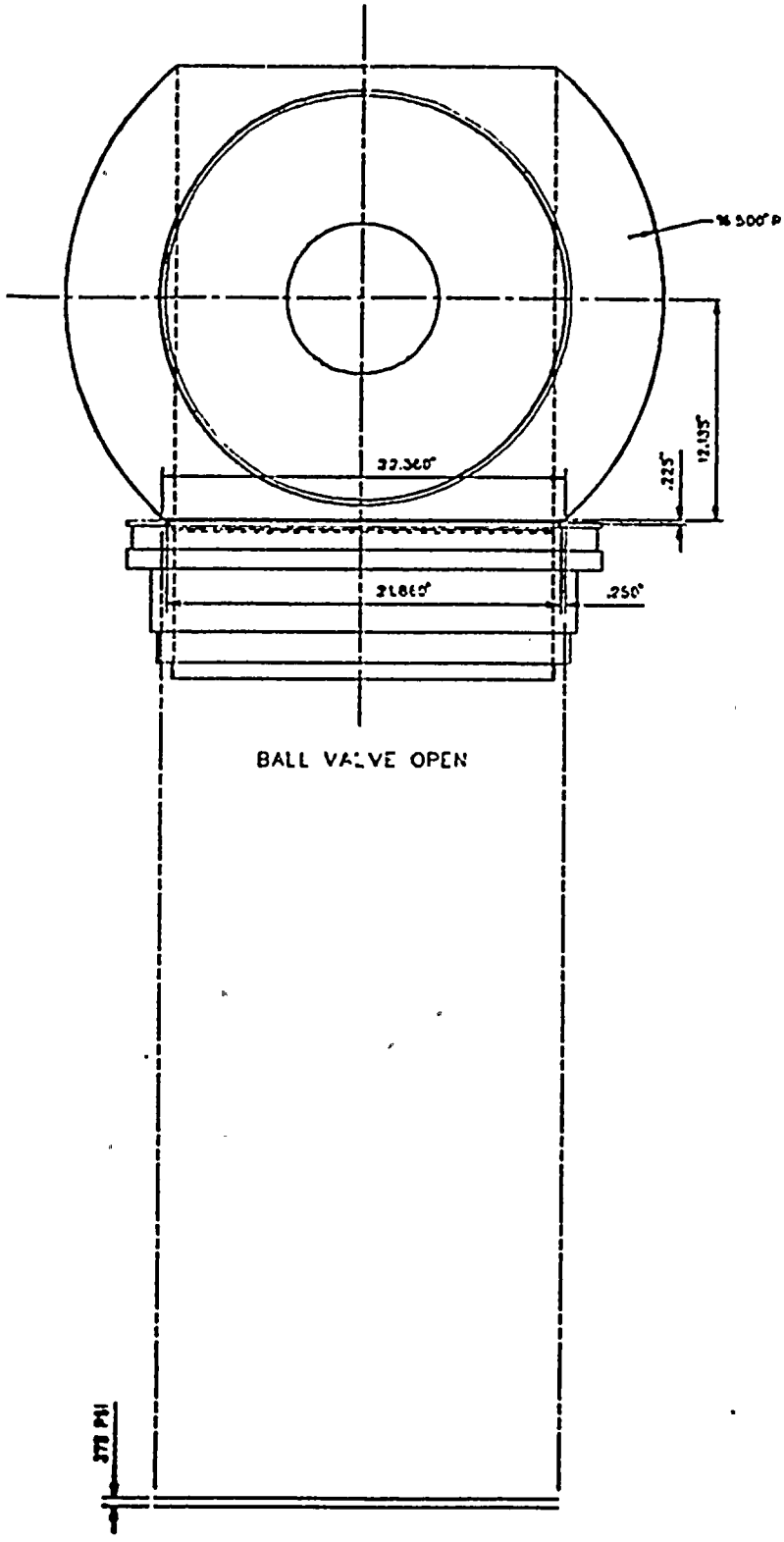


BALL VALVE AT 12°



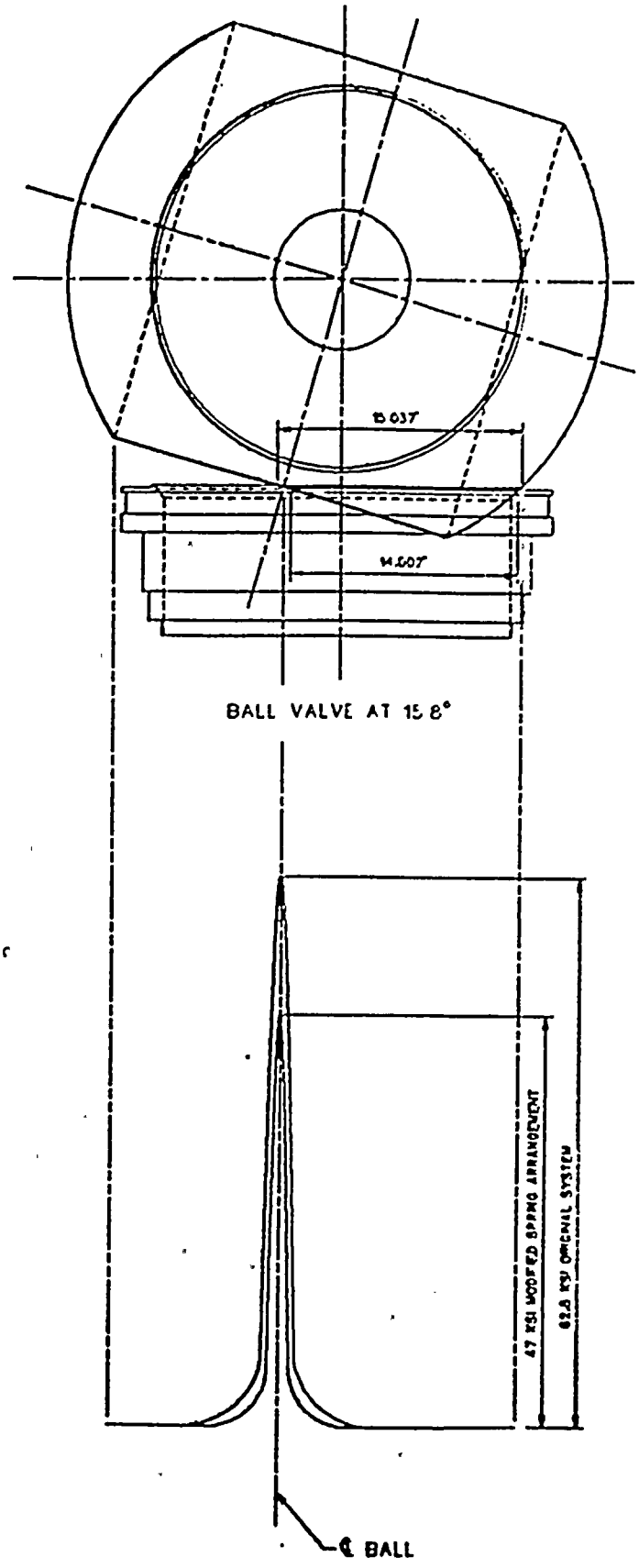
BALL VALVE AT 16°

FOOTPRINT STRESS ON BALL



BALL VALVE OPEN

FOOTPRINT STRESS DIAGRAM



BALL VALVE AT 15.8°

FOOTPRINT STRESS DIAGRAM

DATE	PRELIM TYPE "C" 4/85	ACTUAL TYPE "C" 3/86	RETEST TYPE "C" 9/2/86
6A	0.89	1.09	22
6B	1.37	0.54	40.2
6C	0.321	0.158	37.3
6D	0.99	0.215	42
7A	0.34	0.084	30.3
7B	2.778	1.183	42
7C	0.798	0.199	23.6
7D	0.306	0.088	16.7

NMP2 MSIV
LEAK TESTS

NOTES:

1) ALL VALVES STROKED FOR ACTUATOR TESTING BETWEEN 3/86 AND 9/86

2) ALL TESTING DONE BETWEEN SEATS

3) ALL VALUES IN SCFH

- OPTION 1 6D -

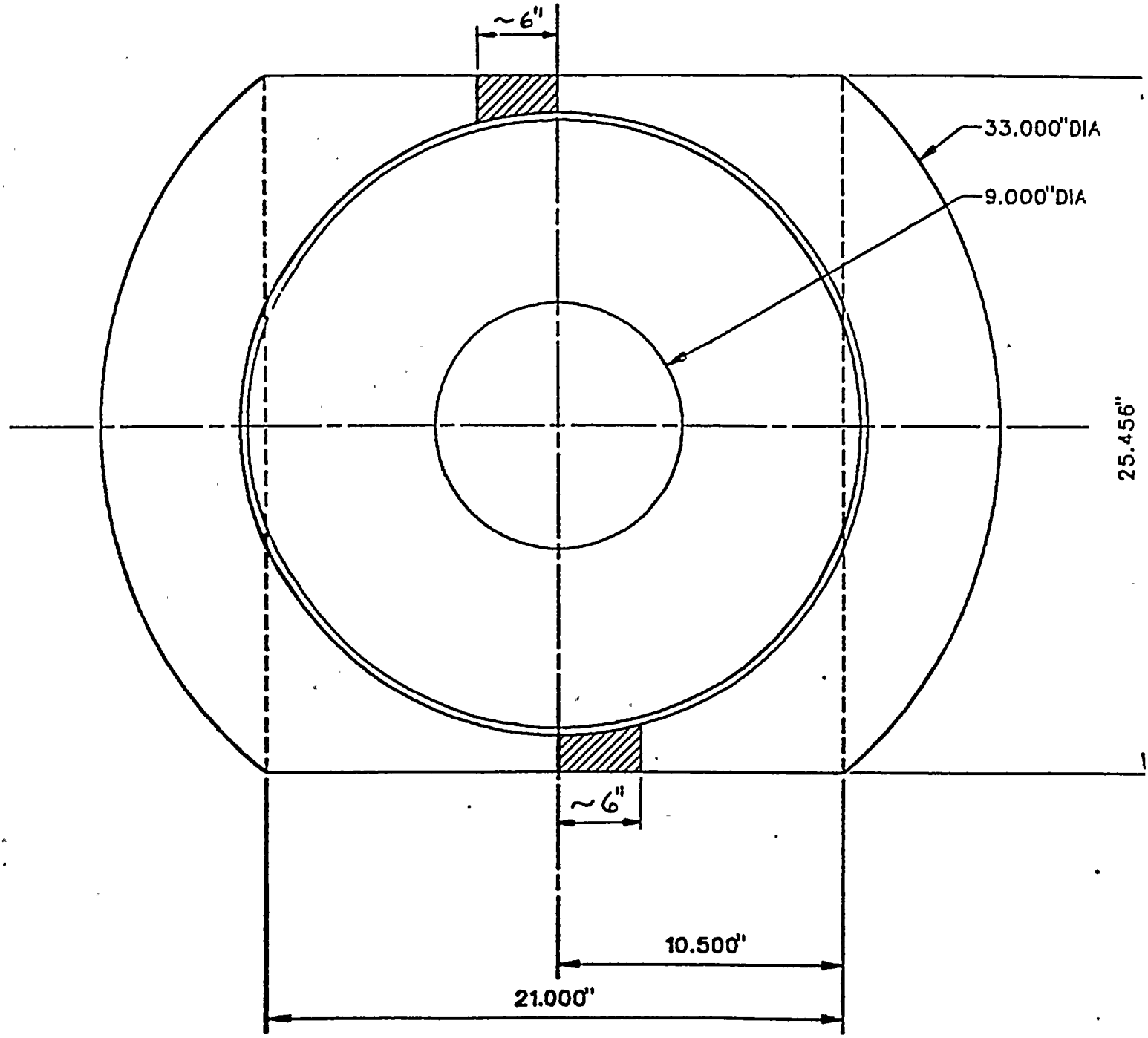
- EXISTING SPRING DESIGN
- REWORKED BALL
- 75 CYCLES

- OPTION 2 7D-

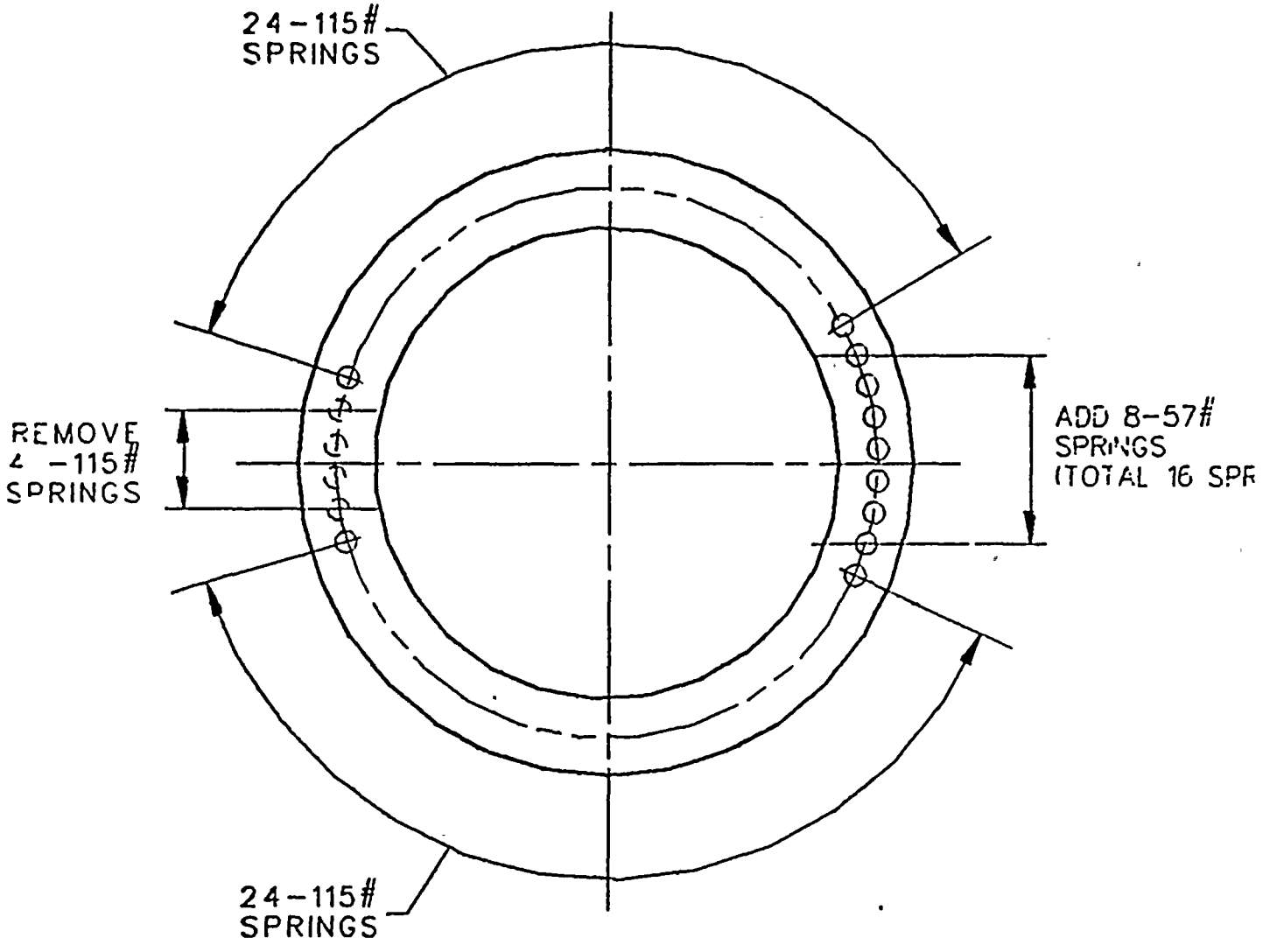
- REVISED SPRING DESIGN
- RECOATED BALL
- 75 CYCLES

BALL CONDITION

TOP VIEW



REVISED SPRING PACK



TOTAL 64 SPRINGS

MSIV STROKES

BASED ON 1ST REFUELING (30 MONTHS)

ISI & RPS (1 MONTH)	30
UNANTICIPATED TRIPS	25 TO 33
PLANNED TRIPS	5
ACTUATOR CHECK OUT	5
PRE OPERATIONAL TESTS	2
FOR TESTING USE TOTAL	75

TEST PROGRAM

ACCUMULATED STROKES	BETWEEN SEATS	THROUGH SEATS
5	X	X
15	X	X
25	X	
35	X	
45	X	
55	X	
65	X	
75	X	X

X - RECORD IN LEAKAGE AT STEADY STATE CONDITIONS

TYPE "C" TEST RESULTS

STROKES		5	15	25	35	45	55	65	75
OPTION 1	TS	5.1	5.5	10.9	-	-	-	-	-
6D	BS	11.2	51	132	-	-	-	-	-
OPTION 2	TS	2.3	2.9	-	-	-	-	-	3.2
7D	BS	4.8	4.9	4.7	4.4	4.2	4.0	3.9	4.4

TS - THROUGH SEATS

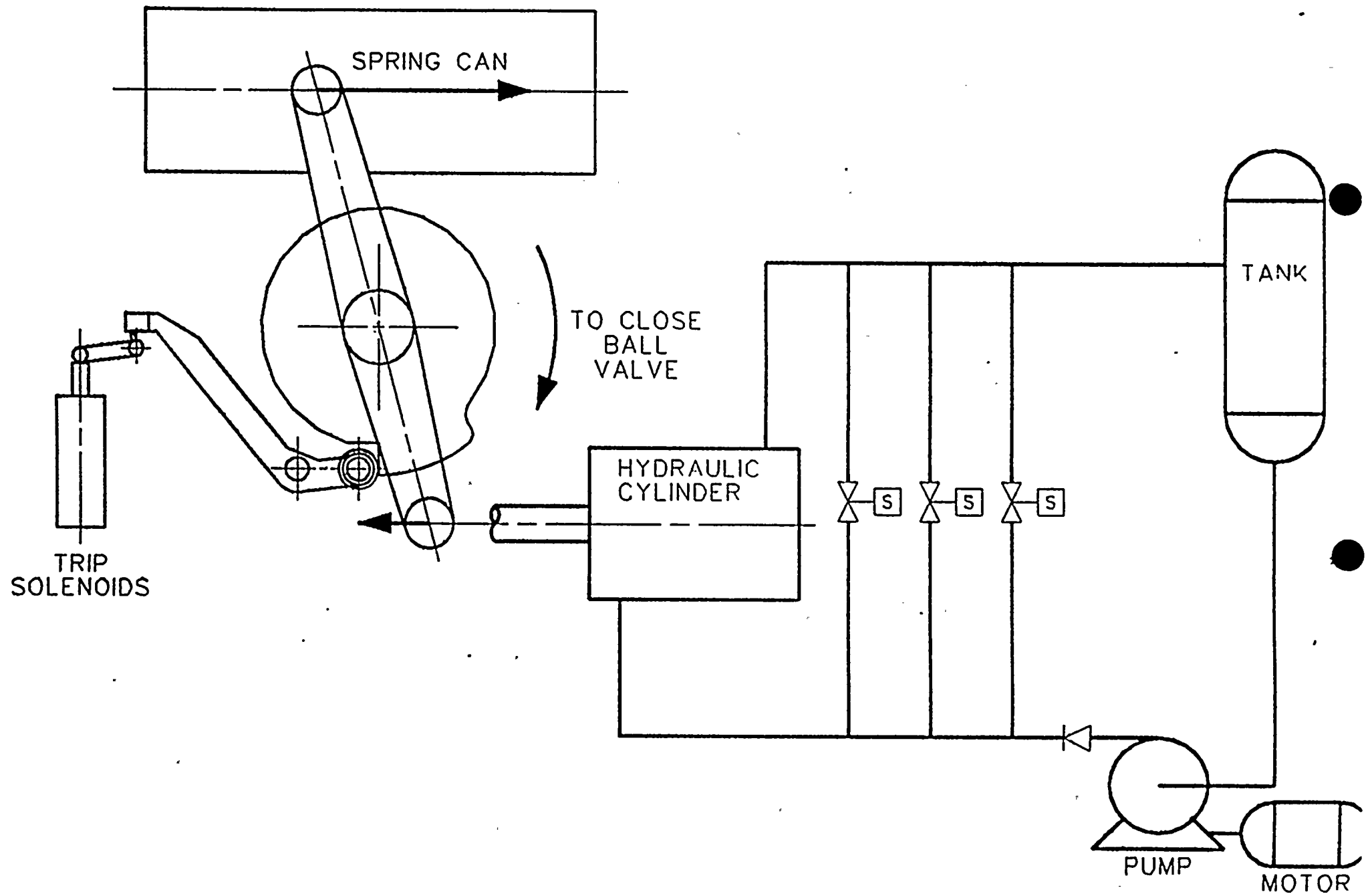
BS - BETWEEN SEATS

ALL VALUES IN SCFH

MSIV ACTUATOR

- ORIGINAL DESIGN
- PROBLEM DESCRIPTION
- PROPOSED SOLUTION
  - DESIGN CONCEPT - HYDRAULIC SYSTEM
  - EQUIPMENT
  - SAFETY FUNCTION
  - SEISMIC QUALIFICATION
- TESTING RESULTS
  - LEAKAGE
  - CYCLE TIMES
  - RESPONSE TIMES
- SCHEDULE

MSIV CLOSURE MECHANISM



MSIV ACTUATOR

- ORIGINAL DESIGN

  A. VALVE OPENING SEQUENCE
     - SOVS CLOSED
     - HYDRAULIC PUMP ON
     - VALVE GOES TO OVERTRAVEL
     - LATCH SLIPS INTO PLACE
     - PUMP IS SHUT OFF
     - OPEN SOVS

MSIV ACTUATOR

- ORIGINAL DESIGN

B. TEST MODE

- VALVE IS ON THE LATCH
- CLOSE SOVS
- TRIP THE LATCH
- CATCH VALVE MOTION ON HYDRAULIC SYSTEM
- DESIGN CAPABILITY TO DUMP SOVS ON COMMAND

MSIV ACTUATOR

- PROBLEM DESCRIPTION
  - SOLENOIDS DID NOT TRIP THE MSIV
  - LOAD REQUIRED TO TRIP INCREASES WITH TIME
  - AT 12 HOURS - LOAD INCREASED BY 1.5X
  - AT 24 HOURS - LOAD INCREASED BY 2.0X
  - AT 7 DAYS - LOAD INCREASED BY 3.0X
  - PRESENT SOLENOIDS ARE NOT ADEQUATE TO TRIP MSIV

MSIV ACTUATOR

- PROPOSED MODIFICATION

  - DESIGN CONCEPT
    - USE THE EXISTING HYDRAULIC SYSTEM TO KEEP THE VALVE OPEN
    - ADD NO CAT. I EQUIPMENT
    - MAINTAIN SAFETY OPERATION OF MSIV
    - MINIMAL CHANGES TO THE ACTUATOR

MSIV ACTUATOR

- PROPOSED MODIFICATION
  - EQUIPMENT
    - EXISTING HYDRAULIC EQUIPMENT
      - PIPING 304SS SCH. 40 .109" TO .154" WALL THK:
      - FLEX HOSE 2500 PSI RATING
      - HYDRAULIC CYLINDER
        - HYDROLINE HL-E-269
      - PUMP
        - 3 HP, 3 GPM, 1500 PSI
      - SOV TARGET ROCK
        - BALANCED PISTON DESIGN
        - DESIGN PRESSURE 1950 PSI
        - SA 182 TP 316
        - MAX. DIFFERENTIAL PRESSURE 1450 PSI

MSIV ACTUATOR

- PROPOSED MODIFICATIONS
  - EQUIPMENT
    - ADDED EQUIPMENT
      - HYDRAULIC ACCUMULATOR
        - PARKER PISTON TYPE
        - PISTON HAS EPR SEALS
        - 2½ GALLON CAPACITY
      - JOCKEY PUMP
        - 3/4 HP, 0.6 GPM, 1800 PSI
      - PRESSURE SWITCHES (2), STATIC O-RING
      - MODIFIED EQUIPMENT
        - HYDRAULIC CYLINDER
          - MECHANICAL STOP
          - LIP SEAL EPR
      - SOV
        - DISK & O-RING MATERIALS ARE BEING QUALIFIED BY TESTING

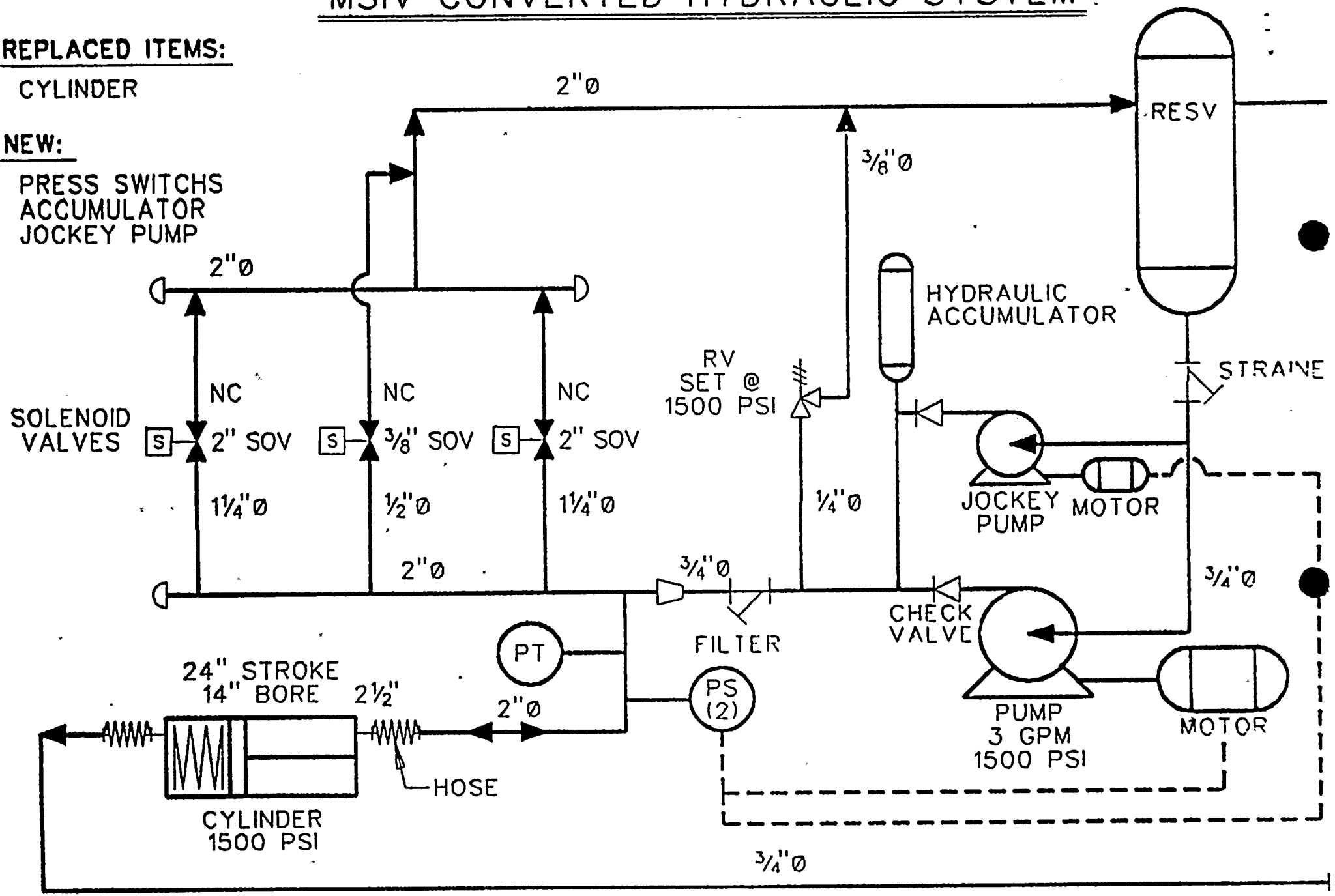
MSIV CONVERTED HYDRAULIC SYSTEM

REPLACED ITEMS:

CYLINDER

NEW:

PRESS SWITCHS
ACCUMULATOR
JOCKEY PUMP



MSIV ACTUATOR

- PROPOSED MODIFICATION
  - SAFETY FUNCTION
  - MECHANICAL SAFETY OPERATION IS ESSENTIALLY UNCHANGED
    - RELEASE OF STORED ENERGY IN SPRINGS
    - HYDRAULICS CONTROL VALVE CLOSURE TIME

MSIV ACTUATOR

- PROPOSED MODIFICATION

SEISMIC/DYNAMIC QUALIFICATION

- DETERMINE EFFECTS OF MODIFICATION ON ACTUATOR ASSEMBLY DYNAMIC RESPONSE - COMPLETE
  - WEIGHT CHANGES ARE INSIGNIFICANT
  - STIFFENESS CHANGES ARE INSIGNIFICANT
  - REQUIRED RESPONSE SPECTRA AT THE ACTUATOR ASSEMBLY BASE REMAIN UNCHANGED
  - DYNAMIC TEST RESULTS FOR THE ACTUATOR ASSEMBLY ARE UNAFFECTED AND VALID (EXCEPT FOR SOME COMPONENTS DISCUSSED BELOW)
- DETERMINE QUALIFICATION ADEQUACY OF THE SOVS
  - DETERMINE SEISMIC/DYNAMIC REQUIREMENTS AT THE SOV LOCATION - UTILIZING TEST RESPONSE SPECTRA AND MODAL ANALYSIS
  - ESTABLISH QUALIFICATION OF SOVS BY SIMILARITY TO EXISTING TEST DATA
- QUALIFICATION OF ADDITIONAL PANEL AND RELAYS
  - DETERMINE SEISMIC/DYNAMIC REQUIREMENTS
  - QUALIFICATION OF RELAYS UTILIZING EXISTING TEST DATA
  - QUALIFICATION OF PANEL BY ANALYSIS

MSIV ACTUATOR

TESTING RESULTS

- LEAKAGE
  - SOV
    - UNDETECTABLE
  - HYDRAULIC CYLINDER
    - 2 CU. IN./MIN.
  - OTHER
    - VERY LOW
- CYCLE TIMES
  - DESIGN — 30 MINUTES
  - ACTUAL — 20 MINUTES TO 3 HOURS
  - PRESSURE BAND — 1400 PSI - 1250 PSI
- RESPONSE TIMES
  - WITHIN 5 SEC. VALVE CLOSURE REQUIREMENT
  - TRIPPING EITHER VALVE INDEPENDENTLY

SCHEDULE

Additional Equipment	9/25
New Hydraulic Cylinder	10/10
New Disks/Seats	10/15
Install Equipment	10/15 - 10/21
Seismic Qualification	10/21
Testing	10/21 - 11/3
MSIVs Complete	11/5

CONCLUSION

MODIFIED HYDRAULIC SYSTEM

- Minimal Changes
- No Additional QA CAT, I Equipment
- Same Safety Operation
- Successful Demonstration Testing

CONCLUSION

- LEAKAGE TESTING WITH VALVE CYCLING GIVES CONFIDENCE OF VALVE OPERABILITY THROUGH FIRST REFUELING OUTAGE

- PREOPERATIONAL AND SHOP TESTING PROGRAM WILL CONFIRM ACTUATOR OPERABILITY BEFORE HEAT UP

- LEAKAGE TESTING TESTING CONDUCTED SHOWS BETWEEN SEAT TEST IS CONSERVATIVE

- TESTING PROGRAMS

  -PROVIDE COMPLETE UNDERSTANDING OF ROOT CAUSE

  -DETERMINE NEED AND TYPE OF LONG TERM MODIFICATIONS, IF ANY

  -DEVELOP MECHANICAL ACTUATOR LATCH