FENOC

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L-06-089

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: **Beaver Valley Power Station, Unit No. 1**
BVPS-1 Docket No. 50-334, License No. DPR-66
Proposed Alternative to American Society of Mechanical Engineers Code Pump Test Requirements
(Request No. PRR-11)

Pursuant to 10 CFR 50.55a(a)(3)(ii), FirstEnergy Nuclear Operating Company (FENOC) hereby requests NRC approval to use alternative test requirements for the recirculation spray pumps. The pump tests are to be performed during the fourth ten-year inservice test interval (to begin September 20, 2007) for Beaver Valley Power Station (BVPS) Unit No. 1. The details of the 10 CFR 50.55a request are enclosed.

FENOC requests approval of the alternative as soon as practicable, to allow for development of necessary modifications (during the BVPS Unit No. 1 maintenance and refueling outage scheduled for September 2007) if the alternative is not approved.

There are no regulatory commitments contained in this letter. If there are any questions concerning this matter, please contact Mr. Gregory A. Dunn, Manager FENOC Fleet Licensing at (330) 315-7243.

Sincerely,

James H. Lash

A047

Enclosure: 10 CFR 50.55a Request No. PRR-11 - Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(ii)

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. P. C. Cataldo, NRC Senior Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

Enclosure to Letter L-06-089

10 CFR 50.55a Request No. PRR-11, Revision 0

Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(ii)

--Hardship or Unusual Difficulty
without a Compensating Increase in Level of Quality or Safety--

1.0 ASME CODE COMPONENTS AFFECTED

1RS-P-1A and 1RS-P-1B; Inside Recirculation Spray Pumps, Code Class 2

1RS-P-2A and 1RS-P-2B; Outside Recirculation Spray Pumps, Code Class 2

2.0 APPLICABLE CODE EDITION AND ADDENDA

ASME Code for Operations and Maintenance of Nuclear Power Plants (ASME OM Code) 2004, No Addenda

3.0 APPLICABLE CODE REQUIREMENTS

ISTB-3100, "Preservice Testing," Paragraph ISTB-3100(b) requires preservice testing of vertical line shaft pumps to be performed in accordance with ISTB-5210, "Preservice Testing." Paragraph ISTB-5210(a) states that in systems where resistance can be varied, flow rate and differential pressure shall be measured at a minimum of five points. If practicable, these points shall be from the pump's minimum flow rate to at least the pump's design flow rate. A pump curve shall be established based on the measured points. At least one point shall be designated as the reference point.

ISTB-3300, "Reference Values," Paragraph ISTB-3300(e)(1) requires reference values to be established within ±20 percent of the pump design flow rate for the comprehensive test.

ISTB-3430, "Pumps Lacking Required Fluid Inventory" requires Group B pumps lacking required fluid inventory (for example, pumps in dry sumps) to receive a comprehensive test at least once every two years except as provided in ISTB-3420, "Pumps in Systems Out of Service." The required fluid inventory shall be provided during this test. A Group B test is not required.

4.0 BACKGROUND INFORMATION

<u>SYSTEM FUNCTION</u>

The recirculation spray system at the Beaver Valley Power Station Unit No. 1, is designed to recirculate water from the containment sump through coolers to spray containment after a Containment Isolation Phase B signal (CIB) and predetermined time delay. The time delay in starting the recirculation spray pumps allows the containment sump to fill, thereby ensuring adequate NPSH is available for the pumps and to avoid pump operating difficulties due to vortexing. The sump is filled with water from the quench spray system and water from ruptured lines or vessels in the reactor coolant system. Recirculation spray system operation is required during post accident conditions for heat removal to reduce containment pressure to less than 50 percent of the peak calculated pressure for the LOCA within 24 hours after the postulated accident. During the recirculation phase of safety injection, the outside recirculation spray pumps may be manually aligned to provide containment sump water to the high head safety injection pumps. The water is injected into the reactor coolant system for core cooling. The outside recirculation spray pumps are used in this application only when the low head safety injection pumps are unavailable.

COMPONENT DESCRIPTION

The four recirculation spray pumps receive their suction supply from the containment sump. Two pumps are located inside containment and two pumps are located outside containment. The water from the sump is recirculated through recirculation spray coolers where it is cooled by the river water system. The cooled water is then used to spray the containment via four recirculation spray headers and the cycle repeats itself for an extended period after the design basis accident.

The piping configuration for the inside recirculation spray pumps (1RS-P-1A and 1B) consists of the pumps receiving suction directly from the containment sump and discharging via ten-inch lines to the recirculation spray coolers. From the coolers, the water flows to the containment spray headers via 12-inch lines. The pump discharge piping is provided with a four-inch recirculation test line which returns flow to the containment sump and is utilized only during pump testing. Locked shut manual isolation valves normally isolate the non-Code four-inch recirculation test line. A spectacle flange is provided in the pump discharge piping to isolate flow to the spray headers during pump testing.

The piping configuration for the outside recirculation spray pumps (1RS-P-2A and 2B) is similar to that of the inside recirculation spray pumps. However, the outside recirculation spray pumps receive their suction from a pump pit, which is provided inventory from 12-inch cross connect lines from the containment sump. The pumps' suction is located below the level of the containment sump. The cross-connect/suction and discharge lines are provided with normally open motor operated valves, which receive an automatic signal to open upon generation of a CIB. In addition, a spectacle flange is provided in the pump discharge piping, which is used to isolate flow to the spray headers during pump testing. The pumps' discharge piping is provided with a six-inch branch connection to the high head safety injection pump suction. To facilitate pump testing, provisions exist for recirculation from the outside recirculation spray pumps discharge to the pump casing. A local flow indicator (FI-1RS-157A, B) is provided in the four-inch recirculation line. When testing the pumps with water the associated spectacle flange must be rotated, the suction and discharge isolation valves closed, and the pump filled with an external supply of primary grade water.

5.0 REASON FOR REQUEST

Due to the restrictions associated with the existing piping configuration, ±20 percent of the design flow rate cannot be achieved through the four-inch recirculation test line for either set of pumps. Refer to Attachment 1 for a simple diagram of the inside and outside recirculation spray pump test circuits.

Prior to initial startup, the inside and outside recirculation spray pumps for Unit No. 1 were subject to long term full flow testing. This testing was performed in 1972 as follows:

a. With the nozzle openings blocked off (195 per header), temporary connections were made between the nozzle headers and containment sumps.

b. Sufficient water was then added to the containment sump so that a recirculation spray pump could recirculate water up through its respective cooler and header.

c. The full flow test through the shell side of the cooler initially ensured that the required recirculation spray for containment depressurization was achieved.

d. Upon completion of the above system test, the water was drained from each recirculation cooler, the pumps, the headers and the sumps. The temporary connections between the header and sumps were removed and the nozzles installed.

Since the system was left in a dry, ready condition after the initial full flow tests, no further testing with water flow through the shell side of the recirculation spray heat exchangers is deemed necessary to ensure system capability. Further, the spray nozzles are inaccessible without a significant amount of scaffolding. Even if accessibility was not a concern, the plugging of 780 spray nozzles, the installation of temporary piping, the performance of the full flow test and the return of the system to its operable configuration present substantial challenges. The effort would present challenges in terms of complexity of the temporary modifications, labor intensive nature of the modifications, the controls and post modification testing to ensure that the system is returned to the original configuration.

Re-establishing this full flow test circuit for the purpose of periodic design flow rate testing would require a similar modification every two years. The expensive and time consuming temporary changes described above would be necessary to duplicate the initial full flow tests, and would cause a hardship without a compensating increase in the level of quality and safety. Likewise, replacement of the four-inch recirculation test line with a line of sufficient size to accommodate design flow rate testing would cause a hardship without a compensating increase in the level of quality and safety.

6.0 PROPOSED ALTERNATIVE AND BASIS FOR USE

PROPOSED ALTERNATIVE

As an alternative to measuring at least five points for the preservice test over a range from pump minimum flow rate to at least pump design flow rate as required by ISTB-3100(b) and ISTB-5210(a), the five points will be obtained within approximately 41 percent of the design flow rate and within approximately 38 to 40 percent of the maximum required accident flow rates. Should a baseline curve be required, the manufacturers curve would be used in conjunction with the pump minimum operating point curves and the points obtained would be reconciled to the manufacturers curve to provide assurance of acceptable pump operation.

The proposed alternative to ISTB-3100(b) and ISTB-5210(a) provides an acceptable level of quality and safety.

As an alternative to testing within 20 percent of the design flow rate during the comprehensive test, as required by ISTB-3300(e)(1) and ISTB-3430, the reference values will be established within approximately 41 percent of the design flow rate (3500 gpm) and within approximately 38 to 40 percent of the maximum required accident flow rates.

The proposed alternative to the requirements specified in ISTB-3300(e)(1) and ISTB-3430 provides an acceptable level of quality and safety and would provide reasonable assurance that the pump would be able to perform its function as well as providing sufficient indication of any potential degradation occurring to the pumps.

Testing will be conducted as follows:

The test circuits identified in Attachment 1 will be used to satisfy preservice testing requirements.

The inside recirculation spray pumps shall have a dike constructed in the containment sump encompassing the pump suction and four-inch recirculation test line return. Sufficient inventory will be provided to establish stable flow conditions through the four-inch recirculation test line. Temporary test instrumentation, of required accuracy, shall be installed as required, in the pump test circuit.

The outside recirculation spray pumps shall be tested by establishing the hydraulic test circuit in a solid condition. Flow shall be recirculated through the pump casing while measuring flow with flow indication provided in the four-inch recirculation test line. Temporary pressure instrumentation shall be utilized at the pumps' suction.

Pump vibration will be measured and recorded in accordance with the criteria specified in the Code. In addition, vibration spectral analysis will also be performed which is a more accurate method of detecting mechanical degradation or changes than that of the traditional inservice test vibration requirements.

BASIS FOR USE

The inside and outside recirculation spray pumps have a design flow rate of 3500 gpm with varying maximum required accident flow rates. The table below shows the maximum required accident flow rates for each pump and the range of values within which test flows are established.

The minimum test flow rate for recirculation spray pump 1R-P-1A is 38 percent less than the maximum required accident flow rate of 3320 gpm. This percentage of the maximum required accident flow rate is specified for recirculation spray pump 1R-P-1A and the other recirculation spray pumps in the table below.

Pump ID	Accident Flow	Test Flow	Percent of Accident Flow
1RS-P-1A	3320 gpm	2050-2075 gpm	-38 %
1RS-P-1B	3370 gpm	2050-2075 gpm	-39 %
1RS-P-2A	3385 gpm	2040-2060 gpm	-40 %
1RS-P-2B	3340 gpm	2040-2060 gpm	-39 %

Presently the inservice test reference flow rates are typically established with the existing test circuit in the range of 2040 to 2075 gpm. The low reference flow rates result from restrictions due to the small four-inch recirculation line and the limited volume of water in the test circuit.

With the restrictions described, the highest flow rate that can be measured while maintaining stable test conditions is within approximately 41 percent of the 3500 gpm design flow rate and within approximately 38 to 40 percent of the maximum required accident flow rates.

In the 2040 to 2075 gpm range of the head curve for these pumps, the curve is not flat but well sloped. Refer to Attachment 2. Therefore, as performance degrades due to internal recirculation caused by increasing internal pump clearances, the differential pressure will measurably decrease for a given reference flow rate.

To be within 20 percent of pump design flow rate on the low end requires a minimum reference flow rate of 2800 gpm. To be within 20 percent of the maximum required accident flow rate on the low end would require minimum reference flow rates ranging from 2656 to 2708 gpm, depending on the pump being tested. For the reasons previously stated, reference flow rates are procedurally controlled within a range of 2040 to 2075 gpm, which is not within the 20 percent of the design flow rate required during the comprehensive test.

Testing at near design flow rate conditions is important for pumps with characteristic head-flow curves that are flat or gently sloping in the low flow region (little change in developed head with increasing flow rate). In the low flow region, increasing internal flow rates, as a result of internal wear, are difficult to detect. Pumps with the flat portion of the curve at low flow rates should be tested at or near design conditions to determine if increasing internal recirculation flow rates have degraded pump performance to the point where design performance cannot be met. This situation does not apply to the inside and outside recirculation spray pumps if they are tested within approximately 41 percent of the design flow rate when considering the slope of the curve. Testing at the proposed reference flow rates will detect degradation since the pump head-curve is well sloped at the point of testing.

OTHER CONSIDERATIONS

In addition to the aforementioned tests, the inside and outside recirculation spray pumps are included in the Beaver Valley Predictive Maintenance (PdM) Program. All pumps have spectral vibration data obtained each refueling outage. The outside recirculation spray pumps are subject to periodic oil sample analysis. The bearings associated with the inside recirculation spray pumps are grease lubricated. These activities are beyond that required by ISTB and further provide assurance as to the ability to detect pump degradation. Also, as a preventive maintenance activity, the pumps' mechanical seals are replaced every seventh refueling outage.

If measured parameters are outside the normal operating range or are determined by analysis to be trending towards a degraded state, appropriate actions are taken. These actions may include monitoring of additional parameters, review of component specific information to identify cause and removal of the pump from service to perform corrective maintenance.

Historically, the pumps have demonstrated excellent performance during surveillance testing. The only corrective maintenance recorded for the pumps was associated with inside recirculation spray pump 1RS-P-1A. As a result of a failed surveillance test on March 23, 2000, during the thirteenth maintenance and refueling outage, the pump was disassembled for inspection and overhaul. A piece of lumber was found lodged in the pump impeller. The resulting Condition Report determined that the wood had been left in the pump suction since initial startup and became unlodged during the surveillance test. A post-maintenance test was performed and acceptable results were obtained on March 31, 2000. Additional corrective maintenance for 1RS-P-1A includes the repair of pump seal leakage detected during surveillance testing performed in 1993.

CONCLUSION

Compliance with the specific ISTB Code requirements identified in this relief request would require hardware changes and cause a hardship without a compensating increase in the level of quality and safety as previously described. It is requested that the NRC evaluate this determination pursuant to 10 CFR 50.55a(f)(6)(i) and grant relief from the identified ISTB Code requirements.

7.0 DURATION OF THE PROPOSED ALTERNATIVE

The proposed alternatives identified in this relief request shall be utilized during the fourth 10-year inservice test interval at BVPS Unit No. 1.

8.0 PRECEDENT

The precedents cited below are cases where other plants have submitted relief requests that were granted. The FirstEnergy Nuclear Operating Company relief request is similar to these precedents, and the precedents support the position that the proposed alternative is acceptable.

1. Virginia Electric and Power Company, Docket Nos. 50-338 and 50-339. SER date January 28, 2002. North Anna Power Station, Units 1 and 2. Re: Inservice Testing for Pumps and Valves, Third Ten Year Interval Update (TAC Nos. MB2221 and MB2222)

2. Seabrook Station, Unit No. 1, Docket No. 50-443, – Relief from ASME Code Operations and Maintenance Code ISTB 4.3(e)(1) Ten-Year Interval Inservice Test for Containment Spray Pumps CBS-P9A and CBS-P9B (TAC No. MB6676)

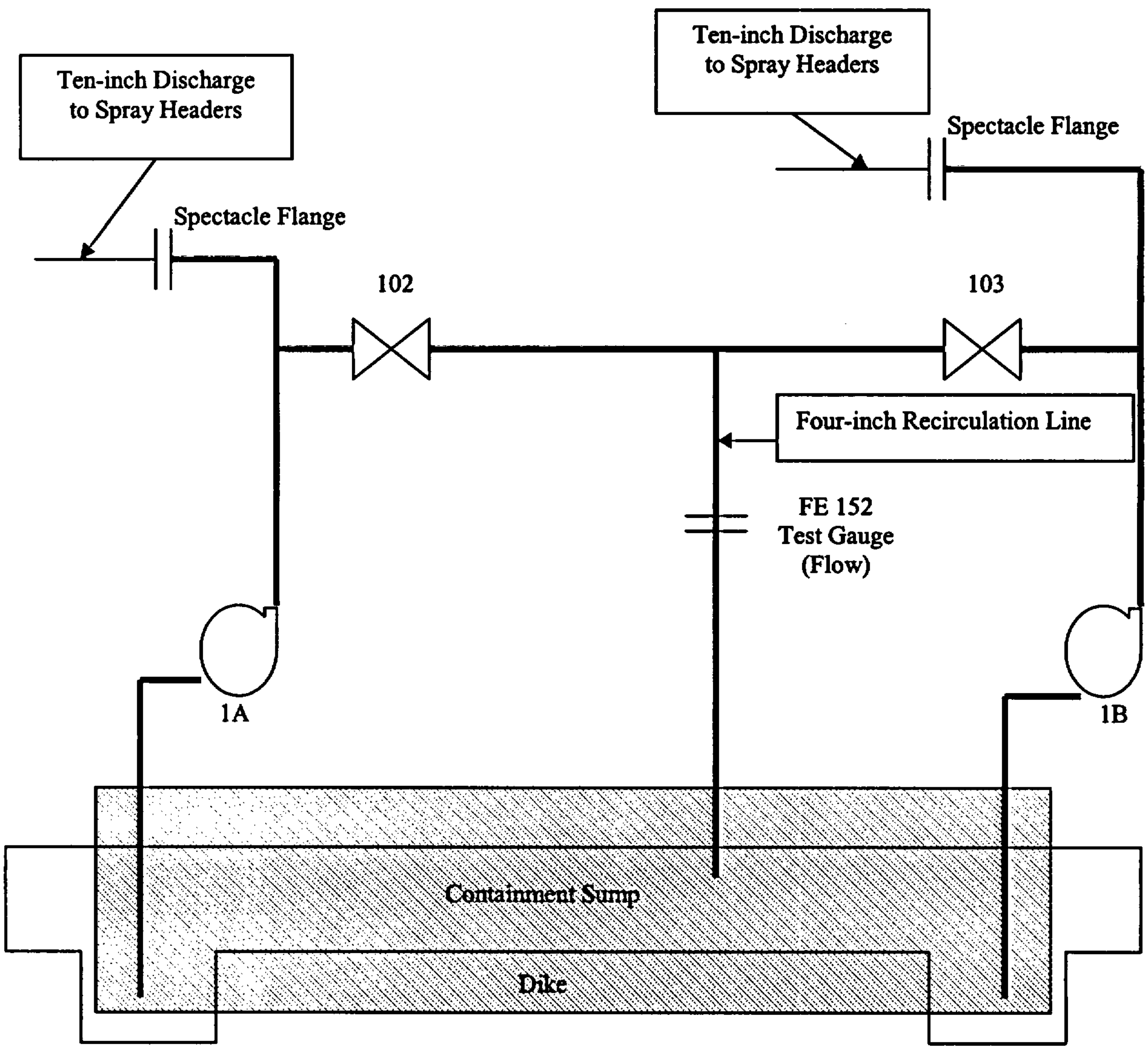
9.0 REFERENCE

NUREG-1482, Revision 1, Section 5.10, "Alternative to ASME OM Code Comprehensive Pump Testing Requirements."

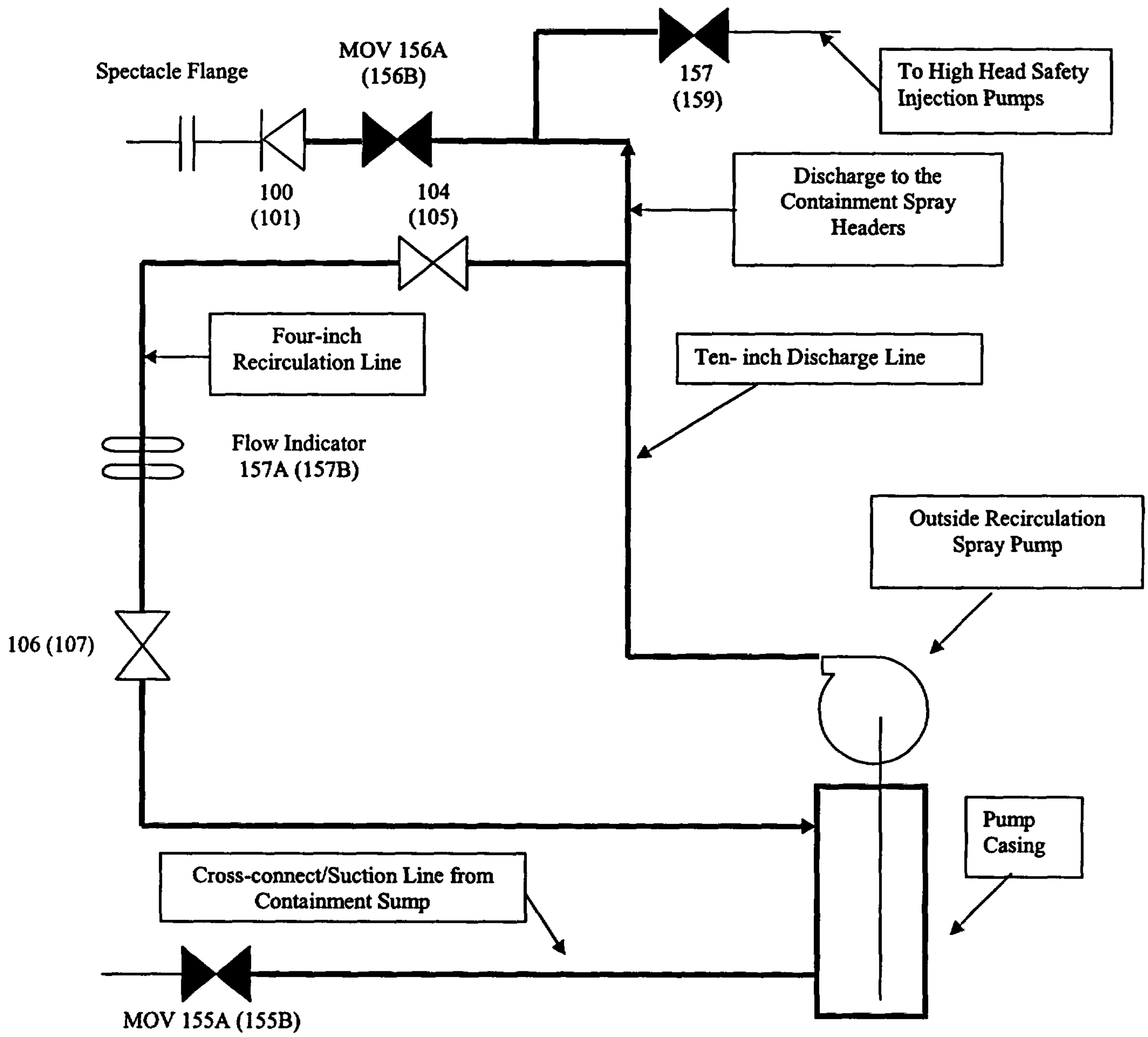
ATTACHMENT 1

INSIDE / OUTSIDE RECIRCULATION SPRAY PUMP TEST CIRCUITS

Inside Recirculation Spray Pump [1RS-P-1A, 1B] Test Circuit



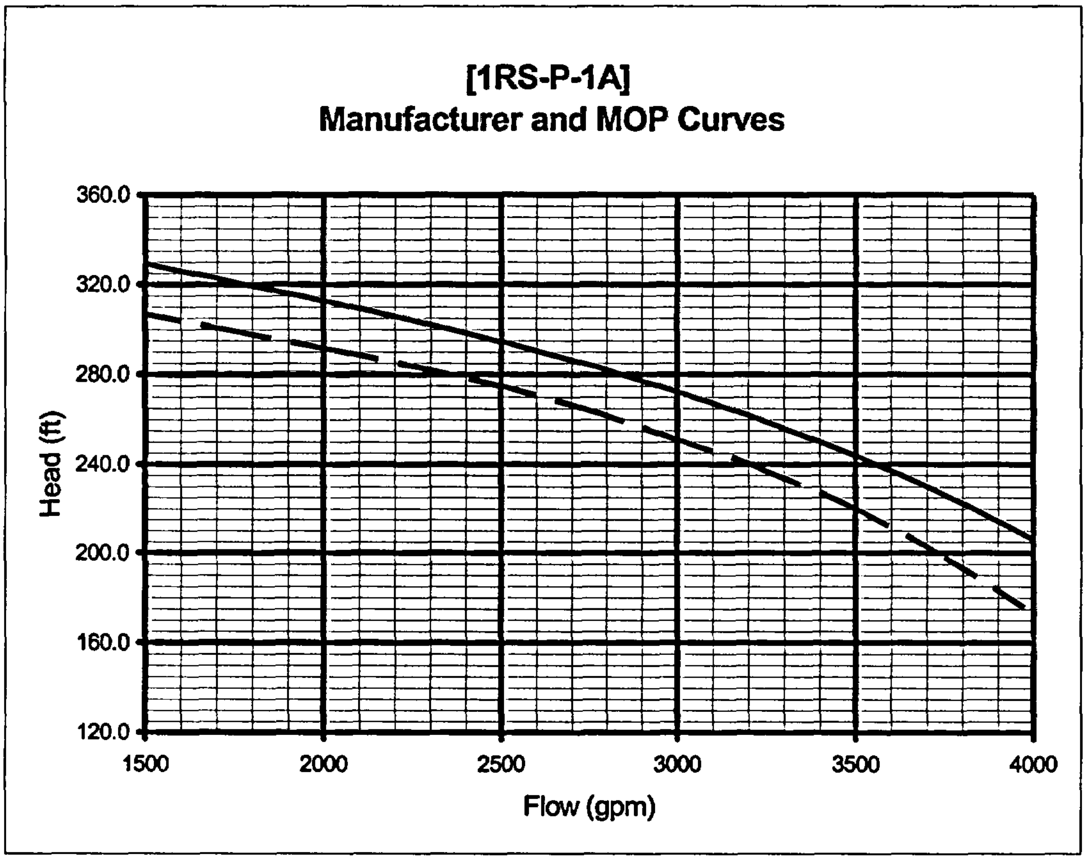
Outside Recirculation Spray Pump [1RS-P-2A, 2B] Test Circuit



ATTACHMENT 2

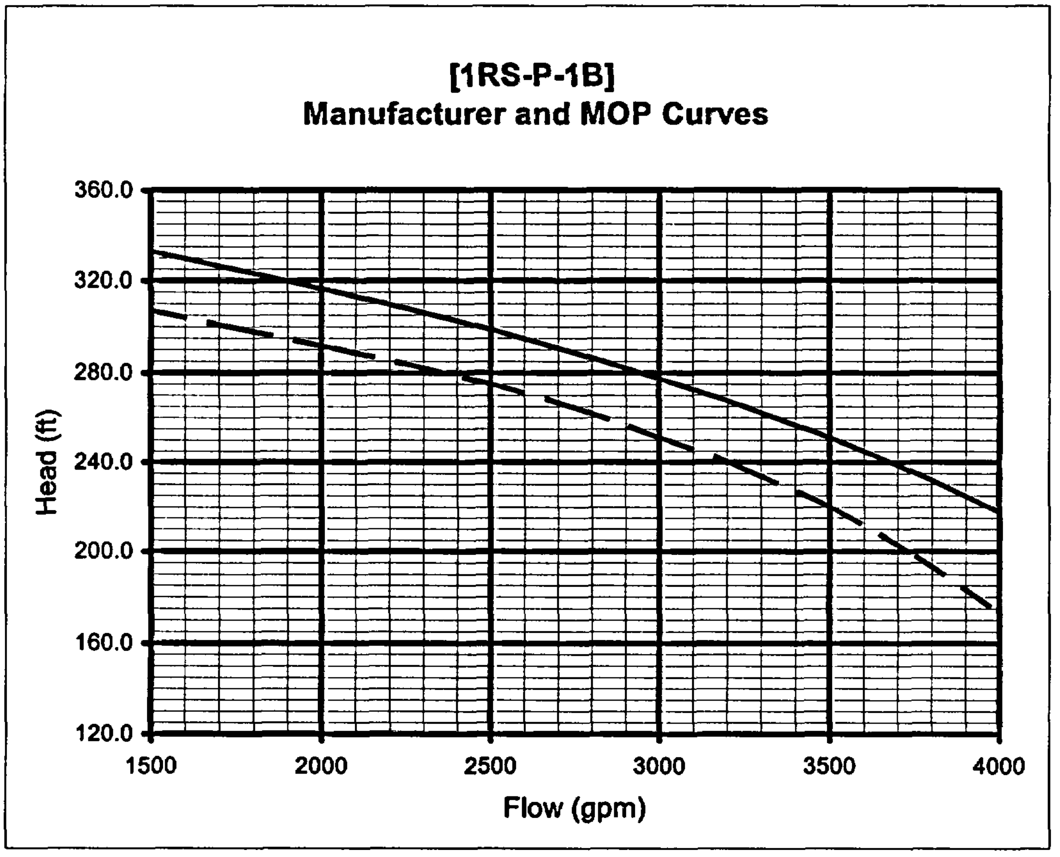
MANUFACTURER'S AND PUMP MINIMUM OPERATING POINT (MOP) CURVES

Pump Name: 1A Inside Recirculation Spray Pump Pump Number: [1RS-P-1A]



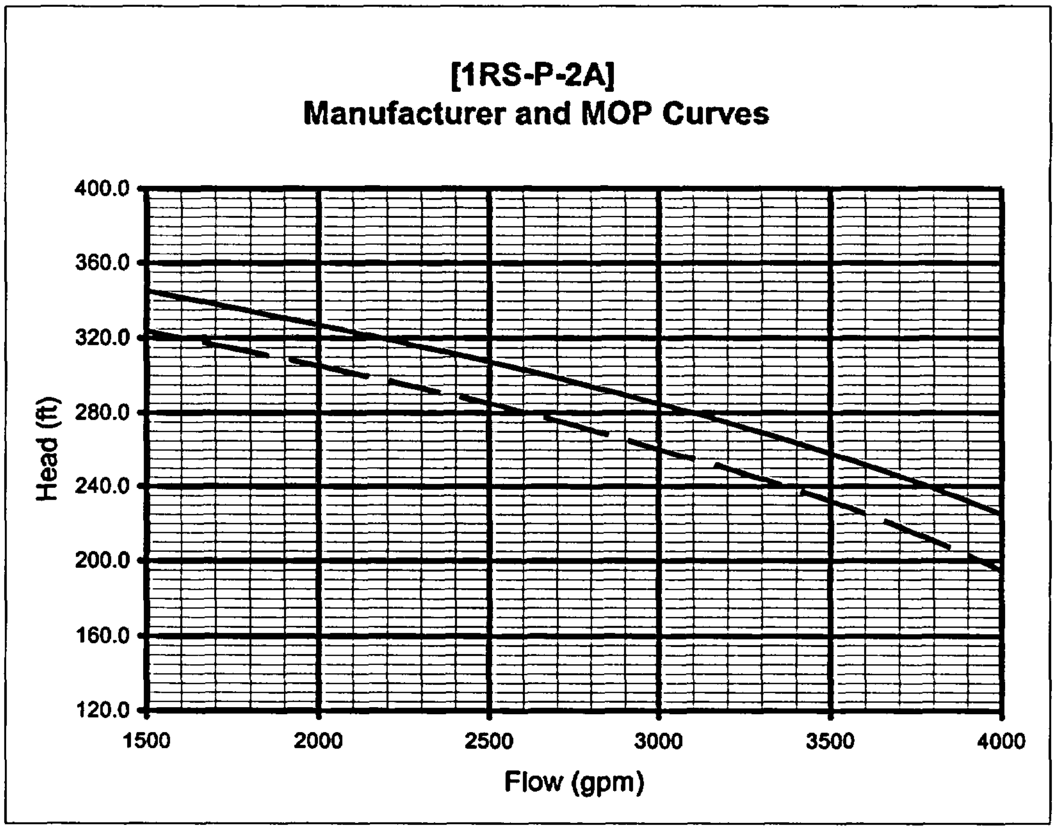
Flow	Manufacturer's Curve Head	MOP Curve Head
1500	329.2	306.9
1750	321.0	299.3
2000	312.7	291.7
2050	311.0	290.2
2250	304.0	283.7
2500	294.6	275.0
2750	284.2	264.2
3000	272.4	251.0
3180	263.0	241.4
3250	259.1	237.0
3500	243.8	220.0
3750	226.3	198.2
4000	206.2	173.0

Pump Name: 1B Inside Recirculation Spray Pump   Pump Number: [1RS-P-1B]



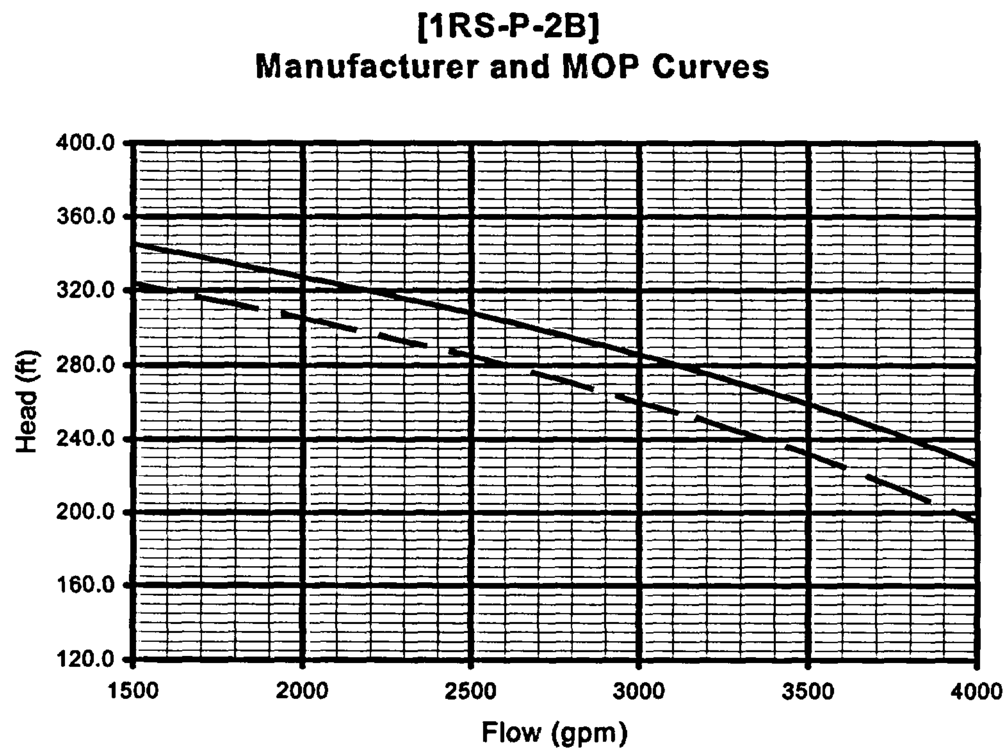
Flow	Manufacturer's Curve Head	MOP Curve Head
1500	332.8	306.9
1750	324.8	299.3
2000	316.6	291.7
2050	314.9	290.2
2250	308.0	283.7
2500	298.7	275.0
2750	288.6	264.2
3000	277.5	251.0
3180	268.6	241.4
3250	265.0	237.0
3500	251.0	220.0
3750	235.3	198.2
4000	217.7	173.0

Pump Name: 2A Outside Recirculation Spray Pump Pump Number: [1RS-P-2A]



Flow	Manufacturer's Curve Head	MOP Curve Head
1500	345.1	323.7
1750	336.2	314.6
2000	327.0	305.2
2040	325.5	303.6
2050	325.2	303.2
2250	317.5	295.3
2500	307.4	285.0
2750	296.6	273.3
3000	284.9	260.0
3165	276.6	251.7
3250	272.1	246.8
3500	258.0	232.0
3750	242.4	214.3
4000	225.1	195.0

Pump Name: 2B Outside Recirculation Spray Pump, Pump Number: [1RS-P-2B]



Flow	Manufacturer's Curve Head	MOP Curve Head
1500	345.1	323.7
1750	336.2	314.6
2000	327.2	305.2
2040	325.7	303.6
2050	325.4	303.2
2250	317.9	295.3
2500	308.0	285.0
2750	297.4	273.3
3000	285.8	260.0
3165	277.6	251.7
3250	273.1	246.8
3500	259.1	232.0
3750	243.5	214.3
4000	226.1	195.0