WOLF CREEK
NUCLEAR OPERATING CORPORATION

Bart D. Withers
President and
Chief Executive Officer

September 29, 1988

WM 88-0244

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Reference: Letter dated July 8, 1988, from B. D. Withers, WCNOC, to Document Control Desk, NRC
Subject: Docket No. 50-482: Updated Response to NRC Bulletin 88-04

Gentlemen:

The purpose of this letter is to provide an updated response to NRC Bulletin 88-05 "Potential Safety Related Pump Loss". The Reference letter transmitted results of the study performed at Wolf Creek Generating Station (WCGS) for safety-related pumps except for the pumps supplied by Ingersoll-Rand. The attachments to this letter provide the total pump study in which the only change from the study transmitted by the Reference is the addition of information on the Ingersoll-Rand Pumps.

If you have any questions concerning this matter, please contact me or Mr. O. L. Maynard of my staff.

Very truly yours,

B D Withers

Bart D. Withers
President and
Chief Executive Officer

BDW/jad

Attachments

cc: B. L. Bartlett (NRC), w/a
D. D. Chamberlain (NRC), w/a
R. D. Martin (NRC), w/a
P. W. O'Connor (NRC), w/a (2)

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STATE OF KANSAS)
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COUNTY OF COFFEY)

Bart D. Withers, of lawful age, being first duly sworn upon oath says that he is President and Chief Executive Officer of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the content thereof; that he has executed that same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By _____
Bart D. Withers
President and Chief Executive Officer

SUBSCRIBED and sworn to before me this 29th day of Sept., 1988.

_____
Notary Public

Expiration Date 9/1/89

TERRA L. HARDLEY NOTARY PUBLIC STATE OF KANSAS

UPDATED RESPONSE TO NRC BULLETIN 88-04

POTENTIAL SAFETY-RELATED PUMP LOSS

I. Introduction

On May 5, 1988, the Nuclear Regulatory Commission (NRC) issued Bulletin 88-04, "Potential Safety-Related Pump Loss". The purpose of the bulletin was to request all holders of operating licenses or construction permits for nuclear power reactors to investigate and correct, as applicable, two mini-flow design concerns. The first concern involves a potential for the dead-heading of one or more pumps in safety-related systems that have a miniflow line common to two or more pumps or other piping configurations that do not preclude pump-to-pump interaction during mini-flow operation. The second concern is whether or not the installed miniflow capacity is adequate for even a single pump in operation.

This response is being submitted to comply with action item 4 of Bulletin 88-04 which requested that licensees provide a written response that:

a) summarizes the problems and the systems affected,

b) identifies the short-term and long-term modifications to plant operating procedures or hardware that have been or are being implemented to ensure safe plant operations,

c) identifies an appropriate schedule for long-term resolution of this and/or other significant problems that are identified as a result of this bulletin, and

d) provides justification for continued operation.

II. Summary of Pump Evaluation

a) Summarize the problems and the systems affected.

An engineering study of safety systems showed that no safety related pumps at Wolf Creek Generating Station (WCGS) have the potential for being dead-headed by running in parallel on miniflow with a stronger pump. Details of that study are given in Attachment II.

An engineering study was initiated to determine the problems and systems affected by low flow hydraulic instabilities. All pump manufacturers and the Nuclear Steam Supply System (NSSS) Vendor were contacted to provide information in regards to this concern. The responses indicate that no design changes are required and no pump performance degradation is anticipated due to low flow hydraulic instabilities if vendor operating recommendations are applied. The results of this study are given in Attachment II.

b) Identify the short-term and long-term modifications to plant operating procedures or hardware that have been or are being implemented to ensure safe plant operations.

Generally, three items have been preliminarily identified for action. The affected Vendor Technical Manuals will be revised to reflect the new information. Applicable operations procedures will be revised to reflect any new information. Training will incorporate the subject of low flow hydraulic instability in the licensed operator training program. No hardware changes are anticipated.

Certain plant conditions warrant allowing a safety related pump to operate at a flow below that recommended for continuous operation. Off Normal and Emergency procedures address upset plant conditions which, in general, are higher priority concerns than pump hydraulic instability. These procedures will not be revised to include precautions concerning low flow operations. A precaution may lead to confusion on the part of the operator, which could negatively affect plant safety. Other plant conditions which may require running pumps at a flow below that recommended for continuous operation are half pipe operation in shutdown cooling and draining the refueling pool during a refueling outage. For similar reasons as above, precautions will not be placed in procedures which address this type of plant condition.

More specific recommendations for action are included in Attachment II. As further information becomes available, it will be reviewed for applicable action items.

c) Identify an appropriate schedule for long-term resolution of this and/or other significant problems that are identified as a result of this bulletin.

Precautions have already been placed in some Emergency Core Cooling System operating procedures. It is anticipated that the long term training, technical manual and operating procedure changes will be completed by April 1, 1989.

d) Provide justification for continued operation particularly with regard to General Design Criterion 35 of Appendix A to Title 10 of the Code of Federal Regulations (10CFR50), "Emergency Core Cooling" and 10CFR50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors."

Wolf Creek Nuclear Operating Corporation (WCNOC) has developed a pump and valve operability program as required by 10CFR50.55a(g). The program meets the requirements of ASME Boiler and Pressure Vessel Code, Section XI and applicable Addenda. It is required operationally by Paragraph 4.0.5 of the WCGS Technical Specifications. A copy of the WCGS pump and valve operability test program summary is given in Attachment III. This program has been set up to detect any degradation in pump performance before the pump is incapable of performing its safety function.

Based on discussions with pump manufacturers, internal recirculation caused by low flow does not result in catastrophic pump failure, but rather in long-term degradation. The WCNOC pump and valve testing program provides sufficient assurance that safety-related pumps can perform their safety functions and that Wolf Creek's safety-related

systems are ready to operate as designed. Any single failure would not prohibit the safety function from being accomplished.

III. Conclusion

In conclusion, WCNOC studies show that no safety-related pumps at WCGS have the potential for being dead-headed by running in parallel on mini-flow with a stronger pump. Information concerning low flow hydraulic instability indicates that some changes to technical manuals, operating procedures and operator training on the subject are necessary. Continued operation of WCGS is justified by the ASME Boiler and Pressure Vessel Code Section XI pump and valve operability program currently in place at WCGS, which will detect any degradation of pump performance, regardless of cause.

ATTACHMENT II

INDIVIDUAL PUMP LOW FLOW STUDY

1. Essential Service Water (ESW)(2 pumps)

Manufacturer: Byron Jackson

Concern Number 1: Dead-Heading on Minimum Flow Operation

The ESW pumps have no minimum flow lines installed. Whenever they are run, they flow through the main cooling header. All automatic initiations of the pumps also line up the system such that the pumps always flow through the main system. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

Communication with the pump manufacturer verified that the original required minimum flow of 8100 gpm, as specified in Vendor Manual M-089-K029, is sufficient for continuous operation. Steps 4.1.6 and 4.2.6 of Procedure SYS-EF-200 call for verification of flow greater than 8,100 gpm when starting a pump. Step 5.1.10 of STS-EF-100 A & B requires a flow greater than 13,300 gpm for the surveillance test.

Actions To Be Taken

None

2. Fuel Pool Cooling Pumps (2 pumps)

Manufacturer: Gould Pumps, Inc.

Concern Number 1: Dead-heading on Minimum Flow Operation

The Fuel Pool Cooling Pumps have no minimum flow lines installed. Whenever they are run, they flow through the main cooling header. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has identified a flow of 1500 gpm as the lowest flow allowed for continuous operation. This is 500 gpm more than presently identified in Vendor Manual M-084-052. Procedure SYS-EC-120 addresses only high flow and does not address low flow. Step 5.1.3.1 of procedure STS-EC-100 A & B requires a flow of greater than 750,000 lbm/hr (1560 gpm) upon pump start.

Actions To Be Taken

a. Add a step or a precaution in procedure SYS-EC-120 to maintain flow for each pump greater than 1500 gpm (722,000 lbm/hr)

b. Change Vendor Manual M-084-052 to reflect the new minimum flow requirement.

c. Change control room flow indicator banding via T.P.S.D. (Total Plant Setpoint Document).

d. Change low flow alarm via T.P.S.D.

3. Component Cooling Water Pumps (4 pumps)

Manufacturer: Gould Pumps, Inc.

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Component Cooling Water Pumps have no minimum flow lines installed. Whenever they are run, they flow through the main cooling header. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has identified a flow of 3000 gpm as the lowest flow allowed for continuous operation. This is 250 gpm more than presently identified in Vendor Manual M-082-039. Steps 5.1.4 and 5.2.4 of surveillance procedures STS-EG-100 A & B require a flow of greater than 2.8 x 106 lbm/hr (5800 gpm) for pump operation. No mention of proper minimum pump flow is made in procedure SYS-EG-120.

Actions To Be Taken

a. Add a step or a precaution to procedure SYS-EG-120 to verify a flow of greater than 3000 gpm (1.5 x 106 lbm/hr) for each running pump.

b. Change Vendor Manual M-082-039 to reflect the new minimum flow requirement.

c. Change low flow alarm via T.S.P.D.

4. Motor Driven Auxiliary Feedwater Pumps (2 pumps)

Manufacturer: Ingersoll-Rand

Concern Number 1: Dead-Heading on Minimum Flow Operation

The motor driven auxiliary feedwater pumps share a common return header for their minimum flow with the turbine driven auxiliary feed pump. A pressure breakdown orifice is installed on the individual pump mini-flow lines before they join the common header. Per drawing M01AL01, the orifices break pressure down from about 1500 psia to less than 150 psia and are designed for operation with all three auxiliary feed pumps on minimum flow. Westinghouse has stated that placement of an orifice in the individual miniflow lines desensitizes the system to the strong/weak pump interaction. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has determined that the Motor Driven Auxiliary Feedwater Pump may be operated up to one hour per month at a minimum flow of 75 gpm with no short term damage. This minimum flow rate corresponds to the presently installed minimum flow capacity.

Actions To Be Taken

a. Add precautions in Procedures STS-AL-101 and 102 to limit any single run of the motor driven auxiliary feedwater pump to one hour minimum flow.

b. Revise the Vendor Manual to indicate the time limit on minimum flow operation.

5. Turbine Driven Auxiliary Feedwater Pump (1 pump)

Manufacturer: Ingersoll-Rand

Concern Number 1: Dead-Heading on Minimum Flow Operation

The turbine driven auxiliary feedwater pump shares a common return header for its minimum flow with the motor driven auxiliary feedwater pumps. A pressure breakdown orifice is installed on the miniflow line before it joins the common header. Per drawing M01AL01, the orifice breaks pressure down from about 1500 psia to less than 50 psia and is designed for operation with all three auxiliary feedwater pumps on minimum flow. Westinghouse has stated that placement of an orifice in the individual miniflow lines desensitizes the system to the strong/weak pump interaction. Thus, this concern is not a problem at WCGS for this pump.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has determined that the Turbine Driven Auxiliary Feedwater Pump may be operated up to one hour per month at a minimum flow of 120 gpm with no short term damage. This minimum flow rate corresponds to the presently installed minimum flow capacity.

Actions To Be Taken

a. Add a precaution in Procedures STS-AL-103 to limit any single run of the Turbine Driven Auxiliary Feedwater Pump to one hour on minimum flow.

b. Revise the Vendor Manual to indicate the time limit on minimum flow operation.

6. Containment Spray Pumps (2 pumps)

Pump Manufacturer: Ingersoll-Rand

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Containment Spray Pumps have no minimum flow lines installed. When they are run, they always flow to the RWST or through the main spray header. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has determined that the Containment Spray Pumps may be operated up to one hour per month at a minimum flow of 150 gpm. As stated under Concern No. 1, these pumps have no minimum flow lines. The flow orifice installed in the pump discharge line to the RWST is sized for 300 gpm. Results of the pump surveillance tests show that flow thru this line is normally slightly more than 300 gpm. In addition, the spray addition eductor is always valved in service, adding approximately 75 gpm to pump flow. Therefore, the containment spray pump is never operated at less that 375 gpm flow. Since 150 gpm is the minimum flow specified originally in the Vendor Technical Manual, no actions need to be taken. This concern is not a problem at WCGS for this pump.

Actions To Be Taken

None

7. Centrifugal Charging Pumps (2 pumps)

Manufacturer: Pacific Pumps

Concern Number 1: Dead-Heading on Minimum Flow Operation

The centrifugal charging pumps share a common return header for their minimum flow. Pressure breakdown orifices are installed in the individual pump miniflow lines before they join the common header. Per drawing M01BG03, the orifices break pressure down from greater than 2400 psia to less than 150 psia. Westinghouse has stated that placement of an orifice in the individual miniflow lines desensitizes the system to the strong/weak pump interaction. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has identified a flow of 130 gpm as the lowest flow allowed for continuous operation. This is 70 gpm more than presently identified in Vendor Manual M-721-093. The pump manufacturer has also indicated that the centrifugal charging pumps may be run on the present minimum flow of 60 gpm for a period of time not to exceed 30 minutes with no noticeable degradation of pump performance.

Surveillance Procedures STS-BG-100 A & B are run quarterly. During the performance of the tests the pumps are not run on minimum flow alone, but due to the ous valve line-ups required, pump flow could be throttled below th. 130 gpm required for continuous operation. This condition exists for only about 15 minutes and therefore meets the recommendations of the pump manufacturer.

Procedures SYS-BG-120 and SYS-BG-201 do not address running the centrifugal charging pumps at a flow less than 130 gpm. When the centrifugal charging pump is running in the charging mode, the minimum flow valves are always open, passing 60 gpm. The minimum flow valves only close upon an Safety Injection signal.

Actions To Be Taken

a. Place a precaution in STS-BG-100 A & B to keep the running time of the centrifugal charging pump less than 30 minutes when the flow is less than 130 gpm.

b. Place a precaution in SYS-BG-120 and SYS-BG-201 to keep charging flow above 70 gpm when a centrifugal charging pump is running.

c. Revise Vendor Manual M-721-093 to include the new minimum flow requirements.

d. Change low flow alarm via T.P.S.D.

e. Revise alarm response procedures ALR-58C and ALR-42A

8. Safety Injection Pumps (2 pumps)

Manufacturer: Pacific Pumps

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Safety Injection Pumps share a common return header for their minimum flow. Pressure breakdown orifices are installed in the individual pump miniflow lines. Per drawing M01EM01, the orifice breaks pressure down from greater than 1200 psia to less than 50 psia. Westinghouse has stated that placement of an orifice in the individual miniflow lines desensitizes the system to the strong/weak pump interaction. This concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has identified a flow of 175 gpm as the lowest flow allowed for continuous operation. This is 130 gpm more than presently identified in Vendor Manual M-721-096. The pump manufacturer has also indicated that the safety injection pump may be run on the present minimum flow of 45 gpm for a period of time not to exceed 30 minutes with no noticeable degradation of pump performance.

Surveillance procedures STS-EM-100 A & B are run quarterly. During this surveillance test the pumps are run on with a minimum flow of 45 gpm. This condition exists for only about 15 minutes and therefore meets the recommendations of the pump manufacturer.

Actions To Be Taken

a. Place a precaution or step in surveillance procedures STS-EM-100 A & B to limit the time on minimum flow to 30 minutes.

b. Revise Vendor Manual M-721-096 to include new minimum flow requirements.

9. Residual Heat Removal Pumps (2 pumps)

Manufacturer: Pacific Pumps

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Residual Heat Removal (RHR) pumps each have their own individual minimum flow lines which return to the pump suction and do not interface with each other. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has identified a flow of 1700 gpm as the lowest flow allowed for continuous operation. This is 1200 gpm more than presently identified in Vendor Manual M-721-099. The pump manufacturer has also indicated that the RHR pumps may be run on the present minimum flow of 500 gpm for a period of time not to exceed 2.25 hours with no noticeable degradation of pump performance.

Surveillance procedures STS-EJ-100 A & B are run quarterly. During this surveillance test the pumps are run with a minimum flow of 500 gpm. This condition exists for only about 15 minutes and therefore meets the recommendations of the pump manufacturer.

Procedures SYS-EJ-110, SYS-EJ-120, and SYS-EJ-321 call for the RHR pumps to be operated at different conditions. At times, pump flows could be less than 1700 gpm, such as during preparation for shutdown cooling operation.

Actions To Be Taken

a. Place a precaution or step in procedures STS-EJ-100 A & B, SYS-EJ110, SYS-EJ-120, and SYS-EJ-321 to limit the time operating on minimum flow to 2.25 hours.

b. Revise Vendor Manual M-721-099 to include new minimum flow requirements.

c. Place a precaution in Procedure FHP-02-001 that low flow cavitation concerns should not be the over-riding concern. An attempt should be made to limit the running time at flow less than 1700 gpm to less than 2.25 hours.

d. Change control room flow indicator banding via T.P.S.D.

10. Boric Acid Transfer Pumps (2 pumps)

Pump Manufacturer: Crane Chempump

Concern Number 1: Dead-Heading on Minimum Flow Operation

Each Boric Acid Transfer Pump has its own individual minimum flow line. No interface exists. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has indicated that, due to the low suction specific speed for these pumps, low flow cavitation is not a concern.

Actions To Be Taken

None

11. Fuel Oil Transfer Pumps (2 pumps)

Pump Manufacturer: Crane Chempump

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Fuel Oil Transfer Pumps have no minimum flow lines installed. When they operate they always flow through the main header. Thus this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has indicated that, due to the low suction specific speed for these pumps, low flow cavitation is not a concern.

Actions To Be Taken

None

12. Jacket Water Keep Warm Pumps (2 pumps)

Pump Manufacturer: Goulds Pumps, Inc.
Pump Supplier: Colt Industries (Fairbanks Morse)

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Jacket Water Keep Warm Pumps have no minimum flow lines installed. When the pump runs, it flows through the main header. Logic circuitry will automatically stop this pump when the engine driven jacket water cooling pump is running. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

Colt Industries has indicated that low flow instabilities are not a concern for these pumps since they are never throttled nor deadheaded. When they run, they always provide nearly rated flow, based on system design.

Actions To Be Taken

None

13. Diesel Intercooler Pump (2 pumps)

Pump Manufacturer: Pegson
Pump Supplier: Colt Industries (Fairbanks-Morse)

Concern Number 1: Dead-Heading on Minimum Flow Operation

The diesel intercooler pumps have no minimum flow lines installed. They are engine driven and operate only when the diesel engine is running. When running they always flow through the main header. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

Colt Industries has indicated that low flow instability is not a concern for these pumps since they will never be throttled nor deadheaded. No valves exist in the system which could be used to throttle flow below nearly design flow.

Actions To Be Taken

None

14. Jacket Water Cooling Pumps (2 pumps)

Pump Manufacturer: Pegson
Pump Supplier: Colt Industries (Fairbanks Morse)

Concern Number 1: Dead-Heading on Minimum Flow Operation

The Jacket Water Cooling Pumps have no minimum flow lines installed. They are engine driven and operate only when the diesel engine is running. When running they always flow through the main header. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

Colt Industries has indicated that low flow instability is not a problem for these pumps since they will never be throttled nor deadheaded. No valves exist in the system which could be used to throttle flow below nearly design flow.

Actions To Be Taken

None

15. Boron Injection Tank Recirculation Pumps (2 pumps)

Pump Manufacturer: Crane Chempump

Concern Number 1: Dead-Heading on Minimum Flow Operation.

These pumps are never used. They are always tagged out of service during all modes of plant operation. This concern is addressed only in the remote chance these pumps ever become necessary.

The BIT Recirculation Pumps have no minimum flow lines installed. When they operate, they always flow through the main header. Thus, this concern is not a problem at WCGS for these pumps.

Concern Number 2: Low Flow Hydraulic Instability

The pump manufacturer has indicated that, due to the low suction specific speed for these pumps, Low Flow Cavitation is not a concern.

Actions To Be Taken

None

ATTACHMENT III

Inservice Testing Program for Pumps

Excerpt from

Inservice Testing of Pumps and Valves

WCNOC Document WCOP-02

2.0 INSERVICE TESTING PROGRAM FOR PUMPS

2.1 General Information

2.1.1 Applicable Code

This testing program for ISI Class 1, 2 and 3 Pumps meets the requirements of Subsection IWP of Section XI of the ASME Boiler and Pressure Vessel Code, 1980 Edition through the Winter of 1981 Addenda. Where these requirements are determined to be impractical, specific requests for relief have been written and included in Section 2.2.

2.1.2 Pump Program Tables

The tables in Appendix A list all pumps included in the Wolf Creek Generating Station (WCGS) IST Program. Data contained in these tables identifies those pumps subject to Inservice Testing, the Inservice Test quantities to be measured, the Inservice Testing Frequency, and any applicable remarks. The column headings are listed and explained below:

PUMP IDENTIFICATION

PUMP NUMBER: The Pump Identification Number.

SYSTEM: The System of which the pump is a Component.

ISI CLASS: The ISI Classification of the pump.

P&ID NUMBER: The WCGS Drawing Number for the P&ID referring to the pump.

P&ID COORD: The drawing coordinate location of the pump on the P&ID.

ISI REQUIREMENTS

PUMP SPEED, INLET (SUCTION) PRESSURE, DIFFERENTIAL PRESSURE, FLOW RATE, VIBRATION, BEARING TEMPERATURE AND LUBRICANT LEVEL OR PRESSURE: When the word "YES" appears in a particular test quantity column, that quantity will be measured or observed during Inservice Testing in accordance with Subsection IWP. If a modified test is planned or a test is being waived, a request for Relief Number will appear in the test quantity column referencing the pump Relief Request. Requests for relief are identified as PR-X, where X is the sequential number of the relief. The requests for relief are included in Section 2.2.

2.1.3 Measurement of Test Quantities

SPEED: Per IWP-4400, shaft speed need not be measured for pumps directly coupled to synchronous or induction type motor drivers. For variable speed pumps, the pump speed is set at the reference speed per IWP-3100.

INLET (SUCTION) PRESSURE: For submerged pumps, inlet pressure will be calculated (using appropriate correction factors) from a measured tank or basin level. All other inlet pressure measurements will be taken using pressure instruments at or near the pump inlet.

DIFFERENTIAL PRESSURE: Differential pressure will be calculated from inlet and discharge pressure measurements or by direct differential pressure measurement.

FLOW RATE: Flow Rate will be measured using a Rate or Quantity Meter installed in the Pump Test Circuit.

VIBRATION: Pump vibration will be measured with one of the instruments referenced in IWP-4520.

BEARING TEMPERATURE: Pump bearing temperature(s) will not be measured. (Relief Request PR-1).

LUBRICANT LEVEL OR PRESSURE: Pump lubricant level or pressure will be observed during each inservice test when applicable.

2.1.4 Allowable Ranges of Test Quantities

The allowable ranges specified in Table IWP-3100-2 will be used for differential pressure, flow and vibration measurements with the following exceptions. The Acceptable Range (on the high side) for differential pressure (DP) and flow (Q) shall be 1.05 times the reference value. The Alert Range (High Values) shall be >1.05 times the reference value for differential pressure and flow. Also for DP and Q the Required Action Range (High Values) will not be used. The aforementioned exceptions are applicable only to certain pumps (see Relief Request PR-11). Should a measured test quantity fall outside the allowable range, corrective action per IWP-3230 shall be followed.

2.1.5 Instrument Accuracy

Allowable instrument accuracies are given in Table IWP-4110-1. If the accuracies of the station's instruments are not acceptable, temporary instruments meeting those requirements in Table IWP-4110-1 will be used.