# IN-SERVICE TESTING OF PUMPS PROGRAM

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ATTACHED A SUMMARY OF RELIEF REQUESTS SUBMITTED TO DATE.

ATTACHED A DESCRIPTION OF COMPUTER ASSISTED MANAGEMENT OF IST.



QA PROGRAM AFFECTING

# IN-SERVICE TESTING OF PUMPS PROGRAM

## 1.0 OBJECTIVES

1.1 To define the in-service testing requirements for ASME Code Class 1, 2 and 3 pumps at Unit 1 which are provided with an emergency power source.

1.2 To meet the requirements of References 2.1.1 (and 2.1.2 to the extent practical as described in References 2.4.3 through 2.4.8).

1.3 To meet the Station Division Responsibility for Pump IST identified in Reference 2.2.1.

## 2.0 REFERENCES

### 2.1 Licensing Commitments

2.1.1 Code Federal Regulations, Title 10, Part 50.55(a), (e) and (g)

2.1.2 American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section XI, ~~1977~~ Edition, including Addenda through ~~Winter of 1979~~ Summer 1983

REVISED TCN 1983

### 2.2 Site Order

2.2.1 SO123-IN-1, In-Service Inspection Program

### 2.3 Procedures

2.3.1 SO1-V-2.14.1, Auxiliary Feedwater In-Service Pump Test

2.3.2 SO1-V-2.14.2, Component Cooling Water In-Service Pump Test

2.3.3 SO1-V-2.14.3, Diesel Fuel Transfer In-Service Pump Test

2.3.4 SO1-V-2.14.4, Safety Injection In-Service Pump Test

2.3.5 SO1-V-2.14.5, Safety Injection Recirculation In-Service Pump Test

2.3.6 SO1-V-2.14.6, Refueling Water In-Service Pump Test

2.3.7 SO1-V-2.14.7, Spray Chemical Addition In-Service Pump Test

2.3.8 SO1-V-2.14.8, Saltwater Cooling In-Service Pump Test

2.3.9 SO1-V-2.14.9, Residual Heat Removal In-Service Pump Test

2.3.10 SO1-V-2.14.10, Feedwater In-Service Pump Test

2.0 REFERENCES (Continued)

2.3.11 SO1-V-2.14.11, Reactor Charging In-service Pump Test

2.3.12 SO1-V-2.15, In-Service Testing of Valves Program

2.3.13 SO123-II-1.0, Calibration and Control of Measurement and Test Equipment

2.4 Other

2.4.1 EG(123) 53, Inservice Pump Test Record

2.4.2 Letter dated July 24, 1980, from J. G. Haynes to D. M. Crutchfield, NRC,

2.4.3 Letter dated January 24, 1984, M. O. Medford to D. M. Crutchfield (NRC), "In-Service Testing Program for Pumps and Valves, Unit 1"

2.4.4 Letter dated June 15, 1984, M. O. Medford to D. M. Crutchfield (NRC), "In-Service Testing of Valves Program, Unit 1"

2.4.5 Letter dated September 11, 1984, M. O. Medford to W. A. Paulson (NRC), "In-Service Testing Program for Pumps and Valves, Unit 1"

2.4.6 Letter dated April 10, 1985, M. O. Medford to J. A. Zwolinski (NRC), "Additional Changes to In-Service Testing Program for Pumps and Valves, Unit 1"

2.4.7 Letter dated March 3, 1986, M. O. Medford to G. E. Lear (NRC), "In-Service Testing Program for Pumps and Valves, Unit 1"

2.4.8 Letter dated July 3, 1986, M. O. Medford to G. E. Lear (NRC), "In-Service Testing Program for Pumps and Valves, Unit 1"

3.0 PREREQUISITES

3.1 Prior to use of an uncontrolled (pink) copy of this Site document, it is the user's responsibility to verify that the revision and any TCNs are current by utilizing one of the following methods:

3.1.1 Check it against a controlled copy and any TCNs;

3.1.2 Access an SCE Document Configuration System (SDCS) TSO terminal;

3.1.3 Contact CDM by telephone or through counter inquiry;

3.0 PREREQUISITES (Continued)

3.1.4 Obtain an uncontrolled (pink) copy of the Site document from CDM;

3.1.5 Reference a current (within one week) Destination Configuration Control Log and associated daily update.

3.2 The implementing Procedures (References 2.3.1 through 2.3.11) shall be updated as necessary within one month after revision of this Procedure is released. The Managers of Operations and Maintenance shall receive a copy of the approved revision from the IST Coordinator to serve as notification of a revision.

4.0 PRECAUTIONS

4.1 The Reference 2.1.2 test requirements shall be met to the maximum extent practical. It is not the intent of this Procedure to place the Plant in an unsafe condition for the purpose of testing a pump. Care should be exercised to ensure that no test will be conducted that would violate Technical Specifications or other Plant operating constraints.

4.2 The In-Service Testing of Pumps Program delineated herein covers a ten (10) year interval commencing January 1, ~~1970~~ 1988 and terminating January 1, ~~1980~~ 1998.

REVISED TCN

5.0 CHECKLIST(S)

5.1 None

6.0 PROCEDURE

6.1 Basis for Test Requirements

6.1.1 The hydraulic and mechanical condition of a pump relative to a previous condition can be determined by attempting to duplicate (by test) a set of basic reference parameters. Deviations detected are symptoms of changes and, depending upon the degree of deviation, indicate need for further tests or corrective action.

6.2 Test Requirements

6.2.1 Attachment 3 specifies each pump subject to the in-service testing requirements of Reference 2.1.2. Each in-service test shall include the measurement and observation of all quantities listed in Attachment 3, except bearing temperatures. Bearing temperatures will be measured during at least one in-service test each year.

6.2.2 Each pump shall be tested in accordance with References 2.3.1 through 2.3.11.

6.0 PROCEDURE (Continued)

6.2.2.1 The following exceptions are permitted if approved by the Cognizant Engineer and the Shift Superintendent:

.1.1 Changes in the pump test valve alignment described in the individual pump test procedures.

.1.2 Changes in the pump test instrumentation.

.1.3 Changes in the "As Left" valve alignment following the test.

.1.4 The above exceptions shall be documented on the pump test procedure and shall be signed by the Cognizant Engineer and Shift Superintendent. They will be responsible for assuring that exceptions/changes do not invalidate the test or violate the Technical Specifications or other operational constraints.

REFORMATTED REQUIREMENT

6.2.3 Each pump should be tested at the frequency specified in the Test Frequency column of Attachment 3.

CLARIFIED

.1 If the test cannot be performed within the specified period the interval may be extended.

.2 An extension shall not exceed twenty-five percent (25%) of the test interval and must not cause any three (3) consecutive test intervals to exceed 3.25 times the specified test interval.

REFORMATTED

.3 Although not mandatory, it is recommended that the specified test frequency be maintained during shutdown periods when this can reasonably be accomplished.

REWORDED

NOTE: Operability of a redundant pump must often be assured prior to testing the second pump. It is suggested that testing be done on a staggered basis where possible.

Added RECOMMENDATION

.4 If not tested during Plant shutdowns, the pump shall be tested prior to entering the Mode in which it is required to perform a safety function.

6.2.4 Pumps operated more frequently than every three (3) months need not be run or stopped for a special test, provided the records show such pumps were operated at least once every three (3) months at the reference conditions and the parameters specified were measured, observed, recorded and analyzed.

6.0 PROCEDURE (Continued)

6.2.5 Reference values are defined as one or more fixed sets of values of the parameters shown in Attachment 3, as measured or observed when the equipment is known to be operating acceptably. All subsequent test results are compared to these reference values or to new reference values established in accordance with steps 6.2.5.1 through 6.2.5.2.

.1 When a pump is replaced or repaired (or maintenance is conducted which could affect the pump performance), a test shall be conducted to reconfirm the previous reference values or establish a new set of reference values.

CLARIFIED WORDING

.2 Deviations between the previous and new set of reference values shall be identified. Verification that the new values represent acceptable pump operation shall be recorded in a Memorandum To File and placed in the IST files for that pump. If space permits, this Memorandum for File can be a notation in Block 6 of the pump test record and/or in the comments section of the individual pump test procedure.

TCN REWORDED AND CLARIFIED.

.3 Establishment of an Additional Set of Reference Values

.3.1 Should it be necessary or desirable for any reason other than that stated in step 6.2.5.1 to establish an additional set of reference values, an in-service test shall first be run at the conditions of an existing set of reference values and the results analyzed.

.3.1.1 If operation is satisfactory, a second test run at the new reference conditions shall follow as soon as practical. The results of this test shall establish the additional set of reference values.

.3.2 If the reference values cannot be met due to Plant conditions, but the results are within the pump Manufacturer's acceptance data and within the safety analysis, the pump will remain in operable status.

.3.2.1 However, when Plant conditions permit, an in-service test shall be run at the conditions of the existing set of reference values and the results analyzed. If the pump operation is satisfactory, the new values will become the references under those Plant conditions.

.3.3 Whenever an additional set of reference values is established, the reasons shall be fully explained and documented on the Pump Test Record or in a memo to file attached to the Pump Test Record.

6.0 PROCEDURE (Continued)

6.2.6 Methods of Measurement

.1 Methods of measuring pump parameters shall meet the requirements of Reference 2.1.2, paragraph IWP-4000.

6.2.7 Test Duration

.1 When measurement of bearing temperature is not required, each pump shall be run for at least five minutes under conditions as stable as the system permits.

.2 At the end of this time, at least one measurement or observation of each of the quantities specified shall be made and recorded.

.3 When the measurement of bearing temperature is required, each pump shall be run until the bearing temperature stabilizes and then the quantities specified shall be measured or observed and recorded.

.4 A bearing temperature shall be considered stable when three (3) successive readings taken at ten minute intervals do not vary by more than 3%. That is, not only are the first and second and second and third reading within 3%, but also the first and third readings are within 3%. | CLARIFIED

6.2.8 Test Control

.1 Control, direction and scheduling of the Test shall be the responsibility of the Cognizant Engineer.

.2 Collection of data may be delegated to an Engineering Aide.

.3 In-Service Testing of pumps shall be coordinated with other operational testing when possible.

6.3 Inservice Pump Test Record

NOTES: 1. Engineering shall control the performance of the tests and shall prepare the Inservice Pump Test Record (Reference 2.4.2). | REWORDED

2. A given pump test may not require all blocks on the Inservice Pump Test Record to be completed. Those blocks not required will be completed using N/A.

.0 PROCEDURE (Continued)

6.3.1 Completing the Inservice Pump Test Record (see Attachment 1)

.1 Upper Right-Hand Corner

EDM code is left blank. Record the Plant tag number for the component tested.

Example: Plant Tag No.: G13A

Record the test date.

In the blank marked "Record No.", place the record number determined as follows:
1) Pump number
2) Month tested
3) Year tested

Example: G74B-5-86

NOTE: If more than one test is run on a given pump in the same month, add a letter following the test number to separate it from the preceeding test(s).

Examples:

G74B-5-86 (First Test)
G74B-5-86A (Second Test)
G74B-5-86B (Third Test)
Etc.

CLARIFIED

.2 Line 1:

Enter the applicable system and pump identification.

NOTE: It is not mandatory to enter the pump class.

.3 Line 2:

Enter the name of the person recording the pump data.

6.0 PROCEDURE (Continued)

6.3.1.4 Line 3:

Enter the pump area location and the reason for test, i.e., quarterly test, establish reference values, etc.

NOTE: It is not mandatory to enter the pump location.

.5 Line 4:

Enter the Plant power level, or Mode, i.e., 400 MW, M-5, M-6, etc. From the pump test records, enter the reference test record number and test date on that record.

CLARIFIED

.6 Line 5:

Enter the current testing frequency and the date of the last in-service pump test.

NOTE: Remember that test frequency is doubled if the pump is in the ALERT RANGE.

This NOTE has been REPEATED here

.7 Line 6:

Determine if the pump can be tested. If the pump cannot be operated under the current Plant conditions, check NO and document the reason. A record shall be completed and provided to the IST Coordinator even though the pump cannot be tested.

REWORDED

NOTES: 1. Calculations can be shown either in the space below Lines 6 or 11 or on an attached sheet of paper.

TCN 7-1

2. If this is a post-maintenance test, write the M.O. number below line 6.

3. If this is a reference test, write the words "Reference Test" below line 6.

Added

6.0 PROCEDURE (Continued)

6.3.1.8 Line 7:

Enter the time the test begins and the time the test is completed. This time should include the pump run time before the measurements are taken. Run time before the test shall not be less than 5 minutes.

REORGANIZED

NOTE: Because of the plant configuration, there are exceptions to the 5 min. pre-test run rule, i.e., pumps G45A and B, G75A and B, and G74A and B.

Added

.9 The following information shall be provided for each of the pump parameters in the Hydraulic, Mechanical, Lubrication and Bearing Temperature sections. For parameters that do not apply to the pump identified in Line 1, enter N/A under Inst. ID Heading.

.9.1 Cal. Value:

If the parameter is a CALCULATED VALUE, check this block; otherwise, leave it blank. If a calculated value is used for a parameter, the INST. ID. and CAL. DUE DATE may be left blank (or "NA" inserted).

NEW COLUMN ON FORM Added

.9.2 Inst. ID:

Enter the INSTRUMENT TAG NUMBER or the serial number of the instrument used to measure the parameter.

.9.3 Cal. Due Date:

Enter the instrument's CALIBRATION EXPIRATION DATE.

.9.4 Units:

Enter the UNITS OF MEASURE for the instrument.

REFORMATTED AND CLARIFIED

.9.5 Ref. Req.:

Identify with a check mark those parameters which are PRETEST REQUIREMENTS. Operations will adjust the system to the reference value within a tolerance of ± 1% (or as close as possible for conditions where it is not possible to assure this degree of tolerance.)

Added

6.0 PROCEDURE (Continued)

6.3.1.9.6 Pretest Value:

Enter the REFERENCE VALUES from the reference test identified on line 4.

NOTE: If the test is to be a reference test, the pretest value column should be left blank.

REORGANIZED

.9.7 Test Value:

After the pretest requirements have been met, record the INSTRUMENT READING (OR CALCULATED VALUE) for each parameter to be measured.

.9.8 Acceptable Range:

This ACCEPTANCE RANGE is determined using Attachment 2.

CLARIFIED

NOTES: 1. Data may be taken which is not required by Reference 2.1.2. For information purposes only, this data will be collected and evaluated independently of Reference 2.1.2 requirements.

2. Every blank in the acceptance range column must be filled out. If no acceptance range is appropriate, "NA" that blank.

Added

.10 Lines 8 and 11: Suction Pressure:

The pressure measured at the inlet side of the pump. In some cases, there is no instrumentation available to measure this parameter directly. In such cases, suction pressure must be calculated from available instrumentation. The equation used to make this calculation is in the implementing procedures (References 2.3.1 through 2.3.11). The calculated or measured results are recorded on Lines 8 and 11 as suction pressure.

When using instrumentation, i.e., a pressure gauge on the inlet of the pump, note the Pre-start (Line 8) and Post-start (Line 11) suction pressures. If the pump is running prior to the in-service test, pre-start inlet pressure is not required.

REFORMATTED

6.0 PROCEDURE (Continued)

6.3.1.11 Line 9: Speed:

This parameter is shaft speed and is required only for pumps with variable-speed drivers.

.12 Line 10: Discharge Pressure:

The pressure measured at the outlet side of the pump.

.13 Line 12: Differential Pressure:

The difference between discharge pressure and suction pressure. This value is the pump's head and, in some cases, must be calculated from other formulae. These formulae will be in the implementing Procedures (References 2.3.1 through 2.3.11).

.14 Line 13: Motor Current:

Electric current of the drive motor measures from meters in the Control Room. Collection of this data is optional (not a required parameter).

.15 Line 14: Flowrate:

Volumetric flowrate of the pumping system. In cases where the resistance of the test loop is fixed, the words, minimum flow (or "Mini-Flo", or equivalent), may be entered.

REWORDED

.16 Lines 15, 16, 17, 18, 19 and 20: Vibration Measurements:

These are open filter amplitude (displacement) readings taken on, or as close as possible to, the bearings.

.17 Lines 21 and 22: Lubrication Data:

The level may be noted as SAT/UNSAT.
Pressure and temperature data on the lubrication system may be recorded if instrumentation is available.

.18 Line 23: Bearing Temperatures:

Bearing Temperatures are required to be taken once a year, except when testing the Saltwater Cooling pumps. Saltwater Cooling pump thrust bearing temperatures shall be taken once each month.

The bearing temperatures shall be considered stable when three successive readings do not vary by more than 3% (these temperatures and their variations are required to be recorded). See paragraph 6.2.7.4, above.

6.0 PROCEDURE (Continued)

6.4 Operability Analysis

NOTE: An operable component may remain operable, on the basis of the last valid test, until the test interval is exceeded. A suspect test need not be acted upon before the Supervisor signs. When the Supervisor signs as approving the test results, the test is considered a valid test (i.e., is to be used in determining whether the pump is operable, in alert or inoperable). If the results are suspect because of potential instrument calibration problems, errors in recording test data, etc., the test can be rerun after correcting the problem.

Added

6.4.1 All test data shall be analyzed within 96 hours after collection of data and the Inservice Pump Test Record signed by the Supervising Engineer.

.1 If the component being tested was out of service prior to the in-service test, sign-off of the Inservice Pump Test Record by the Supervising Engineering is required prior to returning the component to service.

.2 When the operability of a pump is changed due to in-service testing, the Shift Superintendent shall be notified in writing.

6.4.2 The purpose of this analysis is to demonstrate that pump conditions do not impair operability, and that the pump will still fulfill its function.

6.4.3 The allowable ranges of in-service test quantities in relation to the reference valves are tabulated in Attachment 2, which is table IWP-3100-2 from Reference 2.1.2. An Engineering analysis may change these ranges to meet specific pump requirements. The acceptable ranges of test quantities will be specified in each Inservice Pump Test Record.

REWORDED

6.4.4 If deviations occur:

.1 Engineering shall determine the cause of the deviation(s) and perform an analysis to evaluate the operability of the pump. This analysis shall be documented in a Memorandum to File placed in the IST files.

.2 Hydraulic Section of the Inservice Pump Test Record:

6.0 PROCEDURE (Continued)

6.4.4.2.1 When the test results show test values outside the ACCEPTABLE RANGE, the instruments involved may be recalibrated and the test rerun. REWORDED

.2.2 Where deviations in these parameters can be attributed to normal pump wear or to other causes external to the pump, the test data shall be used to establish a revised pump head curve or the reason for the deviation.

.2.2.1 Under the conditions of normal wear, the shape of the pump curve can be assumed to be constant, allowing the revised curve to be determined by interpolation.

.2.2.2 Operability will be determined by comparing the revised pump curve to the operating requirements during normal and emergency conditions. For causes external to the pump, an Engineering analysis will be used to evaluate pump operability.

.2.3 Where deviations in these parameters cannot be attributed to normal wear or external causes, the pump shall be repaired or replaced.

.3 Mechanical Section of the Inservice Pump Test Record:

.3.1 Mechanical pump test data shall be compared with the pump Manufacturer's recommendations. If the pump is operating within the Manufacturer's specifications, it shall be considered operable and a new reference point established using the test data. Engineering shall ensure that the new reference point does not result in the Manufacturer's specifications being exceeded if the pump were to be operating in the Alert Range identified in Attachment 1.

.3.2 If the mechanical test data is found to exceed the Manufacturer's specifications, the pump shall be repaired or replaced.

6.4.5 Corrective Measures

.1 Alert Range:

The following action shall be performed for pumps found to be operating in the Alert Range of Attachment ~~1~~ 2. TCN

.1.1 The pump test frequency shall be doubled.

.1.2 The cause of the deviation shall be determined and the condition corrected. If the cause is determined to be external to the pump, the condition shall be analyzed and accounted for as noted in step 6.4.4.2.2.

6.0 PROCEDURE (Continued)

6.4.5.1.3 When the test results show deviations greater than allowed, the instrument(s) involved may be recalibrated and the test rerun.

.1.4 For deviations resulting from normal wear, corrective action shall consist of the establishment of new reference values and the test frequency returned to normal if an operability analysis of the new Alert Range results in the determination that the pump is operable (see step 6.4.4.3.1).

.1.5 When the conditions of step 6.4.5.1.2 or 6.4.5.1.4 cannot be met, the pump shall be scheduled for maintenance or replacement at the first available outage of sufficient duration. The test frequency shall be returned to normal after the requirements of step 6.2.5.1 are met.

.1.6 The Shift Superintendent and Supervising Engineer shall be notified that the pump is in the Alert Range. They shall be responsible for any additional notifications.

.2 Required Action Range:

The following action shall be performed as appropriate for pumps determined to be operating within the Required Action Range of Attachment 1, 2.

TCN

.2.1 The cause of the deviation shall be determined and the condition corrected. If the cause is determined to be external to the pump, the condition shall be analyzed and accounted for as described in step 6.4.4.2.2.

.2.2 Pump operability and corrective action will be based on the limits specified in the Limiting Conditions for Operation of the Plant Technical Specifications. A pump may remain operable if after an Engineering analysis, it is determined that even though a pump parameter is in the Required Action Range, the pump can still fulfill its intended functions.

REWORDED

.2.3 If the analysis indicates the pump will not fulfill its intended function, the Shift Superintendent, Supervising Engineer and Maintenance Supervisor shall be notified that the pump cannot be considered operable under the IST rules.

.2.4 The pump shall not be returned to service until the cause of the deviation has been determined (as described in step 6.4.5.2.1).

6.0 PROCEDURE (Continued)

6.5 Instrumentation

6.5.1 Instrumentation used shall meet the requirements of Reference 2.1.2, Table IWP-4110-1 to the maximum extent practical. Test instruments, with their transmitters, where used, shall be calibrated in accordance with Reference 2.3.13. Instruments will be calibrated in accordance with the appropriate Procedure.

6.6 Operator Responsibilities

6.6.1 Operator responsibilities are defined in Reference 2.2.1.

6.7 Computer Assisted Management of IST

6.7.1 Refer to Attachment 5 for a description of this program. (Added)

7.0 RECORDS

7.1 Records pertaining to in-service testing of pumps shall include the following:

7.1.1 A list of pumps shall be maintained to record the current status of the test program as required by Reference 2.1.2, Paragraph IWP-6210. The date of each test will be listed (see Attachment 4).

7.1.2 There will be at least one Inservice Pump Test Record per pump per test. The Inservice Pump Test Record will show the test results for each test and will indicate any corrective action needed.

7.1.3 Record of Corrective Action

.1 If a corrective action is taken on a pump listed in Attachment 3, it shall be documented. Maintenance Orders (either hard copy or SOMMS), NCRs and/or Memoranda for File may be used to provide a record of corrective action. Hard copies of the record shall be filed in CDM.

.2 Reference 2.1.2, paragraph IWP-6250 shall be complied with by a combination of the records identified in step 7.1.3.1 and the Inservice Pump Test Record showing confirmation of operational adequacy.

7.1.4 A record of Manufacturer's data for each pump including: the name of the Manufacturer, the Manufacturer's model number, serial number or other identification number, and a copy of the Manufacturer's acceptance test report (if any) or a summary thereof shall be filed in CDM.

7.0 RECORDS (Continued)

7.2 Any proposed changes to this Procedure and any changes to other documentation associated with this Procedure shall be transmitted to the IST Coordinator.

THIS FORM HAS BEEN REVISED TO INCLUDE MINOR CHANGES.

## EG(123) 53, INSERVICE PUMP TEST RECORD

EDM Encode No. _____

Plant Tag No. _____

Test Date _____

### INSERVICE PUMP TEST RECORD Unit _____ Record No. _____

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SYSTEM | | | | | | | | | | PUMP CLASS | |
| 2 | TESTED BY | | 3 AREA | LOCATION | | | REASON FOR TEST | | | | |
| 4 PLANT POWER | | DEP. DATA RECORD NO. | | EFFECTIVE DATE | | 5 TEST FREQUENCY | | DATE LAST TESTED | | | |
| 6 PUMP TESTABLE ○ Yes ○ No *Run pumps for five (5) minutes before testing. If no, why— | | | | | | | | 7 TIME START | STOP | | |
| | | | | | | | | Run Time Before Test | Min. | | |

**HYDRAULIC**

| | | | CAL. VALUE | INST. ID. | CAL. DUE DATE | UNITS | REF. REQ. | PREVIOUS VALUE | TEST VALUE | ACCEPTABLE RANGE |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | Suction Pressure (Prestart) | Ps | | | | | | | | |
| 9 | Speed | N | | | | | | | | |
| 10 | Discharge Pressure | Pd | | | | | | | | |
| 11 | Suction Pressure | Pi | | | | | | | | |
| Calculations | | | | | | | | | | |
| 12 | Diff. Pressure Pd - Pi | ΔP | | | | | | | | |
| 13 | Motor Current | A | | | | | | | | |
| 14 | Flow Rate | Q | | | | | | | | |

**MECHANICAL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | Point No. 1 | Vibration Horiz. (0°) | VI | | | | | | |
| 16 | | Vibration Vert. (90°) | VI | | | | | | |
| 17 | | Vibration Axial | VI | | | | | | |
| 18 | Point No. 2 | Vibration Horiz. (0°) | VI | | | | | | |
| 19 | | Vibration Vert. (90°) | VI | | | | | | |
| 20 | | Vibration Axial | VI | | | | | | |

**LUBRICATION**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21 | Level/Pressure | | | | | | |
| 22 | Temperature | | | | | | |

**23 BEARING TEMPERATURES (Required once a year)**

| POINT NO. 1 | | | TIME | TEMP. (°F) | % VARIATION | MAXIMUM LIMIT |
|---|---|---|---|---|---|---|
| Date Last Taken _____ | | | 1 | | //// | |
| Ref. Data Record No. _____ | | | 2 | | | |
| | | | 3 | | | |
| | | | 4 | | | |
| POINT NO. 2 | | | 1 | | //// | |
| Bearing Temperature Notes — | | | 2 | | | |
| | | | 3 | | | |
| | | | 4 | | | |

**CORRECTIVE ACTION/REVIEW**

| | | |
|---|---|---|
| 24 REQUIRED ACTION | | NCR NO. |
| 25 ENGINEER PERFORMING OPERABILITY ANALYSIS | 26 SUPERVISING ENGINEER OR DESIGNEE | DATE |

EDM EG(123) 53 REV. 0 00/00/00

# ALLOWABLE RANGES OF TEST QUANTITIES

## (FROM REFERENCE 2.1.2 IWP-3100-2)

| Test Quantity | | Acceptable Range | Alert Range[3] | | Required Action Range[3] | |
|---|---|---|---|---|---|---|
| | | | Low Values | High Values | Low Values | High Values |
| $P_i$ | | [1] | [1] | [1] | [1] | [1] |
| $\Delta P$ | | 0.93 to 1.02 $\Delta P_r$ | 0.90 to 0.93 $\Delta P_r$ | 1.02 to 1.03 $\Delta P_r$ | <0.90 $\Delta P_r$ | >1.03 $\Delta P_r$ |
| $Q$ | | 0.94 to 1.02 $Q_r$ | 0.90 to 0.94 $Q_r$ | 1.02 to 1.03 $Q_r$ | <0.90 $Q_r$ | >1.03 $Q_r$ |
| $V$ | When $0 \leq V_r \leq 0.5$ mil | 0 to 1 mil | None | 1 to 1.5 mil | None | >1.5 mil |
| $V$ | When 0.5 mil $< V_r \leq 2.0$ mil | 0 to 2 $V_r$ mil | None | 2 $V_r$ mil to 3 $V_r$ mil | None | >3 $V_r$ mil |
| $V$ | When 2.0 mil $< V_r \leq 5.0$ mil | 0 to (2 + $V_r$) mil | None | (2 + $V_r$) mil to (4 + $V_r$) mil | None | >(4 + $V_r$) mil |
| $V$ | When $V_r > 5.0$ mil | 0 to 1.4$V_r$ mil | None | 1.4 $V_r$ mil to 1.8 $V_r$ mil | None | > 1.8 $V_r$ mil |
| $T_b$ | | [2] | [2] | [2] | [2] | [2] |

1. $P_i$ shall be within the limits specified in the pump record.
2. $T_b$ shall be within the limits specified in the pump record.

NOTES: (1) All values in this table are subject to change by an engineering analysis of individual pump parameters.

(2) Pump Power shall be calculated from the voltage and input amps. The value shall be within the limits specified in the pump record.

## CLASS 1, 2 OR 3 PUMPS

## NOTES AND CLARIFYING REMARKS

YES Indicates quantity can be measured, calculated or observed.

NO Indicates quantity not available for measurement or not needed.

N/A Not Applicable

PRR Pump Relief Request (THESE ARE described IN ATT. 6)

NEW TCN

NOTE 1: During normal operation both feedwater pumps discharge into a common header. Flow is dependent on station load. Feedwater flow (as measured by FE-456, FE-457 and FE-458) is indicative of both feedwater pumps operating in parallel. Pumps should be tested at or near Plant full power operating when possible. Pump motor amperage should also be recorded for each pump.

NOTE 2: This pump will be tested on a monthly frequency. Motor thrust bearing temperature and vibration will be taken monthly as required by Reference 2.4.2.

NOTE 3: There is no installed instrumentation to allow the measurement of bearing temperature. Therefore, a surface pyrometer is used on the bearing casing to measure this parameter.

NOTE 4: The recirculation pumps can only be run dry since they are located in a sump that is filled only during accident conditions. It is therefore not possible to perform the pump tests required by Reference 2.1.2.

The requirements of Reference 2.3.5 shall be used in lieu of the Reference 2.1.2 pump testing requirements. This requires that proper starting of each pump be confirmed by observation of running current and voltage.

Every Refueling, or once every 2 years, a test requiring the sump to be filled with water and the pump to be run at shut-off head will be accomplished (see Reference 2.3.5).

NOTE 5: Testing will be performed at cold shutdown conditions at a frequency to meet as closely as possible the requirements of Reference 2.1.2.

NOTE 6: Inlet pressure for this pump is determined from tank levels and system pressure upstream of the pump.

Added

NOTE 7: These pumps are also tested at cold shutdown, during which flow is measured. Tests are conducted each cold shutdown if the plant is in Mode 5 at least 48 hours, and if the pump(s) have not been tested in cold shutdown in the last 92 days.

TCN 7-2

COLUMN DELETED

CLASS 1, 2 OR 3 PUMPS (Continued)

| PUMP NUMBER | PUMP NAME | CLASS | TEST PARAMETERS | | | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SPEED | INLET PRESS | DIFF PRESS | FLOW RATE | VIBRATION | BEARING TEMP | LUBE LEVEL | TEST FREQUENCY | |
| G-3A | FEEDWATER PUMP | 2 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 1,3,PRR-5 |
| G-3B | FEEDWATER PUMP | 2 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 1,3,PRR-5 |
| G-8A | REACTOR CHARGING PUMP | 2 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 3 |
| G-8B | REACTOR CHARGING PUMP | 2 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 3 |
| G-10 | AUX. FEEDWATER PUMP (STEAM) | 2 | YES | YES | YES | NO | YES | YES | YES | MONTHLY | 3,7,PRR-6 |
| G-10S | AUX. FEEDWATER PUMP (ELECT) | 2 | N/A | YES | YES | NO | YES | YES | YES | MONTHLY | 3,7,PRR-6 |
| G-10W | AUX. FEEDWATER PUMP (ELECT.) | 2 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 3, PRR-6 |
| G-13A | SALTWATER COOLING PUMP | 3 | N/A | YES | YES | YES | ~~YES~~ NO | ~~YES~~ NO | ~~YES~~ NO | MONTHLY | 3,6,PRR-7 |
| G-13B | SALTWATER COOLING PUMP | 3 | N/A | YES | YES | YES | ~~YES~~ NO | ~~YES~~ NO | ~~YES~~ NO | MONTHLY | 3,6,PRR-7 |
| G-13C | SALTWATER COOLING PUMP (AUXILIARY) | 3 | N/A | YES | YES | YES | YES | YES | YES | MONTHLY | 3,6,~~PRR-7~~ |
| G-14A | RESIDUAL HEAT REMOVAL PUMP | 2 | N/A | YES | YES | YES | YES | YES | YES | COLD SHUTDOWN | 3,5,6, PRR-4 |
| G-14B | RESIDUAL HEAT REMOVAL PUMP | 2 | N/A | YES | YES | YES | YES | YES | YES | COLD SHUTDOWN | 3,5,6 PRR-4 |
| G-15A | COMPONENT COOLING PUMP | 3 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 3,6 |
| G-15B | COMPONENT COOLING PUMP | 3 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 3,6 |
| G-15C | COMPONENT COOLING PUMP | 3 | N/A | YES | YES | YES | YES | YES | YES | QUARTERLY | 3,6 |
| G-27N | REFUELING WATER PUMP | 2 | N/A | YES | YES | NO | YES | YES | YES | QUARTERLY | 3,6,PRR-6 |
| G-27S | REFUELING WATER PUMP | 2 | N/A | YES | YES | NO | YES | YES | YES | QUARTERLY | 3,6,PRR-6 |
| G-45A | SAFETY INJECTION RECIRCULATION PUMP | 2 | MOTOR AMPS & VOLTS | NO | NO | NO | NO | NO | NO | ~~QUARTERLY~~ MONTHLY (AMPS) | 4, PRR-3 |
| G-45B | SAFETY INJECTION RECIRCULATION PUMP | 2 | MOTOR AMPS & VOLTS | NO | NO | NO | NO | NO | NO | ~~QUARTERLY~~ MONTHLY (AMPS) | 4, PRR-3 |
| G-50A | SAFETY INJECTION PUMP | 2 | N/A | YES | YES | NO | YES | YES | YES | QUARTERLY | 3,6,PRR-6 |
| G-50B | SAFETY INJECTION PUMP | 2 | N/A | YES | YES | NO | YES | YES | YES | QUARTERLY | 3,6,PRR-6 |

ADDED REFERENCE TO NOTE 7. — TCN

ADDED PUMP

CORRECTIONS

CORRECTIONS

CLASS 1, 2 OR 3 PUMPS (Continued)

| PUMP NUMBER | PUMP NAME | CLASS | TEST PARAMETERS | | | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SPEED | INLET PRESS | DIFF PRESS | FLOW RATE | VIBRATION | BEARING TEMP | LUBE LEVEL | TEST FREQUENCY | |
| G-74A | DIESEL FUEL TRANSFER PUMP | 3 | N/A | YES | YES | YES | NO | NO | NO | QUARTERLY | 6, PRR-2 |
| G-74B | DIESEL FUEL TRANSFER PUMP | 3 | N/A | YES | YES | YES | NO | NO | NO | QUARTERLY | 6, PRR-2 |
| G-75A | DIESEL FUEL TRANSFER PUMP | 3 | N/A | YES | YES | YES | NO | NO | NO | QUARTERLY | 6, PRR-2 |
| G-75B | DIESEL FUEL TRANSFER PUMP | 3 | N/A | YES | YES | YES | NO | NO | NO | QUARTERLY | 6, PRR-2 |
| G-200A | SPRAY CHEMICAL ADDITION PUMP | 2 | YES | YES | YES | YES | YES | YES | YES | QUARTERLY | 3,6,PRR-8 |
| G-200B | SPRAY CHEMICAL ADDITION PUMP | 2 | YES | YES | YES | YES | YES | YES | YES | QUARTERLY | 3,6,PRR-8 |

SUMMARY OF CURRENT TEST STATUS
YEAR: _____

Instructions:
1. Record the year - one sheet per year.
2. As tests are completed, record the date under the appropriate month.
3. Review to ensure test intervals are not exceeded.

| PUMP NO. | PUMP NAME | JAN | FEB | MAR | APR | MAY | JUN | JULY | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G-3A | Feedwater Pump | | | | | | | | | | | | |
| G-3B | Feedwater Pump | | | | | | | | | | | | |
| G-8A | Reactor Charging Pump | | | | | | | | | | | | |
| G-8B | Reactor Charging Pump | | | | | | | | | | | | |
| G-10 | Auxiliary Feedwater Pump (STEAM) | | | | | | | | | | | | |
| G-10S | Auxiliary Feedwater Pump (ELECT) | | | | | | | | | | | | |
| G-10W | Auxiliary Feedwater Pump (ELECT) | | | | | | | | | | | | |
| G-13A | Salt Water Cooling Pump | | | | | | | | | | | | |
| G-13B | Salt Water Cooling Pump | | | | | | | | | | | | |
| G-13C | Auxiliary Salt Water Cooling Pump | | | | | | | | | | | | |
| G-14A | Residual Heat Removal Pump | | | | | | | | | | | | |
| G-14B | Residual Heat Removal Pump | | | | | | | | | | | | |
| G-15A | Component Cooling Water Pump | | | | | | | | | | | | |
| G-15B | Component Cooling Water Pump | | | | | | | | | | | | |
| G-15C | Component Cooling Water Pump | | | | | | | | | | | | |
| G-27N | Refueling Water Pump | | | | | | | | | | | | |
| G-27S | Refueling Water Pump | | | | | | | | | | | | |
| G-45A | Safety Injection Recirculation Pump | | | | | | | | | | | | |
| G-45B | Safety Injection Recirculation Pump | | | | | | | | | | | | |
| G-50A | Safety Injection Pump | | | | | | | | | | | | |
| G-50B | Safety Injection Pump | | | | | | | | | | | | |
| G-74A | Diesel Fuel Transfer Pump | | | | | | | | | | | | |
| G-74B | Diesel Fuel Transfer Pump | | | | | | | | | | | | |
| G-75A | Diesel Fuel Transfer Pump | | | | | | | | | | | | |
| G-75B | Diesel Fuel Transfer Pump | | | | | | | | | | | | |
| G-200A | Spray Chemical Addition Pump | | | | | | | | | | | | |
| G-200B | Spray Chemical Addition Pump | | | | | | | | | | | | |

## COMPUTER ASSISTED MANAGEMENT OF IST

This entire attachment is new.

a. Technical will assign an IST Coordinator to implement its responsibilities under the IST Program. The Coordinator will report to the STA Supervisor, Units 2 and 3.

b. Technical maintains a comprehensive, computerized data base for all pumps and valves in the IST Program. The IST Coordinator from the Technical Division uses this data base to accomplish the following tasks.

1. Track the testing status of each pump and valve. (To be in place for Unit 1 by Return to Service, early July 1986 - Units 2 and 3 by November 26, 1986.)

2. Establish and maintain a technical performance base for each pump and valve. (To be in place by November 28, 1986 for all three units.)

3. Provide maintenance and testing visibility in order for the Coordinator to adjust valve program testing frequency to ensure that the program remains responsive to current conditions. Pump testing frequency is controlled in the Pump IST Program. (To be in place by November 28, 1986 for all three units.)

4. Provide for data base review to ensure that maintenance outage work on pumps and valves takes into account the valve's (or pump's) program performance. The Coordinator will adjust valve testing interval on the basis of the Code requirements and professional judgement. (To be in place by November 28, 1986 for all three units.)

5. Provide reports to the Cognizant Engineers to identify problem valves which need design upgrading.

6. On a periodic basis, issue trend reports to management identifying problem areas and highlighting trends. Trends that are of concern will be brought to the attention of the On-Site Review Committee.

c. Technical will identify those pumps and valves that require testing and the schedule for testing as follows:

1. Quarterly Interval: These valves will be identified in the Program, Reference 2.1.1.

COMPUTER ASSISTED MANAGEMENT OF IST (Continued)

2. Cold Shutdown Interval: At the conclusion of each outage, Technical will issue a memorandum to Operations and Maintenance, as appropriate, which lists the valves which must be tested at the next forced outage of 48 hours duration or greater. This list will be based on four factors:

a. The importance to safety assigned each valve not tested in the last 90 days.

b. The maintenance history (reliability) of each valve. Cold shutdown interval valves will be selected on the basis of the testing performance and the maintenance history (i.e., the worst performing valves will be tested more than others).

c. The time since each valve was tested.

d. A minimum of 25% of all cold shutdown valves shall be tested each Mode 5 outage. The goal will be to test all valves, if time allows.

3. Refueling Interval valves: These valves will be identified in the Program. (Pumps are addressed in the Pump IST Program)

## PUMP RELIEF REQUESTS SUBMITTED TO THE NRC

THIS ENTIRE ATTACHMENT IS NEW.

| Pump Relief Request Number | Content |
|---|---|
| 1 | The full-scale range of each instrument shall be 4 times the reference value rather than 3 times as required by the Code, Article IWP-4120. |
| 2 | The vibration of the pump motor thrust bearings for the Diesel Fuel Transfer Pumps G-74A, G-74B, G-75A and G-75B will be measured and trended on a quarterly basis to provide indirect indication of pump degradation. This activity will commence by the end of the next refueling outage. |
| 3 | The requirements of Technical Specification 4.2.II.B(3) will be used in lieu of the Section XI pump testing requirements for Safety Injection Recirculation Pumps G-45A and G-45B. This Technical Specification requires that proper starting of each pump be confirmed by observation of running current demonstrated on a monthly basis. To be acceptable, pump running current must be less than 150 amps.<br><br>Every refueling or once every 2 years, a test requiring the sump to be filled with water and the pump to be run at shut-off head will be accomplished. No vibration or bearing temperature data will be obtained due to the pump being submerged. |
| 4 | The Residual Heat Removal Pumps G14A and G14B will be tested at cold shutdown intervals. Test frequency during cold shutdown will be quarterly. |
| 5 | The total flow rate from both Feedwater Pumps G3A and G3B shall be measured. Additionally, input amps to each pump motor shall be measured. A ratio of the total flow will be credited to each pump based on the input amps. The flow rate credited to each pump will be evaluated per IWP-3200. |

6 The ASME Code Section XI requires pump flow rate to be measured (See Article IXP-3000). Flow instrumentation is not presently installed in the test loops of the systems discussed below.

No alternate testing for Safety Injection Pumps G50A and G50B and Refueling Water Pumps G27N and G27S is proposed at this time. However, during the Next refueling outage, suitable instrumentation will be installed in the test loops for all four pumps to take differential pressure measurements. By the end of the outage, this instrumentation will be in service and flow rate calculations will be performed on a quarterly basis as part of the In-Service Testing.

For the Auxiliary Feedwater Pumps, alternate testing will consist of the following. At cold shutdown intervals, both pumps will be tested by measuring pump flow rate and pump differential pressure. At monthly intervals, both pumps will be tested by running the pumps using the miniflow lines and by measuring pump differential pressure.

7 The Saltwater Cooling pumps G13A and G13B are submergence type pumps with bearings located under water and inaccessible. Therefore, it is not possible to measure pump vibration or temperature. The pump bearings are cooled and lubricated by fresh water from the Service Water System

Once per month, temperature and vibration measurements on the Saltwater Cooling Pump motor thrust bearings will be taken. Also, once per month, water flow to the pump bearings will be verified in lieu of lubricant level and pressure.

8 The Spray Chemical Addition Pumps G200A and G200B will have vibration measured in units of velocity using existing equipment at greater than or equal to 120 rpm. This will provide vibration monitoring at 1 times rpm where most rotating equipment malfunctions occur. The table in reference 2.3.7 to this procedure entitled "Allowable Ranges of Vibration Velocity for Pump Testing Per Subsection IWP" provides the acceptance criteria for the vibration measurements.