

WATTS BAR NUCLEAR PLANT

SURVEILLANCE INSTRUCTION

SI-7.50

HIGH PRESSURE FIRE PROTECTION PUMPS

UNIT 1 or 2

CURRENT REVISION LEVEL 7

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FORC Review Date 9/25/84

Approved By [Signature]  
Superintendent

Date Approved 9/25/84

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- 1C Shift Engineer's Office
- Stationary Equipment Group
- 1C Technical Support Center
- 1C Unit 1 Control Room
- 1C Unit 2 Control Room
- 1U Supt., Bellefonte Nuclear Plant

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HISTORY OF REVISION/REVIEW

<u>REV. NO.</u>	<u>DATE</u>	<u>REVISED PAGES</u>	<u>REASON FOR CURRENT REVISION (INCLUDE ALL TEMPORARY CHANGE NUMBERS)</u>
4	08/10/82	All	General Revision
5	10/12/82	Pages 2,3,6,8 10 and 12	
6	2/22/83	Page 12	To identify right pump.
7	9/25/84	All	2-year review. Reflect deletion from Section XI program. Incorporate requirements of NFP 20. General Revision. Change SI number. <i>from SI-40.5.26.p.</i>

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PUNCHLIST

1. Acceptance criteria of step 6.2 will be developed from initial performance of this instruction. If 6.1 can be met the data taken in step 5.12 will be degraded by 5% and will become the future acceptance criteria for 6.2.

M. K. Jones      16/05/84  
Signature                      Date

## HIGH PRESSURE FIRE PROTECTION PUMPS

### 1.0 STATEMENT OF APPLICABILITY

- 1.1 For operation at all times the fire suppression water system shall be demonstrated OPERABLE at least once per 18 months by verifying that each pump develops at least 1590 gpm at a system head of 330 feet.

This instruction fulfills SR 4.7.11.1.e.2.

NOTE: In order to comply with the APM, the procedure must be scheduled on an annual basis.

- 1.2 This instruction may be safely performed in modes 1, 2, 3, 4, 5, or 6.

### 2.0 REFERENCES

47W832-1

### 3.0 PREREQUISITES AND TEST EQUIPMENT

#### 3.1 Prerequisites

3.1.1 Determine which pump is to be tested. Tests should be scheduled once per three months on a rotating basis, such that at the end of each year, each pump has been tested once.

3.1.2 Notify Mechanical Engineering to perform TI-31.2 during this SI.

#### 3.2 Test Equipment

Differential pressure gauge range 0-400 inches of H<sub>2</sub>O capable of withstanding 200 psig static pressure, accuracy  $\pm 2\%$  or better.

### 4.0 PRECAUTIONS

- 4.1 If, at any time, the fire pump adjacent to the pump being tested starts, suspend testing by opening the discharge valve and closing the test valve for the pump being tested. Do not resume testing until it has been ascertained why the pumps started and that it is not necessary to have the pump being tested running for fire control.

- 4.2 Due to the nature of the start interlocks of the fire pumps and to ensure a continuous supply of RSW due to RSW isolation when the fire pumps start, it is necessary to run both the A-A and B-B pumps for either unit, no matter which pump is being tested. For example, if pump 2A-A is being tested, pump 2B-B must also be running, but in normal valve alignment rather than test alignment.
- 4.3 Due to the presence of an inverted check valve for air release in the discharge line of the fire pumps, there will be a slug of air in the line when the pump is started. Do not valve in the test  $\Delta P$  gage until after the pump has run for a few moments.

## 5.0 INSTRUCTIONS

NOTE: Record data on the proper data sheet for the pump being tested.

- 5.1 Notify the SRO that a fire pump is to be tested and obtain permission to conduct the test.

NOTE: Discharge valves, test valves, discharge pressure gauges, flow elements, and backup pumps are identified in table 1 and on the data sheets.

CAUTION: Do not valve in the test  $\Delta P$  gauge until after the pump has run for a few moments.

- 5.2 Obtain the latest river elevation downstream of Watts Bar Dam from the hydro plant by calling 365-6300. Record this on the data sheet and use it to calculate the test discharge pressure.
- 5.3 Connect the test  $\Delta P$  gauge to the test taps for the flow element associated with the pump to be tested, but do not open the root valves yet. Record the test  $\Delta P$  gauge ID number and calibration due date.
- 5.4 Start the designated backup pump to supply raw service water and fire protection water while the test is being conducted.
- 5.5 Ensure that raw service water head tank isolation valves 0-FCV-25-90 and 0-FCV-25-106 have closed.
- 5.6 Align the pump to be tested by fully closing its discharge valve, while fully opening the test line isolation valve, and opening the test line throttle valve approximately  $2\frac{1}{2}$  turns. (Actual Flow will be set in Step 5.8).
- 5.7 Start the pump being tested and once discharge pressure is obtained, valve in and vent the test  $\Delta P$  gage.
- 5.8 Use the test line throttle valve to adjust the discharge pressure to the value calculated in step 5.2.

- 5.9 Have Mechanical Engineering record pump vibrations per TI-31.2.
  - 5.10 Record the discharge pressure as read from the designated pressure indicator and the flow element  $\Delta P$  as read from the test gauge on the data sheet.
  - 5.11 Use the test line throttle valve to adjust the flow to 2385 gpm. This is achieved when the  $\Delta P$  shown on the test  $\Delta P$  gauge is  $330 \pm \frac{1}{10}$  inches of water.
  - 5.12 Record on the data sheet the discharge pressure as read from the designated pressure indicator and the flow element  $\Delta P$  as read from the test gauge.
  - 5.13 Stop the pump, close both the test line throttle and isolation valves and open the discharge valve.
  - 5.14 Remove the test gauge.
  - 5.15 Stop the backup pump and return both pump control switches to standby per steps 6 and 7 of section V.A of SOI-25/26.1.
  - 5.16 Notify the SRO that the test is completed.
  - 5.17 Calculate the pump total head and flow for steps 5.10 and 5.12 and record on the data sheet.
- 6.0 ACCEPTANCE CRITERIA
- 6.1 While operating at a total developed head of 330 feet of water, the pump delivered at least 1590 gpm.
  - 6.2 While operating at a flow rate of 2385 gpm the pump developed a head of (see punchlist).

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TABLE 1

TEST PUMP	BACKUP PUMP	DISCHARGE ISOLATION VALVE	TEST LINE ISOLATION VALVE	TEST LINE THROTTLE VALVE	TEST DISCHARGE PRESSURE GAUGE	FLOW ELEMENT
1A-A	1B-B	0-26-556	0-26-591	0-26-855	0-PI-26-2	0-FE-26-19
1B-B	1A-A	0-26-558	0-26-586	0-26-854	0-PI-26-5	0-FE-26-20
2A-A	2B-B	0-26-539	0-26-590	0-26-855	0-PI-26-10	0-FE-26-19
2B-B	2A-A	0-26-554	0-26-587	0-26-854	0-PI-26-12	0-FE-26-20

HIGH PRESSURE FIRE PROTECTION PUMP 1A-A

UNIT 1

Performed By \_\_\_\_\_  
Operator

Date \_\_\_\_\_

This data package contains 3 pages. If any pages were removed from the data package as supplied by Planning and Scheduling indicate by checkmark.  
 (If checked, explain in remarks.)

Were Technical Specifications criteria satisfied?  Yes  No

If criteria were not satisfied, notify the SRO who completes the following:

Was a limiting condition for operation violated?

\_\_\_\_\_ Yes (explain in remarks) \_\_\_\_\_ No (explain in remarks)

Verified by SRO \_\_\_\_\_ Date \_\_\_\_\_

Reason for test:

- \_\_\_\_\_ Required by schedule
- \_\_\_\_\_ Maintenance complete on \_\_\_\_\_
- \_\_\_\_\_ Another system ( \_\_\_\_\_ ) inoperable
- \_\_\_\_\_ Plant condition (explain) \_\_\_\_\_
- \_\_\_\_\_ Other (explain) \_\_\_\_\_

-----  
Review of Test Results

STA \_\_\_\_\_ Date \_\_\_\_\_

Review and Approval of Test Results

Cognizant Engineer \_\_\_\_\_ Date \_\_\_\_\_  
(Mechanical Engineering)

Rescheduled

P&S \_\_\_\_\_ Date \_\_\_\_\_

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FQE Review \_\_\_\_\_ Date \_\_\_\_\_



DATA SHEET 1  
HPFP PUMP 1A-A

5.15 Backup pump 1B-B stopped

1st Person      2nd Person

Pump handswitches returned to standby per SOI-25/26.1 \_\_\_\_\_

5.17 Calculations for step 5.10

Pump head = Discharge pressure (step 5.10)/.4335 + (742.7 - River El)

$$= ( \text{_____} / .4335 ) + ( 742.7 - \text{_____} )$$

$$= \text{_____} \text{ feet}$$

Acceptance criteria  $\geq$  330 feet

Flow = 131.24 x  $\sqrt{\text{Test gauge DP (steps 5.10)}}$

$$= 131.24 \times \sqrt{\text{_____}}$$

$$= \text{_____} \text{ gpm}$$

Acceptance criteria  $\geq$  1590 gpm

Calculations for step 5.12

Pump head = discharge pressure (step 5.12)/.4335+(742.7-River El)

$$= ( \text{_____} / .4335 ) + ( 742.7 - \text{_____} )$$

$$= \text{_____} \text{ feet}$$

Acceptance criteria (see punchlist)

Flow = 131.24 x  $\sqrt{\text{Test gauge DP (steps 5.12)}}$

$$= 131.24 \times \sqrt{\text{_____}}$$

$$= \text{_____} \text{ gpm}$$

Acceptance criteria  $\geq$  2385 gpm

Performed by: \_\_\_\_\_

Date \_\_\_\_\_

Remarks \_\_\_\_\_

HIGH PRESSURE FIRE PROTECTION PUMP 1B-B

UNIT 1

Performed By \_\_\_\_\_  
Operator

Date \_\_\_\_\_

This data package contains 3 pages. If any pages were removed from the data package as supplied by Planning and Scheduling indicate by checkmark.  
 (If checked, explain in remarks.)

Were Technical Specifications criteria satisfied?  Yes  No

If criteria were not satisfied, notify the SRO who completes the following:

Was a limiting condition for operation violated?

Yes (explain in remarks)  No (explain in remarks)

Verified by SRO \_\_\_\_\_ Date \_\_\_\_\_

Reason for test:

Required by schedule

Maintenance complete on \_\_\_\_\_

Another system ( \_\_\_\_\_ ) inoperable

Plant condition (explain) \_\_\_\_\_

Other (explain) \_\_\_\_\_

-----  
Review of Test Results

STA \_\_\_\_\_

Date \_\_\_\_\_

Review and Approval of Test Results

Cognizant Engineer \_\_\_\_\_  
(Mechanical Results)

Date \_\_\_\_\_

Rescheduled

P&S \_\_\_\_\_

Date \_\_\_\_\_

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FQE Review \_\_\_\_\_

Date \_\_\_\_\_



DATA SHEET 2  
HPFP PUMP 1B-B

5.15 Backup pump 1A-A stopped

First Person      Second Person

Pump handswitches returned to standby per SOI-25/26.1

5.17 Calculations for step 5.10

$$\begin{aligned} \text{Pump head} &= \text{Discharge pressure (step 5.10)} / .4335 + (742.7 - \text{River El}) \\ &= ( \quad / .4335 ) + ( 742.7 - \quad ) \\ &= \quad \text{feet} \end{aligned}$$

Acceptance criteria  $\geq$  330 feet

$$\begin{aligned} \text{Flow} &= 131.24 \times \sqrt{\text{Test gauge DP (steps 5.10)}} \\ &= 131.24 \times \sqrt{\quad} \\ &= \quad \text{gpm} \end{aligned}$$

Acceptance criteria  $\geq$  1590 gpm

Calculations for step 5.12

$$\begin{aligned} \text{Pump head} &= \text{discharge pressure (step 5.12)} / .4335 + (742.7 - \text{River El}) \\ &= ( \quad / .4335 ) + ( 742.7 - \quad ) \\ &= \quad \text{feet} \end{aligned}$$

Acceptance criteria (see punchlist)

$$\begin{aligned} \text{Flow} &= 131.24 \times \sqrt{\text{Test gauge DP (steps 5.12)}} \\ &= 131.24 \times \sqrt{\quad} \\ &= \quad \text{gpm} \end{aligned}$$

Acceptance criteria  $\geq$  2385 gpm

Performed by: \_\_\_\_\_ Date \_\_\_\_\_

Remarks \_\_\_\_\_  
\_\_\_\_\_

HIGH PRESSURE FIRE PROTECTION PUMP 2A-A

UNIT 2

Performed By \_\_\_\_\_  
Operator

Date \_\_\_\_\_

This data package contains 3 pages. If any pages were removed from the data package as supplied by Planning and Scheduling indicate by checkmark.  
 (If checked, explain in remarks.)

Were Technical Specifications criteria satisfied?  Yes  No

If criteria were not satisfied, notify the SRO who completes the following:

Was a limiting condition for operation violated?

Yes (explain in remarks)  No (explain in remarks)

Verified by SRO \_\_\_\_\_ Date \_\_\_\_\_

Reason for test:

Required by schedule  
 Maintenance complete on \_\_\_\_\_  
 Another system ( \_\_\_\_\_ ) inoperable  
 Plant condition (explain) \_\_\_\_\_  
 Other (explain) \_\_\_\_\_

-----  
Review of Test Results

STA \_\_\_\_\_ Date \_\_\_\_\_

Review and Approval of Test Results

Cognizant Engineer \_\_\_\_\_ Date \_\_\_\_\_  
(Mechanical Engineering)

Rescheduled

P&S \_\_\_\_\_ Date \_\_\_\_\_

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FQE Review \_\_\_\_\_ Date \_\_\_\_\_



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DATA SHEET 3  
HPFP PUMP 2A-A

5.15 Backup pump 2B-B stopped

First Person      Second Person

Pump handswitches returned to standby per SOI-25/26.1

5.17 Calculations for step 5.10

Pump head = Discharge pressure (step 5.10)/.4335 + (742.7 - River El)

$$= ( \underline{\hspace{2cm}} / .4335 ) + ( 742.7 - \underline{\hspace{2cm}} )$$

$$= \underline{\hspace{2cm}} \text{ feet}$$

Acceptance criteria  $\geq$  330 feet

Flow = 131.24 x  $\sqrt{\text{Test gauge DP (steps 5.10)}}$

$$= 131.24 \times \sqrt{\underline{\hspace{2cm}}}$$

$$= \underline{\hspace{2cm}} \text{ gpm}$$

Acceptance criteria  $\geq$  1590 gpm

Calculations for step 5.12

Pump head = discharge pressure (step 5.12)/.4335+(742.7-River El)

$$= ( \underline{\hspace{2cm}} / .4335 ) + ( 742.7 - \underline{\hspace{2cm}} )$$

$$= \underline{\hspace{2cm}} \text{ feet}$$

Acceptance criteria (see punchlist)

Flow = 131.24 x  $\sqrt{\text{Test gauge DP (steps 5.12)}}$

$$= 131.24 \times \sqrt{\underline{\hspace{2cm}}}$$

$$= \underline{\hspace{2cm}} \text{ gpm}$$

Acceptance criteria  $\geq$  2385 gpm

Performed by: \_\_\_\_\_

Date \_\_\_\_\_

Remarks \_\_\_\_\_  
\_\_\_\_\_

HIGH PRESSURE FIRE PROTECTION PUMP 2B-B

UNIT 2

Performed By \_\_\_\_\_  
Operator

Date \_\_\_\_\_

This data package contains 3 pages. If any pages were removed from the data package as supplied by Planning and Scheduling indicate by checkmark.  
 (If checked, explain in remarks.)

Were Technical Specifications criteria satisfied?  Yes  No

If criteria were not satisfied, notify the SRO who completes the following:

Was a limiting condition for operation violated?

Yes (explain in remarks)  No (explain in remarks)

Verified by SRO \_\_\_\_\_ Date \_\_\_\_\_

Reason for test:

- Required by schedule
- Maintenance complete on \_\_\_\_\_
- Another system ( \_\_\_\_\_ ) inoperable
- Plant condition (explain) \_\_\_\_\_
- Other (explain) \_\_\_\_\_

-----  
Review of Test Results

STA \_\_\_\_\_ Date \_\_\_\_\_

Review and Approval of Test Results

Cognizant Engineer \_\_\_\_\_ Date \_\_\_\_\_  
(Mechanical Engineering)

Rescheduled

P&S \_\_\_\_\_ Date \_\_\_\_\_

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FQE Review \_\_\_\_\_ Date \_\_\_\_\_



DATA SHEET 4  
HPFP PUMP 2B-B

5.15 Backup pump 2A-A stopped

First Person      Second Person

Pump handswitches returned to standby per SOI-25/26.1 \_\_\_\_\_

5.17 Calculations for step 5.10

$$\begin{aligned} \text{Pump head} &= \text{Discharge pressure (step 5.10)} / .4335 + (742.7 - \text{River El}) \\ &= ( \text{_____} / .4335 ) + (742.7 - \text{_____} ) \\ &= \text{_____} \text{ feet} \end{aligned}$$

Acceptance criteria  $\geq$  330 feet

$$\text{Flow} = 131.24 \times \sqrt{\text{Test gauge DP (steps 5.10)}}$$

$$= 131.24 \times \sqrt{\text{_____}}$$

$$= \text{_____} \text{ gpm}$$

Acceptance criteria  $\geq$  1590 gpm

Calculations for step 5.12

$$\text{Pump head} = \text{discharge pressure (step 5.12)} / .4335 + (742.7 - \text{River El})$$

$$= ( \text{_____} / .4335 ) + (742.7 - \text{_____} )$$

$$= \text{_____} \text{ feet}$$

Acceptance criteria (see punchlist)

$$\text{Flow} = 131.24 \times \sqrt{\text{Test gauge DP (steps 5.12)}}$$

$$= 131.24 \times \sqrt{\text{_____}}$$

$$= \text{_____} \text{ gpm}$$

Acceptance criteria  $\geq$  2385 gpm

Performed by: \_\_\_\_\_ Date \_\_\_\_\_

Remarks \_\_\_\_\_  
\_\_\_\_\_