

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT PLANT

AUXILIARY FEEDWATER PUMPS ENDURANCE TEST

## OBJECTIVE

The object of the test was to perform an endurance test on auxiliary feedwater pumps by demonstrating that each pump could run for 48 hours, stopped, cooled, and run for an extra hour without degradation.

The acceptance criteria was that the bearing temperatures and vibrations of the pumps remain within the design limits, and that ambient conditions of the pump area do not exceed environmental qualification limits for safety related equipment in the area. The parameters of each pump (Flow, head, speed) were also to be compared to design operating conditions.

## DESIGN BASIS

The auxiliary feedwater system is designed to supply feedwater to the steam generators in case of loss of normal feedwater. This system is also designed to keep the unit at hot stand by, for a limited period of time, in case of loss of offsite power. If the offsite power is not restored during hot standby, the system stays in service until the reactor temperature and pressure is lowered to a level where the residual heat removal system can be put in operation.

Each of the three quick-starting steam turbine driven auxiliary feedwater pumps, shared by Turkey Point Units 3 and 4, is capable of delivering 600 GPM to the steam generators between 120 psig. to 1085 psig. at respective rated speed of 3200 rpm to 5900 rpm. The auxiliary feedwater pumps are installed such that each supplies auxiliary feedwater to either Unit 3 or 4, with any single pump supplying the total feedwater requirement of either unit.

## ENDURANCE TEST

The endurance test of the auxiliary feedwater pumps at Turkey Point Plant was conducted between May 17 and June 23, 1980. The test was performed in accordance to special test procedure ST-80-04. Copies of completed test procedure, flow diagram, graphs of ambient temperatures and bearing temperatures versus elapsed time are attached.

The following is a brief description of the test method:

1. Each auxiliary feedwater pump was individually run for 48 hours. The first 2 hours at 600 GPM and 5900 rpm, and the remaining 46 hours at a lower flow (150 GPM) and a speed that the pumps normally run to deliver this flow to steam generators. The pump was then stopped, restarted after cooldown, and run for one hour at a speed set by the governor controls to deliver 600 GPM to the steam generators. The entire test was conducted with flows to Unit 3 steam generators. The developed heads of the pumps at low flow (corrected for the speed of 5900 rpm), and at design flow were expectably close to the manufacturer's curve. The developed heads of the B and C pumps were almost the same, while that of the A pumps was about 50 psi. lower than B and C.

A summary comparison of relevant parameters is listed below (mini-recirculation valve was closed when the pumps were being tested at design flow):

<u>Pump</u>	<u>Speed (rpm)</u>	<u>Flow (GPM)</u>	<u>Head (Psi)</u>
A	5900	600	1122.4
B	5900	600	1177
C	5900	600	1171
design (3200-5900)	5900	600	1201

2. The vibrations of the pumps were measured horizontally and vertically at the pump inboard and outboard bearings. The vibration of the drivers were measured horizontally, vertically, and axially at their inboard and outboard bearings. All vibrations were measured by use of a calibrated vibrometer, and the values obtained were satisfactory.
3. The bearing temperatures of the pumps and the drivers were measured at their respective inboard and outboard bearings, by use of a calibrated contact pyrometer. The values obtained were satisfactory.
4. Ambient temperatures was determined by use of the same calibrated pyrometer in the general vicinity of each auxiliary feedwater pump.

The specifications for the auxiliary feedwater equipment requires them to be suitable for outdoor installation in an area subject to the affect of severe sea coast weather conditions, including hurricane winds, torrential rains, and high ambient temperature and humidity. Therefore the acceptance criteria for ambient temperature and humidity for this test was not applicable, and no humidity data was taken. The ambient temperature obtained during the test was normal and did not exceed 95F.

#### SUMMARY

A 48 hour endurance test was performed on each auxiliary feedwater pump at Turkey Point Plant during May and June, 1980, to demonstrate that each could run for this period without degradation. Copies of completed test procedure, flow diagram, and graphs of ambient and bearing temperatures versus elapsed time are attached. Each pump was run at 600 gpm and 5900 rpm for two hours, and at 150 GPM and a speed that pump normally runs to deliver such flow to steam generators for the remaining 46 hours. After running for 48 hours, the pump being tested was stopped, cooled, restarted and run for one hour at 600 GPM and normal speed.

The developed head for the delivered flow of the pumps were expectably close to the manufacturer's curve, with the developed head by the A pump being approximately 50 psi. lower than B and C pumps. The values obtained for vibrations and bearing temperatures for the pumps and drivers were satisfactory. The ambient temperature of the area was not severely affected by the pump run, and it never exceeded 95F during the entire test. An acceptance criteria for humidity and ambient temperature (due to qualified equipment for severe weather conditions, required by the original specification) was not applicable, and humidity was not obtained during the test.

FLORIDA POWER AND LIGHT COMPANY  
TURKEY POINT UNITS 3 AND 4  
SPECIAL TEST ST-80-04  
MAY 15, 1980

1.0 Title:

AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

2.0 Approval and List of Effective Pages:

2.1 Approval:

Reviewed by Plant Nuclear Safety Committee: 80-26

and Approved by Plant Manager - Nuclear: 5/15/80

2.2 List of Effective Pages:

<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>
1	5/15/80	4	5/15/80	7	5/15/80	10	5/15/80
2	5/15/80	5	5/15/80	8	5/15/80	11	5/15/80
3	5/15/80	6	5/15/80	9	5/15/80	12	5/15/80

3.0 Purpose and Discussion:

3.1 Purpose:

This procedure provides instructions for performing a 48 hour endurance test on each Auxiliary Feedwater Pump.

3.2 Test Acceptance Criteria:

Test acceptance criteria shall include a demonstration that the pump remain within design limits, and that the pump area ambient conditions of temperature and humidity do not exceed environmental qualification limits for safety related equipment in the room. In addition, it shall be demonstrated that the pumps can be shutdown, allowed to cooldown, restarted, and run for one hour.

3.2.1 Pump flow and head (at design) to be compared with the manufacturer's curve.

3.2.2 Vibration not to exceed 3 mils.

3.2.3 Bearing temperature not to exceed 160° F (pump) and 180° F (turbine).

4.0 Precautions and Limits:

4.1 Test only one auxiliary feedwater pump at a time to minimize reactivity addition to the core.

- 4.2 Monitor reactor power to ensure that it is maintained at or below 100% during this test.
- 4.3 Monitor steam generator levels closely when an auxiliary feedwater pump is started, to insure that the steam generator water level control system maintains programmed levels.
- 4.4 The auxiliary feedwater pump turbine will trip on overspeed at 6500 rpm.
- 4.5 The auxiliary feedwater pump steam supply valve motors (MOV-\*-1403, 1404, 1405) will trip on overcurrent.
- 4.6 The auxiliary feedwater pump should be stopped by manually closing the steam supply valves (MOV-\*-1403, 1404, 1405). As the pump slows down, trip the turbine overspeed trip valve. Do not allow pump to coast to a stop before manually tripping, as damage may occur to the water lubricated pump internals. Tripping the pump overspeed trip prior to securing steam supply may cause safeties to lift.
- 4.7 The operator at the auxiliary feedwater pumps shall remain in the area of the auxiliary feedwater pumps and maintain communications with the control room until all auxiliary feedwater pumps have been reset for standby operation.
- 4.8 The following interlocks exist in the auxiliary feedwater system:
  - 4.8.1 The auxiliary feedwater pump steam supply valves (MOV-\*-1403, 1404, 1405) open on initiation of safety injection, low low level in any steam generator, automatic trip of both feedwater pumps, loss of voltage on both 4160 volt busses, or manually.
  - 4.8.2 Air to operate the auxiliary feedwater to steam generator control valves (CV-\*-2816, 2817, 2818, 2831, 2832, 2833) is supplied when the steam supply valves (MOV-\*-1403, 1404, 1405) commence opening.
  - 4.8.3 When auxiliary feedwater pump steam supply pressure as determined by PS-2312, 2313, and 2314 increases to 110 psig, the auxiliary feedwater steam supply pressure control valves (CV-3705, 3706 and 3707 respectively) open to supply steam to the auxiliary feedwater pump turbines at  $300 \pm 20$  psig, and SV-2823, 2824 and 2825 open to supply service water to the turbine lube oil coolers.
- 4.9 Prior to removing a pump from service, operability of other pumps shall be verified.
- 4.10 When a pump is to be put back into service after maintenance it shall be tested to verify its operability.

#### 5.0 Related System Status:

- 5.1 The condensate storage tank is available to supply water to the auxiliary feedwater pumps. Condensate storage tank level is in the normal operating band, and all instrumentation and alarms are operable.

5.2 The service water system is lined up to supply cooling water to the auxiliary feedwater pump turbine lube oil coolers.

5.3 The 480 volt motor control centers 3A (4A) Turbine Area, 3B (4B) Reactor Area and 3C (4C) Fuel Area are energized.

#### 6.0 References:

6.1 Operating Procedure 7304.1, Auxiliary Feedwater System - Periodic Test

6.2 NRC Letter of December 3, 1979, (Subject: Auxiliary Feedwater Pump - Endurance Test), Telecopy of January 25, 1980.

#### 7.0 Records Required:

A completed copy of this procedure shall be routed to the Technical Department for analysis, and shall be retained after the completion of the analysis.

#### 8.0 Instructions:

Each auxiliary feedwater pump shall be operated for at least 48 hours in accordance to this procedure. Each pump shall then be shut down and cooled off, restarted, and operated for an additional one hour.

#### INITIALS

BAA

8.1 Obtain permission from the Nuclear Plant Supervisor and/or Nuclear Watch Engineer to start the test.

BAA

8.2 Station an operator in the area of the auxiliary feedwater pumps and establish communications with the control room. The operator shall remain in the area of the auxiliary feedwater pumps in case there is a need to return the pumps back to service immediately. The operator shall not leave the area until all the auxiliary feedwater pumps have been reset for standby operation.

BAA

8.3 Sufficient instrumentation shall be available to obtain the data required to verify that the acceptance criteria have been met. Verify calibration for all the instrumentation used.

BAA

8.4 Perform the following for each auxiliary feedwater pump:

#### INITIALS

A	B	C
<u>BAA</u>	<u>BAA</u>	<u>*</u>
<u>BAA</u>	<u>BAA</u>	<u>*</u>

8.4.1 Verify that the service water system is lined up to supply the auxiliary feedwater pump lube oil cooler.

8.4.2 Verify normal oil levels in the lube oil sump and governor oil sump.

INITIALS

A	B	C	
<u>BAA</u>	<u>BAA</u>	<u>*</u>	8.4.3 Verify that the free blow valve and the inlet valve, outlet valve, and the bypass valve around the steam trap associated with each auxiliary feedwater pump are open.
<u>BAA</u>	<u>*</u>		8.4.4 Verify that the turbine condensate drain valve and the steam exhaust line drain valve are cracked open.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.5 Obtain the initial data on the data sheet and record.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.6 Manually trip the turbine overspeed trip valves to the auxiliary feedwater pumps not being tested.
NOTE: If a pump has already been tested and now the test is being performed on the second or third pump, just verify that overspeed trip valves to the pumps not being tested are tripped.			
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.7 Install a manual speed controller on the governor and set at approximately 10 lbs air pressure.
<u>BAA</u>	<u>BAA</u>	<u>*</u>	8.4.8 Nuclear Control Center Operator position the valve control switch for MOV--1403, 1404, and 1405 to the open position. Verify that the position indicating lights operate properly.
NOTE: Monitor reactor power and maintain at or below 100%.			
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.9 Operator in the auxiliary feedwater pump area verify (for pump being tested) that pump discharge pressure increases as turbine comes up to speed and that lube oil and steam supply pressures are normal.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.10 Operator at the pump and Nuclear Control Center Operator, if any abnormal condition occurs secure the supply steam, then trip the turbine.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.11 Nuclear Control Center Operator ensure that steam generator programmed levels are maintained as auxiliary feedwater flow is supplied to the steam generators. Decrease load (if necessary) to balance Tavg and Tref.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.12 In addition to obtaining flows of 200 gpm to each steam generator, adjust pump speed to 5900 rpm and slowly close recirc valve 177 (277, 377) for pump A (B, C) to the condensate storage tank.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.13 Operator in the auxiliary feedwater pump area close the free blow valve and the bypass valve around the steam trap when the steam supply line has been warmed up and is free of moisture.
<u>BAA</u>	<u>WLL</u>	<u>*</u>	8.4.14 Readjust flows and speed to above required values, if necessary. Maintain the flow at 600 GPM and speed at 5900 rpm for 2 hrs and record data at specified time interval on the data sheet.

INITIALS

A B C

NOTE: If complications arise due to condensate reject problems or any other cause, the flow may be decreased. But at the same time during the test, there shall be two hours of continuous 600 gpm flow delivered to the steam generators.

- |            |           |          |        |  |
|------------|-----------|----------|--------|--|
| <u>BAA</u> | <u>NA</u> | <u>*</u> | 8.4.15 | After 2 hours of operation, reduce the flow to 150 gpm and reduce the speed to where the pump developed discharge pressure is approximately 125 psi above the steam pressure. Maintain the flow and speed for the remaining 46 hours and record data at specified time interval on the data sheet. |
| <u>BAA</u> | <u>*</u>  | <u>*</u> | 8.4.16 | Operator at the auxiliary feedwater pump area open recirc valve 177 (277, 377) from A (B, C) pump to CST.  |
| <u>BAA</u> | <u>*</u>  | <u>*</u> | 8.4.17 | Nuclear Control Center Operator close MOV-*1403, 1404, and 1405 to stop the steam supply. Operator at the auxiliary feedwater pump area stop the operating pump by manually tripping the overspeed trip valve (as MOV-1403, 1404, and 1405 close).   |
| <u>BAA</u> | <u>*</u>  | <u>*</u> | 8.4.18 | Open the free blow valve and the bypass valve around the steam trap.   |
| <u>BAA</u> | <u>*</u>  | <u>*</u> | 8.4.19 | Operator at the auxiliary feedwater pump area reset the overspeed trip valve on the pump to be tested next. Leave the overspeed trip valves to the pumps not being tested in the trip position.  |
| <u>*</u>   | <u>*</u>  | <u>*</u> | 8.4.20 | Complete steps 8.4.1 through 8.4.17 for the remaining auxiliary feedwater pumps.   |
| <u>BAA</u> | <u>*</u>  | <u>*</u> | 8.4.21 | Disconnect the manual speed controller and return to original connection.  |
| <u>*</u>   | <u>*</u>  | <u>*</u> | 8.4.22 | Allow the pump(s) to cool down until pump temperatures reduce to within 20° F. of their values at the start of the 48 hour test and at least 8 hours have elapsed. Record the required data then restart the pump. Assure the pump delivers 600 gpm within 3 minutes.                              |

Time to deliver flow:

A Pump: ✓ B Pump: ✗ C Pump: ✓

Operate the pump in this mode for one hour and record the specified data after the hour is up.

NOTE 1: Free blow valve and the bypass valve around the steam trap are to be closed during the pump run and open after stopping the pump.



INITIALS

A   B   C

NOTE 2:

This step may be performed before step 8.4.19.  
Disconnect the manual speed controller and return  
to original connection before performing this step.

- |          |          |          |        |   |
|----------|----------|----------|--------|---|
| <u>*</u> | <u>*</u> | <u>*</u> | 8.4.23 | <u>Nuclear Control Center Operator and Operator at auxiliary feedwater area stop the pump per step 8.4.17.</u>  |
| <u>*</u> | <u>*</u> | <u>*</u> | 8.4.24 | <u>Nuclear Control Center Operator reset HC-*-2816, 2817, and 2818 to zero 50 percent valve position.</u>   |
| <u>*</u> | <u>*</u> | <u>*</u> | 8.4.25 | Reset all the auxiliary feedwater overspeed trip valves, and leave the system ready for standby operation.  |
| <u>*</u> | <u>*</u> | <u>*</u> | 8.4.26 | A second operator is required to verify that all the pumps' recirculation valves are open, the overspeed trip valves are reset, the free blow valves and the bypass valves around the steam traps are open, and the system is ready for standby operation. Initial upon verification. |
| <u>*</u> | <u>*</u> | <u>*</u> | 8.4.27 | Notify the Shift Supervisor upon completion of the test.  |

\*

1- The extra 1 hr run of the A pump is to be done after the 48 hr run for all pumps is complete.

2- B pump was stopped due to unit trip at N 4:35 AM on 5/21/80. The run on this pump will be repeated.

B. All  
5/21/80

5/15/80

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AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "A"

Pump Start Time: 1:45 AM 5/17/80

DATA SET	AMBIENT TEMPERATURE (F) INST. NO.: ALNOR DIG CAL. DATE: 12/5/79	SPEED (RPM) 1538A INST. NO.: Gen Radio CAL. DATE: 2/21/80	TOTAL FLOW (GPM) FI- -1401 5/12/80 FI- -1457 5/13/80 FI- -1458 5/14/80 CAL. DATE: 5	SUCTION PRESSURE (PSIG) GAGE NO.: 1045 CAL. DATE: 4-18-80	DISCHARGE PRESSURE (PSIG) PI-1429 CAL. DATE: 2/26/80	PUMP TOTAL STATIC HEAD	INITIALS
INITIAL	83	0	0	18.8	-	-	BAA
AFTER START	84	5900	600	17.5	1140	1122.5	BAA
HOUR 2	86	5900	600	17.7	1140	1122.3	BAA
HOUR 4	82	4700	150	19.2	875	855.8	EAS
HOUR 8	84	4775	150	19.0	895	876	JH
HOUR 12	86	4800	150	18.1	90A	881.9	JH
HOUR 16	86	4860	150	18.5	925	906.5	JH
HOUR 20	87	4700	150	17.6	870	852.1	BAA
HOUR 24	86	4700	150	17.8	875	857.2	BAA
HOUR 28	85	4700	150	17.4	875	857.6	BAA
HOUR 32	84	4650	180	18.0	830	812	JH
HOUR 36	88	4700	150	17.6	850	832.4	JH
HOUR 40	86	4900	150	16.2	930	913.8	JH
HOUR 44	86	4700	150	16.2	875	858.8	BAA
HOUR 48	84	4700	150	17.6	875	857.4	E
Cooled _____ hour after stop							
RESTART							
1 Hour after restart							

The specifications for the AFW pumps require them to be suitable for outdoor installation in an area subject to the affect of severe sea coast weather conditions including hurricane winds and torrential rains, high ambient temperature and humidity. Therefore, the acceptance criteria for ambient temperature and humidity for this test is not applicable, and no humidity data was taken.

Data Reviewed by

*B. A. L.*

Date: 5/19/80

5/19/80  
1:45 AM  
5/19/80

SPECIAL TEST ST-80-04, PAGE 8  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "A"

DATA SET	MAIN STEAM		STM SUPP. PRESS. (PSIG) PI-3705 CAL. DATE: 5.12.80	VIBRATION (Mils) INSTR. NO.: <u>IRD 308</u> CAL. DATE: <u>2/21/80</u>										BEARING TEMPERATURE (F) INSTR. NO.: <u>ALNOR DIG</u> CAL. DATE: <u>12/5/79</u>				LUBE OIL PRESSURE COOLER DISCH. > 15 PSIG	INITIALS
	PRESS. (psig) PI-1416 CAL. DATE: <u>2/26/80</u>	TEMP. (F) STEAM TABLE		PUMP					TURBINE					PUMP		TURBINE			
				INB.		OUTB.		A	INB.		OUTB.		A	INB.		OUTB.			
				H	V	H	V		H	V	H	V		INB.	OUTB.	INB.	OUTB.		
INITIAL	750	510.8	0	.35	.13	.3	.17	.17	.1	.16	.16	.2	86	84	88	88	0	BAA	
AFTER START	730	507.7	355	.6	.55	.7	.42	.52	.44	.55	.5	.35	100	102	102	116	22	BAA	
20 Min	730	507.7	355	.55	.74	.65	.34	.52	.45	.5	.45	.35	100	102	104	116	22	BAA	
40 Min	730	507.7	355	.54	.62	.68	.35	.42	.5	.52	.45	.35	102	102	104	114	22	BAA	
60 Min	730	507.7	355	.6	.64	.6	.36	.5	.46	.5	.45	.35	102	103	102	114	22	BAA	
HOURL 2	730	507.7	355	.6	.64	.68	.35	.46	.46	.48	.40	.3	100	100	102	116	22	BAA	
HOURL 4	750	510.8	355	.5	.9	.66	.39	.52	.2	.4	.22	.35	100	100	99	115	22	EAS.	
HOURL 8	745	510.1	358	.54	.8	.65	.34	.45	.18	.3	.25	.30	98	95	103	118	22	JH	
HOURL 12	745	510.1	360	.42	1.0	.7	.45	.2	.16	.25	.25	.25	97	97	100	117	22	JH	
HOURL 16	750	510.8	355	.45	1.0	.7	.40	.22	.2	.24	.21	.25	97	95	99	115	22	JH	
HOURL 20	750	510.8	360	.54	.98	.65	.34	.22	.18	.26	.18	.25	97	99	100	115	22	BAA	
HOURL 24	750	510.8	360	.54	.95	.65	.35	.24	.16	.25	.18	.25	95	97	99	117	22	BAA	
HOURL 28	750	510.8	360	.52	.85	.66	.32	.22	.15	.28	.2	.25	95	95	99	115	22	BAA	
HOURL 32	750	510.8	360	.55	.95	.69	.36	.25	.15	.32	.2	.31	98	97	100	115	22	JH	
HOURL 36	750	510.8	360	.56	.9	.65	.34	.24	.18	.30	.22	.35	100	97	104	111	22	JH	
HOURL 40	750	510.8	360	.48	.8	.63	.41	.22	.22	.26	.2	.35	93	97	102	113	22	JH	
HOURL 44	750	510.8	360	.55	.94	.76	.34	.22	.18	.3	.118	.35	93	97	99	115	22	BAA	
HOURL 48	750	510.8	360	.50	.9	.74	.30	.22	.18	.3	.22	.3	93	95	99	115	22	BAA	
Cooled																			
hour after stop																			
RESTART																			
1 Hour after restart																			

Data Reviewed by

B. A. RO

Date

5/19/80

5/15/80

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AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "B"

Pump Start Time: 9:25 AM 5/19/80

DATA SET	AMBIENT TEMPERATURE (F). INST. NO.: ALNOR Dig CAL. DATE: 12/5/79	SPEED (RPM) 1538A INST. NO.: Gen Radio Strobolac CAL. DATE: 2/21/80	TOTAL FLOW (GPM) FI-3-1401 5/13/80 FI-3-1457 5/13/80 FI-3-1458 5/14/80 CAL. DATE: 5/14/80	SUCTION PRESSURE (PSIG) GAGE NO.: 1045 CAL. DATE: 4/12/80	DISCHARGE PRESSURE (PSIG) PI-1430 CAL. DATE: 2/26/80	PUMP TOTAL STATIC HEAD	INITIALS
INITIAL	83	0	0	18.7	-	-	WAL
AFTER START	86	5900	600	17	1170	1153	EAD
HOURL 2	88	5900	600	17	1180	1163	EAD
HOURL 4	93	4800	150	19	900	981	EAD
HOURL 8	90	4800	150	17.5	900	981.5	WAL
HOURL 12	88	4750	150	17.8	880	862.2	BAA
HOURL 16	90	4700	150	18.7	875	856.3	BAA
HOURL 20	87	4730	150	19.2	875	855.8	BAA
HOURL 24	93	4700	150	17.5	875	857.5	WAL
HOURL 28	90	4720	150	18.0	880	862.0	EAD
HOURL 32	93	4700	150	18.0	880	862	EAD
HOURL 36	86	4800	150	16.5	900	883.5	EAD
HOURL 40	86	4825	150	17.5	925	907.5	WAL
HOURL 44							
HOURL 48							
Cooled _____ hour after stop.							
RESTART							
1. Hour after restart							

The specifications for the AFW pumps require them to be suitable for outdoor installation in an area subject to the affect of severe sea coast weather conditions including hurricane winds and torrential rains, high ambient temperature and humidity. Therefore, the acceptance criteria for ambient temperature and humidity for this test is not applicable, and no humidity data was taken.

Data Reviewed by

*B. All*

Date:

5/21/80

SPECIAL TEST ST-80-04, PAGE 10  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "B"

DATA SET	MAIN STEAM		STM SUPP. PRESS. (PSIG) PI-3706 CAL. DATE: 2/26/80	VIBRATION (Mils) INSTR. NO.: IRD 306 CAL. DATE: 1-23-80										BEARING TEMPERATURE (F) INSTR. NO.: Alnor Design CAL. DATE: 12-5-79				LUBE OIL PRESSURE COOLER DISCH. > 15 PSIG	INITIALS
	PRESS. (psig) PI-1417 CAL. DATE: 2/26/80	TEMP. (F) STEAM TABLE		PUMP					TURBINE					PUMP		TURBINE			
				INB.		OUTB.		A	INB.		OUTB.		A	INB.	OUTB.	INB.	OUTB.		
				H	V	H	V		H	V	H	V							
INITIAL	750	510.8	0	.15	.2	.3	.09	.15	.09	.1	.1	.12	84	84	100	100	0	WRZ	
AFTER START	750	510.8	350	.9	.35	.7	.3	.6	.22	.5	.3	.5	102	108	112	112	19	EAD	
20 Min	745	510.1	350	.8	.30	.7	.4	.5	.3	.5	.25	.5	103	106	113	112	19	EAD	
40 Min	745	510.1	350	.7	.35	.6	.35	.55	.35	.4	.25	.4	104	106	111	111	20	EAD	
60 Min	750	510.8	350	.65	.45	.55	.3	.6	.4	.6	.35	.4	100	102	109	110	20	EAD	
1 HOUR 2	750	510.8	350	.60	.40	.45	.25	.45	.35	.55	.4	.45	100	104	109	110	20	EAD	
1 HOUR 4	770	513.8	350	.50	.30	.40	.2	.20	.15	.3	.2	.7	99	102	106	105	18	EAD	
1 HOUR 8	750	510.8	350	.40	.30	.40	.3	.20	.10	.3	.15	.4	99	102	105	104	18	WRZ	
1 HOUR 12	750	510.8	350	.40	.25	.38	.21	.2	.15	.3	.2	.3	100	100	109	111	18	BAA	
1 HOUR 16	755	511.5	350	.40	.22	.35	.25	.2	.18	.3	.2	.3	100	100	109	113	18	BAA	
1 HOUR 20	755	511.5	350	.40	.22	.30	.20	.25	.18	.3	.2	.2	97	100	109	109	18.5	BAA	
1 HOUR 24	755	511.5	350	.38	.25	.25	.35	.18	.14	.38	.15	.3	97	99	108	106	18.5	WRZ	
1 HOUR 28	755	511.5	350	.35	.20	.28	.25	.18	.14	.3	.16	.3	102	108	115	117	18	EAD	
1 HOUR 32	755	511.5	350	.25	.20	.30	.25	.2	.15	.3	.15	.3	102	109	115	117	17.5	EAD	
1 HOUR 36	770	513.8	350	.3	.20	.30	.20	.2	.15	.25	.15	.3	99	108	117	115	18	EAD	
1 HOUR 40	770	513.8	350	.3	.20	.35	.25	.15	.2	.3	.18	.4	102	108	111	115	18	WAK	
1 HOUR 44																			
1 HOUR 48																			
Cooled																			
hour																			
after stop																			
RESTART																			
1 Hour after restart																			

Data Reviewed by

*B. A. R.*

Date 5/21/80

SPECIAL TEST ST-80-04, PAGE 11  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "C"

Pump Start Time: \_\_\_\_\_

DATA SET	AMBIENT TEMPERATURE (F) INST. NO.: CAL. DATE:	SPEED (RPM) INST. NO.: CAL. DATE:	TOTAL FLOW (GPM) FI- -1401 FI- -1457 FI- -1458 CAL. DATE:	SUCTION PRESSURE (PSIG) GAGE NO.: CAL. DATE:	DISCHARGE PRESSURE (PSIG) PI-1431 CAL. DATE:	PUMP TOTAL STATIC HEAD	INITIALS
INITIAL							
AFTER START							
HOUR 2							
HOUR 4							
HOUR 8							
HOUR 12							
HOUR 16							
HOUR 20							
HOUR 24							
HOUR 28							
HOUR 32							
HOUR 36							
HOUR 40							
HOUR 44							
HOUR 48							
Cooled hour after stop							
RESTART							
1 Hour after restart							

The specifications for the AFW pumps require them to be suitable for outdoor installation in an area subject to the effects of severe sea coast weather conditions including hurricane winds and torrential rains, high ambient temperature and humidity. Therefore, the acceptance criteria for ambient temperature and humidity for this test is not applicable, and humidity data was taken.

Data Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

SPECIAL TEST ST-80-04, PAGE 12  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "C"

DATA SET	MAIN STEAM		STM SUPP. PRESS. (PSIG) PI-3707 CAL. DATE:	VIBRATION (Mils) INSTR. NO.: CAL. DATE:										BEARING TEMPERATURE (F) INSTR. NO.: CAL. DATE:				LUBE OIL PRESSURE COOLER DISCH. > 15 PSIG	INITIAL
	PRESS.(psig) PI-1418 CAL. DATE:	TEMP. (F) STEAM TABLE		PUMP					TURBINE					PUMP		TURBINE			
				INB.		OUTB.		INB.		OUTB.		INB.	OUTB.	INB.	OUTB.				
				H	V	H	V	H	V	H	V					A			
INITIAL																			
AFTER START																			
20 Min																			
40 Min																			
60 Min																			
Hour 2																			
Hour 4																			
Hour 8																			
Hour 12																			
Hour 16																			
Hour 20																			
Hour 24																			
Hour 28																			
Hour 32																			
Hour 36																			
Hour 40																			
Hour 44																			
Hour 48																			
Cooled _____ hour																			
after stop																			
RESTART																			
1 Hour after restart																			

Data Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

FLORIDA POWER AND LIGHT COMPANY  
TURKEY POINT UNITS 3 AND 4  
SPECIAL TEST ST-80-04  
JUNE 4, 1980

1.0 Title:

AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

2.0 Approval and List of Effective Pages:

2.1 Approval:

Change Dated 6/4/80 Reviewed by Plant Nuclear Safety Committee: 80-33  
and Approved by Plant Manager - Nuclear: 6/4/80

2.2 List of Effective Pages:

<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>
1	6/4/80	4	6/4/80	7	6/4/80	10	6/4/80
2	6/4/80	5	6/4/80	8	6/4/80	11	6/4/80
3	6/4/80	6	6/4/80	9	6/4/80	12	6/4/80

3.0 Purpose and Discussion:

3.1 Purpose:

This procedure provides instructions for performing a 48 hour endurance test on each Auxiliary Feedwater Pump.

3.2 Test Acceptance Criteria:

Test acceptance criteria shall include a demonstration that the pump remain within design limits, and that the pump area ambient conditions of temperature and humidity do not exceed environmental qualification limits for safety related equipment in the room. In addition, it shall be demonstrated that the pumps can be shutdown, allowed to cooldown, restarted, and run for one hour.

3.2.1 Pump flow and head (at design) to be compared with the manufacturer's curve.

3.2.2 Vibration not to exceed 3 mils.

3.2.3 Bearing temperature not to exceed 160° F (pump) and 180° F (turbine).

4.0 Precautions and Limits:

4.1 Test only one auxiliary feedwater pump at a time to minimize reactivity addition to the core.



SPECIAL TEST ST-80-04, PAGE 2  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

- 4.2 Monitor reactor power to ensure that it is maintained at or below 100% during this test.
- 4.3 Monitor steam generator levels closely when an auxiliary feedwater pump is started, to insure that the steam generator water level control system maintains programmed levels.
- 4.4 The auxiliary feedwater pump turbine will trip on overspeed at 6500 rpm.
- 4.5 The auxiliary feedwater pump steam supply valve motors (MOV-\*-1403, 1404, 1405) will trip on overcurrent.
- 4.6 The auxiliary feedwater pump should be stopped by manually closing the steam supply valves (MOV-\*-1403, 1404, 1405). As the pump slows down, trip the turbine overspeed trip valve. Do not allow pump to coast to a stop before manually tripping, as damage may occur to the water lubricated pump internals. Tripping the pump overspeed trip prior to securing steam supply may cause safeties to lift.
- 4.7 The operator at the auxiliary feedwater pumps shall remain in the area of the auxiliary feedwater pumps and maintain communications with the control room until all auxiliary feedwater pumps have been reset for standby operation. This operator is also to trip the pump (upon the Nuclear Plant Supervisor or Nuclear Watch Engineer request) if the operating unit trips.
- 4.8 The following interlocks exist in the auxiliary feedwater system:
  - 4.8.1 The auxiliary feedwater pump steam supply valves (MOV-\*-1403, 1404, 1405) open on initiation of safety injection, low low level in any steam generator, automatic trip of both feedwater pumps, loss of voltage on both 4160 volt busses, or manually.
  - 4.8.2 Air to operate the auxiliary feedwater to steam generator control valves (CV-\*-2816, 2817, 2818, 2831, 2832, 2833) is supplied when the steam supply valves (MOV-\*-1403, 1404, 1405) commence opening.
  - 4.8.3 When auxiliary feedwater pump steam supply pressure as determined by PS-2312, 2313, and 2314 increases to 110 psig, the auxiliary feedwater steam supply pressure control valves (CV-3705, 3706 and 3707 respectively) open to supply steam to the auxiliary feedwater pump turbines at  $300 \pm 20$  psig, and SV-2823, 2824 and 2825 open to supply service water to the turbine lube oil coolers.
- 4.9 Prior to removing a pump from service, operability of other pumps shall be verified.
- 4.10 When a pump is to be put back into service after maintenance it shall be tested to verify its operability.

5.0 Related System Status:

- 5.1 The condensate storage tank is available to supply water to the auxiliary feedwater pumps. Condensate storage tank level is in the normal operating band, and all instrumentation and alarms are operable.

5.2 The service water system is lined up to supply cooling water to the auxiliary feedwater pump turbine lube oil coolers.

5.3 The 480 volt motor control centers 3A (4A) Turbine Area, 3B (4B) Reactor Area and 3C (4C) Fuel Area are energized.

6.0 References:

6.1 Operating Procedure 7304.1, Auxiliary Feedwater System - Periodic Test

6.2 NRC Letter of December 3, 1979, (Subject: Auxiliary Feedwater Pump - Endurance Test), Telecopy of January 25, 1980.

7.0 Records Required:

A completed copy of this procedure shall be routed to the Technical Department for analysis, and shall be retained after the completion of the analysis.

8.0 Instructions:

Each auxiliary feedwater pump shall be operated for at least 48 hours in accordance to this procedure. Each pump shall then be shut down and cooled off, restarted, and operated for an additional one hour.

INITIALS

SRS 8.1 Obtain permission from the Nuclear Plant Supervisor and/or Nuclear Watch Engineer to start the test.

S.R.S. 8.2 Station an operator in the area of the auxiliary feedwater pumps and establish communications with the control room. The operator shall remain in the area of the auxiliary feedwater pumps in case there is a need to return the pumps back to service immediately. The operator shall not leave the area until all the auxiliary feedwater pumps have been reset for standby operation. This operator is also to trip the pump (upon the Nuclear Plant Supervisor or Nuclear Watch Engineer request) if the operating unit trips.

S.R.S. 8.3 Sufficient instrumentation shall be available to obtain the data required to verify that the acceptance criteria have been met. Verify calibration for all the instrumentation used.

EAD 8.4 Perform the following for each auxiliary feedwater pump:

INITIALS

A B C

\* BAA SRS 8.4.1 Verify that the service water system is lined up to supply the auxiliary feedwater pump lube oil cooler.

↓ BAA SRS 8.4.2 Verify normal oil levels in the lube oil sump and governor oil sump.

SPECIAL TEST ST-80-04, PAGE 4  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

6/4/80

INITIALS			
A	B	C	
*	<u>ELW/WRL</u>		8.4.3 Verify that the free blow valve and the inlet valve, outlet valve, and the bypass valve around the steam trap associated with each auxiliary feedwater pump are open.
	<u>ELW/WRL</u>		8.4.4 Verify that the turbine condensate drain valve and the steam exhaust line drain valve are cracked open.
	<u>BAA WRL</u>		8.4.5 Obtain the initial data on the data sheet and record.
	<u>ELW</u>	<u>ELW</u>	8.4.6 Manually trip the turbine overspeed trip valves to the auxiliary feedwater pumps not being tested.
			NOTE: If a pump has already been tested and now the test is being performed on the second or third pump, just verify that overspeed trip valves to the pumps not being tested are tripped.
	<u>BAA WRL</u>		8.4.7 Install a manual speed controller on the governor and set at approximately 10 lbs air pressure.
	<u>BAA WRL</u>		8.4.8 Nuclear Control Center Operator position the valve control switch for MOV*-1403, 1404, and 1405 to the open position. Verify that the position indicating lights operate properly.
			NOTE: Monitor reactor power and maintain at or below 100%.
	<u>BAA WRL</u>		8.4.9 Operator in the auxiliary feedwater pump area verify (for pump being tested) that pump discharge pressure increases as turbine comes up to speed and that lube oil and steam supply pressures are normal.
	<u>BAA WRL</u>		8.4.10 Operator at the pump and Nuclear Control Center Operator, if any abnormal condition occurs secure the supply steam, then trip the turbine.
	<u>BAA WRL</u>		8.4.11 Nuclear Control Center Operator ensure that steam generator programmed levels are maintained as auxiliary feedwater flow is supplied to the steam generators. Decrease load (if necessary) to balance Tavg and Tref.
	<u>BAA WRL</u>		8.4.12 In addition to obtaining flows of 200 gpm to each steam generator, adjust pump speed to 5900 rpm and slowly close recirc valve 177 (277, 377) for pump A (B, C) to the condensate storage tank.
	<u>BAA WRL</u>		8.4.13 Operator in the auxiliary feedwater pump area close the free blow valve and the bypass valve around the steam trap when the steam supply line has been warmed up and is free of moisture.
✓	<u>BAA WRL</u>		8.4.14 Readjust flows and speed to above required values, if necessary. Maintain the flow at 600 GPM and speed at 5900 rpm for 2 hrs and record data at specified time interval on the data sheet.

**SPECIAL TEST ST-80-04, PAGE 5**  
**AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST**

INITIALS

A	B	C
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**NOTE 1:** The test coordinator and/or the STA shall be present by the pump until the hand loader is removed, and recirc valve is opened. He is to be in contact with the Control Room, to assure tripping the pump upon the request of Nuclear Plant Supervisor or Nuclear Watch Engineer if the operating unit trips.

**NOTE 2:** If complications arise due to condensate reject problems or any other cause, the flow may be decreased. But at same time during the test, there shall be two hours of continuous 600 gpm flow delivered to the steam generators.

- |  |   |          |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |
|--|---|----------|----------|----------|--------------------|-----|-----|---------------------|-----|-----|-------|------|------|-------------------------------------|------|------|------------|-----|-----|
| <div style="border-left: 1px solid black; padding-left: 10px;"> <p>* <u>EAD WML</u></p> <hr/> <p><u>EAD WML</u></p> <hr/> <p><u>EAD WML</u></p> <hr/> <p><u>EAD WML</u></p> <hr/> <p><u>EAD WML</u></p> <hr/> <p><u>EAD BAA</u></p> <hr/> <p><u>BAA BAA</u></p> <hr/> <p><u>EAD BAA</u></p> </div> | <p>8.4.15 After at least 2 hours of operation, cautiously close the valves regulating the air pressure to the turbine generator. Assure that governor is controlling the pump speed at approximately 5900 rpm. Then open the valve and reduce the speed to about 5700 rpm.</p> <p>8.4.16 Reduce the total flow of 150 gpm, and set the speed so that the pump discharge pressure is approximately 125 psi above the main steam pressure. Record:</p> <table border="0" style="margin-left: 40px;"> <tr> <td></td> <td style="text-align: center;"><u>B</u></td> <td style="text-align: center;"><u>C</u></td> </tr> <tr> <td>Discharge Pressure</td> <td style="text-align: center;">865</td> <td style="text-align: center;">865</td> </tr> <tr> <td>Main Steam Pressure</td> <td style="text-align: center;">745</td> <td style="text-align: center;">745</td> </tr> <tr> <td>Speed</td> <td style="text-align: center;">4600</td> <td style="text-align: center;">4630</td> </tr> <tr> <td><i>For Info</i><br/>Suction Pressure</td> <td style="text-align: center;">20.5</td> <td style="text-align: center;">20.0</td> </tr> <tr> <td>TOTAL FLOW</td> <td style="text-align: center;">150</td> <td style="text-align: center;">150</td> </tr> </table> <p>8.4.17 Operator at the auxiliary feedwater pump area open recirc valve 177 (277, 377) from A (B, C) pump to CST.</p> <p>8.4.18 Increase the total flow back to 600 gpm, and the speed back to approximately 5900 rpm. Remove the hand loader from the governor and return to original connection.</p> <p>8.4.19 Decrease the total flow to 150 gpm (Note pump speed decrease). Run the pump in this mode for the remaining 46 hours and record data at specified time interval on the data sheet.</p> <p>8.4.20 Nuclear Control Center Operator close MOV-*-1403, 1404, and 1405 to stop the steam supply. Operator at the auxiliary feedwater pump area stop the operating pump by manually tripping the overspeed trip valve (as MOV-1403, 1404, and 1405 close).</p> <p>8.4.21 Open the free blow valve and the bypass valve around the steam trap.</p> <p>8.4.22 Operator at the auxiliary feedwater pump area reset the overspeed trip valve on the pump to be tested next. Leave the overspeed trip valves to the pumps not being tested in the trip position.</p> |          | <u>B</u> | <u>C</u> | Discharge Pressure | 865 | 865 | Main Steam Pressure | 745 | 745 | Speed | 4600 | 4630 | <i>For Info</i><br>Suction Pressure | 20.5 | 20.0 | TOTAL FLOW | 150 | 150 |
|  | <u>B</u>  | <u>C</u> |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |
| Discharge Pressure   | 865   | 865      |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |
| Main Steam Pressure  | 745   | 745      |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |
| Speed  | 4600  | 4630     |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |
| <i>For Info</i><br>Suction Pressure  | 20.5  | 20.0     |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |
| TOTAL FLOW   | 150   | 150      |          |          |                    |     |     |                     |     |     |       |      |      |                                     |      |      |            |     |     |

SPECIAL TEST ST-80-04, PAGE 6  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

6/4/80

INITIALS

A B C

- \* EAD EAD EAD 8.4.23 Complete steps 8.4.1 through 8.4.20 for the remaining auxiliary feedwater pumps.
- EAD EAD EAD 8.4.24 Allow the pump(s) to cool down until pump temperatures reduce to within 20° F of their values at the start of the 48 hour test and at least 8 hours have elapsed. Record the required data then restart the pump. Assure the pump delivers 600 gpm within 3 minutes.
- Time to deliver flow:  
A Pump: 1' 23" B Pump: 1' 48" C Pump: 1' 21"
- Operate the pump in this mode for one hour and record the specified data after the hour is up.
- NOTE 1: Free blow valve and the bypass valve around the steam trap are to be closed during the pump run and open after stopping the pump.
- NOTE 2: This step may be performed before step 8.4.23.
- EAD EAD EAD 8.4.25 Nuclear Control Center Operator and Operator at auxiliary feedwater area stop the pump per step 8.4.20.
- EAD EAD EAD 8.4.26 Nuclear Control Center Operator reset HC-\*2816, 2817, and 2818 to zero 50 percent valve position.
- EAD EAD EAD 8.4.27 Reset all the auxiliary feedwater overspeed trip valves, and leave the system ready for standby operation.
- EAD EAD EAD 8.4.28 A second operator is required to verify that all the pumps' recirculation valves are open, the overspeed trip valves are reset, the free blow valves and the bypass valves around the steam traps are open, and the system is ready for standby operation. Initial upon verification.
- EAD EAD EAD 8.4.29 Notify the Shift Supervisor upon completion of the test.

\* The first 48 hrs run for the A pump was completed on  
5/19/80

BAH

6/23/80

6/4/80

SPECIAL TEST ST-80-04, PAGE 7  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "A"

Pump Start Time: 8:45 AM 6/23/80

stopped 9:45 AM

DATA SET	AMBIENT TEMPERATURE (F) INST. NO.: <i>Alnor Dig</i> CAL. DATE: <i>12/5/77</i>	SPEED (RPM) <i>1538A</i> INST. NO.: <i>Gen Ratio Strobe</i> CAL. DATE: <i>2/21/80</i>	TOTAL FLOW (GPM) FI-3-1401 <i>5/13/80</i> FI-3-1457 <i>5/13/80</i> FI-3-1458 <i>5/14/80</i> CAL. DATE: <i>5/13/80</i>	SUCTION PRESSURE (PSIG) GAGE NO.: <i>1045</i> CAL. DATE: <i>4/18/80</i>	DISCHARGE PRESSURE (PSIG) PI-1429 CAL. DATE: <i>2/24/80</i>	PUMP TOTAL STATIC HEAD	INITIAL
INITIAL							
AFTER START							
HOUR 2							
HOUR 4							
HOUR 8							
HOUR 12							
HOUR 16							
HOUR 20							
HOUR 24							
HOUR 28							
HOUR 32							
HOUR 36							
HOUR 40							
HOUR 44							
HOUR 48							
Cooled <i>8 1/8</i> hours after stop	<i>77</i>	<i>0</i>	<i>0</i>	<i>18</i>	<i>0</i>	<i>-</i>	EAD
RESTART	<i>84</i>	<i>5150</i>	<i>600</i>	<i>17</i>	<i>850</i>	<i>833</i>	EAD
1 Hour after restart	<i>86</i>	<i>5100</i>	<i>600</i>	<i>17</i>	<i>860</i>	<i>843</i>	EAD

The specifications for the AFW pumps require them to be suitable for outdoor installation in an area subject to the affect of severe sea coast weather conditions including hurricane winds and torrential rains, high ambient temperature and humidity. Therefore, the acceptance criteria for ambient temperature and humidity for this test is not applicable, and no humidity data was taken.

Data Reviewed by

*B. A. Gil*

Date

*6/23/80*

*start 8:45 AM  
stopped 9:45 AM*

6/4/80

SPECIAL TEST ST-80-04, PAGE 8  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "A"

DATA SET	MAIN STEAM		STM SUPP. PRESS. (PSIG) PI-3705 CAL. DATE: 5/12/80	VIBRATION (Mils) INSTR. NO.: JED 306 CAL. DATE: 5/19/80								BEARING TEMPERATURE (F) INSTR. NO.: Alnor Dig CAL. DATE: 5/23/80				LUBE OIL PRESSURE COOLER DISCH. > 15 PSIG	INITIALS	
	PRESS.(psig) PI-1416 CAL. DATE: 2/26/80	TEMP. (F) STEAM TABLE		PUMP				TURBINE				PUMP		TURBINE				
				INB.		OUTB.		INB.		OUTB.		INB.	OUTB.	INB.	OUTB.			
				H	V	H	V	H	V	H	V							A
INITIAL																		
AFTER START																		
20 Min																		
40 Min																		
60 Min																		
HOUR 2																		
HOUR 4																		
HOUR 8																		
HOUR 12																		
HOUR 16																		
HOUR 20																		
HOUR 24																		
HOUR 28																		
HOUR 32																		
HOUR 36																		
HOUR 40																		
HOUR 44																		
HOUR 48																		
Cooled																		
_____hour																		
after stop	750	510.8	0	.3	.11	.22	.1	.08	.06	.1	.1	.3	82	82	82	84	20	EAD
RESTART	725	507.0	355	.75	.75	.8	.26	.24	.2	.46	.29	.43	86	88	90	106	20	EAD
1 Hour after restart	730	507.7	355	.74	.74	.8	.36	.33	.29	.44	.28	.32	95	99	99	118	20	EAD

Data Reviewed by

B. A. [Signature]

Date

6/23/80

6/4/80

SPECIAL TEST ST-80-04, PAGE 9  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "B"

Pump Start Time: 7:20 AM 6/7/1980

DATA SET	AMBIENT TEMPERATURE (F) INST. NO.: ALNOR 8 CAL. DATE: 5-23-80	SPEED 1538A (RPM) GEN-Ratic INST. NO.: Strobotac CAL. DATE: 2-21-80	TOTAL FLOW (GPM) FI- -1401 5-13-80 FI- -1457 5-13-80 FI- -1458 5-14-80 CAL. DATE: 5-14-80	SUCTION PRESSURE (PSIG) GAGE NO.: PI-1045 CAL. DATE: 4-18-80	DISCHARGE PRESSURE (PSIG) PI-1430 CAL. DATE: 2-26-80	PUMP TOTAL STATIC HEAD	INITIAL
INITIAL	82	0	0	18.5	—	—	BAA
AFTER START	84	5900	600	17.5	1190	1172.5	BAA
HOUR 2	90	5900	600	18.5	1200	1181.5	BAA
LOW FLOW START	90	4600	150	20.5	865	844.5	EAD
HOUR 4	90	4600	150	20.5	865	844.5	EAD
HOUR 8	95	4600	150	20.5	855	834.5	EAD
HOUR 12	91	4600	150	19.5	860	840.5	EAD
HOUR 16	90	4600	150	19.5	860	840.5	WRL
HOUR 20	88	4600	150	19.5	860	841.5	WRL
HOUR 24	86	4600	150	18.0	860	842.0	WRL
HOUR 28	88	4600	150	20.5	860	839.5	SRS
HOUR 32	86	4600	150	19.0	860	841.0	SRS
HOUR 36	82	4600	150	18.5	860	841.5	SRS
HOUR 40	88	4600	150	18.5	860	841.5	WAS
HOUR 44	88	4600	150	18.5	860	841.5	WAS
HOUR 48	84	4600	150	18.5	860	841.5	WAS
Cooled ~ 313 hours after stop	84	0	0	19.0	—	—	EAD
RESTART	89	5050	600	17.75	875	857.25	EAD
1 Hour after restart	95	5000	600	17	880	863	EAD

The specifications for the AFW pumps require them to be suitable for outdoor installation in an area subject to the affect of severe sea coast weather conditions including hurricane winds and torrential rains, high ambient temperature and humidity. Therefore, the acceptance criteria for ambient temperature and humidity for this test is not applicable, and no humidity data was taken.

Data Reviewed by

*B. A. O.*

Date

6/7/80 ; 6/16/80  
6/20/80

2 start  
 8:45 AM  
 6-20-80  
 stop  
 9:50 AM  
 6-20-80



6/4/80

SPECIAL TEST ST-80-04, PAGE 10  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "B"

DATA SET	MAIN STEAM		STM SUPP. PRESS. (PSIG) PI-3706 CAL. 2/26/80	VIBRATION (Mils) INSTR. NO.: IRD 306 CAL. DATE: 5-19-80										BEARING TEMPERATURE (F) INSTR. NO.: ALNOR D3 CAL. DATE: 5-23-80				LUBE OIL PRESSURE COOLER DISCH. > 15 PSIG	INITIALS			
	PRESS. (psig) PI-1417 CAL. DATE: 2/26/80	TEMP. (F) STEAM TABLE		PUMP					TURBINE					PUMP		TURBINE						
				INB.		OUTB.		H	V	INB.		OUTB.		H	V	A	INB.			OUTB.	INB.	OUTB.
				H	V	H	V			H	V	H	V									
INITIAL	730	507.7	0	.02	.02	.02	.01	.02	.01	.02	.05	.05	82	82	100	115	-	BAA				
AFTER START	730	507.7	355	.26	.3	.35	.19	.25	.21	.17	.1	.2	91	94	104	118	2.0	RAA				
20 Min	730	507.7	360	.22	.3	.23	.18	.18	.2	.17	.1	.2	95	94	104	122	20	BAA				
40 Min	730	507.7	365	.26	.31	.22	.2	.18	.21	.2	.1	.22	97	100	104	122	20	AAA				
60 Min	730	507.7	365	.23	.27	.24	.23	.22	.19	.1	.2	.2	99	104	106	126	20	BAA				
HOOR 2	730	507.7	365	.38	.27	.3	.18	.24	.23	.21	.13	.21	100	104	106	124	20	BAA				
LOW FLOW START	735	509.5	360	.22	.26	.24	.18	.14	.2	.17	.13	.21	95	97	104	109	18.5	EAD				
HOOR 4	740	509.3	360	.22	.28	.22	.2	.22	.2	.17	.13	.21	97	97	102	108	18.5	EAD				
HOOR 8	740	509.3	360	.20	.30	.30	.2	.21	.18	.18	.15	.3	97	97	108	111	18.5	EAD				
HOOR 12	740	509.3	360	.18	.26	.22	.2	.24	.2	.18	.15	.27	96	94	104	113	18.5	EAD				
HOOR 16	745	510.1	360	.4	.3	.4	.22	.3	.15	.30	.13	.4	95	91	106	109	18.5	WRS				
HOOR 20	745	510.1	360	.4	.2	.34	.22	.2	.13	.24	.2	.35	93	90	106	108	18.5	WRS				
HOOR 24	745	510.1	360	.38	.22	.32	.25	.4	.2	.13	.2	.32	91	93	106	108	18.5	WRS				
HOOR 28	745	510.1	360	.35	.24	.28	.22	.27	.14	.35	.1	.28	93	93	108	108	18.5	SRS				
HOOR 32	750	510.8	360	.38	.2	.37	.25	.24	.18	.38	.14	.26	93	96	108	108	18.5	SRS				
HOOR 36	745	510.1	360	.32	.36	.4	.18	.38	.19	.34	.17	.3	93	97	108	111	18.5	SRS				
HOOR 40	745	510.1	360	.35	.35	.36	.22	.25	.16	.38	.14	.25	93	97	108	111	18.5	WRS				
HOOR 44	750	510.8	360	.38	.38	.40	.22	.22	.14	.38	.18	.23	93	97	104	111	18.5	WRS				
HOOR 48	745	510.1	360	.38	.4	.41	.18	.2	.12	.34	.18	.27	93	97	102	108	18.5	WRS				
Cooled ~ 313 hours after stop	750	510.8	0	.18	.34	.24	.14	.1	.15	.22	.14	.22	96	86	86	86	-	EAD				
RESTART	730	507.7	360	.35	.34	.3	.28	.28	.22	.22	.2	.3	91	94	100	115	1.7	EAD				
1 Hour after restart	750	510.8	360	.32	.31	.34	.28	.35	.28	.30	.28	.32	100	102	104	120	1.9	EAD				

Data Reviewed by

B. A. U.

Date

6/7/80

6/14/80

6/20/80

6/4/80

SPECIAL TEST ST-80-04, PAGE 11  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "C"

Pump Start Time: 3:40 AM 6/5/1980

DATA SET	AMBIENT TEMPERATURE (F) INST. NO.: ALNCR Dis CAL. DATE: 5-23-80	SPEED <sup>1537A</sup> (RPM) Gen Radio INST. NO.: strokafac CAL. DATE: 5-23-80	TOTAL FLOW (GPM) FI- -1401 5-13-80 FI- -1457 5-13-80 FI- -1458 5-14-80 CAL. DATE:	SUCTION PRESSURE (PSIG) GAGE NO.: 1045 CAL. DATE: 4-18-80	DISCHARGE PRESSURE (PSIG) PI-1431 CAL. DATE: 2-26-80	PUMP TOTAL STATIC HEAD	INITIAL
INITIAL	93	0	0	20	-	-	BAA
AFTER START	90	5900	600	19	1190	1171	BAA
HOUR 2	88	5900	600	19	1190	1171	BAA
LOW FLOW START	86	4600	150	20	855	835	BAA
HOUR 4	86	4600	150	19	855	836	EAD
HOUR 8	84	4600	150	18.5	850	831.5	EAD
HOUR 12	86	4600	150	18.5	850	831.5	EAD
HOUR 16	93	4600	150	19.1	855	835.9	BAA
HOUR 20	90	4600	150	19.3	855	835.7	BAA
HOUR 24	86	4600	150	18.8	855	836.2	BAA
HOUR 28	82	4600	150	18.0	855	837	EAD
HOUR 32	88	4600	150	18.5	855	836.5	EAD
HOUR 36	84	4600	150	19.0	855	836	EAD
HOUR 40	84	4600	150	18.7	855	836.3	BAA
HOUR 44	88	4600	150	18.5	855	836.5	BAA
HOUR 48	84	4600	150	18.5	855	836.5	BAA
Cooled N322 hour; after stop	91	0	0	18.0	-	-	EAD
RESTART	91	5000	600	17.0	860	843	EAD
1 Hour after restart	94	5000	600	17.0	860	843	EAD

Restart  
10:55 AM  
stopped  
12:00 AM  
6/12/80  
BAA

The specifications for the AFW pumps require them to be suitable for outdoor installation in an area subject to the affect of severe sea coast weather conditions including hurricane winds and torrential rains; high ambient temperature and humidity. Therefore, the acceptance criteria for ambient temperature and humidity for this test is not applicable, and no humidity data was taken.

Data Reviewed by

*B. A. H.*

Date

6/7/80

*also 6/12/80*

6/4/80

SPECIAL TEST ST-80-04, PAGE 12  
AUXILIARY FEEDWATER PUMPS - ENDURANCE TEST

DATA SHEET

Auxiliary Feedwater Pump "C"

DATA SET	MAIN STEAM		STM SUPP. PRESS. (PSIG) PI-3707 CAL. DATE: 2-26-80	VIBRATION (Mils) INSTR. NO.: IRD 306 CAL. DATE: 5-17-80										BEARING TEMPERATURE (F) INSTR. NO.: ALNOR Dig CAL. DATE: 5-23-80				LUBE OIL PRESSURE COOLER DISCH. > 15 PSIG	INITIALS
	PI-1418 CAL. ALNOR Dig DATE: 5-23-80	TEMP. (F) STEAM TABLE		PUMP					TURBINE					PUMP		TURBINE			
				INB.		OUTB.		A	INB.		OUTB.		A	INB.	OUTB.	INB.	OUTB.		
				H	V	H	V		H	V	H	V							
INITIAL	730	507.7	0	.04	.01	.04	.02	.01	.02	.01	.01	.04	90	90	100	100	0	BAA	
AFTER START	730	507.7	370	.38	.4	.42	.2	.4	.44	.3	.12	.35	97	100	102	113	20	BAA	
20 Min	730	507.7	375	.38	.38	.3	.2	.55	.59	.2	.18	.31	97	97	108	113	20	BAA	
40 Min	725	507.0	375	.39	.41	.28	.2	.29	.60	.39	.21	.32	97	97	108	115	20	BAA	
60 Min	730	507.7	375	.32	.42	.38	.2	.24	.53	.28	.22	.4	97	101	108	113	20	BAA	
1 HOUR 2	725	507.0	370	.24	.42	.44	.22	.26	.52	.22	.22	.41	95	97	109	111	20	BAA	
LOW FLOW START	745	510.1	375	.2	.22	.20	.22	.25	.58	.35	.28	.36	93	97	108	110	18	BAA	
1 HOUR 4	745	510.1	370	.2	.2	.23	.25	.28	.52	.23	.26	.39	93	95	106	113	18	EAD	
1 HOUR 8	745	510.1	370	.2	.24	.23	.2	.27	.50	.24	.27	.36	93	95	104	111	18	EAD	
1 HOUR 12	745	510.1	370	.22	.19	.23	.26	.28	.51	.20	.26	.34	95	97	104	108	18	EAD	
1 HOUR 16	745	510.1	370	.2	.26	.24	.18	.28	.52	.22	.28	.36	93	97	106	108	18	BAA	
1 HOUR 20	745	510.1	370	.26	.26	.26	.19	.28	.51	.22	.28	.35	95	97	107	113	18	BAA	
1 HOUR 24	745	510.1	370	.26	.26	.28	.19	.28	.53	.26	.28	.35	91	95	109	113	18	BAA	
1 HOUR 28	745	510.1	375	.23	.27	.21	.17	.28	.52	.24	.26	.36	91	95	104	111	18	EAD	
1 HOUR 32	745	510.1	370	.22	.27	.22	.18	.27	.52	.25	.28	.36	95	97	104	109	18	EAD	
1 HOUR 36	750	510.8	370	.23	.26	.23	.19	.27	.51	.25	.27	.34	91	95	106	109	18	EAD	
1 HOUR 40	745	510.1	370	.22	.27	.25	.19	.28	.54	.24	.28	.34	91	95	104	106	18	BAA	
1 HOUR 44	750	510.8	370	.22	.25	.25	.18	.29	.51	.21	.29	.34	93	97	106	108	18	BAA	
1 HOUR 48	750	510.8	370	.22	.25	.25	.18	.28	.53	.20	.27	.34	91	95	106	109	18	BAA	
Cooled																			
hour after stop	750	510.8	0	.38	.15	.1	.1	.15	.1	.16	.08	.14	88	88	91	95	0	EAD	
RESTART	745	510.1	370	.44	.32	.3	.24	.38	.7	.32	.28	.26	91	93	104	108	19	EAD	
1 hour after restart	745	510.1	370	.52	.32	.35	.3	.38	.68	.38	.3	.34	100	100	108	115	19	EAD	

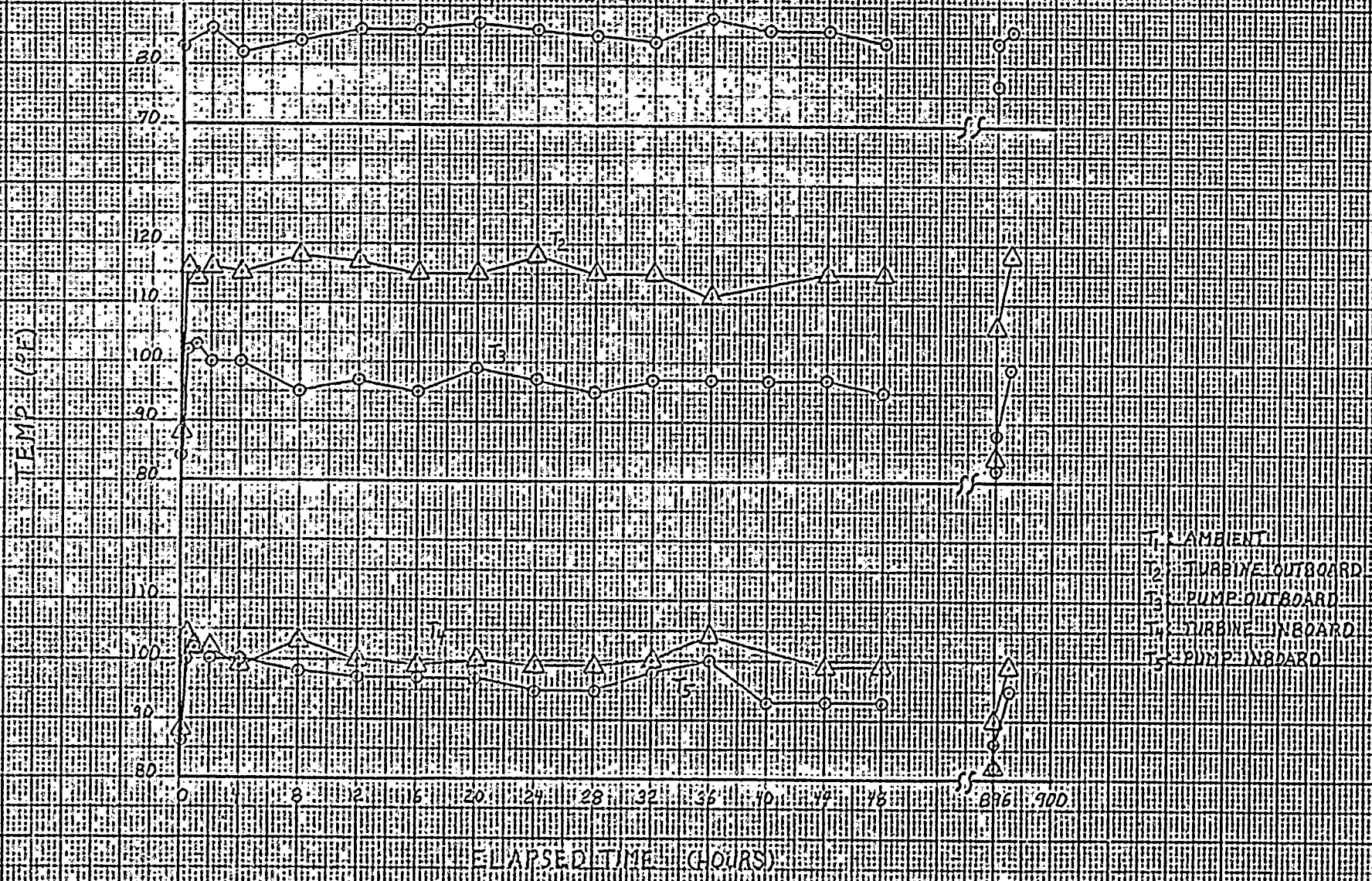
Data Reviewed by

B. A. L.

Date

6/7/80

TURKEY POINT PLANT  
A-AFW PUMP  
ENDURENCE TEST

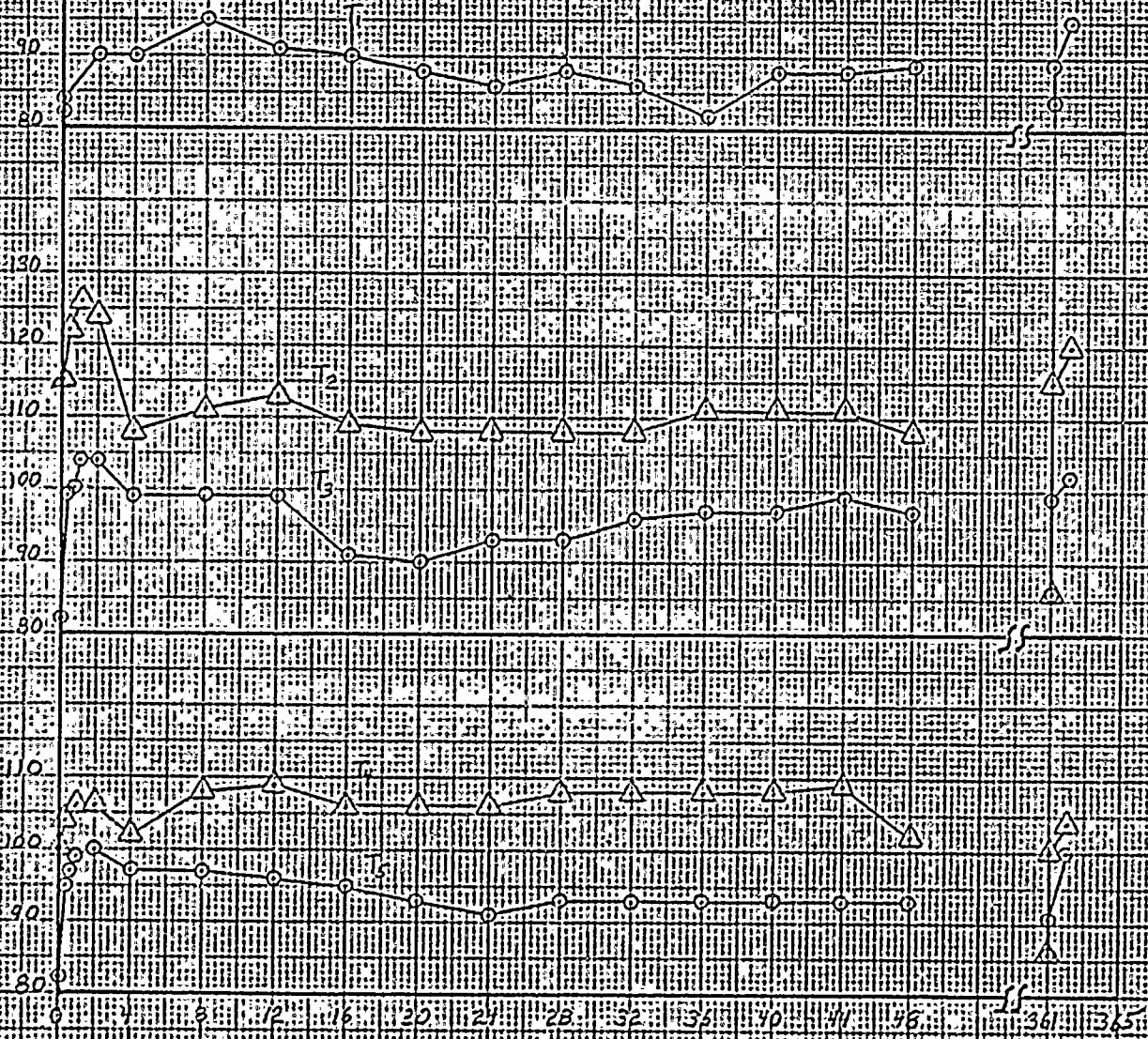


TURKEY POINT PLANT  
B AFW PUMP  
ENDURENCE TEST

TEMP (°F)

ELAPSED TIME (HOURS)

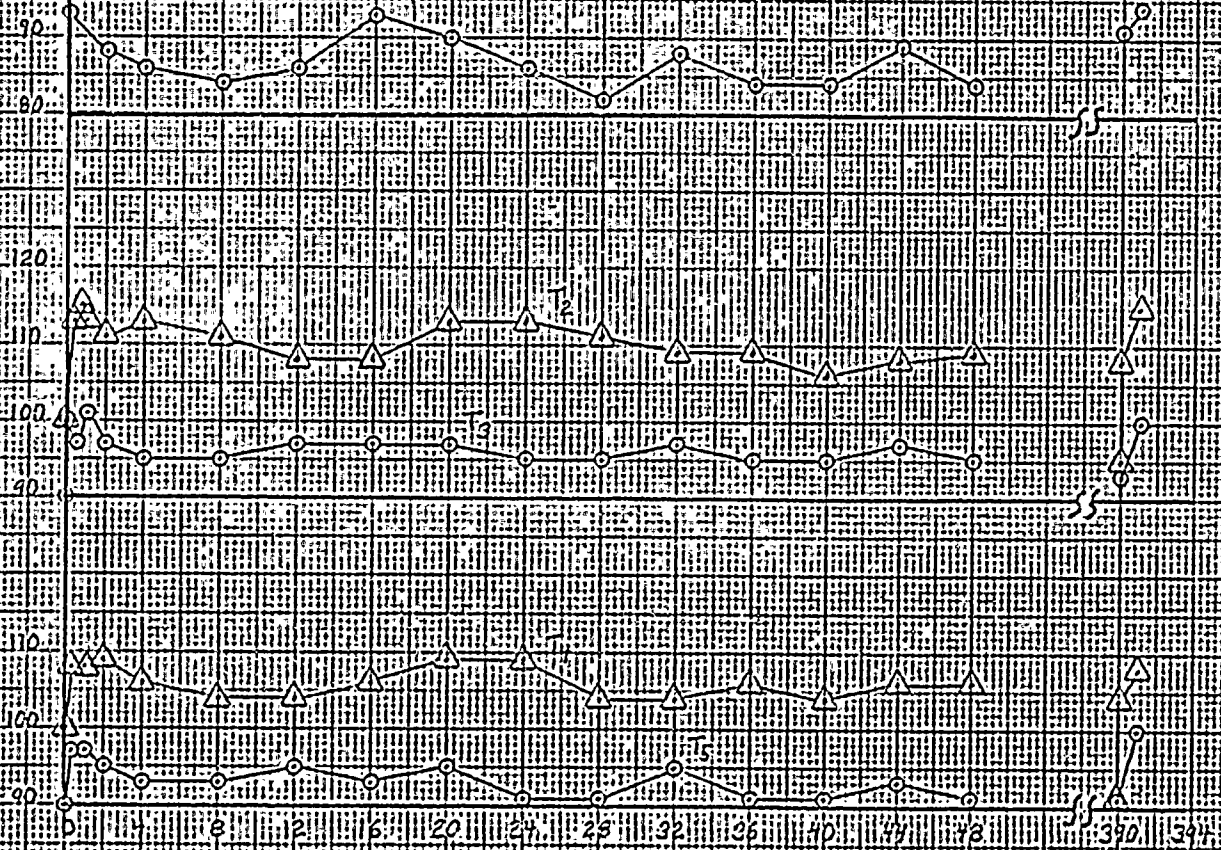
T<sub>1</sub> - AMBIENT  
T<sub>2</sub> - TURBINE OUTBOARD  
T<sub>3</sub> - PUMP OUTBOARD  
T<sub>4</sub> - TURBINE INBOARD  
T<sub>5</sub> - PUMP INBOARD





TURKEY POINT PLANT  
TWO PUMP  
ENDURANCE TEST

TEMP. (°F)



ELAPSED TIME (HOURS)

T1 - AMBIENT  
T2 - TURBINE OUTBOARD  
T3 - PUMP OUTBOARD  
T4 - TURBINE INBOARD  
T5 - PUMP INBOARD

