FEEDWATER SYSTEM
TRAINING SYSTEM OPERATING PROCEDURE (IRI-07-SOP)
IRI POWER PLANT

(Date)

PREFACE

This Training System Operating Procedure (SOP) has been designed to assist you in meeting the requirements of Module IRI-07 of the Power Plant Training Program. It contains information about operation of the IRI Power Plant Feedwater System. This includes purpose, precautions, limits and setpoints, procedures and references for operating the system equipment.

You should also walk down the system and identify the components and controls. Should you have additional question about system operation, ask your supervisor.

FEEDWATER SYSTEM

TRAINING SYSTEM OPERATING PROCEDURE

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I. Purpose

This procedure provides information and guidance for the correct and safe operation of the IRI Power Plant Feedwater System.

II. Precautions, Limitations and Setpoints

A. Ensure all maintenance work is completed and all tagout tags are cleared and removed.

B. Recirculation flow for BFP's 1 – 5 must not drop below minimum flow set point of 40,000 pounds per hour.

C. Feedwater header pressure "LOW" alarm is 520 psi.

D. Feedwater pressure should be maintained at 600 to 700 psi.

III. Procedure

A. System Startup

Boiler Feed Pumps 1, 2, 4 and 5

__1. On the feedwater pump DCS control, for the pump you are going to start, check that the Manual/Automatic control station for the feedwater recirculation control valve is on "AUTO)" and 100 percent open.

__2. Be sure the upstream and downstream stop valves in the recirculation line are open.

NOTE: All of the stop valves for the Boiler Feed Pumps are to remain open at all times. If a severe leak or, other emergency condition occurs, the Operations, or Maintenance, supervisor may direct the closing of certain recirculating valves, but only after the feedwater pump involved has been shut down.

__3. On the pump you are going to start;

___a. Be sure the pump suction and discharge valves are open.

___b. Open the pump vent valves to be sure all air is out, and continue to vent water until pump has warmed to DA water temperature. Close vent valves.

___c. Check the oil level of the pump and motor bearings,

__1). Bearings with an oil cup should have an oil level about 1/8-inch to ¼-inch from the top of the cup.

__2). Bearing with a sight glass should have an oil level about the center of the sight glass.

__3). Bearings with "Constant Level Oilers" must have oil showing in the oiler bottle reservoir.

___d. Adjust cooling (city) water to pump bearing oil coolers for proper flow.

__4. If starting Boiler Feedwater Pump No. 1 and/or No. 2,

___a. On the feedwater pump control screen, start the pump

__1). The pump will start and the annunciator circuit for this pump will be energized. The indicator will show the pump flow in thousand pounds per hour (reading X 1000)

__2). The alarm "BFWP #- LOW FLOW" on the auxiliary panel board will alarm before pump flow exceeds the minimum flow set point of about 40,000 pounds per hour. Silence and reset the alarm.

___b. Immediately check the pump and motor bearing oil rings.

NOTE: Be sure gland seals on Boiler Feedwater Pump No. 1 have proper leak off. Boiler Feedwater Pump No. 2 has mechanical seals and should not have any external leak off.

___c. Put the pump feedwater recirculation Manual/Automatic control to Automatic.

__5. If starting Boiler Feedwater Pump No. 4 and/or No. 5,

___a. At the pump, press the pump "Start" pushbutton. The pump will start and pump discharge pressure will increase to about 600 to 700 psi.

___b. Immediately check the pump and motor bearing oil rings.

___c. Check pump gland seal leak off.

___d. On the feedwater pump control panel,

__1). The indicator will show the pump flow in thousand pounds per hour (reading X 1,000).

__2). Match the circuit breaker control switch flag to the indicating light by turning the switch to the "Start" position. This will also energize the annunciator circuit for this pump.

___e. Put the pump feedwater recirculation in Automatic

Boiler Feed Pump 3

NOTE: Boiler Feedwater Pump No. 3 is now in stand-by service, and will automatically start if our feedwater header pressure drops too low. The steam control valve for this pump has an orifice line around it continually allowing a small amount of steam to enter the turbine. This keeps the turbine hot and ready for automatic operation.

__6. In case of a failure, or overloading, of our motor driven feedwater pumps in service, the following sequence of events will occur.

___a. As the feedwater header pressure drops to about 520 psi, a pressure switch will cause the "Boiler Feedwater Pressure Low" alarm in the Control Room.

___b. If the feedwater header pressure drops to about 500 psi, the pressure switch mounted on the discharge line of BFP No. 3, will trip the Manual Reset Solenoid on the steam supply control valve, causing it to open and start the steam turbine. As the control valve

opens, a position switch will cause the "Boiler Feed Pump No. 3 In Service" alarm to annunciate.

___c. Boiler Feedwater Pump No. 3 will continue to run until the feedwater pressure has been regained with your motor driven feedwater pumps, and you manually reset Boiler Feedwater Pump No. 3.

__7. To reset Boiler Feed Pump No. 3

___a. Be sure you have enough motor driven feedwater pumps in service to carry the steam load. Feedwater pressure should be about 600 to 700 psi.

___b. Manually lift up on the Manual Reset lever until it latches. The steam control valve will close and the pump will shut down. (The Manual Reset lever is yellow lever located at the top of the steam control valve).

NOTE: In the event of AC power failure to the Manual Reset Solenoid, or loss of control air pressure, the steam supply control valve will open placing Boiler Feedwater Pump No. 3 in service. If this should happen, and this pump is not needed, shut down the pump by closing "HPS-119" and "HPS-126" stop valves located on bottom of high-pressure steam header between Boilers No. 1 and 2 until the control problems are corrected. After repairs are completed, be sure to place this pump back in stand-by service by resetting the Manual Reset Solenoid and re-opening the steam supply stop valves.

Boiler Feed Pumps 71, 72, and 73

__8. Check that pump suction and discharge valves are open.

__9. Partially open the pump vent valves to be sure all air is out, and continue to vent water until pump has warmed to Deaerator water temperature. Close vent valves.

__10. Check motor and pump bearings for proper oil level,

___a. Bearings with an oil cup should have an oil level about 1/8-inch to ¼-inch from top of cup.

___b. Bearings with a sight glass should have an oil level about the center of the sight glass.

___c. Bearings with "Constant Level Oilers" must have oil showing in the oil bottle reservoir.

__11. Open and adjust cooling water valves to pump bearing housings to maintain proper cooling.

__12. Verify Feedwater recirculation valve in “AUTO” and open 100 percent

__13. Start the pump

___a. Immediately check the pump and motor bearing oil rings to be sure they are turning. Check pump gland seal leak off.

Boiler Feed Pumps 81, 82 and 83

__14. In the DA No. 8 / Feedwater GRAPHIC be sure the RECIRC VALVE for the pump you are going to start is in AUTO and is "OPEN". Under normal conditions the Recirculating Valve controllers on all three (3) pumps should be left in automatic.

__15. In the basement, at the Recirculating Valve for the pump you are going to start:

___a. Check the recirculating valve stem indicator to be sure the valve is open.

___b. Be sure the upstream and downstream stop valves in the recirculating line are open.

___c. Be sure the recirculating valve bypass is closed.

__16. On the pump you are going to start;

___a. Be sure the pump suction, and discharge valves are open.

___b. Check the oil level of the pump and motor bearings;

__1). The motor bearing oil level should be about the centerline of the sight glass.

__2). Check that the oil cup level on BFB number 81 is 1/8" from the top of the cup. Be sure the constant level oiler bottles on BFP number 82 & 83 have oil in them.

___c. Open the three (3) pump vent valves to be sure all air is out, and continue to vent water until pump has warmed to DA water temperature then close the vent valves. The ¾-inch supply valve to the mechanical seals is locked open.

___d. Be sure the cooling water to pump bearing oil coolers has proper flow. Under normal conditions this cooling water flow should always be left on at all three (3) pumps so that they are available to start from the Control Room at any time.

___e. Start the pump by pushing the "START" pushbutton at the pump or in the Deaerator No. 8/ Feedwater GRAPHIC click on the pump to open the BFP pop-up window. Click the "START" pushbutton. Click "EXIT" to close the popup window. In the basement check to be sure the bearing oil rings are turning and that everything is all right.

B. Normal Operation

__1. Check Boiler Feed Pumps oil levels and temperatures.

__2. Check boiler Feed Pumps cooling water.

__3. Check Boiler Feed Pumps for abnormal noise and vibration.

__4. Check Feedwater Regulators for proper operation and air leaks.

__5. Monitor Feedwater System temperatures, pressures, flows and levels.

C. System Shutdown

Boiler Feed Pumps 1, 2, 4 and 5

__1. On the feedwater pump control panel, shut off the pump by turning the circuit breaker control switch to the "STOP" position.

___a. The pump will shut down,

___b. The annunciator circuit for this pump will be de-energized.

___c. The pump feedwater flow indicator will decrease to zero.

___d. The recirculation control valve will go wide open.

NOTE: If Boiler Feedwater Pump No. 4 or No. 5 is shut down by pressing the "Stop" push button at the pump, the "Boiler Feed Pump “Low Flow" alarm will sound on the auxiliary panel annunciator as the feedwater flow decreases on this pump. On the pump control panel, you must match the circuit breaker control switch flag to the indicating light by turning the switch to the "STOP" position to de-energize the annunciator window for this pump, then reset the annunciator.

__2. Put the pump recirculation Manual/Automatic control station on Manual by:

___a. With the manual operator, match the manual and automatic indicators.

___b. When the indicators read the same, turn the switching cock ½ turn clockwise to the "MAN" position. Be sure the control valve is adjusted to 100 percent open.

__3. At the pump you have shut off, close the cooling (city) water supply valves to the bearing oil coolers.

__4. Check all pressures, and flows.

Boiler Feed Pumps 71, 72 and 73

__5. Shut off the pump motor

__6. Close the pump bearing housing cooling water valves. Check all pressures, levels and flows.

Boiler Feed Pumps 81, 82 and 83

__7. Shut off the pump by pushing the "STOP" pushbutton at the pump or in the Deaerator No. 8 / Feedwater GRAPHIC click on the pump to open the BFP pop-up window. Click the "STOP" pushbutton. Click "EXIT" to close the pop-up window.

__8. Leave the cooling water supply on to the pump bearing oil coolers.

__9. Check all boiler pressures, levels, and flows.

IV References

Byron Jackson

General Electric

Appendix I

Feedwater System Valve List

Valve Number	Description	Startup	Normal	Shutdown
COS-196	Unit 7 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-197	Unit 1 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-198	Unit 1&2 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-199	Unit 1&2 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-200	Unit 2 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-201	Unit 1&2 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-202	Unit 1&2 Boiler Feed Pumps Deaerator Isolation Valve	Open	Open	Open
COS-216	Feedwater Cooler Level Control Valve Inlet Valve	Closed	Closed	Closed
COS-217	Feedwater Cooler Level Control Valve Outlet Valve	Closed	Closed	Closed
COS-218	Feedwater Cooler Level Control Valve Bypass Valve	Closed	Closed	Closed
HPFW-101	Feedwater Heater Unit 8 Inlet Isolation Valve	Open	Open	Open
HPFW-102	Feedwater Heater Unit 8 Outlet Isolation Valve	Open	Open	Open
HPFW-103	TV-1112 Isolation Valve	Open	Open	Open
HPFW-104	Feedwater Heater Unit 8 Bypass Valve	Closed	Closed	Closed
HPFW-105	TV-1112 Isolation Valve	Open	Open	Open
HPFW-106	TV-1112 Isolation Valve	Open	Open	Open
HPFW-107	TV-1112 Bypass Valve	Closed	Closed	Closed

Valve Number	Description	Startup	Normal	Shutdown
HPFW-108	Unit 8 Economizer Inlet Valve	Open	Open	Open
HPFW-109	Unit 8 Feedwater Control Valve Outlet	Open	Open	Open
HPFW-110	Boiler 8 Feedwater Control Valve Inlet	Open	Open	Open
HPFW-111	Boiler 8 Feedwater Control Valve North Bypass	Open	Open	Open
HPFW-112	Boiler 8 Feedwater Control Valve South Bypass	Open	Open	Open
	BFP 81 Suction Valve	Open	Open	Closed
	BFP 81 Discharge Valve	Open	Open	Closed
	BFP 81 Recirculation Inlet Isolation Valve	Open	Open	Open
	BFP 81 Recirculation Outlet Isolation Valve	Open	Open	Open
	BFP 81 Recirculation Bypass Valve	Closed	Closed	Closed
	BFP 82 Suction Valve	Open	Open	Closed
	BFP 82 Discharge Valve	Open	Open	Closed
	BFP 82 Recirculation Inlet Isolation Valve	Open	Open	Open
	BFP 82 Recirculation Outlet Isolation Valve	Open	Open	Open
	BFP 82 Recirculation Bypass Valve	Closed	Closed	Closed
	BFP 83 Suction Valve	Open	Open	Closed
	BFP 83 Discharge Valve	Open	Open	Closed
	BFP 83 Recirculation Inlet Isolation Valve	Open	Open	Open
	BFP 83 Recirculation Outlet Isolation Valve	Open	Open	Open
	BFP 83 Recirculation Bypass Valve	Closed	Closed	Closed
HPFW-113	Steam Temperature Spray Control Inlet Valve	Open	Open	Open
HPFW-114	Steam Temperature Spray Control Outlet Valve	Open	Open	Open
HPFW-115	Steam Temperature Spray Control Bypass Valve	Closed	Closed	Closed

Valve Number	Description	Startup	Normal	Shutdown
HPFW-116	Feedwater Supply from Unit 8 Isolation Valve	Open	Open	Open
HPFW-117	Feedwater Isolation Valve	Open	Open	Open
HPFW-118	Feedwater Isolation Valve	Open	Open	Open
HPFW-119	Feedwater Isolation Valve	Open	Open	Open
HPFW-120	Feedwater Isolation Valve	Open	Open	Open
HPFW-121	Unit 7 HP Heater Bypass Valve	Closed	Closed	Closed
HPFW-122	Feedwater Isolation Valve	Open	Open	Open
HPFW-123	Unit 7 HP Heater Inlet Valve	Open	Open	Open
HPFW-124	Unit 7 HP Heater Bypass Valve	Open	Open	Open
HPFW-125	Feedwater Isolation Valve	Open	Open	Open
HPFW-126	Feedwater Isolation Valve	Open	Open	Open
HPFW-127	Feedwater Isolation Valve	Open	Open	Open
HPFW-128	Feedwater Isolation Valve	Open	Open	Open
HPFW-129	Feedwater Isolation Valve	Open	Open	Open
HPFW-130	Feedwater Supply to Unit 8 Isolation Valve	Open	Open	Open
HPFW-131	Feedwater Isolation Valve	Open	Open	Open
HPFW-132	Feedwater Bypass Valve	Open	Open	Open
HPFW-133	Feedwater Isolation Valve	Open	Open	Open
HPFW-134	Feedwater Bypass Valve	Open	Open	Open
HPFW-135	Feedwater Isolation Valve	Open	Open	Open
HPFW-136	Feedwater Isolation Valve	Open	Open	Open
HPFW-137	GT 6 Feedwater Heater Bypass Valve	Closed	Closed	Closed
HPFW-138	GT 6 Feedwater Heater Inlet Valve	Open	Open	Open
HPFW-139	GT 6 Feedwater Heater Outlet Valve	Open	Open	Open
HPFW-141	Feedwater Isolation Valve to Boiler 1	Open	Open	Open

Valve Number	Description	Startup	Normal	Shutdown
HPFW-142	Feedwater Isolation Valve to Boiler 2	Open	Open	Open
HPFW-145	Feedwater Isolation Valve	Open	Open	Open
HPFW-147	Feedwater Isolation Valve	Open	Open	Open
HPFW-148	Feedwater Isolation Valve	Open	Open	Open
HPFW-149	HP Heater 1 Feedwater Supply Valve (Alternate)	Closed	Closed	Closed
HPFW-150	HP Heater 1 Feedwater Supply Valve	Open	Open	Open
HPFW-151	HP Heater 1 Feedwater Inlet Valve	Open	Open	Open
HPFW-152	HP Heater 1 Feedwater Outlet Valve	Open	Open	Open
HPFW-153	HP Heater 1 Feedwater Bypass Valve	Closed	Closed	Closed
HPFW-154	Feedwater Isolation to Boiler 3	Open	Open	Open
HPFW-155	Feedwater Supply Valve	Open	Open	Open
HPFW-156	HP Heater 2 Feedwater Supply Valve (Alternate)	Closed	Closed	Closed
HPFW-157	HP Heater 2 Feedwater Supply Valve	Open	Open	Open
HPFW-158	HP Heater 2 Feedwater Inlet Valve	Open	Open	Open
HPFW-159	HP Heater 2 Feedwater Outlet Valve	Open	Open	Open
HPFW-160	HP Heater 2 Feedwater Bypass Valve	Closed	Closed	Closed
HPFW-161	Feedwater Isolation to Boiler 3	Open	Open	Open
	Boiler 1 Feedwater Control Valve Inlet	Open	Open	Open
	Boiler 1 Feedwater Control Valve Outlet	Open	Open	Open
	Boiler 1 Feedwater Control Valve Bypass	Closed	Closed	Closed
	Boiler 2 Feedwater Control Valve Inlet	Open	Open	Open
	Boiler 2 Feedwater Control Valve Outlet	Open	Open	Open
	Boiler 2 Feedwater Control Valve Bypass	Closed	Closed	Closed
	Boiler 3 Feedwater Control Valve Inlet	Open	Open	Open
	Boiler 3 Feedwater Control Valve Outlet	Open	Open	Open

Valve Number	Description	Startup	Normal	Shutdown
	Boiler 3 Feedwater Control Valve Bypass	Closed	Closed	Closed
	Boiler 6 Feedwater Control Valve Inlet	Open	Open	Open
	Boiler 6 Feedwater Control Valve Outlet	Open	Open	Open
	Boiler 6 Feedwater Control Valve Bypass	Closed	Closed	Closed
	Boiler 7 Feedwater Control Valve Inlet	Open	Open	Open
	Boiler 7 Feedwater Control Valve Outlet	Open	Open	Open
	Boiler 7 Feedwater Control Valve Bypass	Closed	Closed	Closed
HPFW-162	Feedwater Supply Valve	Open	Open	Open
HPFW-163	Feedwater Temperature Control Spray Valve Bypass South	Closed	Closed	Closed
HPFW-164	Feedwater Temperature Control Spray Valve Isolation South	Open	Open	Open
HPFW-165	Feedwater Temperature Control Spray Valve Isolation North	Open	Open	Open
HPFW-166	Feedwater Temperature Control Spray Valve Bypass North	Closed	Closed	Closed
HPFW-167	Feedwater Isolation Valve	Open	Open	Open
HPFW-168	Feedwater Isolation Valve	Open	Open	Open
HPFW-169	Feedwater Isolation Valve	Open	Open	Open
HPFW-174	Feedwater Temperature Control Spray Valve Isolation Valve	Open	Open	Open
	BFP 1 Suction Valve	Open	Open	Open
HPFW-175	BFP 1 Discharge Valve	Open	Open	Open
	BFP 1 Recirculation Inlet Isolation Valve	Open	Open	Open
	BFP 1 Recirculation Outlet Isolation Valve	Open	Open	Open
	BFP 2 Suction Valve	Open	Open	Open
HPFW-177	BFP 2 Discharge Valve	Open	Open	Open
	BFP 2 Recirculation Inlet Isolation Valve	Open	Open	Open

Valve Number	Description	Startup	Normal	Shutdown
	BFP 2 Recirculation Outlet Isolation Valve	Open	Open	Open
	BFP 3 Suction Valve	Open	Open	Open
HPFW-176	BFP 3 Discharge Valve	Open	Open	Open
	BFP 4 Suction Valve	Open	Open	Open
HPFW-178	BFP 4 Discharge Valve	Open	Open	Open
	BFP 4 Recirculation Inlet Isolation Valve	Open	Open	Open
	BFP 4 Recirculation Outlet Isolation Valve	Open	Open	Open
	BFP 5 Suction Valve	Open	Open	Open
HPFW-179	BFP 5 Discharge Valve	Open	Open	Open
	BFP 5 Recirculation Inlet Isolation Valve	Open	Open	Open
	BFP 5 Recirculation Outlet Isolation Valve	Open	Open	Open
HPFW-180	BFP's 1, 2, 4 and 5 Recirculation Isolation Valve	Open	Open	Open
	BFP 71 Suction Valve	Open	Open	Open
	BFP 71 Discharge Valve	Open	Open	Open
	BFP 72 Suction Valve	Open	Open	Open
	BFP 72 Discharge Valve	Open	Open	Open
	BFP 73 Suction Valve	Open	Open	Open
	BFP 73 Discharge Valve	Open	Open	Open
HPFW-181	BFP's 71, 72 and 73 Recirculation Isolation Valve	Open	Open	Open
HPFW-182	BFP's 4 and 5 Recirculation Isolation Valve	Open	Open	Open
HPFW-183	Feedwater Cooler Inlet Valve	Closed	Closed	Closed
HPFW-184	Feedwater Cooler Outlet Valve	Closed	Closed	Closed
HPFW-185	Feedwater Cooler Bypass Valve	Closed	Closed	Closed
HPFW-186	Feedwater Cooler Isolation Valve	Closed	Closed	Closed