

AUXILIARY FEEDWATER SYSTEM OPERATION

1. OBJECTIVE

To provide instruction on the method of alignment for operation of the auxiliary feedwater system including auxiliary feedwater pumps, valves and pump suction supply.

2. REFERENCES

- 2.1 S-3-2.39 "Safety Related Valve Alignment"
- 2.2 S-2-19 "Auxiliary Feedwater System Testing"
- 2.3 DPR-13 Appendix A Part 3.4
- 2.4 S-0-111 "Equipment Testing Before and after Maintenance"

3. PREREQUISITES

- 3.1 Condensate make-up system is in service to the point where suction is available to the auxiliary feedwater pumps.
- 3.2 Steam is available to the turbine driven auxiliary feedwater pump.
- 3.3 Pump(s) are primed, flush water on and service water available.
- 3.4 Auxiliary feedwater pumps are aligned per S-3-2.38 "Safety Related Valve Alignment" Part I.
- 3.5 Auxiliary feedwater MOV-1204 operable and on automatic.

4. PRECAUTIONS

- 4.1 The reactor shall not be pressurized above 500 psig unless both auxiliary feedwater pumps are operable, or the steam driven pump is in continuous operation when the residual decay heat levels are greater than the natural heat losses from the reactor coolant system.
- 4.2 After criticality, one auxiliary feedwater pump may be removed from service for a period not to exceed 24 consecutive hours.
- 4.3 T average temperature changes must be anticipated when using the auxiliary feedwater pumps to supply the steam generator.

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4. PRECAUTIONS (Cont'd)

4.4 To assure reliability, the steam turbine and exhaust lines must be drained after use of the turbine driven pump.

* 4.5 When the safety injection system is operable and the main feedwater pump normal discharge valves HV-852A and/or HV-852B are open, the steam driven auxiliary feedwater pump normal discharge valve shall be locked closed and the electric auxiliary feedwater pump discharge valve MOV-1204 shall be closed and have its electric disconnect switch (local) open and locked with its fuses removed and its valve handwheel chained and locked.

4.6 Equipment requires testing before and after maintenance, per Station Order S-V-111.

4.7 The automatic auxiliary feedwater system shall be operable and in the ENABLE mode when the reactor coolant system pressure is 500 psig unless there is an operator stationed at the redundant auxiliary feedwater manual control valves (with no other assigned concurrent duties and in direct and continuous communication with the control room) to promptly initiate adequate auxiliary feedwater to the steam generator(s) if required.

5. CHECK OFF LIST/FORMS

5.1 Not applicable

6. PROCEDURES

6.1 Unit Startup Operation.

	<u>Important Step</u>		<u>Key Point</u>
6.1.1	Verify pump(s) discharge valves closed to main feedwater header.		
6.1.2	Verify main and auxiliary feedwater regulators closed.		
6.1.3	Start motor driven pump.	6.1.3	Verify bearing and seal water established.
6.1.4	Slowly open the pump discharge valve to the main feedwater header.	6.1.4	Pressurize slowly to avoid pressure shock. MOV-1204 need not be opened.

6. PROCEDURES (Cont'd)

	<u>Important Step</u>		<u>Key Point</u>
6.1.5	Adjust flow as required on the auxiliary regulators.	6.1.5	Observe pump amps - do not exceed red line.
6.1.6	Upon completion of pumping, close the pump discharge valve.		
6.1.7	Stop motor driven pump.		
	NOTE: If steam is available, the turbine driven pump may be used as follows:		
6.1.8	Start turbine driven pump by performing or verifying:		
	.1 Overspeed trip latched.		
	.2 Crack open steam supply bypass valve.		
	.3 Close turbine and exhaust drains when steam flows.	.3	Total of three drain valves.
	.4 Slowly open main steam supply valve.	.4	Observe turbine speed and pump discharge pressure increasing by action of turbine governor. If discharge pressure >1350 psig, verify proper turbine speed using portable RPM indicator (4400 RPM)
	.5 Close steam supply bypass valve.	.5	Observe steam control valve regulating downstream pressure at ~610 psig.
6.1.9	Slowly open the steam driven pump discharge valve to main feedwater header.	6.1.9	Pressurize slowly to avoid pressure shock.
6.1.10	Adjust flow as required on the auxiliary regulators.		

6. PROCEDURES (Cont'd)

	<u>Important Step</u>	<u>Key Point</u>
6.1.11	Upon completion of pumping, close pump discharge valve.	
6.1.12	Stop turbine driven pump.	
	.1 Slowly close main steam supply valve.	
	.2 Open turbine and exhaust drain when pump has stopped.	.2 Total of three drain valves.
6.2	Automatic System Operation	
NOTE:	The automatic auxiliary feedwater system shall remain out-of-service with all pertinent leads lifted to prevent inadvertent operation. This condition shall remain until its use is approved.	
NOTE:	There shall be an operator stationed at the redundant auxiliary feedwater manual control valves (with no other assigned concurrent duties and in direct and continuous communications with the Control Room) to promptly initiate adequate auxiliary feedwater to the steam generator(s) whenever the automatic auxiliary feedwater system is not in the ENABLE mode and the reactor coolant system pressure is >500 psig.	
6.2.1	Upon low level (<26%) in 2/3 steam generators, verify:	
	.1 Electric auxiliary feedwater pump starts.	
	.2 MOV-1204 opens after 20 sec. TD.	.2 Discharge valve to 1st point heater outlet.
	.3 Establish flow to all steam generators through auxiliary regulators.	.3 Auxiliary regulators (CV-142, 143 and 144) manually positioned except on SI when they close.
NOTE:	On a unit trip, or other conditions causing low steam generator level (except safety injection), feedwater flow will be through the auxiliary and main feedwater regulators from both the main feedwater pumps and the electric auxiliary feedwater pump. Upon safety injection the auxiliary feedwater pump alone will feed the steam generators through the redundant feedwater header.	

6. PROCEDURES (Cont'd)

	<u>Important Step</u>		<u>Key Point</u>
6.2.2	Adjust flow to maintain steam generator level within the narrow range instrumentation (>26%).	6.2.2	Upon unit trip establish 50% level.
6.2.3	If the main and/or auxiliary feedwater regulators are unavailable, initiate flow through the redundant feed header.	6.2.3	Emergency redundant feed header ties into main feed line downstream of main/and auxiliary regulators.
	.1 Verify running or start the electric and/or steam driven pump.	.1	See 6.1.8 for starting steam driven pump.
	.2 Open the inlet block valves to each steam generator feed line.	.2	Valves located in Controlled Area, just south of containment sphere.

NOTE: Maintain communications with Control Room to assure flow is within capability of pump(s).

6.3 Loss of Suction from Condensate Storage Tank.

- * 6.3.1 Place auxiliary feedwater system in DISABLE mode. See Precaution 4.7
- 6.3.1 Insure integrity of of electric auxiliary feedwater pump.
- NOTE: The automatic auxiliary feedwater system shall remain out-of-service with all pertinent leads lifted to prevent inadvertent operation. This condition shall remain until its use is approved.
- 6.3.2 Initiate unit shutdown to cold conditions.
- 6.3.3 Initiate repair and/or return to service of suction from Condensate Storage Tank.
- * 6.3.4 Verify alignment of the permanently installed suction hose between hose connection at fire hydrant No. 7 and suction connection at the electric auxiliary feedwater pump inlet.
- 6.3.4 FH-7 located near sulfuric acid tank.
- * 6.3.5 Open valves to the suction of the electric auxiliary feedwater pump if it is needed during shutting down of the unit.

6. PROCEDURES (Cont'd)

6.3 (continued)

6.3.6 Upon return to service of normal suction, perform weekly test of auxiliary feedwater pumps. The unit shutdown may be terminated.

6.4 Alternate Auxiliary Feedwater Pumps and/or Condensate Storage Tank (CST) Supply Operation.

	<u>Important Step</u>	<u>Key Point</u>
6.4.1	Primary Makeup Tank to Condensate Storage Tank.	
	.1 Verify primary makeup pump running.	
	.2 Open pump discharge valve to condensate tank approx. 2-3 turns.	.2 Located at CST. Second primary makeup pump may auto start.

NOTE: Primary makeup pumps have a design flow of 100 gpm. If the auxiliary feedwater pumps are in service, this flow rate may not be adequate to maintain or increase level in the condensate storage tank.

.3 Upon completion of pumping, close isolation valve at CST.

6.4.2 Unit 2 Condensate Tank to Unit 1 Condensate Storage Tank.

.1	Align 2 1/2" fire hose between Unit 2 CST and Unit 1 CST inlet connection.	.1 Contact Unit 2 and 3 Operations to assist in this.
.2	Request Unit 2 and 3 Operations start transfer pump and charge line.	
.3	Open inlet block valve at Unit 1 CST.	.3 Do not exceed transfer pump capability, Contact Unit 2 and 3 Operations.

NOTE: Unit 2 condensate transfer pump is rated at 1000 gpm.

NOTE: Under normal operations, verify water chemistry within acceptable limits prior to initiating transfer. In an emergency, obtain Watch Engineers approval prior to transfer.

6. PROCEDURES (Cont'd)

- | | <u>Important Step</u> | <u>Key Point</u> |
|-------|---|---|
| 6.4.3 | Service Water Reservoir to Condensate Storage Tank. | |
| .1 | Align 2 1/2" fire hose between FH-7 and inlet connection of CST. | .1 FH-7 located near Sulphuric Acid Tank. |
| | <u>CAUTION:</u> This alignment is for emergency conditions only and should never be utilized unless authorized by the Watch Engineer. | |
| .2 | Start a fire pump. | |
| .3 | Open inlet block valve at CST. | |
| .4 | Open hydrant valve. | .4 If maximum pump amps are exceeded, start second fire pump. |

NOTE: This flow path is capable of 1000 gpm which exceeds the pumping capability of both auxiliary feedwater pumps combined.

- * 6.4.4 Service Water Reservoir to Electric Auxiliary Feedwater Pump Suction.
- * .1 Stop electric auxiliary feedwater pump
- * .2 Close electric auxiliary feedwater pump normal suction valve.
- * .3 Verify alignment of the permanently installed suction hose between hose connection at fire hydrant No. 7 and suction connection at the electric auxiliary feedwater pump inlet.

CAUTION: This alignment is for emergency conditions only and should never be utilized unless authorized by the Watch Engineer.

6. PROCEDURES (Cont'd)

	<u>Important Step</u>	<u>Key Point</u>
*	.4 Open block valve at FH-7 and load hose.	
*	.5 Open emergency suction valve at electric auxiliary feed-water pump.	
*	.6 Start electric auxiliary feedwater pump.	
	6.4.5 Domestic Water System to Condensate Storage Tank.	
	.1 Align 2 1/2" fire hose between outlet at domestic water filter and inlet connection at CST.	
	<u>CAUTION:</u> This alignment is for emergency condition only and should never be utilized unless authorized by the Watch Engineer.	
	.2 Open outlet valve at domestic water filter to charge hose.	
	.3 Open inlet block valve at CST.	

NOTE: This flow path is capable of approximately 250 gpm.

7. RECORDS

Not applicable.



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*Indicates revision