

Davis-Besse Nuclear Power Station

Unit No. 1

System Procedure SP 1104.43

Steam Generator Feedwater and Condensate Chemical
Addition System

Record of Approval and Changes

Prepared by Dennis Hennen/ Allen Mosbaugh 2/21/75
Date

Submitted by D. W. Biden 11/21/75
Section Head Date

Recommended by NA DWB
SRB Chairman Date

QA Approved NA DWB
Manager of Quality Assurance Date

Approved by [Signature] 1/10/76
Station Superintendent Date

Revision No.	SRB Recommendation	Date	QA Approved	Date	Sta. Supt. Approved	Date
1	NA		NA		TD Murray	12/27/77
2	NA		NA		TD Murray	6/30/81
3	NA		NA		TD Murray	2/13/83
4	NA		NA		TD Murray	4/14/84

8507300317 850419
PDR ADOCK 05000346
PDR

1. PURPOSE

- 1.1 The feedwater chemical addition system is designed to maintain a prescribed oxygen level and pH in the main feedwater system by injection of appropriate chemicals into the feedwater. Control of oxygen and pH is maintained to prevent or limit metal oxidation and corrosion in the steam generators and associated feedwater equipment.

Normally ammonium hydroxide and hydrazine are injected to the feedwater of the outlet of the condensate polishers. Flow elements installed in the discharge side of each booster feedwater pump regulate, through an electro-pneumatic controller, the injection rate in proportion to the rate of feedwater flow. There are secondary injection points that may be used for large inleakage of air contaminated water and/or corrosion control.

MODES OF OPERATION

SECTION

F.W. Chem Add Sys Chem Tank Operation	4
F.W. Chem Add Sys Pump Operation	5
Normal Feed	6
Normal Layup	7
Miscellaneous Injection Points in the Condensate and Feedwater Systems	8

2. PRECAUTIONS AND LIMITATIONS

- 2.1 The safety precautions for handling chemicals outlined in TECo Safety Manual must be followed.
- 2.2 Do not feed hydrazine ahead of the condensate polishers when they are in service as it will be removed by ion exchange thus depleting the hydrazine injected and shortening the polishers run lengths.
- 2.3 The chemical feed pumps must have an adequate oil level per equipment lubrication sheet.

3. REFERENCES

- 3.1 Bechtel System Description, 1104.43
- 3.2 P&ID M-004A, Low Pressure Extraction Steam System
- 3.3 P&ID M-006A, Condensate System

3.4 P&ID M-006B, Feedwater System

3.5 P&ID M-045, Chemical Addition Systems

3.6 Operational Chemical Control Limits, PP 1101.04

4. FEEDWATER CHEMICAL ADDITION SYSTEM CHEMICAL TANK OPERATION

In normal operation, the ammonia and hydrazine feed tanks will be used daily and treated with the proper chemicals using the tank factors logged for each tank. For slug type chemical injection of ammonia or hydrazine the FW Chemical Injection Mix Tank will be used.

4.1 Prerequisites

- ____ 4.1.1 When in use, the hydrazine and ammonia feed tank levels should be checked daily. Water and chemicals should be added to maintain full tanks.

NOTE: Feed pump damage may result from pumping a tank to dryness.

- ____ 4.1.2 Hydrazine should not be placed in the ammonia feed tank because of damage to the tank lining.

- ____ 4.1.3 Electrical Supply for agitators.

	Motor Control			
	Center	Breaker	Panel	Location
Hydrazine Feed Tk Mixer 1-2	F32B	BF3279		Aux
Ammonia Feed Tk Mixer 1-1	F32B	BF3278		Boiler
Mix Tank Agitator 1-3	L4301	CKT. 26		Area
				Elev 585

4.2 Procedure

- ____ 4.2.1 Record the inches that the liquid is from the top of the tank in the Tank Log.
- ____ 4.2.2 Calculate the amount of chemical(s) to be added by multiplying the number of inches (4.2.1) times the tank factor listed for the particular tank in the Tank Log.
- ____ 4.2.3 Start chemical feed tank mixer on the tank being treated (S32-1 Ammonia Feed Tank Mixer, S32-2 Hydrazine Feed Tank Mixer).

- ____ 4.2.4 Add the chemical(s) calculated in 4.2.2 directly to the hydrazine and ammonia feed tanks through the hatch.
- ____ 4.2.5 Fill remainder of the tank with condensate water by opening valves CD 211, CD 212 and/or CD 62 for the hydrazine feed, ammonia feed, and/or feedwater chemical injection mix tanks respectively.
- ____ 4.2.6 Mix for approximately 5 minutes.

5. FEEDWATER CHEMICAL ADDITION SYSTEM PUMP OPERATION

In the "auto" mode of operation, the feed pumps that are in the "auto" position receive a signal from an electro-pneumatic controller which proportions the chemical feed pump stroke to the flow rate from the discharge of the booster feedwater pumps. The "auto" mode is used for the normal chemical feed.

Manual operation is used for injecting chemicals at various points in the Condensate and Feedwater Systems in batch type quantities.

5.1 "Auto" Mode

5.1.1 Prerequisites

- ____ 1. The flow indicators FI 438 and FI 428 on the discharge of the booster FW pumps must show flow in order to give a signal to the chemical addition pumps.
- ____ 2. A flow path must be available as those found in Sections 6-8 to prevent dead heading the pump.
- ____ 3. The chemical feed tank being pumped from should be treated and filled following Section 4.
- ____ 4. Electrical Supply for pumps.

	Motor Control Center	Breaker	Panel	Location
Hydrazine Feed Pump 1-1	F32B	BF 3271		Aux
Ammonia Feed Pump 1-2	F32B	BF 3286		Boiler
Spare Chem Inj Pump 1-3	F32B	BF 3282		Area Elev 585'

5.1.2 Procedure

- ____ 1. Choose the point of injection.

- ____ 2. Place valves in the positions as stated following that particular section for the injection point.
- ____ 3. Place the desired pump controller in auto.

5.2 Manual Operation

5.2.1 Prerequisites

- ____ 1. A flow path must be available as found in sections 6-8 to prevent dead heading the pump.
- ____ 2. The chemical feed tank being used should be treated and filled following Section 4.

5.2.2 Procedure

- ____ 1. Choose the location of the point of injection and follow the valve lineup for that section.
- ____ 2. Place the desired pump(s) controller in manual.

NOTE: The ammonia and hydrazine tank levels must be maintained to protect the pump.

6. NORMAL FEED

4 | The normal feed injection point is the outlet of the Condensate Polishers. The chemical pumps are controlled automatically as found in Section 5. Hydrazine levels of the outlet of the final feedwater heater must be maintained at 20 to 100 ppb and pH must be 9.3 to 9.6 measured at 77°F.

6.1 Prerequisites

- ____ 6.1.1 The valves are in the positions as stated on Valve Verification List #1.
- ____ 6.1.2 The Condensate and Feedwater Systems are in operation.
- ____ 6.1.3 The Ammonia Feed Tank 1-1 and the Hydrazine Tank 1-1 must be filled with ammonia and hydrazine solutions respectively of the proper concentrations per Section 4.

6.2 Procedure

- ____ 6.2.1 Place the Ammonia Feed Pump 1-1 and the Hydrazine Feed Pump 1-1 controllers in auto.

- 4 |
- ____ 6.2.2 Check the discharge pressure indicator to ensure the pump in service is pumping. The gauge should show pressure and fluctuate with each pump stroke.
 - ____ 6.2.3 Sample the Condensate and Feedwater Systems from the common discharge of the last set of HP heaters through SS 31.
 - ____ 6.2.4 Determine the pH and hydrazine content of the sample following CH 4097.00 and CH 4078.00.
 - ____ 6.2.5 Record the results noting the 9.3 - 9.6 pH range and the 20 - 100 ppb hydrazine range.
 - ____ 6.2.6 If the pH or hydrazine limits are not met, an adjustment should be made in the tank factor for the limit exceeded.

NOTE: pH is controlled by the addition of ammonia. To raise pH, the ammonia concentration in the tank or tank factor must be raised. Lower the tank factor for too high a pH. The same is true for hydrazine feed; raise tank factor for too low concentration, lower tank factor for too high a concentration.

- ____ 6.2.7 Make additions to the tanks as needed following Section 4 and using the appropriate tank factors.

7. NORMAL LAYUP

Normal layup consists of the Condensate and Feedwater Systems in the cleanup recirculation mode of operation laid up with 50 - 200 ppm hydrazine, 2-20 ppm ammonia at a pH of 9.5 - 10.5 as per PP 1101.04. The steam generator is laid up by its own layup system.

7.1 Prerequisites

- ____ 7.1.1 Ensure the valves are in the positions as stated on Valve Verification List #1.
- ____ 7.1.2 The Condensate and Feedwater Systems are in the cleanup recirculation mode.
- ____ 7.1.3 The Ammonia Feed Pump 1-1 and the Hydrazine Feed Pump 1-1 are shutdown.

7.2 Procedure

- ____ 7.2.1 Add to the Feedwater Chemical Injection Mix Tank

enough hydrazine and ammonia to obtain the required concentrations in the Condensate Feedwater Systems. More than one tank volume may be required.

- ____ 7.2.2 Close valves SC 6 and SC 8 which are used for normal feed.
- ____ 7.2.3 Close valves SC 42, 44 discharge of Ammonia Feed Pumps 1-1 and Hydrazine Feed Pump 1-1.
- ____ 7.2.4 Open valves SC 26 and 32, tank outlet valves from the mix tank to spare chemical injection pump and SC 45 discharge of spare chemical injection pump to hydrazine header.
- ____ 7.2.5 Open valve SC 4 hydrazine feed header to condensate pump discharge header.
- ____ 7.2.6 Place spare chemical injection pump in manual and pump the tank as nearly empty as possible without allowing the pump to become air bound.
- ____ 7.2.7 Fill the tank with approximately one foot of water and continue pumping until the tank is almost empty again.
- ____ 7.2.8 Repeat 7.2.7.
- ____ 7.2.9 Shut off spare chemical injection pump.
- ____ 7.2.10 Allow the Condensate and Feedwater Systems to recirculate until chemistry is at equilibrium.
- ____ 7.2.11 Sample the Condensate and Feedwater Systems to determine the amount of hydrazine, pH and ammonia in the system following procedures CH 4097.00, CH 4078.00 and CH 4099.00 respectively.
- ____ 7.2.12 If the chemical concentrations are not in limits as stated in Section 7, more chemicals or a dilution may be required as necessary.
- ____ 7.2.13 Repeat 7.2.11 on a weekly basis.

8. MISCELLANEOUS INJECTION POINTS IN THE CONDENSATE AND FEEDWATER SYSTEM

The chemical feed points will be used in certain abnormal instances for local corrosion and oxygen control. The decision to use these points will be determined at the time of use and by the Chemistry and Health Physics Foreman. Feed tank and pump selection will be decided also at the time of use.

8.2 Chemical Injection to H.P. Heaters Discharge

8.1.1 Prerequisites

- ____ 1. The valves should be in the positions as stated on Valve Verification List #1.

8.1.2 Procedure

- ____ 1. Close valves SC 30, 36, 42 ammonia feed tank isolation ammonia pump suction, and discharge respectively and valves SC 31, 37, 44 hydrazine feed tank isolation, hydrazine pump suction and discharge respectively until pump selection has been made.
- ____ 2. Make tank(s) and pump(s) selection.
- ____ 3. Treat the tank with the proper amount of chemicals.
- ____ 4. Open valve(s) SC 22 and/or SC 24 HP heaters discharge from ammonia and/or hydrazine feed pumps common discharge header respectively.
- ____ 5. Choose the pump mode of operation and place pump in service.
- ____ 6. Ensure that the tank being pumped down does not go dry while pumping.

8.2 Chemical Injection to Booster Feed Pump Suction

8.2.1 Prerequisites

- ____ 1. Repeat 8.1.1 - 1.

8.2.2 Procedure

- ____ Repeat 8.1.2 1-6 replacing valves SC 22 and/or SC 24 in Step 4 with SC 12 and SC 16 and/or SC 10 and SC 14 Booster Feed Pump Suction from hydrazine and/or ammonia feed pumps discharge header(s) respectively.

8.3 Chemical Injection to Condensate Storage Tanks

8.3.1 Prerequisites

- ____ 1. Repeat 8.1.1 - 1.
- ____ 2. It is necessary that demineralized water is being added to the Condensate Storage Tanks through CD 163 or CD

164 before ammonia or hydrazine injections are made to these miscellaneous injection points. This is to assure uniform concentrations in the tank.

- ____ 3. It is also necessary that flow of demineralized water from the demineralized water header valve DW 2598 be going only to the Condensate Storage Tanks to avoid introducing high concentrations of hydrazine and ammonia into other systems.

8.3.2 Procedure

- ____ 1. Repeat 8.1.2 - 1-6 replacing valves SC 22 and/or SC 24 in Step 4 with SC 206 and/or SC 208 ammonia and/or hydrazine discharge header(s) respectively to condensate storage tanks and ensuring valves CD 163 and CD 164 condensate storage tanks 1-1 and 1-2 to hotwell respectively are open.

8.4 Hydrazine Injection to Deaerator Storage Tanks 1-1 and 1-2

8.4.1 Prerequisites

- ____ 1. Repeat 8.1.1 - 1.

8.4.2 Procedure

- ____ 1. Repeat 8.1.2 - 1-6 replacing valves SC 22 and SC 24 in Step 4 with SC 18 and SC 20 hydrazine discharge header to Deaerator Storage Tank(s) 1-1 and 1-2 respectively.

8.5.1 Prerequisites

- ____ 1. Repeat 8.1.1 - 1.

8.5.2 Procedure

- ____ 1. Repeat 8.1.2 - 1-6 replacing valves SC 22 and SC 24 in Step 4 with SC 102 and SC 103 hydrazine discharge header to L.P. F.W. Heater Drain Tanks 1-1 and/or 1-2 respectively.

Sheet No. 1
of 4

VALVE VERIFICATION LIST #1

Chemical Feed Original Line-up List

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
From Cond Pumps Disch. Header to NH ₄ OH Feed Tank 1-1	M-045-11 (A-2)	CD 212	Closed	
From Cond Pumps Disch. Header to NH ₄ OH Feed Pump 1-1 Suction	M-045-11 (A-2)	CD 63	Closed	
NH ₄ OH Feed Tank 1-1 Level Gage Isolation (Top)	M-045-11 (A-2)	SC 1593B	Open	
NH ₄ OH Feed Tank 1-1 Level Gage Isolation (Bottom)	M-045-11 (B-2)	SC 1593A	Open	
NH ₄ OH Feed Tank 1-1 Isolation Valve	M-045-11 (B-2)	SC 30	Open	
NH ₄ OH Feed Tank 1-1 Sample Conn.	M-045-11 (B-2)	SS 100	Closed	
NH ₄ OH Feed Tank 1-1 Service Drain	M-045-11 (B-2)	SC 34	Closed	
NH ₄ OH Feed Tank 1-1 Recirc Line	M-045-11 (C-2)	SC 38	Closed	
Spare Chem Inj Pump 1-1 Recirc to NH ₄ OH Feed Tank 1-1	M-045-11 (B-3)	SC 28	Closed	
F.W. Chem. Inj. Mix Tk. to NH ₄ OH Fd. Tk. Shut Off Vlv.	M-045-11 (B-2)	SC 105	Closed	
F.W. Chem. Inj. Mix Tk. to NH ₄ OH Fd. Pump Suct. Shut Off Vlv.	M-045-11 (B-2)	SC 106	Closed	
NH ₄ OH Feed Pump 1-1 Suction	M-045-11 (B-1)	SC 36	Open	
NH ₄ OH Feed Pump 1-1 Discharge Service Drain	M-045-11 (D-2)	SC 40	Closed	
NH ₄ OH Feed Pump 1-1 Discharge Press Ind Isolation	M-045-11 (C-2)	SC 1596	Open	
NH ₄ OH Feed Pump 1-1 Discharge to NH ₄ OH Header	M-045-11 (D-3)	SC 42	Open	
Spare Chem Inj Pump 1-1 Discharge to NH ₄ OH Feed Header	M-045-11 (C-5)	SC 46	Closed	
NH ₄ OH Feed Pump 1-1 to Booster FW Pump 1-1	M006B-12 (C-3)	SC 12	Closed	
NH ₄ OH Feed Pump 1-1 to Booster FW Pump 1-2	M006B-12 (C-11)	SC 16	Closed	
NH ₄ OH Feed Pump 1-1 to HP FW HTR 1-1-6 and 1-2-6 Outlet	M006B-12 (B-6)	SC 22	Closed	
NH ₄ OH Feed Pump 1-1 to Cond Pumps Discharge	M006A-14 (K-7)	SC 2	Closed	
NH ₄ OH Feed Pump 1-1 to LP FW HTR 1-1-2 and 1-2-2	M-008-9 (A-12)	SC 8	Open	

Sheet No. 2
 of 4

VALVE VERIFICATION LIST #1

Chemical Feed Original Line-up List

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
NH ₄ OH Fd. to Cnds. Strg. Tk. Vlv.	M006A-14 (F-13)	SC 206	Closed	
NH ₄ OH Fd. to Cnds. Strg. Tk. Vlv.	M004A-10 (F-13)	SC 208	Closed	
N ₂ H ₄ Fd. Pump 1-1 to LP FW HTR. DT Vlv.	M004A-10 (J-8)	SC 103	Closed	
From Cond Pumps Disch. Header to N ₂ H ₄ Feed Tank 1-1	M-045-11 (A-6)	CD 211	Closed	
From Cond Pumps Disch. Header to N ₂ H ₄ Feed Pump 1-1 Suction	M-045-11 (B-6)	CD 61	Closed	
N ₂ H ₄ Feed Tank 1-1 Level Gage Isolation (Top)	M-045-11 (A-6)	SC 1594B	Open	
N ₂ H ₄ Feed Tank 1-1 Level Gage Isolation (Bottom)	M-045-11 (B-6)	SC 1594A	Open	
N ₂ H ₄ Feed Tank 1-1 Isolation Valve	M-045-11 (B-6)	SC 31	Open	
N ₂ H ₄ Feed Tank 1-1 Samp. Conn.	M-045-11 (B-6)	SS 102	Closed	
N ₂ H ₄ Feed Tank 1-1 Service Drain	M-045-11 (B-5)	SC 35	Closed	
N ₂ H ₄ Feed Tank 1-1 Recirc Line	M-045-11 (B-5)	SC 39	Closed	
Spare Chem Inj Pump 1-1 Recirc to N ₂ H ₄ Feed Tank 1-1	M-045-11 (B-5)	SC 29	Closed	
FW Chem Inj Mix Tank Isolation to N ₂ H ₄ Feed Tank 1-1	M-045-11 (B-5)	SC 27	Closed	
Spare Chem Inj Pump 1-1 Suction to N ₂ H ₄ Feed Tank 1-1	M-045-11 (B-5)	SC 33	Closed	
N ₂ H ₄ Feed Pump 1-1 Suction	M-045-11 (B-6)	SC 37	Open	
N ₂ H ₄ Feed Pump 1-1 Discharge Press Ind Isolation	M-045-11 (C-6)	SC 1599	Open	
N ₂ H ₄ Feed Pump 1-1 Discharge Service Drain	M-045-11 (C-6)	SC 41	Closed	
N ₂ H ₄ Feed Pump 1-1 Discharge to N ₂ H ₄ Feed Header	M-045-11 (C-5)	SC 44	Open	
Spare Chem Inj Pump 1-1 Discharge to N ₂ H ₄ Feed Header	M-045-11 (C-5)	SC 45	Closed	
N ₂ H ₄ Feed Pump 1-1 to Booster FW Pump 1-1	M-006B-12 (C-3)	SC 10	Closed	
N ₂ H ₄ Feed Pump 1-1 to Booster FW Pump 1-2	M006B-12 (C-11)	SC 14	Closed	

Sheet No. 3
of 4

VALVE VERIFICATION LIST #1

Chemical Feed Original Line-up List

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
N ₂ H ₄ Feed Pump 1-1 to HP FW HTR 1-1-6 and 1-2-6 Outlet	M006B-12 (B-8)	SC 24	Closed	
N ₂ H ₄ Feed Pump 1-1 to Deaer Stor Tk 1-1	M006B-12 (B-3)	SC 18	Closed	
N ₂ H ₄ Feed Pump 1-1 to Deaer Stor Tk 1-2	M006B-12 (B-10)	SC 20	Closed	
N ₂ H ₄ Feed Pump 1-1 to Cond Pumps Discharge	M006A-14 (J-9)	SC 4	Closed	
N ₂ H ₄ Feed Pump 1-1 to LP FW HTR 1-1-2 and 1-2-2	M-008-9 (A-12)	SC 6	Open	
N ₂ H ₄ Feed Pump 1-1 to LP FW HTR Drain Tank 1-1	M004A-10 (J-4)	SC 102	Closed	
Outlet From Cond. Strg. Tk. 1-1 Vlv	M006A-14 (F-12)	CD 163	Open	
Outlet From Cond. Strg. Tk 1-2 Vlv	M006A-14 (F-12)	CD 164	Open	
From Cond Pumps Disch. Header to FW Chem Inj Mix Tank	M-045-11 (A-4)	CD 62	Closed	
FW Chem Inj Mix Tank Level Gage Isolation (Top)	M-045-11 (A-3)	SC 2800B	Open	
FW Chem Inj Mix Tank Level Gage Isolation (Bottom)	M-045-11 (A-3)	SC 2800A	Open	
FW Chem Inj Mix Tank Samp. Conn.	M-045-11 (B-3)	SS 101	Closed	
FW Chem Inj Mix Tank Service Drain	M-045-11 (B-4)	SC 25	Closed	
FW Chem Inj Mix Tank Isolation to Spare Chem Inj Pump 1-1	M-045-11 (B-3)	SC 26	Closed	
FW Chem Inj Mix Tank Isolation to N ₂ H ₄ Feed Tank 1-1	M-045-11 (B-5)	SC 27	Closed	
Spare Chem Inj Pump 1-1 Suction to FW Chem Inj Mix Tank	M-045-11 (B-3)	SC 32	Closed	
Spare Chem Inj Pump 1-1 Discharge Press. Ind. Isolation	M-045-11 (B-4)	SC 2710	Open	
Spare Chem Inj Pump 1-1 Discharge Service Drain	M-045-11 (B-4)	SC 48	Closed	
Demin. Water to Chem Feed Fill Shutoff Vlv.	M-045-11 (A-7)	DW 65	Closed	
L.P. F.W. Htr. 1-2-2 Bypass Vlv.	M006A-14 (C-8)	CD 162	Closed	

Sheet No. 4
of 4

VALVE VERIFICATION LIST #1

Chemical Feed Original Line-up List

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
N ₂ H ₄ Header to Cond. Polishers Iso.	M045 (C-3)	SC 52	Closed	
N ₂ H ₄ Header Normal Feed to Cond. Polishers	M045 (C-3)	SC 53	Open	

END