

1.9  
MTX 24.6

FUNCTIONAL TEST  
CONDENSATE POLISHER

POR  
Y

7911090567

DOT

NUMBER 1P 270, 1

MTX 24.6 ✓

## CONDENSATE POLISHING SYSTEM

CATEGORY B

## FUNCTIONAL TEST

DRAFT Rev. 0

PREPARED: Cognizant Engineer AD Pullia Date 2/26/76APPROVED: Lead Engineer D T English Date 2/1/76APPROVED: Technical Engineer McKelton Date 4/22/76

## DOT APPROVAL FOR PERFORMANCE:

GPU DOT Representative McKelton Date 5/13/76Net-Ed DOT Representative Barbara McElwain Date 5/12/76NSSF DOT Representative N.A. Date \_\_\_\_\_or  
A-E DOT Representative P.P. Brownell Date 5/13/76TEST RESULTS: Acceptable with the following test exceptions and deficiencies-  
E/D - 1 thru 13Technical Engineer McKelton Date 8/23/77

## DOT APPROVAL OF TEST RESULTS:

GPU DOT Representative McKelton Date 11/17/77Net-Ed DOT Representative G. J. Thacker Date 11/17/77NSSF DOT Representative N.A. Date \_\_\_\_\_or  
A-E DOT Representative P.P. Brownell Date 11/17/77

ENCLOSURES: 1. Test Exception and Deficiency List

2. Remote Regenerating Station - Automatic  
Valve Operating Sequence

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- 1.1 Verify the Condensate Polishers will accommodate approximately 2500 gpm per unit. (Normally seven units in operation and one unit in standby)
- 1.2 Verify that resin cannot be transferred from a polishing tank to the regenerating tank while a resin bed is being regenerated.
- 1.3 Verify the following options provided with the automatic regeneration of resins:
  - 1.3.1 Any timed step may be extended or repeated if resin has not been or is not being transferred to another vessel.
  - 1.3.2 Preselected elimination of chemical treatment.
- 1.4 Verify automatic resin transfer.
- 1.5 Verify the operability of the Ammonia and Hydrazine injection system to the effluent of the Condensate Polishers.
- 1.6 During the regeneration cycle, verify the automatic valves operate properly and record sequence step timer settings.

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2.0 REFERENCES

2.1 Burns and Roe, Inc. Flow Diagrams

2.1.1 Make-Up Water Treatment and Condensate Polishing  
(2006, Rev. <sup>18</sup>15) <sup>14</sup>

2.2 L\*A Water Conditioning Company Flow Diagrams

E-5 2.2.1 Condensate Demineralizer Mixed Bed Polisher  
System (D-4519, Rev. <sup>E</sup>D) (B+R # 15-00-0415)

E-5 2.2.2 Condensate Demineralizer External Regeneration  
System (D-4522, Rev. <sup>I</sup>E) (B+R # 15-00-0400)

2.3 Vendor Manuals

2.3.1 L\*A Water Purification System, Volume I (1500)

E-1 2.4 FSAR, Section 10.4.6, Amendment No. <sup>56</sup>39

2.5 2106-2.2, Condensate Polishing System, February, 1976

2.6 L\*A Water Conditioning Co. Drawings

E-1 2.6.1 D-3835, Rev. <sup>E</sup>E (15-00-0216)

2.6.2 D-3836, Rev. D (B+R # 15-00-0217)

2.6.3 D-4051, Rev. E (B+R # 15-00-0518)

E-1 2.6.4 D-4088, Rev. <sup>C</sup>C (B+R # 15-00-0519)

E-1 2.6.5 D-4767, Rev. <sup>C</sup>C (B+R # 15-00-0520)

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3.0

TIME REQUIRED

3.1 Three men, three shifts.

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## PREREQUISITES

### 4.1 Tests

The following tests have been completed sufficiently to support performance of this test procedure.

#### 4.1.1 TP 250/2 - Instrument Calibration - MTX 24.1

Signature *A. C. White* Date 5-30-77

#### 4.1.2 TP 250/2 - Electrical Test - MTX 24.2

Signature *A. C. White* Date 5-30-77

#### 4.1.3 TP 250/1 - Pressure Test - MTX 24.3

Signature *A. C. White* Date 5-30-77

#### 4.1.4 TP 250/4 - Flush - MTX 24.4

Signature *A. C. White* Date 5-30-77

#### 4.1.5 TP 250/2 - Preliminary Operational Test - MTX 24.5

Signature *A. C. White* Date 5-30-77

### 4.2 Construction Completion Status

#### 4.2.1 Met-Ed has accepted the system for preoperational testing.

Signature *A. C. White* Date 5-30-77

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4.3 Environmental Conditions

4.3.1 No special environmental conditions are required.

Signature [Signature] Date 3-30-77

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5.0 TEST EQUIPMENT

5.1 None

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## LIMITATIONS AND PRECAUTIONS

- 6.1 Remove a polisher from service when an alarm annunciates polisher low flow or high pressure drop across the resin trap, and ensure there has been no resin loss due to under-drain screen break.
- 6.2 Adequate safety precautions for strong chemical solutions must be observed when working with caustic or acid.

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7.1 Instrument Air available for the performance of this test.

Signature *J. L. C. [illegible]* Date 5-2-77

7.2 Service Air available for the performance of this test.

Signature *J. L. C. [illegible]* Date 5-2-77

7.3 Demineralized Service Water available for the performance of this test.

Signature *J. L. C. [illegible]* Date 5-2-77

E-4 7.4 Condensate System in operation to support the performance of this test.

Signature *J. L. C. [illegible]* Date 5-2-77

7.5 Secondary Sampling System in operation to support the performance of this test.

Signature *J. L. C. [illegible]* Date 5-2-77

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- 8.1 The Condensate Polishing System is in normal operation in accordance with 2106-2.2 with polisher number <sup>412</sup>one in stand-by status.

Signature *J. P. White* Date 5-30-77

- 8.2 The spare resin bed is located in the mixing and storage tank.

Signature \_\_\_\_\_ Date \_\_\_\_\_

- 8.3 The hydrazine and ammonium hydroxide chemical injection is in operation.

Signature *J. P. White* Date 5-30-77

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NOTE: The sequence of testing of major sections is optional.

- E-12-4* 9.1 This section verifies that the Condensate Polishers will accommodate approximately 2500 gpm per unit.

NOTE: Depending on the plant conditions that exist at the time of this test any two polishers may be used in Sections 9.1.2 and 9.1.3.

9.1.1 Record in section 10.1.1 the flow rate through each in-service polisher, the differential pressure across each in-service polisher, and the outlet conductivity for each in-service polisher.

*E-2* 9.1.2 Place the standby polisher in-service and remove polisher number eight (CO-K-1A) from service per 2106-22.

9.1.3 Record in section 10.1.3 the flow rate through polisher number one (CO-K-1H), the differential pressure across polisher number one, and the outlet conductivity for polisher number one.

Section 9.1 Accomplished Sat. \_\_\_\_\_ Unsat. \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

9.2 This section verifies that resin cannot be transferred from a polishing tank to the regenerating tank while a resin bed is being regenerated.

*See* 9.2.1 On Panel 304, select and initiate module G (storage tank refill and final rinse).

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9.2.2 With module G energized, attempt to OPEN valve C-1 (resin inlet to regenerating tank) using the valve control switch. Record results in Section 10.2.2.

Section 9.2 Accomplished Sat. ✓ Unsat.       

Signature John C. Ulrich Date 8-4-77

9.3 This section verifies the following:

- (a) Any timed step may be extended or repeated if resin has not been or is not being transferred to another vessel.
- (b) Preselected elimination of chemical treatment.
- (c) Automatic resin transfer.
- (d) Automatic valves operate properly
- (e) Sequence step timer settings are recorded.

A/D 9.3.1 Record all sequence step timer settings from Panel 304 in Section 10.3.1

Note: For all the following regeneration or transfer steps, observe that the automatic valves operate properly as per Enclosure 2.

9.3.2 Depress module J "Start" pushbutton. Observe that resin is automatically transferred to the regenerating tank. During regeneration record acid and caustic conductivity from panel 304. Take a grab sample from sample valves located near the conductivity Elements to check acid and caustic specific gravity. Record data in section 10.3.2.

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9.3.3 Set the module H Selector Switch to the module C position.

Depress module H "Initiate" pushbutton. During the first timed step of module H (step 25), place the TIME - EXTEND Switch in the EXTEND position. Observe that timer THI stops. Extend this step for five minutes, then return the TIME - EXTEND Switch to the TIME position. Observe that timer THI starts. Record data in Section 10.3.3.

9.3.4 Depress the module H "Repeat" pushbutton. Observe that Step 25 is repeated. Record data in Section 10.3.4.

9.3.5 After the completion of section 9.3.4 verify that the Condensate Polishing Unit continues through the remaining steps automatically.

9.3.6 Verify Condensate Polishing Unit and the valves listed in Enclosure 2 operate properly by recording results in section 10.3.6.

9.3.7 after resin has been transferred to storage tank. Verify the operation of module J.

Section 9.3 Accomplished Sat. ☒ Unsat. ☐

Signature Andrés Domínguez Date 8-4-77

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9.4 This section verifies the operability of the Ammonia and Hydrazine injection system to the effluent of the Condensate Polishers.

E-12-

9.4.1 Note the reading on the Panel 310 recorder (SS-CR-3152) for hydrazine concentration at the condensate booster pump discharge. Note the reading on the Panel 310 recorder (SS-CR-3151) for pH at the polisher effluent.

9.4.2 Start chemical injection system by placing the Panel 305 control switches for AM-P-1A and AM-P-2 in AUTO.

9.4.3 Operate the chemical injection system for a period of eight hours to check for proper automatic operation. Record data in Section 10.4.3.

Section 9.4 Accomplished Sat. \_\_\_\_\_ Unsat. \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

9.5 Return the system to Met-Ed for normal operation per 2106-2.2.

Signature *Andrés Dominguez* Date 8-4-77

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STEP	DESCRIPTION OF DATA REQUIRED	DATA	ACCEPTANCE CRITERIA	INIT. / ORG.	DATE
1.1.1	Polisher No. 2 flowrate	gpm	$\geq 2500$ gpm		
	Polisher No. 2 inlet pressure	psig	N.A.		
	Polisher No. 2 outlet pressure	psig	N.A.		
-5	Polisher No. 2 differential press. = inlet press. - outlet press.	psid	30 35-45 psid		
5	Polisher No. 2 outlet conductivity	umhos	0.05 - 0.30 0.12-0.15 umhos		
2.5	Polisher No. 3 flowrate	gpm	$\geq 2500$ gpm		
	Polisher No. 3 inlet pressure	psig	N.A.		
	Polisher No. 3 outlet pressure	psig	N.A.		
-5	Polisher No. 3 differential press. = inlet press. - outlet press.	psid	30 35-45 psid		
5	Polisher No. 3 outlet conductivity	umhos	0.05 - 0.30 0.12-0.15 umhos		

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APP C.	DESCRIPTION OF DATA REQUIRED	DATA	ACCEPTANCE CRITERIA	INIT. CRG.	DATE
0.1.1 E 5	Polisher No. 4 flowrate	___ gpm	$\geq 2500$ -gpm not flow $\geq 2500$ gpm		
	Polisher No. 4 inlet press.	___ psig	N.A.		
	Polisher No. 4 outlet press.	___ psig	N.A.		
5	Polisher No. 4 differential Press = inlet press. - outlet press.	___ psid	20 35-45 psid 5-1		
5	Polisher No. 4 outlet conductivity	___ umhos	0.05-0.30 0.12-0.15 umhos		
5	Polisher No. 5 flowrate	___ gpm	not flow $\geq 2500$ gpm $\geq 2500$ -gpm		
	Polisher No. 5 inlet press.	___ psig	N.A.		
	Polisher No. 5 outlet press.	___ psig	N.A.		
5	Polisher No. 5 differential press = inlet press. - outlet press.	___ psid	20 35-45 psid 5-1		
E 5	Polisher No. 5 outlet conductivity	___ umhos	0.05-0.30 0.12-0.15 umhos 5-1		

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ID	DESCRIPTION OF DATA REQUIRED	DATA	ACCEPTANCE CRITERIA	INIT.	DATE
				OPG.	
1.1.1	Polisher No. 6 flowrate	___ gpm	<del>&gt; 2500 gpm</del> 2500-8 gpm		
	Polisher No. 6 inlet press.	___ psig	N.A.		
	Polisher No. 6 outlet press.	___ psig	N.A.		
	Polisher No. 6 differential press. = inlet press. - outlet press.	___ psid	20 35-45 psid		
	Polisher No. 6 outlet conductivity	___ umhos	0.05-0.30 0.12-0.15 umhos		
	Polisher No. 7 flowrate	___ gpm	<del>&gt; 2500 gpm</del> 1000-2500 gpm		
	Polisher No. 7 inlet press.	___ psig	N.A.		
	Polisher No. 7 outlet press.	___ psig	N.A.		
	Polisher No. 7 differential press. = inlet press. - outlet press.	___ psid	20 35-45 psid		
	Polisher No. 7 outlet conductivity	___ umhos	0.05-0.30 0.12-0.15 umhos		

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NO.	DESCRIPTION OF DATA REQUIRED	DATA	ACCEPTANCE CRITERIA	INIT.	
				CFG.	DATE
0.1.1 5	Polisher No. 8 flowrate	____ gpm	$\geq 2500$ gpm <i>(Flow 2500 gpm)</i>		
	Polisher No. 8 inlet press.	____ psig	N.A.		
	Polisher No. 8 outlet press.	____ psig	N.A.		
5	Polisher No. 8 differential press. = inlet press. - outlet press.	____ psid	$\geq 35$ -45 psid <i>70</i>		
5	Polisher No. 8 outlet conductivity	____ umhos	$0.05-0.30$ $0.12-0.15$ umhos <i>70</i>		
0.1.3 5	Polisher No. 1 flowrate	____ gpm	$\geq 2500$ gpm <i>(Flow 2500 gpm)</i>		
	Polisher No. 1 inlet press.	____ psig	N.A.		
	Polisher No. 1 outlet press.	____ psig	N.A.		
5	Polisher No. 1 differential press. = inlet press. - outlet press.	____ psid	$\geq 35$ -45 psid <i>70</i>		
5	Polisher No. 1 outlet conductivity	____ umhos	$0.05-0.30$ $0.12-0.15$ umhos <i>70</i>		

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DESCRIPTION OF DATA REQUIRED	DATA	ACCEPTANCE CRITERIA	INIT.	
			CRG.	DATE
2.2 Resin transfer to the regenerated tank is prevented with module C energized.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No.	Yes	<del>P/D</del> CPU	8-2-77
3.1 Step 16 timer setting	<del>145</del> min. 0	N.A.	<del>P/D</del> CPU	8-2-77 <del>7-8-77</del>
Step 16A timer setting	<del>145</del> min. 0	N.A.	<del>P/D</del> CPU	8-2-77 <del>7-8-77</del>
Step 17 timer setting	<del>145</del> min. 0	N.A.	<del>P/D</del> CPU	8-2-77 <del>7-8-77</del>
Step 18 timer setting	<del>145</del> min. 0	N.A.	<del>P/D</del> CPU	8-2-77 <del>7-8-77</del>
Step 19 timer setting	100 min.	N.A.	P/D CPU	7-8-77
Step 20 timer setting	60 min.	N.A.	P/D CPU	7-8-77
Step 21 timer setting	20 min.	N.A.	P/D CPU	7-8-77
Step 10 timer setting	0 min.	N.A.	P/D CPU	7-8-77
Step 11 timer setting	0 min.	N.A.	P/D CPU	7-8-77

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IP	DESCRIPTION OF DATA PROVIDED	DATA	ACCEPTANCE CRITERIA	INIT. CPG.	DATE
3.1	Step 12 timer setting	<u>0</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 13 timer setting	<u>0</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 14 timer setting	<u>30</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 15 timer setting	<u>20</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 25 timer setting	<u>30</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 26 timer setting	<u>10</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 27 timer setting	<u>25</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
13	Step 28 timer setting	<u>120</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 29 timer setting	<u>30</u> min.	N.A.	<del>P/D</del> CPG	7-8-77
	Step 21 timer setting	<u>20</u> min.	N.A.	<del>P/D</del> CPG	7-8-77

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NO.	DESCRIPTION OF DATA REQUIRED	DATA	ACCEPTANCE CRITERIA	INIT.	DATE
				CRG.	
3.1	Step 21A timer setting	<del>5 min.</del> 0	N.A.	<del>R/D</del> GPU	8-2-77 <del>7-8-77</del>
	Step 21B timer setting	10 min.	N.A.	<del>R/D</del> GPU	7-8-77
	Step 22 timer setting	10 min.	N.A.	<del>R/D</del> GPU	7-8-77
	Step 23 timer setting	5 min.	I.A.	<del>R/D</del> GPU	7-8-77
	Step 24 timer setting	20 min.	N.A.	<del>R/D</del> GPU	7-8-77
	Step 34 timer setting	0 min.	N.A.	<del>R/D</del> GPU	7-8-77
E-11 3.2	Resin transfer to regenerating tank completed satisfactorily (Resin visible in upper sight glass)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Yes		
4.5	Acid Conductivity	<del>5.5</del> 6.25	5.5 to 6.5 7.5 to 8.5 on scale	<del>R/D</del> GPU	8-3-77
	Caustic Conductivity	<del>5.5</del> 4.5	4.5 to 5.5 on scale	<del>R/D</del> GPU	8-2-77 <del>7-8-77</del>

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Step No.	Description of Data Required	Data	Acceptance Criteria	Initials Org.	Date
0.3.2 cont'd) 6.5	Acid Specific Gravity	$\frac{1.048}{1.059}$ 6.5	1.048 to 1.059	<del>A/D</del> GPU	8-3-77
0-9	Caustic Specific Gravity	$\frac{1.049}{1.056}$ 1.049	1.049 to 1.056	<del>A/D</del> GPU	8-2-77 <del>7-8-77</del>
0.3.3	Step 25 timer stops when in EXTEND mode	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Yes	<del>A/D</del> GPU	7-8-77
	Step 25 timer starts when in TIME mode	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Yes	<del>A/D</del> GPU	7-8-77
0.3.4	Step 25 is repeated	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Yes	<del>A/D</del> GPU	7-8-77
0.3.6	Condensate Polishing Unit and auto. valves operate properly	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Yes	<del>A/D</del> GPU	8-4-77
4.3 4.2	pH valve maintained by injection system (SS-CR-3151)	<input type="checkbox"/> pH	Section 11.2		

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11.0 ACCEPTANCE CRITERIA

- 11.1 With the exception of 11.2 all acceptance criteria is included in Section 10.0.
- 11.2 The chemical injection system should maintain the pH at the Condensate Polisher effluent in the range 9.3 - 9.5. The chemical injection system should maintain the hydrazine concentration at the Condensate Booster Pumps discharge in the range 40 - 60 ppb.

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## COVER PAGE

The exception and deficiency consists of the following pages: 1, 2, 3

Justified/  
Completed

Signoff Date

E/D	Par.	Description/Initial/Date	Justification/Resolution	Signoff	Date
E	2.1.1 2.4 2.5	Updated reference material to the latest revision and initials JCL 5-7-77	Doesn't change scope or intent of TP	JCL 5-7-77	5-7-77
E	9.1.2 9.3.2	Correct typing errors to make procedure read correctly. JCL 5-20-77	Doesn't change the intent of the TP	JCL 5-20-77	5-20-77
E	8.2	The gear bed doesn't need to be graded as long as operations can display approx. 2% variation of the one and not on line. The gear bed is not regulated at all just for regeneration which is not JCL 5-20-77	Doesn't change the scope or intent of the TP	JCL 5-20-77	5-20-77
E	7.4 9.1 8.1	The system is in operation at the present time but the maximum # of polishes on line is 3. The system not used during night cycle will be changed at a later date. There is no need for 7 polishes to be on at one time to check per section 9.1, the required data for 3 polishes is sufficient JCL 5-20-77	Doesn't change the intent of the TP  See E-12 for final closure for E-4 Task.	JCL 5-20-77	5-20-77

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No.	P	Par.	Description/Initial/Date	Justification/Resolution	Sigloff	
5		9.3.2 Exe 2	The existing procedure was changed to reflect changes made which make the system more the utilization of the principle has been included and have been proven to work better.	Review of procedure done times 10-12-77 at 1.1.2 and signing of registration letter 2/1/78 Table 2 B Change to accordance with 2/1/78 Review 1 Low Risk 10% B&W ≤ 2500 Polish Differential Pressure 20-25 psi Water Outlet Conductivity 105-130 umhos Acid Conductivity 5.5-6.5 or some Acid Specific Gravity 1.020-1.035	T. J. Hines	
6	E	4.3.2	Module I was not used and resin transfer was not needed. A/D / 7-8-77	Resin was manually transferred from polisher to receiving TH for this test since the spare had not been loaded. Module I will be utilized after 4.3.6 in added step 4.3.7.	A.J. Dominguez	7-E
7	E	End 2 PS 1	Steps 10 thru 13 were not needed. A/O / 7-8-77	Sulfate injection is no longer performed due to B&W recommendation.	A.J. Dominguez	7-E
8	E	End 2 192	Step 16a not needed. A/O / 7-8-77	Step 16a is no longer used due to change in operating procedure and philosophy during course addition.	A.J. Dominguez	7-E

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Official Letter/ Copy

Loc.	S.D.	Par.	Description/Initial/Date	Justification/Resolution	Signoff	
1	E	10.3.2	Conduct specific gravity out of spec. Density will be calculated and conduct SG recorded. During subsequent count injection. <i>N/D/7-E-77</i>	Based on which should be conductivity measurement of SG to be equal to SG = 1.056 which is acceptable. Initial SG was not temp. corrected.	<i>R.J. Dominguez</i>	7/1
10	E	Encl 2 Pg 3	Step Sequence No 30 and 31 not verified. <i>Jul 7/5/77</i>	Steps 30 & 31 are not used due to change in operating procedure and philosophy during ammonia addition.	<i>J.P. Garrison</i>	7/5/77
11	E	Encl 2 10.3.2	MEC 2106-2.2 has a PCX <sup>mit</sup> which has made the changes reflected in the TP. <i>Jul 7-31-77</i>	Changed Encl 2 to reflect latest PCX <sup>mit</sup> . <i>R.P.A.</i>	<i>J.C. Allrich</i>	7-31-77
12	E	9.1 9.4	Paragraphs 9.1 & 9.4 can not be done pre-operatively & will not be performed. <i>CEG E/E/77</i> Conditions required cannot be obtained from PET. <i>CEG 9/1/77</i>	Performance of the process will be monitored during PET and of course by met-E&C Chemistry Control & operating procedures. Data taken will be of no value in assessing unit performance.	<i>C.E. Watts</i>	8/1/77
13	E	10.3.1	Maximum time this is 12.0 minutes but enclosure 2 requires 150 minutes. <i>Jul 8-17-77</i>	Per MEC's OP the timer is set on 1.5 hours for 30 minutes or the timer is reset for 30 extra minutes to accomplish this step.	<i>J.C. Allrich</i>	8-17-77

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MODULE

C	Step 10	0 Min	<i>See</i>
C	Step 11	0 Min	<i>See</i>
C	Step 12	0 Min	<i>See</i>
C	Step 13	0 Min	<i>See</i>
C	Step 14	20 Min	<i>See</i>
C	Step 15	20 Min	<i>See</i>
D	Step 16	0 Min	<i>See</i>
D	Step 16A	0 Min	<i>See</i>
D	Step 17	0 Min	<i>See</i>
D	Step 18	0 Min	<i>See</i>
D	Step 19	100 Min	<i>See</i>
D	Step 20	60 Min	<i>See</i>
F	Step 21	20 Min	<i>See</i>
F	Step 21A	0 Min	<i>See</i>
F	Step 21B	10 Min	<i>See</i>
F	Step 22	10 Min	<i>See</i>
G	Step 23	5 Min	<i>See</i>
G	Step 24	20 Min	<i>See</i>
H	Step 25	<sup>30</sup> 3 Min	<i>See</i>
H	Step 26	10 Min	<i>See</i>
H	Step 27	25 Min	<i>See</i>
E	Step 28	<i>See</i> 120 Min	<i>See</i>
E	Step 29	<i>See</i> 30 Min	<i>See</i>

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4.4.3 Place Logic Module Selector Switches in the following positions:



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STEP	FUNCTION	TIME (MINS)	OPEN	CLOSE	FLOW (GPM)	REMARKS
14	Slow Backwash (Remove Fines)	20	C5 ✓ C13 ✓ X1 ✓	X2 ✓	100	If fines are not removed within 20 minutes, place extend cycle step control switch in "Extend" and allow backwash to continue until fines are removed. Then place switch back to "TIME" position and allow timer to Time Out. <u>NOTE:</u> Be carefull not to exceed 100 GPM in order to prevent resin loss as Outlet for this backwash is un-screened.
15	Fast Backwash	20	C5 ✓ C12 ✓ X1 ✓	X2 ✓	140	Resin separation takes place during this step. Interface can be seen in lower sight-glass. It should be approximately "2" from top of glass. Anion on top, cation on bottom. Vibrator energized to prevent resin from blocking flow at screened outlet.
16	Inject Caustic <u>NOTE:</u> This Step in Manual. Follow <del>4-1-8</del> 4-1-5	45	C5 ✓ C9 ✓ R5 ✓ R6 ✓ R8 ✓ X2 ✓ WT-V-320G ✓	R7 ✓     X1 ✓	Dilution 31.2 Blocking 15	Caustic concentration: 4% - 5%, Use dilute caustic conductivity recorder (Red Pen). Reading should be 4.5 - 5.5. Dilution Temp - 120°F ± 5
17	Displace Caustic <u>NOTE:</u> This Step is manual. Follow <del>4-1-8</del> 4-1-9	40	C5 ✓ C9 ✓ R8 ✓ R7 ✓ X2 ✓ WT-V-320G ✓	R5 ✓ R6 ✓   X1 ✓	Dilution 31.2 Blocking 15	Dilution Temperature 120°F. X1 and X2 will cycle when waste outlet conductivity reaches 500 umho (Green Pen on conductivity recorder) If cycling is excessive place control switch for X1 and X2 in the middle position. This will keep X2 open and X1 Closed. Leave this way until conductivity is below 500 umho and then return switch to "AUTO" X1 should stay open now and X2 should stay Closed.

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TABLE 2B

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2106-2.2  
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03/21/77TMI Unit II  
TP 276/1  
Enclosure 2  
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STEP	FUNCTION	TIME (MINS)	OPEN	CLOSE	FLOW (GPM)	REMARKS
27	Backwash Screen	5	C16 ✓ C4 ✓ X1 ✓	X2 ✓	70-140	Unit will automatically shift from backflush to backwash after 5 minutes.
	Unscreened Backwash	20	C5 ✓ C13 ✓ X1 ✓	X2 ✓	100	Be carefull not to exceed 100 GPM during unscreened backwash in order to prevent loss of resin
21	Transfer Resin to Storage Tank	20	S2 ✓ S6 ✓ C11 ✓ C8 ✓ C7 ✓ X1 ✓	X2 ✓	Sluice 75 Air 56 SCFM	<del>See note 2 - not used</del>
21A	Partial Refill Storage Tank	80	S11 S2		75	<del>May not be used. - See note preceding</del>
21B	Air Mix	10	S2 ✓ S7 ✓		145 SCFM	Mix anion and cation resins
22	Air Mix Drain Storage Tank	10	S2 ✓ S4 ✓ S7 ✓ X1 ✓	X2	145 SCFM	<del>See Note 2 - not used</del>
23	Refill Storage Tank	5	S2 ✓ S5 ✓		200	Fill for 5 minutes or until water issues from vent.
24	Final Rinse	20	S5 ✓ S6 ✓ X1 ✓	X2 ✓	200	Final conductivity rinse to remove trace chemicals

# VALVE OPERATING SEQUENCE

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STEP SEQUENCE NO.	UNIT & STEP FUNCTION	VALVES OPENED	INITIALS/DATE	TIME MIN.
<del>E-7</del> 10.	<del>Inject Sulfite, Receiving Tank</del>	<del>R9 R10 C10 C13</del>	<del></del>	<del>40</del>
<del>E-7</del> 11.	<del>Sulfite Soak Period, Receiving Tank</del>	<del></del>	<del></del>	<del>30</del>
<del>E-7</del> 12.	<del>Displace Sulfite, Receiving Tank</del>	<del>R10 C10, C13 C5</del>	<del></del>	<del>50</del>
<del>E-7</del> 13.	<del>Fast Rinse, Receiving Tank</del>	<del>C14 C4</del>	<del></del>	<del>5</del>
<del>14.</del>	<del>Backwash No. 1, Receiving Tank</del>	<del>C5 C13</del>	<del>AP 1-8-77</del>	<del>20</del>
<del>15.</del>	<del>Screened Backwash, Receiving Tank</del>	<del>C5 C12</del>	<del>AP 1-7-8-77</del>	<del>20</del>
<del>16.</del>	<del>Inject Caustic, Receiving Tank</del>	<del>R8 R5, R6 R7 closed C9, C4</del>	<del>AP 1-7-8-77</del>	<del>45</del>

NOTE: The following options are available in this series of steps.

1. Pushbutton: Repeat Steps 10 through 15.
  2. Pushbutton: Repeat Steps 13, 14, 15.
  3. Pushbutton: Repeat Steps 14, 15.
  4. Pushbutton: Repeat Step 15.
- Step 15 may be selected to precede Step 14.

~~16. Inject Caustic, Receiving Tank R8 R5, R6 R7 closed C9, C4~~

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STEP SEQUENCE NO.	UNIT & STEP FUNCTION	VALVES OPENED	INITIALS/DATE	TIME MIN.
E-6 16a.	Backwash, Receiving Tank	C5 C13		20
17.	Displace Caustic, Receiving Tank	R8 C9, C4	<i>AD 1-8-77</i>	40
18.	Rinse Caustic, Receiving Tank	C14 C4	<i>AD 1-8-77</i>	25
19.	Inject Acid, Receiving Tank	R4 R1, R2 C3, C4	<i>AD 1-8-77</i>	80
20.	Displace Acid, Receiving Tank	R4 C3, C4	<i>AD 1-8-77</i>	50
21.	Transfer Resin, Receiving to Storage Tank	S2, S6, X1, C11, C8, C7		20
21a.	Partial Refill, Storage Tank	S11 S2		8
21b.	Air Mix	S7 S2		10
22.	Air Mix & Drain, Storage Tank	S2, S4, S7		10
23.	Refill. Storage Tank	S2 S5		5
24.	Final Rinse, Storage Tank	S5 S6, X1		20

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UNIT II  
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ELEETE

FUNCTION

ance,  
iving Tank

wash & Vibrate  
en, Receiving

flush Screen,  
iving Tank

kwash Unscreened,  
eiving Tank

ject Ammonia  
rough Full Bed,  
eiving Tank

splace Ammonia  
rough Full Bed,  
eiving Tank

nject Ammonia  
Through Cation Bed,  
Receiving Tank

Displace Ammonia  
Through Cation Bed,  
Receiving Tank

VALVES  
OPENED

INITIALS/DATE

TIME  
MIN.

C12,  
C6

11/10/78 7/11/78 10

C12  
C5

11/10/78 7/11/78 10

C16, C4  
X1

11/10/78 7/11/78 5

C5,  
C13, X1

11/10/78 7/11/78 20

R12,  
C17, C4  
R11

11/10/78 7/11/78 30

R12, C17,  
C4

11/10/78 7/11/78 20

33

R12,  
R11,  
C2, C4

10

R12,  
C2, C4

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<u>STEP SEQUENCE NO.</u>	<u>UNIT &amp; STEP FUNCTION</u>	<u>VALVES OPENED</u>	<u>INITIALS/DATE</u>	<u>TIME MIN.</u>
32. (Optional) (Manual)	Backwash, Storage Tank	S9, S10		10
33. (Optional) (Manual)	Air Mix and Drain, Storage Tank	S2, S4, X1, S7		10
34. (Optional) (Manual)	Resin Return to Receiving Tank	S11, C15, C4, C12, S1		20

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