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ED 6926

SECTION 1

PROCEDURE TITLE AND NUMBER
Makeup and Purification Syst SP1104.02.20

REASON FOR CHANGE

Allow ~~main~~ SS 24 and 25 to be OPEN for PASS flowpath.

CHANGE

Valve Verification List A, page 7 of 25

Change SS 24 from closed to OPEN

SS 25 from closed to OPEN

IS PROCEDURE REVISION REQUIRED Yes [1] No [ ] If no, this modification is valid until ___

PREPARED BY	DATE 4/7/85
APPROVED BY	DATE 4/7/85
APPROVED BY	DATE 4/7/85
SUBMITTED BY (Section Head)	DATE 4/10/85
RECOMMENDED BY (SRB Chairman)	DATE APR 11 1985
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent)	DATE APR 11 1985

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SECTION 1

PROCEDURE TITLE AND NUMBER

Makeup & Purification System SP 1104.02.20

REASON FOR CHANGE

T-8590 not entirely correct
remove references to sealed valves

CHANGE

- void T-8590
- on page 58:
  change MUB To MU3
- on page 65:
  change the second MU 30C To MU 30G
  change MU 223 To MU 233
- on page 67:
  change MU 14B To MU 148
- on page 73:
  change MU 42B To MU ~~14~~ 428
- on page 70:
  delete the line which reads:

Cation Bed 1-2 Inlet Line Unit	C-13	MU 129	closed	

- change sealed closed To closed on pages 69, 72
- change sealed open to open on pages 76, 78, 79

IS PROCEDURE REVISION REQUIRED Yes [X] No [ ] If no, this modification is valid until _____

PREPARED BY TK Wagner	DATE 3/28/85
APPROVED BY TK Wagner	DATE 3/28/85
APPROVED BY [signature]	DATE 3/28/85
SUBMITTED BY (Section Head) [signature]	DATE 4/2/85
RECOMMENDED BY (SRB Chairman) [signature]	DATE APR 3 1985
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent) [signature]	DATE APR 3 1985

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SECTION 1

PROCEDURE TITLE AND NUMBER
MAKEUP AND PURIFICATION SYSTEM. SP1204C2.2

REASON FOR CHANGE
VALVE MU 213 IS REFERENCED TO THE WRONG ROOM.

CHANGE
DELETE MU 213 FROM PAGE 60, UNDER ROOM 303.
ADD MU 213 TO PAGE 74, UNDER ROOM 236

IS PROCEDURE REVISION REQUIRED Yes [X] No [ ] If no, this modification is valid until ____

PREPARED BY John Bulowski	DATE 3/26/85
APPROVED BY [signature]	DATE 3/26/85
APPROVED BY [signature]	DATE 3/26/85
SUBMITTED BY (Section Head) [signature]	DATE 4/1/85
RECOMMENDED BY (SRB Chairman) [signature]	DATE APR 3 1985
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
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SECTION 1

PROCEDURE TITLE AND NUMBER
Makeup & Purif. System SP1104.02

REASON FOR CHANGE
FCR 81-248 was incorporated to add a time delay to the makeup pumps for tripping the pumps on loss of DC power. This prevents additional loading on the DC system which is already heavily loaded after loss of offsite power.

CHANGE

Change the last sentenance of step 2.1.39 to read:

"If DC control power is lost to the breaker, the make up pumps will not trip on low lube oil pressure unless oil pressure falls below 3psig and fails to rise above 6psig within the next 20 seconds."

IS PROCEDURE REVISION REQUIRED Yes [X] No [ ] If no, this modification is valid until ___

PREPARED BY	[signature]	DATE 4-1-85
APPROVED BY	[signature]	DATE 4-1-85
APPROVED BY	[signature]	DATE 4/1/85
SUBMITTED BY (Section Head)	[signature]	DATE 4/2/85
RECOMMENDED BY (SRB Chairman)	[signature]	DATE APR 3 1985
QA APPROVED BY (Manager of Quality Assurance)	N/R	DATE
APPROVED BY (Station Superintendent)	[signature]	DATE APR 3 1985

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SECTION 1

PROCEDURE TITLE AND NUMBER
Makeup and Purification System Operating Procedure, SP1104.02
REASON FOR CHANGE

To clarify which cartridge element should be used as a replacement in the Seal Injection Filter.

CHANGE Add the following to step (9) of sections 3 and 4:

During startup and when specified by the Maintenance staff to correct excessive plugging, the replacement filter cartridge will be ~~Tech~~ Stock No 89-8336 (Nominal rating of 3 microns and Absolute rating of 23 microns). During normal operation the replacement cartridge will be ~~Tech~~ Stock No 89-8338 (Nominal rating of 0.45 microns and Absolute rating of 3 microns).

IS PROCEDURE REVISION REQUIRED Yes [X] No [ ] If no, this modification is valid until _____

PREPARED BY [signature]	DATE 3-11-85
APPROVED BY [signature]	DATE 3-11-85
APPROVED BY [signature]	DATE 3/11/85
SUBMITTED BY (Section Head) [signature]	DATE 3/12/85
RECOMMENDED BY (SRB Chairman) D. W. Breiden	DATE MAR 13 1985
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent) [signature]	DATE MAR 13 1985

Tech

SECTION 2

COMMENTS

SECTION 3

SAFETY REVIEW

Yes ☐ No ☒ NSR change in the facility as described in the FSAR.

Yes ☐ No ☒ NSR change in the procedures as described in the FSAR.

Yes ☐ No ☒ NSR test or experiment not described in the FSAR.

Yes ☐ No ☒ Change in the Technical Specifications.

NOTE: If any of the above Section III are "Yes", a Section IV Safety Evaluation shall be performed, unless this is part of a FCR. (FCR No. _____ if applicable).

Yes ☐ No ☒ Decrease in the effectiveness of the Industrial Security Plan. If this is "Yes", the change cannot be made without NRC concurrence.

SECTION 4

SAFETY EVALUATION

Yes ☐ No ☒ The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the Safety Analysis Report may be increased.

Yes ☐ No ☒ A possibility for an accident or malfunction of a different type than any evaluated previously in the Safety Analysis Report may be created.

Yes ☐ No ☒ The margin of safety as defined in the bases for any Technical Specification is reduced.

NOTE: If any of Section IV is "Yes", an "Unreviewed Safety Question" is involved and the change cannot be made without NRC concurrence. (FCR No. _____ if applicable)

SECTION 5

FOR DELETIONS OR ADDITIONS OF PROCEDURES, A TEMPORARY MODIFICATION MUST BE SUBMITTED FOR AD 1805.02 AND/OR AD 1838.00, IF APPLICABLE.

Yes ☐ No ☒ AD 1805.02 Temporary Modification submitted

Yes ☐ No ☒ AD 1838.00 Temporary Modification submitted

SECTION 6

FOR ADDITIONS, DELETIONS, NSR MODIFICATIONS, AND MODIFICATIONS REQUIRING SAFETY EVALUATIONS, AND NSR/NON-NSR CHANGES

SRB Comments: _____

_____

SRB Recommendation: _____ Date _____

SECTION 7

STATION SUPERINTENDENT APPROVAL	DATE

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SECTION 1

PROCEDURE TITLE AND NUMBER
MAKEUP AND PURIFICATION SYSTEM SP 1104.02

REASON FOR CHANGE
Discrepancy between this procedure and EP 1202.01 Specific rule #4 concerning overriding Safety equipment

CHANGE Change step 2.16 to read

2.16 SFAS actuated makeup ~~and~~ purification equipment ~~may~~ shall not be overriden except as listed in specific rules # 2 and #4 in EP 1202.01 RPS, SFAS, SFRCS Trip or SG Tube Rupture

IS PROCEDURE REVISION REQUIRED Yes [✓] No [ ] If no, this modification is valid until ____

PREPARED BY Dave Eshelman	DATE 2-20-85
APPROVED BY J. L. Michaelis	DATE 2/20/85
APPROVED BY Dave Eshelman	DATE 2-20-85
SUBMITTED BY (Section Head)	DATE 2/26/85
RECOMMENDED BY (SRG Chairman)	DATE FEB 27 1985
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent)	DATE FEB 27 1985

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1-CR 1-OPS ENG

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ED 6926

SECTION 1

PROCEDURE TITLE AND NUMBER
MAKEUP AND PURI. SYS. SP 1104.02

REASON FOR CHANGE
PLACE VLV. VERI. LIST A IN WALKDOWN ORDER

CHANGE
MOVE CONTROL ROOM VLV's IN CTMT SECTION TO THE CONTROL ROOM SECTION. PAGE 2

MU 1A	MU 59 A - PAGE 20
MU 1B	MU 59 B - PAGE 18
MU 2A	MU 59 C - PAGE 21
MU 2B	MU 59 D - PAGE 22

IS PROCEDURE REVISION REQUIRED Yes ☒ No ☐ If no, this modification is valid until _____

PREPARED BY R.S. Morris	DATE 17 DEC 84
APPROVED BY D Howell	DATE 18 DEC 84
APPROVED BY [signature]	DATE 12/18/84
SUBMITTED BY (Section Head) [signature]	DATE 12/27/84
RECOMMENDED BY (SRG Chairman) [signature]	DATE 12/27/84
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent) [signature]	DATE 12/27/84

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SECTION 1

PROCEDURE TITLE AND NUMBER
MAKE UP PUMP SP 1104.02

REASON FOR CHANGE
CORRECT VLV. VERI. LIST A

CHANGE
PAGE 79 SHEET 22

ELIMINATE

RCP 1-1-1 SEAL RETURN FE MU 60 C BYPASS	F-4	MU 426	CLOSED

CHANGE

RCP 1-1-2 CONTROLLED BLEEDOFF LINE VENT	F-2	MU 246	CLOSED

TO

RCP 1-1-2 CONTROLLED BLEEDOFF LINE VENT	F-2	MU 426	CLOSED

IS PROCEDURE REVISION REQUIRED Yes ☒ No ☐ If no, this modification is valid until _____

PREPARED BY R.S. Morris	DATE 17 DEC 84
APPROVED BY D Brand	DATE 19 Dec 84
APPROVED BY [signature]	DATE 12/18/84
SUBMITTED BY (Section Head) [signature]	DATE 12/27/84
RECOMMENDED BY (SRG Chairman) [signature]	DATE 12/27/84
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent) [signature]	DATE 12/27/84

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SECTION 1

PROCEDURE TITLE AND NUMBER
MAKEUP & PURIFICATION SP 1104.02 Rev. 19

REASON FOR CHANGE
ADD NEW VALVES AS PER D.C.N. M-031-28
FCR 81-057
SEE ATT.

CHANGE ADD TO VALVE VERIF. LIST "A" PAGE 59 BEFORE MU 219

RCP SEAL INJ. FILTER 1-1 INLET ISO. BYPASS	M-031 H-5	MU-224	#	

ADD TO VALVE VERIF. LIST "A" PAGE 59 BEFORE MU 218

RCP SEAL INJ. FILTER 1-2 INLET ISO. BYPASS	M-031 H-5	MU-225	#	

IS PROCEDURE REVISION REQUIRED Yes ☒ No ☐ If no, this modification is valid until _____

PREPARED BY Vernon L. Cotton	DATE 18 DEC. 84
APPROVED BY [signature]	DATE 12/18/84
APPROVED BY [signature]	DATE 12/21/84
SUBMITTED BY (Section Head) [signature]	DATE 12-27-84
RECOMMENDED BY (SRB Chairman) [signature]	DATE 12/27/84
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent) [signature]	DATE 12/27/84

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1-CR 1-OPS ENG

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TEMPORARY MODIFICATION REQUEST
ED 6926

SECTION 1

PROCEDURE TITLE AND NUMBER
MAKE UP AND PURI. SYSTEM SP 1104.02

REASON FOR CHANGE
PLACE VLV. VERI. LIST A IN WALK DOWN ORDER

CHANGE

MOVE MU 478 FROM PAGE 78 SHEET Nº 21
TO PAGE 75 SHEET Nº 18
BETWEEN MU 432 AND MU 419
ADD TO PAGE 78 SHEET Nº 21 BELOW MU 260

RCP 1-1-1 SEAL RETURN (FE MU 60C) BYPASS	F-4	MU 264	CLOSED

IS PROCEDURE REVISION REQUIRED Yes ☒ No ☐ If no, this modification is valid until _____

PREPARED BY R. S. Morris	DATE 17 DEC 84
APPROVED BY D Ford	DATE 18 Dec 84
APPROVED BY Patton Graf	DATE 12/18/84
SUBMITTED BY (Section Head)	DATE 12/27/84
RECOMMENDED BY (SRB Chairman)	DATE 12/27/84
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent)	DATE 12/27/84

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SECTION 1

PROCEDURE TITLE AND NUMBER
Makeup & Purification System SP1104.02

REASON FOR CHANGE

There have been numerous failures of the helical flow type letdown coolers at other B&W plants. The cause seems to be related to the thermal stress on the coolers whenever the letdown flow is isolated.

CHANGE

Add a new step to the Precautions & Limitations:

2.18 Due to repeated failures of the letdown coolers by other B&W plants, believed to be caused by thermal stress, minimize the number of times the letdown system is isolated whenever possible (unless required by a procedure)

IS PROCEDURE REVISION REQUIRED Yes ☐ No ☒ If no, this modification is valid until Until further information is obtained on the letdown cooler problem.

PREPARED BY	[signature]	DATE 4/4/83
APPROVED BY	[signature]	DATE 4/4/83
APPROVED BY	[signature]	DATE 4-4-83
SUBMITTED BY (Section Head)	[signature]	DATE 4/5/83
RECOMMENDED BY (SRB Chairman)	[signature]	DATE 4/12/83
QA APPROVED BY (Manager of Quality Assurance)	N/A	DATE
APPROVED BY (Station Superintendent)	[signature]	DATE 4/12/83

1cc

Davis-Besse Nuclear Power Station

Unit No. 1

System Procedure SP 1104.02

MAKEUP AND PURIFICATION SYSTEM

NUCLEAR SAFETY RELATED

Record of Approval and Changes

Prepared By Jadgchew, Nissen — 6/17/75 Date

Submitted By Larry Stalter, Section Head — 7/22/75 Date

Recommended By Jack Evans, SRB Chairman — 7/22/75 Date

QA Approved N/A, Quality Assurance Director — Date

Approved By Jack Evans, Plant Manager — 7/22/75 Date

Revision No.	SRB Recommendation	Date	QA Approved	Date	Plant Manager Approval	Date
20	[signature]	DEC 12 1984	N/A		[signature]	12/21/84

1. PURPOSE

1.1 To provide procedures for operating the Makeup and Purification System in each of the following modes:

Mode	Section
Startup	4.0
Normal Operation	5.0
Shutdown of Makeup System	6.0
Infrequent Operations	7.0

The normal functions of the Makeup and Purification System are:

1. To control the Reactor Coolant System inventory during all phases of normal reactor opeartion.

2. To receive, purify, and recirculate reactor coolant water.

3. To maintain the required boron concentration of the reactor coolant system.

4. To add lithium hydroxide to the reactor coolant system for pH control.

5. To add hydrogen and hydrazine to the reactor coolant system for oxygen control.

6. To degas the reactor coolant system.

7. To provide injection water for the seals of the reactor coolant pumps.

8. And to add borated water to the core flooding tanks.

The makeup and purification system is operated during all phases of the nuclear steam supply systems (NSSS) operation, including startup, power operation, and shutdown. The system may also be operated during refueling by employing the purification equipment through interconnections to the decay heat removal system. During normal NSSS operation, one makeup pump continuously supplies high pressure water from the makeup tank to the seals of the reactor coolant pumps, and to a makeup line which is connected to the reactor inlet thru a high pressure injection line. This line is the only interconnection between the makeup system and the high pressure injection system. Makeup flow to the reactor coolant system is regulated by the makeup control valve (MU 32), which operates on signals from the liquid level controller of the reactor coolant system pressurizer.

A control valve (MU 19) in the RC pump seal injection line automatically maintains the desired flow rate to the seals. Needle valves in the individual seal injection lines are used to manually throttle flow to the seals of each pump. A part of the water supplied to the seals leaks into the reactor coolant system. The remainder returns to the makeup tank after passing through one of the two seal return coolers. The second seal return cooler is placed in service when running a makeup pump on recirc flow only, to maintain the makeup tank temperature less than 140°F.

11

Seal water inleakage to the reactor coolant system requires a continuous letdown of reactor coolant to maintain the desired coolant inventory. In addition, letdown of reactor coolant is required for removal of impurities and boric acid from the reactor coolant and to accommodate volume changes in the reactor coolant system during changes in power level. Reactor coolant is removed from one of the reactor inlet lines, cooled during passage through one of the letdown coolers, passed from the containment vessel through a containment isolation valve, reduced in pressure during flow through the letdown flow control station, passed through the purification demineralizer prefilter, and then passed through a purification demineralizer. Normally the letdown flow is routed through one of two mixed bed Purification Demineralizers 1-1 or 1-2 to maintain good chemistry (low chlorides and fluorides) and to remove radioiodines to keep the dose equivalent iodine low. The mixed bed purification demineralizer will also remove radiocesium and other gross activity. The "operational" mixed bed Purification Demineralizer will be Li^7 saturated and the "Spare" mixed bed Purification Demineralizer will be normally unsaturated with Li^7. The Purification Demineralizer 1-3 can be used for additional radiocesium, gross activity and Li^7 removal when needed as indicated by C&HP. A three-way valve (MU 11) directs the coolant either through the purification makeup filter to the makeup tank or to the clean radioactive waste disposal system. The normal letdown flow rate is 45 gpm. This permits recirculation of one reactor coolant system volume through the purification train during a 24 hour period. The maximum letdown flow rate allowed at full reactor pressure is 140 gpm. This flow rate permits changing boron concentration by bleeding coolant from the reactor coolant system during xenon peaking following a 50 percent power change. During this period, non-borated reactor grade water is added to the reactor coolant system to dilute the boric acid concentration in the reactor coolant system. This is done to compensate for the negative reactivity addition resulting from the xenon peaking.

Normally, the three-way valve MU11, when in the open position, directs flow to the Makeup Tank. If the boric acid concentration in the reactor coolant is to be changed, the feed and bleed

permissive indicating light, IL-MU11 must be illuminated. This light is interlocked to the Integrated Control System which gives the permission for boron changes by illuminating the light IL-MU11. If the boric acid concentration in the reactor coolant is to be reduced, the three-way valve is placed in the closed position to direct the letdown flow to the clean radioactive waste disposal system. Boric acid removal is accomplished in the clean radioactive waste disposal system either by directing the letdown flow through a deborating demineralizer or BA evap with the effluent returned to the makeup tank, or by directing the letdown flow to a clean waste receiver tank. The level in the makeup tank is maintained with deborated water from primary water storage tank or with demineralized water from the station demineralized water storage tank. The flow of demineralized water is measured and totaled by an inline flow integrator and associated instrumentation. The flow of demineralized water to the makeup tank is controlled remotely by the makeup tank feed flow valve. During normal operation the flow integrator (batch controller), the integrated control system interlock, or the operator will terminate dilution. The above procedure for reducing the reactor coolant system boric acid concentration is the feed and bleed method.

The makeup tank also receives chemicals for addition to the reactor coolant. Chemicals in solution are injected into the letdown flow upstream of the makeup filters and then passed into the makeup tank which serves as a final mixing location. A hydrogen overpressure is maintained in the tank to ensure that the required amount of dissolved hydrogen remains in the reactor coolant.

System control is accomplished remotely from the control room with the exception of the seal return coolers, and the cation demineralizer 1-3. The letdown flow rate is established by the block orifice (RO-MU5) during normal opeartion, but may be increased by opening the letdown control valve (MU 6). The operational and spare purification demineralizer 1-1 and 1-2 can be placed in service by remote positioning of the demineralizer isolation valves. The cation demineralizer 1-3 can be placed in service by remote positioning of the isolation valve. However, to place the cation demineralizer 1-3 in series with one of the purification demineralizers 1-1 or 1-2 requires using manual valves. Diverting the letdown flow to the clean radioactive waste treatment system is accomplished by remote positioning of the three-way valve and the valves in the clean radioactive waste disposal system. This should always be done flowing through the "Spare Purification Demineralizer" to recover the contained Li^7. The control valve in the injection line to the reactor coolant pump seals is automatically set by a flow controller to maintain the desired total flow rate to the seals.

Coolant at the refueling boron concentration is supplied to the reactor coolant system for preoperational fill by using the boric acid pumps and the clean waste receiver transfer pumps or the demineralized water supply pumps. The fill line bypasses the makeup tank and makeup pumps and connects into the RC System through the normal makeup control valve (MU 32). When the fill operation is completed, the auxiliary fill line is secured; makeup and inventory control is then continued by operation of a makeup pump.

Makeup and purification valves MU3, MU33, MU38 and MU66A through D have auxiliary air supplies in the form of air volume tanks. These tanks come into effect in the event of a loss of station air. Upon a loss of instrument air, a check valve in the control air supply line isolates the air volume tank from the supply line. The air volume tank contains enough air at high enough pressure to stroke the valve closed and maintain it closed. Should instrument air be lost, and the in line check valve leak, automatic actions take place to protect against uncontrolled letdown. The air volume tank has a PSL which is initiated at tank pressure of 85 PSIG at which time a computer trouble alarm Q839 is typed out (The PSL resets at 93 PSIG). Should the air volume tank pressure drop to 75 PSIG the respective valve is then signaled to closed by the PSLL through an interlock.

The makeup and purification system provides makeup to the reactor coolant system to replenish inventory lost due to a small rupture in the reactor coolant system pressure boundary. The makeup control valve senses a decrease in pressurizer level and positions itself to maintain level.

A high flow alarm may be associated with the increase in additional makeup, and following this alarm will be a low makeup tank level alarm. During this condition, the water supply to the suction of the makeup pumps should be transferred to the BWST by using the three-way valve (MU 3971 in the closed position). If the makeup tank level drops to 10 inches, a signal will automatically position the three-way valve MU 3971 to provide suction from the BWST. If MU 3971 does not transfer on low makeup tank level of ten inches, a 45 second time delay will automatically trip the makeup pumps (The time delay starts with the signal to position MU 3971 to provide suction from the BWST at ten inches in the MU Tank.) At 86 inches (increasing) in the makeup tank, the makeup pump suction automatically transfers from the BWST to the makeup tank.

19 The makeup tank has two redundant compensated level indicators. One is powered from NNI-X (LIMU16-1) and the other is powered from NNI-Y (LIMU16-2). Both level indicators are located next to each other on the same front console of the control room.

The makeup and purification system also has a tap to the radiation

monitoring system (RI 1998). This is used to monitor the reactor coolant for fission products due to failed fuel during operation.

The makeup system also has a boron analyzer which monitors the boron concentration in the reactor coolant system. The boron concentration is recorded on AR 1999 located on control room panel C5703. The recorder has four ranges shown by IL 199A through D. The ranges are noted by the following:

INDICATING LIGHT	RANGE
IL 1999A	0-550 ppm Boron
IL 1999B	500-1050 ppm Boron
IL 1999C	1000-1550 ppm Boron
IL 1999D	1500-2050 ppm Boron

The Makeup and Purification System serves no emergency function.

The following information is taken from nameplate data:

Makeup Pump Motor	
Manufacturer:	Westinghouse
Type	LAC Inductor Motor
Model	HSDP
Frame	5010 - S
Insulation Class	B
Horsepower	450
Volts	4000
Amps (full load)	57
RPM	1776
Weight	3420 lbs.

Makeup Pump	
Manufacturer	Bingham
Size	2 x 3 x 7 1/2
Type	12 stage centrifugal
RPM	5400
Capacity	150 GPM

Design Conditions	
Pressure	3050 psig
Temperature	200°F
Flow	60 GPM
NPSH at Design Flow	5 feet
Total Developed Head	5800 feet

CAUTION: Minimum recirculation lines must be open during normal pump operation.

Normal Operating Conditions	
Pressure (Suction)	0-100 psig

(Discharge)	2510 psig
Temperature (Suction)	120°F
Flow	60-150 GPM
Radial Bearing Temperature	150°F
Gear Bearing Temperature (Pump End)	130°F
(Pump Center)	130°F
(Motor Center)	130°F
(Motor End)	130°F
Thrust Bearing Temperature	140°F

Makeup Pump Speed Increaser (Gear Box)

Manufacturer	Westinghouse
Ident. No.	PO 35880-2
Figure No.	RH-SU 1023-6
Cat. No.	6831D66G01
Ratio	3.029
Service HP	450
Input RPM	1778

Seal Return Coolers

Design Conditions

Pressure Tube/Shell	150/150 psig
Temperature Tube/Shell	200/250°F
Flow Tube/Shell	42/40 GPM
Heat Transferred	0.5 Mbtu/hr

Normal Operating Conditions

Pressure Tube/Shell	50/100 psig
Inlet Temperature Tube/Shell	140/95°F
Outlet Temperature Tube/Shell	120/115°F
Flow Tube/Shell	4.0/40 GPM

Makeup Tank

Design Conditions

Pressure	100 psig
Temperature	200°F
Volume (Total)	4301 gallons
(Usable)	3086 gallons
Volume per inch of level	30.9 gallons
Distance between level taps	100 inches

1 Normal Operating Conditions

Pressure	15-35 psig
Hydrogen Partial Pressure	0-21.8 psig
Temperature	125°F
Water Volume	2992 gallons
Level	73 inches

RCP Seal Injection Filters

Design Conditions	
Pressure	3050 psig
Temperature	200°F
Flow	50 GPM
Pressure Drop at Design Flow	6.5 psig

Normal Operating Conditions	
Pressure	2500 psig
Temperature	130°F
Flow	32 GPM
Differential Pressure	3.4 psig

Purification Demineralizer

Design Conditions	
Pressure	150 psig
Temperature	200°F
Volume when full (Resin)	50 cu. ft.
(Water)	65 cu. ft.
Flow	70 GPM

Normal Operating Conditions	
Pressure	25 psig
Temperature	120°F
Pressure drop	8 psig
Flow	45 GPM

Letdown Coolers

Design Conditions	
Pressure Tube/Shell	2500/200 psig
Tempeature Tube/Shell	600/350°F
Flow Tube/Shell	70/400 GPM
Heat Transferred	16.19 mbtu/hr

Normal Operation Conditions	
Pressure Tube/Shell	2200/100 psig
Inlet Temperature Tube/Shell	557/95°F
Outlet Temperature Tube/Shell	120/176°F
Flow Tube/Shell	45/400 GPM

Purification Demin Filter and Makeup Filter

Design Conditions	
Pressure	150 psig
Temperature	200°F
Flow	140 GPM
Maximum Differential Pressure	75 psig

Normal Operating Conditions	
Pressure	150 psig
Temperature	120°F
Flow	45 GPM
Nominal Rating, Microns	1
Clean Pressure Drop at Rated Flow (140 GPM)	5 psid

2. PRECAUTIONS AND LIMITATIONS

2.1 The following limits and precautions are taken from "NSS Limits and Precautions", PP 1101.01.

Makeup and Purification System

2.1.1 Maximum allowable letdown flowrate is 140 gpm.

2.1.2 A flow path to the makeup tank or to the waste disposal system must be provided before opening the letdown valve.

2.1.3 When pumping boric acid refer to the solubility Attachment 8 curve for minimum allowable solution temperature.

2.1.4 Before initiating flow on either side of heat exchangers or coolers in this system: The cooler, all connecting piping and components shall be filled and vented by reduced flow rates (preferably gravity flow). Also, establish component cooling water flows before primary water flows.

NOTE: This precaution is necessary to prevent impact or water hammer forces on tubes and baffles.

20 1. Both letdown coolers are in service in parallel for normal as well as maximum letdown conditions. This will reduce the number as well as the severity of thermal transients encountered when placing a standby cooler in service.

2. To place a standby cooler in operation, the reactor coolant letdown should be admitted slowly 20 by stopping letdown, cut in cooler (open MU1A or 1B) and slowly increasing letdown to desired value to minimize the thermal transients.

2.1.6 Cooling water flow through each letdown cooler is limited to a maximum of 400 GPM with a maximum transient limit of 500 GPM.

2.1.7 Maximum RCP seal return flow through each seal return cooler is 42 GPM, or 3.3 psid.

NOTE: To improve RCP seal performance it is desired to raise the seal injection temperature. For this reason normally only one seal return cooler will be in service. If running a MU pump on recirc flow only, the second seal return cooler should be placed in service to maintain MU tank temperature less than 140°F. Running two MU pumps with only one seal return cooler in service for short periods of time is allowed (approxiamtely 1/2 hour). Normally, the 42 GPM flow limit will be exceeded only during shifting MU pumps and when two MU pumps are on during recovery from a reactor trip.

2.1.8 Cooling water flow to each seal return cooler is limited to a maximum of 40 GPM, or 14.5 psid.

2.1.9 Maximum allowable differential pressure across the RCP seal injection filters is 75 psid and the filter should be replaced at this time.

2.1.10 Maximum allowable flow per RCP seal injection filter when clean is 50 gpm.

2.1.11 Maximum allowable flow rate through each purification demineralizer is 70 GPM.

2.1.12 Minimum allowable flow rate through each purification demineralizer in service is 25 GPM.

2.1.13 Maximum allowable temperature in the makeup tank and in the letdown header upstream of the purification demienralizer is 135°F unless the demineralizers are bypassed.

2.1.14 Maintain the makeup tank hydrogen partial pressure between 0 and 21.8 psig. Refer to Section 2.3.3 of B&W Chemistry Manual 1385. Maximum tank pressure is 100 psig. Normal operating pressure should be maintained between 15-40 psig. 13

2.1.15 Minimum allowable makeup tank water level is 18" when the reactor is critical (10" level in the makeup tank transfers makeup pump suction from the makeup tank to the BWST).

13 CAUTION: If MU 3971 does not automatically transfer on low makeup tank level, a 45 second time delay will automatically trip the makeup pumps.

2.1.16 Maximum allowable makeup tank water level is 100" (at 86" in the makeup tank, the makeup pump suction automatically transfers from the BWST to the makeup tank.)

2.1.17 The reactor coolant pump controlled bleedoff valves MU 59A through D should be opened after seal injection flow is established.

2.1.18 Prior to any rod withdrawal or boric acid dilution, the source range nuclear instrumentation should indicate at least 2 CPS.

2.1.19 The nuclear instrumentation will be continuously monitored during any reactivity changes.

2.1.20 All subcritical soluble boron changes in the reactor coolant system will be verified for each predicted change of 30 PPM.

Makeup Pump and Motor

2.1.21 Maximum allowable pump radial bearing oil temperature is 180°F. See computer points (CPT) T743, T744, T761, and T765.

2.1.22 Maximum allowable per gear bearing metal temperature is 175°F for:

1. Pump End - CPT T740, T758
2. Pump Center - T739, T757
3. Motor End - T737, T755
4. Motor Center - T738, T756

2.1.23 Maximum allowable pump thrust bearing metal temperature is 170°F. See CPT T748 and T766.

2.1.24 Minimum allowable makeup tank pressure to satisfy pump NPSH requirements is 15 psig during normal operation, and 5 psig during degasing of makeup tank. See Attachment 6 for minimum allowable MU tank pressure vs. flow.

2.1.25 Maximum allowable temperature at suction nozzle is 120°F when RCP seal injection is being supplied.

2.1.26 (THE RECIRCULATION FLOWPATH FOR EACH MU PUMP SHOULD BE OPEN AT ALL TIMES.)

2.1.27 The MU pump auxiliary oil pumps should be exercised once per week by running each for two minutes to maintain lubrication film.

(TS 4.1.2.3) 2.1.28 Each MU pump should be run at least once per month to ensure operability.

11 2.1.29 Operation of the makeup pumps on orifice bypass alone for longer than 15 minutes is not recommended but as long as the minimum flow is maintained, no pump damage will occur. For recirculating the MU tank for core flood tank fill, operation on recirc flow only is allowed. MU tank temperature is not to exceed 140°F and two seal return coolers should be in service.

2.1.30 Rated runout capacity of MU Pump is 350 GPM.

2.1.31 Maximum allowable makeup pump motor bearing oil tempearture is 180°F. See CPT T747, T762, T745, and T763.

2.1.32 Maximum allowable makeup pump motor stator temperature is 266°F. See CPT T746 and T764.

2.1.33 Minimum makeup pump motor starting voltage is 80 percent of rated voltage.

2.1.34 Maximum allowable makeup pump motor voltage variation is 10 percent of rated voltage.

2.1.35 Maximum allowable makeup pump motor frequency variation is 5 percent.

2.1.36 Maximum makeup pump motor time for locked rotor without damage at 100 percent voltage is 12 seconds.

NOTE: A locked rotor is indicated by a lack of decline in starting current.

2.1.37 Number of allowed successive starts with motor initially at ambient temperature is two starts. Number of allowed successive starts with motor initially at rated temperature is one start.

NOTE: An interval of five minutes with motor running or five minutes with motor not running must elapse before an additional start.

2.1.38 Seal injection water flow is required to all reactor coolant pumps when reactor coolant temperature is above 150°F, except when operating in the loss of injection mode.

14 | 2.1.39 The makeup pump 1-1 (1-2) lube oil pressure switches are powered from DC control power to breakers AC105 (AD105). If DC control power is lost to the breaker, the makeup pump will trip on low lube oil pressure.

2.2 Do not start or continue to run a makeup pump with the reactor coolant system in a solid water condition.

2.3 Prior to positioning the three-way valve MU 11 to the bleed position, ensure that the downstream manual valves in the waste disposal system are open as directed by the Shift Supervisor.

2.4 Fill water quality must meet requirements of opeartional chemical control limits, PP 1101.04, Table 4.3.

2.5 A Radiation Exposure Permit (REP) shall be required for work within Radiation Access Control Area (RACA) and work involving water which contains radioactivity.

2.6 Whenever one or more Reactor Coolant Pumps are operating, the Component Cooling Water Pump providing the RCP cooling water and the Makeup Pump providing the RCP seal injection must be aligned to opposite essential busses. However, it is permissible to perform ST 5011.03 on the Makeup Pump aligned to the same bus as the operating CCWpump, but the opposite makeup pump MUST be placed back in service as soon as possible after completion of the test.

(TS 3.1.1.2) 2.7 The RCS flow rate through the core shall be $\geq$2800 GPM whenever a reduction is being made in the boron concentration of the RCS. (All modes)

(TS 3.1.2.1) 2.8 As a minimum, one of the following boron injection flow paths and one associated heat tracing circuit shall be OPERABLE. (Modes 5 and 6)

a. A flow path from the boric acid storage system via a boric acid pump to a makeup pump to the RCS if only the boric acid storage system in Specification 3.1.2.8a is OPERABLE, or

b. The flow path from the BWST via a makeup pump to the RCS if only the BWST in Specification 3.1.2.8b is OPERABLE.

(TS 3.1.2.2) 2.9 Each of the following boron injection flow paths and at least one associated heat tracing circuit shall be OPERABLE.

a. The flow path from the boric acid storage system via both boric acid pumps and one makeup pump to the RCS, and

b. The flow path from the BWST via another makeup pump to the RCS.

(TS 3.1.2.3) 2.10 As a minimum, one makeup pump shall be OPERABLE and capable of being powered from an OPERABLE essential bus. (Mode 5*)

(TS 3.1.2.4) 2.11 At least two makeup pumps shall be OPERABLE. (Modes 1, 2, 3, and 4*)

*With RCS pressure $\geq$150 psig.

2.12 Should the makeup pumps or any portion of the system be removed from service for maintenance such that the boric acid injection flowpath from the boric acid addition system or BWST is unavailable, refer to the boron concentration control system procedure, SP 1103.04, for an alternate flowpath.

2.13 Flow through the letdown flow control valve MU6 should be maintained at $\geq$10 GPM. Flows of <10 GPM will result in a reduction of the life of the valve.

2.14 If an SFAS signal to some ESF equipment is "Blocked" (ie. overridden), that equipment is incapable of responding to either any subsequent automatic actuation signal or the SFAS system-level manual actuate ("Trip") pushbutton on panel C5717. Before an operator "Blocks" any SFAS signal, he must assure that the safety function of that equipment is no longer needed. Afterward the operator is totally responsible for the proper operation of that equipment, including actuation if required, until the "Block" is removed.

Reactuation, subsequent to a "Block", can be accomplished two ways. First, at the equipment level, "Blocked" equipment will respond to the individual control switches for that piece of equipment. Second, at the SFAS system level, operation of the system-level "reset" pushbutton on panel C5717 will clear any output logic blocks in the system (output logic "Blocks" are the block switches next to the SAM light and on the output modules). The equipment will then respond to the system-level manual actuate ("Trip") pushbutton and to automatic actuation signals. For guidance on resetting the SFAS after a real or erroneous trip, see Section 4. of EP 1202.01, "RPS, SFAS, Trip or SG Tube Rupture". 20

2.15 If an operator blocks an SFAS signal and changes the status of the actuated equipment, he is responsible for assuring proper equipment operation and reinitiation if required until the SFAS is reset. For guidance on resetting the SFAS after a real or

20 erroneous trip, see Section 4.0 of EP 1202.01, "RPS, SFAS, SFRCS Trip or SG Tube Rupture".

2.16 The conditions which must be satisfied before the operator may change the status of SFAS actuated equipment (Makeup and Purification System) are as follows:

1) RCS makeup - the RCS makeup isolation valve may be overridden to the open position when RCS pressure is greater than 400 psig.

2) Reactor Coolant Pump (RCP) Seal Injection and Return - The RCP Seal Injection and Return Isolation valves may be overridden to the open position when RCS pressure is greater than 400 psig.

3) RCS Letdown - The Letdown isolation valve may be opened as required to control RCS inventory when the RCS pressure is greater than 400 psig, given that no seismic event occurred.

4) CCW to Makeup Pump - The CCW to Makeup Pump valve may be overridden to the open position when RCS pressure is greater than 400 psig, given that no seismic event occurred.

5) If plant conditions are stable at normal operating or hot standby conditions after a transient with no evidence of an RCS leak, other systems may be overridden with the Shift Supervisor's permission.

6) If there are any questionable conditions or any sign of an RCS leak, no safety systems will be bypassed without
20 approval of Station Management (Plant Manager of his designee).

2.17 Radioactive System Filter Changes

2.17.1 Isolate, drain and vent system filters only when Maintenance is prepared to perform the filter change.

2.17.2 Draining, venting and opening filter housings are all potential causes of radioactive gaseous releases. Exercise caution during these operations and be prepared to take appropriate action if a release does occur.

2.17.3 When venting filters for returning them to service, vent the minimum amount necessary to ensure the filter housing is completely filled and vented.

2.17.4 As soon as Maintenance completes the change of a filter, it should be refilled, vented and placed in standby per the appropriate section of this procedure.

3. REFERENCES

(TS) 3.1 Technical Specifications, Section 3.1.1.2, 3.1.2.1, 3.1.2.2, 3.1.2.3, and 3.1.2.4

3.2 NSSS Limits and Precautions, PP 1101.01, Makeup and Purification System

3.3 NSSS Setpoints, PP 1101.02, Makeup and Purification System

3.4 Hydrogen Addition and Degasification, SP 1102.12

3.5 Boron Concentration Control, SP 1103.04

3.6 DH Removal System Operating Procedure, SP 1104.04

3.7 Chemical Addition System Operating Procedure, SP 1104.03

3.8 Component Cooling Water System Operating Procedure, SP 1104.12

3.9 Clean Liquid Radwaste System Operating Procedure, SP 1104.29

3.10 Nitrogen Purge and Blanket System Operating Procedure, SP 1104.26

3.11 Gaseous Radwaste Disposal System Operating Procedure, SP 1104.27

3.12 Vibration and Loose Parts Monitor System Procedure, SP 1105.18

3.13 Nuclear Filter Cartridge Replacement and Removal, MP 1402.04

3.14 Operational Chemical Control Limits, Plant Procedure PP 1101.04, Sec. 12

20| 3.15 Davis-Besse Unit 1 USAR, Section 9.3.4

3.16 Makeup and Purification System Piping and Instrument Diagram M-031

3.17 ICS/NNI Instruction Manual (Bailey)

3.18 Vendor Technical Manuals:

3.18.1 Pall Trinity (Makeup Filters and Prefilters)

3.18.2 Pall Trinity (Reactor Coolant Pump Seal Injection Filters)

3.19 Ionics Inc., Demineralizer Instruction Manual #4546

3.20 Byron-Jackson Instruction Manuals on RC Pumps

3.21 Makeup Pump Aux Connection and Instrumentation, B&W Dwg. 173919E, File No. 2765

20| 3.22 EP 1202.01, "RPS, SFAS, SFRCS Trip or SG Tube Rupture".

4. STARTUP PROCEDURE

This section of the procedure is used to establish makeup flow and seal injection. The portions of this section concerned with initiation of seal injection apply also during recovery from loss of injection.

4.1 Prerequisites

_____4.1.1 Reactor coolant system pressurizer level instrumentation is operable and is providing control signals to the makeup system.

_____4.1.2 Clean Liquid Radwaste System is operable as per procedure, SP 1104.29.

_____4.1.3 Component cooling water flow has been established in the header supplying the makeup pumps and lube oil coolers, letdown coolers, and seal return coolers in accordance with the Component Cooling Water Operating Procedure, SP 1104.12.

_____4.1.4 Makeup tank pressure is being maintained between 15 and 40 psig as per Hydrogen addition and Degasification Procedure, SP 1102.12.

_____4.1.5 Verify power is available to makeup and purification
20| components, see Attachment 1.

_____4.1.6 Makeup and Purification System is filled and vented and the makeup tank level is between 60-80 inches. Use level recorder LR-MU16.

4.2 Procedure

_____4.2.1 Verify system lineup in accordance with the makeup and purification system normal valve lineup, Valve Verification List A, with the following exceptions:

_____1. RC Letdown Block Orifice Is ltion, MU 4, Closed.

_____2. RCP Seal Return Isolation Valve, MU 38, Closed.

_____3. Seal Injection Flow Control Valve, MU 19, in Manual Mode and Closed.

_____4. Normal Makeup Control Valve, MU 32, Closed.

_____5. RC Letdown Cooler 1-2 Inlet Isolation, MU 1B, Open; and RC Letdown Cooler 1-1 Inlet Isolation MU1A open.

NOTE: RC Letdown Cooler Inlet Isolation Valves 1A and 1B are interlocked to the RC Letdown Cooler CCW Inlet Motor Operated Valves CC1409 and CC1410 such that when MU1A and MU1B are opened, the respective Component Cooling Water valve opens automatically.

_____4.2.2 Perform Makeup Pump Startup Checklist, Attachment 2 of this procedure for both makeup pumps.

13 | _____1. Makeup Pump 1-1 complete.

_____2. Makeup Pump 1-2 complete.

_____4.2.3 Verify Component cooling water flows to the following components:

_____1. Makeup pumps gear lube oil and pump lube oil coolers 1-1 (1-2) flow rate of 12 GPM per pump as read on local flow indicators FI 2190 (FI 2191).

_____2. Seal return coolers 1-1 (1-2) flow rate of 25 GPM per cooler as read on local flow indicators FI 2638 (FI 2642).

_____3. Letdown coolers flow rate of 400 GPM per letdown cooler as read on local flow indicator FI 1405 located on CCW return line.

NOTE: If FI 1405 is already indicating a flow rate, an increase of 400 GPM per letdown cooler should be established on this indicator.

NOTE: Component Cooling Water Inlet Valves to letdown coolers will open on a signal from HIS MU1A (HIS MU1B), inlet to letdown coolers, before letdown is established to coolers.

_____4.2.4 Establish communications between control room and makeup pump room.

CAUTION: IT IS ABSOLUTELY MANDATORY THAT THE RECIRC LINES ARE OPEN ON THE MU PUMPS.

_____4.2.5 Start makeup pump 1-1 (1-2 as follows:

_____1. Start Makeup Pump 1-1 (1-2) Main Oil Pump 1-1-1 (1-2-1) using switch HIS-MU24A1 (HIS-MU24B1) on left console, panel C5704 from the control room or locally with switch NP 371B (NP372B).

NOTE: When Main Oil Pump 1-1-1 (1-2-1) is started, the DC Aux. Oil Pump 1-1-2 (1-2-2), providing the DC Aux. Oil Pump Switch, NP371C (NP372C) is not in "LOCK OUT", and Aux. Gear Oil Pump will also start automatically. Red indicating lights on each start switch for each respective pump will light to indicate pump running.

When starting or switching makeup pump, except for emergency start, station someone at the DC Aux. Oil Pump to verify that it starts after the Main Oil Pump is started.

If the Aux. Gear Oil Pump or DC Aux. Oil Pump did not start automatically, dispatch an operator to inspect the pump for damage or abnormal conditions. The Aux. Gear Oil Pump may be started manually by using switch HIS-24A3 (HIS-24B3) on left console, panel C5704 from the control room or locally using switch NP371B (NP372D), after the pump has been checked for proper operation.

NOTE: Makeup Pump will trip when lube oil system pressure indicator decreases to 3 PSIG. The lube oil pressure switches are powered from the DC control power to breaker AC105 (MU pump 1-1) & AD105 (MU pump 1-2). When Main Oil Pump 1-1-1 (1-2-1) oil pressure reaches 15 psig as read locally on PI-MU 106A (PI-MU 106B), the DC Aux. Oil Pump 1-1-2 (1-2-2) will automatically trip off and remain off unless oil pump pressure decreases to 5 psig at which time the DC Aux. Oil Pump will automatically start again. The DC Aux. Oil Pump can then only be stopped locally using switch NP 371C (NP372C). When DC Aux. Oil Pump 1-1-2 (1-2-2) automatically stops, place switches HIS-MU24A (HIS-MU24B2) on left console, panel C5704 in control room in auto. This will place DC Aux. Oil Pump in standby.

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When the MU pump is started and 12 psig oil pressure is reached on local PI-MU109A (PI-MU109B), a timer is started which, after

4 or 5 minutes, will automatically stop the Aux. Gear Oil Pump. Gear Oil pressure is then maintained by the gear increaser shaft driven pump.

CAUTION: Do NOT attempt to manually stop the Aux. Gear Oil Pump until at least 5 minutes after the MU Pump is started, or the Aux. Gear Oil Pump logic will be confused and the Aux. Gear Oil Pump will neither be automatically stopped nor be able to be manually stopped.

If for some reason, oil pressure drops to 5 psig the Aux. Gear Oil Pump will automatically start again. Aux. Gear Oil Pump can only be stopped if Makeup Pump is tripped or both Main and DC Aux. Oil Pumps are tripped.

_____2. Have an operator check pump bearing site flow glasses that oil is flowing and normal oil pressure of >8 psig on the pump oil system indicator and between 3 and 10 psig on the speed increaser oil system indicator to ensure proper lubrication.

_____3. Start makeup pump 1-1 (1-2) using switch HIS-MU24A (HIS-MU24B) on left console, panel C5704 from the control room or locally with switch NP 371A (NP 372A).

NOTE: Operator should complete Step 13 of Attachment 2 for starting of the makeup pump for proper operation.

_____4. Ensure Aux. Gear Oil Pump 1-1 (1-2) has stopped after MU pump 1-1 (1-2) is started.

NOTE: Second makeup pump is in standby and ready for operation.

_____4.2.6 Have an operator adjust makeup flow control valve bypass flow needle valve MU 58A to 3 GPM flow as read on FI MU58 locally, if RCS pressure is less than 50 psig. This will result in a minimum bypass flow of approximately 1 GPM at normal operation RCS pressure to prevent thermal shocking of the makeup piping to RCS, in the event normal makeup valve MU 32 is closed for a period of time.

_____4.2.7 Establish Seal Injection to RCP pumps:

_____1. Slowly increase seal injection flow by opening MU 19, Seal Injection Flow Control Valve in hand until a total seal injection flow indicates ~32 GPM as read on FI MU 19 on control panel C5704. Adjust MU 19 H/A station setpoint knob to 32 GPM and place MU 19 H/A station in auto.

_____2. Adjust the seal injection flow to each RCP as follows:

_____a. Ensure pressure gauges are installed at PDT MU67 (downstream or low pressure side of PDT) and FT MU30B (upstream side of FT).

NOTE: These should be 3000 psi gauges with 10 psi increments and they should be calibration checked prior to use.

_____b. Ensure MU 19 H/A station is in auto and set for 32-36 GPM.

_____c. Ensure MU 32 is closed and/or isolated such that no makeup flow is present.

NOTE: FIMU58 is to be adjusted per Step 4.2.6 above.

_____d. Set MU 231, 230, 232, and 233 as per Attachment #7.

_____3. Caution, RCS pressure must be $\geq$150 psig before establishing controlled bleedoff flow, open MU59A, MU59B, MU59C and MU59D RCP seal return isoaltion valves. Open MU38, RCP Seal Return Isolation Stop Valve, to establish controlled bleedoff flow from the RCP seals from Control Room on Panel C5717 (SFAS), using switch HIS-MU38. Flow may be read from computer points F835 for RCP 1-2-1, F855 for RCP 1-2-2, F795 for RCP 1-1-1 and F815 for RCP 1-1-2. 8

NOTE: Now that a flow has been established on the makeup pumps 1-1 (1-2), refer to Vibration and Loose Parts (V&LP) System Procedure, SP 1105.18, to compare the current makeup pump operation with its associated baseline power spectral density (PSD) signature and operating limits.

_____4.2.8 Place pressurizer level controller LIC RC-14 H/A station in auto with its setpoint at 75". This will

place normal makeup flow control valve MU 32 in service.

_____4.2.9 Open MU 4, RC Letdown Block Orifice Isolation Valve, with switch HIS-MU4 from the control room on panel C5703, left console, and observe letdown flow on FI MU7 on panel C5703, left console, in the control room.

_____4.2.10 Adjust letdown flow to equal seal inleakage plus MU flow control valve bypass flow plus 10 GPM using HC-MU6 block orifice bypass valve if necessary, which can be opened from control room on panel C5703. Using nominal values mentioned above, this will be about 41 GPM, with a constant pressurizer level of 75".

Example: 4 RCP (8 GPM Seal Injection - $\frac{1 \text{ GPM}}{\text{RCP}}$ controlled bleedoff) + 3 GPM MU valve bypass + 10 GPM = 41 GPM

NOTE: This will assist in maintaining a uniform outflow from the pressurizer to the RCS piping during heatup to minimize thermal cycles in the pressurizer surge line. The makeup flow provides some control over pressurizer level during changes in letdown flow.

CAUTION: Letdown flow should be at least above minimum demineralizer flow requirements, 25 GPM, as specified in PP 1101.01, when a demineralizer is in service. Also flow through MU6 should be maintained at $\geq$10 GPM.

_____4.2.11 Increase letdown flow by opening letdown flow control valve MU 6, with hand control station HC-MU 6 located on panel C5703 in the control room, if required by fluid expansion during plant startup. Refer to Step 5.2.2 of this procedure for equipment required in service at various letdown flow rates.

_____4.2.12 Close the three-way valve MU 11, using switch HIS-MU11 on left console, panel C5702 from the control room, to bleed reactor coolant letdown flow to waste disposal if necessary to compensate for expansion volume or feed to the makeup tank. One of two of the Clean Waste Receiver Tanks will be used to store the borated water, ~24,000 gallons, generated during reactor coolant system heatup. The bleed liquid should be routed through the "spare" purification demineralizer to recover the Li^7 in it.

NOTE: This borated water will be eventually used during RCS cooldown to fill the volume left from reactor coolant contraction.

____4.2.13 Establish required hydrogen concentration by controlling hydrogen overpressure (15 psig) in the makeup tank in accordance with the Hydrogen Addition and Degasification Operating Procedure, SP 1102.12.

____4.2.14 Saturating a Mixed Bed Purification Demineralizer with Boric Acid.

1. Whenever flow is first established through a newly charged Mixed Bed Demineralizer, boron will be removed. A RCS boron concentration drop of about 125 ppm can be expected from saturation of a 50 ft^3 bed of NR-6.

3 2. RCS boron concentration should initially be raised about 125 ppm or additions should be made to compensate for the boron decrease during the saturation process.

3. When flow is established through the Purification Demineralizer, C&HP should analyze the Purification Demineralizer Inlet, Outlet, and Pressurizer Liquid for Boron, Lithium and Cl^- hourly for the initial six hours, then every 2 hours for the next twelve hours.

4. The boron removal rate will depend on the Purification Demineralizer flow rate. At 40 gpm RCS boron should drop about 12 ppm/hour.

Section 4 Completed_____Date_____

5. NORMAL OPERATION

5.1 Prerequisites

____5.1.1 One or more makeup pumps are operating supplying normal RC system makeup, and RC pump seal injection.

____5.1.2 The system is in its normal lineup as per Valve Verification List A.

____5.1.3 The running component cooling water pump and Makeup Pump are supplied from opposite essential 4.16 KV buses to prevent the simultaneous loss of cooling and seal injection water to the RCP's.

5.2 Procedure

____5.2.1 Ensure that the Limits of Section 2 (Plant Limits and Precautions) of this procedure are not exceeded.

____5.2.2 The following equipment must be in service for the various letdown flow rates listed:

Letdown Flow Rate (GPM)	Letdown Coolers Required	Demineralizers Required**	Makeup Filters Required	Letdown Flow Control Valve (MU6) In Service
25-45	1	1	1	No*
45-70	1	1	1	Yes
70-140	2	2***	2	Yes

*Valid if Reactor Coolant System is at normal operating pressure.
**Or bypass the demineralizers by opening MU 104.
***Normally, flow in excess of 70 gpm thru the "operating" Purification Demineralizer should be bypassed to comply with Li^7 management policy (Section 5.2.10-5.2.12).

____5.2.3 Increase or decrease letdown and purification rate and utilize Purification Demineralizers as specified by the C&HP section to maintain the proper RCS chemistry.

NOTE: When it is necessary to increase letdown flow, use the letdown flow control valve MU 6. The block orifice RO MU5 is sized to pass about 45 GPM at Reactor Coolant System Operating Pressure (2155 psig).

____5.2.4 Observe makeup filter and purification demineralizer prefilter differential pressures. Use differential indicators PDI-MU13 and PDI-MU62 respectively located in the control room on panel C5703.

NOTE: When the makeup filter or demin prefilter differential pressure reaches 25 psid, write a Work Request to change the plugged filter.

15

NOTE: Makeup filters and purification demineralizer prefilter changeout can also be based on radiation levels as indicated by C&HP.

____5.2.5 Maintain makeup tank hydrogen pressure between 15-40 psig to produce the desired hydrogen concentration in accordance with SP 1102.12, Hydrogen Addition and Degasification and as specified by the C&HP Section.

NOTE: The makeup tank pressure can also be maintained using Nitrogen as a substitute for hydrogen should the hydrogen partial pressure be too high. Nitrogen loading of the Makeup Tank is done per SP 1102.12, Hydrogen Addition and Degasification, Section 9.

____5.2.6 With pressurizer level controller LIC-RC14 in automatic and setpoint at 180" normal level, observe pressurizer level on LRS-RC-14 to confirm the proper operation of the Normal Makeup Flow Control Valve MU 32.

____5.2.7 Maintain makeup tank level between 55" and 85".

NOTE: If it becomes necessary to add water to the makeup tank at the existing RCS boron concentration to bring the tank level to normal (73"), refer to Boron Concentration Control Operating Procedure, SP 1104.03.

____5.2.8 The three-way valve MU 11 may be positioned using switch HIS-MU 11 located on left console, panel C5702 from the control room, to the clean liquid radwaste system to reduce the water inventory in the reactor coolant system or the makeup system if necessary during normal or transient plant operating conditions.

NOTE: The alternate Clean Waste Receiver Tank will be used to collect the letdown flow from the RCS as per water management plan, Section 4.4, PP 1101.06, Flow thru the "Spare" Purification Demineralizer to recover Li^7 when going to the Clean Waste Receiver Tanks.

____5.2.9 Observe normal RCP seal injection flow of 32 GPM on FI MU 19 on left console, panel C5704 in the control room, and may be adjusted by using flow controller FIC-MU 19.

____5.2.10 The normal valve lineup per Valve Verification List A has routed the letdown flow continuously through Purification Demineralizer 1-1. However, the roles ("Operational" and "Spare") of Purification Demineralizers 1-1 and 1-2 will switch based on bed exhaustion, replaced with fresh resin, and becomes the "Spare"; the previous "Spare" then becomes the "Operational" demineralizer for the next time period.

12 The "Operational" demineralizer will be intentionally

saturated with Li^7 by multiple chemical additions and by production of Li^7 from Boron-10.

12 _____5.2.11 The "Spare" demienralizer will not be intentionally saturated with Li^7. But, once the "Operational" demineralizer is saturated with Li^7, all bleed liquid from the RCS and all flow for the purpose of Li^7 concentration reduction should be routed through the "Spare" demineralizer. This will slowly saturate the "Spare" with Li^7. It will then become the "Operational" demineralizer for the next time period. This will save about 5-10 kg of Li^7 per time period, which is roughly one fuel cycle.

_____5.2.12 The Purification Demineralizer 1-3 is a Cation esin bed and will be used as directed by C&HP for radio-cesium and other gross activity removal. It can be used to reduce RCS Li^7 concentrations in the event both Purification Demineralizers 1-1 and 1-2 are Li^7 saturated. Open inlet valve MU1903 to place this bed in service.

_____5.2.13 Under unusual conditions the Cation and Mixed Bed Purification Demineralizers can be placed in series as directed by C&HP.

_____1. To place Mixed Bed Purification Demineralizer 1-1 (1-2) in series with the Cation Bed:

_____a. Open MU119 (MU121), Mixed Bed Outlet to Cation Bed Line Valve.

_____b. Close MU139 (MU140) Mixed Bed Outlet Valve.

_____2. To place the paralleled Mixed Bed Purification Demineralizers in series with the Cation Bed:

_____a. Open MU119 and MU121, Mixed Bed Outlet 1-1, 1-2 Outlet to Cation Bed Line Valves.

_____b. Close MU139 and MU140, Mixed Bed 1-1, 1-2 Outlet Valves.

_____3. To return to one demineralizer operation after running in series with Cation bed:

_____a. Open MU139 (MU140) Mixed Bed Purification Demin 1-1 (1-2) Outlet Valve.

_____b. Close MU119 (MU121) Mixed Bed Purification Demin 1-1 (1-2) to Cation Bed Valve.

_____5.2.14 To switch makeup pumps during normal operation complete the following steps:

NOTE: Whenever one or more Reactor Coolant Pumps are operating, the component cooling water pump providing the RCP cooling water and the makeup pump providing the RCP seal injection must be aligned to opposite essential busses. However, it is permissible to prform ST 5011.03 on the makeup pump aligned to the same bus as the operating CCW pump, but the opposite Makeup Pump must be placed back in service as soon as possible after completion of the test.

NOTE: When not in emergency conditions, complete Step 5.2.14.

NOTE: 1) Before the operating MU pump is removed from service, obtain a comparison of the current PSD signature with its baseline and operating limits.

2) After the other MU pump is placed in service, obtain the same data as above. Refer to V&LPM System Procedure SP 1105.18. 20|

_____1. Perform makeup pump startup checklist, Attachment 2 of this procedure for both makeup pumps.

_____2. Verify second seal return cooler is in service as second makeup pump recirculation flow of 35 gpm will exceed the maximum flow rate of one seal return cooler of 42 gpm.

_____3. Perform Step 4.2.5 of this procedure to start second makeup pump.

_____4. When second pump is on the line, stop other makeup pump from the control room or locally.

_____5. When makeup pump has coasted down to a stop after approximately two minutes, stop makeup pump AC oil pump and gear AC oil pump of off going pump.

LETDOWN COOLERS

_____5.2.15 To switch letdown coolers 1-1 (1-2) open the letdown cooler inlet isolation valve MU 1A (MU 1B) from the control room, [illegible] the second cooler and close the letdown cooler [illegible] valve of the first cooler.

NOTE: Component cooling water inlet valve CC 1409 (CC 1410) to letdown coolers are interlocked to open and close automatically with letdown cooler inlet isolation valves.

____5.2.16 To parallel letdown coolers 1-1 (1-2) open letdown cooler inlet isolation valve MU 1A (MU 1B) from the control room of the second cooler.

PURIFICATION DEMINERALIZERS

____5.2.17 To switch purification mixed bed demineralizers 1-1 (1-2) open mixed bed letdown inlet valve MU 10A (MU 10B) from the control room, of the second demineralizer and close the mixed bed letdown inlet valve of the first demineralizer.

____5.2.18 To parallel purification demineralizers 1-1 (1-2) open the mixed bed letdown inlet valve MU 10A (MU 10B) of the second cooler.

____5.2.19 In the event of a small line break (≤3/4") the BWST can be used as a water supply for the makeup pumps. The three way valve MU-3971 should be positioned to the BWST supply mode before the makeup tank reaches the low level interlock to the makeup pumps (5 inches).

1

6. SHUTDOWN OF MAKEUP SYSTEM

6.1 Prerequisites

____6.1.1 Reactor coolant pumps are not in service.

____6.1.2 Discontinue makeup and letdown flows when permitted by reactor coolant system conditions as specified in PP 1102.10, Unit Shutdown and Cooldown.

____6.1.3 When the reactor coolant pumps are off, seal injection may be terminated when reactor coolant system temperature is less than 150°F.

6.2 Procedure

____6.2.1 Close the Letdown Isolation Valve MU3.

____6.2.2 Close the Normal Makeup Line Isolation Valve MU33.

____6.2.3 Close the Seal Return Isolation Valve, MU 38.

____6.2.4 Close the Seal Injection Flow Control Valve MU 19.

_____6.2.5 Stop the makeup pump(s).

_____6.2.6 The makeup system is left with:

_____1. Makeup tank level at approximately 73".

_____2. Makeup tank space filled with hydrogen or nitrogen.

_____3. All components and piping solidly filled with borated water.

_____4. Remaining valves in makeup and purification system are in their normal position.

Section 6 Completed_____Date_____

7. INFREQUENT OPERATIONS

7.1 Lithium Hydroxide and Hydrazine Addition-Lithium hydroxide and hydrazine are supplied to the makeup tank to control pH and oxygen respectively in the RCS. LiOH and N_2H_4 are injected into the makeup and purification system downstream of the purification demineralizers in accordance with the Chemical Addition system Operating Procedure, SP 1104.03.

7.1.1 Lithium may be removed from the RCS by changing the letdown flow to the "Spare" demineralizer which normally will not be lithium saturated. If the "spare" demineralizer is saturated, route the flow thru Purification Demineralizer 1-3. As a last alternative feed and bleed can be used to reduce Lithium concentrations.

7.2 Makeup and Purification System Filter Replacement

When the filter differential pressure increases to 25 PSID, remove clogged filter from service and place spare filter in service.

7.2.1 Seal Injection Filters

NOTE: Before removing the clogged seal injection filter, place the spare filter in service.

1. Returning Seal Injection Filter 1-1 to service.

_____(1) Close MU 480, MU 503, MU 505, MU 501, and MU 508.

20 _____(2) Slowly open MU 221, Inlet Stop.*

20 | _____(3) Very slowly open MU 224, Inlet Isolation Bypass Valve,* to allow filter housing to fill.

_____(4) Slowly open MU 219 Inlet Isolation.*

_____(5) Open MU 508 and slowly crack MU 501 to vent until all air vented. Minimize flow out vent.

_____(6) Close vent MU 501.

_____(7) Close vent MU 508.

_____(8) Open MU 223 Outlet Stop.*

_____(9) Open MU 229 Outlet Isolation.*

_____(10) Close MU 218 filter 1-2 inlet isolation.

20 | _____(11) Close MU 225 filter 1-2 Inlet Isolation Bypass Valve.

Completed_____Date_____

2. Returning Seal Injection Filter 1-2 to service.

_____(1) Close MU 481, MU 504, MU 506, MU 502, and MU 508.

20 | _____(2) Slowly open MU 220, Inlet Stop.*

_____(3) Very slowly open MU 225, Inlet Isolation Bypass Valve,* to allow filter housing to fill.

_____(4) Slowly open MU 218 Inlet Isolation.*

_____(5) Open MU 508 and slowly crack MU 502 to vent until all air is vented. Minimize flow out vent.

_____(6) Close vent 502.

_____(7) Close vent 508.

_____(8) Open MU 222 Outlet Stop.*

_____(9) Open MU 228 Outlet Isolation.*

_____(10) Close MU 219 filter 1-1 inlet isolation.

20 | _____(11) Close MU 224 filter 1-1 Inlet Isolation.*

Completed_____Date_____

3. Removing Seal Injection Filter 1-1 from service.

_____(1) Close MU 223 Outlet Stop.

_____(2) Close MU 229 Outlet Isolation.

_____(3) Close MU 219 Inlet Isolation.

20| _____(4) Close MU 224 Inlet Isolation Bypass Valve.

_____(5) Close MU 221 Inlet Stop.

_____(6) Open vent MU 501.

_____(7) Open MU 508.

_____(8) Open MU 480, MU 503, and MU 505. Drain for ten minutes, filter should be drained.

_____(9) After the clogged filter is isolated and removed from service, maintenance may proceed with Nuclear Filter Cartridge Removal and Replacement Maintenance Procedure, MP 1402.04.

Completed_____Date_____

4. Removing Seal Injection Filter 1-2 from service.

_____(1) Close MU 222 Outlet Stop.

_____(2) Close MU 228 Outlet Isoaltion.

_____(3) Close MU 218 Inlet Isolation.

20| _____(4) Close MU 225 Inlet Isolation Bypass Valve.

_____(5) Close MU 220 Inlet Stop.

_____(6) Open vent MU 502.

_____(7) Open vent MU 508.

_____(8) Open MU 481, MU 504, and MU 506. Drain for ten minutes. Filter should be drained.

_____(9) After the clogged filter is isolated and removed from service, maintenance may proceed with Nuclear Fitler Cartridge Removal and Replacement Maintenance Procedure, MP 1402.04.

Completed_____Date_____

5. Placing Seal Injection Filter 1-1 in standby.

_____(1) Close MU 480, MU 503, MU 505, MU 501, and MU 508.

20 _____(2) Slowly open MU 221, Inlet Stop.*

_____(3) Very slowly open MU 224, Inlet Isolation Bypass Valve*, to allow filter housing to fill.

_____(4) Slowly open MU 219 Inlet Isolation.*

_____(5) Open MU 508 and slowly crack MU 501 to vent until all air is vented. Minimize flow out vent.

_____(6) Close vent MU 501.

_____(7) Close vent MU 508.

_____(8) Close MU 221.

_____(9) Close MU 219.

20 _____(10) Close MU 224.

Completed_____Date_____

6. Placing Seal Injection Filter 1-2 in standby.

_____(1) Close MU 481, MU 504, MU 506, MU 502, and MU 508.

20 _____(2) Slowly open MU 220, Inlet Stop.*

_____(3) Very slowly open MU 225, Inlet Isolation Bypass Valve,* to allow filter housing to fill.

_____(4) Slowly open MU 218 Inlet Isolation.*

_____(5) Open MU 508 and slowly crack MU 502 to vent until all air is vented. Minimize flow out vent.

_____(6) Close vent 502.

_____(7) Close vent 508.

_____(8) Close MU 220.

_____(9) Close MU 218.

20 _____(10) Close MU 225.

Completed_____Date_____

*NOTE: Just prior to filling and venting seal injection filter, contact Control Room operator and warn of possible upset in RCP seal injection flow. Crack open seal injection filter inlet valves slowly.

7.2.2 Makeup Filters:

_____1. When the 1-1 (1-2) MU filter differential pressure reaches 25 psid, place the spare filter in service by opening inlet valve MU 12B (MU 12A) from the control room on panel C5703, left console, using switch HIS MU12B (HIS MU12A).

CAUTION: Ensure the 1-1 (1-2) MU filter is in standby.

_____2. Isolate the clogged filter 1-1 (1-2) by closing inlet isolation valve MU 12A (MU 12B) from the control room on panel C5703 left console using control switch HIS MU12A (HIS MU12B).

_____3. When Maintenance is prepared to perform the filter change, perform Steps 4 through 13.

_____4. Close MU 177 (MU 161) filter outlet isolation valve locally.

_____5. Check closed MU 174 (MU 166) MU filter 1-1 (1-2) vent, MU 110 N_2/Demin Supply to Purif. Demin and MU 133 Demin Multipurpose.

_____6. Open MU 171 (MU 170) MU filter 1-1 (1-2) Disch to storage tank valve.

_____7. Open MU 172 (MU 163) MU filter 1-1 (1-2) refill valve.

_____8. Monitor Spent Resin Storage Tank level and pressure while performing Step 9.

CAUTION: The Spent Resin Storage Tank relief will lift at approximately 60 PSIG and the rupture disk will rupture at approximately 75 PSIG.

_____9. Open NN 102 and NN 103 N_2 PCV Inlet and Outlet to Purification Demin to blow dry the filter with nitrogen for approximately five minutes while maintaining less than 50 PSIG in the Spent Resin Storage Tank.

_____10. When the purge is complete, close NN 102 and NN 103.

_____11. Close MU 172 (MU 163) and MU 171 (MU 170).

_____12. Open MU 174 (MU 166) MU filter 1-1 (1-2) vent.

CAUTION: This may cause a gaseous release. See Step 2.17.

_____13. Inform Maintenance the filter is isolated and drained and they may proceed with the Nuclear Filter Cartridge Removal and Replacement Maintenance Procedure MP 1402.04.

_____14. If it is necessary to flush the filter can after the used filter is removed but before the new filter is installed, perform the following steps after the filter can is buttoned up.

_____(1) Check closed MU 110 and MU 133.

_____(2) Close MU 174 (MU 166).

_____(3) Open MU 171 (MU 170) and MU 172 (MU 163).

_____(4) Monitor Spent Resin Storage Tank level and pressure while performing Steps (5) through (8).

CAUTION: The Spent Resin Storage Tank relief will lift at approximately 60 psig and the rupture disk will rupture at approximately 75 psig.

_____(5) Open DW 67 Demin Wtr Iso Vlv to Purification demin to flush the filter can.

_____(6) After five minutes or when a one foot level increase is seen in the Spent Resin Storage Tank, close DW 67.

_____(7) Open NN 102 and NN 103 for approxiamtely five minutes while maintaining Spent Resin Storage Tank pressure less than 50 psig.

_____(8) When the purge is complete, close NN 102 and NN 103.

_____(9) Close MU 171 (MU 170) and MU 172 (MU 163).

_____(10) Open MU 174 (MU 166) MU filter 1-1 (1-2) vent.

CAUTION: This will cause a gaseous release. See Step 2.17.

_____(11) Inform Maintenance the flush is complete and they may proceed with the filter replacement.

_____15. When Maintenance has completed the filter change, perform Steps 16 through 23 to leak check the filter housing.

_____16. Inform the Control Room that the filter is about to be leak checked.

_____17. Check closed MU 171 (MU 170) and MU 172 (MU 163).

_____18. Crack open MU 12A (MU 12B) MU filter 1-1 (1-2) Inlet Iso Valve.

_____19. Vent for the minimum amount necessary to ensur ethe filter is completely filled and vented.

CAUTION: This may cause a radioactive gaseous release. See Step 2.17.

_____20. Close MU 174 (MU 166) MU filter 1-1 (1-2) vent.

_____21. Check the filter housing for leaks.

_____22. Close MU 12A (MU 12B) MU filter 1-1 (1-2) inlet valve.

_____23. Open MU 177 (MU 161) MU filter 1-1 (1-2) outlet valve.

Section 7.2.2 Completed By_____Date_____

7.2.3 Using makeup filter 1-2 as a substitute for purification demin prefilter:

_____1. When the purification demineralizer prefilter differential pressure reaches 25 psid, place MU filter 1-2 in service, if possible, by performing the following steps.

CAUTION: Makeup filter 1-1 must be in service or bypassed before the 1-2 Makeup filter can be used as the substitute for the purification demin prefilter. If the 1-2 Makeup filter is in service as the Makeup filter, the purification demin prefilter bypass valve MU 63 may be used until the 1-2 Makeup filter is available or the purification demin refilter is replaced.

_____(1) Close MU 159 MU filter 1-2 inlet isolation and MU 162 MU filter 1-2 outlet isolation locally.

_____(2) Open MU 93 Purif Demin Filter Bypass to MU filters locally.

_____(3) Open MU 12B MU filter 1-2 Motor Operated Inlet.

_____(4) Open MU 97 MU filter 1-2 outlet return to demineralizers locally.

_____(5) Close MU 94 Purif Demin Filter Inlet and MU 96 Purif Demin Filter Outlet.

_____2. When Maintenance is prepared to perform the filter change, perform Step 3 through 11.

_____3. Check closed MU 99 Purif Demin Prefilter Vent, MU 110 N_2/Demin Supply to Purif Demin and MU 133 Demin Multipurpose.

_____4. Open MU 103 Purif Demin Prefilter Backwash Drain.

_____5. Open PW 8 Pri Wtr to Purif Demin Prefilter.

_____6. Monitor Spent Resin Storage Tank level and pressure while performing Step 7.

CAUTION: The Spent Resin Storage Tank relief will lift at approximately 60 psig and the rupture disk will rupture at approximately 75 psig.

_____7. Open NN 102 and NN 103 N_2 PCV Inlet and Outlet to Purif Demin to blow dry the filter with nitrogen for approximately five minutes while maintaining less than 50 psig in the Spent Resin Storage Tank.

_____8. When the purge is complete, close NN 102 and NN 103.

_____9. Close PW 8 and MU 103.

_____10. Open MU 99 purif demin filter vent.

CAUTION: This will cause a gaseous release. See Step 2.17.

_____11. Inform Maintenance the filter is isolated and drained and they may proceed with the Nuclear Filter Cartridge Removal and Replacement Maintenance Procedure MP 1402.04.

_____12. If it is necessary to flush the filter can after the used filter is removed but before the new filter is installed, perform the following steps after the filter can is buttoned up.

____ (1) Check closed MU 110 N_2/Demin Supply to Purif Demin and MU 133 Demin Multipurpose.

____(2) Close MU 99 Purif Demin Prefilter Vent.

____(3) Open MU 103 Purif Demin Prefilter Backwash Drain and PW 8 Pri Wtr to Purif Demin Prefilter.

____(4) Monitor Spent Resin Storage Tank level and pressure while performing Steps (5) through (8).

CAUTION: The Spent Resin Storage Tank relief will lift at approximately 60 psig and the rupture disk will rupture at approximately 75 psig.

____(5) Open DW 67 Demin Wtr Iso Vlv to Purif Demin to flush the filter can.

____(6) After five minutes or when a one foot level increase is seen in the Spent Resin Storage Tank, close DW 67.

____(7) Open NN 102 and NN 103 for approximately five minutes while maintaining less than 50 PSIG in the Spent Resin Storage Tank.

____(8) When the purge is complete, close NN 102 and NN 103.

____(9) Close PW 8 and MU 103.

____(10) Open MU 99 Purif Demin Prefilter Vent.

CAUTION: This may cause a gaseous release. See Step 2.17.

____(11) Inform Maintenance the flush is complete and they may proceed with the filter replacement.

____13. When Maintenance has completed the filter change, perform Steps 14 through 21 to leak check the filter housing.

____14. Inform the Control Room the filter is about to leak checked.

____15. Check closed MU 103 and PW 8.

____16. Crack open MU 94 Purif Demin Prefilter Inlet.

_____17. Vent for the minimum amount necessary to ensure the filter is completely filled and vented.

CAUTION: This may cause a radioactive gaseous release. See Step 2.17.

_____18. Close MU 99 Purif Demin Prefilter Vent.

_____19. Check the filter housing for leaks.

_____20. Close MU 94 Purif Demin Prefilter Inlet.

_____21. Open MU 96 Purif Demin Prefilter Outlet.

_____22. To return the Purif Demin Prefilter to service and remove the 1-2 MU filter from service as the Purif Demin Prefilter, perform Steps 23, 25, 26, and 27. To return the Purif Demin Prefilter to service and remove the Purif Demin Prefilter bypass valve from service, perform Steps 23 and 24.

_____23. Open MU 94 Purif Demin Prefilter Inlet.

_____24. Close MU 63 Purif Demin Prefilter Bypass.

_____25. Close MU 12B MU filter 1-2 inlet iso.

_____26. Close MU 97 MU filter outlet return to demineralizers and MU 93 Purif Demin Prefilter Bypass to MU filters locally.

_____27. Open MU 159 MU Filter 1-2 Inlet Iso and MU 162 MU Filter 1-2 Outlet Iso locally.

Section 7.2.3 Completed By_____Date_____

7.3 Recovery from Letdown Isolation (135°F)

A high temperature alarm (TSH 3745B) is set at 135°F (T715 - "RC Letdown Temp Hi" on annunciator panel 2) and signals a high temperature in the delay coil downstream of the letdown coolers. The alarm also signals the letdown cooler inlet isolation valve, MU 2B, inside the containment vessel to close, thus protecting the purification demineralizers resins due to a decrease or loss of component cooling water flow to the letdown coolers.

Should the cause of the high temperature trip be known, perform the following steps:

7.3.1 Manually override the high temp trip signal by holding HIS-MU2B on the open position until the trip clears. 18|

Should the cause of the High Temperature Trip not be known, perform the following steps:

_____7.3.2 Isolate the purification demineralizers 1-1, 1-2, 1-3 by closing the demineralizer inlet isolation valves MU10A, MU10B, and MU 1903 from the control room on panel C5703, left console, using switches HIS-MU10A, HIS-MU10B, and HIS MU-1903 respectively.

_____7.3.3 Unlock and open the demineralizer bypass valve MU104 (locally).

_____7.3.4 Take immediate action to correct the cause of the high temperature letdown flow to the demineralizers:

18 | _____1. Manually override the high temperature signal by holding HIS-MU2B in the open position until the trip clears.

_____2. Re-establish component cooling water flow in the header supplying the letdown coolers as per Component Cooling Water Operating Procedures, SP 1104.12.

_____7.3.5 Restore the makeup system to the normal valve lineup by opening MU 10A, MU 10B, and MU 1903 (if needed) purification demineralizers 1-1, 1-2, and 1-3 inlet isolation valves and lock close demineralizer bypass valve MU 104.

Section 7.3 Completed_____Date_____

7.4 Recovery from Letdown Isolation (160°).

A high tempeature alarm (TSH 3745A) is set at 160°F (T715 - "RC Letdown Temp Hi" on annunciator panel 2) and signals a high temperature in the delay coil downstream of the letdown coolers. TSH 3745A will signal RC letdown cooler 1-1 and 1-2 inlet isolation valves MU 1A and MU 1B to close, thus protecting the purification demineralizers resins due to a decrease or loss of component cooling water flow to letdown coolers.

_____7.4.1 Isolate the purification demineralizers 1-1, 1-2, 1-3 by closing the demineralizer inlet isolation valves MU 10A, MU 10B, and MU 1903 from the control room on panel C5703 using switches HIS-MU10A, HIS MU10B, and HIS MU 1903 respectively.

_____7.4.2 Unlock and open the demienralizer bypass valve MU 104, (locally).

____7.4.3 Take immediate action to correct the cause of the high temperature letdown flow to the demineralizers:

____1. Reestablish component cooling water flow in the header supplying the letdown coolers as per component cooling water operating procedure, SP 1104.12.0.

10 ____2. Manually override the high temperature trip signal by holding HIS-MU1A (HIS-MU1B) letdown cooler 1-1 (1-2) inlet isolation valve on left console, panel C5703 in the control room, in the open position until the trip clears.

____7.4.4 Restore the makeup system to the normal valve lineup by opening MU 10A, MU 10B, and MU 1903 (if needed) purification demineralizers 1-1, 1-2, and 1-3 inlet isolation valve and lock close demineralizer bypass valve MU 104.

Section 7.4 Completed_____Date_____

7.5 Preparing to Fill the Core Flood Tanks:

7.5.1 Prerequisites

____1. Makeup system operational but shutdown as per Section 6.2.

____2. Nitrogen system available as per Nitrogen Purge and Blanket System Operating Procedure, SP 1104.26.

____3. Chemical Addition System available as per Chemical Addition System Operating Procedure, SP 1104.20.

____4. Gaseous Radwaste System available as per Gaseous Radwaste Disposal Operating Procedure, SP 1104.27.

7.5.2 Procedure

____1. Drain MU tank to 24 inches to the reactor coolant drain tank by opening MU 189 locally.

____2. Vent makeup tank of H_2 Gaseous Radwaste System and purge tank with N_2.

____a. Open MU 395, Makeup Tank Vent to Gaseous Radwaste MU 14 inlet isolation valve.

____b. Open MU 185, Makeup Tank Vent to Gaseous Radwaste MU 14 Outlet Isoaltion Valve.

_____c. Open MU 14, Makeup Tank vent to Gaseous Radwaste System with Switch HIS-MU14 located in control room on panel C5703.

_____d. Open MU 53, Nitrogen Supply to Makeup Tank from the control room on panel C5703 and purge the makeup tank with nitrogen for (later) minutes.

_____e. When tank has been purged with about 2 volumes of N_2, have a sample taken. If H_2 is still present purge one volume again and sample.

_____f. When tank is purged of H_2 close MU 53 N_2 supply to makeup tank, MU 14 vent control valve to gaseous radwaste system, M 395 and MU 185 isolation valves for MU 14.

_____3. Sample for boron in the MU tank as per SP 1104.10, Sample System in the Nuclear Area Procedure.

_____4. Calculate the amount of boric acid to fill the MU tank with 3500 ppm boron as per SP 1103.04, Boron Concentration Control.

_____5. Isolate RC system, seal injection, letdown coolers, and purification demineralizers:

_____a. Close MU 214, RCP Seal Injection Flow Control Inlet Isolation.

_____b. Close MU 58A, Normal Makeup Flow (FE MU 58) Source Needle Valve.

_____c. Close MU 209, Normal Makeup Flow Control Inlet Isolation.

_____d. Close MU 38, RCP Seal Return Isolation with MU 38.

_____e. Close MU 148, Three-way (MU 11) Outlet Isolation.

_____6. Add water and boric acid to the MU tank as per SP 1104.03, Chemical Addition Procedure, Section 5.

_____7. Pressurize with N_2 to 20 PSIG with MU 53, Nitrogen Supply to Makeup Tank.

11 _____8. Start makeup pump 1-1 (1-2) as per Sections 4.2.2, 4.2.3.1, and 4.2.5 of this procedure. Recirc for approximately two makeup tank volumes. Makeup tank

temperature is not to exceed 140°F. Two seal return cooling should be in service.

_____9. Sample makeup tank to ensure that boron concentration is 3200 to 3500 ppm.

_____10. Stop makeup pump 1-1 (1-2) from control room or locally.

_____11. The core flood tanks can not be filled as per SP 1104.01, Core Flooding System Operating Procedure, Section 4, Method 1.

_____7.5.3 Return makeup system to shutdown conditions as per Section 6.2 of this procedure after filling the core flood tanks.

_____1. Sample for boron in the MU tank as per SP 1104.10, Sample System in the Nuclear Area Procedure.

_____2. Add primary or demineralized water and drain to the reactor coolant drain tank as necessary to bring makeup tank to correct boron concentration.

_____3. Start makeup pump 1-1 (1-2) as per Sections 4.2.2, 4.2.3.1, 4.2.5 of this procedure, and recirc for five (5) minutes.

_____4. Sample Makeup Tank to ensure that boron concentration is back to the valve for that point in core life.

_____5. Stop makeup pump 1-1 (1-2) from the control room or locally.

_____6. Return makeup system to normaloperating flow path:

_____a. Open MU 214, RCP Seal injection flow control inlet isolation.

_____b. Open MU 58A, Normal Makeup Flow (FE MU 58) Source Needle Valve.

_____c. Open MU 209, Normal Makeup Flow Control Inlet Isolation.

_____d. Open MU 38, RCP Seal Return Isolation with HIS-MU 38.

_____e. Open MU 148, three-way (MU 11) outlet isolation.

Section 7.5 Completed_____Date_____

7.6 Recovery from letdown isolation (135 PSIG).

A high pressure interlock exists between the component cooling water system and the RC Letdown Cooler Inlet Isolation Valve MU2B, RC Letdown Cooler 1-1 Inlet Isolation Valve MU1A, and RC Letdown Cooler 1-1 Inlet Isolation Valve MU1B. Pressure switches PSH 3759 and PSH 3763 monitor component cooling water header pressure downstream of letdown coolers 1-1 and 1-2. These pressure switches are interlocked ot the RC Letdown Cooler Inlet Isolation Valve MU2B and close this valve upon a cooling water pressure of 135 PSIG. Pressure switches PSH3711 and PSH3712 monitor letdown cooler shell pressure and close the RC Cooler 1-1 Inlet Isolation MU1A and RC Cooler 1-2 Inlet Isolation MU1B respectively upon a shell pressure of 135 PSIG. All of the pressure switches trigger the annunciator and computer point alarm P101 on the alarm printer.

7.6.1 Letdown Cooler 1-1 in Service.

_____1. Verify RC Letdown Cooler Isoaltion VAlves MU2B and MU1A are closed.

_____2. Open RC Letdown Cooler 1-2 Isolation Valve MU1B using HIS MU1B, located on Control Room Panel C5703.

_____3. Press the open pushbutton on HIS MU2B located on Control Room Panel C5703 and verify that MU2B opens.

7.6.2 Letdown Cooler 1-2 in Service.

_____1. Verify RC Letdown Cooler Isolation Valves MU2B and MU1B are closed.

_____2. Open RC Letdown Cooler 1-1 Isolation Valve MU1A using HIS MU1A located on Control Room Panel C5703.

_____3. Press the open pushbutton on HIS MU2B located on Control Room Panel C5703 and verify MU2B opens.

Breakers & Switches for Makeup & Purification System

Equipment Ident. No.	MU 4	MU 63	MU 10A	MU 10B	MU 1903	MU 11	MU 40	MU 12A
Equipment Name	Letdown Pressure Reducer Inlet Iso	Purification Demin Filter Bypass	Purification Demin 1-1 Inlet Vlv	Purification Demin 1-2 Inlet Valve	Purification Demin 1-3 Inlet Vlv	Three-Way Valve	Batch Feed Stop Valve	Makeup Filter 1-1 1-1 Inlet Vlv
Control Room Switch/Panel#	HIS-MU 4 C 5703	HIS-MU 63 C 5703	MIS-MU 10A C 5703	HIS-MU 10B C 5703	HIS-1903 C 5703	HIS-MU 11 C 5702	HIS-MU 40 C 5702	HIS-MU12A C 5703
Control Room Switch Name	RC Let-down Press Reduce Vlv	Purif Demin Prefilter Bypass	RC Let-down Purf. Demin 1 In	RC Let-down Purf. Demin 2 In	RC Let-down Purf. Demin 3 In	RC Let-down Divert Vlv	BA Batch Stop Vlv	RC MU Fltr 1 In Valve
Breaker No. & MCC	BE-2259 E-22B	BE-2268 E22B	BE-2262 E-22B	BE-2263 E22B	BE 2271 E 22B	BE 2278 E 22B	BE 1109 E 11A	BE 1125 E11A
MCC Location (Area & Elev.)	BWST HTR Area 565' Area 8	BWST Htr Area 565' Area 8	BWST Htr Area 565' Area 8	BWST Htr Area 565' Area 8	BWST Htr Area 565' Area 8	BWST Htr Area 565' Area 8	BWST Htr Area 565' Area 8	BWST Htr Area 565' Area 8
Local Control Switch No.	NV MU 040	NV MU 630	NV MU 10A	NV MU 10B	NV 19030	NV MU 110	NV MU 400	NV MU 12A
SA Signals	None	None	None	None	None	None	None	None
Verified By								

Breakers & Switches for Makeup & Purification System

Equipment Ident. No.	MU 12B	P-371B	P-371D	P-372-B	P-372D	MU 3971	P 37-2	P37-1
Equipment Name	Makeup Filter 1-2 Inlet Vlv	MU Pump 1-1 Main Oil Pmp 1-1-1	MU Pump 1-1 Aux Gear Oil Pump	MU Pump 1-2 Main Oil Pmp 1-2-1	MU Pump 1-2 Aux Gear Oil Pump	Three-Way From MU Tk or BWST to MU Pumps	MU Pump 1-2	MU Pump 1-1
Control Room Switch/Panel#	HIS-MU12B C 5703	HIS-MU24A1 C 5704	HIS-MU24A3 C 5704	HIS-MU24B1 C 5704	HIS-MU28B3 C 5704	HIS MU 3971 C 5703	HIS-MU24B C 5704	HIS-MU24A C 5704
Control Room Switch Name	RC MU Fltr 2 In Vlv	MU Pmp 1 AC Oil Pmp	MU Pmp 1 Gear AC Oil Pmp	MU Pmp 2 AC Oil Pmp	MU Pmp 2 Gear AC Oil Pmp	RC MU Pmp Suction Valve	RC MU Pmp 2	RC MU Pmp 1
Breaker No. & MCC	BF 1107 F 11D	BE-1191 E 11D	BE-1192 E 11D	BF-1167 F-11C	BF-1168 F-11C	BE 1127 E11D	AD-105 C1 (4160)	AC-105 C1(4160)
MCC Location (Areas & Elev)	Boric Acid Evap Rm 565' Area 7	Boric Acid Evap rm 565' Area 7	Boric Acid Evap rm 565' Area 7	#2 Mech Penetration Rm 565' Area 7	#2 Mech Penetration Rm 565' Area 7	Boric Acid Evap Rm 565' Area 7	High Voltage Switch-gear Room B 585' Area 6	High Volt-age Switch-gear Room A 585' Area 6
Local Control Switch No.	NV MU 12B	NP 371B	NP 371D	NP 372B	NP 372D	NV 39710	NP 372A	NP 371A
SA Signals	None	None	None	None	None	None	None	None
Verified By								

1

Breakers & Switches for Makeup & Purification System

Equipment Ident. No.	MU 1A	MU 1B	MU 2B	MU 2A	MU 59A	MU 59B	MU 59C	MU 59D
Equipment Name	RC Let-down Cooler Inlet Isolation	RC Let-down Cooler Inlet Isolation	RC Let-down Cooler Inlet Isolation	Letdown Coolers Outlet Isolation	RCP 1-2-1 Seal Return Valve	RCP 1-2-2 Seal Re-turn Valve	RCP 1-1-1 Seal Re-turn Valve	RCP 1-1-2 Seal Return Valve
Control Room Switch/Panel#	HIS-MU 1A C 5703	HIS-MU 1B C 5703	HIS-MU 2B C 5703	HIS-MU 2A C 5717	HIS MU 59A C 5717	HIS MU 59B C 5717	HIS-MU59C C 5717	HIS-MU 59D C 5717
Control Room Switch Name	RC Let-down Clr 1 in Vlv	RC Let-down Clr 2 In Vlv	RC Let-down Clrs In Iso Vlv	RC Let-down Clrs Out Iso Vlv	RCP 2-1 Seal Ret Iso Vlv	RCP 2-2 Seal Ret Iso Vlv	RCP 1-1 Seal Ret	RCP 1-2 Seal Ret
Breaker No. & MCC	BF 1237 F 12A	BF 1238 F 12A	BE-1172 E 11B	BE-1171 E11B	BE 1174 E 11B	BE 1175 E 11B	BE-1177 E 11B	BE-1178 E11B
MCC Location (Area & Elev)	CTMT Purge & Exhaust Fan 585' Area 8	CTMT Purge & Exhaust Fan 585' Area 8	Fuel Hand-ling Area 585' Area 8	Fuel Hand-ling Area 585' Area 8	Fuel Hand-ling Area 585' Area 8	Fuel Hand-ling Area 585' Area 8	Fuel Hand-ling Area 585' Area 8	Fuel Hand-ling Area 585' Area 8
Local Control Switch No.	NV MU01A	NV MU 01B	NV MU02B	NV MU02A	NV MU 59A	NV MU 59B	NV MU 59C	NV MU59D
16 SA Signals	None	None	None	SA 271A	SA 331E	SA 331F	SA 331G	SA 331H
Verified By								

Breakers & Switches for Makeup & Purification System

Equipment Ident. No.	P-372C	P-371C	
Equipment Name	MU Pump 1-2 Aux Oil Pmp 1-2-2	MU Pump 1-1 Aux Oil Pmp 1-1-2	
Control Room Switch/Panel#	HIS-MU24B2 C 5704	HIS-MU24A2 C 5704	
Control Room Switch Name	MU Pmp 2 DC Oil Pmp	MU Pmp 1 DC Oil Pmp	
Breaker No. & MCC	D-217 (DC) MCC 2	D-217 (DC) MCC 1	
MCC Location (Area & Elev)	Low Voltage Switchgear Room 603' Area 6	Low Voltage Switchgear Room 603' Area 6	
Local Control Switch No.	NP 372C	NP 371C	
SA Signals	None	None	
Verified By			

Makeup Pump Pre Startup Checkoff List
Name: Makeup Pumps 1-1 & 1-2

Number: P 37-1 & P 37-2

Manufacturer: Bingham

Model: Type-CP Capacity: 150 GPM Head: 5800 Feet

Pump RPM: 5400 Motor HP: 450 Motor RPM: 1800

1. Makeup pump electrical breaker is racked in.

   Pump 1-1 Pump 1-2

   AC 105_____ AD 105_____

2. Makeup pump AC main oil pump electrical breaker is closed.

   AC Main Oil Pump 1-1-1 AC Main Oil Pump 1-2-1

   B E11 91 (E11D)_____ B F11 67 (F11C)_____

3. Makeup pump DC aux oil pump electrical breaker is closed.

   DC Aux Oil Pump 1-1-2 DC Aux Oil Pump 1-2-2

   D117 (MCC 1)_____ D217 (MCC2)_____

4. Makeup pump AC aux gear oil pump electrical breaker is closed.

   AC Aux Oil Pump 1-1 AC Aux Gear Oil Pump 1-2

   B E11 92 (E11D)_____ B F11 68 (F11C)_____

5. Check for proper oil level in the motor, speed increaser gear box, and pump oil reservoir oil sight indicators.

	MU Pump 1-1	MU Pump 1-2
Motor Inboard Bearing:	_____	_____
Motor Outboard Bearing:	_____	_____
Speed Increaser Gear Box Reservoir	_____	_____
Pump Oil Reservoir	_____	_____

6. Establish component cooling water to makeup pump gear lube oil and pump lube oil coolers by opening the following valves.

Makeup Pump 1-1	Makeup Pump 1-2
CC 127_____	CC 128_____
CC 2190A_____	CC 2191A_____
CC 2190B_____	CC 2191B_____
Throttle CC 129 to establish a 12 GPM flow rate as read on FI 2190_____.	Throttle CC 130 to establish a 12 GPM flow rate as read on FI 2191_____.

7. Open the pump suction valve:

Makeup Pump 1-1	Makeup Pump 1-2
MU 191_____	MU 190_____

8. Open the pump vent valves to prime the pump and then close the vent valves:

Makeup Pump 1-1	Makeup Pump 1-2
MU 195A and MU 429_____	MU 194 and MU 428_____

NOTE: Perform this step only if makeup pump has been drained or makeup tank pressure was less than 5 psig while the pump was shutdown.

9. Open pump discharge pressure source valves:

Makeup Pump 1-1	Makeup Pump 1-2
MU 25A to PI MU 25A_____	MU 25B to PI MU 25B_____

10. Open the pump discharge valves:

Makeup Pump 1-1	Makeup Pump 1-2
MU 199_____	MU 198_____

11. (VERIFY THE PUMP RECIRCULATION VALVES ARE LOCKED OPEN[1] AND RESTRICTING ORIFICES ARE INSTALLED)

Makeup Pump 1-1	Makeup Pump 1-2
MU 205 (L.O.)_____	MU 202 (L.O.)_____
MU 206 (L.O.)_____	MU 203 (L.O.)_____
R.O. MU57A (installed)____	R.O. MU57B (installed)____
MU 479 (L.O.)_____	MU 479 (L.O.)_____

Seal Return Cooler 1-1	Seal Return Cooler 1-2
MU 269 (L.O.)_____	MU 268 (L.O.)_____
MU 271 (Closed)_____	MU 270 (L.O.)_____

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NOTE: Normally seal return cooler 1-2 will be in service and MU 270 must be locked open. Seal return cooler 1-1 will be in standby and MU271 closed. If seal return cooler 1-1 is in service, MU271 must be open and MU 270 closed.

12. Open pump suction pressure source valve to pressure indicators and verify suction pressure. Suction valve MU3971 is open* (i.e. from MU Tank). This is the normal suction.

Makeup Pump 1-1	Makeup Pump 1-2
MU 1895_____	MU 1896_____
PI 1895 15 PSIG_____	PI 1896 15 PSIG_____

*Pumps also can take suction from BWST (i.e. MU 3971 closed). If running MU Pump for testing, recirculating BWST, see ST 5011.03.

NOTE: If the BWST is the water supply for the MU pumps, then the 3-way valve (MU 3971) must be positioned ot the BWST. Also the recirculation path must be changed from MU Tank to the BWST by closing MU 479 and then opening MU 208. Throttle HP29 one and 1/2 turns, open HP 1556 and HP 35. Also, verify that the BWST outlet supply valves are open: DH 79, HD 7A (DH 7B), DH 132 and DH 131 (DH 130, DH 129).

[1]Controlled per AD 1839.02

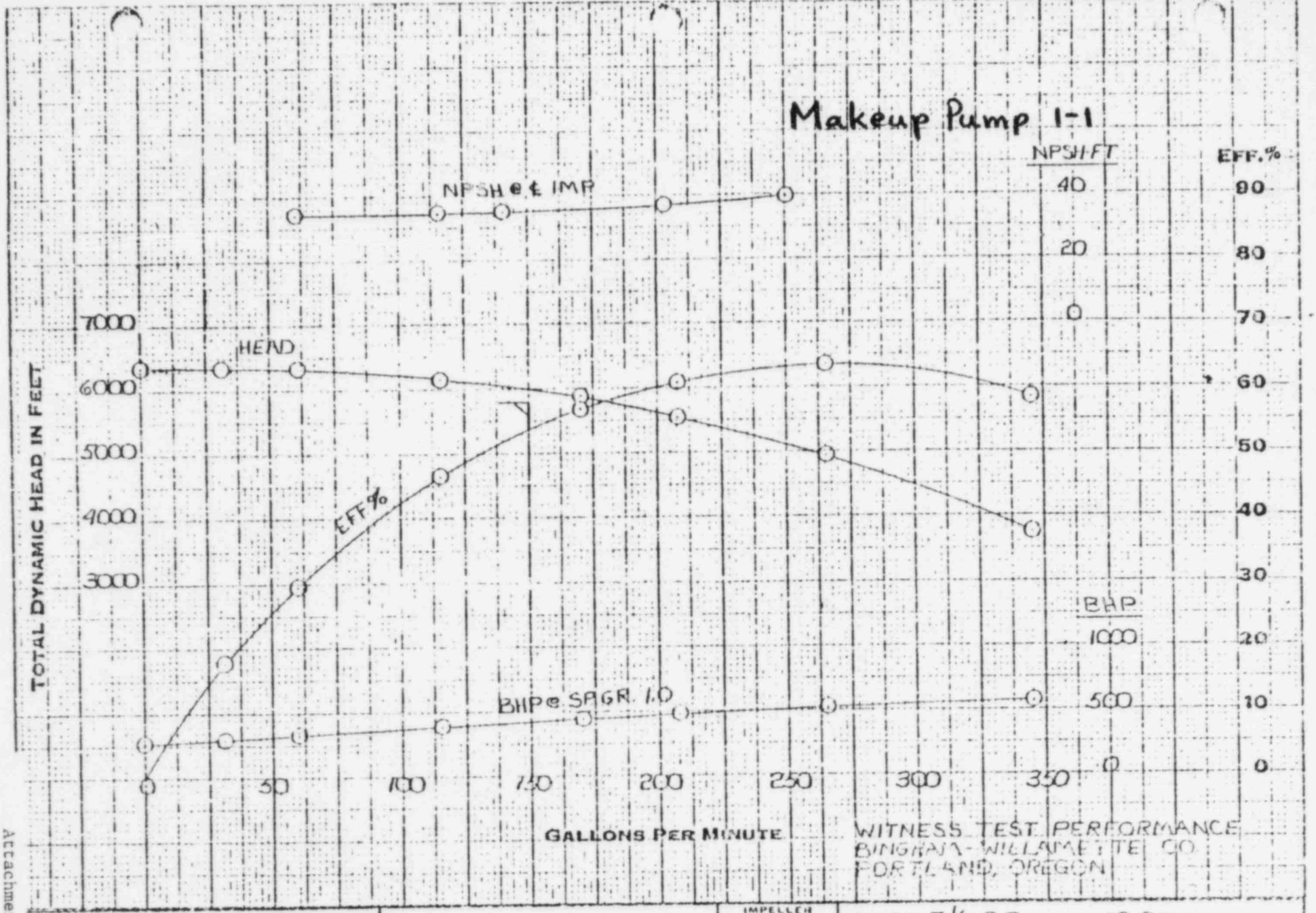
13. After the pump is started, check the following:

	Makeup Pump 1-1	Makeup Pump 1-2
Increasing Discharge Pressure	_____	_____
Observe Pump for Excess Vibration*	_____	_____
Pump Leakage (Water)	_____	_____
Speed Increaser Leakage (Oil)	_____	_____
Outlet Cooling Temperature (CCW)	_____	_____
Check Oil Rings on Pump and Motor	_____	_____
Pump Oil Sight Glasses for Flow	_____	_____
Pump Oil Pressure 8 PSIG	_____	_____
Gear Increaser Oil Pressure 10 PSIG	_____	_____

*If there is any question about excessive vibration, contact control room operator and have a PSD taken on the Vibration and Loose Parts Monitoring System.

30856

Makeup Pump 1-1



WITNESS TEST PERFORMANCE
BINGHAM-WILLAMETTE CO
PORTLAND, OREGON

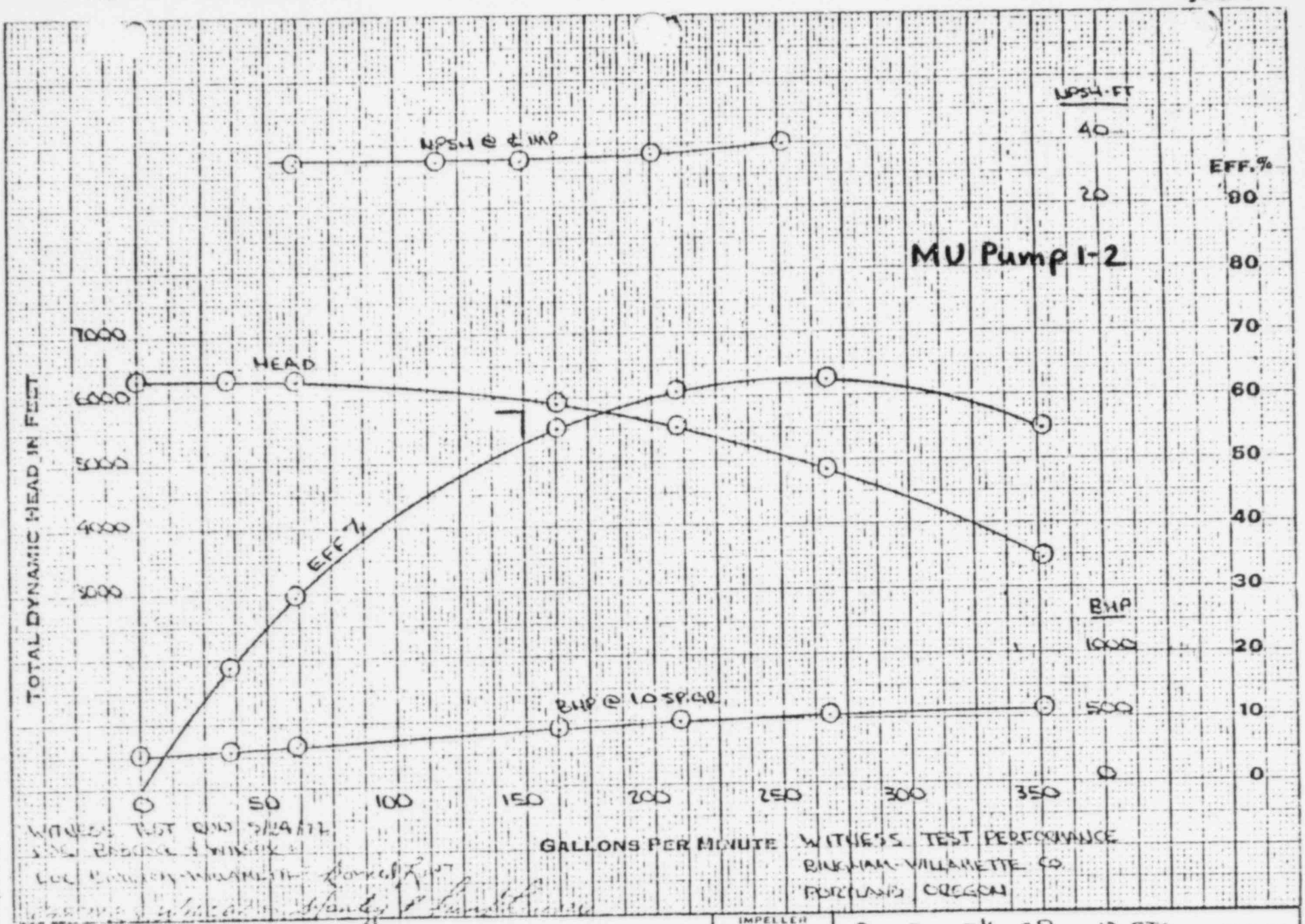
THE BABCOCK & WILCOX CO
TOLEDO EDISON CO
MAKE : SEAL INJECTION
PUMP No 200136

CHARACTERISTIC CURVE SHEET
BINGHAM PUMP DIVISION
BINGHAM WILLAMETTE COMPANY
PORTLAND, OREGON

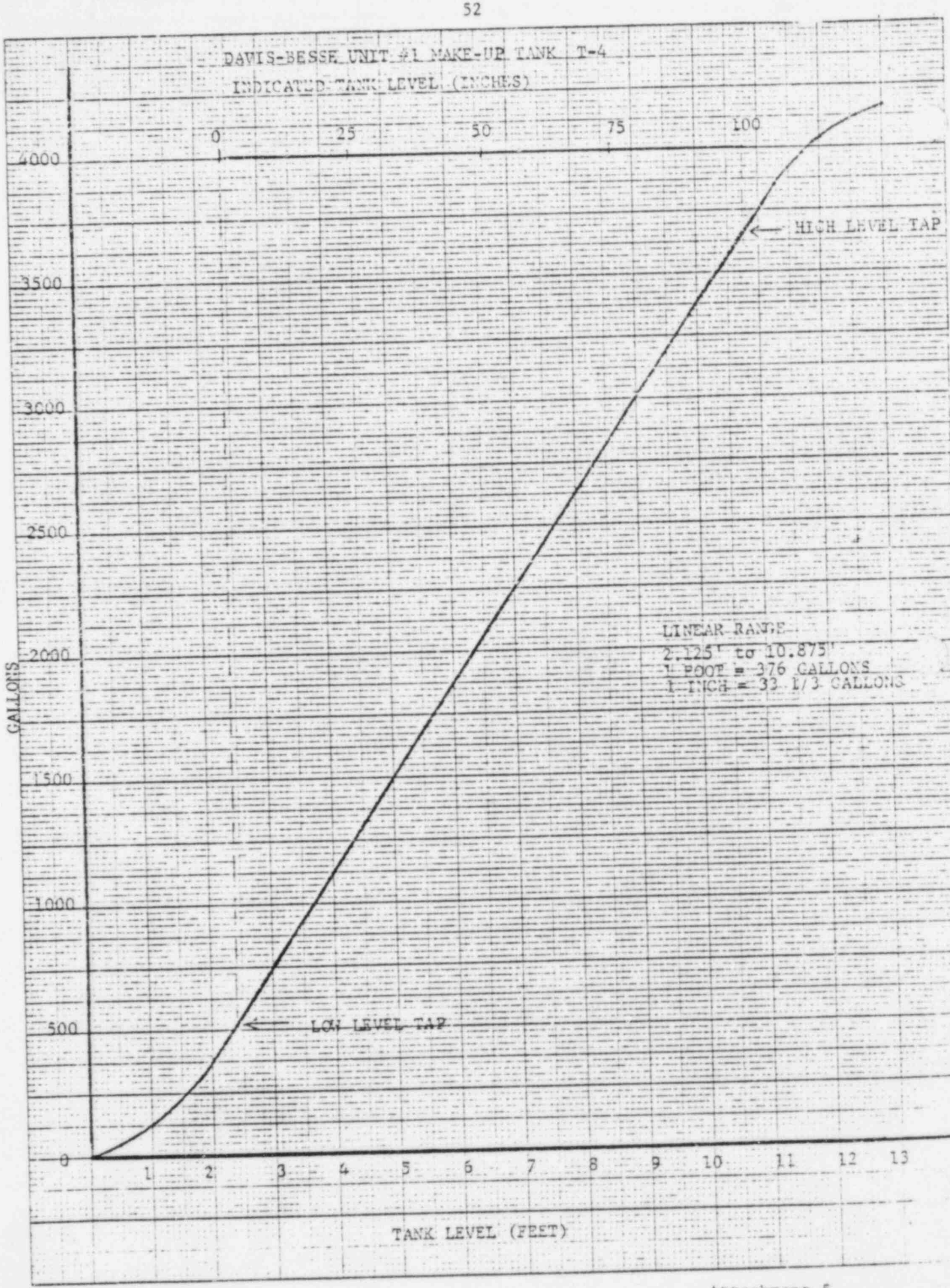
IMPELLER MAX. DIA 7½	2X3X7½ CP	12 STG	PUMP
MIN DIA	DIA IMPELLER 7 3/16	IMPELLER PATT 1) 313MSD-C6 2&3) 313MSD C4&C5	5404 R.P.M.
CYL 98 SQ AREA IN	NPSH REQUIRED	REFERENCE	CURVE NO 305

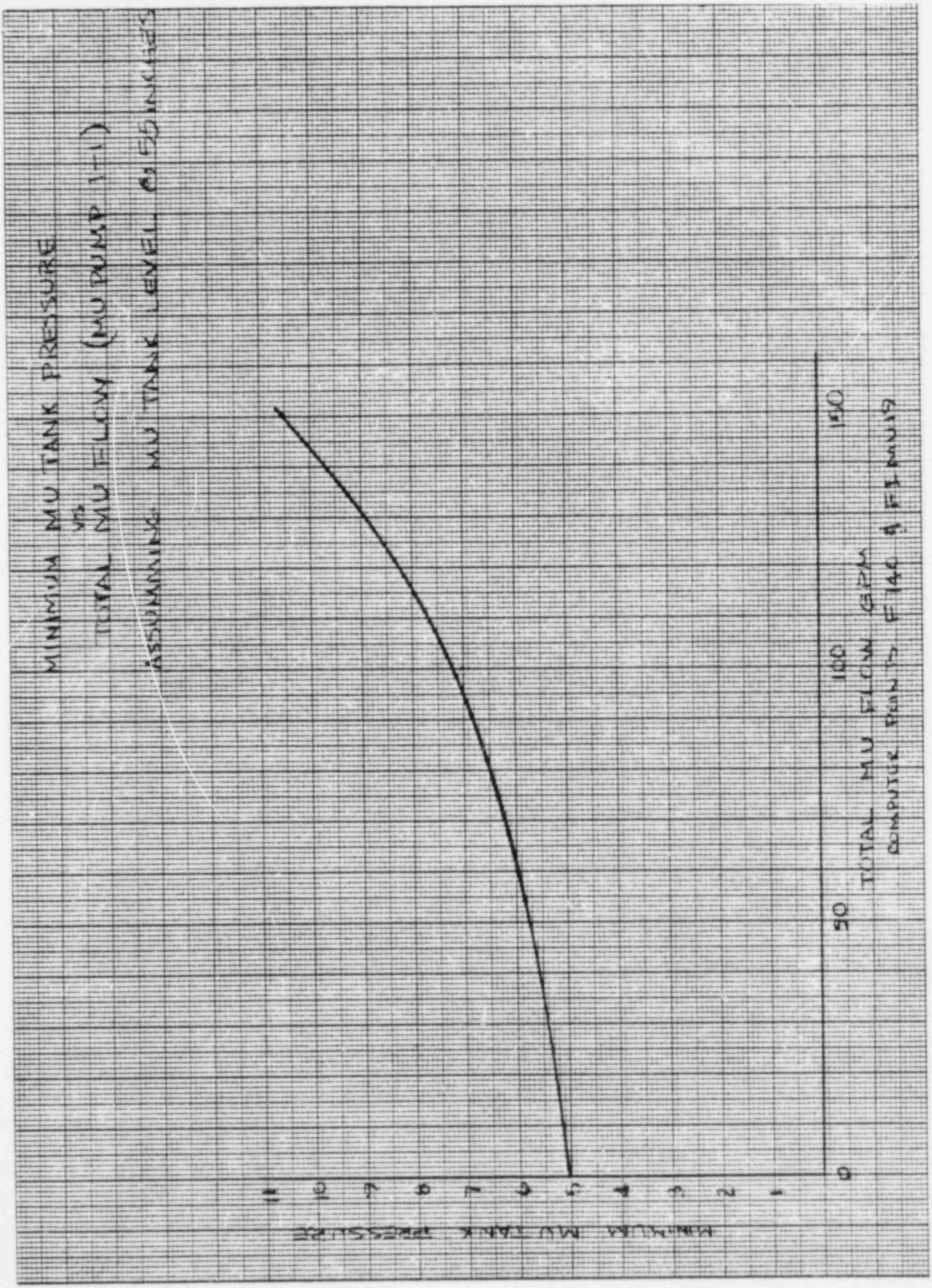
Attachment 3
Page 1 of 1

SP 1104.02.0

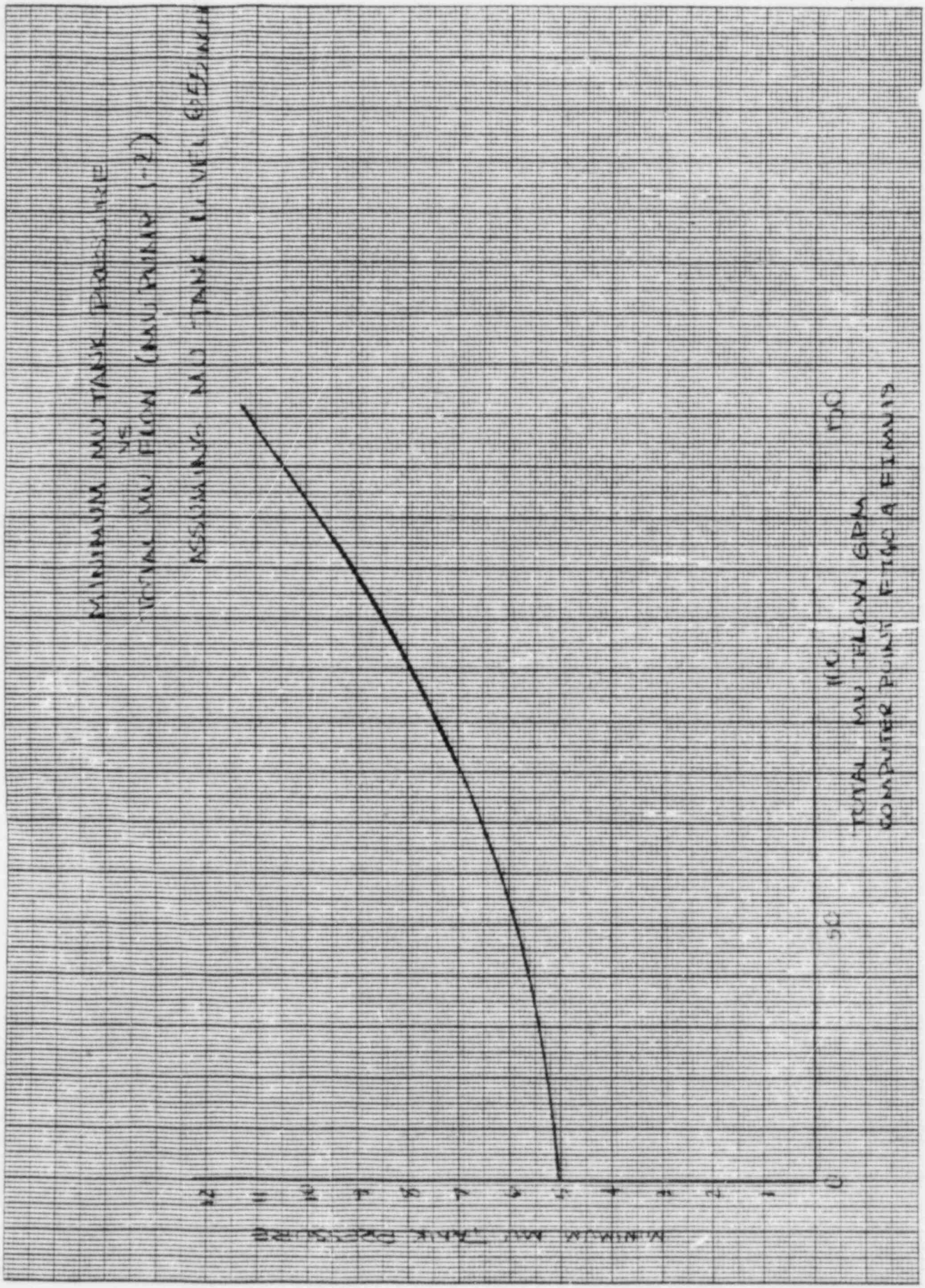


THE BABCOCK & WILCOX CO. TOLEDO EDISON CO. MAKE UP & SEAL INJECTION PUMP S.N. 200437	CHARACTERISTIC CURVE SHEET BINGHAM PUMP DIVISION BINGHAM WILLAMETTE COMPANY PORTLAND OREGON & RENSEPORT LA	IMPELLER MAX DIA 7 1/2 MIN DIA EYE 9.8 SQ IN AREA	2 - 3 - 7 1/2 CP 12 STG. PUMP	
		DIA IMPELLER 7 3/16	IMPELLER PATT. 313MSD-22 313MSD-29125	5404 R.P.M.
		NPSH REQUIRED	REFERENCE	CURVE NO 30219





Attachment 6
Page 1 of 2



_____1. Set Needle Valve 1. (MU 231) First perform Step 4.2.7.2 as written then do the steps below.

_____a. Record the four individual seal flow rates and the dP measurement on Needle Valve 1.

FIMU30C____ FIMU30D____ FIMU30A____ FIMU30B____
MU231 No. Turns open____

____b. Compute Cv for Needle Valve 1 where

$$Cv = \frac{\text{Flow through needle valve GPM}}{\sqrt{\text{needle valve dP, PSI}}}$$

Cv MU231 Initial = _____ MU231 dP = _____

Desired Cv is between 0.76 and 0.89, but closer to 0.89, if possible (this corresponds to a dP range of 110 to 80 PSI at 8 GPM). IF Cv is not in desired range, change needle valve position (to increase Cv, open valve and to decrease Cv, close valve). Wait until flow steadies, then record Needle Valve 1 flow and dP and compute Cv. Repeat as necessary to obtain desired Cv. Flow rate through needle valve does not have to be 8 GPM; the desired Cv (which is valve position) can be obtained at various flow rates.

Cv MU231 Final = _____ MU231 DP = _____

2. Determine number of turns open for Needle Valve 1 to use for preliminary setting of Needle Valves 2, 3, and 4.

_____a. Close Needle Valve 1 and count number of turns and record.

NU231 No. turns open_____

_____b. Re-open Needle Valve 1 to the number of turns open recorded in Step 2.a.

_____c. When Needle Valve 1 flow steadies, record Needle Valve 1 flow and dP and compute Cv. If Cv is not as desired, change valve position and compute Cv and maintain record of number of turns open. Repeat as necessary to obtain desired Cv. Record number of turns open for final valve position.

MU231 No. turns open_____

_____3. Preliminary setting of Needle Valves 2, 3, and 4.

Close Needle Valves 2, 3, and 4 and then re-open each valve to the final recorded number of turns open for Needle Valve 1 from Step 2.

4. Final setting of Needle Valve 2, 3, and 4.

_____a. Flow in all four lines now should be about equal. (In the range 6-10 GPM.) If not, adjust Needle Valves 2, 3, and 4 one at a time as necessary as described in Step 4.b. DO NOT ADJUST NEEDLE VALVE 1 (MU 231). The desired flow for each line is 8 GPM, but do not adjust Needle Valve 1 to achieve this.

_____b. Needle Valve 1 is the reference line. If the individual flow distribution is not satisfactory, determine which line flow is "off" the most, either above or below the desired flow (excluding Needle Valve 1). Throttle this line needle valve slightly, but do not throttle flow beyond desired flow valve (6-10 GPM). Wait for total flow to steady at setpoint before performing next step.

_____c. Repeat Step 4.b. as necessary until a satisfactory flow distribution is obtained, but do not adjust Needle Valve 1 (MU231).

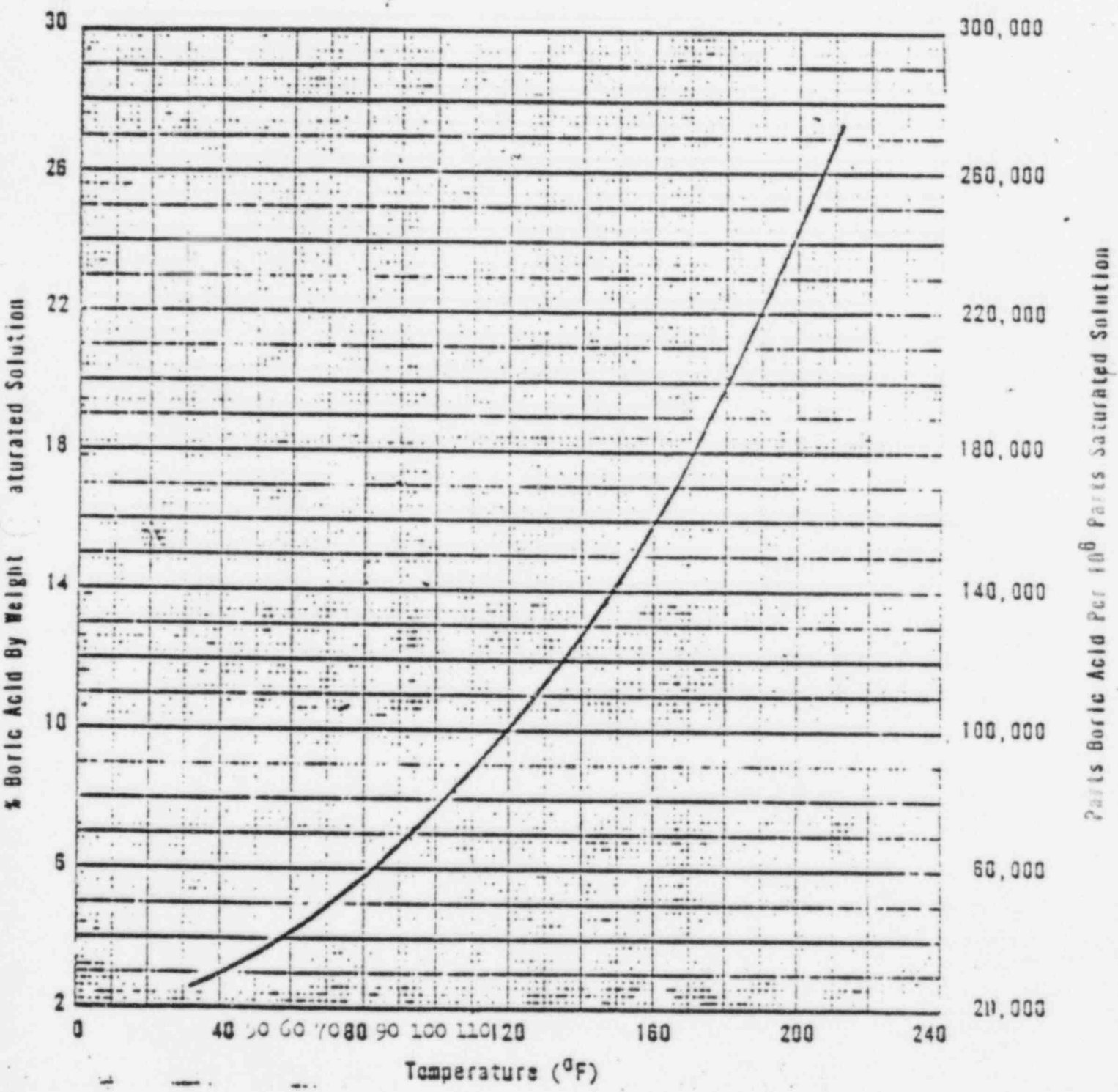
_____d. Record final position of valves 2, 3, and 4.

MU230 No. turns open_____
MU232 No. turns open_____
MU233 No. turns open_____

FIGURE 1

PPM BORON = 0.175 (PPM BORIC ACID)

REF: UNITED STATES BORAX & CHEMICAL CORP PRODUCTS CATALOG 0267 DATED MARCH 1967



SOLUBILITY OF BORIC ACID IN WATER

Sheet No. 1
of 25

VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
CRTM OPERATED VALVES				
Mixed Bed 1-2 Letdown Flow Inlet	M-031 C-12	** MU 10B	Closed	
Three-Way (Letdown to Radwaste Dr. MU Tank)	E-10	MU 11	Normal (to MU Tank)	
Makeup Filter 1-1 Inlet Isolation	D-9	MU 12A	Open	
Makeup Filter 1-2 Inlet	D-9	MU 12B	Closed	
Makeup Tank 1-1 Vent (Pneumatic)	G-10	MU 14	Closed	
Batch Flow Controller	F-12	MU 39	Closed	
Batch Feed Stop	F-10	MU 40	Closed	
Purif Demin Filter Bypass	A-10	MU 63	Closed	
Cation Bed L-3 Letdown Flow Inlet	C-12	MU 1903	Closed	
Makeup Tank 1-1 N_2 Supply Isolation	G-11	MU 53	Closed	
Makeup Tank 1-1 H_2 Supply Isolation	H-11	MU 54	Closed	
Normal Makeup to RCS Isolation	F-5	MU 33	Open	
RCP Seal Return Isolation	E-5	MU 38	Open	
MU Pumps Suction Three-Way	J-9	MU 3971	Normal from MU Tk	
Mixed Bed 1-1 Letdown Inlet	C-11	** MU 10A	Open	
RCP Seal Inj Flow Controller	H-6	MU 19	Throttled Closed	
Letdown Stop Vlv	C-5	MU B	Open	
Letdown block Orifice Isolation	C-7	MU 4	Open Closed	
Letdown Flow Control	C-7	MU 6	Closed	

**MU10A and MU10B may be positioned in accordance with Shift Supervisor's directions with the exception that one of them must be open.

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of 25

VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Makeup Flow Controller	F-6	MU 32	Open Closed	
RC Letdown Clr 1-1 CCW Inlet	M-036 D-4	CC 1409	Open Closed	
RC Letdown Clr 1-2 CCW Inlet	E-4	* CC 1410	Open Closed	
RM 300				
RCP Seal Inj Filter 1-1 Inlet Isolation	M-031 H-5	MU 219	#	
RCP Seal Inj Filter 1-1 Inlet Byapss	H-5	MU 224	#	
RCP Seal Inj Filter 1-2 Inlet Bypass	H-5	MU 225	#	
RCS Seal Inj Filter 1-1 Inlet Stop	H-5	MU 221	#	
RCP Seal Inj Filter Vent Isolation	H-5	MU 507	Closed	
RCP Seal Inj Filter 1-1 Inlet Line Drain	H-5	MU 503	Closed	
RCP Seal Inj Filter 1-1 Vent	H-5	MU 501	Closed	
RCP Seal Inj Filter 1-1 Outlet Stop	H-5	MU 223	#	
RCP Seal Inj Filter 1-1 Outlet Drain	J-5	MU 480	Closed	
RCP Seal Inj Filter 1-2 Inlet Isoaltion	H-5	MU 218	#	
RCP Seal Inj Filter 1-2 Vent	J-5	MU 502	Closed	
RCP Seal Inj Filter 1-2 Inlet Stop	H-5	MU 220	#	
RCP Seal Inj Filter 1-2 Inlet Line Drain	H-5	MU 504	Closed	
RCP Seal Inj Filter 1-2 Outlet Line Drain	J-5	MU 481	Closed	

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*This valve has a "Normal" position which is different than its "Prestartup" position. The first position listed in the "Normal" and the second position listed in the "Prestartup" position.

#These valve positions shall be determined by the Shift Supervisor, depending on which seal inj. filter is in service.

Sheet No. 3
of 25

VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP Seal Inj Filter 1-2 Outlet Stop	H-5	MU 222	#	
RCP Seal Inj Filter 1-2 Drain Isolation	J-5	MU 506	Closed	
RCP Seal Inj Filter 1-2 Outlet Isolation	H-5	MU 228	#	
RCP Seal Inj Filter Vent Isolation	J-5	MU 508	Closed	
RCP Seal Inj Filters (PDT MU 62) Inlet Source	J-5	MU 67A	Open	
RCP Seal Inj Filters (PDT MU 67) Outlet Source	J-5	MU 67B	Open	
RCP Seal Inj Filter Pressure Diff Trans	J-5	PDTMU67	In Service	
RCP Seal Inj Filter Bypass	H-5	MU 217	Closed	
RCP Seal Inj Filter 1-1 Outlet Stop	H-5	MU 229	#	
RCP Seal Inj Filter 1-1 Drain Isolation	H-5	MU 505	Closed	
Mixed Bed 1-1 Resin Fill Inlet	C-11	MU 130	Closed	
Mixed Bed 1-2 Resin Fill Inlet	C-12	MU 131	Closed	
Mixed Bed 1-3 Resin Fill Inlet	D-13	MU 132	Closed	
Resin Fill Line to Purif Demin 1-1, 1-2 Iso	B-12	MU 382	Closed	
RM 302				
Letdown (MU 91) Outlet Line Vent	C-9	MU 92	Closed	
RCP Seal Return Cooler Line Vent	E-7	MU 273	Closed	
RM 303				
Normal Makeup to RCS Line Vent	G-5	MU 213	Closed	
MU Pump Discharge (PT-MU 26) Source	H-6	MU 26	Open	

#These valve positions shall be determined by the Shift Supervisor, depending on which seal inj. filter is in service.

Sheet No. 4
of 25

VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
MU Pump Discharge PT MU26 Transmitter	H-6	PTMU26	In Service	
RCP Seal Inj FT-MU 19 Inlet Source	H-6	MU 19A	Open	
RCP Seal Inj FT-MU 19 Outlet Source	H-6	MU 19B	Open	
RCP Seal Injection Flow Transmitter	H-6	FTMU19	In Service	
RCP Seal Inj Flow Control Inlet Isolation	H-6	MU 214	Open	
RCP Seal Inj Flow Control Outlet Isolation	H-6	MU 215	Open	
RCP Seal Inj Flow Control Bypass	H-6	MU 216	Closed	
Hydro Test Pmp Disch Stop Valve	J-6	MU 299	Closed	
Hydro Test Pmp Disch Iso Valve	J-6	MU 298	Closed	
RM 304				
Purif Demin 1-1, 1-2, 1-3 Vent Line Drn to Sta Vent	C-11	MU 449	Closed	
RM 314				
Purif Demin 1-1, 1-2, 1-3 Vent Isolation to Sta Vent	C-11	MU 440	Closed	
Purif Demin 1-1, 1-2, 1-3 Vent Line Drn to Sta Vent	C-11	MU 448	Closed	
RM 107				
Makeup Tank 1-1 Vent Line Drain	G-11	MU 441	Closed	
WEST STAIRWELL				
Makeup Tank 1-1 LT MU 16-1 Inlet Source	H-10	MU 16B	Open	
Makeup Tank 1-1 LT MU 16-1 Inlet Source	H-10	MU 16A	Open	
Makeup Tank 1-1 LT MU 16-1	H-10	LT MU 16-2	In Service	
Makeup Tank 1-1 LT MU 16-2 Inlet Source	H-10	MU 16D	Open	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Makeup Tank 1-1 LT MU 16-2 Inlet Source	H-10	MU 16C	Open	
Makeup Tank 1-1 LT MU 16-2	H-10	LT MU 16-1	In Service	
Makeup Tank 1-1 Press Trans (MU 21) Source	H-9	MU 21	Open	
Makeup Tank 1-1 Press Trans	H-9	PTMU21	In Service	
RM 209				
Purification Demin Filter Backwash Drain	C-10	MU 103	Closed	
Makeup Filter 1-1 Resin Disch to Stor Tk	D-9	MU 171	Closed	
Makeup Filter 1-1 Vent	E-8	MU 174	Closed	
Makeup Tank 1-1 Outlet Line Vent to RC Dr Tk	J-10	MU 430	Closed	
Makeup Tank 1-1 Outlet Line Drn to RC Drn Tk	J-10	MU 431	Closed	
Makeup Tank 1-1 Outlet Iso to RC Drn Tk	J-10	MU 189	Closed	
Purification Demin Filter Vent	C-10	MU 99	Closed	
Makeup Filter 1-2 Inlet Line Vent	D-9	MU 165	Closed	
Makeup Filter 1-2 Vent	D-9	MU 166	Closed	
Makeup Filter 1-2 Resin Disch to Stor Tk	D-9	MU 170	Closed	
RM 208				
Seal Return Clr 1-2 CCW Source to FI 2642	E-7	CC2642A	Open	
Seal Return Clr 1-2 CCW Source to FI 2642	E-7	CC2642B	Open	
Seal Return Clr 1-2 CCW Flow Indicator (FI2638)	M-036 E-7	FI 2642	In Service	
Seal Return Clr 1-2 CCW Inlet Iso	E-7	CC 71	Open	
Seal Return Clr 1-2 CCW Outlet Iso	E-7	CC 75	Throttled (40 gpm)	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP Seal Return Cooler Sample Isolation	M-031 E-7	SS 15	Closed	
RCP Seal Return Inlet Leak Test for MU 38	E-5	MU 266	Closed	
RCP Seal Return Outlet Leak Test for MU 38	E-6	MU 267	Closed	
RCP Seal Return Cooler 1-1 Inlet Isolation	D-7	MU 269	Locked Open[1]	
18| RCP Seal Return Cooler 1-1 Outlet Isolation	D-7	MU 271	Closed[2]	
Seal Return Clr 1-1 & 1-2 CCW in Test Pres Source	M-036 D-7	CC 3726	Closed	
Seal Return Cooler 1-1 CCW Drain Valve	D-7	CC 79	Closed	
Seal Return Cooler 1-1 CCW Vent Valve	D-7	CC 77	Closed	
Seal Return Clr 1-1 CCW Out Test Press Press Source	D-7	CC 3722	Closed	
Seal Return Clr 1-1 CCW Source to FI 2638	D-7	CC2638A	Open	
Seal Return Clr 1-1 CCW Source to FI 2638	D-7	CC2638B	Open	
Seal Return Cooler 1-1 CCW Flow (FI 2638) Indicator	D-7	FI 2638	In Service	
Seal Return Cooler 1-1 CCW Inlet Iso	D-7	CC 72	Open	
Seal Return Cooler 1-1 CCW Outlet Iso	D-7	CC 76	Throttled (40 gpm)	
RCP Seal Return Cooler 1-1 Inlet Isolation	M-031 D-7	MU 268	Locked Open[1]	
RCP Seal Return Cooler 1-2 Outlet Isolation	D-7	MU 270	Locked Open[2]	
RCP Seal Return Cooler Outlet Line Drain	D-7	MU 272	Closed	
Seal Return Cooler 1-2 CCW Drain Valve	M-036 E-7	CC 80	Closed	
Seal Return Cooler 1-2 CCW Vent Valve	E-7	CC 78	Closed	
Seal Return Clr 1-2 CCW Out Test Press Source	E-7	CC 3723	Closed	

[1]Controlled per AD 1839.02

18\| [2]If Seal Return Cooler 1-1 is put in service MU271 and MU270 can both be open with Shift Supervisor direction, but at least one of them must be open.

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
MU Pump Min Recirc Iso Vlv	M-031 E-6	MU 479	Locked Open[1]	
Makeup Tank 1-1 Outlet Iso to RC Train Tk Hdr	M-040A F-8	MU 292	Open	
Isolation Valve Leak Test Before MU 3	C-5	MU 7[illegible]	Closed	
Isolation Valve Leak Test After MU 3	C-5	MU 80	Closed	
Letdown Line Drain Downstream of MU 3	C-5	MU 81	Closed	
Letdown Line Sample Isolation to Per Sample	C-5	SS 25	Closed	
Letdown Line Sample Stop Valve to Per Sample	C-5	SS 24	Closed	
Letdown Line RO MU 5 Bypass Vent	B-6	MU 82	Closed	
Letdown Line RO MU 5 Bypass	B-7	MU 83	Closed	
Letdown RO MU 5 Outlet Isolation	C-7	MU 87	Open	
Letdown Flow Control Line Vent	C-6	MU 84	Closed	
Letdown FC Inlet Isolation to MU 6	C-7	MU 85	Open	
Letdown FC Outlet Isolation	M-031 C-7	MU 86	Open	
DH Removal Clr Outlet to Letdown Line	C-8	DH 123	Closed	
Letdown FE MU 7 Inlet Line Drain	C-8	MU 88	Closed	
Letdown FT MU 7 Inlet Source	C-8	MU 7A	Open	
Letdown FT MU 7 Outlet Source	C-8	MU 7B	Open	
Purif Demineralizer Filters LD Flow Trans	C-8	FT MU 7	In Service	
Letdown FE MU 7 Outlet Line Vent	C-8	MU 89	Closed	
Letdown Line PT MU 9 Source	C-9	MU 9	Open	

[1]Controlled per AD 1839.02

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Letdown Prefilter PT MU 9	B-8	PT MU 9	In Service	
Letdown FE MU 7 Outlet Line Drain	C-9	MU 90	Closed	
Letdown Sample Isolation	C-8	SS 26	Closed	
Boron Analyzer (AE 1999) Inlet Source	C-9	MU1999A	Open	
Boron Analyzer (AE 1999) Outlet Source	C-9	MU1999B	Open	
Boron Analyzer	C-9	AE 1999	In Service	
Letdown Isolation to Demin Filter	C-9	MU 91	Open	
Boron Analyzer Drain Ln Drn Vlv	C-9	MU1999C	Closed	
Boron Analyzer Ven Ln Vlv	C-9	MU1999D	Closed	
Failed Fuel Detector RE 1998	C-9	RE 1998	In Service	
RCP 1-1-1 Seal Inj Needle	H-4	MU 232	Throttled/ 1 Turn Open	
RCP 1-1-1 Seal Inj (FT MU 306) Inlet Source	H-4	MU 30C	Open	
RCP 1-1-1 Seal Inj (FT MU 30C) Outlet Source	H-4	MU 30C	Open	
RCP 1-1-1 Seal Inj Flow Transmitter	H-4	FTMU30C	In Service	
Inlet Leak Test Isolation for MU 66C	H-3	MU 236	Closed	
RCP 1-1-1 Seal Inj Flow Isolation	H-3	** MU 66C	Open	
Outlet Leak Test Isolation for MU 66C	H-3	MU 240	Closed	
RCP 1-1-2 Seal Inj Needle	H-4	MU 223	Throttled/ 1 Turn Open	
RCP 1-1-2 Seal Inj (FT MU 30D) Inlet Source	H-4	MU 30D	Open	
RCP 1-1-2 Seal Inj (FT MU 30D) Outlet Source	H-4	MU 30H	Open	

**Control Room Operated Valve

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP 1-1-2 Seal Inj Flow Transmitter	H-4	FTMU30D	In Service	
Inlet Leak Test Isolation Valve for MU 66D	H-3	MU 237	Closed	
RCP 1-1-2 Seal Inj Flow Isolation	H-3	** MU 66D	Open	
Outlet Leak Test Isolation Valve for MU 66D	H-3	MU 241	Closed	
RCP 1-2-1 Seal Inj Needle	H-4	MU 230	Throttled 1 Turn Open	
RCP 1-2-1 Seal Inj (FT MU 30A) Inlet Source	K-4	MU 30A	Open	
RCP 1-2-1 Seal Inj (FT MU 30A) Outlet Source	K-4	MU 30E	Open	
RCP 1-2-1 Seal Inj Flow Transmitter	K-4	FTMU30A	In Service	
Inlet Leak Test Isolation Valve for MU 66A	K-3	MU 234	Closed	
RCP 1-2-1 Seal Inj Flow Isolation	K-3	** MU 66A	Open	
Outlet Leak Test Isolation Valve for MU 66A	K-3	MU 238	Closed	
RCP 1-2-2 Seal Inj Needle	J-4	MU 231	Throttled 1 Turn Open	
RCP 1-2-2 Seal Inj (FT MU 30B) Inlet Source	J-4	MU 30B	Open	
RCP 1-2-2 Seal Inj (FT MU 30F) Outlet Source	J-4	MU 30F	Open	
RCP 1-2-2 Seal Inj Flow Transmitter	J-4	FTMU30B	In Service	
Inlet Leak Test Isolation Valve for MU 66B	J-3	MU 235	Closed	
RCP 1-2-2 Seal Inj Flow Isoaltion	J-3	** MU 66B	Open	
Outlet Leak Test Isolation Valve for MU 66B	M-3	MM 239	Closed	
RM 212 LOWER				
Wye Strainer PDI 1846 Inlet Source	M-031 E-11	MU1846A	Open	

**Control Room Operated Valve

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Wye Strainer PDI 1846 Outlet Source	E-11	MU1846B	Open	
Wye Strainer PDI 1846 Instr	E-11	PDI1846	In Service	
Three-Way (MU 11) Inlet Isolation	E-10	MU 147	Open	
Three-Way (MU 11) Outlet Isolation	E-10	MU 14B	Open	
Mixed Bed 1-2 Outlet Line Multipurpose	E-12	MU 114	Closed	
Mixed Bed 1-1 Spent Resin Drain	D-11	MU 134	Closed	
Wys Strainer Drain	E-11	MU 145	Closed	
MU Filter Outlet Return to Demineralizers	C-10	MU 97	Closed	
Purification Demin Filter Outlet Isolation	C-10	MU 96	Open	
Mixed Bed 1-1 Outlet Line Multipurpose	D-11	MU 115	Closed	
Makeup Filter 1-2 Inlet Line Drain	D-9	MU 164	Closed	
Purification Demin Filter Outlet Drain	C-10	MU 102	Closed	
Purif Demin Filter PDT-MU62 Inlet Source	B-10	MU 62A	Open	
Purif Demin Filter PDT-MU62 Outlet Source	B-10	MU 62B	Open	
Prefilter 1-1 PDT MU 62 Instr	B-10	PDTMU62	In Service	
Makeup Tank 1-1 Vent Inlet Iso to MU 14	G-10	MU 395	Closed	
Mixed Bed 1-2 Spent Resin Drain	D-12	MU 135	Closed	
Cation Bed Outlet Line Multi-purpose	E-13	MU 113	Closed	
Makeup Filter 1-2 Inlet Isolation	D-9	MU 159	Open	
Makeup Filter 1-1 & 1-2 Bypass	E-9	MU 158	Closed	
Purif Demin Filter Bypass to Makeup Filter	D-9	MU 93	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Cation Bed 1-3 Spent Resin Drain	D-13	MU 136	Closed	
Demin Wtr Backwash Valve to Purif Demin Filter	B-10	PW 8	Closed	
Makeup Filter 1-1 & 1-2 PDT MU 13 Inlet Source	E-9	MU 13A	Open	
Makeup Filter 1-1 & 1-2 PDT MU 13 Outlet Source	E-8	MU 13B	Open	
Makeup Filter 1-1 & 1-2 PDT MU 13	E-8	PDTMU13	In Service	
Purification Demin Filter Inlet Drain	C-9	MU 101	Closed	
Makeup Filter 1-1 Inlet Line Drain	E-9	MU 173	Closed	
Demin Wtr Supply to Purification Demin's	B-14	DW 67	Closed	
Purification Demin Filter Inlet	C-9	MU 94	Open	
Purification Demin Filter PDT-1911 Inlet Source	B-10	MU1911A	Open	
Purification Demin Filter PDT-1911 Outlet Source	B-10	MU1911B	Open	
Letdown Prefilter PDT Instrument	B-10	PDT1911	In Service	
Makeup Filter 1-2 Sample Isolation	D-8	SS 16	Open	
Makeup Filter 1-2 Outlet Isolation	D-8	MU 161	Open	
Makeup Filter 1-1 Outlet Isolation	D-8	MU 177	Open	
Makeup Filter 1-2 Inlet Line Drain	D-9	MU 433	Closed	
Makeup Filter 1-2 Outlet Line Drain	D-8	MU 168	Closed	
Makeup Filter 1-1 Outlet Line Drain	E-8	MU 436	Closed	
Makeup Filter 1-2 Refill Isolation	D-8	MU 163	Closed	
Makeup Filter 1-1 Refill Isolation	D-8	MU 172	Closed	
Batch Feedline Iso to Misc Waste Dr Tk	F-10	MU 155	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Batch Totalizer Outlet Isolation	F-11	MU 153	Open	
Batch Totalizer Bypass	F-11	MU 154	Closed	
Batch Totalizer Inlet Isolation	F-11	MU 152	Open	
Demin Wtr Inlet to FI 1901 Source	B-14	DW1901A	Open	
Demin Wtr Outlet to FI 1901 Source	B-14	DW1901B	Open	
Demin Wtr FI 1901 to Purif Demin	B-14	FI1901	In Service	
RM 212 UPPER				
Purification Demin Drain to Misc Waste Drn Tk	D-14	MU 112	Closed	
N_2/Demin Supply to Purif Demin	C-14	MU 111	Closed	
MU System PW Fill Valve	D-11	MU 116	Closed	
Mixed Bed 1-1 Outlet	D-11	MU 139	Open	
Demin Multipurpose	D-14	MU 133	Closed	
Purif Demin Bypass Vent	C-11	MU 105	Closed	
Purification Demin Bypass	C-11	MU 104	Sealed Closed	
Mixed Bed 1-1 Misc Inlet or Outlet	C-12	MU 124	Closed	
Bixed Bed 1-1 Vent	C-11	MU 106	Closed	
N_2/Demin Supply to Purif Demin	C-14	MU 110	Closed	
Mixed Bed 1-2 Inlet or Outlet	C-12	MU 125	Closed	
Mixed Bed 1-1 Inlet Line Vent	C-11	MU 127	Closed	
Mixed Bed 1-1 Inlet (MU 10A) Bypass	C-11	MU 278	Closed	
Mixed Bed 1-2 Inlet (MU 10B) Bypass	C-12	MU 279	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Mixed Bed 1-2 Vent	C-12	MU 107	Closed	
Mixed Bed 1-2 Inlet Line Vent	C-12	MU 128	Closed	
Mixed Bed 1-2 Outlet	D-12	MU 140	Open	
Mixed Bed 1-1 Outlet to Cation Bed Line	D-12	MU 119	Closed	
Mixed Bed 1-2 Outlet to Cation Bed Line	D-12	MU 121	Closed	
Cation Bed 1-3 Vent	C-13	MU 108	Closed	
N_2/Demin Supply to Purif Demin	B-14	MU 381	Open	
Cation Bed 1-3 Inlet Line Vent	C-13	MU 129	Closed	
Cation Bed 1-2 Inlet Line Vent	C-13	MU 129	Closed	
Cation Bed 1-3 Inlet or Outlet	C-13	MU 126	Closed	
Cation Bed 1-3 Outlet	E-13	MU 141	Open	
Primary Str Supply to Purification Demin's	B-13	PW 28	Closed	
Purification Demin Filter Inlet Vent	C-10	MU 98	Closed	
N_2 Supply Isolation to Purification Demin	B-13	NN 103	Closed	
Purification Demin Filter Outlet Vent	C-10	MU 100	Closed	
Makeup Filter 1-1 Inlet Line Vent	D-9	MU 435	Closed	
Makeup Filter 1-2 Inlet Line Vent	D-9	MU 434	Closed	
Makeup Tank 1-1 Inlet Isolation	G-9	MU 182	Locked Open	
Makeup Filter 1-2 Isolation	D-8	MU 162	Open	
Makeup Filter 1-2 Outlet Line Vent	D-8	MU 167	Closed	
Makeup Tank & Pumps Bypass Line Vent	G-7	MU 180	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
MU Flow to DH Removal Pump Suct Line Vent	F-7	MU 276	Closed	
Makeup Flow to DH Removal Pump Suct	F-7	MU 274	Closed	
Makeup Filter 1-1 Outlet Line Vent	E-8	MU 175	Closed	
Batch Flow Controller Bypass	F-12	MU 151	Closed	
Batch Flow Controller Inlet Isolation	F-12	MU 149	Open	
Batch Flow Controller Outlet Isolation	F-12	MU 150	Open	
RM 225				
MU Pumps Suction Line Vent	M-031 J-9	MU 444	Closed	
MU Pump 1-1 & 1-2 Suction Sample Iso	J-10	SS 18	Open	
MU Pump 1-1 Inlet Isolation	J-8	MU 191	Locked Open[1]	
MU Pump 1-1 Suction Line Flush	J-8	MU 193	Closed	
MU Pump 1-1 Suction Press Source	H-8	MU 1895	Open	
MU Pump 1-1 Suction Press Indicator	H-8	PI1895	In Service	
MU Pump 1-1 Discharge Press Source	H-8	MU 25A	Open	
MU Pump 1-1 Discharge Pump Indicator	H-8	PIMU25A	In Service	
MU Pump 1-1 Discharge Line Flush Iso	H-8	MU195A	Closed	
MU Pump 1-1 Discharge Line Flush Vent	H-8	MU 429	Closed	
MU Pump 1-1 Recirc Iso to Seal Return	H-7	MU 205	Locked Open[1]	
MU Pump 1-1 Recirc Stop to Seal Return	H-7	MU 206	Locked Open[1]	
MU Pump 1-1 Outlet Isolaiton	H-7	MU 199	Open	

[1]Controlled per AD 1839.02

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
MU Pump 1-1 CCW Inlet Stop Check to Lube Oil Clrs	M-036 J-10	CC 127	Open	
MU Pump 1-1 CCW Lube Oil Clr (FI 2190) Source Vlv	J-10	CC2190A	Open	
MU Pump 1-1 CCW Lube Oil Clrs (FI 2190) Source Vlv	J-10	CC2190B	Open	
MU Pump 1-1 CCW Lube Oil Clrs Indicator	J-10	FI2190	In Service	
MU Pump 1-1 CCW Out Stop Check from Lube Oil Clrs	J-10	CC 129	Throttled (12 gpm)	
MU Pumps Discharge Line Vent	H-7	MU 200	Closed	
High Pressure Line Flow Test Isolation	G-6	MU 208	Sealed Closed	
Normal Makeup Flow (FT MU 31) Inlet Source	F-6	MU 31A	Open	
Normal Makeup Flow (FT MU 31) Outlet Source	F-6	MU 31B	Open	
Normal Makeup Flow Transmitter	M-031 F-6	FTMU31	In Service	
Normal Makeup Flow Controller Inlet Isolation	F-6	MU 209	Open	
Normal Makeup Flow Controller Outele Isolation	F-6	MU 210	Open	
Normal Makeup Flow Controller Line Drain	F-5	MU 212	Closed	
Normal Makeup Flow Controller Bypass	F-6	MU 211	Closed	
Normal Makeup Flow (FE MU 58) Source/ Needle	F-6	MU 58A	Open	
Normal Makeup Flow (FE MU 58) Source	F-5	MU 58B	Open	
Makeup Tank & Pumps Bypass	H-7	MU 178	Sealed Closed	
MU Pump 1-1 Seal Water Vent	H-8	MU 34	Closed	
MU Pump 1-1 Seal Water Vent	H-8	MU 35	Closed	
MU Pump 1-2 Seal Water Vent	J-8	MU 36	Closed	
MU Pump 1-2 Seal Water Vent	J-8	MU 37	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
High Press Line Flow Test Vent	G-6	MU 439	Closed	
Makeup Tank 1-1 Outlet Line Drain	J-9	MU 443	Closed	
MU Pump 1-2 Inlet Isolation	J-9	MU 190	Locked Open[1]	
MU Pump 1-2 Suction Line Flush	J-8	MU 192	Closed	
MU System Hydro Test Connection Valve	J-9	MU 467	Closed	
MU Pump 1-2 Suction Press Source	J-8	MU 1896	Open	
MU Pump 1-2 Suction Press Indicator	J-9	PI 1896	In Service	
MU Pump 1-2 Discharge Press Source	J-8	MU 25B	Open	
MU Pump 1-2 Discharge Press Indicator	J-8	PIMU25B	In Service	
MU Pump 1-2 Discharge Line Flush Iso	J-8	MU 194	Closed	
MU Pump 1-2 Discharge Line Flush Vent	J-8	MU 42B	Closed	
MU Pump 1-2 Recirc Iso to Seal Return	J-7	MU 202	Locked Open[1]	
MU Pump 1-2 Recirc Stop to Seal Return	J-7	MU 203	Locked Open[1]	
MU Pump 1-2 Outlet Isolation	J-7	MU 198	Open	
MU Pump 1-2 CCW in Stop Check to Lube Oil Clrs	M-036 J-11	CC 128	Open	
MU Pump 1-2 CCW Lube Oil Clr (FF2190) Source Vlv	J-11	CC2191A	Open	
MU Pump 1-2 CCW Lube Oil Clr (FI2190) Source Vlv	J-11	CC2191B	Open	
MU Pump 1-1 CCW Lube Oil Clr Flow Indicator	J-11	FI 2191	In Service	
MU Pump 1-2 CCW [illegible] Stop Check from Lube Oil Clr	J-11	CC 130	Throttled (12 gpm)	
RM 227				

[1]Controlled per AD 1839.02

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Purif Demin to Misc Waste Drn Tk Line Drain	M-031 B-13	MU 445	Closed	
Purif Demin to Misc Waste Drn Tk Line Drain	B-13	MU 446	Closed	
RM 236				
Normal Makeup Flow Indicator	F-5	FIMU58	In Service	
Normal Makeup Flow Line Leak Test Conn	F-5	MU 452	Closed	
***INACCESSIBLE				
Purif Demin to Misc Waste Drn Tk Line Drain	B-13	*** MU 447	Closed	
Makeup Tank 1-1 N_2 & H_2 Inlet Isolation	H-10	*** MU 188	Open	
Makeup Tank 1-1 Outlet Line Vent	J-9	*** MU 390	Closed	
Makeup Tank 1-1 Outlet Line Vent	J-9	*** MU 388	Closed	
Makeup Tank 1-1 Outlet Line Drain	J-9	*** MU 389	Closed	
Spent Resin Tk Overflow Pmp to Purif Demin Vent	B-14	*** WC 116	Closed	
Makeup Tank 1-1 Sample Isolation	H-10	*** SS 17	Open	
Makeup Tank 1-1 Inlet Line Vent	G-9	*** MU 184	Closed	
Mixed Bed 1-1 Outlet to Cation Bed Line Drain	D-11	*** MU 118	Closed	
Mixed Bed 1-1 Outlet to Cation Bed Line Vent	D-11	*** MU 117	Closed	
Mixed Bed 1-2 Outlet to Cation Bed Line Drain	D-12	*** MU 123	Closed	
Mixed Bed 1-1 Outlet Line Drain	D-11	*** MU 137	Closed	
Mixed Bed 1-2 Outlet Line Drain	D-12	*** MU 138	Closed	

***These valves are inaccessible and need not be checked unless the Shift Supervisor determines it necessary due to maintenance or evolutions being performed in the area.

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Batch Feed Line Drain	F-10	*** MU 156	Closed	
Batch Feed Line Vent	E-10	*** MU 157	Closed	
Makeup Tank 1-1 Vent Outlet Iso to MU 14	G-10	*** MU 158	Closed	
Makeup Tank 1-1 Inlet Line Vent	G-9	*** MU 183	Closed	
Makeup Tank 1-1 Inlet Line Drain	G-9	*** MU 386	Closed	
Batch Feedline Vent to Misc Waste Dr Tk	F-10	*** MU 438	Closed	
Batch Feedline Drain to Misc Waste Dr Tk	F-9	*** MU 437	Closed	
Sample System Line from Mixed Bed 1-1 Outlet	D-10	*** SS 19	Open	
Sample System Line from Mixed Bed 1-2 Outlet	E-12	*** SS 20	Open	
Cation Bed Outlet Sample Line	E-13	*** SS 21	Open	
Cation Bed Outlet Sample Isolation	D-8	*** SS 22	Open	
Sampling Sys Return to MU & Purif Sys	E-9	*** SS 501	Open	
Sampling Sys Return to MU & Purif Sys	E-9	*** SS 502	Open	
Sampling Sys Return to MU & Purif Sys	E-9	*** SS 503	Open	
Sample Sys Valve Upstream of Three-way Vlv	D-11	*** SS 137	Open	
Resin Outlet from Demin's Flush Valve	E-11	*** MU 432	Closed	
RCP 1-2-2 Controlled Bleedoff Line Vent	G-1	MU 419	Closed	
RCP 1-2-2 Controlled Bleedoff Line Vent	F-1	MU 420	Closed	
RCP 1-2-2 Controlled Bleedoff Line Vent	F-1	MU 421	Closed	

***These valves are inaccessible and need not be checked unless the Shift Supervisor determines it necessary due to maintenance or evolutions being performed in the area.

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VALVE VERIFICATION LIST A
Makeup and Purification System
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Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP 1-2-2 Controlled Bleedoff Line Vent	F-1	MU 422	Closed	
RCP 1-2-2 Controlled Bleedoff Line Drain	F-1	MU 413	Closed	
RCP 1-2-2 Controlled Bleedoff Line Drain	F-1	MU 414	Closed	
RCP 1-2-2 Controlled Bleedoff Line Drain	F-1	MU 415	Closed	
RCP 1-2-2 Seal Return Leak Test	E-2	MU 251	Closed	
RCP 1-2-2 Seal Return Isolation	E-2	** MU 59B	Open/ Closed	
RCP 1-2-2 Seal Return (FE-MU 60B) Inlet Iso	E-4	MU 255	Open	
RCP 1-2-2 Seal Return (FE-MU 60B) Outlet Iso	E-4	MU 259	Open	
RCP 1-2-2 Seal Return Flow Transmitter	E-4	FIMU60B	In Service	
RCP 1-2-2 Seal Return FE-MU60B Bypass	E-4	MU 263	Closed	
RCP 1-2-2 Seal Inj Line Drain (CTMT)	J-1	MU 287	Closed	
RCP 1-2-2 Seal Inj Line Drain (CTMT)	J-1	MU 288	Closed	
RCP 1-2-2 Seal Inj Line Vent	J-2	MU 457	Closed	
RCP 1-2-2 Seal Inj Line Vent	J-2	MU 456	Closed	
RCP 1-2-2 Seal Inj Line Vent	H-2	MU 473	Closed	
RCP 1-2-2 Seal Inj Line Drain	J-2	MU 459	Closed	
RCP 1-2-2 Seal Inj Line Drain	J-2	MU 458	Closed	
RCP 1-2-2 Seal Inj Line Vent	H-3	MU 472	Closed	
RCP 1-2-2 Seal Inj Stop Check	J-2	MU 243	Sealed Open	
RCP 1-2-2 Seal Inj Stop Check	J-2	MU 328	Open	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP 1-2-2 Seal Inj Line Vent	J-2	MU 404	Closed	
RCP 1-2-2 Seal Inj Line Vent	J-2	MU 405	Closed	
RCP 1-2-2 Seal Inj Line Vent	J-2	MU 406	Closed	
RCP 1-2-2 Seal Inj Line Drain	J-2	MU 283	Closed	
RCP 1-2-2 Seal Inj Line Drain	J-2	MU 284	Closed	
RCP 1-2-2 Seal Inj Line Vent (CTMT)	J-1	MU 407	Closed	
RCP 1-2-2 Seal Inj Line Vent (CTMT)	J-1	MU 408	Closed	
RCP 1-2-2 Seal Inj Line Vent (CTMT)	J-1	MU 409	Closed	
RCP 1-2-2 Seal Inj Line Drain (CTMT)	J-1	MU 285	Closed	
RCP 1-2-2 Seal Inj Line Drain (CTMT)	J-1	MU 286	Closed	
RCP 1-2-2 Seal Inj Stop Check Leak Test	J-2	MU 247	Closed	
RCP 1-2-1 Seal Inj Line Drain	K-2	MU 280	Closed	
RCP 1-2-1 Seal Inj Line Drain	K-2	MU 281	Closed	
RCP 1-2-1 Seal Inj Line Drain (CTMT)	K-1	MU 282	Closed	
RCP 1-2-1 Seal Inj Line Vent	K-2	MU 461	Closed	
RCP 1-2-1 Seal Inj Line Vent	K-2	MU 460	Closed	
RCP 1-2-1 Seal Inj Line Vent	K-2	MU 474	Closed	
RCP 1-2-1 Seal Inj Line Drain	K-2	MU 463	Closed	
RCP 1-2-1 Seal Inj Line Drain	K-2	MU 462	Closed	
RCP 1-2-1 Controlled Bleedoff Line Vent	E-1	MU 417	Closed	
RCP 1-2-1 Controlled Bleedoff Line Vent	E-1	MU 418	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP 1-2-1 Controlled Bleedoff Line Drain	E-1	MU 410	Closed	
RCP 1-2-1 Controlled Bleedoff Line Drain	E-1	MU 411	Closed	
RCP 1-2-1 Controlled Bleedoff Line Drain	E-1	MU 412	Closed	
RCP 1-2-1 Seal Return Leak Test	D-1	MU 250	Closed	
RCP 1-2-1 Seal Return Isolation	D-2	*** MU 59A	Open/ Closed	
RCP 1-2-1 Seal Return (FE MU60A) Inlet Iso	D-3	MU 254	Open	
RCP 1-2-1 Seal Return (FE MU60A) Outlet Iso	D-4	MU 258	Open	
RCP 1-2-1 Seal Return Flow Transmitter	D-4	FTMU60A	In Service	
RCP 1-2-1 Seal Return RE MU 60A Bypass	D-4	MU 262	Closed	
RCP Seal Return Line Vent	E-5	MU 309	Closed	
RCP 1-1-2 Seal Inj Stop Check	H-3	MU 245	Sealed Open	
RCP 1-1-2 Seal Inj Stop Check Leak Test	H-2	MU 249	Closed	
RCP 1-1-2 Seal Inj Line Vent	H-2	MU 451	Closed	
RCP 1-1-2 Seal Inj Stop Valve	H-2	MU 326	Open	
RCP 1-1-2 Seal Inj Line Drain	H-2	MU 289	Closed	
RCP 1-1-2 Seal Inj Line Vent	G-2	MU 464	Closed	
RCP 1-1-2 Seal Inj Line Vent	G-2	MU 477	Closed	
RCP 1-1-2 Seal Inj Line Vent	G-2	MU 476	Closed	
RCP 1-1-2 Seal Inj Line Vent	G-2	MU 455	Closed	
RCP 1-1-2 Seal Inj Line Vent	G-2	MU 454	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP 1-2-2 Seal Inj Line Drain	G-1	MU 478	Closed	
RCP 1-2-1 Controlled Bleedoff Line Vent	E-1	MU 416	Closed	
RCP 1-2-1 Seal Inj Line Drain	K-2	MU 475	Closed	
RCP 1-2-1 Seal Inj Stop Check Leak Test	K-2	MU 246	Closed	
RCP 1-2-1 Seal Inj Stop Check	K-2	MU 242	Sealed Open	
CTMT				
RCP 1-2-1 Seal Inj Stop Valve	K-2	MU 329	Open	
RCP 1-2-1 Seal Inj Line Vent	K-2	MU 401	Closed	
RCP 1-2-1 Seal Inj Line Vent	K-2	MU 402	Closed	
RCP 1-2-1 Seal Inj Line Vent	K-2	MU 403	Closed	
RCP 1-1-1 Seal Return Leak Test	F-2	MU 252	Closed	
RCP 1-1-1 Seal Return Isolation	F-2	*** MU 59C	Open/ Closed	
RCP 1-1-1 Seal Return (FE MU 60C) Inlet Iso	F-4	MU 256	Open	
RCP 1-1-1 Seal Return (FE MU 60C) Outlet Iso	F-4	MU 260	Open	
RCP 1-1-1 Seal Return Flow Transmitter	F-4	FTMU60C	In Service	
RCP 1-1-1 Seal Inj Stop Check	H-2	MU 244	Sealed Open	
RCP 1-1-1 Seal Inj Stop Check Leak Test	H-2	MU 248	Closed	
RCP 1-1-1 Seal Inj Line Vent	H-2	MU 450	Closed	
RCP 1-1-1 Seal Inj Stop Valve	H-2	MU 327	Open	
RCP 1-1-1 Seal Inj Line Vent	H-2	MU 466	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RCP 1-1-1 Seal Inj Line Vent	H-2	MU 465	Closed	
RCP 1-1-1 Seal Return FE MU 60C Bypass	F-4	MU 426	Closed	
RCP 1-1-2 Controlled Bleedoff Line Vent	F-2	MU 425	Closed	
RCP 1-1-2 Controlled Bleedoff Line Vent	F-2	MU 246	Closed	
RCP 1-1-2 Controlled Bleedoff Line Drain	F-2	MU 427	Closed	
RCP 1-1-2 Seal Return Leak Test	F-2	MU 253	Closed	
RCP 1-1-2 Seal Return Isolation	F-3	** MU 59D	Open/ Closed	
RCP 1-1-2 Seal Return (FE MU60D) Inlet Iso	F-3	MU 257	Open	
RCP 1-1-2 Seal Return (FE MU60D) Outlet Iso	F-3	MU 261	Open	
RCP 1-1-2 Seal Return Flow Transmitter	F-2	FTMU60D	In Service	
RCP 1-1-2 Seal Return (FE MU60D) Bypass	F-3	MU 265	Closed	
RCP Letdown Clr 1-2 CCW Inlet Test Press Source	E-4	CC 2545	Closed	
RCP Letdown Clr 1-1 and 1-2 Inlet Header Drain X-connect	B-2	MU 64	Open	
RC Letdown Clr 1-2 Inlet Header Drain	D-2	MU 69A	Closed	
RC Letdown Clr 1-2 Inlet Header Drain	D-2	MU 69B	Closed	
RC Letdown Clr 1-2 CCW Inlet Source to PSH3712	M-036 E-5	CC 3712	Open	
RC Letdown Clr 1-2 CCW Outlet Source to PSH 3712	F-5	CC 3763	Open	
RC Letdown Clr 1-2 CCW Vent Valve	E-5	CC 100	Closed	
RC Letdown Clr 1-2 CCW Inlet Isolation	E-4	CC 97	Open	
RC Letdown Clr 1-2 CCW Outlet Isolation	E-5	CC 103	Throttled Open	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
Letdown Line Delay Coil Drain	M-031 C-4	MU 76	Closed	
Letdown Line Delay Coil Vent	C-4	MU 77	Closed	
Letdown Line Delay Coil Vent	C-4	MU 78	Closed	
Letdown Line Delay Coil Drain	C-4	MU 310	Closed	
Letdown Coolers Outlet Isolation	C-4	** MU 2A	Open	
RC Letdown Line Drain	C-2	MU 70	Closed	
RC Letdown Line Vent	C-2	MU 71	Closed	
RC Letdown Cooler Inlet Isolation	C-2	MU 2B	Open	
RC Letdown Line Vent	B-2	MU 72	Open	
RC Letdown Cooler 1-1 Inlet Isolation	B-3	** MU 1A	Open	
RC Letdown Cooler 1-1 Outlet Stop Check	B-3	MU 370	Open	
RC Letdown Cooler 1-1 CCW Drain Valve	M-036 D-4	CC 101	Closed	
RC Letdown Cooler 1-1 CCW Inlet Test Press Source	D-4	CC 2543	Closed	
RC Letdown Cooler 1-1 CCW Inlet Source to PSH 3711	D-5	CC 3711	Open	
RC Letdown Cooler 1-1 Outlet Source to PSH 3759	D-5	CC 3755	Open	
RC Letdown Cooler 1-1 CCW Vent Valve	D-4	CC 102	Closed	
RC Letdown Cooler 1-1 CCW Inlet Isolation	D-4	CC 98	Open	
RC Letdown Clr 1-1 CCW Outlet Isolation	D-5	CC 104	Throttled (400 gpm)	
RC Letdown Cooler 1-2 Inlet Line Drain	M-031 C-3	MU 73	Open	
RC Letdown Cooler 1-1 Inlet Header Drain	B-2	MU 68A	Closed	

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VALVE VERIFICATION LIST A
Makeup and Purification System
Normal/Prestartup Lineup

Verification List Only - Consult Shift Supervisor Prior to Repositioning Valve

VALVE DESCRIPTION	P&ID No. Coord.	VALVE NUMBER	VALVE POSITION	VERIFY BY
RC Letdown Cooler 1-2 Inlet Isolation	C-3	** MU 1B	Closed/ Open	
RC Letdown Cooler 1-2 Outlet Stop Check	C-4	MU 369	Open	
RC Letdown Clr 1-2 CCW Drain Valve	M-036 E-4	CC 99	Closed	

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Reviewed by _____ Date _____
(Shift Supervisor or Ass't Shift Supervisor)

END