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INDIAN POINT STATION

UNIT 2

SYSTEM OPERATING PROCEDURE 1.2.1 REV. 0

DRAINING REACTOR COOLANT SYSTEM
VIA RHR LETDOWN TO CVCS HOLUP TANK

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DRAINING REACTOR COOLANT SYSTEM VIA RHR LETDOWN TO CVCS HOLDUP TANK

1 PRECAUTIONS AND LIMITATIONS

1.1 Maintain two RHR heat exchangers with CCW in service until minimum temperature can no longer be maintained.

1.2 Maintain RHR flow balanced between RHR heat exchangers when two RHR heat exchangers are in service.

1.3 WHEN Reactor Coolant System (RCS) level is lowered below 63 ft. EL, frequently monitor level indication to ensure RHR pumps are not cavitating.

1.4 PRIOR to draining RCS below 63 ft. EL following shall be met:

1 RCS Iodine 131 Activity less than $9.0E^{-3}$ uc/cc.
2 At least one safety injection pump available.

NOTE: SI Pump may be held off for RCS protection but shall not be held off for maintenance.

1.5 IF RHR is lost in mid loop drained down condtion, RCS boiling could occur in as little time as 2.5 minutes.

1.6 WHEN RCS is in drained down condition, close HCV 638 AND HCV 640 prior to starting RHR pump to prevent vortexing.

1.7 Level indicating system is vented to Pressurizer. PORVs and block valves should be open to Pressurizer Relief Tank (PRT) AND Reactor Vessel Head should also be vented to PRT. This prevents pressure differential between Reactor Head and reference leg on RCS level indicating system. This also ensures all points of RCS are under common atmosphere.

1.8 WHEN loops are being drained, indicated hose level will lag actual level.

1.9 To ensure steam generator tubes remain full, do NOT lower water level in pressurizer surge line to point where air or nitrogen enters RCS loop piping, unless required for maintenance operations.

1.10 WHEN RCS is initially drained to 63 ft. 2 inch EL, level will increase due to breaking of vacuum in steam generator tubes, if vacuum is not broken with nitrogen.

1.11 WHEN nitrogen is introduced to steam generator tubes, displacing coolant, operator should anticipate slight level increases on drain down level indicator.

1.12 WHEN venting Pressurizer to PRT, pressure in PRT should not exceed 25 psig AND Pressurizer should be less than 200F.

1.13 Maintain seal injection in service until RCS level is below Reactor Coolant Pump (RCP) seal package (64 ft. 6 inch EL).

1.14 Hydrogen concentration in RCS should be less than 5 cc/Kg and gaseous activity should be less than 0.01 uc/cc.

1.15 Observe applicable Health Physics procedures when venting potentially contaminated liquids or vapors.

1 Install vent lines to prevent water traps from forming OR collection device should be used to collect water.

1.16 Ensure sufficient gas decay tank usable volume to receive cover gas when draining RCS water to any Chemical and Volume Control System (CVCS) tank.

1.17 RWP shall be obtained when ever RCS is to be opened to atmosphere.

1.18 Radiation release permit shall be completed prior to opening any steam generator manway diaphragm or valve which may cause rapid venting of RCS to Containment exhaust system.

1.19 DO NOT place Purification Booster Pump in service UNTIL RCS pressure is 50 psig or less.

2 INITIAL CONDITIONS

2.1 Ensure RHR system in service with only ONE RHR pump running. _____

3 PROCEDURE

3.1 Draining Via RHR Letdown to CVCS Holdup Tank(s)

3.1.1 Ensure there is sufficient gas decay tank volume to receive cover gas. _____

3.1.2 Establish normal RHR letdown purification path (SOP 4.2.1, RHR). _____

3.1.3 Open charge pump recirculation valves AND reduce charging pump speed to minimum. _____

1 Reduce thermal barrier flow to minimum. _____

NOTE: Maintain seal injection in service until RCS level is below RCP seals (64 ft. 6 inch EL).

3.1.4 Verify VCT Tank Inlet LCV-112A in NORM AND automatic makeup switches are in AUTO. _____

3.1.5 Ensure CVCS Holdup Tank in service has adequate capacity available to receive diverted letdown. _____

NOTES: 1 Where possible, use empty CVCS holdup tank to start letdown as it will be at proper boron concentration to refill RCS.

2 RCS draindown will need more than one tank.

```
* * * * * * * * * * * * * * * * * * * * * * * *
*                  CAUTION                    *
*                                             *
*   Atmosphere in CVCS holdup tank shall be   *
*   same as RCS OR 100 percent nitrogen.      *
*                                             *
* * * * * * * * * * * * * * * * * * * * * * * *
```

3.1.6 Close following to maximize letdown.

Charging Valve HCV-142	CLOSED	_____
Letdown Isolation Stop LCV459	CLOSED	_____

3.1.7 Adjust RHR Letdown Flow Control HCV-133 AND L/D Back Pressure Regulator PCV-135 to establish maximum letdown rate, not to exceed 120 gpm. _____

3.1.8 WHEN cold range indicated Pressurizer level reaches approximately 20 percent, vent Pressurizer per SOP 3.3. _____

```
* * * * * * * * * * * * * * * * * * * * * * * * *
*                    CAUTION                    *
*                                               *
*     Leave HCV-133 fully open if Purification  *
*     Booster Pump is in service.               *
*                                               *
* * * * * * * * * * * * * * * * * * * * * * * * *
```

3.1.9 Place purification Booster Pump in service if needed as follows:

NOTES:
1. RHR Purification Pump may be placed in service when RCS has depressurized under 50 psi, temperature is less than 350F and letdown cannot be maintained at 50 gpm.
2. RHR Purification Pump should be used with at least one residual heat removal pump in operation.

1. Ensure RHR Letdown HCV-133 fully open. _____
2. Ensure Purification Pump Bypass 4055 open (VC, 46 ft. EL Recirculation Sump Room). _____
3. Close Purification Pump Inlet Drain 4979. _____
4. Open Inlet Stop 4054 (VC, 46 ft. EL Recirculation Sump Room). _____
5. Vent Pump as follows:
   - Outboard (1st stage) Casing Vent _____
   - Inboard (2nd stage) Casing Vent _____
   - Discharge Vent 4937 _____
6. Open Discharge Stop 4056 (VC, 46 ft. EL Recirculation Sump Room). _____
7. Energize Purification Pump from MCC-28A (VC, 68 ft. EL compartment 2B). _____
8. Close Letdown Isolation LCV-459. _____

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* * * * * * * * * * * * * * * * * * * * * * * * *
*                    CAUTION                    *
*                                               *
*  Do NOT completely close Purification Pump    *
*  Bypass 4055 during pump operation.           *
*                                               *
* * * * * * * * * * * * * * * * * * * * * * * * *
```

9. Throttle Purification Pump Bypass 4055 to regulate flow. _____

10 Throttle PCV-135 to regulate letdown and Volume Control Tank (VCT) level. _____

11 Maintain VCT level greater than 60 percent. _____

12 Ensure VCT Inlet LCV-112A in NORM. _____

3.1.10 IF RCS Level is to be drained below 20 percent, as indicated on cold calibrated level indications, place RCS Level system in service as per SOP 1.2 step 3.1.7. _____

3.1.11 Recommence draining by adjusting letdown flow. _____

3.1.12 WHEN level is reduced below 76 ft. 6 inches EL, vent Reactor Head by opening following stops:

Head Vent Stop 4142 OPEN _____
Head Vent Stop 4143 OPEN _____

3.1.13 IF draindown level differences per Attachment 1, of SOP 1.2 indicate significant vacuum in head THEN:

1 Have NPO energize HCV 3100 and 3101 at MCC 26AA and 26BB respectively. _____
2 OPEN 3100 and 3101, relieve vacuum, THEN CLOSE.

Valve 3100 CLOSED _____
Valve 3101 CLOSED _____

NOTE: Repeat above step if necessary as draindown continues.

3.1.14 Place RHR Purification with VCT bypassed if needed as follows:

NOTE: Charging flow will be established without charging pumps by RHR purification head.

3.1.14.1 RCS drained below RCP seal package (64 ft.6 inches) and seal flow terminated. _____

1 Fully open HCV-142. _____

2 RCP 21 Seal Injection 250A.
CLOSED _____

RCP 22 Seal Injection 250B.
CLOSED _____

RCP 23 Seal Injection 250C.
CLOSED _____

RCP 24 Seal Injection 250D.
CLOSED _____

3 Seal Injection Filter Inlet Stop 4906 closed. CLOSED _____

3.1.14.2 At Charging Pump 21 cubicle, check closed Drain Stop 4057 (PAB, 80 ft. EL inside cubicle). _____

3.1.14.3 Open VCT Bypass Stop 4051 (PAB, 80 ft. EL). _____

3.1.14.4 Place line in service by:

1 Stopping charging pumps. _____

2 Close VCT Inlet Stop 357 while slowly opening VCT Bypass Stop 4050.

VCT Inlet Stop 357 (PAB, 98 ft. EL)
CLOSED _____

VCT Inlet Stop 4050 (PAB, 98 ft. EL)
OPEN _____

3 Close Charging Stop 4062 (PAB, 80 ft. EL outside cubicle). _____

* *

CAUTION

Do NOT exceed relief valve set pressure of 150 psig.

* *

3.1.14.5 Adjust Charging Line Flow Control HCV-142 to control flow in charging line and prevent overpressurization of bypass line. _____

3.1.14.6 Continue draindown as desired by placing VCT Inlet LCV-112A in DIVERT. _____

3.1.15 WHEN level is below RCP Seal Package (64 ft. 6 inches),

1 Secure charging pump. _____

2 Terminate seal flow:

RCP 21 Seal Injection 250A.	CLOSED	_____
RCP 22 Seal Injection 250B.	CLOSED	_____
RCP 23 Seal Injection 250C.	CLOSED	_____
RCP 24 Seal Injection 250D.	CLOSED	_____

3.1.16 IF desired, add nitrogen to primary side of each steam generator to eliminate vacuum during RCS draindown:

3.1.16.1 Have available for each steam generator approximately 900 cubic ft. of nitrogen (4 bottles at full pressure), manifold with nitrogen regulator (0-2400 psi) and associated tubing and fittings. _____

3.1.16.2 Using Hi Side of FT 415, FT 425, FT 435 and FT 445, perform following valve line-up (Refer to Figure 1).

1 Open transmitter equalizing valve. _____
2 Close Low Side inlet root Stop at transmitter. _____
3 Close Low and High Side stops to transmitter block. _____
4 Ensure both series drain valves are CLOSED on Low Side. _____
5 Ensure both series drain valves are CLOSED on High Side. _____
6 Connect nitrogen supply to High Side capped connection between series drain valves. _____
7 Ensure High Side inlet root stop at transmitter is open. OPEN _____
8 Ensure High Side inlet root stops at Intermediate legs are OPEN.

Valve 513	OPEN	_____
Valve 509	OPEN	_____
Valve 503	OPEN	_____
Valve 506	OPEN	_____

9 Open first of High Side series drain valves. _____
10 Establish nitrogen flow through line by adjusting regulator setting. _____

3.1.16.3 Continue nitrogen addition until each steam generator has received approximately 900 cubic ft. _____

3.1.16.4 All nitrogen shall be added before RCS level is brought below 64 ft. _____

3.1.16.5 Restore FT 415, 425, 435 and 445 line up as follows:

1 Close nitrogen bottle stops (at bottles). _____
2 Close first High Side series drain valve. _____
3 Disconnect nitrogen line and cap open end. _____
4 Open Low Side inlet root stop at transmitter. _____
5 Open Low and High Side inlets to transmitter block. _____
6 Ensure High Side inlet root stop at transmitter is OPEN. _____
7 Close equalizing valve. _____

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* * * * * * * * * * * * * * * * * * * * * * * * * *
*                    CAUTION                        *
*                                                   *
*  Minimum level for Cold S/D drained down          *
*  condition is 62 ft. 10 inches, to avoid          *
*  vortexing RHR suction piping.                    *
*                                                   *
* * * * * * * * * * * * * * * * * * * * * * * * * *
```

3.1.17 WHEN desired RCS level is obtained:

1 Set up RHR purification flow to maintain constant RCS level. _____

2 Complete Table 1, Section 2.4, 2.5 and 2.6 of SOP 1.2. _____

3.1.18 To drain RCS below level 62 ft. 10 inches, go to SOP 1.2.4. _____

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* * * * * * * * * * * * * * * * * * * * * * * * * *
*                    CAUTION                      *
*                                                 *
*  Prior to removal of steam generator manway     *
*  diaphragms, adjust PRT eductor to maintain     *
*  approximately 6 inch Hg on PI 3100, to         *
*  preclude high radiogas in work area during     *
*  removal.  When high activity has dissipated,   *
*  return eductor setting to .5 to 1 inch Hg.     *
*                                                 *
* * * * * * * * * * * * * * * * * * * * * * * * * *
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* * * * * * * * * * * * * * * * * * * * * * * * * *
*                    CAUTION                      *
*                                                 *
*  IF RHR pump is secured, when restarting,       *
*  close HCV 638 AND HCV 640, THEN start pump to  *
*  prevent vortexing.  Reestablish RHR flow for   *
*  cooling.                                       *
*                                                 *
* * * * * * * * * * * * * * * * * * * * * * * * * *
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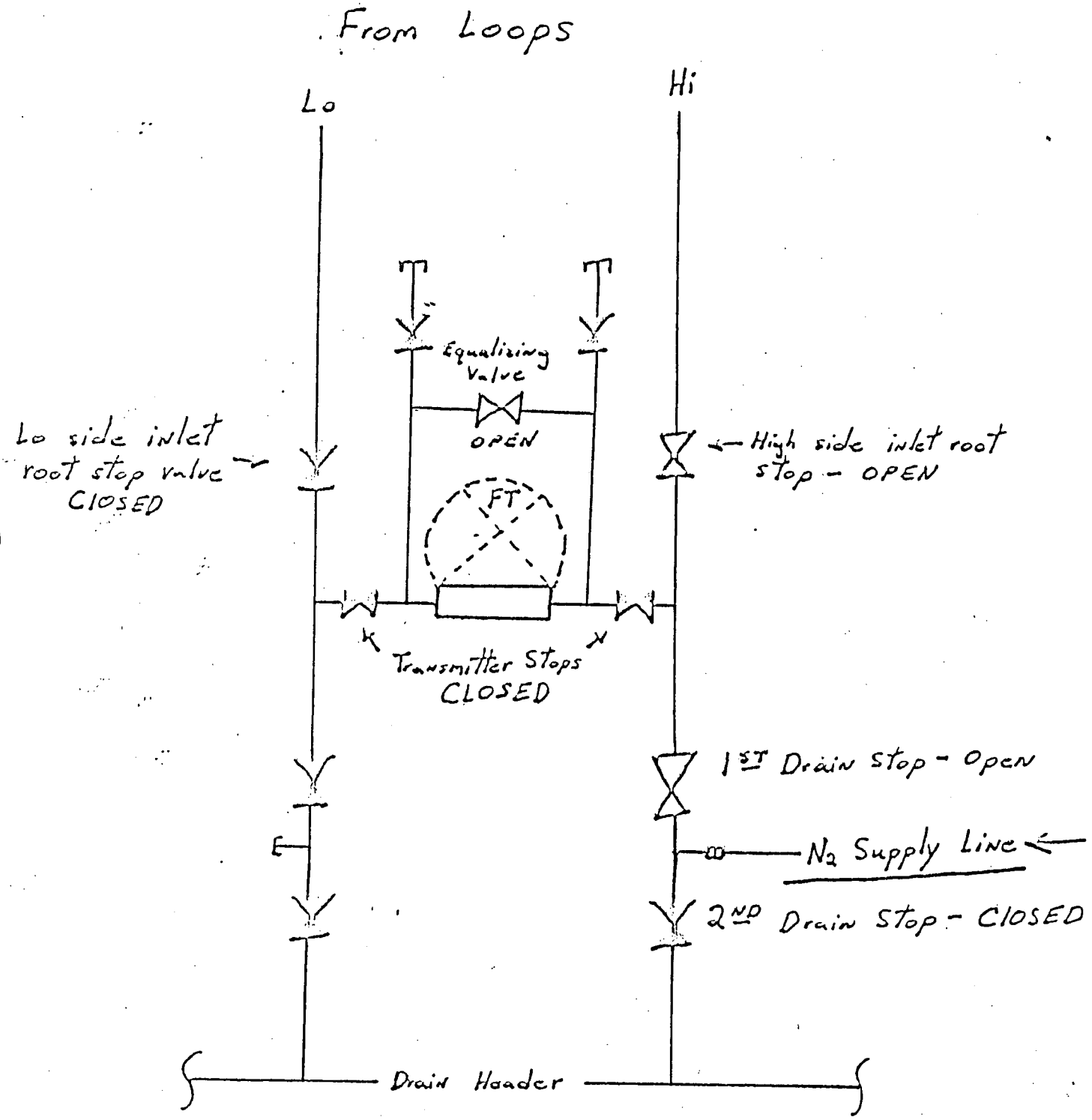
3.1.19 During RHR operation with loops partially drained, frequently monitor RHR pumps for cavitation. _____

FIGURE 1

Valving alignment for FT 415, 425, 435, 445