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Emergency Procedure EP 1202.06

Loss of Reactor Coolant and Reactor Coolant Pressure

Davis-Besse Nuclear Power Station

Unit No. 1

Emergency Procedure EP 1202.06

LOSS OF REACTOR COOLANT AND REACTOR COOLANT PRESSURE

NUCLEAR SAFETY RELATED

Record of Approval and Changes

Prepared by G.D. Humphreys and J.R. Lingenfelter — 6-9-76 (Date)

Submitted by Larry Stalter (Section Head) — 6/16/76 (Date)

Recommended by Jack Evans (SRB Chairman) — 6/22/76 (Date)

QA Approved NA (Manager of Quality Assurance) — (Date)

Approved by Jack Evans (Station Superintendent) — 6/28/76 (Date)

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1. SMALL REACTOR COOLANT SYSTEM LEAKS

1.1 Symptoms

1.1.1 Pressurizer level decreasing slowly without a change in Tave.

1.1.2 Reactor Coolant System (RCS) pressure decreasing.

1.1.3 Makeup tank level decreasing.

1.1.4 "RC MU FLOW HI" annunciator alarm.

1.1.5 Increasing normal sump level.

1.1.6 "MN STM LINE 1 (2) RAD HI" annunciator alarm or "VACM SYS DISCH RAD HI" annunciator alarm. If either of these alarms exist, refer to EP 1202.57, OTSG Tube Leak.

1.1.7 Increasing quench tank level, pressure or temperature.

1.2 Automatic Actions

1.2.1 The makeup flow control valve (MU32) will open in an attempt to maintain pressurizer level at its setpoint.

1.3 Immediate Operator Actions

1.3.1 Close the RC letdown coolers inlet valve MU2B.

1.3.2 Verify that the makeup flow control valve, MU32, is open.

1.3.3 Start the second MU Pump if necessary. If a second pump is unavailable or if pressurizer level or RCS pressure continues to decrease, implement the actions of Section 2 of this procedure.

1.3.4 If the reactor trips, implement EP 1202.04, Reactor/Turbine Trip.

1.4 Supplementary Action

14 NOTE: Check Emergency Plan Activation, EI 1300.01 to determine if Emergency Action Levels have been exceeded.

1.4.1 Attempt to locate and isolate the leak if possible. Check RC drain tank level, sump levels and RE's to locate the leak. Isolable leaks include:

1. The electromatic relief valve (close the block valve, RC11). If the RCS pressure decreases to below 1800 psig, close the electromatic relief block valve.

2. A break between the control valve and block valve on the spray line (close both valves, RC2 and RC10).

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3. A makeup system leak (close the letdown isolation, MU2B).

4. Pressurizer sample line leaks (close RC239A and RC239B).

1.4.2 Maintain a minimum level of 18 inches on "Makeup Tank Level" (LI-MU16) control room "Reactor Coolant Makeup and Pressurizer Control" panel (C-5703). Add boric acid and primary water to the Makeup Tank by initiating a batch addition as per Section 5 of the Boron Concentration Control Procedure, SP 1103.04.

NOTE: In this batch addition, both boric acid and primary (or demineralized) water are to be added with boric acid flow at least 20% of the total batch flow. Monitor "Boric Acid Flow" from FI-MU41 on panel C-5702 and total flow from the indicator on the batch controller.

NOTE: At 10 inches in the MU Tank, MU3971, the Makeup Pump Suction Valve will automatically shift the makeup pump suction from the MU tank to the BWST. At the receipt of the MU Tank low level signal of 10 inches, a 45 second time delay will start and automatically trip the makeup pumps if MU3971 fails to transfer to the BWST and the MU Tank level is still less than 10 inches. At 86 inches in the MU Tank, MU3971 will shift the MU pump suction from the BWST back to the MU tank.

1.4.3 Prepare to shutdown the reactor within the time requirement of Technical Specification 3.4.6.2. Initiate an investigation to determine the cause of the leak and correct the problem.

1.4.4 If plant conditions stabilize, attempt to estimate the size of the leak.

1.4.5 If all feedwater is lost (main and auxiliary) refer to AB 1203.05, Complete Loss of Main and Auxiliary Feedwater, to aid in restoring auxiliary feedwater in the event both OTSG's are dry.

1.4.6 If the leak is truly a small leak, the RCS pressure will eventually stabilize at some point above the SFAS 1650 psig trip. When the pressure stabilizes, a "normal" cooldown may be started per PP 1102.10, "Plant shutdown and Cooldown". SFA3 may be bypassed as during a normal cooldown. 19

1.5 Discussion

For the purposes of this procedure, a small RCS leak is defined as one for which the makeup pump capacity is sufficient to maintain pressurizer level and RCS pressure. If the two makeup pumps cannot maintain level and RCS pressure, the RCS pressure will drop until High Pressure Injection can be used; such a leak is defined as medium size and is covered in the next section.

If the makeup pumps can maintain pressurizer level and RCS pressure, a controlled shutdown may be possible. If the leak is close to the capacity of the pumps, the RCS cooldown from 25% to 0% may be beyond the capacity of the pumps to supply the additional makeup and a reactor trip on low pressure may result. This may cause an additional drop in pressurizer level and RCS pressure, but when conditions stabilize, the makeup pumps should be able to regain pressurizer level.

A controlled cooldown/depressurization can then be established to establish the conditions necessary to repair the leak.

If any SFAS actuation occurs, do NOT block and change the status of any safety equipment unless the conditions specified in Section 2.6 are satisfied.

2. MEDIUM SIZED RCS LEAKS

2.1 Symptoms

2.1.1 Pressurizer level and pressure decreasing without an associated change in RCS temperature.

CAUTION: Pressurizer level may NOT be decreasing if RCS pressure has decreased to saturation pressure and steam voids exist outside the pressurizer, or if a leak exists on top of the pressurizer.

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2.1.2 Makeup tank level decreasing.

2.1.3 Increasing containment pressure, temperature, and/or radiation or normal sump level.

2.1.4 The following annunciator alarms may indicate a loss of reactor coolant/pressure:

1. "RC LOOP 1 (2) HLG PRESS"
2. "RC PRZR LVL"
3. "RC PRZR LO LVL HTR TRIP"
4. "RPS RC LO PRESS TRIP"
5. "RPS RC PRESS TEMP TRIP"
6. "RC MU FLOW HI"
7. "SFAS RC PRESS < 1600 TRIP"
8. "CTMT PRESS HI SFAS CH 1 (2, 3, 4)"

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2.1.5 Actions of Section 1 of this procedure have been attempted, and the makeup pumps cannot maintain pressurizer level and RCS pressure.

2.1.6 "MN STM LINE 1 (2) RAD HI" annunciator alarm. If alarming, an OTSG tube leak is probable; implement EP 1212.57, OTSG Tube Leak Emergency Procedure.

2.1.7 Quench tank level, pressure and temperature may rise until the rupture disk breaks.

2.1.8 RCS temperature/pressure reaching saturated conditions.

2.1.9 RCS hot leg temperature equals or exceeds the pressurizer temperature.

2.1.10 Additional symptoms during heatup and cooldown:

During heatup - pressurizer level decreasing with minimum letdown.

19| During cooldown of ≤100°F/hr - makeup tank level cannot be maintained.

2.2 Automatic Actions

2.2.1 The reactor may trip on low pressure or pressure/temperature.

2.2.2 SFAS level 1 and 2 actuation may occur on low RCS pressure.

2.3 Immediate Operator Actions

The parameters marked with an asterisk (*) below must be reverified as the first step of supplementary actions.

2.3.1 If SFAS incident levels 1 and 2 have been actuated and RCS pressure is less than 1650 psig, trip all running reactor coolant pumps. Verify RCS pressure is less than 1650 psig before tripping pumps.

19| 2.3.2 Trip the reactor (if not tripped) and perform EP 1202.04, Reactor/Turbine Trip.

*2.3.3 Determine the status of RCS subcooling (using TDI-4950 or TDI-4951 RCS T_{SAT} METERS). If saturated conditions occur, initiate HPI.

19| *2.3.4 Verify that the proper OTSG level is being maintained (low level limits if only normal feed is being provided or 93" on the startup range if AFW is operating).

19| *2.3.5 When SFAS incident level 2 is actuated, verify:

1. Both HPI pumps are running, and

2. Both injection line flows on each pump are balanced. (Higher flow should be less than 1.5 times the lower flow.)

Throttle only the line with abnormally high flow using the associated HPI isolation valve HP2A, B, C, or D. Do NOT throttle the line with the high flow below the flowrate shown on Figure 4.

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NOTE: If makeup pumps are running, the indicated flow on the injection lines for HPI Pump 1-2 may be misleading.

2.3.6 If SFAS low pressure trip(s) has (have) been bypassed due to heatup or cooldown, initiate HPI and/or LPI.

2.4 Supplementary Actions

NOTE: Reverify the parameters marked with an asterisk (*) in the immediate operator action section. Where possible, use alternate indications of these parameters.

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The supplementary actions to be taken vary with the availability of equipment and other factors. To aid in determining the proper sequence of actions to take, a flow chart indicating the various paths the actions might take has been included as Figures 1A & 1B. Note that step numbers have been included on the figure to simplify correlation to the steps of corrective action.

Note that the actions listed describe general methods of dealing with the accident and specific instructions on the operation of equipment are omitted. The time span over which these actions are performed is sufficient to consult other documents and the operator should use other procedures, drawings, etc., to aid in completing these actions.

NOTE: Check Emergency Plan Activation, EI 1300.01 to determine if Emergency Action Levels have been exceeded.

2.4.1 Initial Actions

For additional guidance of the following subjects, consult Section 2.6 before taking any actions relative to those subjects.

1. Blocking of any safety equipment functions including HPI.

2. Switching of HPI suction to emergency sump if HPI still required when BWST low level (8 feet) reached.

3. Unusual or offscale indications develop.

4. Isolation of a leaking OTSG.

5. Anticipated loss of all RCP's.

6. Erroneous steam generator and pressurizer level indications due to unusual containment conditions.

7. Transfer of DH and CS pump suction to the emergency sump on BWST low level (8 feet).

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2.4.1.1 If, during the completion of the following steps, the transient is determined to be caused by a non-LOCA event (I.E., an over-cooling transient), proceed to Section 2.4.4.

2.4.1.2 Attempt to locate and isolate the leak, if possible. Check RC drain tank level, sump levels and RE's to locate the leak. Isolable leaks include:

1. The electromatic relief valve (close the block valve, RC11). If the RCS pressure decreases to below 1800 psig, close the electromatic relief block valve.

2. A break between the control valve and block valve on the spray line (close both valves, RC2 and RC10).

3. A makeup system leak (close the letdown isolation MU2B).

4. Pressurizer sample line leaks (close RC239A and RC239B).

2.4.1.3 Start a plot of RCS pressure vs. hotleg (and/or incore

thermocouple or wide range Tc if nothing else is available) temperature on Figures 2A and 2B and a plot of temperature vs. time on Figure 3. These plots will make it possible to track the plant's condition through plant cooldown. Primary temperature and pressure will decrease along the saturation curve until subcooled conditions are established. This will be indicated by primary system pressure no longer following the saturation curve. Primary system pressure should then be controlled by adjusting HPI flow to maintain a minimun of 50°F subcooling margin (20°F if on natural circ).

High pressure injection may be stopped or throttled, provided the criteria of Section 2.6.1.6 are met.

NOTE: If the plant computer is not available for incore thermocouple readings, refer to IC 2001.07, Manual Measurement of Incore Thermocouples.

2.4.1.4 If either the RCS T_{SAT} METERS, the hot leg temperature indications, or the incore thermocouple temperatures indicate super-heated conditions for the existing pressure, refer to AB 1203.06, Inadequate Core Cooling Guidelines. An increase in the source or intermediate range nuclear instrumentation may also indicate an inadequate core cooling situation.

2.4.1.5 If both main and auxiliary feedwater is lost, refer to AB 1203.05, Complete Loss of Main and Auxiliary Feedwater, to aid in restoring auxiliary feedwater in the event both OTSG's are dry.

2.4.1.6 Begin monitoring BWST level on LI1525A, B, C, and D and manually transfer pump suction to the emergency sump when the BWST level reaches 8 feet. Transfer pump suction to the emergency sump by blocking SFAS incident level 2 for DH9A and DH9B and then opening DH9A and DH9B using HISDH9A and HISDH9B. Verify that the BWST outlet valves DH7A and DH7B start to close as DH9A and DH9B start to open. Verify the transfer is complete by checking that the indicating lights on DH7A and B and DH9A and B and by checking that low pressure injection flow has NOT substantially changed.

NOTE: SFAS incident level 5 must be tripped (at 8 feet BWST level) before the transfer will work. The annunciator "BWST LO LO LVL, XFER TO EMER SUMP" provides the operator assurance that the transfer is possible, but since this alarm may NOT be relied upon to work, continue to attempt to transfer until completed (see Section 2.6.7 for further explanation of this interlock).

2.4.1.7 Place the Emergency Station Vent Sampling Assembly in

service per AD 1850.04 Post Accident Radiation Sampling and Counting.

2.4.2 Actions with at least one RCP running

2.4.2.1 Go to or maintain one RCP running per loop. Operation of at least one RCP is desirable. RCP should be stopped if the RCP vibration as measured by the Bentley-Nevada equipment exceeds 30 mills. Note that the X2 (times-two) switch on the Bentley-Nevada equipment must be used for the expanded range. If only one RCP can be run it is desirable to run one on the side with the highest SG level.

2.4.2.2 Establish and maintain OTSG cooling by adjusting steam pressure via the turbine bypass valves and/or atmospheric vent valves. Cooldown at 100°F per hour to achieve an RCS pressure of $\leq$ 250 psig and RCS temp $\leq$ 280°F.

2.4.2.3 Track cooldown on Figures 2A, 2B and 3. If the RCS is $\geq$ 50° subcooled (using RCS T_{sat} meters) the core flood tanks should be isolated at 700 psig and SFAS level 3 should be blocked at 600 psig.

2.4.2.4 When RCS press $\leq$ 250 psig and temp $\leq$ 280°F go into LPI cooling described in Step 2.5.

2.4.3 Actions with no RCP's initially running

2.4.3.1 Verify that the OTSG level is being maintained at or approaching 93" on the startup range under Auxiliary Feedwater system control.

NOTE: If desired, the OTSG level may be raised as high as 95% on the operate range to improve RCS cooling but the transition must be slow enough to prevent excessive changes in RCS pressure and temperature.

2.4.3.2 Monitor RCS pressure and proceed as directed by one of the 3 steps below.

1. RCS pressure INCREASING, go to Step 2.4.3.4.c.

2. RCS pressure STABILIZES, go to Step 2.4.3.3.

3. RCS pressure DECREASES PAST SECONDARY PRESSURE, go to Section 3.

2.4.3.3 Establish a controlled cooldown of the RCS of about 100°F per hour by reducing secondary side pressure (a secondary side pressure drop of approximately 8 psi/minute will approximate a 100°F/hour cooldown for the first hour, thereafter, a smaller rate of pressure drop will be required).

2.4.3.4 Continue to plot conditions on Figures 2A, 2B and 3 and while monitoring RCS pressure and temperature proceed as directed by one of the 3 steps below.

NOTE: System response may change at any time during the cooldown. This will require re-routing to the proper steps.

(1) If the RCS pressure continues to DECREASE following the secondary system pressure drops, and if the RCS pressure/temperature (using RCS T_{SAT} METERS) indicates a SATURATED condition, go to Step 2.4.3.4.A.

(2) If RCS pressure stops decreasing (STABLE) in response to secondary system pressure drops and the RCS pressure/temperature (using the RCS T_{sat} METERS) indicates a SUBCOOLED condition go to Step 2.4.3.4.B.

(3) If RCS pressure starts to INCREASE while decreasing secondary system pressure and the RCS pressure/temperature (using the RCS T_{sat} METERS) indicates a SATURATED condition go to Step 2.4.3.4.C.

2.4.3.4.A Actions for saturated cooldown.

NOTE: See discussion section for further explanation of this section.

1. Do NOT isolate core flood tanks at 700 psig unless the RCS is at least 50°F subcooled.

2. Do NOT block SFAS level 3 at 600 psig unless the RCS is at least 50°F subcooled.

3. Continue RCS cooldown and depressurization by decreasing secondary side pressure to an RCS pressure of approximately 250 psig (this corresponds to a saturation temperature of approximately 406°F). At 250 psig pressure decrease the secondary side cooldown enough to allow HPI to maintain RCS pressure at about 250 psig. At this point as the decay heat load gradually decreases and the core is cooled via HPI through the leak and some secondary side cooling, subcooled margin will be gradually regained.

4. Continue monitoring BWST level and piggyback LPI and HPI pumps per SP 1104.04 Section II if required. Also monitor BWST level per Step 2.4.1.6.

5. Continue cooldown to the operating conditions of the DHR system, $\leq$ 250 psig and $\leq$ 280°F. As the subcooling margin is increased secondary side cooling may be increased if desired to increase the system cooldown rate.

   NOTE: When subcooled margin is regained in these steps, do NOT re-route to Step 2.4.3.4.B.

6. When RCS conditions of $\leq$ 250 psig and $\leq$ 280°F are reached go to Step 2.5.

2.4.3.4.B Actions for a cooldown when 20°F subcooled margin was NOT lost OR 20°F subcooled was initially lost but is regained during the cooldown.

1. Continue to monitor RCS pressure and temperature during cooldown for the following 2 conditions:

   1.1 BOTH hot AND cold leg temperatures are decreasing in response to steam generator pressure/temperature decreases.

   1.2 ALL hot AND cold leg temperatures are $\geq$ 20°F subcooled. Hot leg subcooling is determined using RCS T_{sat} METERS. Cold leg subcooling is determined on Figure 2.

   If the conditions of Steps 1.1 AND 1.2 ARE BOTH satisfied, adequate natural circulation is available, proceed in this section.

   If the conditions of Steps 1.1 AND 1.2 ARE NOT BOTH satisfied, go to Step 2.4.3.4.C.

NOTE: Step 4 below may occur before Steps 2 and 3.

2. If the conditions of Steps 1.1 AND 1.2 ARE BOTH satisfied, core flood tank should be isolated at 700 psig.

3. If the conditions of Steps 1.1 AND 1.2 ARE BOTH satisfied, SFAS level 3 should be blocked at 600 psig.

4. At this point the best course of action depends on RCP availability and RCS pressure and temperature. Proceed as directed by one of the 3 steps below:

   1. RCP's are NOT startable, proceed to Step 5 below.

   2. RCP's are startable but RCS pressure is $<$ 280 psig and RCS temperature is $<$ 300°, proceed to Step 5 below.

      NOTE: In this case the plant is so close to the DHR system operating conditions the fastest course of action is probably to continue a natural circulation cooldown.

   3. RCP's are startable and EITHER RCS pressure is $\geq$ 280 psig or RCS temperature is $\geq$ 300°F, proceed to step 2.4.3.4.C.

5. Continue a natural circula-

tion cooldown to approximately 250 psig and ≤ 280°F.

6. Go to Step 2.5.

2.4.3.4.C Actions for restarting RCP's

Restart an RCP in one or both loops if possible per the instructions of one of the 4 steps below. If an RCP CANNOT be started, AND RCS pressure is increasing go to Step 2.4.3.5.

1. If RCS pressure is ≥ 1600 psig and increasing, restart an RCP in one or both loops and go to Step 2.4.2.1.

2. NOTE: This step is more easily visualized on Figure 1A.

RCS pressure is < 1600 psig but exceeds the highest steam generator secondary pressure by 600 psig or more "bump" one RCP until pump amps stabilize or approximately 10 seconds (preferable in operable steam generator loop). Allow RCS pressure to respond. Return to Step 2.4.3.2. Continue cooldown. If RCS pressure again exceeds secondary pressure by 600 psi, wait at least 15 minutes and repeat the pump "bump". Bump alternate pumps so that no pump is bumped more than once in a hour. This may be repeated with an interval of 15 minutes, up to five times. For

the fifth "bump", pick a pump on the loop with the highest SG level and allow the RCP to continue in operation. This sequence assumes 4 RCP's are available. If less than 4 RCP's are available, wait until it has been 1 hr. since the reactor trip before doing the final "bump" where the RCP is started and continues to run. Go to Step 2.4.3.4.A.

NOTE: The RCP left running in this step may be running with the RCS saturated. It should remain in operation until one LPI pump is operating in the DHR mode at $\geq$ 1000 gpm flow unless vibration exceeds 30 mills on the Bentley - Nevada (see Step 2.4.2.1).

3. If RCS pressure has stabilized for greater than one hour, highest secondary pressure is less than 100 psig and primary pressure is greater than 250 psig, bump a pump, wait 30 minutes, and start an alternate pump in the

loop with the highest SG level and allow it to continue in operation. Go to Step 2.4.3.4.A.

NOTE: The RCP left running in this step may be running with the RCS saturated. It should remain in operation until one LPI pump is operating in the DHR mode at ≥ 1000 gpm flow unless vibration exceeds 30 mills on the Bailey - Nevada (see Step 2.4.2.1).

4. If the RCS is ≥ 20°F subcooled, natural circulation exists, but the plant pressure conditions do not match Steps 1, 2 or 3 above, start an RCP in the loop with the highest SG level. If at least 50°F subcooling is not present after 2 minutes, trip the RCP and go to Step 2.4.3.2. If ≥ 50°F subcooling is present after 2 minutes, allow the RCP to continue to run and go to Step 2.4.2.1.

2.4.3.5 Actions for conditions with no reactor to SG heat transfer and no RCP's available.

NOTE: For additional discussion of the mode of cooling which is established by this step see the discussion Section 2.7.

1. If SG levels have NOT been increased to 95% on the Operate kange, increase SG levels to and maintain 95% at this time.

2. If RCS pressure reaches 2300 psig, open the PORV block valve if closed and open the PORV. Reclose when RCS pressure falls to 100 psi above secondary side pressure.

   NOTE: If the PORV or the PORV block valve cannot be opened the safties will relieve the overpressure.

3. If incore thermocouples indicate the core outlet temperature is colder than SG T-sat, lower SG pressure until SG T-sat is 50°F less than incore thermocouple temperature.

4. Continue to repeat the actions in Step 2 AND 3 above as necessary until the conditions of Step 5 OR 6 below are met.

5. If an RCP becomes available go to Step 2.4.3.4.C.

6. If reactor to SG heat transfer is restored

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(indicated by RCS pressure and temperature decreasing and SG pressure possibly increasing) go to Step 2.4.3.4.

2.4.4 Non-LOCA (overcooling) Transient with Feedwater Available

2.4.4.1 Immediately restart an RCP in each loop if the RCS is 50°F subcooled. (RCS hot leg subcooling can be determined using TDI-4950 or TDI-4951, RCS T_{SAT} METERS.. RCS cold leg temperatures should be compared to Figures 2A & 2B.

2.4.4.2 Using the turbine bypass valves or atmospheric dump valves for secondary pressure control and normal feedwater or auxiliary feedwater for OTSG level control, stabilize or control plant heatup. Note that considerable extra water may have been injected into the RCS and cold water may have surged into the pressurizer. This will require care in controlling the heatup until RCS inventory can be reduced and until normal pressure control can be established with heaters.

2.4.4.3 As long as the RCS is maintained 50°F subcooled, throttle HPI and/or makeup and letdown as necessary to maintain pressurizer level at approximately 100 inches. The degree of subcooling in non-LOCA situations is limited by the normal tech spec pressure temperature limits.

2.5 LPI/DH Cooling

NOTE: This section is written assuming that HPI is running with suction from the BWST at the time

of transition to LPI cooling. If the cool-down/depressurization was such that the HPI suction was switched to the emergency sump via the HPI pumps in the "piggyback" mode of operation, the following steps may be deleted or rearranged to accomplish the desired modes of cooling.

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Cooldown in this section may be with RCP's initially running or on natural circulation. If on natural circulation, the steps pertaining to RCP's may be ignored.

Core flood tanks may have been isolated by previous sections of this procedure, if so steps pertaining to isolating core flood tanks may be ignored.

2.5.1 Determine the operability of the DH pumps. If both DH pumps are operable go to Steps 2.5.2. If only one pump is operable continue below.

2.5.1.1 Align the discharge of the operable DH pump to the suction of the HPI pumps (use cross connect to provide suction to both HPI pumps and close the suction valve of the inoperable DH pump).

2.5.1.2 Start the DH pump and maintain primary system pressure by throttling HPI and DH flow. (DH flow must be throttled using DH1A or DH1B only - do NOT use DH14A or DH14B). When the BWST low level is reached (at 8 feet), the suction for the DH pump must be manually transferred as per Step 2.4.1.6.

2.5.1.3 Go to single RC pump operation (one out of four - RCP 2-2 is preferred pump).

2.5.1.4 When the second DH pump is available, align it in the decay heat mode and commence decay heat removal. With

decay heat flow greater than 1000 gpm the remaining RCP may be stopped.

CAUTION: Verify adequate NPSH exists for the DH pump by observing the indicated flow to assure it is not erratic. If NPSH is inadequate, realign the DH pump to the injection mode.

NOTE: If the second DH pump is not available, maintain 250 psig and OTSG cooling with one (or more) RCP's running. Within 7 days, establish a boron dilution flowpath as per Step 3.4.10 and 3.4.11.

2.5.1.5 Reduce RCS pressure to 150 psig by throttling HPI flow. Control RC temperature using decay heat cooler bypasses to maintain system pressure at least 50 psi above saturation pressure to assure adequate NPSH for the DH pump.

2.5.1.6 Close the core flood tank isolation valves if open.

2.5.1.7 Stop the HPI pump and close the valves supplying HPI suction from decay heat.

2.5.1.8 Reduce RCS temperature to 100°F by controlling the DH cooler bypass valves.

NOTE: If one of the DH pumps is lost, return to OTSG cooling using natural

circulation or restart a reactor coolant pump. (See EP 1202.32, Loss of Decay Heat Emergency Procedure.)

2.5.2 Cooldown with both DH pumps operable.

2.5.2.1 Align one DH pump in the decay heat removal mode. When aligning DH 1-1 (DH 1-2) for decay heat removal mode, close DH 26 (DH 10) to prevent lifting relief valve DH 1509 (DH 1508).

2.5.2.2 Go to single RC pump operation (RCP 2-2 is preferred pump).

2.5.2.3 Start the decay heat pump in the decay heat removal mode, and when decay heat system flow is greater than 1000 gpm, secure the running RC pump.

2.5.2.4 Reduce RC pressure to 150 psig by throttling HPI flow. Control RC temperature using DH cooler bypasses in order that system pressure is controlled at least 50 psi above saturation pressure for the controlled temperature.

2.5.2.5 Close the core flood tank isolation valves if open.

2.5.2.6 Start the second DH pump in the injection mode. Secure HPI pump.

2.5.2.7 When the BWST level drops to the low level setpoint (8 ft.), the suction of the DH pump in the injection mode must be manually shifted to the emergency sump as per Step 2.4.1.6.

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2.5.2.8 Reduce reactor coolant temperature to 100°F by controlling the decay heat system cooler bypass.

NOTE: If one of the LPI/decay heat pumps is lost, return to OTSG cooling using natural circulation or start one RCP (see EP 1202.32, Loss of Decay Heat Emergency Procedure).

2.6 ADDITIONAL PRECAUTIONS AND GUIDELINES

This section provides additional guidance for the subjects mentioned in 2.4.1

2.6.1 DO NOT OVERRIDE ANY SAFETY EQUIPMENT EXCEPT AS LISTED BELOW:

2.6.1.1 RCS Makeup - The RCS makeup isolation valve MU33 may be overridden to the open position when RCS pressure is greater than 400 psig.

2.6.1.2 Reactor Coolant Pump Seal Injection and Return - The RCP Seal Injection Valves MU66A, B, C, D and Seal Return Isolation Valves MU59A, B, C, D, MU38 may be overridden to the open position when RCS pressure is greater than 400 psig. Seal injection should be maintained to the RCP's even if they are tripped, to assure long term seal integrity.

2.6.1.3 RCS Letdown - The letdown isolation valves MU2A, MU3A may be opened as required to control RCS inventory when the RCS pressure is greater than 400 psig given that no seismic event occurred.

2.6.1.4 Containment Air and Pressurizer/ RCS Samples - the sample line isolation valves for collecting Containment Air Samples (CV5010A, B, C, D, CV5011A, B, C, D, CV5010E, CV5011E) and Pressurizer/ RCS Samples (RC240A, RC240B) may be opened as soon as it is necessary to sample.

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2.6.1.5 Decay Heat (DH) Cooler Outlet Valves - The DH Cooler Outlet Valves DH14A, DH14B may be throttled in the event of a failure of one DH pump which then requires the remaining pump feed through both Low Pressure injection (LPI) lines.

2.6.1.6 High Pressure Injection may be stopped or throttled provided:

a) All hot and cold leg temperatures are at least 50 degrees below the saturation temperature for the existing RCS pressure (RCS hot leg subcooling can be determined using TDI-4950 or TDI-4951, RCS T_{SAT} METERS. RCS cold leg temperatures are to be compared to Figures 2A & 2B), and not more than 50°F above the secondary side saturation temperature. The degree of subcooling beyond 50°F by HPI shall be limited by the emergency pressure/temperature curve of Figure 2A if any RCP's are running or 2B if all RCP's are off, and

b) Pressurizer level is being maintained.

CAUTION: Do NOT rely entirely on pressurizer level indication to determine the inventory of the RCS. If the RCS temperature is not 50 degrees below the saturation temperature for the RCS pressure, a steam void may exist in the RCS.

If both of these conditions are satisfied, the HPI may be stopped by blocking and stopping the pumps, or throttled using HP2A, B, C, and D.

CAUTION: If 50°F subcooling cannot be maintained after stopping HPI, the HPI shall be restarted.

HPI may also be throttled during piggyback operation to less than 950 gpm per pump or as required to balance flow. HPI flow may be stopped if both low pressure injection pumps are in operation with a flow of at least 1000 gpm per pump, and the RCS conditions have been stable for 20 minutes.

If RCS pressure increases above 1650 psig, the makeup pumps should be run with the same instructions for stopping or throttling as for HPI.

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2.6.1.7 Component Cooling Water Valve 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 no seismic event occurred.

2.6.1.8 Diesel Generator - If a diesel was previously being operated on the hydraulic governor, it may be blocked, stopped, and restarted in the "safety mode".

2.6.1.9 Atmospheric vent valves - The atmospheric vent valves may be opened if required for secondary pressure control.

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 BYPASSED WITH THE SHIFT SUPERVISOR'S PERMISSION.

IF THERE ARE ANY QUESTIONABLE CONDITIONS OR ANY SIGN OF AN RCS LEAK, NO OTHER SAFETY SYSTEMS SHOULD BE BYPASSED WITHOUT APPROVAL OF STATION MANAGEMENT (STATION SUPERINTENDENT OR HIS DESIGNEE).

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IF AN SFAS SIGNAL TO SOME ESF EQUIPMENT IS "BLOCKED" (I.E. OVERRIDDEN), THAT EQUIPMENT IS INCAPABLE OR RESPONDING TO EITHER ANY SUBSEQUENT AUTOMATIC ACTUATION SIGNAL OR THE SYSTEM-LEVEL MANUAL, ACTUATE ("TRIP") PUSHBUTTONS. 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

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OF THAT EQUIPMENT, INCLUDING REACTUATION 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 SYSTEM LEVEL, OPERATION OF THE SYSTEM-LEVEL "RESET" PUSHBUTTON WILL CLEAR ANY OUTPUT LOGIC BLOCKS IN THE SYSTEM (OUTPUT LOGIC "BLOCKS" ARE THE BLOCK SWITCHES NEXT TO THE SAM LIGHTS 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 THIS PROCEDURE.

2.6.2 Depending on the size of the RCS leak and the total time for cooldown and depressurization, the BWST may or may not reach its low limit (8 feet) before the HPI pumps are ready to be stopped. If the BWST approaches its low level limit and continued HPI operation is required, the piggyback mode of operation must be established with a decay heat pump(s) taking suction from the containment emergency sump and providing suction to the HPI pumps. Details of the operation are presented in Section 11 of SP 1104.04, Decay Heat and Low Pressure Injection Operating Procedure.

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Note that is some cases, a single DH pump may be required to supply suction to both HPI pumps. This may be accomplished by closing the suction valve on the non running pump (DH 2733 for pump 1-1 or DH 2734 for pump 1-2) and then opening DH831 (DH830) if DH Pump 1-1 (1-2) is running and proceeding as described in Section 11 of SP 1104.04.

2.6.3 Alternate instrument channels should be checked as available to confirm key parameter readings (i.e., system temperature and pressures and pressurizer level). In determining hot leg and cold leg temperatures, remember that all hot leg indications are confined to a 520 - 620°F range as are the cold leg narrow range indications.

The core outlet thermocouples can be used to give some indication of hot leg temperatures if the normal indications go off scale down (use computer points T511 through T562 - the center fuel assembly uses T536) and the wide range cold leg indications will provide adequate cold leg temperature indication.

NOTE: If the plant computer is not available for incore thermocouple readings refer to IC 2001.07 Manual Measurement of Incore Thermocouples.

2.6.4 If high activity is detected in a steam generator, isolate the leaking generator. If high activity is detected in both generators, isolate only the one that appears to be leaking the most; do NOT isolate both steam generators. If an OTSG is leaking, consult EP 1202.57, OTSG Tube Leak Emergency Procedure, which should be followed in conjunction with this procedure but if any conflicts between the required actions should arise, the actions required in EP 1202.06 take precedence. 19

2.6.5 If, while performing the actions of this procedure a condition develops such that the loss of all RCP's is anticipated, go to EP 1202.14, "Loss of RC Flow - RC Pump Trip," for instructions on a controlled transition to natural circulation.

2.6.6 If containment temperature is elevated, compensation is required for potentially erroneous SG and pressurizer level indication. The elevated reference leg temperature causes the measured level to indicate higher than actual level. Therefore, if containment temperature is elevated above 150°F, (as read by TI1356, TI1357, TI1358 or CPT T298, T302, T306), manually control the indicated SG level at greater than 60" if incident level 2 is NOT present or at greater than 125" 19

if incident level 2 is present. Maintain pressurizer level at greater than 80" as read by the compensated pressurizer level recorder LRS RC14 if containment temperature is above 150°F or manually shut off the pressurizer heaters if indicated level drops below 80" to prevent uncovering the heaters.

If RCS pressure drops below 600 psig within several minutes, off-gassing of the reference leg may interfere with pressurizer level indication. The operator should, if he can, shut off all pressurizer heaters to prevent possible burnup. They may be reenergized when RCS pressure reaches approximately 1600 psig and pressurizer level increases to approximately 100 inches.

Also, note the CF tank levels, SG operating range levels, and SG full range levels may be affected by the increased containment temperature.

For further details, see the appropriate operating procedure:

SP 1104.01, CF System Operating Procedure

SP 1103.05, Pressurizer Operation

19| SP 1106.07, Main Feedwater System Operating Procedure.

2.6.7 Following a LOCA, the BWST level will decrease until at the 8 feet level the operator must manually transfer the suction of the DH and CS Pumps to the emergency sump. The operator will open the emergency sump outlet valves DH9A and DH9B which will automatically close the BWST outlet valves DH7A and B. Note that SFAS incident level 5 must be actuated before the transfer can occur; this requires any two channels of SFAS logic to reach the low level setpoint of 8 feet. The annunciator "BWST LOLO LVL, XFER TO EMER SUMP" will indicate that the incident level 5 logic has been actuated and that the transfer is possible. The annunciator does not meet safety grade specifications however and therefore must NOT be relied upon to indicate the incident level 5 trip. When the 8 feet level is reached

(as indicated on LI1525A, B, C, and D), the annunciator should be received and the transfer should be initiated. Considering the worst case instrument tolerances, the SFAS incident level 5 actuation will occur by the time the indicated BWST level reaches 8 feet. If the manual transfer has been continually attempted as required, the transfer should have been completed by that time.

2.7 Discussion

19 | For the purposes of this procedure, a medium sized leak is one for which the HPI pump capacity is sufficient to maintain pressurizer level or RCS pressure. If the HPI pumps cannot keep up with the leak, then RC pressure will fall until the LPI system can provide additional makeup; this is defined as a large leak and is discussed in the next section.

19 | Depending on the size of the leak, the RCS pressure will slowly or quickly fall to the 1650 psig pressure setpoint of the SFAS for level 1 and 2 actuation. Note that for small breaks with a complete loss of feedwater, RCS pressure may not fall low enough to actuate SFAS levels 1 and 2. Manual actuation of SFAS could be accomplished by actuating each component in level 1 or 2 or by actuating

19 | levels 1, 2, 3, and 4 except C.S. pumps, by means of the manual actuation pushbutton. Manual actuation should NOT be used unless the SFAS setpoints are reached and the actuation does not occur. Once HPI is initiated and level is restored to enable pressure control, a cooldown can be started. The cooldown should proceed normally with the exception that one of the ECCS pumps must remain in operation in the injection mode to makeup the water lost out of the leak. HPI can be shutdown within the limits of item 6 of 2.6.1.

If possible the depressurization/cooldown will be complete before the BWST low level is reached and the "piggybacking" of the HPI and Decay Heat Pumps will not be necessary. If the depressurization/cooldown cannot be completed in time, the pressurizer level may be maintained by aligning the Decay Heat Pumps to take a suction from the emergency sump and discharge to the suction of the HPI pumps.

The transfer of pump suction to the emergency sump when BWST level reaches 8 feet is performed manually. The operator must monitor the BWST level indicators during injection and initiate the transfer at the 8 foot level.

An alarm "BWST LO LO LVL, XFER TO EMER SUMP", will also be received at 8 feet to provide assurance to the operator that the transfer may be completed. (See Step 2.6.7 for additional guidance.)

19 A flowpath from the RCS hot leg to the DH System must be established within seven days to prevent boron concentration buildup as described in Step 3.4.10. If this flowpath cannot be established, an alternate path through the auxiliary spray line must be used as described in Step 3.4.11.

For additional details on possible consequences of a medium sized leak, see The Evaluation of Transient Behavior and Small Reactor Coolant System Breaks in the 177 Fuel Assembly Plant - Section 5 (B&W).

Notes on Step 2.4.3.5

19 When this step is reached, auxiliary feedwater has established a 93" level in the OTSG's and no RCS flow exists (forced or natural). Depending on the size of the break, the RCS may repressurize enough to reach the code safety valves setpoint. If the electromatic relief is available, the RCS pressure may be reduced manually. If not, the RCS pressure will be relieved by the break and the safeties if the pressure goes that high. At some pressure, the energy escaping from the break (and the electromatic or safeties if used) will equal the decay heat energy input. At that point, the pressure will stabilize. The pressure will stay at that level until the RCS inventory boils off far enough that the primary system level is lower than secondary system level in the OTSG's. When this occurs, steam condensation in the primary side of the OTSG will start to remove heat and the primary pressure will start to fall. Eventually, the RCS pressure will fall low enough to allow HPI to start to refill the RCS which will in turn reduce the heat transfer via steam condensation and pressure will increase. This cyclic operation will continue without operator action (electromatic need not be opened) until an RCP can be started or until decay heat decreases to the point that the break can discharge the energy (in conjunction with some OTSG cooling) at a pressure which

19 allows HPI to make up the volume loss. SG level should be increased to 95% on the Operate Range to allow steam condensation to start at a higher RCS inventory. Some breaks may result in the core being cooled by HPI pumping through the core and out the break with no RCS circulation through the SG's. This will result in

19 the incore thermocouples indicating colder than SG T-sat. In this case the SG's become a heat source. SG pressure is lowered until SG T-sat is 50° less than incore thermocouple temperature in an attempt to get natural circulation started.

Notes on Step 2.4.3.4.A

The only way the RCS can remain in a saturated state while cooling down and depressurizing is if it has a break which is continuously increasing in size. This is because with the fixed break size as RCS pressure is decreased the leak flow rate decreases and the HPI flow rate increases, therefore subcooled margin should be regained at some point in the cooldown. Therefore if the RCS is remaining in a saturated state the break must be increasing in size.

Although this condition is unlikely it is not impossible. If it did occur, the step in the procedure where it calls for maintaining RCS pressure at 250 psig with HPI could not be successfully accomplished. In this case RCS pressure would decrease below secondary pressure and Section 3 should be consulted.

3. LARGE RCS LEAKS

3.1 Symptoms

3.1.1 Pressurizer level and pressure decreasing rapidly without an associated change in RCS temperature.

3.1.2 RCS pressure falling below secondary pressure

3.1.3 The following annunciator alarms may indicate a large RCS leak:

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1. "SFAS CTMT RAD TRIP"
2. "SFAS CTMT PRESS > 18.4 PSIA TRIP"
3. "SFAS CTMT PRESS > 38.4 PSIA TRIP"
4. "SFAS RC PRESS < 1600 TRIP"
5. "SFAS RC PRESS < 400 PSIG TRIP"
6. "CTMT NORM SUMP LVL HI"
7. "CF TK 1 (2) LVL LO"

3.1.4 Actions of Sections 1 and/or 2 of this procedure have been attempted and the makeup pumps and HPI pumps cannot maintain pressurizer level and pressure.

3.2 Automatic Actions

3.2.1 The reactor will trip on low pressure or low pressure/temperature.

3.2.2 SFAS level 1, 2, 3, and perhaps 4 will be actuated on low RCS pressure and/or high containment pressure.

3.3 Immediate Operator Actions

3.3.1 Trip the reactor if not already tripped.

3.3.2 Verify that SFAS components are actuated with their respective incident levels.

3.3.3 Verify that the core flood tanks discharge to the RCS.

3.4 Supplementary Actions

Implement Site Emergency Procedure, EI 1300.04.

18| CAUTION: DO NOT BLOCK AND OVERRIDE ANY SAFETY EQUIPMENT EXCEPT AS SPECIFIED IN SECTION 2.6.

3.4.1 If the flow rate between the two HPI lines for an HPI Pump becomes unbalanced, throttle the HPI valves and split the flow between the injection lines. Do NOT throttle the line with the high flow below the flow rate shown on Figure 4.0.

Assure proper HPI operation per Section 5.0 of SP 1104.07, "HPI Operating Procedure".

When LPI is actuated and LPI flow is greater than 1000 gpm per pump for 20 minutes, the operator may stop the HPI pump.

3.4.2 Verify the LPI pumps are injecting into the RCS when RCS pressure decreases to approximately 200 psig by reading FI DH2B and FI DH2A on C5716. No throttling of the LPI valves is required if both LPI pumps are in operation since mechanical stops are installed on the cooler outlet valves. Assure proper LPI operation per Section 9 of SP 1104.04, "LPI Operating Procedure".

3.4.3 If a DH Pump has failed and a break does not exist outside of containment, close the suction on the disabled pump, open DH831 or DH830, and

balance flows using DH14A and DH14B if available or DH1A and DH1B if DH14A and DH14B cannot be throttled.

19| 3.4.4 Stop the makeup pumps.

3.4.5 Place the Emergency Station Vent Sampling Assembly in service per AD 1850.04, Post Accident Radiation Sampling and Counting.

3.4.6 Before the BWST level reaches 8 feet requiring a transfer of pump suction from the BWST to the emergency sump, the HPI pumps must either be stopped or placed in the piggyback mode of operation. If LPI flow is less than 1000 gpm per pump, put the HPI pump in the piggyback mode by opening the LPI to HPI cross-connect as per Section 11 of the DH and LPI Operating Procedure, SP 1104.04. If LPI flow is greater than 1000 gpm per pump, stop the HPI pumps prior to making the transfer to the emergency sump.

3.4.7 Begin monitoring BWST level on LI1525A, B, C, and D and manually transfer pump suction to the emergency sump when the BWST level reaches 8 feet. Transfer pump suction to the emergency sump by blocking SFAS incident level 2 for DH9A and DH9B and then opening DH9A and DH9B using HISDH9A and HISDH9B. Verify that the BWST outlet valves DH7A and DH7B start to close as DH9A and DH9B start to open. Verify the transfer is complete by checking the indicating lights on DH7A and B and DH9A and B and be checking that low pressure injection flow has NOT substantially changed.

NOTE: SFAS incident level 5 must be tripped (at 8 feet BWST level) before the transfer will work. The annunciator "BWST LO LO LVL XFER TO EMER SUMP" provides the operator assurance that the transfer is possible, but since this alarm may NOT be relied upon to work, continue to attempt the transfer until completed. (See Section 2.6.7 for further explanation of this interlock.)

3.4.8 See Section 6 of this procedure for guidance before overriding any other safety equipment.

3.4.9 Monitor RB pressure and temperature and if CS Pumps are in operation, assure CS 1530 and CS 1531 throttle when recirculating from the emergency sump.

3.4.10 Initiate a drain flow from the RCS hot leg pipe to the Decay Heat System as follows within seven days:

1. Open DH12 and DH11, the RCS to DH System Isolation Valves, using HIS DH12 and HIS DH11 on Panel C-5704, the RC Makeup and Pressurizer Control Panel. If power is not available to DH11 or DH12, see Step 3.4.12.

18| 2. Verify a minimum of 40 gpm flow through each bypass line (bypassing DH1517, DH1518, the DH Pump Suction from RCS Valves) on FI4904 (8) located on Panel C-5716, Engineered Safety Features Panel.

3.4.11 Establish a flow through the auxiliary spray line to the pressurizer within seven days as follows:

1. Close RC10, Pressurizer Spray Isolation Valve with HIS RC10 on Panel C-5705, or close RC2, the Pressurizer Spray Control Valve using HIS RC2-1 on Panel C-5705.

2. Open DH 2736 and DH 2735, the Decay Heat Auxiliary Spray Throttle and Stop Valves, using HIS-2736 and HIS-2735 on Panel C-5705.
18| If power is NOT available to DH 2735 or DH 2736, see Step 3.4.12.

3. Verify a minimum of 40 GPM on the Aux Spray Flow Local Indicator FI 4999 located on Elevation 565' in hallway across from Makeup Pump Room.

18| 3.4.12 If MCCE11B or MCCF11A is NOT powered, an emergency tie of MCCE11B and MCCF11A can be accomplished as follows:

1. Insert breaker modules BE1153 (E11B) and BF1135 (F11A).

2. Identify non-energized MCC and open incoming breaker BF1105 for F11A or BE1166 for E11B.

3. Manually trip all load breakers of the non-energized MCC except the Auxiliary Spray and Decay Heat Cooldown Isolation Valve Breakers BF1125 and BF1130 if F11A is not energized or BE1155 and BE1183 if E11B is not energized. 19

4. Close cross tie breakers BE1153 and BF1135 which completes the tie between E11B and F11A.

3.5 Discussion

For the purposes of this procedure, a large leak is defined as one for which the HPI pumps cannot maintain pressurizer level or RCS pressure. If a large leak occurs, the pressurizer level and RCS pressure will fall rapidly resulting in a reactor trip on low pressure or pressure/temperature, and an initiation of SFAS incident level one and two when RCS pressure reaches 1650 psig or containment pressure reaches 18.0 psia. The decrease in RCS pressure will slow when HPI is initiated, but pressure will continue to fall until at 600 psig, the core flood tanks will begin to inject water. The core flood tanks will also help slow the decrease of RCS pressure, but eventually pressure will drop below 450 psig at which point LPI will be initiated if not previously initiated by 18.0 psia containment pressure. The total time for the pressure drop is dependent on the size of the leak. 19 19

After LPI is initiated, the BWST level will decrease to a low level of 8 feet at which time the decay heat pump must be manually transferred from the BWST to the emergency sump. The CS Pumps discharge valves will throttle when the transfer is made and if not piggybacked, HPI pumps must be shutdown.

In the case of a large leak the containment air coolers may not be able to maintain containment pressure below the 38.1 psia setpoint of SFAS incident level 4 which actuates containment spray. Additional information on SFAS and the engineered safety features equipment may be found in the respective system procedures. 19

Once the accident is over and the decay heat pumps are taking a suction from the emergency sump and discharging to the reactor, the system is in the "long term cooling" mode of operation. Under some circumstances this operation could lead to the increase of boron concentration in the core. To prevent the boron concentration from

increasing to level at which it may begin to precipitate, an additional method of adding water to the core or removing it directly from the core must be established. The primary flowpath is from the RCS hot leg through the two RCS to DH Sytem Isolation Valves DH11 and DH12, and around the DH Pump Suction from RCS Valves DH1517 and DH1518 via the bypass lines, to the DH pump suction and back to the core. Note that the suction from the emergency sump is maintained to assure a supply of water to the pumps. Under certain circumstances, the normal decay heat suction lines from the RCS may contain air or steam which could damage the pumps. For this reason, only DH11 and DH12 are to be opened; do NOT open DH1517 or DH1518 to establish normal decay heat suction.

If the primary flowpath to prevent boron concentration increases is unavailable, the second flowpath into the RCS via the auxiliary spray line will prevent the increase.

4. SFAS INITIATION RECOVERY GUIDELINE

The purpose of this section is:

- To ensure that the SFAS is in the most relible operational condition at all times.
- To act as a guide for recovery from any incident level after a real or erroneous SFAS actuation.

This section is written strictly as a guide for the operator and is in no way intended to be detailed in actions to be taken. No real detail can be provided since the plant conditions at the time of the incident are in themselves unpredictable. The intent of this procedure is to remind or instruct the operator how to evaluate the incident, what general actions need to be taken, what problems to look for, and what detailed emergency and operating procedures will be needed for recovery from the various situations. This procedure in no way removes the responsibility from the operator for the safe and correct operation of the reactor and associated systems.

The purpose of the Safety Features Actuation System (SFAS) is to automatically prevent or limit fission product and energy release from the core, to isolate the containment vessel and to initiate the operation of the ESF equipment in the event of a Loss of Coolant Accident (LOCA).

Following a real or erroneous trip of any SFAS incident level, the status of the associated equipment is dependent mainly on the

incident level(s) actuated. Therefore, this section is divided into subsections by which incident levels occurred. The subsections are:

4.1 Incident Level 1 Occurrence
4.2 Incident Levels 1 and 2 Occureence
4.3 Incident Levels 1, 2, and 3 Occurrence
4.4 Incident Levels 1, 2, 3, and 4 Occurrence
4.5 Deleted

The initial conditions of the reactor, primary and secondary systems, the operator actions during SFAS actuation and the failure of components or systems during SFAS actuation will also determine the corrective action.

Specific restrictions on the blocking and overriding of safety equipment have been established and are listed below. The operator may override certain components provided the associated conditions are met. These components and their conditions are listed in Section 2.6 and are repeated below:

DO NOT OVERRIDE ANY SAFETY EQUIPMENT EXCEPT AS LISTED BELOW:

18| 1. RCS Makeup - The RCS makeup isolation valve MU33 may be overridden to the open position when RCS pressure is greater than 400 psig.

18| 2. Reactor Coolant Pump (RCP) Seal Injection and Return - The RCP Seal Injection and Return Isolation Valves MU66A, B, C, D, MU59A, B, C, D, MU38 may be overridden to the open position when RCS pressure is greater than 400 psig.

18| 3. RCS Letdown - The letdown isolation valves MU2A, MU3 may be opened as required to control RCS inventory when the RCS pressure is greater than 400 psig given that no seismic event occurred.

18| 4. Containment Air and Pressurizer/RCS Samples - The Sample Line Isolation Valves for collecting Containment Air Samples (CV5010A, B, C, D and CV5011A, B, C, D, CV5010E, CV5011E) and Pressurizer/RCS Samples (RC240A, RC240B) may be openned as soon as it is necessary to sample.

18| 5. Decay Heat (DH) Cooler Outlet Valves - The DH cooler outlet valves DH14A, B may be throttled if the cross connect is used per Section 9.0 of SP 1104.04, "DH and LPI Operating Procedure."

6. High pressure injection may be stopped or throttled, provided:

a) All hot and cold leg temperatures are at least 50 degrees below the saturation temperature for the existing RCS pressure (RCS hot leg subcooling can be determined using TDI-4950 or TDI-4951, RCS T_{SAT} METERS. RCS cold leg temperatures are to be compared to Figures 2A or 2B), and not more than 50°F above the secondary side saturation temperature. The degree of subcooling beyond 50°F by HPI shall be limited by the emergency pressure/temperature curve of Figure 2A if any RCP's are running or 2B if all RCP's are off, and

b) Pressurizer level is being maintained.

CAUTION: Do NOT rely entirely on pressurizer level indication to determine the inventory of the RCS. If the RCS temperature is not 50 degrees below the saturation temperature for the RCS pressure, a steam void may exist in the RCS.

If both of these conditions are satisfied, the HPI may be stopped by blocking and stopping the pumps, or throttled using HP2A, B, C, and D.

CAUTION: If 50°F subcooling cannot be maintained after stopping HPI, the HPI shall be restarted. HPI may also be throttled during piggyback operation to less than 950 gpm per pump or as required to balance flow. HPI flow may be stopped if both low pressure injection pumps are in operation with a flow of at least 1000 gpm per pump, and the RCS conditions have been stable for 20 minutes.

If RCS pressure increases above 1650 psig, the makeup pumps should be run with the same restrictions for stopping or throttling as for HPI.

7. Component Cooling Water (CCW) Valve to Makeup Pump - The CCW to Makeup Pump Valve CC 1460 may be overridden to the open position when RCS pressure is greater than 400 psig given no seismic event occurred.

8. Diesel Generator - If a diesel was previously being operated on the hydraulic governor, it may be blocked, stopped, and restarted in the "safety mode".

18 9. Atmospheric vent valves - The atmospheric vent valves (ICS11A, ICS11B) may be opened if required for secondary pressure control.

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 BYPASSED WITH THE SHIFT SUPERVISOR'S PERMISSION.

IF THERE ARE ANY QUESTIONABLE CONDITIONS OR ANY SIGN OF AN RCS LEAK, NO OTHER SAFETY SYSTEMS SHOULD BE BYPASSED WITHOUT APPROVAL OF STATION MANAGEMENT (STATION SUPERINTENDENT OR HIS DESIGNEE).

19 IF AN SFAS SIGNAL TO SOME ESF EQUIPMENT IS "BLOCKED" (I.E. OVERRIDDEN), THAT EQUIPMENT IS INCAPABLE OF RESPONDING TO EITHER ANY SUBSEQUENT AUTOMATIC ACTUATION SIGNAL OR THE SYSTEM-LEVEL MANUAL ACTUATE ("TRIP") PUSHBUTTONS. 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 REACTUATION 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 RESPONDHE INDIVIDUAL CONTROL SWITCHES FOR THAT PIECE OF EQUIPMENT. SECOND, AT THE SYSTEM LEVEL, OPERATION OF THE SYSTEM-LEVEL "RESET" PUSHBUTTON WILL CLEAR ANY OUTPUT LOGIC BLOCKS IN THE SYSTEM (OUTPUT LOGIC "BLOCKS" ARE THE BLOCK SWITCHES NEXT TO THE SAM LIGHTS AND ON THE OUTPUT MODULES). THE EQUIPMENT WILL THEN RESPOND TO THE SYSTEM-LEVEL MANUAL ACTUATE ("TRIP") PUSHBUTTON AND TO AUTOMATIC ACTUATION SIGNALS.

Please note that blocking to re-initiate system operations should be avoided when possible. The desired method for re-establishing system operations after an erroneous trip is to reset the SFAS first.

The corrective action steps listed in the sections do not have to be completed in the order given except as noted. In fact, it would be better if the steps listed were divided among personnel on shift at the time to speed their completion.

4.1 Incident Level 1 Occurrence

An Incident Level 1 Occurrence will automatically initiate when high radiation (2 times background at 100% power) is detected by two out of four containment radiation detectors, or by one out of three detectors when one has been declared inoperable and has been placed in the tripped condition.

PRECAUTION: Prior to any restoration of systems, ensure that the conditions warranting this actuation have been cleared, the plant is in a stable and controlled condition or the fault causing

the automatic initiation has been determined and corrected.

The trip can be determined to be real or erroneous by comparing all four SFAS channels radiation levels and by noting any unusual RCS conditons which would indicate a leak exists.

4.1.1 SFAS Equipment Recovery From Real Initiation

(A) If a real high radiation condition does exist, it is probably indicative of a small RCS leak. Follow Section 1 of this procedure.

(B) After the unit is shutdown, no specific recovery is required from Incident Level 1. Restore actuated equipment listed on Attachment 1 as required after approval per Section 4.0, but do not open closed containment isolation valves unless required by plant conditions.

4.1.2 SFAS Equipment Recovery From Erroneous Initiation

(A) Reset the SFAS cabinets in accordance with SP 1105.03, "SFAS Operating Procedure", Section 5. This may require placing one of the channels with the erroneous input in the tripped condition. Do not reset the SFAS until the fault causing the actuation is cleared. 19

(B) Re-establish the Containment Gas H_2 Analyzer System per SP 1105.15, Section 7.

NOTE: Blocking will not be required as per Step 7.1.1 of SP 1105.15 if Step (A) above has been completed.

(C) Secure the Emergency Ventilation System per SP 1104.15, Section 4, Steps 4.23 through 4.2.6.

(D) Restart the Control Room Ventilation System per SP 1104.14, Section 4, as required.

(E) Re-establish ECCS Rooms Ventilation per SP 1104.16, Section 4, Steps 4.3.14 through 4.3.16.

(F) Secure the Containment Purge System per SP 1104.21, Section 6; or restart per Section 4 as required.

(G) Restore other SFAS actuated equipment as listed on Attachment 1 to normal as directed by the Shift Supervisor.

4.2 Incident Levels 1 and 2 Occurrence

A combined occurrence of Incident Levels 1 and 2 will automatically initiate when primary plant pressure drops to less than 1650 psig or containment vessel pressure raises to greater than 18.0 psia. 19

PRECAUTION: Prior to any restoration of systems, ensure that the conditions warranting this actuation have been cleared, the plant is in a stable and controlled condition, or the fault causing the automatic initiation has been determined and corrected.

The trip can be determined to be real or erroneous by comparing all four SFAS channels for the parameter which tripped the SFAS as indicated by the annunciators. If RCS pressure has reduced to 1985 psig, the independent RPS pressure transmitters would have tripped the reactor. Also, if enough reactor coolant was released into containment to provide 18.0 psia, radiation levels should have increased and pressurizer water level should have dropped. 19

NOTE: If an SFAS Level 2 Trip has occurred and the EDG's are supplying C-1 and D-1 busses DO NOT reset SFAS until offsite power is restored. If SFAS is reset and subsequently actuated with an existing loss of offsite power the EDG sequencer will not be reset and all loads will be instantaneously placed on the EDG, overloading the unit. The sequencer logic will only be reset by closing the essential bus feeder breaker or cross-tie.

4.2.1 SFAS Equipment Recovery From Real Initiation

Recovery from this situation will generally be

conducted after the establishment of cooldown and depressurization per Sections 1, 2, or 3 of EP 1202.06.

The primary concern during this recovery is the assurance of no further release of fission products or energy from the core and continued integrity of the containment vessel. To ensure this, the plant must be in a shutdown condition with a reliable source of cooldown and depressurization in progress.

After approval per Section 4.0:

(A) Return both Emergency Diesel Generators to normal standby conditions per SP 1107.11, "EDG Operating Procedure" if not required for emergency power.

(B) If the condition causing the trip has cleared, reset the SFAS cabinets per SP 1105.03, (SFAS), Section 5. 19|

NOTE: Resetting of the SFAS cabinets will not change the status of the actuated equipment.

(C) If the SFAS cabinets have been reset, restore other SFAS actuated equipment as listed on Attachment 1 to normal. Do not open containment isolation valves unless necessary.

4.2.2 SFAS Equipment Recovery From Erroneous Incident Levels 1 and 2 Trip

After approval from the Shift Supervisor:

(A) Reset the SFAS cabinets per SP 1105.03, "SFAS Operating Procedure", Section 5. This may require placing one of the channels with the erroneous input in the tripped condition. Do not reset the cabinets until the fault causing the actuation is cleared. 19|

(B) Re-establish seal injection flow by:

(1) Closing the seal injection flow control valve using FIC MU19 on C5704.

(2) Reopen the RCP seal injection valves MU66C (D, A, B) from C5717.

(3) Reopen MU19 until a flow of 3-5 GPM per seal is established. Open MU38, MU59C, (D, A, B) and slowly establish approximately 32 GPM. Transfer hand/auto station to auto.

(4) Re-establish letdown when necessary for RCS inventory control.

(C) Stop both HPI Pumps and close all four injection valves HP2A, B, C, and D from C5716.

(D) Return both Emergency Diesel Generators to normal standby conditions per SP 1107.11, "EDG Operating Procedure".

(E) Re-establish the Containment Gas H_2 Analyzer Sytem per SP 1105.15, Section 7.

NOTE: Blocking will not be required as per Step 7.1.1 of SP 1105.15, if Step (A) above has been completed.

(F) Secure the Emergency Ventilation System per SP 1104.15, Section 4.

(G) Re-start the Control Room Ventilation System per SP 1104.14, Section 4, as required.

(H) Re-establish ECCS Rooms Ventilation per SP 1104.16, Section 4.

(I) Restore the Containment Purge System per SP 1104.21.

(J) Restore other SFAS actuated equipment as listed on Attachment 1.

19 (K) If an SFRCS trip has occured in parallel with the SFAS trip such that the OTSG level control setpoint has been changed

19 to the "HIGH" value, return the setpoint to the "LOW" value by pressing "LOW" on HIS SP9B for SG1 and HIS SP9A for SG2. Switches located on the SFAS valve panel.

4.3 Incident Levels 1, 2, and 3 Occurrence

19 A combined occurrence of Incident Levels 1, 2, and 3 will automatically initiate when primary plant pressure drops to 450 psig or containment pressure of 18.0 psia. A comparison of the RCS pressure reading in each SFAS Channel will determine if the trip is from a real incident or from erroneous instrumentation. Also, the RPS has separate RC pressure transmitters that will trip the reactor if RCS pressure drops to 1985 psig. If the event is indeed due to a LOCA, containment pressure and radiation levels would be elevated. See Section 1 through 3 of this procedure for further guidance on deciding if the actuation is from a real incident.

PRECAUTION: Prior to any restoration of systems, ensure that the conditions warranting this actuation have been cleared, the plant is in a stable and controlled condition, or the fault causing the atuomatic initiation has been determined and corrected.

NOTE: If an SFAS Level 2 Trip has occurred and the EDG's are supplying C-1 and D-1 busses DO NOT reset SFAS until offsite power is restored. If SFAS is reset and subsequently actuated with an existing loss of offsite power the EDG sequencer will not be reset and all loads will be instantaneously placed on the EDG, overloading the unit. The sequencer logic will only be reset by closing the essential bus feeder breaker or cross-tie.

4.3.1 Recovery From Real Incident Levels 1, 2, and 3 Occurrence.

Recovery from this situation will generally be conducted after the establishment of cooldown and depressurization per Sections 1, 2, or 3, of EP 1202.06.

The primary concern during this recovery is the assurance of no further release of fission products, to keep the core cool, and the continued integrity of the containment vessel. To ensure this, the plant must be in a shutdown condition with a reliable source of cooldown and depressurization in progress.

After approval per Section 4.0:

(A) High pressure injection may be stopped or throttled provided:

a) All hot and cold leg temperatures are at least 50 degrees below the saturation temperature for the existing RCS pressure (RCS hot leg subcooling can be determined using TDI-4950 or TDI-4951, RCS T_{SAT} METERS. RCS cold leg temperatures are to be compared to Figures 2A or 2B), and not more than 50°F above the secondary side saturation temperature. The degree of subcooling beyond 50°F by HPI shall be limited by the emergency pressure/temperature curve of Figure 2A if any RCP's are running or 2B if all RCP's are off. and

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b) Pressurizer level is being maintained.

CAUTION: Do NOT rely entirely on pressurizer level indication to determine the inventory of the RCS. If the RCS temperature is not 50 degrees below the saturation temperature for the RCS pressure, a steam void may exist in the RCS.

If both of these conditions are satisfied, the HPI may be stopped by blocking and

stopping the pumps, or throttled using HP2A, B, C, and D.

CAUTION: If 50°F subcooling cannot be maintained after stopping HPI, the HPI shall be restarted.

HPI may also be throttled during piggy-back operation to less than 950 gpm per pump or as required to balance flow. HPI flow may be stopped if both low pressure injection pumps are in operation with a flow of at least 1000 gpm per pump, and the RCS conditions have been stable for 20 minutes.

If RCS pressure increases above 1650 psig, the makeup pumps should be run with the same restrictions for stopping or throttling as for HPI.

(B) Return both Emergency Diesel Generators to normal standby condition per SP 1107.11, "EDG Operating Procedure" if not required for emergency power.

(C) If the condition causing the trip has cleared, reset the SFAS cabinets per SP 1104.03, "SFAS Operating Procedure", Section 5. 19|

(D) If the SFAS is reset, restore other SFAS actuated equipment as listed on Attachment 1 to normal. Do not open containment isolation valves unless necessary.

4.3.2 SFAS Recovery From Erroneous Incident Levels 1, 2, and 3 Occurrence

After approval from the Shift Supervisor:

(A) Reset the SFAS cabinets in accordance with SP 1105.03, "SFAS Operating Procedure", Section 5. This may require placing one of the channels with the erroneous input in the tripped condition. Do not reset the SFAS until the fault causing the actuation is cleared. 19|

(B) Re-establish seal injection flow by:

(1) Re-open CC1460 to supply cooling water to the MU Pumps.

(2) Closing the seal injection flow control valve using FIC MU19 on C5704.

(3) Reopen the RCP seal injection valves MU66C (D, A, B) from C5717.

(4) Reopen MU19 until a flow of 3-5 GPM per seal is established. Open MU38, MU59C (D, A, B) and slowly establish approximately 32 GPM. Transfer hand/auto station to auto.

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(5) Re-establish letdown when required for RCS inventory control.

(C) Stop both HPI Pumps and close all four injection valves HP2A (B, C, D) from C5716.

(D) Stop both DH Pumps from C5716.

(E) Return both Emergency Diesel Generators to normal standby condition per SP 1107.11, "Emergency Diesel Generator Operating Procedure".

(F) Close CS Valves CS1530 and CS1531 from C5716.

(G) Restore CCW to normal lineup and close the CCW to DH Coolers outlet valves CC1467 and CC1469 from C5716.

(H) Re-establish the Containment Gas H_2 Analyzer System per SP 1105.15, Section 7.

NOTE: Blocking will not be required as per Step 7.1.1 of SP 1105.15, if Step (A) above has been completed.

(I) Secure the Emergency Ventilation System per SP 1104.15, Section 4.

(J) Restart the Control Room Ventilation System per SP 1104.14, Section 4 as required.

(K) Re-establish ECCS Rooms Ventilation per SP 1104.16, Section 4.

(L) Restore the Containment Purge System per SP 1104.21.

(M) Restore other SFAS actuated equipment as listed on Attachment 1 to normal.

19 (N) If an SFRCS trip has occured in parallel with the SFAS trip such that the OTSG level control setpoint has been changed to the "HIGH" value, return the setpoint to the "LOW" value by pressing "LOW" on HIS SP9B for SG1 and HIS SP9A for SG2. Switches located on the SFAS valve panel.

4.4 Incident Levels 1, 2, 3, and 4 Occurrence

19 A combined occurrence of Incident Levels 1, 2, 3, and 4 will automatically initiate when containment pressure increases to 38.1 psia. Since the only real incident that can cause this change increase in containment is a major LOCA, by a quick observation of RCS pressure, pressurizer level, and containment radiation levels, the operator can determine if the incident is real or erroneous.

PRECAUTION: Prior to any restoration of systems, ensure that the conditions warranting this actuation have been cleared, the plant is in a stable and controlled condition, or the fault causing the automatic initiation has been determined and corrected.

If Incident Levels 1 through 4 are due to a real occurrence, the BWST level will drop within a matter of hours to the low level setpoint and the DH and CS Pumps suction will be transferred to the emergency sump. Therefore, the recovery from a real Incident Level 1 through 4 Occurrence is the same as from an Incident Level 1 through 5 Occurrence.

NOTE: If an SFAS Level 2 Trip has occurred and the EDG's are supplying C-1 and D-1 busses DO NOT reset SFAS until offsite power is restored. If

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SFAS is reset and subsequently actuated with an existing loss of offsite power the EDG sequencer will not be reset and all loads will be instantaneously placed on the EDG, overloading the unit. The sequencer logic will only be reset by closing the essential bus feeder breaker or cross-tie.

4.4.1 Recovery From Real Incident Levels 1, 2, 3, and 4 Occurrence

Recovery from this situation will generally be conducted after the establishment of cooldown and depressurization per Section 3 or EP 1202.06.

The primary concern during this recovery is the assurance of no further release of fission products, to keep the core cool and the continued integrity of the containment vessel. To ensure this, the plant must be in a shutdown condition with a reliable source of cooldown and depressurization in progress.

After approval per Section 4.0:

(A) High pressure injection may be stopped or throttled provided:

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a) All hot and cold leg temperatures are at least 50 degrees below the saturation temperature for the existing RCS pressure (RCS hot leg subcooling can be determined using TDI-4950 or TDI-4951, RCS T_{SAT} METERS. RCS cold leg temperatures are to be compared to Figures 2A or 2B), and not more than 50°F above the secondary side saturation temperature. The degree of subcooling beyond 50°F by HPI shall be limited by the emergency pressure/temperature curve of Figure 2A if any RCP's are running or 2B if all RCP's are off. and

b) Pressurizer level is being maintained.

CAUTION: Do NOT rely entirely on pressurizer level indication to determine the inventory of the RCS. If the RCS temperature is not 50 degrees below the saturation temperature for the RCS pressure, a steam void may exist in the RCS.

If both of these conditions are satisfied, the HPI may be stopped by blocking and stopping the pumps, or throttled using HP2A, B, C, and D.

CAUTION: If 50°F subcooling cannot be maintained after stopping HPI, the HPI shall be restarted.

HPI may also be throttled during piggyback operation to less than 950 gpm per pump or as required t balance flow. HPI flow may be stopped if both low pressure injection pumps are in operation with a flow of at least 1000 gpm per pump, and the RCS conditions have been stable for 20 minutes.

If RCS pressure increases above 1650 psig, the makeup pumps should be run with the same restrictions for stopping or throttling as for HPI.

(B) If containment pressure has returned to below 15 psia, shut off both CS Pumps and close CS Isolation Valves CS1530 and CS1531.

(C) Return both EDG to normal standby condition per SP 1107.11, "Emergency Diesel Generator Operating Procedure" if not required for emergency poweer.

(D) If the condition causing the trip has cleared, reset the SFAS cabinets per SP 1105.03, "SFAS Operating Procedure", Section 5. 19|

(E) If the SFAS has been reset, restore other SFAS actuated equipment as listed on Attachment 1 to normal. Do not open Containment Isolation Valves unless necessary. Do not close the containment emergency sump outlet valves if DH/CS suction is from the emergency sump.

4.4.2 SFAS Equipment Recovery From Erroneous Incident Levels 1 through 4 Occurrence

Since Incident Level 4 closes the MSIV's, the plant trip is a certainty. The operators efforts must be to stop both CS Pumps from spraying borated water into containment and reestablishing CCW to the containment header. 19|

After approval from the Shift Supervisor:

(A) Push the block pushbuttons by the CS Pump control switch on C5716 and stop both CS Pumps.

(B) Block and reopen the CCW Isolation Valves CC1407A and B and CC1411 A and B. If all RCP's are lost, follow EP 1202.14, "Loss of Reactor Coolant Flow - RCP Trip".

(C) Reset the SFAS cabinets in accordance with SP 1105.03, "SFAS Operating Procedure" Section 5. This may require placing one of the channels with the erroneous input in the tripped condition. Do not reset the SFAS until the fault causing the actuation is cleared. 19|

(D) Open the MSIV's per Step 1.4.12 of EP 1202.26, "Loss of S.G. Feed", and control SG pressure using the turbine bypass valves.

(E) Stop both HPI Pumps and close all four injection valves HP2A (B, C, D) from C5716.

(F) Stop both DH Pumps from C5716.

(G) Return both Emergency Diesel Generators to normal standby condition per SP 1107.11, "Emergency Diesel Generator Operating Procedure".

(H) Close CS Injection Valves CS1530 and CS 1531 from C5716.

(I) Restore CCW to normal lineup and close the CCW to DH Coolers Outlet Valves CC1467 and CC1469 from C5716.

(J) Re-establish the Containment Gas H_2 Analyzer System per SP 1105.15, Section 7.

NOTE: Blocking will not be performed as per Step 7.1.1 if Step (C) above has been completed.

(K) Secure the Emergency Ventilation System per SP 1104.15, Section 4.

(L) Restart the Control Room Emergency Ventilation System per SP 1104.14, Section 4, as required.

(M) Re-establish ECCS Room Ventilation per SP 1104.16, Section 4.

(N) Restore the Containment Purge System per SP 1104.21.

(O) Restore other SFAS actuated equipment as listed on Attachment 1 to normal.

19 (P) If an SFRCS trip has occured in parallel with the SFAS trip such that the OTSG level control setpoint has been changed to "HIGH" value, return the setpoint to the "LOW" value by pressing "LOW" on HIS SP9B for SG1 and HIS SP9A for SG2. Switches located on the SFAS valve panel.

ACTUATED EQUIPMENT TABULATION

SFAS Incident Level 1

EQUIP NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
C30-1	M-029A	Emer Vent Fan 1	SA 111A	Start	Off
HV 5439	M-028B	ECCS Room 105 HV&AC Iso Vlv	SA 111B	Closed	Open
HV 5440	M-028B	ECCS Room 105 HV&AC Iso Vlv	SA 111C	Closed	Open
HV 5024	M-029A	Emer Vent Fan 1 Vlv from Aux. Bldg.	SA 111D	Closed	Various
HV 5716	M-028B	ECCS Room 115 Iso Dmpr	SA 111E	Closed	Various
C30-2	M-029A	Emer Vent Fan 2	SA 112A	Start	Off
HV 5441	M-028B	ECCS Room 115 HV&AC Iso Vlv	SA 112B	Closed	Open
HG 5442	M-028B	ECCS Room 115 HV&AC Iso Vlv	SA 112C	Closed	Open
HV 5025	M-029A	Emer Vent Fan 2 Vlv from Aux. Bldg.	SA 112D	Closed	Various
HV 5715	M-028B	ECCS Room 105 Iso Dmpr	SA 112E	Closed	Various
CV 5008	M-029A	CTMT Purge Out Iso Vlv	SA 121B	Closed	Closed
CV 5011A	M-029B	CTMT Air Sample Iso Vlv	SA 121C	Closed	Open
CV 5011B	M-029B	CTMT Air Sample Iso Vlv	SA 121D	Closed	Open
CV 5011C	M-029B	CTMT Air Sample Iso Vlv	SA 121E	Closed	Open
CV 5011D	M-029B	CTMT Air Sample Iso Vlv	SA 121F	Closed	Open
CV 5006	M-029A	CTMT Purge In Iso Vlv	SA 121G	Closed	Closed
CV 5009	M-029A	Mech Pent Room 4 Purge Vlv	SA 121H	Closed	Closed
CV 5016	M-029A	Mech Pent Room 4 Purge Vlv	SA 121I	Closed	Closed
CV 5011E	M-029B	CTMT Air Smpl Ret Iso Vlv	SA 121J	Closed	Open
S10-1	M-027A	CTRM Ret Fan & HV/AC Unit 1	SA 121L	Various	

ACTUATED EQUIPMENT TABULATION

SFAS Incident Level 1

EQUIP. NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
CV 5010D	M-029B	CTMT Air Sample Iso Vlv	SA 122B	Closed	Open
CV 5004	M-029A	Mech Pent Room 3 Purge Vlv	SA 122C	Closed	Closed
CV 5021	M-029A	Mech Pent Room 3 Purge Vlv	SA 122D	Closed	Closed
CV 5005	M-029A	CTMT Purge In Iso Vlv	SA 122E	Closed	Closed
CV 5007	M-029A	CTMT Purge Out Iso Vlv	SA 122F	Closed	Closed
CV 5010A	M-029B	CTMT Air Sample Iso Vlv	SA 122G	Closed	Open
CV 5010B	M-029B	CTMT Air Sample Iso Vlv	SA 122H	Closed	Open
CV 5010C	M-029B	CTMT Air Sample Iso Vlv	SA 122I	Closed	Open
CV 5010E	M-029B	CTMT Air Sample Ret Iso Vlv	SA 122J	Closed	Open
S10-2	M-027A	CTRM Ret Fan & HV/AC Unit 2	SA 122L	Stop	Various
		SFAS Incident Level 2			
P58-1	M-033	HP Inj PMP 1	SA 211A	Start	Off
HP2C	M-033	HP Inj 1-1 Vlv	SA 211B	Open	Closed
HP2D	M-033	HP Inj 1-2 Vlv	SA 211C	Open	Closed
P58-2	M-033	HP Inj Pmp 2	SA 212A	Start	Off
HP2A	M-033	HP Inj 1-2 Vlv	SA 212B	Open	Closed
HP2B	M-033	HP Inj 2-2 Vlv	SA 212C	Open	Closed
C 1-1	M-029A	CTMT Clr Fan 1	SA 221A	Start	Various
C 1-3	M-029A	CTMT Clr Fan 3	SA 221B	Slow	Various
C 1-2	M-029A	CTMT Clr Fan 2	SA 222A	Slow	Various
C 1-3	M-029A	CTMT Clr Fan 3	SA 222B	Slow	Various

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ACTUATED EQUIPMENT TABULATION

SFAS Incident Level 2

EQUIP. NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
P43-1	M-036	CC Pump 1	SA 231A	Start	Various
P43-3	M-036	CC Pump 3	SA 231B	Start	Various
CV 5070	M-029B	CTMT Vacm Rlf Iso Vlv	SA 231C	Closed	Open
CV 5071	M-029B	CTMT Vacm Rlf Iso Vlv	SA 231D	Closed	Open
CV 5072	M-029B	CTMT Vacm Rlf Iso Vlv	SA 231E	Closed	Open
CV 5073	M-029B	CTMT Vacm Rlf Iso Vlv	SA 231F	Closed	Open
DH 5074	M-029B	CTMT Vacm Rlf Iso Vlv	SA 231G	Closed	Open
P43-2	M-036	CC Pump 2	SA 232A	Start	Various
P43-3	M-036	CC Pump 3	SA 232B	Start	Various
CV 5075	M-029B	CTMT Vacm Rlf Iso Vlv	SA 232C	Closed	Open
CV 5076	M-029B	CTMT Vacm Rlf Iso Vlv	SA 232D	Closed	Open
CV 5077	M-029B	CTMT Vacm Rlf Iso Vlv	SA 232E	Closed	Open
CV 5078	M-029B	CTMT Vacm Rlf Iso Vlv	SA 232F	Closed	Open
CV 5079	M-029B	CTMT Vacm Rlf Iso Vlv	SA 232G	Closed	Open
P3-1	M-041	SW Pump 1	SA 241A	Start	Various
P3-3	M-041	SW Pump 3	SA 241B	Start	Various
SW 1424	M-041	SW From CC HX 1 Iso Vlv	SA 241C	Open	Various
SW 1429	M-041	SW From CC HX 3 Iso Vlv	SA 241D	Open	Various
P3-2	M-041	SW Pump 2	SA 242A	Start	Various
P3-3	M-041	SW Pump 3	SA 242B	Start	Various
SW 1434	M-041	SW From CC HX 2 Iso Vlv	SA 242C	Open	Various
SW 1429	M-041	SW From CC HX 3 Iso Vlv	SA 242D	Open	Various
CS 1530	M-034	CS 1 Iso Vlv	SA 251A	Open	Closed
CS 1531	M-034	CS 2 Iso Vlv	SA 252A	Open	Closed
K 5-1	E-3	Emer DG 1	SA 261A	Start	Off
K 5-2	E-3	Emer DG 2	SA 262A	Start	Off

ACTUATED EQUIPMENT TABULATION

SFAS Incident Level 2

EQUIP NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
MU2A	M-031	RC Letdown Delay Coil Out Vlv	SA 271A	Closed	Open
DR 2012A	M-046	CTMT Norm Sump Iso Vlv	SA 271D	Closed	Open
RC 240A	M-030	RC PRZR Sample Vlv	SA 271E	Closed	Closed
SW 1399	M-041	SW Iso Vlv to Clng Wtr	SA 271F	Closed	Open
RC 1773A	M-040A	RC DT Hdr Iso Vlv	SA 271G	Closed	Open
RC 1719A	M-040A	CTMT Vent Hdr Iso Vlv	SA 271H	Closed	Open
SS 607	M-007	SG 1 Sample Iso Vlv	SA 271I	Closed	Open
ICS 11B	M-007	SG 1 Atm Stm Vent Vlv	SA 271J	Closed	Open
SS 235A	M-040A	Przr Qnch Tk Sample Iso Vlv	SA 271K	Closed	Closed
CF 1544	M-034	CF Tk 1 H_2O and N_2 Fill Iso Vlv	SA 271L	Closed	Closed
MU 3	M-031	RC Letdown Hi Temp Vlv	SA 272A	Closed	Open
DR 2012B	M-046	CTMT Norm Sump Iso Vlv	SA 272C	Closed	Open
RC 240B	M-030	RC Przr Vapor Sample Vlv	SA 272D	Closed	Closed
CF 1542	M-034	CF Tk Vent Iso Vlv	SA 272E	Closed	Closed
SW 1395	M-041	SW Iso Vlv to Clng Wtr	SA 272F	Closed	Closed
RC 1773B	M-040A	RC DT Hdr Iso Vlv	SA 272G	Closed	Open
RC 1719B	M-040A	CTMT Vent Hdr Iso Vlv	SA 272H	Closed	Open
SS 598	M-007	SG 2 Sample Iso Vlv	SA 272I	Closed	Open
ICS 11A	M-007	SG 2 Atm Stm Vent Vlv	SA 272J	Closed	Open
SS 235B	M-040A	PRZR Qnch Tk Sample Iso Vlv	SA 272K	Closed	Closed
CF 1541	M-034	CF TK 2 H_2O and N_2 Fill Iso Vlv	SA 272L	Closed	Closed
DH 9B	M-033	CTMT Emer Sump Vlv	SA 281A	Closed	Closed
MU 59A	M-031	RCP 2-1 Seal Ret Vlv	SA 281B	Closed	Open
MU 59B	M-031	RCP 2-2 Seal Ret Vlv	SA 281C	Closed	Open
MU 59C	M-031	RCP 1-1 Seal Ret Vlv	SA 281D	Closed	Open
MU 59D	M-031	RCP 1-2 Seal Ret Vlv	SA 281E	Closed	Open
DH 7B	M-033	BWST Out Vlv	SA 281G	Open	Open
NN 236	M-019	N_2 CTMT Iso Vlv	SA 281H	Closed	Open
RC 229A	M-040A	PRZR Qnch Tk Out Iso Vlv	SA 281I	Closed	Open
MS 394	M-003	Mn Stm Line 1 WU Drn Iso Vlv	SA 281J	Closed	Open

ACTUATED EQUIPMENT TABULATION

SFAS Incident Level 2

EQUIP. NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
MU 33	M-031	RC MU Iso Vlv	SA 281K	Closed	Open
MU 66B	M-031	RCP 2-2 Seal In Iso Vlv	SA 281L	Closed	Open
MU 66C	M-031	RCP 1-1 Seal In Iso Vlv	SA 281M	Closed	Open
RC 232	M-040A	PRZR Qnch Tk In Iso Vlv	SA 282A	Closed	Open
RC 229B	M-040A	PRZR Qnch Tk Out Iso Vlv	SA 282B	Closed	Open
HV MU66A	M-031	RCP 2-1 Seal In Iso Vlv	SA 282C	Closed	Open
CC 1545	M-034	CF Tk Sample Vlv	SA 282D	Closed	Closed
DH 9A	M-033	CTMT Emer Sump Vlv	SA 282E	Closed	Closed
MU 38	M-031	RCP Seal Ret Iso Vlv	SA 282F	Closed	Open
DH 7A	M-033	BWST Out Vlv	SA 282G	Open	Open
IA 2011	M-015	CTMT Instr Air Iso Vlv	SA 282H	Closed	Open
SA 2010	M-015	CTMT Serv Air Iso Vlv	SA 282I	Closed	Open
MS 375	M-003	Mn Stm Line 2 WU Drn Iso Vlv	SA 282J	Closed	Closed
MU 66D	M-031	RCP 1-2 Seal In Iso Vlv	SA 282K	Closed	Open
CV 5065	M-029A	CTMT H2 Dilution In Iso Vlv	SA 291A	Closed	Closed
DW 6831A	M-010B	RCP STDP Demin Wtr Iso Vlv	SA 291C	Closed	Open
CV 5038	M-029A	CTMT H2 Dilution Out Iso Vlv	SA 291E	Closed	Closed
CV 5090	M-029A	CTMT H2 Dilution In Iso Vlv	SA 292B	Closed	Closed
DW 6831B	M-010B	RCP STDP Demin Wtr Iso Vlv	SA 292C	Closed	Open
CV 5037	M-029A	CTMT H2 Dilution Out Iso Vlv	SA 292E	Closed	Closed

ACTUATED EQUIPMENT TABULATION

SFAS Incident Level 3

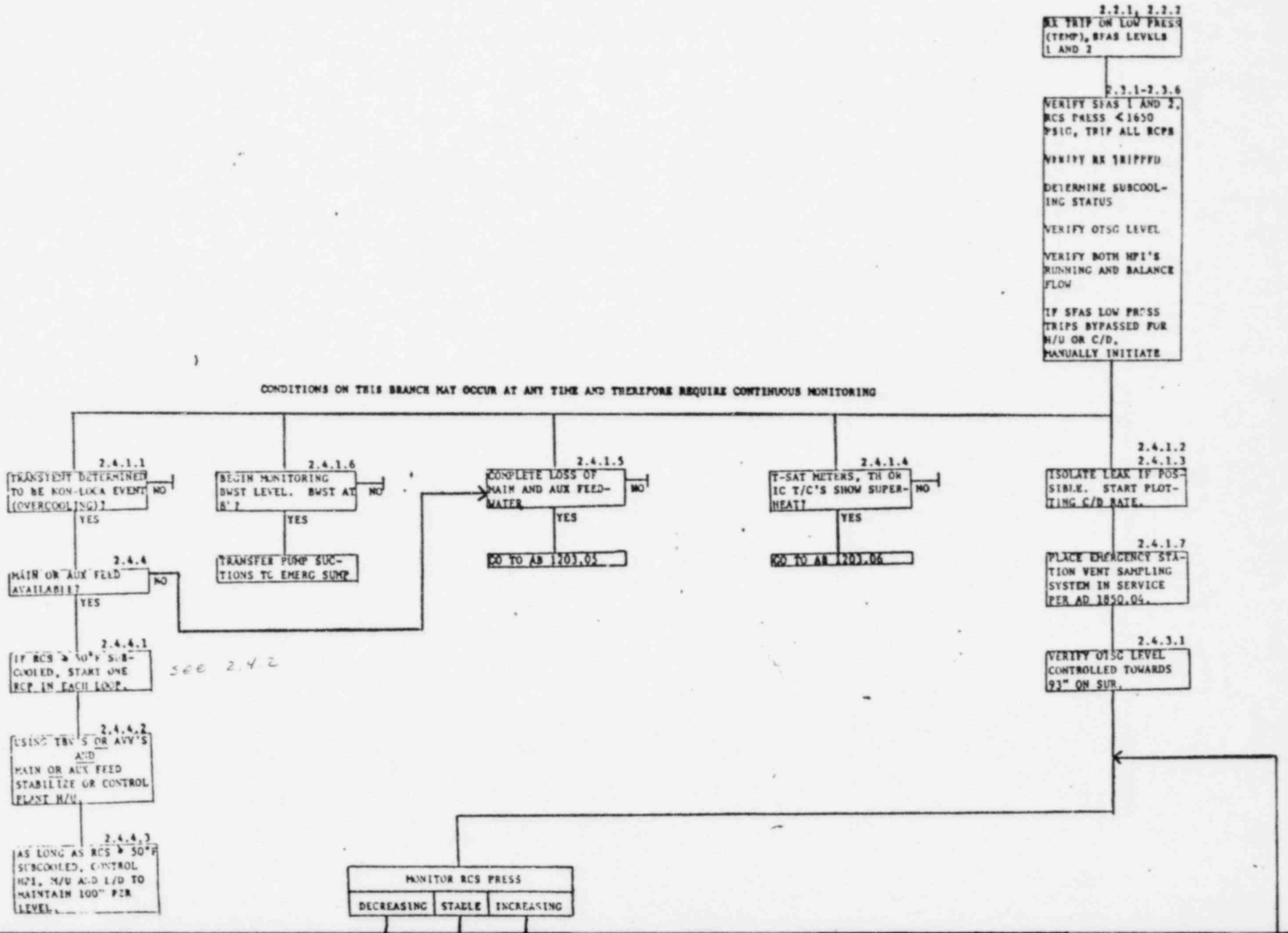
EQUIP. NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
P 42-1	M-033	DH Pump 1	SA 311A	Start	Various
HV 1467	M-036	CC From DH Clr 1 Out Vlv	SA 311C	Open	Various
HV 2733	M-033	DH Pump 1 Suct Vlv From BWST	SA 311D	Open	Various
HV DH14B	M-033	DH Clr 1 Out Vlv	SA 311E	Open	Various
HV DH13B	M-033	DH Clr 1 Bypass Vlv	SA 311F	Closed	Various
P 42-2	M-033	DH Pump 2	SA 312A	Start	Various
HV 1469	M-036	CC From DH Clr 2 Out Vlv	SA 312C	Open	Various
HV 2734	M-033	DH Pump 2 Suct Vlv from BWST	SA 312D	Open	Various
HV DH14A	M-033	DH Clr 2 Out Vlv	SA 312E	Open	Various
HV DH13A	M-033	DH Clr 2 Bypass Vlv	SA 312F	Closed	Various
HV 1495	M-036	CC Aux Equip In Vlv	SA 321A	Closed	Open
HV 1460	M-036	CC Vlv to Emer Inst Air Cmps	SA 322A	Closed	Open

SFAS Incident Level 4

P 56-1	M-034	CS Pump 1	SA 411A	Start	Off
P 56-2	M-034	CS Pump 2	SA 412A	Start	Off
CC 1411A	M-036	CC In Iso Vlv to CTMT	SA 421A	Closed	Open
CC 1407A	M-036	CC Out Iso Vlv from CTMT	SA 421B	Closed	Open
CC 1567A	M-036	CC In Iso Vlv to CRD	SA 421C	Closed	Open
CC 1328	M-036	CC CRD Booster Pump 1 Suct Vlv	SA 421D	Closed	Open

SFAS Incide. Level 4

EQUIP. NO.	P&ID NO.	EQUIPMENT DESCRIPTION	SA SIGNAL NO.	SA POSITION	NORMAL POSITION
CC 1411B	M-036	CC In Iso Vlv to CTMT	SA 422A	Closed	Open
CC 1407B	M-036	CC Out Iso Vlv from CTMT	SA 422B	Closed	Open
CC 1567B	M-036	CC In Iso Vlv to CRD	SA 422C	Closed	Open
CC 1338	M-036	CC CRD Booster Pump 2 Suct Vlv	SA 422D	Closed	Open
MS 101	M-003	Mn Stm Line 1 Iso Vlv	SA 431A	Closed	Open
FW 612	M-007	Mn FW 1 Stop Vlv	SA 431C	Closed	Open
MS 101=1	M-003	Mn Stm Line 1 WU Iso Vlv	SA 431E	Closed	Closed
MS 100	M-003	Mn Stm Line 2 Iso Vlv	SA 432A	Closed	Open
FW 601	M-007	Mn FW 2 Stop Vlv	SA 432C	Closed	Open
MS 100-1	M-003	Mn Stm Line 2 WU Iso Vlv	SA 432E	Closed	Closed


2.2.1, 2.2.2
RX TRIP ON LOW PRESS (TEMP), SFAS LEVELS 1 AND 2
2.2.1-2.3.6
VERIFY SFAS 1 AND 2, RCS PRESS < 1650 PSIG, TRIP ALL RCPS
VERIFY RX TRIPPED
DETERMINE SUBCOOLING STATUS
VERIFY OTSG LEVEL
VERIFY BOTH HPI'S RUNNING AND BALANCE FLOW
IF SFAS LOW PRESS TRIPS BYPASSED FOR H/U OR C/D, MANUALLY INITIATE
CONDITIONS ON THIS BRANCH MAY OCCUR AT ANY TIME AND THEREFORE REQUIRE CONTINUOUS MONITORING
2.4.1.1
TRANSIENT DETERMINED TO BE NON-LOCA EVENT (OVERCOOLING)?
NO
YES
2.4.1.6
BEGIN MONITORING BWST LEVEL. BWST AT 8'?
NO
YES
TRANSFER PUMP SUCTIONS TO EMERG SUMP
2.4.1.5
COMPLETE LOSS OF MAIN AND AUX FEEDWATER
NO
YES
GO TO AB 1203.05
2.4.1.4
T-SAT METERS, TH OR IC T/C'S SHOW SUPERHEAT?
NO
YES
GO TO AB 1203.06
2.4.1.2
2.4.1.3
ISOLATE LEAK IF POSSIBLE. START PLOTTING C/D RATE.
2.4.4
MAIN OR AUX FEED AVAILABLE?
NO
YES
2.4.4.1
IF RCS ≥ 50°F SUBCOOLED, START ONE RCP IN EACH LOOP.
SEE 2.4.2
2.4.4.2
USING TBV'S OR AVV'S AND MAIN OR AUX FEED STABILIZE OR CONTROL PLANT H/U.
2.4.4.3
AS LONG AS RCS ≥ 50°F SUBCOOLED, CONTROL HPI, H/U AND L/D TO MAINTAIN 100" PZR LEVEL.
2.4.1.7
PLACE EMERGENCY STATION VENT SAMPLING SYSTEM IN SERVICE PER AD 1850.04.
2.4.3.1
VERIFY OTSG LEVEL CONTROLLED TOWARDS 93" ON SUR.
MONITOR RCS PRESS
DECREASING
STABLE
INCREASING

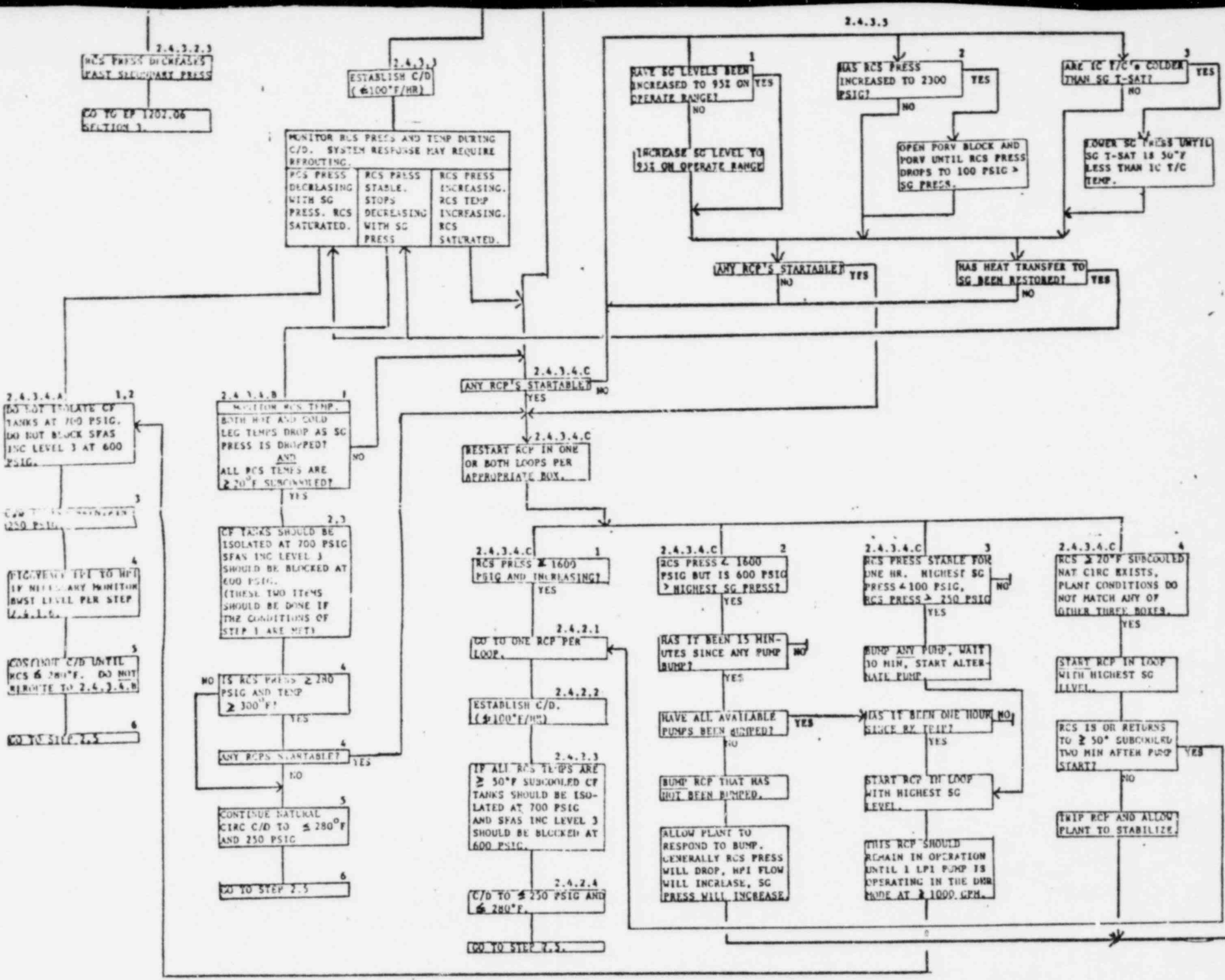
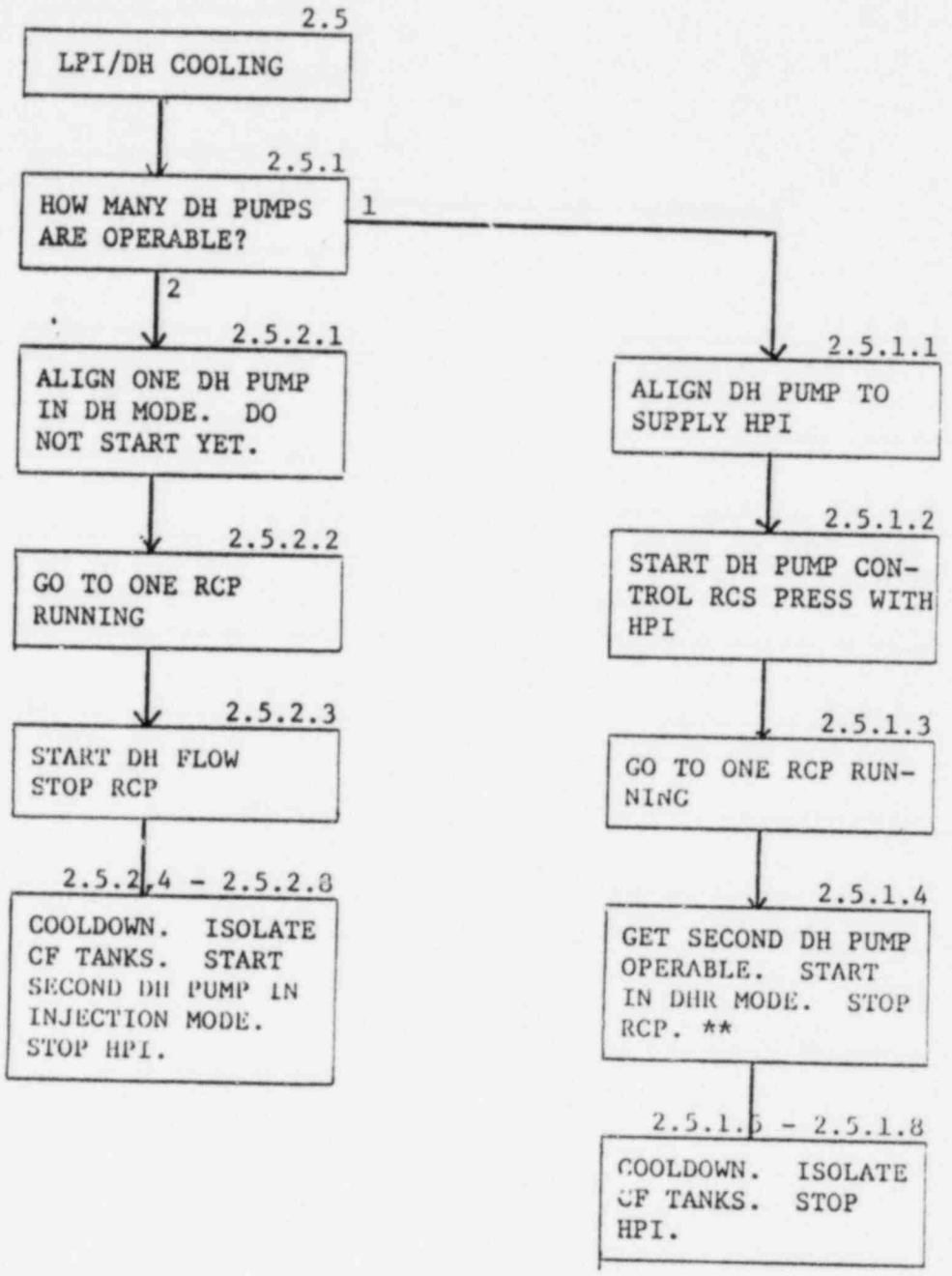

2.4.3.2.3
RCS PRESS DECREASES PAST SECONDARY PRESS
GO TO EP 1202.06 SECTION 3.
2.4.3.1
ESTABLISH C/D (≤100°F/HR)
MONITOR RCS PRESS AND TEMP DURING C/D. SYSTEM RESPONSE MAY REQUIRE REROUTING.
RCS PRESS DECREASING WITH SG PRESS. RCS SATURATED.
RCS PRESS STABLE. STOPS DECREASING WITH SG PRESS
RCS PRESS INCREASING. RCS TEMP INCREASING. RCS SATURATED.
2.4.3.3
1
HAVE SG LEVELS BEEN INCREASED TO 95% ON OPERATE RANGE?
YES
NO
INCREASE SG LEVEL TO 95% ON OPERATE RANGE
2
HAS RCS PRESS INCREASED TO 2300 PSIG?
YES
NO
OPEN PORV BLOCK AND PORV UNTIL RCS PRESS DROPS TO 100 PSIG > SG PRESS.
3
ARE IC T/C ≥ COLDER THAN SG T-SAT?
YES
NO
LOWER SG PRESS UNTIL SG T-SAT IS 50°F LESS THAN IC T/C TEMP.
ANY RCP'S STARTABLE?
YES
NO
HAS HEAT TRANSFER TO SG BEEN RESTORED?
YES
NO
2.4.3.4.A
1,2
DO NOT ISOLATE CF TANKS AT 700 PSIG. DO NOT BLOCK SFAS INC LEVEL 3 AT 600 PSIG.
3
C/D TO ≤ 280°F, 250 PSIG
4
INITIATE HPI TO HOT IF NEED ANY MONITOR BWST LEVEL PER STEP 2.4.1.6.
5
CONTINUE C/D UNTIL RCS ≤ 280°F. DO NOT REROUTE TO 2.4.3.4.B
6
GO TO STEP 2.5
2.4.3.4.B
1
MONITOR RCS TEMP.
BOTH HOT AND COLD LEG TEMPS DROP AS SG PRESS IS DROPPED?
AND
ALL RCS TEMPS ARE ≥ 20°F SUBCOOLED?
NO
YES
2,3
CF TANKS SHOULD BE ISOLATED AT 700 PSIG SFAS INC LEVEL 3 SHOULD BE BLOCKED AT 600 PSIG. (THESE TWO ITEMS SHOULD BE DONE IF THE CONDITIONS OF STEP 1 ARE MET)
4
IS RCS PRESS ≥ 280 PSIG AND TEMP ≥ 300°F?
NO
YES
4
ANY RCPS STARTABLE?
YES
NO
5
CONTINUE NATURAL CIRC C/D TO ≤ 280°F AND 250 PSIG
6
GO TO STEP 2.5
2.4.3.4.C
ANY RCP'S STARTABLE?
NO
YES
2.4.3.4.C
RESTART RCP IN ONE OR BOTH LOOPS PER APPROPRIATE BOX.
2.4.3.4.C
1
RCS PRESS ≥ 1600 PSIG AND INCREASING?
YES
2.4.2.1
GO TO ONE RCP PER LOOP.
2.4.2.2
ESTABLISH C/D. (≤100°F/HR)
2.4.2.3
IF ALL RCS TEMPS ARE ≥ 50°F SUBCOOLED CF TANKS SHOULD BE ISOLATED AT 700 PSIG AND SFAS INC LEVEL 3 SHOULD BE BLOCKED AT 600 PSIG.
2.4.2.4
C/D TO ≤ 250 PSIG AND ≤ 280°F.
GO TO STEP 2.5.
2.4.3.4.C
2
RCS PRESS < 1600 PSIG BUT IS 600 PSIG > HIGHEST SG PRESS?
YES
HAS IT BEEN 15 MINUTES SINCE ANY PUMP BUMP?
NO
YES
HAVE ALL AVAILABLE PUMPS BEEN BUMPED?
YES
NO
BUMP RCP THAT HAS NOT BEEN BUMPED.
ALLOW PLANT TO RESPOND TO BUMP. GENERALLY RCS PRESS WILL DROP, HPI FLOW WILL INCREASE, SG PRESS WILL INCREASE.
2.4.3.4.C
3
RCS PRESS STABLE FOR ONE HR. HIGHEST SG PRESS < 100 PSIG, RCS PRESS > 250 PSIG
NO
YES
BUMP ANY PUMP, WAIT 30 MIN, START ALTERNATE PUMP
HAS IT BEEN ONE HOUR SINCE BY TEIT?
NO
YES
START RCP IN LOOP WITH HIGHEST SG LEVEL.
THIS RCP SHOULD REMAIN IN OPERATION UNTIL 1 LPI PUMP IS OPERATING IN THE DHR MODE AT ≥ 1000 GPM.
2.4.3.4.C
4
RCS ≥ 20°F SUBCOOLED NAT CIRC EXISTS, PLANT CONDITIONS DO NOT MATCH ANY OF OTHER THREE BOXES.
YES
START RCP IN LOOP WITH HIGHEST SG LEVEL.
RCS IS OR RETURNS TO ≥ 50° SUBCOOLED TWO MIN AFTER PUMP START?
YES
NO
TRIP RCP AND ALLOW PLANT TO STABILIZE.

FIGURE 1A



**If second DH Pump is not available, establish boron dilution flowpath within 7 days.

FIGURE 1B

LOCA EMERGENCY PRESSURE/TEMPERATURE
LIMIT CURVE

RCPs RUNNING

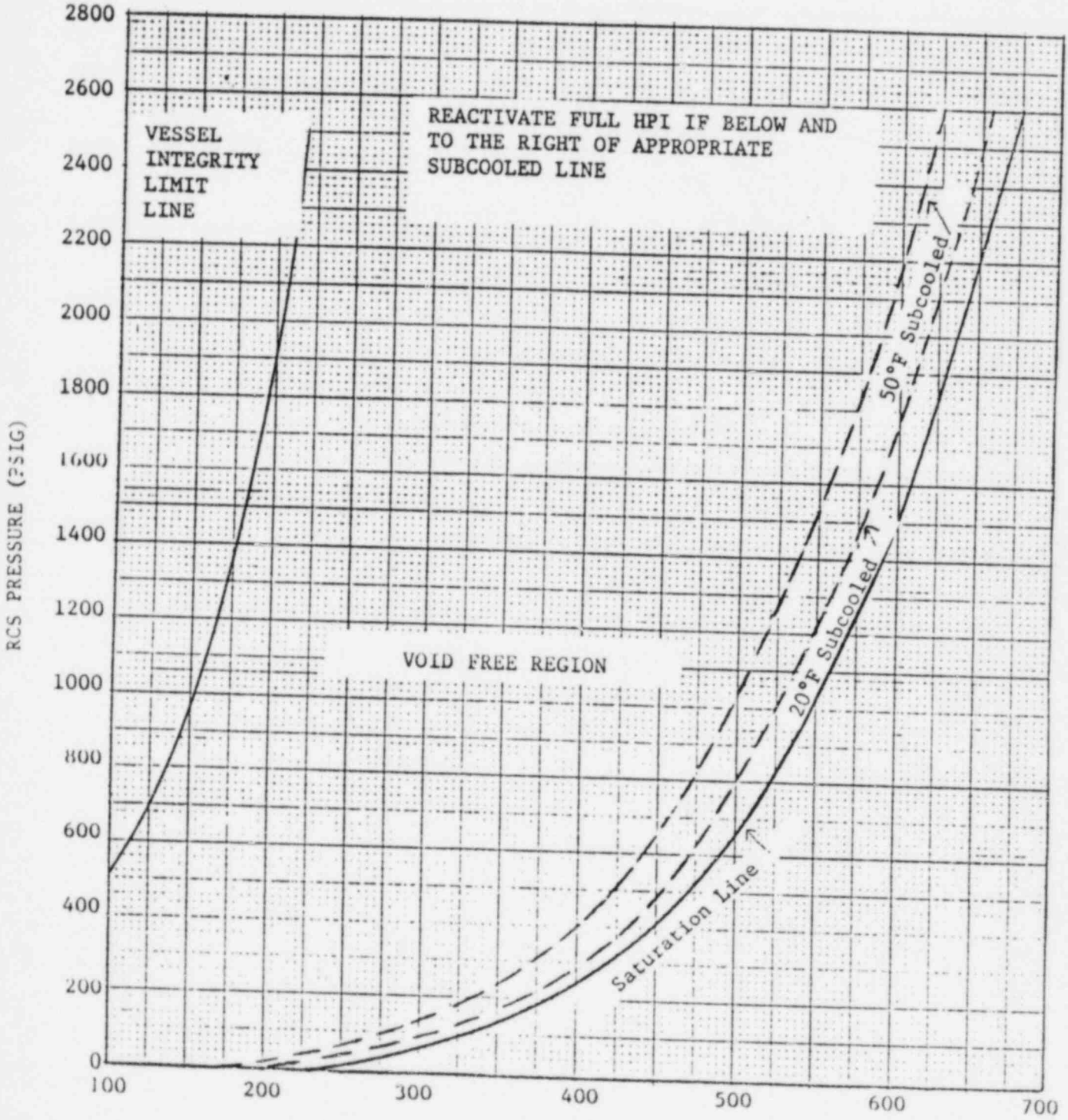
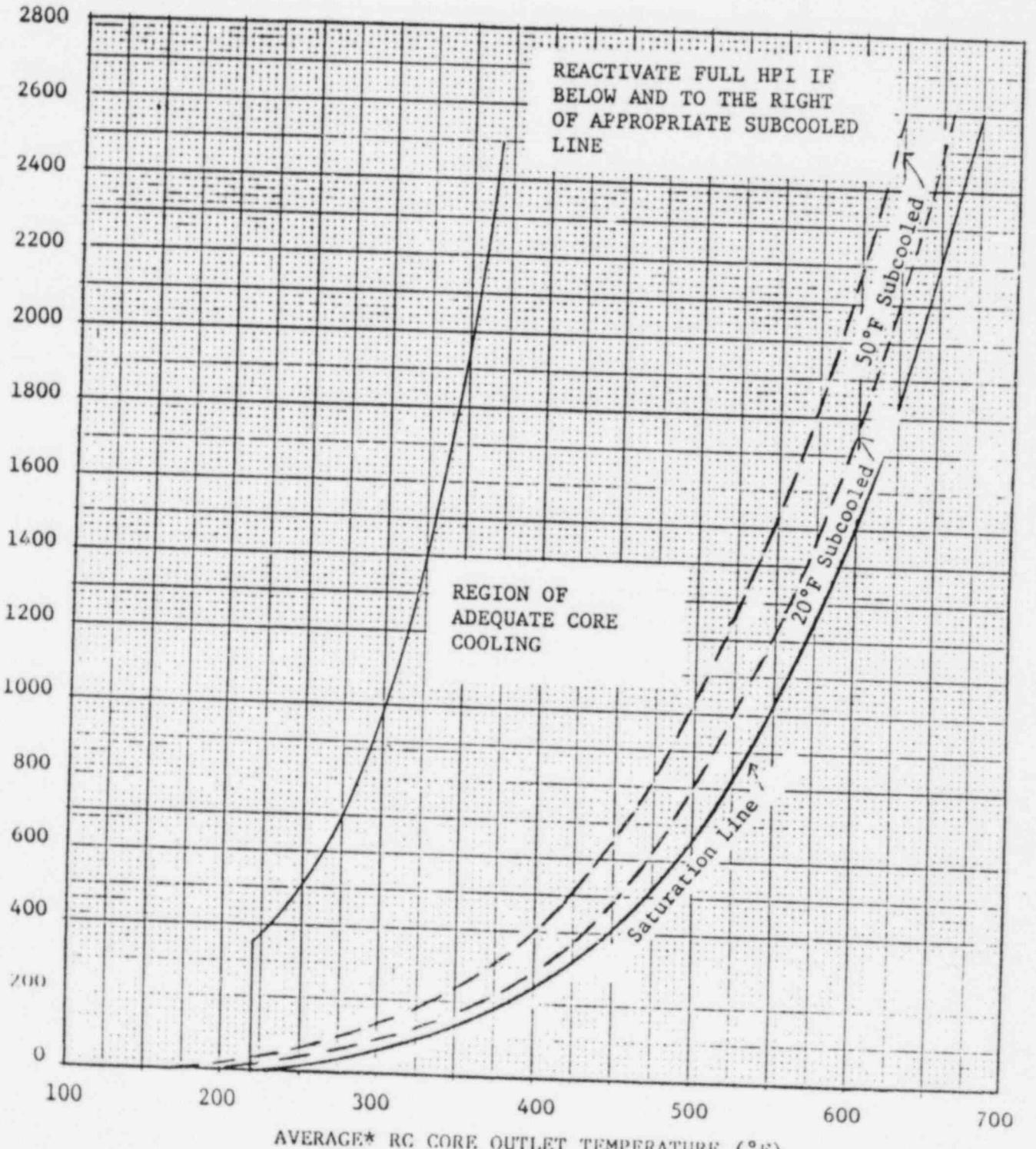


FIGURE 2A

LOCA EMERGENCY PRESSURE/TEMPERATURE LIMIT CURVE

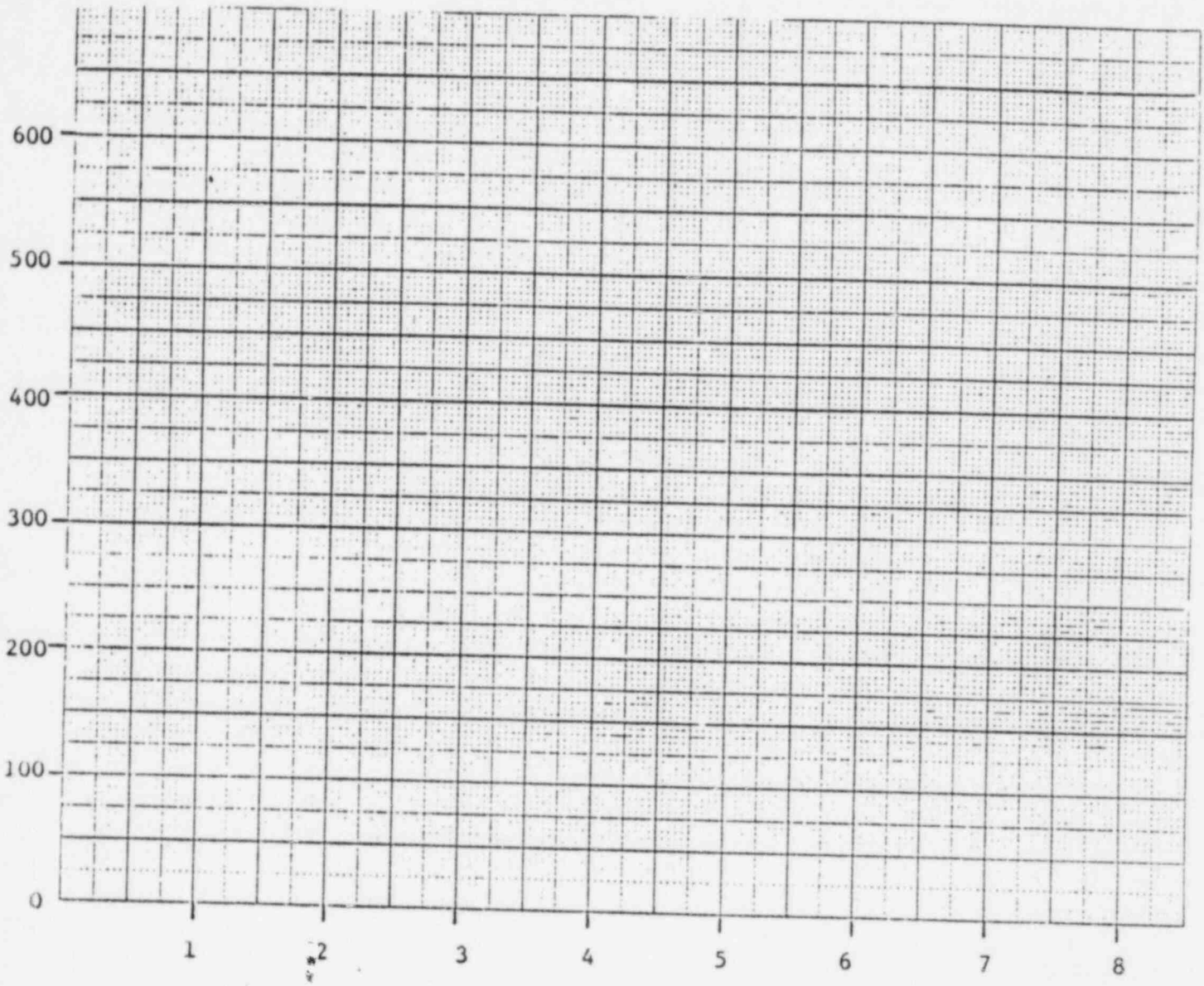
NO RCPs RUNNING



*Average of at least five of the lowest incore outlet T/C (adjustments for instrument error and elevation differences have already been incorporated)

FIGURE 2B

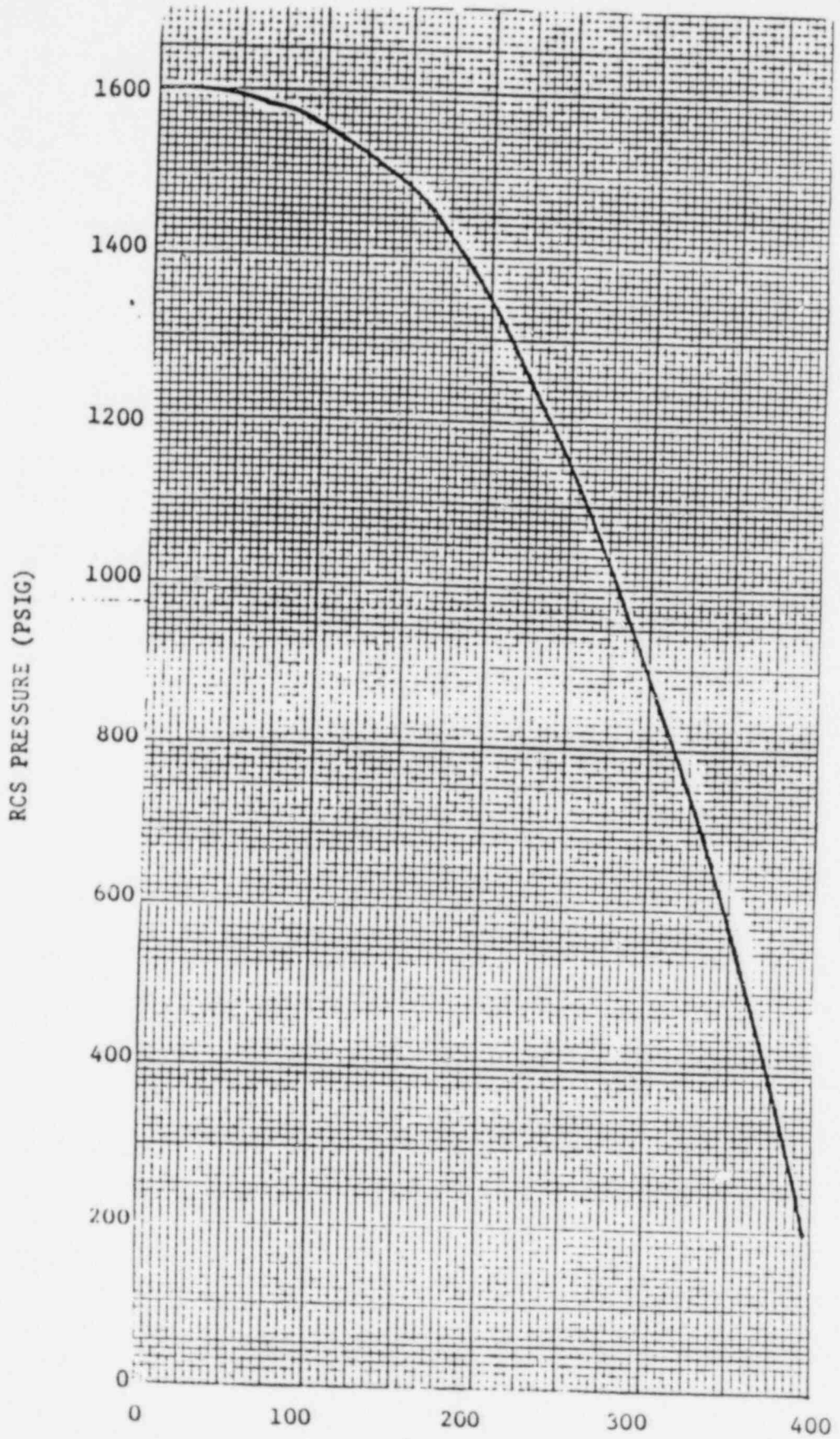
COOLDOWN PLOT



(Record the indications being used on this sheet)

FIGURE 3

– MINIMUM REQUIRED HPI FLOW vs. RCS PRESSURE



END

FIGURE 4.0