

DATE 5/7/79

EMERGENCY PROCEDURE EP- 33

TITLE: CORE COOLING WITH NO RCP'S OR NATURAL CIRCULATION

UNIT SUPT.: HA Tunde DATE 5/9/79
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CORE COOLING WITH NO RCP'S OR NATURAL CIRCULATION

1.0 PURPOSE

- 1.1 To provide core cooling when all other attempts to establish Forced or Natural Circulation through the core have failed.
- 1.2 This procedure is to be implemented only when so directed by EP-34.

2.0 REFERENCES

- 2.1 Decay Heat Removal Pump Characteristic Curves (Figures 1 and 2).
- 2.2 Decay Heat Removal Operating Procedure, 2104-1.3.
- 2.3 Loss of Natural Circulation Emergency Procedure, EP-34.

3.0 PRECAUTIONS AND LIMITATIONS

- 3.1 To ensure continuous operation of DH system components, attempt to maintain the following conditions:
 1. Do not exceed a maximum OH pump bearing temperature of 180°F. (Computer points 336, 338 for DH-P-1A and 337, 339 for DH-P-1B).
 2. Do not exceed a motor bearing temperature of 190°F. (Computer points 340, 342 for DH-P-1A and 341, 343 for DH-P-1B).
 3. Do not exceed a motor stator temperature of 130°C (265°F), (Computer points 1666 for DH-P-1A and 1667 for DH-P-1B).
 4. Do not exceed two successive OH pump motor starts. A subsequent restart is allowed after the motor stator temperature drops below 8°C (14.5°F) of the normal operating temperature.
 5. Ensure that the maximum allowable ΔT of 200°F between OH cooler tube and shell is not exceeded. (Loop "A" - DH-6-T11, OC-T1-957, Loop "B" - DH-6-T2, OC-T1-968, located on Panel #8).
 6. Ensure that the maximum allowable flow per DH cooler of 3750 GPM is not exceeded, (DHI-F11, 2, located on Panel #8).
 7. Before initiating cooling water flow on either side of DH coolers, ensure that the coolers and all connecting piping is filled and vented (assumed accomplished).
 8. When changing flow on either side of the DH coolers, ensure that the maximum allowable cooler flow (3750 GPM) is not exceeded.
 9. Ensure that the flush water supply to the decay heat pump mechanical seal does not exceed 500 PSIG as read on PI 464 and 466 located on Panel #8 (Computer points 115 and 116).

10. Do not operate DH pumps in the recirculation mode for more than three minutes without cooling water cut in to coolers.
11. Should cooling water pump cavitation occur or if a high flow alarm annunciates (3750 GPM) throttle decay heat cooler discharge valves DHV-128 A/B.

CAUTION: Do not open DH-V6A/B simultaneously with DH-V5A/B or the BWST will drain into the RB sump.

3.2 Temperature limitations for incore thermocouples:

1. All operable incore thermocouples must be maintained $\leq 350^{\circ}\text{F}$.
2. All incore thermocouple temperature increases on operable thermocouples must not be $> 30^{\circ}\text{F}/\text{Hr}$.

- 3.3 Do not fill the BWST during this procedure unless Containment water inventory (level) permits further addition.

4.0 IMMEDIATE ACTIONS

4.1 Automatic

- 4.1.1 None.

4.2 Manual

- 4.2.1 Secure all pressurizer heaters.

- 4.2.2 Perform the valve lineup per Attachment 1. To prevent damage to the Reactor Building Spray pumps, rack out their breakers as indicated:

1. For RBS pump BS-P-1A, rack out its breaker in position 1E-4 off Bus 2-1E.
2. For RBS pump BS-P-1B, rack out its breaker in position 2E-5 off Bus 2-2E.

- 4.2.3 Determine which DHR pump is to be used, then start the DHR system as follows:

1. Verify cooling water is available to the DHR cooler for the pump selected.
2. Start the selected DHR pump.
3. Open DH-V4A if pump "A" was started, or DH-V4B if pump "B" was started.
4. Secure the operating Makeup pump. Close seal return valve MU-V377 and secure letdown by closing MU-V376.

5. Establish flow through the core by fully opening RC-V137.
 → Calculated flow is approximately 50gpm at 150 psi DHR pump pressure.
6. Monitor operable core thermocouples.
7. If a core heatup is in progress, as indicated by a temperature rise on the majority of the core thermocouples or if the limits of 3.2 are approached, proceed as follows:
 - A. Open RC-R2 and throttle open RC-V2 in an attempt to stay within the limits of Section 3.2. Flow through RC-V2 is calculated to be between 275 and 315 gpm when fully open.

NOTE: If it becomes apparent that it will be necessary to switch to the Reactor Building sump, concurrence should be received from R. C. Arnold or J. G. Herbein prior to opening DH-V6A or DH-V6B. Opening these valves should be considered only if all other methods to provide core cooling have been exhausted.

- B. If BWST level drops to 12 feet, shift DHR pump suction to the RB sump by opening DH-V6A and closing DH-5A for the "A" pump and by opening DH-V6B and DH-V5B for the "B" pump.
 - C. Monitor pump operation per Figure ¹/₂ for the "A" pump or Figure ²/₃ for the "B" pump.
8. If a core cooldown is in progress, as indicated by a decrease in the majority of core thermocouple readings, proceed as follows:

rev 2 if open or on

 - A. Throttle down on RC-V137 until the decrease in core temperature is negligible.
 - B. Monitor pump operation per Figure 1 for the "A" pump or Figure 2 for the "B" pump.

5.0 SUPPLEMENTARY ACTION

- 5.1 If this method of core cooling is required to be in effect for more than ten days and DHR pump suction has remained on the BWST total flow through operating DHR pump should be increased to 720 gpm. This is to insure adequate long term pump cooling. Flow can be increased by opening DH-V116 and throttling open DH-V108 A/B as appropriate. Total flow may be monitored on DH-1-F11/F12. Core flow should be adjusted per 6.2.3.7 as required to maintain desired core temperature.

4.2.3.7

NOTE: Prior to taking the following action R. C. Arnold or J. G. Herbein must be notified.

- 5.2 If the DHR pumps fail to remain in operation and no other method of core cooling is available, leave RC-V137 open to promote boiling in the core as a final implementation to allow the core to cool naturally.

ATTACHMENT 1
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| <u>VALVE NUMBER</u> | <u>REQUIRED POSITION</u> | <u>POSITIONER INITIALS</u> |
|-------------------------|------------------------------|--------------------------------|
| DH-V149 | Open ✓ | _____ |
| DH-V157 | Shut ✓ | _____ |
| DH-V8A | Shut ✓ | _____ |
| DH-V8B | Shut ✓ | _____ |
| DH-V5A*Note 1 | Open ✓ | _____ |
| DH-V5B*Note 1 | Open ✓ | _____ |
| DH-V6A | Shut ✓ | _____ |
| DH-V6B | Shut ✓ | _____ |
| DH-V101A | Shut ✓ | _____ |
| DH-V101B | Shut ✓ | _____ |
| DH-V100A | Shut ✓ | _____ |
| DH-V100BB | Shut ✓ | _____ |
| DH-V102A | Open ✓ | _____ |
| DH-V102B | Open ✓ | _____ |
| DH-V178A | Open ✓ | _____ |
| DH-V178B | Open ✓ | _____ |
| DH-V128A | Open ✓ | _____ |
| DH-V128B | Open ✓ | _____ |
| DH-V106A | Shut ✓ | _____ |
| DH-V106B | Shut ✓ | _____ |
| DH-V112A | Shut ✓ | _____ |
| DH-V112B | Shut ✓ | _____ |
| DH-V193A | Shut ✓ | _____ |
| DH-V193B | Shut ✓ | _____ |
| DH-V108A | Shut ✓ | _____ |
| DH-V108B | Shut ✓ | _____ |
| DH-V4A | Shut ✓ | _____ |

**VALVE
NUMBER**

**REQUIRED
POSITION**

**POSITIONER
INITIALS**

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DH-V4B ✓

Shut

DH-V7A

Shut

DH-V7B

Shut

DH-V186A /

Shut

DH-V186B /

Shut

BS-V3A

Shut ✓

BS-V3B

Shut ✓

*Note 1 **CAUTION:** Do not open DH-V5A(B) unless DH-V6A(B) are closed or the BWST will drain to the RB sump.

