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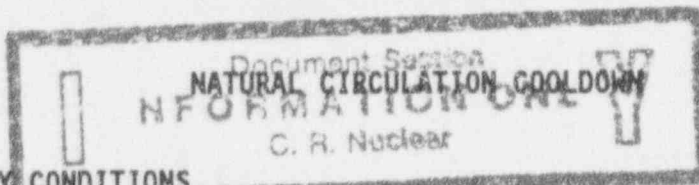
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NCCD	REV 01	EOP-09
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1.0 ENTRY CONDITIONS

IF Nat Circ is required to provide core cooling,
AND no other EOP is applicable,
THEN use this procedure.

2.0 IMMEDIATE ACTIONS

Note

There are no immediate actions for this procedure.

This Procedure Addresses Safety Related Components		
Approved by MNPO <u>C. W. Beightson for G. Helton</u> Date <u>10-6-94</u> (Signature on file)		
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Rule 3, EFW Control

1. Ensure EFW flow limits are not exceeded...
2. Ensure required OTSG level...
3. IF adequate SCM does not exist,
THEN ensure OTSG levels are continuously progressing towards 80 to 90%...
4. EFW flow should be throttled to prevent OTSG PRESS from decreasing > 100 psig below desired setpoint...

Rule 4, Pressurized Thermal Shock

1. The PTS guidelines must be implemented when any of the following conditions exist:
 - o Forced RC flow: $T_{cold} < 380^{\circ}\text{F}$ and cooldown rate exceeds ITS limit.
 - o No forced RC flow: RCPs off and HPI flow exists.
2. PTS guidelines, ensure minimum adequate SCM is maintained.

3.0 FOLLOW-UP ACTIONS

ACTIONS

DETAILS

Status

- o RCPs are not available,
 - o Adequate SCM exists.
-

Note

Rule 4, Pressurized Thermal Shock guidelines are applicable if HPI has been used with RCPs off.

- 3.1 — Ensure OTSGs levels are at or trending towards 60 to 70%. Establish OTSG levels using EFW. [Rule 3, EFW Control]

IF EFW is NOT available,
THEN use MFW.

- 3.2 — IF MFW is being used to feed the OTSGs,
AND MFW TEMP is > 150°F,
THEN establish and maintain OTSG level 60 to 70% using SUCVs in manual.
- o FWV-40, OTSG A SUCV
 - o FWV-39, OTSG B SUCV

Steaming the OTSGs may be required to promote Nat Circ while feeding up to level.

Rule 3, EFW Control

1. Ensure EFW flow limits are not exceeded...
2. Ensure required OTSG level...
3. IF adequate SCM does not exist,
THEN ensure OTSG levels are continuously progressing towards 80 to 90%...
4. EFW flow should be throttled to prevent OTSG PRESS from decreasing > 100 psig below desired setpoint...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.3 — IF MFW is being used to feed the OTSGs,
AND MFW TEMP is $\leq 150^{\circ}\text{F}$,
THEN transfer MFW to the OTSG upper nozzles,
limiting flow to
 $< 0.7 \times 10^6$ lbm/hr per OTSG.

DETAILS

Components to be operated are listed in the table below.

- 1 — Notify available SPO to unlock and close the DPDP switches that power EMBVs.
- 2 — Ensure MFW flow to each OTSG is $< 0.7 \times 10^6$ lbm/hr.
- 3 — Open EMBVs to OTSGs.
- 4 — Close SUBVs.
- 5 — Control feed flow using the SUCVs.
[Rule 3, EFW Control]

Components listed by OTSG

OTSG	A	B
EMB power supply switches	DPDP-8A ___ 9 ___ 10	DPDP-8B ___ 11 ___ 12
EMB	___ FWV-35	___ FWV-34
SUBV	___ FWV-36	___ FWV-33
SUCV	___ FWV-40	___ FWV-39

Table 1: Nat Circ Cooldown Limits

RC T _{incore}	Cooldown limit
RC PRESS maintained above Nat Circ curve of Figure 1	$\leq 25^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
$> 280^{\circ}\text{F}$	$\leq 5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.4 — Verify Nat Circ exists in at least 1 OTSG. <u>IF</u> Nat Circ cannot be verified, <u>THEN</u> GO TO EOP-04, Inadequate Heat Transfer, beginning with step 3.1.	Verify indications of Nat Circ: — T_{cold} coupled with and tracking T_{sat} for OTSGs — ΔT ($T_{incore} - T_{cold}$) develops and stabilizes — T_{incore} within 10°F of T_{hot} .
3.5 — <u>IF</u> cooldown is in progress, <u>THEN</u> maintain cooldown rate within limits.	o Use TBVs or ADVs to control cooldown rate. o See Table 1 for Nat Circ Cooldown Limits.
3.6 — <u>IF</u> PZR Htrs are <u>NOT</u> available, <u>AND</u> RC PRESS control cannot be maintained, <u>THEN</u> establish solid plant PRESS control.	o Adjust makeup and letdown flow to control RC PRESS. o Stabilize RC TEMP using TBVs or ADVs.
3.7 — <u>IF</u> PZR Htrs are available, <u>THEN</u> maintain RC PRESS control using Htrs and high PRESS Aux spray.	Establish high PRESS Aux spray flow path using OP-305, Operation of the Pressurizer, Section 4.3.

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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

3.8 — IF steaming to atmosphere,
THEN close the MSIVs to
isolate non-essential
steam loads and control RC
cooldown.

Close all MSIVs:

— MSV-412

— MSV-413

— MSV-411

— MSV-414.

3.9 — IF steaming to the
condenser,
THEN isolate non-essential
AS loads to control RC
cooldown.

AS loads to isolate

Load	A OTSG	B OTSG
MFWP	— MSV-107	— MSV-108
GS	— MSV-58	— MSV-57
MSR	— MSV-30	— MSV-29
	— MSV-32	— MSV-31
DFT	N/A	— MSV-180
AS	— MSV-179	N/A

Table 1: Nat Circ Cooldown Limits

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$> 280^{\circ}\text{F}$	$\leq 5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

Table 2: Adequate SCM

RCS	Margin
$> 1500 \text{ psig}$	30°F
$\leq 1500 \text{ to } > 250 \text{ psig}$	50°F
$\leq 250 \text{ to } > 150 \text{ psig}$	70°F
$\leq 150 \text{ psig}$	SPDS
$\leq 200^{\circ}\text{F}$	N/A

Table 3: OTSG Tube to Shell ΔT Limits

Tensile ΔT Limit ($\text{Avg } T_{\text{shell}} - T_{\text{cold}}$)	$\leq 100^{\circ}\text{F}$
Compressive ΔT Limit ($T_{\text{hot}} - \text{Avg } T_{\text{shell}}$)	$\leq 60^{\circ}\text{F}$
A OTSG shell Temps A730 A731 A732 A733 A734 Avg R771	
B OTSG shell Temps A735 A736 A737 A738 A739 Avg R772	

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

CAUTION

Starting an RCP could result in a temporary loss of adequate SCM due to collapsing of voids. All RCPs must be secured if adequate SCM does not recover within 2 minutes.

Note

Starting RCP-1B will provide maximum PZR spray capability.

3.10 IF at any time while performing this procedure, RCPs become available,
THEN:

- ___ Ensure PORV is closed
- ___ Start at least 1 RCP
- ___ GO TO EOP-10, Post-Trip Stabilization, beginning with step 3.1.

RCPs are available when all of the following conditions exist:

- ___ 6900V Rx Aux Busses energized
- ___ $\geq 70^{\circ}\text{F}$ SCM exists, See Table 2
- ___ All RCP start permissives are met
- ___ Compressive tube to shell ΔT is $\leq 60^{\circ}\text{F}$, See Table 3.

RCP starting:

- 1 ___ Ensure PORV is closed.
- 2 ___ IF RCPs were tripped due to loss of SCM,
THEN establish PZR level $\geq 200''$.
- 3 ___ IF either OTSG is available,
THEN start 1 RCP in each loop, starting the RCP in the loop with the highest OTSG level first.

IF no OTSG is available,
THEN start 1 RCP.
- 4 ___ GO TO EOP-10, Post-Trip Stabilization, beginning with step 3.1.

Applicable carry-over steps:

3.10 Start at least 1 RCP when available...

Table 1: Nat Circ Cooldown Limits

RC T _{incore}	Cooldown limit
RC PRESS maintained above Nat Circ curve of Figure 1	$\leq 25^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
$> 280^{\circ}\text{F}$	$\leq 5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.11 — <u>WHEN</u> either OTSG PRESS is between 725 and 600 psig, <u>THEN</u> bypass EFIC MS and MFW isolation actuations. Continue on in this procedure.	Depress "< 725 PSI STM GEN PRESS EFIC ACT BYPASS" pushbuttons: ___ "CHANNEL A" ___ "CHANNEL B" ___ "CHANNEL C" ___ "CHANNEL D".
3.12 — <u>IF</u> EFWPs are operating with suction from EFT-2, <u>AND</u> CD is available, <u>THEN</u> maintain EFT-2 level 10 to 37 ft. Continue on in this procedure.	CD fill to EFT-2 is available when CD Hdr PRESS is ≥ 50 psig. All referenced valves are located 95 ft TB behind the Atmospheric Drain Tank. 1 ___ Ensure CD Hdr PRESS is ≥ 50 psig. 2 ___ Notify available SPO to open CDV-260. 3 ___ Notify available SPO to initially throttle CDV-259 two turns open, then adjust as required to achieve desired fill rate. 4 ___ <u>WHEN</u> EFT-2 fill from CD is no longer desired, <u>THEN</u> notify available SPO to close: o CDV-259 o CDV-260.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...

Rule 3, EFW Control

- 1. Ensure EFW flow limits are not exceeded...
- 2. Ensure required OTSG level...
- 3. IF adequate SCM does not exist,
THEN ensure OTSG levels are continuously progressing towards 80 to 90%...
- 4. EFW flow should be throttled to prevent OTSG PRESS from decreasing > 100 psig below desired setpoint...

Table 1: Nat Circ Cooldown Limits

RC T _{in} core	Cooldown limit
RC PRESS maintained above Nat Circ curve of Figure 1	$\leq 25^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
> 280°F	$\leq 5^{\circ}\text{F}/\frac{1}{2} \text{ hr}^{\circ} \phi$
280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

- 3.13 — IF at any time while performing this procedure, EFT-2 level cannot be maintained ≥ 8.5 ft while supplying EFWs, THEN establish EFW suction from the CST.

Notify available SPO to unlock and open CDV-103, CST isolation to EFW suction.

- 3.14 — IF an OTSG tube leak exists, THEN GO TO EOP-06, Steam Generator Tube Rupture, beginning with step 3.1.

Observe RMA-12, condenser exhaust monitor and MS line radiation monitors and recorder traces for trends and alarms.

MS line monitors

OTSG	A	B
ADV	RMG-25	RMG-28
MS line	RMG-27	RMG-26

- 3.15 — IF RC cooldown is NOT required, THEN maintain RC TEMP as directed while restoration of forced RC flow is in progress.

- o Use TBVs or ADVs to maintain RC TEMP.
- o EFW may be throttled to reduce cooldown provided OTSG level does not decrease while progressing towards required level.
[Rule 3, EFW Control]

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...

Table 1: Nat Circ Cooldown Limits

RC T _{incore}	Cooldown limit
RC PRESS maintained above Nat Circ curve of Figure 1	$\leq 25^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

Note

The remainder of this procedure is applicable only if the decision has been made to cooldown using Nat Circ or if RC TEMP cannot be maintained.

- 3.16 — IF RC cooldown is required, THEN establish and maintain cooldown rate within limits.
- o Use TBVs or ADVs to control cooldown rate.
 - o See Table 1 for Nat Circ Cooldown Limits.
-

- 3.17 — Borate the RCS to ensure $\geq 1\%$ shutdown margin at 73°F RC TEMP.
- Continue on in this procedure.
- Refer to OP-103C, Reactivity Worth Curves, Curves 18 and 19.
- o IF 2 or more control rods are stuck, THEN continue boration until any of the following conditions exist:
 - Actual boron concentration is ≥ 1925 ppm
 - OR
 - Actual boron concentration is \geq value determined by the Reactor Engineer or designee.
-

- 3.18 — Ensure RC cooldown surveillance is in progress.
- CONCURRENTLY PERFORM SP-422, RC Heatup and Cooldown Surveillance, beginning with the first step.
-

- 3.19 — IF cooling down on 1 OTSG, THEN GO TO step 3.31 in this procedure.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...

Table 1: Nat Circ Cooldown Limits

RC Tincore	Cooldown limit
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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

Table 2: Adequate SCM

RCS	Margin
$> 1500 \text{ psig}$	30°F
$\leq 1500 \text{ to } > 250 \text{ psig}$	50°F
$\leq 250 \text{ to } > 150 \text{ psig}$	70°F
$\leq 150 \text{ psig}$	SPDS
$\leq 200^{\circ}\text{F}$	N/A

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

Note

Indications of steam voiding include an unexpected rise in PZR level without changing primary inventory or cooldown rate. Some head voiding is expected if cooldown rate approaches 25°F/½ hr.

- 3.20 — IF at any time while performing this procedure, indication of steam voiding in the head develops, THEN ensure RC cooldown rate is maintained within limits.

IF cooldown rate is > 5°F/½ hr, THEN ensure RC PRESS is maintained above the Nat Circ Curve.

See Figure 1: Cooldown Curve for Nat Circ and Forced Flow.

See Table 1: Nat Circ Cooldown Limits.

- 3.21 — WHEN RC PRESS < 1700 psig, AND adequate SCM exists, THEN bypass HPI actuation.

Continue on in this procedure.

HPI actuation channels

ES A	ES B
___ RC1	___ RC1
___ RC2	___ RC2
___ RC3	___ RC3

See Table 2: Adequate SCM.

- 3.22 — WHEN RC PRESS is < 900 psig, AND adequate SCM exists, THEN bypass LPI actuation.

Continue on in this procedure.

LPI actuation channels

ES A	ES B
___ RC4	___ RC4
___ RC5	___ RC5
___ RC6	___ RC6

See Table 2: Adequate SCM.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...
- 3.20 IF steam voids develop, THEN control RC PRESS above the Nat Circ curve...
- 3.21 Bypass HPI actuation at 1700 psig if adequate SCM exists...
- 3.22 Bypass LPI actuation at 900 psig if adequate SCM exists...

Table 1: Nat Circ Cooldown Limits

RC T _{incore}	Cooldown limit
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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.23 — IF EFWDs are operating with suction from the CST, THEN maintain CST level 10 to 31 ft using CD or DW.

Continue on in this procedure.

DETAILS

- o IF steaming to the condenser, THEN maintain CST level using CD:

- 1 — Ensure CD Hdr PRESS is \geq 50 psig.
- 2 — Notify available SPO to ensure hotwell level control is rejecting excess CD to CST.

- o IF steaming to atmosphere, THEN maintain CST level using DW:

DW fill to CST is available when WTP-6A or WTP-6B are operating and DWV-346 is open.

- 1 — Notify available SPO to open CDV-112.
- 2 — WHEN CST fill from DW is no longer desired, THEN notify available SPO to close CDV-112.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...
- 3.20 IF steam voids develop, THEN control RC PRESS above the Nat Circ curve...
- 3.21 Bypass HPI actuation at 1700 psig if adequate SCM exists...
- 3.22 Bypass LPI actuation at 900 psig if adequate SCM exists...
- 3.23 Maintain CST level 10 to 31 ft using CD or DW...

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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.24 — IF EFWPs are operating with suction from the CST, AND CST level cannot be maintained ≥ 10 ft, THEN break condenser vacuum to prepare the hotwell to supply EFWP suction.

DETAILS

- 1 — Place both condenser ARPs in "PULL TO LOCK":
 - o ARP-1A
 - o ARP-1B.
- 2 — Open both condenser vacuum Bkrs:
 - o ARV-48
 - o ARV-49.
3. Close all MSIVs:
 - MSV-412
 - MSV-413
 - MSV-411
 - MSV-414.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...
- 3.20 IF steam voids develop, THEN control RC PRESS above the Nat Circ curve...
- 3.21 Bypass HPI actuation at 1700 psig if adequate SCM exists...
- 3.22 Bypass LPI actuation at 900 psig if adequate SCM exists...
- 3.23 Maintain CST level 10 to 31 ft using CD or DW...
- 3.24 IF CST level cannot be maintained, THEN break vacuum...

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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

CAUTION

The condenser must be at atmospheric PRESS before opening EFV-1 or EFV-2.
This is required to maintain NPSH to the EFWPs.

3.25 — IF at any time while performing this procedure, CST level cannot be maintained > 5 ft while supplying EFWPs, THEN establish EFWP suction from hotwell.

1 — Notify available SPO to open EFV-36, hotwell shutoff to EFW, located between the inlets to C and D waterboxes.

2 — Notify available PPO to unlock and open EFWP suctions from hotwell, located at the EFWPs:

o EFV-1

o EFV-2.

3 — WHEN EFWP suction flow path from hotwell is open per details 1 and 2, THEN notify available PPO to unlock and close EFWP suctions from CST and EFT-2:

o EFV-3

o EFV-4.

Applicable carry-over steps:

- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...
- 3.20 IF steam voids develop, THEN control RC PRESS above the Nat Circ curve...
- 3.21 Bypass HPI actuation at 1700 psig if adequate SCM exists...
- 3.22 Bypass LPI actuation at 900 psig if adequate SCM exists...
- 3.23 Maintain CST level 10 to 31 ft using CD or DW...
- 3.24 IF CST level cannot be maintained, THEN break vacuum...
- 3.25 Swap EFWP suction source to hotwell at 5 ft CST level...

Table 1: Nat Circ Cooldown Limits

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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

Table 2: Adequate SCM

RCS	Margin
$> 1500 \text{ psig}$	30°F
$\leq 1500 \text{ to } > 250 \text{ psig}$	50°F
$\leq 250 \text{ to } > 150 \text{ psig}$	70°F
$\leq 150 \text{ psig}$	SPDS
$\leq 200^{\circ}\text{F}$	N/A

3.0 FOLLOW-UP ACTIONS (CONT'D)

<u>ACTIONS</u>	<u>DETAILS</u>
3.26 — <u>WHEN</u> RC PRESS is < 700 psig, <u>AND</u> adequate SCM exists, <u>THEN</u> isolate CFTs.	See Table 2: Adequate SCM. 1 — Notify available PPO to unlock and close Bkrs for CFT isolation valves at ES MCC 3AB: o CFV-5 unit 6B o CFV-6 unit 6C. 2 — Close CFT isolation valves: o CFV-5 o CFV-6.
3.27 — <u>WHEN</u> RC PRESS is 540 to 500 psig, <u>THEN</u> ensure PORV is selected to the low TEMP overpressure protection mode.	Ensure RCV-10 switch in "NNI CAB #3" is selected to the "LOW" position.
3.28 — Continue cooldown and depressurization to establish DH system operation.	CONCURRENTLY PERFORM OP-404, Decay Heat Removal System, Section 4.5.

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280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.29 ____ WHEN DH system is providing core cooling, THEN stop OTSG cooling.

DETAILS

1. Ensure the following valves are closed:

Valves to close when on DHR

Valve	A OTSG	B OTSG
MBV	__FWV-30	__FWV-29
LLBV	__FWV-31	__FWV-32
SUCV	__FWV-40	__FWV-39
MS to EFP-2	__MSV-55	__MSV-56
MS to TBVs and MFWPS	__MSV-53	__MSV-54
EFW Block Valves	__EFV-11	__EFV-32
	__EFV-14	__EFV-33

2 ____ Stop MFWPs:

- o FWP-2A
- o FWP-2B.

3 ____ Stop MFWBPs:

- o FWP-1A
- o FWP-1B.

4 ____ Stop EFWPs:

- o EFP-1
- o EFP-2.

3.30 ____ Exit this procedure.

The TSC will provide any necessary guidance from this point.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
- 3.13 Swap EFWP suction source to CST at 8.5 ft EFT-2 level...
- 3.20 IF steam voids develop, THEN control RC PRESS above the Nat Circ curve...
- 3.21 Bypass HPI actuation at 1700 psig if adequate SCM exists...
- 3.22 Bypass LPI actuation at 900 psig if adequate SCM exists...
- 3.23 Maintain CST level 10 to 31 ft using DW...
- 3.24 IF CST level cannot be maintained, THEN break vacuum...
- 3.25 Swap EFWP suction source to hotwell at 5 ft CST level...

Table 1: Nat Circ Cooldown Limits

RC T _{incore}	Cooldown limit
RC PRESS maintained above Nat Circ curve of Figure 1	$\leq 25^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
$> 280^{\circ}\text{F}$	$\leq 5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$
280 to 150°F	$\leq 2.5^{\circ}\text{F}/\frac{1}{2} \text{ hr}$

Table 3: OTSG Tube to Shell ΔT Limits

Tensile ΔT Limit (Avg T _{shell} - T _{cold})	$\leq 100^{\circ}\text{F}$
Compressive ΔT Limit (T _{hot} - Avg T _{shell})	$\leq 60^{\circ}\text{F}$
A OTSG shell Temps A730 A731 A732 A733 A734 Avg R771	
B OTSG shell Temps A735 A736 A737 A738 A739 Avg R772	

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

Status

- o RCPs are not available,
- o Adequate SCM exists,
- o Cooldown is on 1 OTSG.

3.31 — Maintain tube to shell ΔT within limits.

1 — Determine tube to shell ΔT :

IF OTSG is depressurized,
THEN determine tube to shell ΔT per Table 3.

IF OTSG is pressurized,
THEN calculate tube to shell ΔT as follows:

o Tensile limit is 100°F (OTSG shell TEMP - OTSG Tsat) tubes colder than shell

o Compressive limit is 60°F (OTSG Tsat - OTSG shell TEMP) tubes hotter than shell.

2 — Maintain tube to shell ΔT within limits:

o IF tensile limit is approached,
THEN decrease RC cooldown rate

o IF compressive limit is approached,
THEN increase cooldown rate without exceeding cooldown rate limits.

See Table 1: Nat Circ Cooldown Limits.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
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Table 2: Adequate SCM

RCS	Margin
$> 1500 \text{ psig}$	30°F
≤ 1500 to $> 250 \text{ psig}$	50°F
≤ 250 to $> 150 \text{ psig}$	70°F
$\leq 150 \text{ psig}$	SPDS
$\leq 200^{\circ}\text{F}$	N/A

Table 3: OTSG Tube to Shell ΔT Limits

Tensile ΔT Limit (Avg $T_{\text{shell}} - T_{\text{cold}}$)	$\leq 100^{\circ}\text{F}$
Compressive ΔT Limit ($T_{\text{hot}} - \text{Avg } T_{\text{shell}}$)	$\leq 60^{\circ}\text{F}$
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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

3.32 — Control plant cooldown and RC PRESS to maintain idle loop That adequately subcooled.

o IF OTSG is isolated due to SGTR, THEN decrease or stop cooldown and depressurization to maintain idle loop That adequately subcooled.

o IF OTSG is isolated due to a steam or feedwater leak in the RB, THEN decrease or stop cooldown and depressurization to maintain idle loop That adequately subcooled.

o IF OTSG is isolated due to a steam or feedwater leak NOT in the RB, THEN notify the TSC to consider feeding the affected OTSG to maintain SCM and promote Nat Circ.

Applicable carry-over steps:

- 3.10 Start at least 1 RCP when available...
- 3.11 Bypass EFIC MSLI and MFLI at 725 to 600 psig OTSG PRESS...
- 3.12 Maintain EFT-2 level 10 to 37 ft using CD...
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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.33 — IF an RC hot leg void develops,
THEN minimize the void to ensure RC PRESS control during Nat Circ cooldown.

DETAILS

Minimize the void by performing the following:

- 1 — Stabilize RC TEMP.
- 2 — Raise RC PRESS to maintain an increased SCM.
- 3 — Maintain RC TEMP and PRESS stable while observing PZR level trend decreases to normal.

IF PZR PRESS control has NOT been re-established,

THEN perform the following:

- 1 — Establish stable or slightly increasing RC PRESS using MU or HPI flow.
- 2 — Energize and open affected loop HPVs:

HPVs

A HOT LEG	B HOT LEG
DPDP-5A __switch 1	DPDP-5B __switch 1
__RCV-157	__RCV-163
__RCV-158	__RCV-164

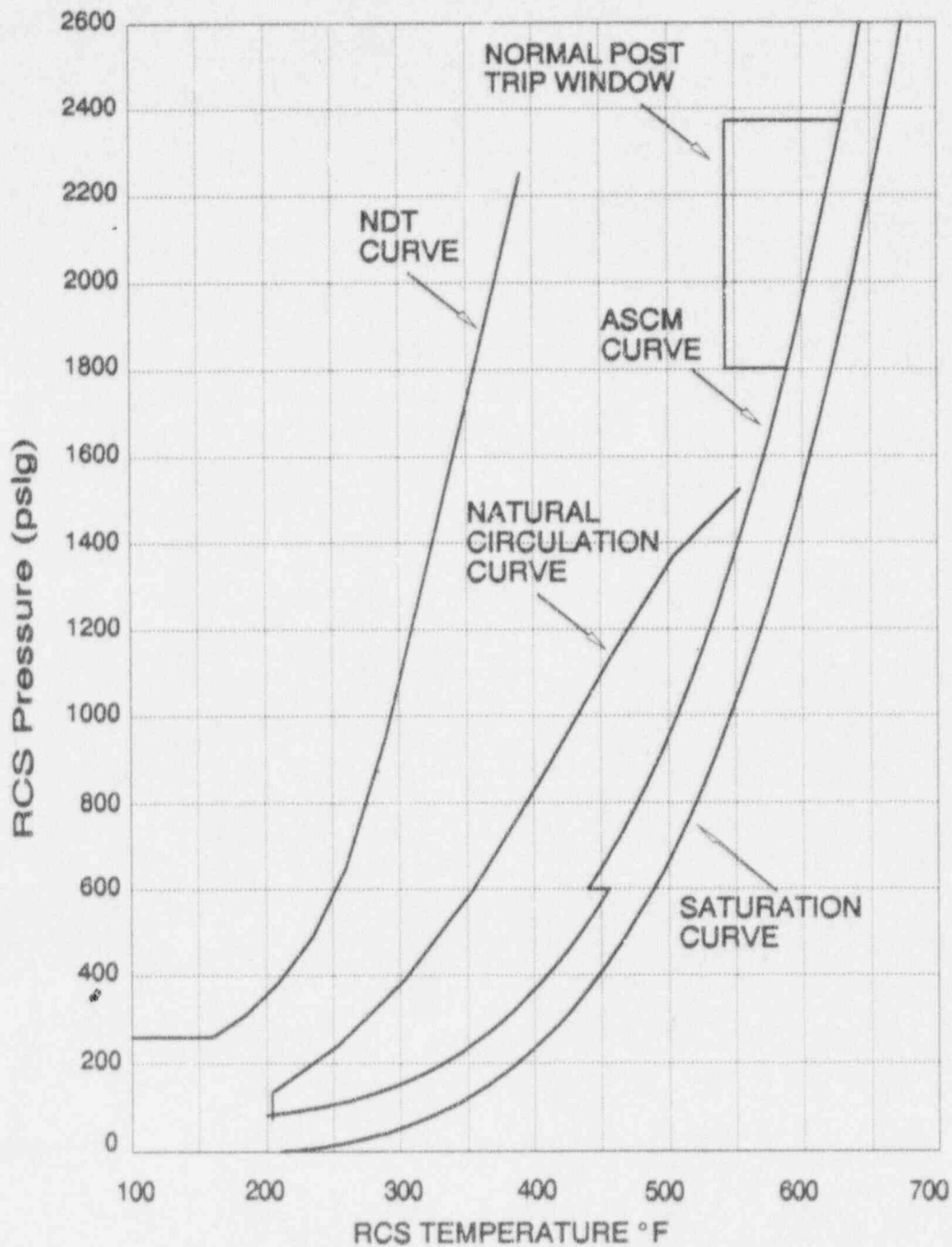
- 3 — WHEN idle loop That decreases to saturation,
THEN close the HPVs.

3.34 — GO TO step 3.20 in this procedure.

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Figure 1:

Cooldown Curve for Nat Circ and Forced Flow



Acceptable region is:

- o Below and to the right of the NDT curve
- o Above and to the left of the adequate SCM curve
- o Above and to the left of the Nat Circ curve if RCPs are off and cooldown rate $\geq 5^{\circ}\text{F}/\frac{1}{2}\text{hr}$

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