

EOP: ES-0.2	TITLE: NATURAL CIRCULATION COOLDOWN	REV: 4 PAGE 1 of 17
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ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

TECHNICAL REVIEW

PORC REVIEW DATE 5/6/92

Thomas A. Marlow
PLANT SUPERINTENDENT

5/8/92
EFFECTIVE DATE

CATEGORY 1.0

REVIEWED BY: _____

9206160376 920605
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A. PURPOSE - This procedure provides actions to perform a natural circulation RCS cooldown and depressurization to cold shutdown, with no accident in progress, under requirements that will preclude any upper head void formation.

B. SYMPTOMS AND OR ENTRY CONDITIONS

This procedure is entered from:

- 1) ES-0.1, REACTOR TRIP RESPONSE, when it has been determined that a natural circulation cooldown is required.
- 2) ECA-0.1, LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED, when it has been determined that a natural circulation cooldown is required.
- 3) Other normal operating procedures when a natural circulation cooldown is required.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<p>*****</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>o IF SI ACTUATION OCCURS DURING THIS PROCEDURE, E-0, REACTOR TRIP OR SAFETY INJECTION, SHOULD BE PERFORMED.</p> <p>o VOIDING MAY OCCUR IN THE RCS DURING RCS DEPRESSURIZATION. THIS WILL RESULT IN A RAPIDLY INCREASING PRZR LEVEL.</p> <p>*****</p> <p><u>NOTE:</u> o Foldout page should be open and monitored periodically.</p> <p>o If conditions can be established for starting an RCP during this procedure, Step 1 should be repeated.</p> <p>1 Try To Restart An RCP:</p> <p>a. Establish conditions for starting an RCP:</p> <p>o Bus 11A or 11B energized</p> <p>o Refer to Attachment RCP START</p> <p>b. Start one RCP</p> <p>c. Any RCP - RUNNING</p> <p>d. Go to 0-2.2, PLANT SHUTDOWN FROM HOT SHUTDOWN TO COLD CONDITION</p> <p>a. Go to Step 2.</p> <p>c. Go to Step 2.</p>		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2 Check VCT Makeup System:		
	a. Verify the following:	
	1) Boric acid flow control valve - SET FOR REQUIRED CSD CONCENTRATION	
	2) RMW mode selector switch in AUTO	
	3) RMW control armed - RED LIGHT LIT	
	b. Check VCT level	b. Manually increase VCT makeup flow as follows:
	o Level - GREATER THAN 20% -OR-	1) Ensure BA transfer pumps and RMW pumps running.
	o Level - STABLE OR INCREASING	2) Place RMW flow control valve HCV-111 in MANUAL and increase RMW flow.
		3) Increase boric acid flow as necessary.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3	<p>Check Charging Pump Suction Aligned To VCT:</p> <p>a. Check VCT level:</p> <ul style="list-style-type: none"> o Level - GREATER THAN 20% o VCT makeup system - AVAILABLE <p>b. Verify the following:</p> <ul style="list-style-type: none"> o LCV-112C - OPEN o LCV-112B - CLOSED 	<p>a. <u>IF</u> VCT level can <u>NOT</u> be maintained greater than 5%, <u>THEN</u> perform the following:</p> <p>1) Ensure charging pump suction aligned to RWST</p> <ul style="list-style-type: none"> o LCV-112B open o LCV-112C closed <p>2) Continue with Step 4. <u>WHEN</u> VCT level greater than 40%, <u>THEN</u> do Step 3b.</p> <p>b. Manually align valves as necessary.</p>
4	<p>Borate RCS To Cold Shutdown Boron Concentration (Refer to Figure SDM)</p>	
5	<p>Establish Maximum Rx Vessel Head Cooling:</p> <ul style="list-style-type: none"> o Check control rod shroud fans (45 kw) - BOTH RUNNING o Check one Rx compartment cooling fan (23 kw) - RUNNING 	<p>Start fans as necessary.</p>

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6	<p>Verify Adequate Shutdown Margin</p> <p>a. Direct HP to sample the RCS for boron concentration</p> <ul style="list-style-type: none"> • RCS loop A • RCS loop B • PRZR <p>b. Verify boron concentration - GREATER THAN REQUIREMENTS OF FIGURE SDM</p>	<p>b. Perform the following:</p> <ol style="list-style-type: none"> 1) Maintain RCS average temperature greater than 500°F until adequate SDM established. 2) Continue to borate as necessary.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

<u>CAUTION</u>		
<ul style="list-style-type: none">o IF CST LEVEL DECREASES TO LESS THAN 5 FEET, THEN ALTERNATE WATER SOURCES FOR AFW WILL BE NECESSARY (REFER TO ER-AFW.1, ALTERNATE WATER SUPPLY TO AFW PUMPS).o SI MUST BE BLOCKED BEFORE S/G PRESSURE DECREASES TO 514 PSIG.o THE ΔT BETWEEN PRZR LIQUID AND THE HOT LEG TEMPERATURE SHOULD NOT BE PERMITTED TO EXCEED 200°F. IF THIS LIMIT IS EXCEEDED, THEN NOTIFY TECHNICAL ENGINEERING OF THE MAXIMUM ΔT OBSERVED.		

7	Initiate RCS Cooldown To Cold Shutdown:	
	<ul style="list-style-type: none">a. Dump steam to condenserb. Establish and maintain cooldown rate in RCS cold legs - LESS THAN 25°F/HRc. Maintain S/G narrow range level - BETWEEN 17% AND 39%d. Plot RCS cold leg temperatures and PRZR temperature twice per hour (Refer to O-2.2, PLANT SHUTDOWN FROM HOT SHUTDOWN TO COLD SHUTDOWN, for plot paper)	<ul style="list-style-type: none">a. Manually or locally dump steam using S/G ARVs.c. Control feed flow as necessary.
8	Check RCS Hot Leg Temperatures - LESS THAN 550°F	Return to Step 7.

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STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

- NOTE:
- o If charging line to PRZR vapor ΔT exceeds 320°F, then plant staff should be consulted before using auxiliary spray.
 - o WHEN using a PRZR PORV, THEN select one with an operable block valve.
 - o If auxiliary spray is in use, spray flow may be increased by closing normal charging valve AOV-294 and normal PRZR spray valves.

9 Depressurize RCS To 1950 PSIG:

a. Check letdown - IN SERVICE

a. Try to establish letdown (Refer to Attachment LETDOWN).

IF letdown can NOT be established, THEN depressurize RCS using one PRZR PORV and go to Step 10.

b. Depressurize RCS using auxiliary spray valve (AOV-296)

b. IF auxiliary spray valve NOT available, THEN use one PRZR PORV.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<p>*****</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>SI ACTUATION CIRCUITS WILL AUTOMATICALLY UNBLOCK IF PRZR PRESSURE INCREASES TO GREATER THAN 1992 PSIG.</p> <p>*****</p>		
10	Check If SI Should Be Blocked:	
	<p>a. Check the following:</p> <ul style="list-style-type: none"> o PRZR pressure - LESS THAN 1950 PSIG <p style="text-align: center;">-OR-</p> <ul style="list-style-type: none"> o LOW PRZR PRESS BLOCK SAF INJEC status light - LIT 	<p>a. Return to Step 9.</p>
	<p>b. Place SI block switches to BLOCK</p> <ul style="list-style-type: none"> • Train A • Train B 	
	<p>c. Verify SAFETY INJECTION BLOCKED status light - LIT</p>	<p>c. Maintain PRZR pressure greater than 1750 psig and S/G pressure greater than 514 psig until SI blocked.</p>
11	Determine RCS Pressure And Temperature Limits:	
	<p>a. Check control rod shroud fans - BOTH RUNNING</p>	<p>a. Perform the following:</p> <ul style="list-style-type: none"> 1) Maintain RCS pressure within limits of Figure NAT CIRC C/D WITHOUT SHROUD FANS. 2) Go to Step 12.
	<p>b. Maintain RCS pressure - WITHIN LIMITS OF FIGURE NAT CIRC C/D WITH SHROUD FANS</p>	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12	Maintain PRZR Level Between 20% And 30%	
13	Monitor RCS Cooldown: <ul style="list-style-type: none"> Core exit T/Cs - DECREASING RCS hot leg temperatures - DECREASING RCS subcooling based on core exit T/Cs - INCREASING Cooldown rate in RCS cold legs - LESS THAN 25°F/HR 	

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STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

- NOTE:
- o If at any time it is determined that a natural circulation cooldown and depressurization must be performed at a rate that may form a steam void in the vessel, then procedure ES-0.3, NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN VESSEL, should be used.
 - o If charging line to PRZR vapor ΔT exceeds 320°F, then plant staff should be consulted before using auxiliary spray.
 - o WHEN using a PRZR PORV, THEN select one with an operable block valve.
 - o If auxiliary spray is in use, spray flow may be increased by closing normal charging valve AOV-294 and normal PRZR spray valves.

14 Initiate RCS Depressurization:

a. Check letdown - IN SERVICE

a. Try to establish letdown (Refer to Attachment LETDOWN).

IF letdown can NOT be established, THEN depressurize RCS using one PRZR PORV and go to Step 15.

b. Depressurize RCS using auxiliary spray valve (AOV-296)

b. IF auxiliary spray valve NOT available, THEN use one PRZR PORV.

c. Plot RCS temperature and pressure on curve selected in Step 11 hourly

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15	Continue Cooldown And Depressurization:	
	a. Check RCS cold leg temperature - GREATER THAN 335°F	a. Stabilize RCS temperature and go to Step 15c.
	b. Maintain cooldown rate in RCS cold legs - LESS THAN 25°F/HR	
	c. Maintain RCS temperature and pressure within limits of Figure determined previously	c. Control RCS pressure as necessary to restore pressure/ temperature relationship to within limits of appropriate Figure.
16	Establish Required RCS Hydrogen Concentration (Refer to S-3.3C, H2 OR O2 REMOVAL FROM PRIMARY SYSTEM BY BURPING VCT)	
17	Check For Steam Void In Reactor Vessel:	Repressurize RCS within allowable limits and continue cooldown.
	o PRZR level - NO UNEXPECTED LARGE VARIATIONS	<u>IF</u> RCS depressurization must continue, <u>THEN</u> go to ES-0.3, NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN VESSEL.
	o RVLIS level (no RCPs) - GREATER THAN 95%	

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STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

18 Check If SI ACCUMs Should Be Isolated:

a. RCS pressure - LESS THAN 1500 PSIG

b. Dispatch AO with locked valve key to locally close breakers for SI ACCUM discharge valves

- MOV-841, MCC C position 12F
- MOV-865, MCC D position 12C

c. Close SI ACCUM discharge valves

- ACCUM A, MOV-841
- ACCUM B, MOV-865

d. Locally open breakers for MOV-841 and MOV-865

a. Continue with Step 19. WHEN RCS pressure is less than 1500 psig, THEN do Steps 18b through d.

c. IF any valve can NOT be closed, THEN perform the following:

- 1) Dispatch personnel to locally close valves, as necessary.
- 2) Maintain RCS pressure greater than 1000 psig until both SI ACCUMs isolated.

IF any SI ACCUM can NOT be isolated AND RCS depressurization to less than 1000 psig is required, THEN:

1) Open vent valves for unisolated SI ACCUMs.

- ACCUM A, AOV-834A
- ACCUM B, AOV-834B

2) Open HCV-945.

3) Maintain RCS pressure greater than SI ACCUM pressure.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
19	Maintain Letdown Flow: a. Open letdown orifice valves as necessary b. Adjust low pressure letdown control valve setpoint as necessary	
20	Maintain Required RCP Seal Injection Flow And Labyrinth Seal D/P: o Labyrinth seal D/P to each RCP - GREATER THAN 15 INCHES OF WATER o Seal injection flow to each RCP - GREATER THAN 6 GPM	Perform the following: o Adjust charging flow to REGEN Hx (HCV-142) as necessary. -OR- o Dispatch AO to adjust seal injection needle valves if necessary. • RCP A, V-300A • RCP B, V-300B

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
21	<p>Check If SI System Normal Shutdown Alignment Should Be Established:</p> <p>a. RCS cold leg temperature - LESS THAN 350°F</p> <p>b. RCS pressure - LESS THAN 1500 PSIG</p> <p>c. Lock out SI system as follows:</p> <ol style="list-style-type: none"> 1) Place all SI pump switches in PULL STOP 2) Locally close breakers for SI pump discharge valves to cold legs <ul style="list-style-type: none"> • MOV-878B, MCC D position 8C • MOV-878D, MCC D position 8F 3) Close SI pump discharge to cold legs <ul style="list-style-type: none"> • MOV-878B • MOV-878D 4) Locally open breakers for MOV-878B and MOV-878D 	<p>a. Return to Step 15.</p> <p>b. Stabilize RCS temperature and return to Step 14.</p>

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22	Check If RHR Normal Cooling Can Be Established:	
	a. RCS pressure - LESS THAN 400 PSIG	a. Stabilize RCS temperature and return to Step 14.
	b. Verify all SI pump switches in PULL STOP	b. Return to Step 21.
	c. Sample the RHR system to ensure adequate boron concentration (Refer to Attachment RHR SAMPLE)	
	d. Place RCS overpressure protection system in service (Refer to 0-7, ALIGNMENT AND OPERATION OF THE REACTOR VESSEL OVERPRESSURE PROTECTION SYSTEM)	d. IF RCS overpressure protection system can <u>NOT</u> be placed in service, <u>THEN</u> consult Plant staff to determine if RHR normal cooling should be established and go to Step 23.
	e. Establish RHR normal cooling (Refer to Attachment RHR COOL)	
23	Continue RCS Cooldown To Cold Shutdown	
***** <u>CAUTION</u> DEPRESSURIZING THE RCS BEFORE THE ENTIRE RCS IS LESS THAN 200°F MAY RESULT IN ADDITIONAL VOID FORMATION IN THE RCS. *****		
24	Continue Cooldown Of Inactive Portion Of RCS:	
	a. Cool upper head region using control rod shroud fans	
	b. Cool S/G U-tubes by dumping steam from all S/Gs	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<p>***** <u>CAUTION</u> IF LESS THAN TWO CONTROL ROD SHROUD FANS ARE RUNNING, THE UPPER HEAD REGION MAY REMAIN ABOVE 200°F FOR UP TO 29 HOURS AFTER REACHING CSD. *****</p>		
25	<p>Determine If RCS Depressurization Is Permitted:</p> <p>a. Entire RCS - LESS THAN 200°F</p> <ul style="list-style-type: none"> • Core exit T/Cs • Upper head T/Cs • RCS hot leg temperature • RCS cold leg temperature <p>b. Check control rod shroud fan status - BOTH RUNNING DURING COOLDOWN</p> <p>c. Maintain cold shutdown conditions (Refer to O-2.3, PLANT AT COLD SHUTDOWN)</p>	<p>a. Do <u>NOT</u> depressurize RCS. Return to Step 23.</p> <p>b. Consult Plant staff to determine wait period for upper head cooling.</p>
-END-		

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ES-0.2 APPENDIX LIST

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9) ATTACHMENT RHR SAMPLE	1
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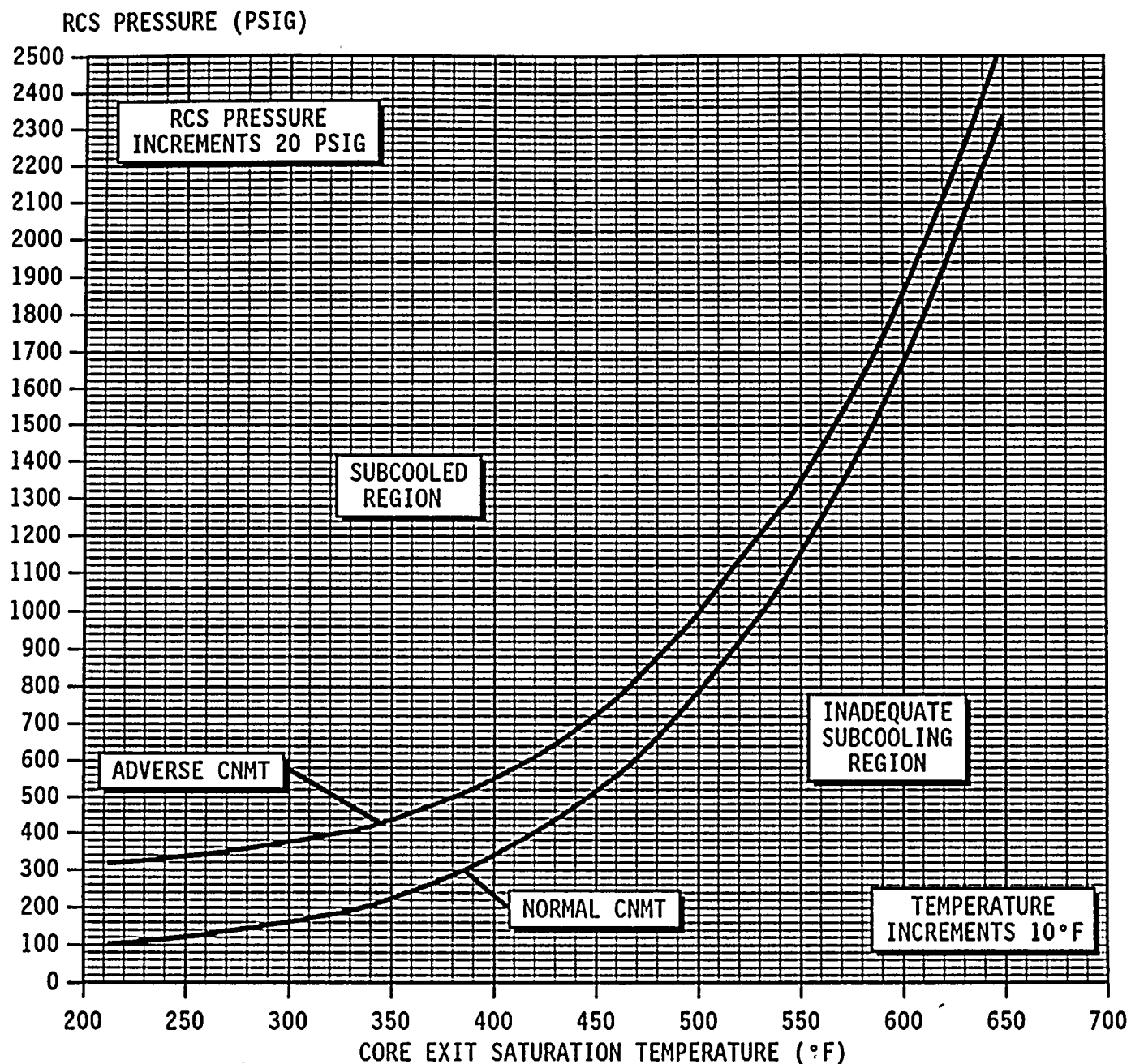
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RED PATH SUMMARY

- a. SUBCRITICALITY - Nuclear power greater than 5%
- b. CORE COOLING - Core exit T/Cs greater than 1200°F
-OR-
Core exit T/Cs greater than 700°F AND
RVLIS level (no RCPs) less than 43% [46%
adverse CNMT]
- c. HEAT SINK - Narrow range level in all S/Gs less than 5%
[25% adverse CNMT] AND total feedwater flow
less than 200 gpm
- d. INTEGRITY - Cold leg temperatures decrease greater than
100°F in last 60 minutes AND RCS cold leg
temperature less than 285°F
- e. CONTAINMENT - CNMT pressure greater than 60 psig

FIGURE MIN SUBCOOLING

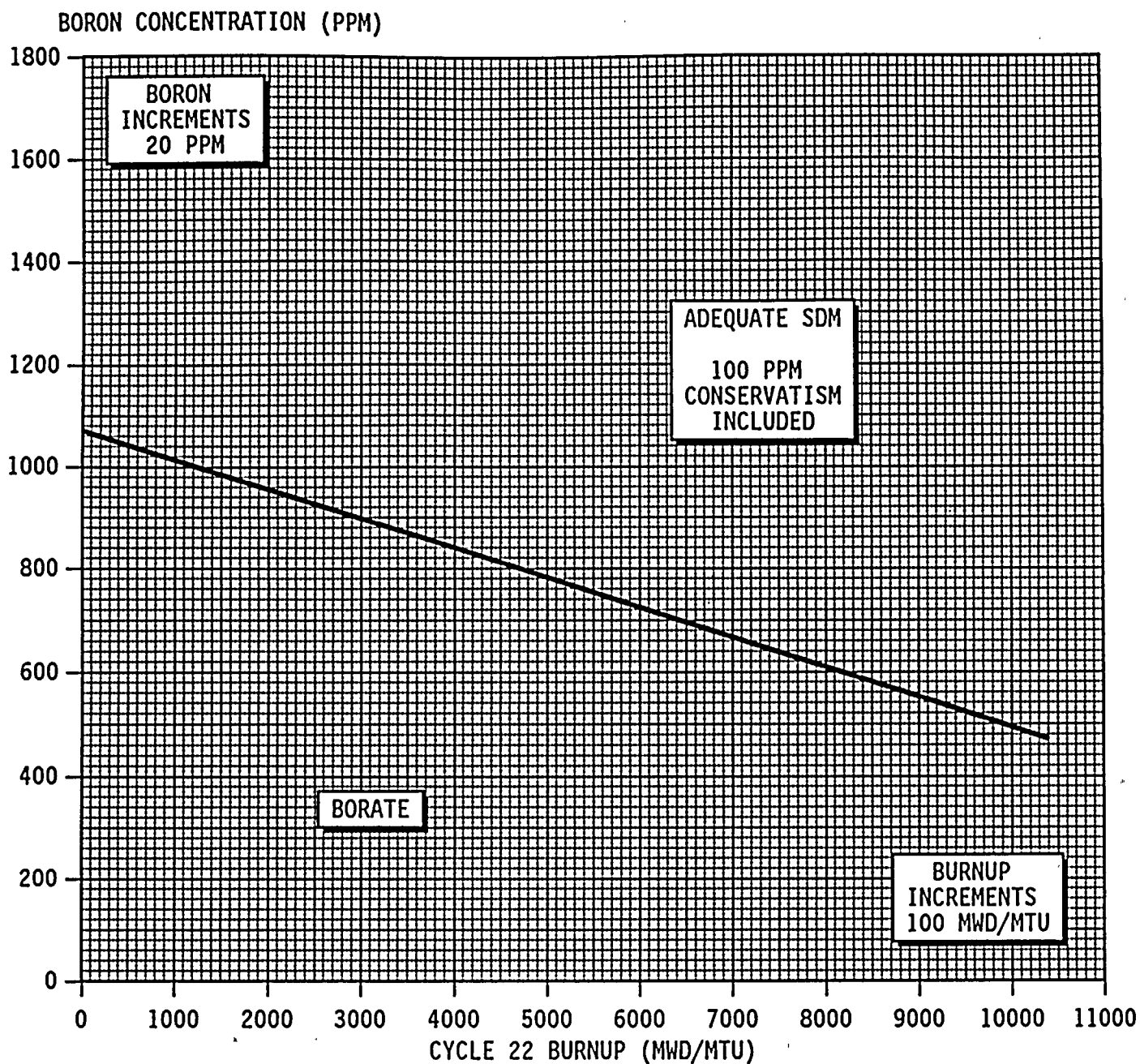
NOTE: Subcooling Margin = Saturation Temperature From Figure
Below [-] Core Exit T/C Indication





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FIGURE SDM



NOTE: To obtain core burnup, use PPCS turn on code BURNUP.

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2. 2002-2003

3. 2004-2005

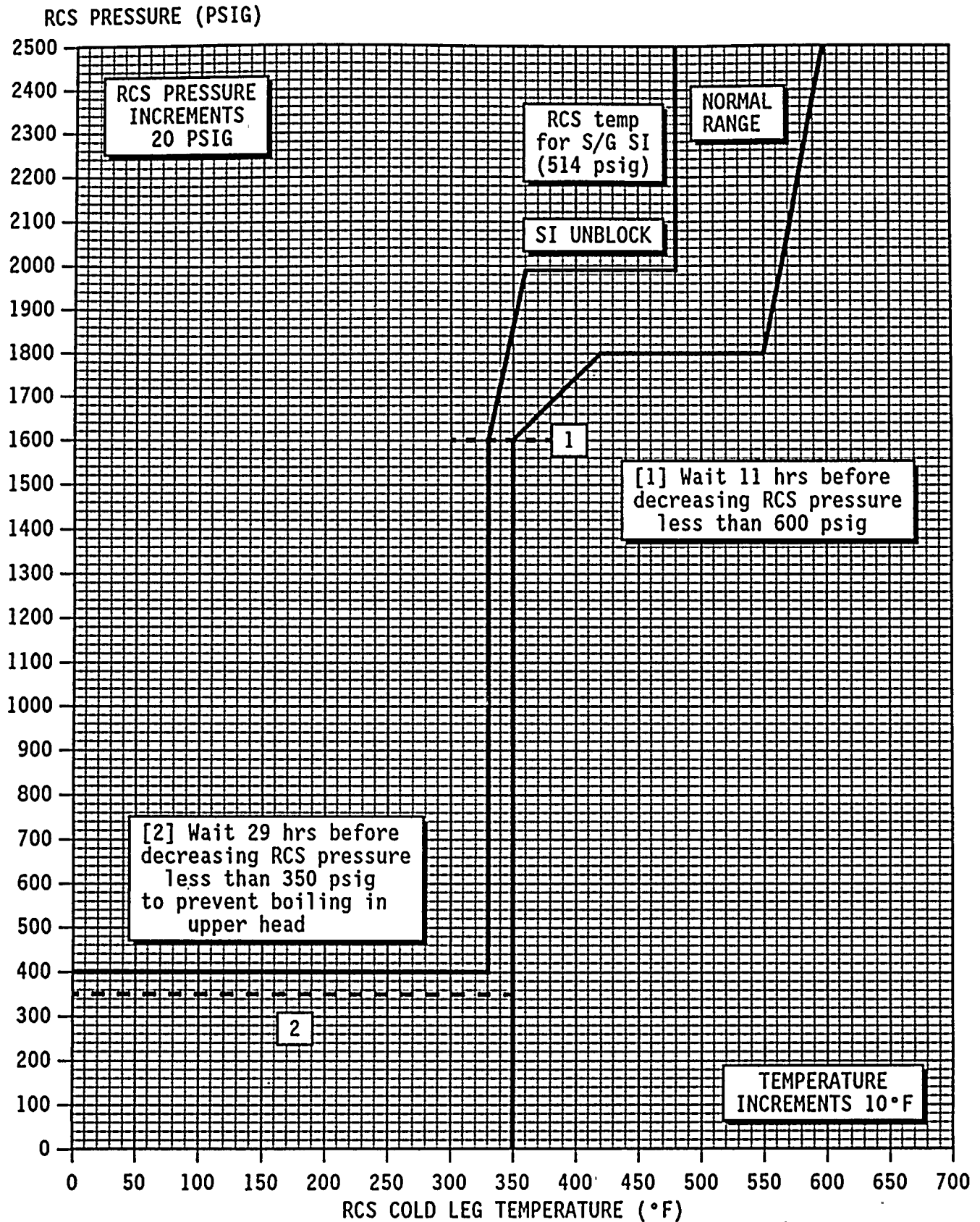
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FIGURE NAT CIRC C/D WITHOUT SHROUD FANS



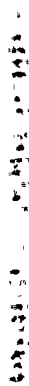
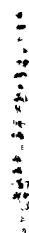
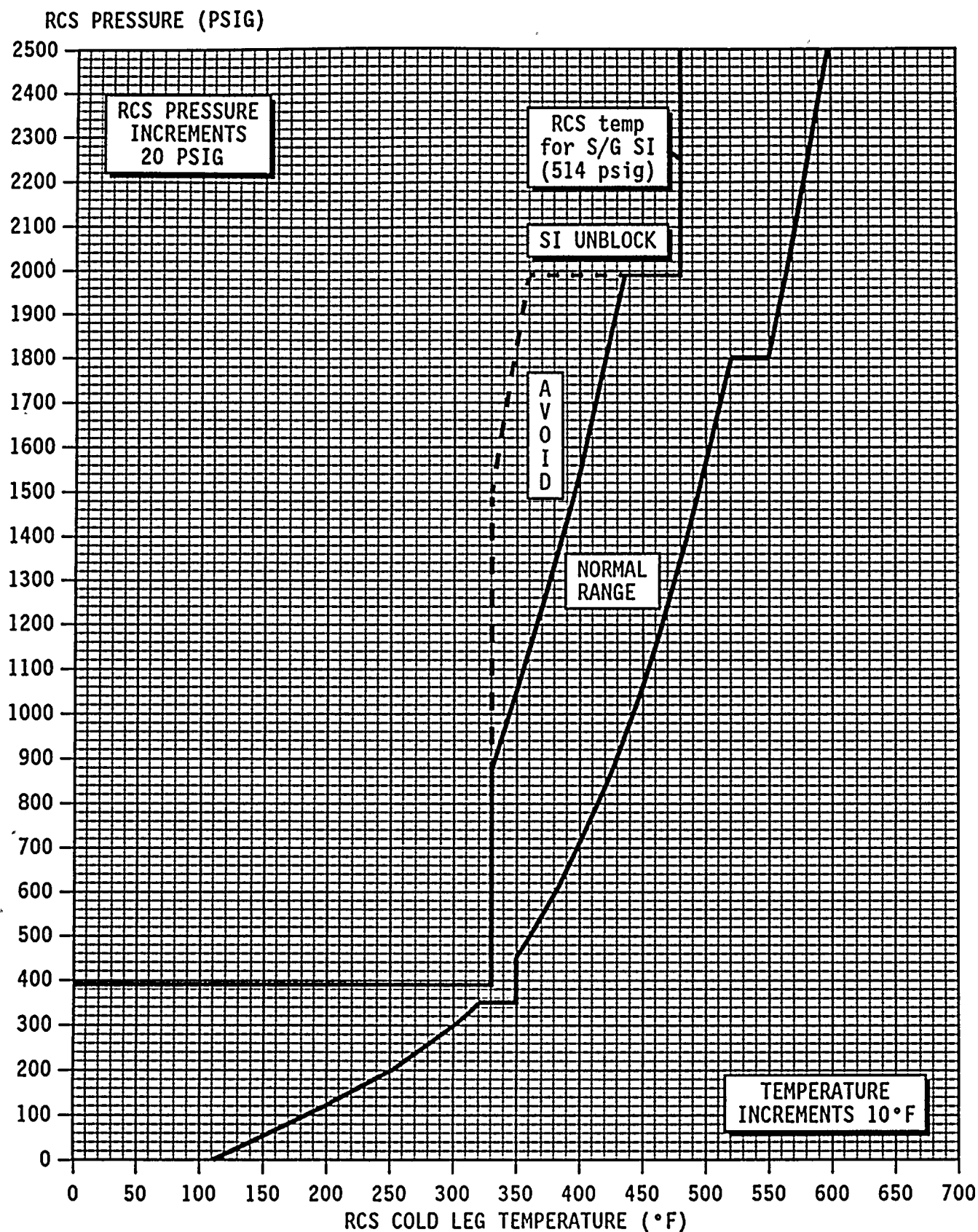


FIGURE NAT CIRC C/D WITH SHROUD FANS



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FOLDOUT PAGE

1. RCP TRIP CRITERIA

IF BOTH conditions listed below occur, THEN trip both RCPs:

- a. SI pumps - AT LEAST TWO RUNNING
- b. RCS pressure minus maximum S/G pressure - LESS THAN 175 PSIG

2. SI PUMP AUTO SWITCHOVER CRITERION

WHEN BAST level decreases to 10%, THEN ensure SI pump automatic switchover to RWST.

3. SI ACTUATION CRITERIA

IF EITHER condition listed below occurs, THEN actuate SI and go to E-0, REACTOR TRIP OR SAFETY INJECTION, Step 1.

- o RCS subcooling based on core exit T/Cs - LESS THAN 0°F USING REQUIREMENTS OF FIGURE MIN SUBCOOLING

- OR -

- o PRZR level - CHARGING CAN NOT CONTROL LEVEL GREATER THAN 5%

4. AFW SUPPLY SWITCHOVER CRITERION

IF CST level decreases to less than 5 feet, THEN switch to alternate AFW water supply (Refer to ER-AFW.1, ALTERNATE WATER SUPPLY TO AFW PUMPS).

