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TSRROC Wc En. 48

1202-6B
Revision 7
03/19/81

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-6B
LOSS OF REACTOR COOLANT/REACTOR COOLANT PRESSURE
(SMALL BREAK LOCA) CAUSING AUTOMATIC HIGH PRESSURE INJECTION

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BUCKETING & SERVICE
BRANCH

Unit 1 Staff Recommends Approval

Approval

NA
Cognizant Dept. Head

Date

Unit 1 PORC Recommends Approval

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Chairman of PORC

Date

3/17/81

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Date

3-19-81

QA Modifications/Operations Mgr

NA

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THREE MILE ISLAND NUCLEAR STATION

UNIT 1 EMERGENCY PROCEDURE 1202-6B

LOSS OF REACTOR COOLANT/REACTOR COOLANT PRESSURE

(SMALL BREAK LOCA) CAUSING AUTOMATIC HIGH PRESSURE INJECTION

-
- NOTE: (1) If RC pressure remains above ESAS setpoint proceed per 1202-6A.
- (2) If OTSG tube rupture is confirmed proceed per 1202-5.
- (3) If loss of coolant is large enough to initiate HPI, CF and LPI flow automatically and RC pressure drops below 200 psig, proceed per 1202-6C.
- (4) The block diagram in Attachment 5 may be used as an aid in determining the applicable procedure and section. The block diagram does not supersede any procedure steps.
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5.B.1

Symptoms

1. Decrease in reactor coolant pressure. RC Pressure Hi/Lo Alarm.
2. Reactor Trip Alarm.
3. Turbine Trip Alarm.
4. ES Actuation A and ES Actuation B not bypassed alarm.
5. ES Actuation indicated by status lights on PCR panel.
6. Δp indication on RC-RV-2 (PORV) or code safety valve discharge line or alarm on the acoustic monitor on RC-RV2 (PORV).

6.B.2

Immediate Action

A. Automatic Action

1. Reactor trip on low RCS pressure or pressure to temperature.
2. Reactor trip containment isolation occurs.
3. ESAS actuation at 1600 psig.

B. Manual Action

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NOTE: The parameters indicated with an asterisk (*) will be reverified as the first step in Follow-Up Action.

1. Press the reactor trip push button and verify that all rods have inserted (except Group 8).
2. If RCS pressure decreases to HPI setpoint:
 - a.) Verify HPI automatically initiates, HPI pumps start, MU-V14A and B open and MU-V16A, B, C and D open.
 - b.) Trip all operating Reactor Coolant Pumps immediately following verification of HPI.

CAUTION: Do not start any major motors such as the condensate pump or the condensate booster pump during E.S. block loading.

3. Verify the Turbine is tripped and verify that the Turbine stop valves are closed.
4. Close MU-V12.
5. Close RC-V2 (may be reopened if necessary to control a pressure increase).
- *6. Verify that EF-P-1, EF-P-2A and EF-P-2B start and discharge pressure increases to >1010 psig, EF-V30A and B open and flow is indicated to increase steam generator level to 50 percent.

NOTE: Control of OTSG feedrate is critical to obtaining RCS Pressure Control (neglecting effects of LOCA pressure transient) Monitor RCS pressure and cold leg temperatures and manually control OTSG feed rate to prevent an overcooling event.

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7. Evaluate for a Non-LOCA overcooling event by observing the following:

NOTE: During a loss of coolant accident, RCS conditions will approach saturation. Temperature will remain fairly constant and pressure will decrease to saturation pressure. During a Non-LOCA overcooling event, pressure and temperature will both decrease rapidly. Some subcooling will be maintained unless pressurizer level is lost.

- a. RCS pressure, temperature, and saturation margin.
- b. OTSG pressure: Decrease for steam line break.
- c. OTSG level: Higher than required for an overfeeding event, low level for steam line break.
- d. Main and startup and/or Emergency feedwater flow: High flow for overfeeding event, isolated for steam line break.

If non-LOCA overcooling is indicated proceed per Attachment-2.

8. Take or verify manual control of EF-V-30A and B and slowly raise OTSG level to 95 percent on operate range.

NOTE: Monitor RCS pressure and cold leg temperatures during OTSG level changes to insure feed rate does not cause significant RCS pressure transient.

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9. Verify that the reactor trip building isolation and high pressure injection systems have actuated.
10. Evaluate for OTSG tube rupture by observing the following:
 - a. Main steam line high radiation monitors.
 - b. Condensor air ejector high radiation monitor (RMA-5)
 - c. Verify no increase in RC drain tank and reactor building temperature, pressure and radiation level.

If a tube rupture is confirmed, proceed per EP1202-5.

11. Monitor reactor coolant drain tank level, pressure, and temperature for any unexpected increase. Check PORV and code safety valve discharge flow alarms in the control room, and check acoustic monitoring for PORV.
12. If ESAS has been bypassed due to heatup on cooldown, initiate HPI manually.

6.B.3 Follow-Up Action

The objectives of the Small Break LOCA Emergency Procedure are to trip the reactor, determine whether a LOCA or a NON-LOCA overcooling event has occurred, conserve RCS inventory, keep the core covered and cooled by maintaining 50°F subcooled condition, establish natural circulation and remove core heat through the steam generators, achieve a cold shutdown condition and to minimize radioactive release to the environment.

- ____ 1. Reverify the parameters in Manual Action that are marked with an asterisk(*). Use redundant indication if available.
- ____ 2. Declare a Site Emergency (carry out EPIP 1004.3).
- ____ 3. Verify the following reactor building isolation valves

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! NOTE: These valves automatically close on reactor trip. !

RB Sump

_____ WDL-V534

_____ WDL-V535

RC Drain Tank

_____ WDG-V3

_____ WDL-V303

_____ WDG-V4

_____ WDL-V304

RCS Sample

_____ CA-V1

_____ CA-V3

_____ CA-V2

_____ CA-V13

RB Purge

_____ AH-V1A

_____ AH-V1C

_____ AH-V1B

_____ AH-V1D

Core Flood Tank

_____ CF-V2A

_____ CF-V2B

_____ CF-V19A

_____ CF-V19B

_____ CF-V20A

_____ CF-V20B

Demin Water

_____ CA-V189

OTSG Sample

_____ CA-V4A

_____ CA-V5A

_____ CA-V4B

_____ CA-V5B

Letdown Cooler

_____ MU-V3

- _____ 4. Verify that both trains of HPI components are operating per table 1. If both HPI trains have not actuated, attempt to start second HPI train.

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CAUTION: Do not attempt to operate ES valves to the Non ES position and do not trip any ES components until the ES signal is bypassed. The breaker anti-pump feature will prevent reclosure of tripped breakers until the ES start signal is cleared.

____ 5. Maintain RCS Pressure/Temperature relationship in accordance with the following:

- a) If RCP's are off with HPI flow on, maintain RCS between curves NO. 1 (Interim Brittle Fracture Curve) and NO. 2 (50°F subcooled) of figure 1.

NOTE: If the RCS inadvertently violates (goes above and to the left) curve NO. 1 on Figure 1, RCS pressure shall be decreased as soon as possible until the RCS is again back between curves NO. 1 and NO. 2. See Step 11 for HPI throttling criteria.

- b) If RCP's are off with no HPI flow on (MU-V-16 A/B/C/D Closed), maintain RCS between curves NO. 1 (Technical Specification NDT Curve) and NO. 2 (50°F Subcooled curve) of Fig. 2.
- c) If RCP's are on, maintain RCS between Curve NO. 1 and NO. 2 of Fig. 2.

____ 6. If reactor building pressure reaches 4 psig, verify that the RB isolation valves have closed as indicated on Panel PCR (See Table II).

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- ____ 7. Verify that total HPI flow exceeds the required flow for RCS pressure as indicated below.

RC Pressure, psig	Required HPI flow gpm
0	550
600	500
1200	438
1500	405
1600	392
1800	365
2400	260
2500	216

If flow requirements are not met verify valve positions and attempt to start another Make-Up Pump.

- ____ 8. If inadequate core cooling is indicated by one or more of the following conditions refer to Attachment 3:
- Superheated conditions as indicated by the saturation meter.
 - Superheated conditions as indicated by the RC hot leg RTD's and the narrow or wide range RC pressure indicators.
 - Superheated conditions as indicated by the incore thermocouples for the existing RCS pressure measured by the narrow or wide range pressure indicators.

NOTE:	With NO. RCP's running, the degree of subcooling shall be determined by the saturation meter or the five highest and operable incore thermocouples, depending on the ability to establish or verify Natural Circulation flow. (ie: no flow, use 5 highest and operable incore thermocouples)
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- ___ 9. Close or verify closed RC-V3, RC-V1, RC-V35, MU-V1A, MU-V1B and RC-V28 in an attempt to isolate the leak.
- ___ 10. Intermediate Closed Cooling (IC) and seal injection should be maintained to the RC Pump seals to assure long term availability. If RUC Service closed cooling to the RC Pump Motors is lost, monitor bearing and stator temperatures. Each pump should not be run for more than 30 minutes without cooling water to the motor.
- 11.
- ___ a. Throttle HPI after bypassing ESAS only when one of the following conditions exists:
- (1) The LPI system is in operation and flowing at a rate in excess of 1000 gpm in each line and the situation has been stable for 20 minutes.
 - (2) The degree of subcooling is at least 50°F (as determined by saturation meter or 5 highest and operable incore thermocouples) and the action is necessary to prevent pressurizer level from going off scale high.

!	<u>NOTE:</u>	If the degree of subcooling cannot be maintained at	!
!		≥50°F, full HPI shall be reinitiated.	!

!	<u>NOTE:</u>	The degree of subcooling beyond 50°F shall be	!
!		limited by the applicable pressure-temperature	!
!		restrictions of Fig. 1 or 2.	!

!	<u>NOTE:</u>	Monitor total make-up flow to maintain ≥80 gpm	!
!		per pump. Open MU-V-36 and MU-V-37 if needed to	!
!		provide bypass flow.	!

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CAUTION: Because MU-V-12 is closed, monitor make-up tank level and pressure to avoid lifting the make-up tank relief valve (MU-RV-1).

- _____ b. With criteria to throttle HPI met, bypass ESAS as follows:
- (1) Defeat 2 channels of RB isolation in Actuation A and B (required only if 4 psig RB isolation has occurred).
 - (2) Bypass all three channels for 1600 psig in Actuation A and B (If RCS has repressurized to greater than 1700 psig, reset the 1600 psig bistables rather than bypass)
- _____ 12. Verify that Natural Circulation has been established by observing:
- a. Cold leg temperatures approach saturation temperature for secondary side pressure within approximately 5 minutes.
 - b. Primary delta T($T_{hot} - T_{cold}$) becomes constant at approximately 30°F - 50°F.
- _____ 13. Monitor Source Range Nuclear instrumentation and incore thermocouple temperatures. Unexpected increase in source range indication or incore thermocouple temperatures may indicate voiding and inadequate core cooling. If voiding occurs assure that full High Pressure Injection is in operation.

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- ____ 14. Send an operator to the emergency feed pump area to take manual control of the EF Valves if problems occur. If neither main nor emergency feedwater is available, maintain full high pressure injection until feedwater is restored. Open the RC-RV-2 (PORV) and RC-V2 or allow the code safety valves to open to provide a flow path. Refer to Attachment 4 for restoring Emergency Feedwater.
- ____ 15. Reduce turbine header pressure setpoint or take manual control of the bypass valves to cooldown the RCS so that the degree of subcooling is at least 50°F and cooldown rate is approximately 100°F/hour but within Tech Spec limits. When 50°F subcooling is achieved and RC pressure is below 700 psig close CF-V1A and CF-V1B to isolate core flood tanks.
- ____ 16. If the criteria for RC pump restart per attachment 1 is met and if RC pumps and emergency feedwater are available, bump the RC pumps in accordance with Attachment 1, and proceed to forced cooling.
- ____ 17. If RC pumps are not available continue cooldown on natural circulation.

6.B.4

Long Term

- ____ 1. Upon a Borated Water Storage Tank Lo-Lo alarm of 36", shift suction of MU pumps from the Borated Water Storage Tank to the Reactor Building Sump by opening DH-V7A and DH-V7B, DH-V6A and 6B and closing DH-V5A and 5B and closing MU-V14A and 14B. Injection flow path is now as follows:

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Spilled coolant to R.B. sump, R.B. sump to LPI pumps, LPI pumps to MU pumps, MU pumps to RCS via MU-V16A, B, C, D.

2. When both MU pumps are in piggy back mode of operation with >500 gpm flow per pump and RC pressure is <250 psig trip all RC pumps (if operating). Monitor Hot Leg RCS temperatures and incore thermocouple temperatures.
3. If RCS pressure decreases to <200 psig, and the HPI throttling criteria have been met, throttle HPI discharge flow by throttling MU-V16A/B/C/D. If required open MU-V36 and MU-V37 to provide at least 80 gpm thru each HPI pump. Periodically open MU-V12 as necessary to control makeup tank level and pressure.

CAUTION: Because MU-V12 is closed, monitor make-up tank level and pressure to avoid lifting the makeup tank relief valve (MU-RV-1).

Observe that LPI pumps deliver water to RCS via DH-V4A/B (>1000 gpm per LPI loop).

4. When LPI is verified >1000 gpm and stable for >20 minutes in both loops, stop the make-up pumps and close DH-V7A, 7B and MU-V16A/B/C/D. Injection flow path is now as follows:

Spill coolant to RB sump, RB sump to LPI pumps, LPI pumps to RCS through DH-V4A and B.

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- ____ 5. Throttle DH-V4A and 4B as required to maintain LPI pump flow of >1000 <3500 gpm and when time permits, throttle manual valves DH-V19A and 19B and reopen DH-V4A and 4B. Within about 24 hours establish a long term cooling circulation mode as described in OP 1104-4 and listed below.
- Mode 1 - Forced circulation using decay heat drop line.
- Mode 2 - Gravity draining reactor coolant hot leg to the Reactor Building sump via the D.H. drop line.
- Mode 3 - Hot leg injection using pressurizer auxiliary spray line.
- Mode 4 - Reverse flow through the decay heat drop line into "B" reactor coolant loop hot leg.
- ____ 6. Monitor reactor building hydrogen concentration. Place the hydrogen recombiner in operation if hydrogen concentration reaches 3 percent per OP 1104-62.
- ____ 7. Containment isolation valves may be opened to obtain samples in accordance with approved procedures. The isolation valves shall be reclosed after the sample is obtained.

- ____ 8. Other containment isolation valves automatically closed shall remain closed until the following conditions are met.
- a. Reactor building pressure is less than 2 psig.
 - b. Containment radiation levels have been assessed based on radiation monitor readings or samples.
 - c. The integrity of the system outside the reactor building has been assessed. (Stable surge tank level, visual inspection or pressure test should be considered to verify integrity).
 - d. The Shift Supervisor or Emergency Director shall give permission to re-open containment isolation valves.
 - e. Installed radiation monitors or portable monitors shall be available to detect any release that may result from opening the valve.

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TABLE No. 1 HPI

Actuation A		(Left)	Actuation B		(Right)
Status Light Description	Status Light Color		Status Light Description	Status Light Color	
BWST SUP MU-V14A	Blue	A.	BWST SUP MU-V14B	Blue	
R.B. SUMP DH-V6A	Blue	B.	R.B. SUMP DH-V6B	Blue	
DH to MU DH-V7A	Blue	C.	DH to MU DH-V7B	Blue	
Diesel A Running	Blue	D.	Diesel B. Running	Blue	
E. Aux. Bldg. MCC A Bkr	Blue	E.	Aux. Bldg. MCC B Bkr	Blue	
F. Scrn. House MCC A Bkr	Blue	F.	Scrn. House MCC B Bkr	Blue	
G. LPI Line DH-V4A	Blue	G.	LPI Line DH-V4B	Blue	
BWST SUP DH-V5A	Blue	H.	BWST SUP DH-V5B	Blue	
R.B.C. Pump A RR-P1A	Blue	I.	R.B.C. Pump B RR-P1B	Blue	
J. RBC PP REC RR-V10A	Blue	J.	RBC PP REC RR-V10B	Blue	
K. RB Fan A AH-E1A	Blue	K.	RB Fan B AH-E1B	Blue	
L. RB Fan Mtr NS-V52A	Blue	L.	RB Fan Mtr NS-V52B	Blue	
M. RB Fan Mtr NS-V53A	Blue	M.	RB Fan Mtr NS-V53B	Blue	
N. DR Pump A DR-P1A	Blue	N.	DR Pump B DR-P1B	Blue	
O. DR Pump Dis DR-V1A	Blue	O.	DR Pump Dis DR-V1B	Blue	
P. NR Pump A/B NR-P1A/B	Blue	P.	NR Pump B/C NR-P1B/C	Blue	
Q. NR Pump Dis NR-V1A/B	Blue	Q.	NR Pump Dis NR-V1B/C	Blue	
R. D.C. Pump A DC-P1A	Blue	R.	D.C. Pump B DC-P1B	Blue	
S. NS Pump A/B NS-P1A/B	Blue	S.	NS Pump B/C NS-P1B/C	Blue	
T. NS Deicing NR-V4A	Blue	T.	NS Deicing NR-V4B	Blue	
U. Aux. BL Fan AH-E-15A	Blue	U.	Aux. BL Fan AH-E-15B	Blue	

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TABLE No. 1 HPI (Cont'd)

Actuation A		(Left)	Actuation B		(Right)
Status Light Description	Status Light Color		Status Light Description	Status Light Color	
V. SCR HS Fan AH-E-27A	Blue		V. SCR HS Fan AH-E-27B	Blue	
W. H-P Recirc MU-V36	Blue		W. H-P Recirc MU-V37	Blue	
X. RB Sample CM-V-1	Blue		X. RB Sample CM-V-2	Blue	
Y. RB Sample CM-V-3	Blue		Y. RB Sample CM-V-4	Blue	
Z. MU-V-2A	Blue		Z. MU-V-2A	Blue	
AA. RR-V-1A	Blue		AA. RR-V-1B	Blue	
BB. RR-V-3A	Blue		BB. RR-V-3B	Blue	
CC. PR-V-4A	Blue		CC. RR-V-4B	Blue	
			DD. RB-V-7	Blue	

Actuation A or B		(Center)
Status Light Description	Status Light Color	
A. Non ESS Dump NS-V32	Blue	
B. RB Fan C, AH-E1C	Blue	
C. RB Fan Mtr NS-V52C	Blue	
D. RB Fan Mtr NS-V53C	Blue	
E. Make up MU-V-18	Blue	
F. RR-V-3C	Blue	
G. RR-V-4C	Blue	
H. RR-V-4D	Blue	
I. RB-V-2A	Blue	

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TABLE NO. II R.B. ISOLATION 4 PSIG

Actuation A		(Left Side)	Actuation B		(Right Side)
Status Light	Description	Color	Status Light	Description	Color
A.	S.G.B. Sample CA-V-5B	Blue	A.	S.G.A. Sample CA-V-5A	Blue
B.	S.G.A. Sample CA-V-4A	Blue	B.	S.G.B. Sample CA-V-4B	Blue
C.	R.B. Air Sam CM-V-1	Blue	C.	R.B. Air Sam CM-V-2	Blue
D.	R.B. Air Sam CM-V-3	Blue	D.	R.B. Air Sam CM-V-4	Blue
E.	R.B. Purge AH-V-1B	Blue	E.	R.B. Purge AH-V-1A	Blue
F.	R.B. Purge AH-V-1D	Blue	F.	R.B. Purge AH-V-1C	Blue
G.	R.B. Gas Vnt WDG-V-3	Blue	G.	R.B. Gas Vnt WDG-V-4	Blue
H.	R.C. Drn Tk WDL-V-303	Blue	H.	R.C. Drn Tk WDL-V-304	Blue
I.	R.B. Smp out WDL-V-534	Blue	I.	R.B. Smp Out WDL-V-535	Blue
J.	CFA Sam IS CF-V-2A	Blue	J.	CFA Sam IS CF-V-20A	Blue
K.	CFB Sam IS CF-V-2B	Blue	K.	CFB Sam IS CF-V-20B	Blue
L.	R.C. Letd IS MU-V-3	Blue	L.	R.C. Letd IS MU-V-2A	Blue
M.	R.C. Sam IS CA-V-2	Blue	M.	R.C. Letd IS MU-V-2B	Blue
			N.	PRZ Stm SA CA-V-1	Blue
			O.	PRZ Wtr SA CA-V-3	Blue
			P.	R.C. Let Sam CA-V-13	Blue
			Q.	R.B. Cooler RB-V-7	Blue

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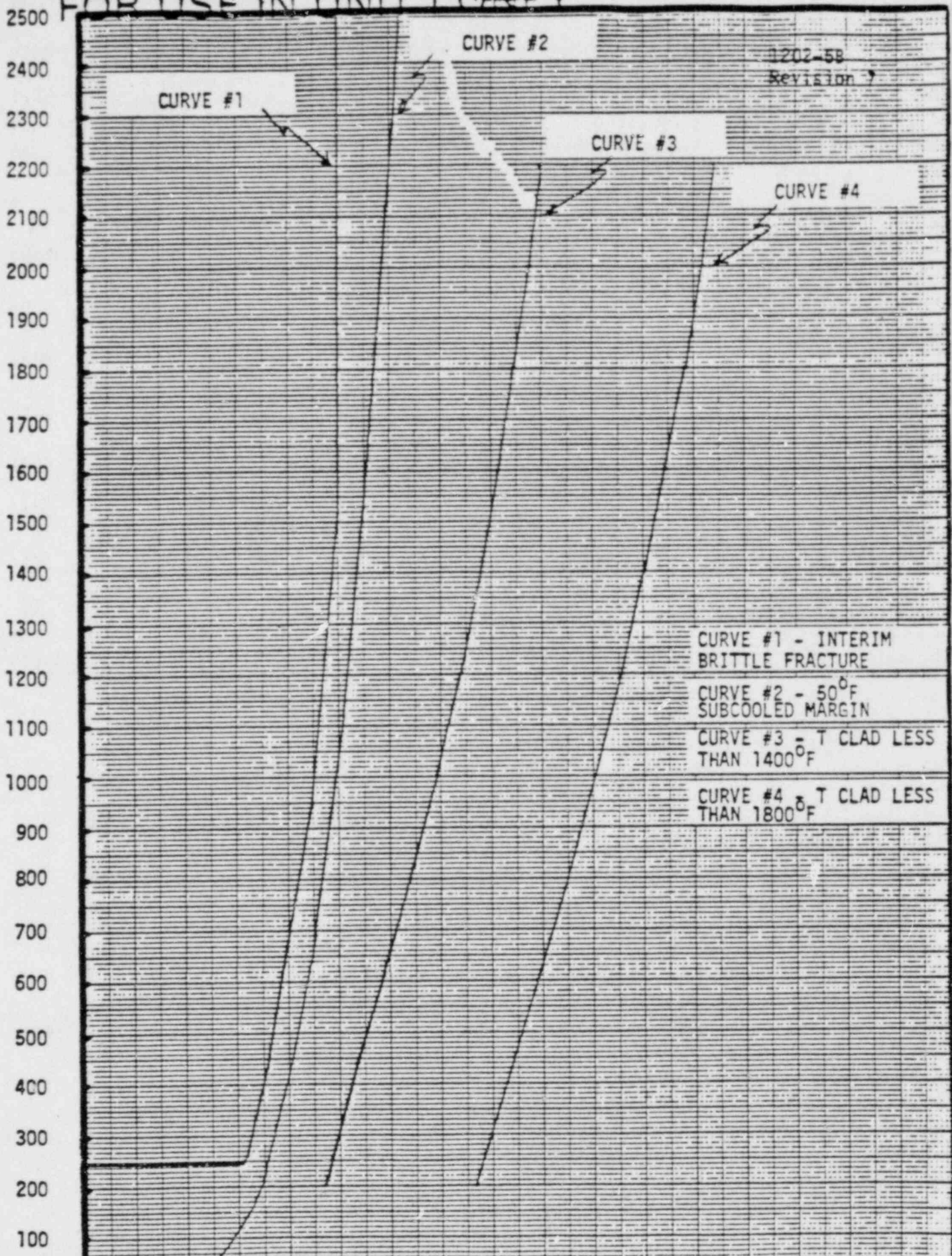
TABLE NO. II (cont'd)

Actuation "A" or "B" (center)		
Status	Light Description	Color
A.	R.B. Rec Wtr CA-V-189	Blue
B.	Normal MU MU-V-18	Blue
"	R.B. Cooler RB-V-2A	Blue
	CF Tk Fill CF-V-19A	Blue
	CF Tk Fill CF-V-19B	Blue

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RCS PRES. (E)



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- CURVE #1 - INTERIM BRITTLE FRACTURE
- CURVE #2 - 50°F SUBCOOLED MARGIN
- CURVE #3 - T CLAD LESS THAN 1400°F
- CURVE #4 - T CLAD LESS THAN 1800°F

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INCORE THERMOCOUPLES
(Use average of five highest)

FIGURE 8
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CURVE #1

CURVE #2

CURVE #1 - T.S. NDT

CURVE #2 - 50°F Margin

RCS PRES

2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100

100

200

300

400

500

600

700

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INDICATED RC TEMP OF

19.0

ATTACHMENT 1RESTART OF REACTOR COOLANT PUMPS
FOLLOWING AUTOMATIC ESAS ACTUATION1.0 PREREQUISITES

NOTE: The normal limits for minimum RC pressure for RC pump operation are superseded by these instructions. RC pump shaft vibration may also exceed normal limits. If the vibration is off-scale (>40 mils) the pumps should only be run if incore Tc temperatures are greater than Curve 4 of Figure 1.

1.1 Restart of the Reactor Coolant pumps is recommended for the following conditions:

- a. Feedwater flow is available and RCS repressurizes to greater than 1600 psig or RCS is greater than 350 psig with at least a 50°F subcooled margin. Refer to Section 2.1 of Attachment 1.
- b. Feedwater flow is available and RCS pressure exceeds secondary system pressure by 600 psig, refer to Section 2.2 of Attachment 1.
- c. Secondary system pressure is less than 100 psig and RCS pressure is greater than 250 psig, refer to Section 2.3 of Attachment 1.
- d. Inadequate core cooling, refer to Attachment 3.
- e. Non-LOCA - Overcooling Event, refer to Attachment 2.

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- ___ 1.2 Verify the following RC pump services.
- a. Seal injection total flow approximately 32 gpm (>22 gpm).
 - b. Seal cooling: Intermediate Closed Cooling pump on, IC-V2, 3, and 4 open.
 - c. RC Pump Motor Cooling, NS-V4, 15, and 35 open.
- ___ 1.3 Start RC Pump Motor Backstop Oil Pump.
- ___ 1.4 Start RC Pump Motor Oil Lift Pump.

RESTART OF RC PUMP

- 2.1 RCS Repressurized to >1600 psig, or >250 psig with at least a 50°F subcooled margin.
- ___ a. Verify that emergency feedwater is available to at least one steam generator.
 - ___ b. Start one RC pump on the operable steam generator.
 - ___ c. Continue cooldown at approximately 100°F/hour but within Technical Specification limits.
- 2.2 RCS Pressure Exceed Secondary System Pressure by 600 psig.
- ___ a. Verify that emergency feedwater is available to at least one steam generator.
 - ___ b. Bump one RC pump on the steam generator with feedwater for 10 seconds.

! NOTE:	Bumping of RC pump on steam generator with low steam generator level would not help condense the trapped RC vapors.	!
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- ___ c. Allow RCS pressure to stabilize while continuing to cool down.

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- ____ d. If after 15 minutes, RCS pressure exceeds secondary system pressure by 500 psig bump a different pump on steam generator with feedwater for 10 seconds. Bump alternate RC pumps so that no pump is bumped more than once in an hour.
- ____ e. After five (5) bumps allow the RC pump to continue in operation.

2.3 Secondary System Is Less Than 100 psig and RCS Pressure Is Greater Than 250 psig.

- ____ a. Verify that emergency feedwater is available to at least one steam generator.
- ____ b. RC pressure has been stabilized for greater than one hour.
- ____ c. Bump an RC pump on steam generator with feedwater for approximately 10 seconds.
- ____ d. Wait 30 minutes and start an alternate RC pump, if RC flow is indicated and established, maintain OTSG cooling by adjusting turbine by pass valves for the respective OTSG.

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ATTACHMENT 2

NON-LOCA OVERCOOLING TRANSIENT WITH FEEDWATER AVAILABLE

- ____ 1. If a steam line break is indicated, verify the following valves closed for the affected steam generator.

A Steam Generator

FW-V17A

FW-V16A

FW-V92A

FW-V5A

EF-V30A

MS-V3D

MS-V3E

MS-V3F

B Steam Generator

FW-V17B

FW-V16B

FW-V92B

FW-V5B

EF-V30B

MS-V3A

MS-V3B

MS-V3C

Refer to AP 1203-24 Steam Supply System Rupture.

- ____ 2. If an overfeeding event is indicated close the following valves for the affected steam generator.

A Steam Generator

FW-V16A

FW-V17A

FW-V5A

FW-V92A

EF-V30A

B Steam Generator

FW-V16B

FW-V17B

FW-V5B

FW-V92B

EF-V30B

If unable to isolate main feedwater flow trip the main feedwater pumps.

- ____ 3. Immediately restart one RC pump in each loop if the RCS is 50°F subcooled.

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- ____ 4. Bypass ESAS and secure HPI. Restore normal make-up and letdown.

!	<u>NOTE:</u>	Considerable H.P.I. may have been added to the	!
!		R.C.S. which could lead to going solid in the	!
!		RCS. Use the turbine bypass or atmospheric dump	!
!		valves to control and stabilize the RCS heatup	!
!		rate.	!

- ____ 5. When RCS conditions have been stabilized, use the normal heatup or cooldown procedures to establish the desired plant conditions.

ATTACHMENT 3

ACTIONS FOR INADEQUATE CORE COOLING

: NOTE:	Where instructions require opening the RC-RV-2 (PORV), it must be accomplished by inserting key into the RC-RV-2 (PORV) manual control key switch and keeping the spring loaded switch in open position for the duration RC-RV-2 (PORV) needs to be open.	:
---------	---	---

IMMEDIATE STEPS FOR INADEQUATE CORE COOLING.

: NOTE:	If RC pumps are running, do not trip pumps. This supersedes instructions in Section B Manual Action.	:
---------	--	---

- ____ 1.1 Verify HPI/LPI systems are functioning properly with maximum flow. Start third HPI pump and open MU-V217, if possible, to increase injection flow. Refer to step 6.B.3.7 for HPI Min Flow. (LPI System may only be on pump recirc due to high (\geq 250 psig) RCS pressure.
- ____ 1.2 Verify steam generator level is being controlled at 95 percent on operate range.
- ____ 1.3 Depressurize operative steam generator(s) to establish a 100°F/hour decrease in secondary saturation temperature.
- ____ 1.4. Ensure core flood tank isolation valves CF-V1A and B are open.
- ____ 1.5 If reactor coolant system pressure increases to 2300 psig open pressurizer RC-RV-2 (PORV) to reduce reactor coolant system pressure. Reclose RC-RV-2 (PORV) when RCS falls to 100 psig above the secondary pressure. Repeat if necessary. If RC-RV-2 (PORV) is not operable, pressurizer safety valves will relieve pressure.
- ____ 1.6 When the indicated incore thermocouple temperatures or hot leg RTD temperatures are superheated for the existing RCS pressure,

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operator action shall be based on conditions determined from Figure 1, by a sample of the highest incore thermocouple temperature readings to determine the core exit thermocouple temperature.

: NOTE: More than one thermocouple temperature reading should be :
: used (for example use the average of 5). :
:

- 1.7 When the incore thermocouple temperature has been determined, proceed per the following guidelines.

<u>INCORE THERMOCOUPLE TEMPERATURE</u>	<u>SECTION</u>
Incore T/C \leq Saturation (left of Curve 2 fig. 1)	6.B.3 Follow-up Action
Incore T/C $>$ Saturation Curve 2 but less than Curve 3 fig. 1	Repeat Section 1 of this attachment
Curve 3 \leq incore T/C $<$ Curve 4 Figure 1	2 of this attachment
Incore T/C \geq Curve 4 Figure 1	3 of this attachment

: NOTE: The incore thermocouple temperature readings shall be :
: continuously monitored until the indicated incore :
: thermocouple temperatures return to saturation temperature :
: for the existing RCS pressure. :
:

2.0 ACTIONS FOR CURVE 3 \leq INCORE T/C $<$ CURVE 4 FIGURE 1.

- 2.1 If RC pumps are not operating, start one pump per loop (if possible). This instruction supersedes previous instructions to trip RC pumps.

: NOTE: Do not bypass normal interlocks. Operate RC pumps until :
: pump shaft vibrations are up to 30 mils. :
:

- 2.2 Depressurize operative steam generator(s) as rapidly as possible to 400 psig or as far as necessary to achieve a 100°F decrease in secondary saturation temperature.

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- 2.3 Open the RC-RV-2 (PORV); as necessary, to maintain RCS pressure within 50 psi of steam generator secondary side pressure.

NOTE: If steam generator depressurization was not possible, open RC-RV-2 (PORV) and leave open.

- 2.4 Immediately continue plant cooldown by maintaining 100°F/hour. Decrease secondary saturation temperature to achieve 150 psig RCS pressure.

CAUTION If emergency feed pump EF-P1 is supplied by main steam, do not decrease steam pressure below 150 psig, necessary for EF-P1 operation.

- 2.5 If the average incore thermocouple temperature increases to Curve 4 Figure 1 proceed immediately to Section 3.0.

- 2.6 When RCS pressure reaches 150 psig, proceed per section 6.B.4 'Long Term Cooling'.

3.0 ACTIONS FOR INCORE T/C > CURVE 4 FIGURE 1

- 3.1 If possible, start all R.C. pumps.

NOTE 1: Starting interlocks may be defeated if necessary. (See GAI 208-110). In order to minimize the possibility of a fire due to bypassing some interlocks, the following guidance should be observed: Do Not defeat the overload trip circuit and if Nuclear Services closed cooling is not restored to the motor within 30 minutes, trip the RC pump. Starting the RCP with neither intermediate closed cooling nor seal injection will probably fail the pump seals and may cause the pump shaft to break. These consequences are deemed acceptable is an effort to establish adequate core cooling

NOTE 2: High levels of shaft vibration should be expected. The RC pumps should not be tripped if vibration limits are exceeded.

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- ___ 3.2 Depressurize the operative steam generator(s) as quickly as possible to atmospheric pressure. (150 psig if EF-P1 is in operation using main steam).

! CAUTION: If emergency feed pump is supplied by main steam, do !
! not decrease steam pressure below 150 psig. !

- ___ 3.3 Open the pressurizer RC-RV-2 (PORV) and leave open.

! NOTE: The RCS will depressurize and the LPI system should !
! restore core cooling. !

- ___ 3.4 When incore thermocouple temperatures return to the saturation temperature for the existing RCS pressure - and - the LPI system is delivering flow (flow dependent on RCS pressure), proceed as follows:

- ___ 3.4.1 Close the pressurizer RC-RV-2 (PORV); reopen if RCS pressure increases above 150 psig.

- ___ 3.4.2 Decrease to two (2) RC pump operation (one per loop).

- ___ 3.4.3 Isolate the core flood tanks.

- ___ 3.4.4 Maintain steam generator pressure at atmospheric pressure (150 psig if EF-P1 is in operation using main steam).

- ___ 3.4.5 HPI flow may be throttled if criteria of 6.B.3.11 is met.

- ___ 3.4.6 Monitor BWST level as Lo-Lo level limits are approached, align LPI system for suction from RB sump per Section 6.B.4 Long Term.

! NOTE: If HPI is required per 6.B.3.11 align LPI and HPI in !
! piggyback mode. Close HPI suction valves to BWST. !

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ATTACHMENT 4

ACTIONS FOR FAILURE OF THE EMERGENCY FEEDWATER SYSTEM

A. Failure of EF-P1 to Start.

1. Verify that MS-V2A and MS-V2B are open.
2. Verify that CO-V10A, CO-V10B, EF-V1A and EF-V1B are open.
3. Press the OPEN push button for MS-V13A and MS-V13B.
4. If EF-P1 fails to start press the CLOSE push button for MS-V13A and MS-V13B.
5. Have an Aux. Operator check locally that EF-P1 overspeed trip is reset and that the Manual Operator for MS-V6 is in the open position.

B. Failure of EF-P2A or EF-P2B To Start.

1. Verify that there is voltage available at the associated bus.

!	<u>NOTE:</u>	With an ES signal present there will be a 20 second delay in pump start.	!
---	--------------	--	---

2. Verify that control power is available as indicated by the green indicator light at the control switch.
3. Manually start the pump using the control switch.

!	<u>NOTE:</u>	If EF-P1 and either motor driven pump have started any further investigation may be performed when plant conditions become stable.	!
---	--------------	--	---

4. Check locally for targets on relays located at the switchgear.
5. Use the 69 bypass key and attempt to start the pump locally.

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C. Failure of EF-V30A or EF-V30B to open.

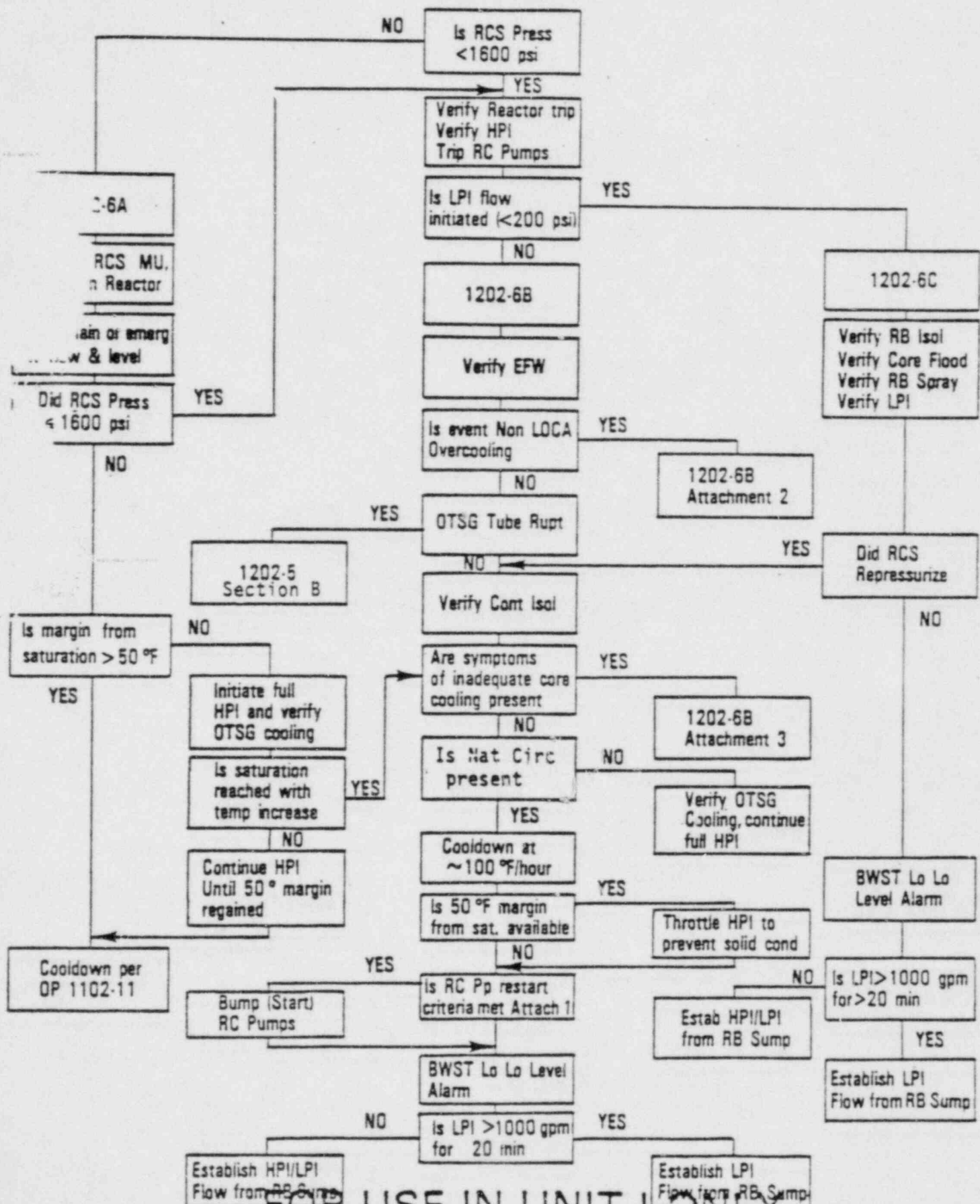
1. Check steam generator level to determine whether an open signal is required. The valves should be open if steam generator level is > 30 inches on the startup range (RC Pumps on) or > 50 percent on the operating range (RC Pumps off).
2. Verify that EF-V30A and EF-V30B Hand-Auto Stations are in AUTO.
3. If the valves have failed to open, place the Hand-Auto Station in HAND and attempt to open the valve.
4. If the valves have not opened, attempt to open using the backup Manual Control Station located in the control room.
5. If the valves are still not open, have the aux. operator establish communication with control room operator and take local handwheel control of the valves and open them as directed by the control room operator.

D. No Indicated Flow (Low Flow) With Steam Generator Level Below Setpoint.

1. Verify that EFP discharge pressure is higher than steam generator pressure. If not Turbine Header pressure setpoint may be reduced to get additional flow.
2. Verify that the following valves are open:
EF-V2A EF-V30A
EF-V2B AND
CO-V10A EF-V30B
CO-V10B
3. Have aux. operator check locally for pump malfunction and correct lineup of manual valves.

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ATTACHMENT 5



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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-6C
LOSS OF REACTOR COOLANT/REACTOR COOLANT PRESSURE CAUSING AUTOMATIC
HIGH PRESSURE INJECTION, CORE FLOOD AND LOW PRESSURE INJECTION

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Unit 1 Staff Recommends Approval

Approval

NA
Cognizant Dept. Head

Date

Unit 1 PORC Recommends Approval

W. H. H. H.
Chairman of PORC

Date 3/31/81

Manager TMI I Approval

R. J. Tole

Date 3-31-81

Mgr QA Approval

NA

Date

NRC Approval

NA

Date

DOCUMENT ID:0006N

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THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 1 EMERGENCY PROCEDURE 1202-6C

LOSS OF REACTOR COOLANT/REACTOR COOLANT PRESSURE CAUSING AUTOMATIC HIGH PRESSURE INJECTION, CORE FLOOD AND LOW PRESSURE INJECTION

- NOTE:
- (1) If RC Pressure remains above ESAS Set Point, proceed per 1202-6A.
 - (2) If HPI initiates automatically but pressure remains above 200 PSIG proceed per 1202-6B.
 - (3) If OTSG tube rupture is confirmed proceed per 1202-5B.

1.0 SYMPTOMS

1. Rapid continuing decrease of reactor coolant pressure.
2. Reactor Trip Alarm.
3. RCS Pressure ES Actuation.
4. ES Actuation as indicated by the status lights on PCR panel.
5. RB Pressure Hi Alarm.
6. Core Flood Tank 1A/1B Level Hi/Lo Alarm.
7. LPI Flow indicated.

2.0 IMMEDIATE ACTION

A. Automatic Action

1. Reactor trip on low RCS pressure.
2. Turbine trip.
3. Hi pressure and low pressure injection initiated at 1600 psig, 500 psig RCS pressure or 4 psig reactor building pressure.
4. Both core flood tanks discharge at 600 psig.

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5. Various degrees of reactor building isolation occurs on reactor trip, high pressure injection, 4 psig RB pressure, and 30 psig RB pressure.
6. Reactor building emergency cooling initiated at 4 psig reactor building pressure.
7. Reactor Building pressure recorder transfer to wide range transmitter.
8. Reactor building spray initiates at 30 psig.

B. Manual Action

NOTE: The parameters indicated with an asterisk (*) will be reverified as the first step in Follow-Up Action.

1. Press the reactor trip push button and verify that all rods have inserted except Group 8.
- *2. Verify that the HPI and LPI pumps have started and that HPI flow is <275 gpm per leg.

CAUTION: Do Not start any major motors such as the condensate pump or the condensate booster pump during block loading.

3. Trip all operating RC pumps.
4. Close MU-V12.
- *5. Verify Reactor Building Isolation Systems have actuated as required, see Attachment 2.
- *6. Verify that Core Flood Tanks discharged to the reactor coolant system at 600 psig.
7. Verify that reactor building spray initiated at 30 psig building pressure.
- *8. Verify Reactor Building Emergency Cooling has started.

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3.0 FOLLOW-UP ACTION

The objectives of the LOCA Emergency Procedure are to recover and cool the core using HPI, Core Flood and LPI, to isolate and cool the reactor building, and to achieve a cold shutdown condition on long term recirculation from the Reactor Building Sump.

- ___ 1. Reverify the status/parameters in Manual Action that are marked with an asterisk (*), using redundant indication, if available.
- ___ 2. Declare a Site Emergency (carry out EPIP 1004.3)
- ___ 3. Verify that all ES equipment is in its ES position by observing that all status lights on the PCR panel are blue with the following exceptions. Also verify that containment isolation valves have closed per Attachment 2.
 - a. BKR-G1-02
 - b. BKR-G11-02
 - c. STM GN A MS-V1A
 - d. STM GN A MS-V1B
 - e. STM GN B MS-V1C
 - f. STM GN B MS-V1D
 - g. C.F. Tank A CF-V1A
 - h. C.F. Tank B CF-V1B
 - i. RBS Pump A BS-P1A
 - j. RBS Pump B BS-P1B
 - k. MU-V20

RBS Pump starts when RB pressure \geq 30 psig. RBS pumps discharge valves BS-V1A/B open at RB pressure of 4 psig.

NOTE: The breaker anti pump feature will prevent reclosure of tripped breakers until the ES start signal is cleared. Should any component not operate properly, defeat 2 RB channels, bypass all three 1600 psi and 500 psi channels, and attempt to actuate the failed component using its remote switch in the control room. If it still does not operate check the control power fuses. If the component has a local "69" bypass switch, place switch from "normal" to "bypass" and again attempt to start.

4. Monitor incore thermocouple temperatures as evidence of over heating and void formation. Verify both trains of HPI and LPI are in operation and that core flood tanks have discharged.

CAUTION: Do not throttle HPI to less than 500 gpm/pump unless the LPI system is in operation and flowing at a rate in excess of 1000 gpm in each line and the situation has been stable for 20 minutes.

5. If the RCS repressurizes
- a. Verify Emergency Feedwater is in operation and take manual control of EF-V30A and EF-V30B and increase steam generator levels to 95 percent on the operating range.
 - b. If RCS repressurizes due to superheated condition, refer to 1202-6B Attachment 3, "Actions for Inadequate Core Cooling."
 - c. If the RCS is subcooled and RCS pressure is >300 psig refer to 1202-6B, "Follow-Up Action" for guidance on pressure-temperature restrictions.

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- ____ 6. Within 10 minutes commence continuous monitoring of the following for the plant status evaluation, and monitoring.
- a. Liquid levels in:
 - 1. Borated Water Storage Tank, DH-T1 (DH-3-LI 1 and 2).
 - 2. Sodium Thiosulfate Tank (BS-T1) BS-3-LI.
 - 3. Sodium Hydroxide Tank (BS-T2) BS-5-LI.
 - b. Safeguards injection flow rate in each of the:
 - 1. Two low pressure (decay heat) injection lines.
 - 2. Four high pressure (makeup) injection lines, NS-23-FI, 2, 3 and 4.
 - 3. Two reactor building spray injection lines, BS-1-FI and 2.
 - 4. Three (each) reactor building emergency cooling water inlet and outlet lines NS-20, 21 and 22-FI and NS-23, 24 and 25-FI, respectively.
 - c. Reactor Building environmental indications:
 - 1. RB Sump liquid level.
 - 2. RB Temperature.
 - 3. RB Pressure.
 - 4. Reactor Building liquid level indicator.
- ____ 7. If conditions require throttling, obtain shift supervisor permission, bypass all three Hi pressure and low pressure injection channels, and defeat 2 of the 3 RB pressure channels on Actuation A and B.

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8. Throttle only as required to prevent pump runout:
- Hi pressure injection flow (MU-V16A/B/C/D) 500 to 550 gpm/pump.
 - Lo pressure injection flow (DH-V4A/B) 2800-3500 GPM/PUMP
 - Building spray flow (BS-V1A/B) 1500-1800 GPM/PUMP

NOTE: Hi flow alarms should actuate as a warning to throttle flows.

9. If either LPI loop does not have 1500 gpm flow with RCS pressure < 100 psig refer to Attachment 1.
10. Upon receiving a BWST Lo-Lo alarm at 36 inches:
- If reactor coolant system is above 200 psig or if LPI flow is less than 1000 gpm per loop.
 - Open DH-V6A.
 - Close DH-V5A while observing LPI Loop A flow.
 - Open DH-V7A while observing HPI loop A flow and LPI Loop A flow.
 - Open DH-V6B.
 - Close DH-V5B while observing LPI Loop B flow.
 - Open DH-V7B while observing HPI loop B flow and LPI loop B flow.

NOTE: MU-V14A and B may be left open to provide suction to the HPI pump in the event the LPI pump trips.

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- ___ 7. When RCS pressure decreases to less than 200 psig and LPI flow is >1000 gpm and has been stable for >20 minutes, trip MU-P1A, MU-P1B and MU-P1C and close the following valves:

DH-V7A

DH-V7B

MU-V14A

MU-V14B

MU-V16A

MU-V16B

MU-V16C

MU-V16D

If reactor coolant pressure is less than 200 psig, LPI is greater than 1000 gpm in each loop and has been stable for 20 minutes.

- ___ 1. Open DH-V5A.
- ___ 2. Close DH-V5A while observing LPI loop A flow.
- ___ 3. Open DH-V6B.
- ___ 4. Close DH-V5B while observing LPI loop B flow.
- ___ 5. Trip MU-P1A, MU-P1B and MU-P1C.
- ___ 6. Close MU-V14A

MU-V14B

MU-V16A

MU-V16B

MU-V16C

MU-V16D

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11. If the RB Spray Pumps have actuated:
- ___ a. When the Sodium Thiosulphate Tank level reaches 3 ft. close BS-V4A and BS-V4B.
 - ___ b. Stop the spray pumps when RB pressure is less than 4 psig.
- ___ 12. If the RB Spray pumps have not actuated and reactor building pressure has decreased to less than 4 psig, close BS-V4A and BS-V4B.
- ___ 13. Evaluate radiation levels in the Auxiliary Building and establish access controls and post high radiation areas.
- ___ 14. Monitor Aux. Building sump level to detect possible LPI system leakage and assure that there is capacity in WDL-T2 for sump discharge.
- ___ 15. When time permits, throttle manual valves DH-V19A and 19B and reopen DH-V4A and 4B. Within 24 hours, establish one of the long-term cooling circulation modes described in OP 1104-4 and listed below.
- Mode 2 - Gravity draining reactor coolant hot leg to the Reactor Building sump via the D.H. drop line.
- Mode 3 - Hot leg injection using pressurizer auxiliary spray line.
- Mode 4 - Reverse flow through the decay heat drop line into "B" Reactor coolant loop hot leg.

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4.0 Long Term Action

- ____ 1. Secure turbine, feedwater, and steam systems when time permits.
- ____ 2. When the reactor building pressure is reduced to \approx atmospheric, monitor for H_2 buildup. Using OP 1104-62, place the Hydrogen Recombiner in service when hydrogen concentration reaches 3 percent.
- ____ 3. Monitor R.B. Sump for pH and add Sodium Hydroxide as required thru the decay heat removal system.
- ____ 4. As conditions permit, evaluate plant conditions and return non-essential equipment to its normal line up.

NOTE: Refer to the following instructions and procedures for additional information as required:

- | | | |
|----|------------|--------------------------------|
| a. | OP 1104-21 | Penetration Pressurization |
| b. | OP 1104-20 | Field Block |
| c. | OP 1104-19 | Control Room Tower Ventilation |
| d. | OP 1106-6 | Emergency Feedwater |

- ____ 5. Containment isolation valves may be opened to obtain samples in accordance with approved procedures. The isolation valves shall be reclosed after the sample is obtained.
- ____ 6. Other containment isolation valves automatically closed shall remain closed until the following conditions are met.
 - a. Reactor building pressure is less than 2 psig.
 - b. Containment radiation levels have been assessed based on radiation monitor readings or samples.

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- c. The integrity of the system outside the reactor building has been assessed. (Stable surge tank level, visual inspection or pressure test should be considered to verify integrity).
- d. The Shift Supervisor or Emergency Director shall give permission to reopen containment isolation valves.
- e. Installed radiation monitors or portable monitors shall be available to detect any release that may result from opening the valve.

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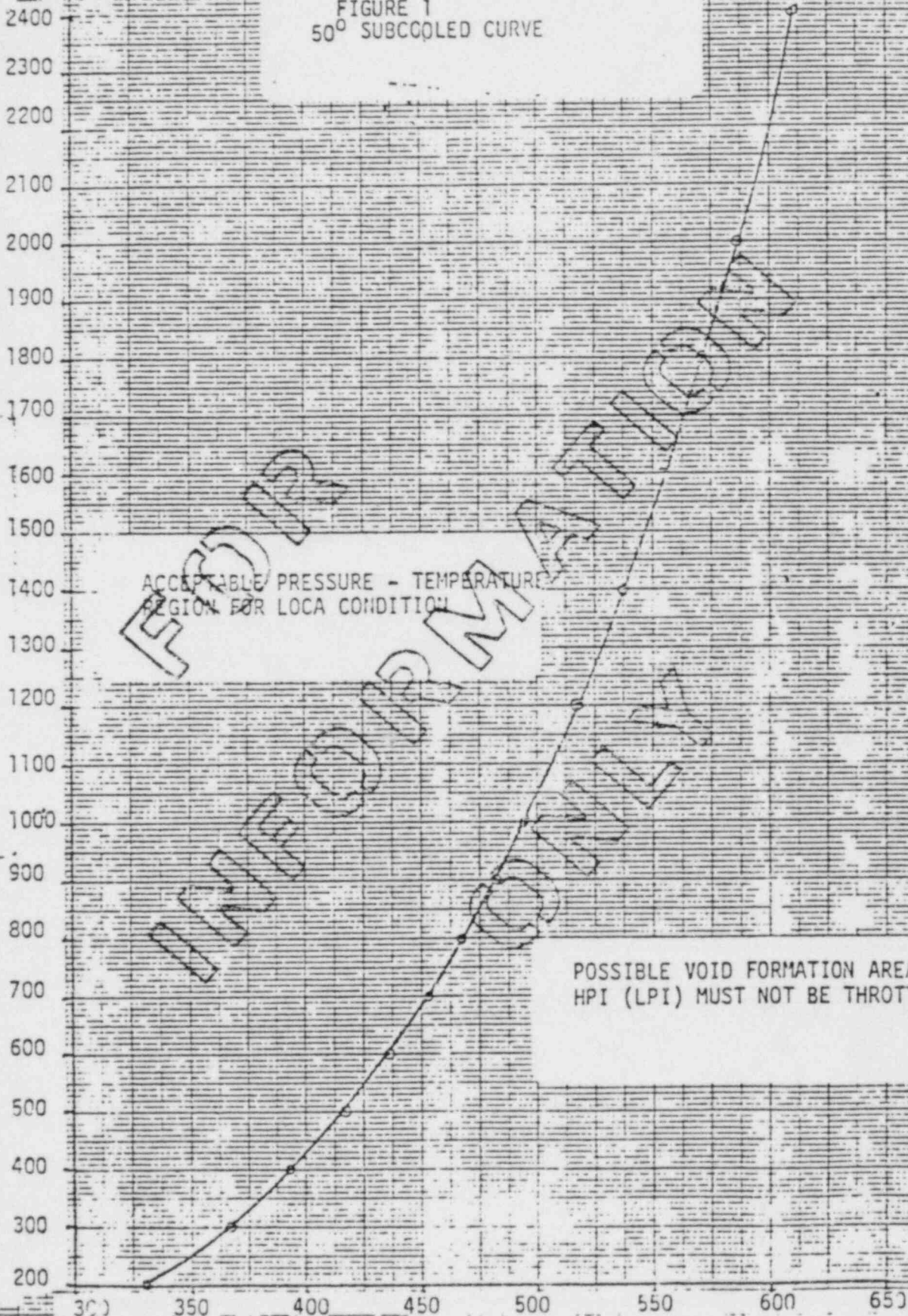
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FIGURE 1
50° SUBCOOLED CURVE

R.C. PRESSURE, PSIG
EACH DIV. = 10 PSIG



ACCEPTABLE PRESSURE - TEMPERATURE
REGION FOR LOCA CONDITION

POSSIBLE VOID FORMATION AREA
HPI (LPI) MUST NOT BE THROTTLED

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Th (Tc) Hottest R.C. Temp. °F

ATTACHMENT 1

FAILURE OF ONE LPI LOOP

If DH-V4A/B are open, RCS is less than 100 psig, and flow is less than 1500 gpm in one of the Decay Heat Injection Lines, proceed as follows:

- ___ 1. Obtain the administrative keys for the DH cross-connect isolation valves (DH-V38A and DH-V38B) and the DH injection manual flow control valves (DH-V19A and DH-V19B) from the shift supervisor.
- ___ 2. Proceed from the control room to the north end of the auxiliary building at elevation 281'0".
- ___ 3. The entrance to potentially high radiation areas should be per Emergency Plan AP 1004.15.
- ___ 4. Remove the administrative locks from the isolation valves in the DH cross-connect line and the DH injection manual flow control valves.
- ___ 5. Open the DH cross-connection isolation valve (e.g. DH-V38A next to the line having the higher flow rate as rapidly as possible and then crack open the second cross-connection isolation valve (e.g. DH-V38B).
- ___ 6. Open the second isolation valve which was just cracked in step 5 above in the DH cross-connect line.
- ___ 7. While opening the second decay heat cross-connect isolation valve, throttle either DH-V19A or DH-V19B as required to achieve essentially equal flow rates in both DH injection lines.

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ATTACHMENT 2

REACTOR BUILDING ISOLATION SYSTEMS

(All Valves Close)

RB Isolation from Reactor Trip or 4 PSIG	RB Isolation from HPI or 4 PSIG
AH-V-1A	CM-V-1
AH-V-1B	CM-V-2
AH-V-1C	CM-V-3
AH-V-1D	CM-V-4
WDL-V-534	RB-V-2A
WDL-V-535	RB-V-7
WDG-V-3	MU-V-2A
WDG-V-4	MU-V-2B
WDG-V-303	MU-V-18
WDG-V-304	
CA-V-1	
CA-V-2	
CA-V-3	
CA-V-13	
CA-V-4A	
CA-V-4B	
CA-V-5A	
CA-V-5B	
MU-V-3	
CF-V-2A	
CF-V-2B	
	RB Isolation from 30 PSIG
	NS-V-4
	NS-V-15
	NS-V-35
	IC-V-2
	IC-V-3
	IC-V-4
	IC-V-6
	MU-V-25
	MU-V-26

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ATTACHMENT 2 (CONT'D)

RB Isolation from Reactor Trip or 4 PSIG	
CF-V-19A	_____
CF-V-19B	_____
CF-V-20A	_____
CF-V-20B	_____
CA-V-189	_____

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06/29/81

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-2
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Unit 1 Staff Recommends Approval

Approval NA

Date

Cognizant Dept. Head

Unit 1 PORC Recommends Approval

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Date 6/29/81

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Date 6-29-81

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NA

Date

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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-2
STATION BLACKOUT

1.0 SYMPTOMS

1. Separation from the 230 KV system and generator tripped as indicated by:
 - a. Zero volts on 230 KV bus voltmeters on substation panel.
 - b. Generator breakers open (amber and green lights above extension controls on console GL).

2.0 IMMEDIATE ACTION

A. Automatic Action

1. Reactor Trips because of loss of voltage to the control rod drive system.
2. Turbine trips.
3. Control room DC lighting comes on.
4. Emergency turbine feedwater pump starts due to loss of all four reactor coolant pumps.
5. The ICS (Integrated Control System) maintains OTSG (Once Through Steam Generator) level at 50 percent on the operate range.
6. Atmospheric steam dump valves (MS-V4A/B) control main steam pressure at 1010 psig.
7. Main Steam relief valves open if pressure reaches 1040 psig.
8. RC-RV-2 (PORV) opens when primary system pressure reaches 2450 psig.

9. Pressurizer code safety valves open if primary system pressure reaches 2500 psig.
10. Generator DC emergency seal oil pump starts.
11. DC lube oil pumps start on the main turbine and feed pump turbines.
12. The DC oil lift pumps for the reactor coolant pumps start.
13. The screenhouse and circulating water house diesel fire pumps start because of loss of AC power.
14. The station batteries supply power to all five inverters.
15. The 1A and 1B diesel generators start.
16. 1D 4KV and 1E 4KV busses are energized by the diesel generators thus energizing the P, S, R and T 480V busses and the ES control centers.
17. Both motor driven emergency feedwater pumps start.
18. The battery chargers are energized by 1A and 1B ES motor control centers.
19. The inverters switch back to their normal 480V AC source.
20. The standby intermediate closed cooling pump starts and supplies cooling water to the thermal barrier heat exchanger of the RC pumps.
21. The nuclear services closed and nuclear services river water standby pump starts.
22. The lead instrument air compressor starts (1A-P1A or B).
23. The air compressors for control tower ventilation start (AH-P8A/B and AH-P9A/B).

24. The diesel generator ventilation fans start if they were previously running (AH-E29A and B).
25. The AC oil lift pumps start on the RC pumps. The DC lift pumps stop when the RC pumps reach zero speed.
26. If not manually started, the AC turbine lift pumps will start automatically when the main turbine reaches zero speed.
27. The main turbine turning gear starts and engages when the turbine reaches zero speed.

B. Manual Action

The parameters marked with an asterisk (*) shall be verified as the first step in follow-up action.

1. Verify the following:

- *a. Reactor is tripped and control rods have inserted.
- *b. Both diesel generators start.

NOTE:	If both diesel generators fail to start, refer to EP 1202-2A, Station Blackout With Loss Of Diesel Generators.
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- *c. Emergency feedwater pumps start (EF-P1, EF-P2A, and EF-P2B), discharge pressure comes up to >1010 psig, EF-V30A and B open, and emergency feedwater flow is indicated to control steam generator level to 50 percent on the operating range.
- d. If the emergency feedsystem fails to respond, refer to Attachment 1.
- *e. Turbine is tripped and both generator breakers open.

2. Close or check closed MU-V3.
3. Restore makeup and seal injection as follows:
 - a. Take manual control at the hand auto station and close MU-V32 and MU-V17.
 - b. Verify that lube pump (MU-P3A) is running.
 - c. Open MU-V14A, close MU-V12.
 - d. Start MU-P1A, DC-P1A and DR-P1A.
 - e. Throttle open MU-V217 as needed to maintain or restore pressurizer level at ≥ 100 inches.
 - f. If pressurizer level continues to decrease to less than 80 inches, open MU-V16A and/or initiate high pressure injection Actuation A. If saturation margin is $> 50^{\circ} \text{F}$, when pressurizer level is restored to 100 inches reset Manual Actuation and throttle MU-V16A and MU-V16B.

<p>NOTE: This action is to preserve the mass of hot water stored in the pressurizer which is providing the margin to saturation after loss of pressurizer heaters.</p>

- If needed to keep pressurizer level on scale, initiate MPI "A" and "B".
- h. Slowly reopen MU-V32 to establish seal injection.
 - i. Adjust pressurizer level setpoint to match existing level (but > 100 inches), and place MU-V-17 in AUTO.
 4. Verify the following:
 - *a. RC pressure stable or decreasing slowly, and RC-R-V2 and pressurizer code safety valves closed as indicated by the differential pressure indications on the discharge line.

- *b. Diesel generator voltage is between 4000 and 4200 volts and frequency is 59 to 61 hertz.
- *c. Verify that the RCS is subcooled by at least 50°F as indicated on the saturation margin meter. If margin is < 50°F increase steam generator level to enhance natural circulation cooling until 50°F margin is achieved. Increase makeup flow to maintain pressurizer level constant.
- d. Verify that reactor power is less than 10 percent within one minute or commence emergency boration.
- e. Instrument air compressor running IA-P1A or B.

NOTE: If ES has been initiated, the instrument air compressors will be locked out. Refer to EP 1202-36.

- 5. If ES actuates, refer to EP 1202-6B.

3.0 FOLLOW-UP ACTION

Objective:

The objectives of this procedure are to preserve the hot water in the pressurizer as a margin to saturation, establish natural circulation cooling with heat removal through the steam generators, borate the RCS to assure the reactor remains subcritical, commence cooldown at a rate determined by heat loss from the pressurizer and to restore power to RC pumps and pressurizer heaters as soon as possible.

- 1. Using the redundant indication if possible reverify the parameters in manual action that are indicated with an asterisk (*).

2. Declare an Unusual Event (carry out EPIP 1004.1).
3. Verify steam generator level is at 50 percent on the operating range and that steam generator pressure is being maintained at 1010 psig.

NOTE: If $T_{ave} < 550^{\circ} F$ or if RCS pressure is < 2000 psig check for possible overcooling condition such as stuck open bypass valve or overfeeding condition.

4. Dispatch an operator to the emergency feedwater valve area with instructions to take manual control of EFV 30A and/or B if directed by the control room operator.
5. Verify natural circulation by one or more of the following methods:

NOTE: Indications of natural circulation may not stabilize for 15 to 30 minutes.

- a) RCS Δt increases to approximately $30^{\circ} F$ to $50^{\circ} F$ and stabilizes and T_h is $< 600^{\circ} F$.
- b) Cold leg temperatures approach saturation temperature for secondary side pressure (normally within 5 minutes).
- c) Verify heat removal from OTSG's
 - 1) Turbine bypass valve positions
 - 2) Atmospheric dump valve positions
 - 3) Feedwater valve position
 - 4) Feedwater flow

NOTE: Heat removal from OTSG's may not be noticeable for low decay heat cases.

d) Incore thermocouple temperatures stabilizes and is less than 600°F.

- ___ 6. Verify that the P, S, R and T 480V buses are energized and voltage is between 440 and 500 volts. Current indicated on the console amp meter should be < 160 a to each bus.
- ___ 7. If 230 KV line voltage is available, obtain dispatcher concurrence, reset any lockout relays on RBA, RBS or substation building panels and re-energize an auxiliary transformer, verify RCS is greater than 1600 psig. Start one RC pump per loop per OP 1102-6 and place pressurizer heater controls in automatic.
- ___ 8. If power is not available refer to OP 1102-16, Natural Circulation Cooling and continue with followup action in this procedure.

NOTE: Primary system pressure will decrease approximately 70 to 150 psi/hour because of pressurizer heat loss. Cooldown rate must be controlled to maintain at least a 50°F subcooled margin (Verify margin using incore thermocouple temperatures as well as hot leg temperatures).

- ___ 9. Add 4814 gal of 12,250 ppm boron or equivalent (906 cu. ft. of 8700 ppm) to the makeup tank to assure shutdown margin is maintained during cooldown. Open MU-V12 and, if necessary, close MU-V14A to get the boric acid into the RCS. Verify boron was injected into the system by observing the decrease in Make-Up Tank level.

- ___ 10. Open MU-V14A and close MU-V12. Makeup for additional RCS contraction from the BWST thru MU-V14A.

! CAUTION: Do not exceed 3 MW load on the diesel generator. !

11. Verify or start the following ventilation fans:

- ___ a. Emergency feed pump room AH-E-24A, or AH-E-24B.
___ b. Decay Heat/Nuc Service Closed Pump room AH-E-15A or AH-E15B.
___ c. Screen House AH-E-27A or B.
___ d. Diesel Generator Fans AH-E-29A and AH-E-29B.
___ e. Control power ventilation.
___ 1. Air compressors AH-P-8A/B and AH-P-9A/B.
___ 2. Chilled water pump
___ 3. Standby chiller
___ 4. AH-E-19A or B.
___ 5. AH-E-17A or B.
___ 6. AH-E-95A or B.

12. Verify or start the following components:

- ___ a. One Nuc Services River Pump NR-P1A(B)(C)
___ b. One Nuc Service Closed Pump NC-P1A(B)(C)
___ c. One Secondary River Pump SR-P1A(B)(C)
___ d. One Intermediate Closed Pump IC-P1A(B)
___ e. One Spent Fuel Cooling Pump SF-P1A(B)
___ f. One Penetration Cooling Fan AH-E9A(B)

13. Pressurizer heater group 8 or 9 may be powered from the diesel. Refer to EP 1202-29 for procedure for transfer of the group to the ES bus.

NOTE:

- a. If one diesel has failed, do not put pressurizer heaters on the ES Bus.
- b. If pressurizer heaters are on ES Bus and one diesel fails, take the pressurizer heaters off the ES Bus.
- c. Do not put both groups of pressurizer heaters on ES Buses at the same time.
- d. Transfer of a heater group to the ES Bus should take place within two hours. (Earlier if needed to maintain saturation margin).

NOTE: If step 13 cannot be performed due to diesel loading, notify the airport control tower that the aircraft warning lights are out.

14. Energize the N bus by closing N1-02 breaker.

CAUTION: Do not exceed 3 MW on either diesel generator.

15. Start SC-PIC to provide turbine lube oil cooling.

NOTE: The normal feeder breaker to the bus must be tripped before the tie can be closed.

16. Energize the 1C and 1J 480V turbine plant bus through the tie to the 1N 480V bus per OP 1107-2.

The following equipment is energized without operator action when the tie is closed.

- a. Aircraft warning lights on cooling tower.
- b. Feed pump turbine turning gear if the feed pump has stopped.

- ___ 17. Verify that the main turbine turning gear starts and engages when the main turbine coasts to a stop.
- ___ 18. If reactor building temperature exceeds 140°F, provide cooling as follows:
 - ___ a. Open RR-V4B and start RR-P1B.
 - ___ b. Open RR-V1B to provide cooling water to the reactor building cooling units.
 - ___ c. Start AH-E1B.

! NOTE: If permitted by diesel loadings, a different reactor building cooling may be selected. !

4.0 LONG TERM

- ___ 1. Obtain RCS samples per OP 1104-43 to determine boron concentration and activity levels.
- ___ 2. Continue cooling down using natural circulation cooling (OP 1102-16) until offsite power is restored. Rate of cooldown may be determined by available condensate for emergency feed.
- ___ 3. When offsite power is restored, transfer the 4KV ES busses back to the Auxiliary transformers as follows:
 - ___ A. "Verify 1A(B) Diesel Man Voltage Control". Set at 43.0 percent. This must be done before switching exciter to manual.
 - ___ B. Place the exciter droop switch in PARALLEL position.
 - ___ C. Place the droop knob on engine governor at 70 percent.

- ___ D. Place Diesel Generator "1A(1B) Diesel Exciter" selector on Console CR to the "Manual" position.
- ___ E. Place the synchroscope into operation by placing the switch to the immediate right of the "1SB-D2 (1SA-E2) Bus 1E FEEDER" control switch to the "ON" position.
- ___ F. Match 1E Bus voltage with system voltage (Read from the two voltmeters to the immediate left of synchroscope) using the "1A(1B) Diesel Man. Voltage Control".

NOTE: One volt meter reads system voltage and the other DG voltage. They automatically are connected to the same breaker as the synchroscope.

- ___ G. Adjust "1A(1B) Diesel Gen. Governor" control until the synchroscope is moving slowly in the "Fast" direction (clockwise), when moving slowly and at 12:00 o'clock or 5 to 12 on the synchroscope dial, close 1SB-D2 (1SA-E2). Shift load from the Diesel to the Aux Transformer per OP 1107-3.
- ___ H. Place the diesel generators in ES standby per OP 1107-3.
- ___ 4. Stop the diesel driven fire pumps and place them in standby per OP 1104-45.
- ___ 5. Start one RC pump per loop per OP 1103-6 to assure boron equalization. Repeat RC samples per 1104-43.

- ___ 6. Stabilize plant conditions, establish circulating water, draw condenser vacuum and commence feedwater cleanup per applicable operating procedure.
- ___ 7. Restore pressurizer heaters power supply back to normal per 1202-29.

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ATTACHMENT 1

Actions for Failure of the Emergency

Feedwater System

A. Failure of EF-P1 to Start.

- ___ 1. Verify that MS-V2A and MS-V2B are open.
- ___ 2. Verify that CO-V10A, CO-V10B, EF-V1A and EF-V1B are open.
- ___ 3. Press the OPEN pushbutton for MS-V13A and MS-V13B.
- ___ 4. If EF-P1 fails to start press the CLOSE pushbutton for MS-V13A and MS-V13B, and place the EF-P1 Auto Start switches in defeat.
- ___ 5. Have an Aux Operator check locally that EF-P1 overspeed trip is reset and that the Manual Operator for MS-V6 is in the open position.
- ___ 6. After verifying the EF-P1 overspeed trip is reset and MS-V6 Manual Operator is open to remove the EF-P1 Auto Start switches from DEFEAT.

B. Failure of EF-P2A or EF-P2B to Start.

- ___ 1. Verify that the alternate control switch is in Pull to Lock.
- ___ 2. Verify that there is voltage available at the associated bus.

! NOTE: With an ES signal present there will be a 20 second !
! delay in pump start. !

- ___ 3. Verify that control power is available as indicated by the green indicator light at the control switch.
- ___ 4. Manually start the pump using the control switch.

NOTE: If EF-P1 and either motor driven pump have started any further investigation may be performed when plant conditions become stable.

- ___ 5. Check locally for targets on relays located at the switchgear.
 - ___ 6. Use the 69 bypass key and attempt to start the pump locally.
- C. Failure of EF-V30A or EF-V30B to Open.
- ___ 1. Check steam generator level to determine whether an open signal is required. The valves should be open if steam generator level is <30 inches on the startup range (RC Pumps on) or <50 inches on the operating range (RC Pumps off).
 - ___ 2. Verify that EF-V30A and EF-V30B Hand-Auto Stations are in AUTO.
 - ___ 3. If the valves have failed to open place the Hand-Auto Station in HAND and attempt to open the valve.
 - ___ 4. If the valves have not opened, attempt to open using the backup Manual Control Station located in the control room.
 - ___ 5. If the valves are still not open, have the aux operator take local handwheel control of the valves and open them as directed by the control room operator.
- D. No Indicated Flow (Low Flow) with steam generator level below setpoint.
- ___ 1. Verify that EFP discharge pressure is higher than steam generator pressure. If not turbine header pressure setpoint may be reduced to get additional flow.

- ___ 2. Verify that the following valves are open:

EF-V2A

EF-V2B

CO-V10A

CO-V10B

- ___ 3. Have Aux Operator check locally for pump malfunction and correct lineup of Manual Valves.

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IMPORTANT SAFETY
ENVIRONMENTAL IMPACT RELATED

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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-5
OTSC TUBE LEAK/RUPTURE

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Unit 1 Staff Recommends Approval

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Date 8-11-81

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THREE MILE ISLAND NUCLEAR STATION UNIT NO. 1 EMERGENCY PROCEDURE 1202-5 OTSG TUBE LEAK/RUPTURE

Section I: Automatic Reactor Trip Has NOT Occurred.

1.0 SYMPTOMS

- A. Decreasing reactor coolant pressure.
 - B. Decrease in pressurizer level.
 - C. Make-up tank level decreasing.
 - D. Make-up flow increasing.
 - *E. RM-A5 off-gas monitor alarm/alert/increased count rate.
 - *F. Secondary sample analysis indicates activity in the secondary side.
 - G. Possible increase of water level in damaged OTSG.
 - *H. Increase count rate on Steam Line Radiation Monitors.
- *Unique symptoms of the Tube Rupture.

2.0 IMMEDIATE ACTIONS

- A. Automatic Action
 - 1. MU-V-17 will open to compensate for reduced pressurizer level.
 - 2. PZR heaters may energize to maintain RCS pressure.
- B. Manual Action
(An asterisk indicates a key parameter which requires reverification as a follow-up action.)
 - 1. If an automatic reactor trip occurs while in Section I, proceed to Section II of this procedure immediately.
 - *2. If any one of the below conditions exist, immediately begin reducing load at 10 percent per minute.:
 - a. Make-up tank level is decreasing at greater than 10 gpm (1 inch/3 minutes).

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- b. RM-A-5 and/or Steam Line Radiation Detectors have confirmed alarms and pressurizer level cannot be maintained at 220" by MU-V-17.

NOTE: If only RM-A-5 and/or the Steam Line Radiation detectors are in alarm, an evaluation must be made to determine tube leak rate and radioactive release rates. Unit shutdown may not be required with tube leak rates less than 1 gpm.

- *3. Close MU-V-3 and start an additional make-up pump and open MU-V-217 as necessary to maintain pressurizer level greater than 100 inches.

NOTE: With MU-V-3 closed, MU-V-14A/B must be opened as Make-up tank level decreases to below 55".

C. Follow-Up Action

Objective:

This procedure is designed to expeditiously cool down and depressurize the unit to atmospheric pressure without lifting steam relief valves or unnecessarily steaming affected OTSG in order to minimize radioactive releases outside of containment. This is accomplished by isolating the affected OTSG when RCS temperature is below 540° F and minimizing saturation margin to reduce the primary to secondary ΔP . Affected OTSG level is to be maintained < 95 percent on the operate range to prevent water carry over to steam lines until primary pressure can be lowered such that the secondary pressure is controllable below the steam relief valve setpoints.

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- ___ 1. Re-verify those immediate manual actions marked by an asterisk using alternative instruments if available.

NOTE: If primary to secondary leakage is > 1 gpm an Alert shall be declared in accordance with EPIP 1104.2.

NOTE: If primary to secondary leakage is > 50 gpm a Site Emergency shall be declared in accordance with EPIP 1004.3.

- ___ 2. Continue to reduce power to less than 20 percent at 10 percent per minute.

NOTE: When removing the first main feed pump, remove the feed pump that is being steam fed from the affected OTSG if known. Remove the feed pump per OP 1102-10.

- ___ 3. By sampling OTSG's, surveying steam lines, observation of OTSG levels and feed rates, etc. determine affected OTSG.

NOTE: Affected OTSG should indicate higher level, lower feed rate, and/or higher Beta-Gamma, H^3 , Na^{24} , I^{131} and $CS-137$ sample results.

- ___ 4. At approximately 0 MWe, and with turbine bypass valve in manual, controlling steam pressure, trip the turbine generator. Verify generator breakers open and turbine stop valves closed.

CAUTION: Adjust turbine bypass valves as necessary to pick up additional steam flow from turbine and not challenge main steam safeties.

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- ___ 5. Verify turbine bypass valves in manual and manually trip the reactor.
- ___ 6. Reduce RCP's to one pump per loop.

! NOTE: Keep RC-P-1A on for PZR spray. !

- ___ 7. Turn off PZR heaters and manually start pressurizer spray to depressurize RCS and reduce the subcooled margin to 20° F as soon as possible while RCS pressure is greater than 1600. Maintain 30° F subcooling below 1600 psig.
- ___ 8. In conjunction with above step, manually control turbine bypass valve to obtain a 100° F/hr. cooldown rate while maintaining a 20° F subcooled margin when above 1600 psig. Maintain RCS conditions within pressure temperature curve.

! NOTE: Steam both OTSG's to reduce RCS to less than 540° F. !

- ___ 9. With RCS temperature less than 540° F, isolate the affected OTSG by closing:
M9-V-1A and B or C and D

! NOTE: Assure MFP is being fed from unaffected OTSG or Auxiliary Steam. !

FW-V-17 A or B

FW-V-5 A or B

FW-V-16 A or B

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FW-V-92 A or B

FW-V-85 A or B

EF-V-30 A or B

MS-V-85 A and B or C and D

MS-V-13 A or B (close manual hand wheel)

MS-V-10 A or B

MS-V-3 D/E/F or A/B/C

NOTE: Affected OTSG must be steamed to maintain less than 1000 psig and less than 95 percent on operate range.

10. Maintain 100° F/hr. cooldown rate.
11. IF RCS pressure is being controlled, bypass ESAS at normal bypass pressure setpoints.
12. At 1600 psig, reduce pressurizer spray to obtain a 50° F saturation margin.
13. Terminate discharge from IWTS and IWFS until monitoring and controls are established in accordance with HPP 1699B. Open breakers for the following sump pumps to control discharge to the IWTS (IWFS):

		Unit	MCC
Turbine Bldg. Sump Pumps	SD-P5	10E	1D Turb.
	SD-P2 A	1C	1C Turb.
	SD-P2 B	1E	1D Turb.
Powdex Sump Pumps	SD-P1 A	4D	1A Turb.
	SD-P1 B	4D	1R Turb.

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- ____ 14. Notify Health Physics to begin survey of the Intermediate and Turbine Buildings to determine the need for controlled areas. Initiate Emergency Plan if required, as a result of the surveys.
- ____ 15. Notify Unit II Control Room to isolate auxiliary steam cross connect by closing AS-V-23 and its bypass AS-V-209.
- ____ 16. The affected OTSG must be steamed only as necessary to maintain level < 95 percent on the operate range and OTSG pressure below 1000 psig. After the primary pressure is lowered such that the secondary pressure can be controlled and maintained below 1000 psig, it is acceptable to secure steaming the affected OTSG and completely fill the MS lines up to the applicable MS-V-1 valves.

NOTE: Under emergency situations, blocking/pining of MS hangers when flooding the applicable MS lines is not necessary. If the MS lines are filled without blocking/pining of the MS hangers, an engineering evaluation of the structural integrity of the MS lines must be performed prior to resuming normal operations.

- ____ 17. Cooldown at 100° F per hour on the unaffected OTSG using OP 1102-11 (taking exceptions for only one OTSG).
- ____ 18. When on DH Removal, depressurize RCS to vent header pressure per OP 1104-4.
- ____ 19. If OTSG tube leakage exceeded the limits of Tech. Spec. 3.1.6.3, an unscheduled inservice inspection of the affected OTSG must be conducted prior to startup pursuant to Tech. Spec. 4.19.3.C.1.

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Section II: Automatic Reactor Trip Has Occurred.

1.0 SYMPTOMS

- A. Decreasing RCS pressure.
- B. Decreasing pressurizer level.
- C. Decreasing Make-Up Tank level.
- D. Increasing Make-Up flow.
- *E. RM-A-5 off-gas monitor alarm, increasing count rate.
- F. Possible increasing water level in damaged OTSG.
- *G. Increase count rate on Steam Line Radiation Monitors.
- H. Reactor trip - ~~turbine~~ trip.

*Unique symptoms of OTSG tube leak.

2.0 IMMEDIATE ACTIONS

- A. Automatic Actions.
 - 1. Reactor trip isolation per 1202-4.
 - 2. MU-V-17 opens to maintain PZR level.
 - 3. PZR heaters energize to maintain pressure.
 - 4. Possible ESAS if pressure decreases to 1600 psig.
- B. Manual Action.
 - *1. Verify Reactor trip and turbine trip.
 - *2. Verify MU-V-3 is closed, and start additional make-up pump; open MU-V-217 as necessary to maintain pressurizer level greater than 100 inches.

NOTE:	With MU-V-3 closed, MU-V-14 A/B must be opened as make-up tank level decreases to below 55 inches.
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- *3. If ESAS auto actuates at 1600 psig:
 - a. Immediately trip RC pumps.

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- b. Verify that EF-P-1, EF-P-2A and EF-P-2B start and discharge pressure increase to > 1010 psig and flow (as required) is indicated to each OTSG.
- c. Take manual control of EF-V-30A/B on affected OTSG and maintain 30" on s/u range.
- d. Take manual control of EF-V-30A/B on unaffected OTSG and manually raise level to 95 percent.

C. Follow-Up Action

Objective:

The objective of this procedure is to cooldown and depressurize RCS to atmospheric pressure (on forced flow if possible) as quickly as possible to minimize radioactive releases outside of containment. This is accomplished by isolating the affected OTSG when RCS temperature is below 540° F and minimizing the saturation margin to reduce the primary to secondary ΔP . Affected OTSG level is to be maintained < 95 percent to prevent water carry over to the steam lines until primary pressure can be lowered such that the secondary pressure is controllable below the steam relief valve setpoints.

1. Re-verify those immediate manual actions marked by an asterisk using alternate instruments if available.

NOTE:	If primary to secondary leakage is > 1 gpm but < 50 gpm an Alert shall be declared in accordance with EPIP 1004.2.
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NOTE:	If primary to secondary leakage is > 50 gpm a Site Emergency shall be declared in accordance with EPIP 1004.3.
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- ____ 2. Reduce RCP's, if running, to one RCP per loop.

NOTE: Leave RCP 1A in operation to provide spray.

- ____ 3. If RCP's had been tripped, verify Natural Circulation.
- ____ 4. De-energize pressurizer heaters.
- ____ 5. If ESAS actuated, verify HPI injection. Throttle HPI and start one RCP per loop as soon as RCS pressure control is established with at least a 50° F subcooled margin.

NOTE: Monitor total make-up flow to maintain >80 gpm per pump. Open MU-V-36 and MU-V-37 if needed to provide bypass flow.

CAUTION: Because MU-V-12 is closed, monitor make-up tank level and pressure to avoid lifting the make-up tank relief valve (MU-RV-1).

- ____ 6. Taking manual control by turbine bypass valves, establish and maintain a 200° F per hour cooldown rate (steaming both OTSG's), to an RCS temperature of < 540° F.
- ____ 7. Coincident with establishing cooldown rate, depressurize the RCS using spray, if RCP's are running, or open the PORV. Depressurize the RCS as rapidly as possible, maintaining at least at 50° F saturation margin.
- ____ 8. Confirm affected OTSG [i.e. sampling (refer to Attachment 1, to override containment isolation), surveying steam lines, observation of OTSG level and feed rates].

NOTE: Affected OTSG should indicate higher water level, lower feed rate, and/or higher Beta-Gamma, H³, Na²⁴, I-133 and CS-137 sample results.

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9. With RCS less than 540° F, isolate affected OTSG by closing:

MS-V-1 A and B or C and D

NOTE: Assure MFP is being fed from unaffected OTSG or Auxiliary Steam as necessary.

FW-V-17 A or B

FW-V-5 A or B

FW-V-16 A or B

FW-V-92 A or B

FW-V-85 A or B

EF-V-30 A or B

MS-V-85 A and B or C and D

MS-V-3 D/E/F or A/B/C

NOTE: MS-V-3 D/E/F are from A OTSG.

MS-V-13 A or B (close manual hand wheel)

MS-V-10 A or B

10. The affected OTSG must be steamed only as necessary to maintain level < 95 percent on operate range and OTSG pressure below 1000 psig. After the primary pressure is lowered such that the secondary pressure can be

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controlled and maintained below 1000 psig, it is acceptable to secure steaming the affected OTSG and completely fill the MS lines up to the applicable MS-V-1 valves.

NOTE: Under emergency situations blocking/pinning of MS hangers when flooding the applicable MS lines is not necessary. If the MS lines are filled without blocking/pinning of the MS hangers, an engineering evaluation of the structural integrity of the MS lines must be performed prior to resuming normal operations.

11. Continue 100° F/hr. cooldown and depressurization using unaffected OTSG.

a. If RCP's running and HPI throttled, follow OP 1102-11 taking exceptions for only one OTSG.

b. HPI unthrottled and RCS pressure is less than secondary pressure follow EP 1202-6B.

12. Terminate discharge from IWTs/IWFS until monitoring and controls are established in accordance with HPP 1699B. Open breakers for the following sump pumps to control discharge to the IWTs (IWFS).

		Unit	MCC
Turbine Bldg. Sump Pumps	SD-P5	10E	1D Turb.
	SD-P2 A	1C	1C Turb.
	SD-P2 B	1E	1D Turb.
Powdex Sump Pumps	SD-P1 A	4D	1A Turb.
	SD-P1 B	4D	1B Turb.

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- ____ 13. Notify Health Physics to begin survey of the Intermediate and Turbine Buildings to determine the need for controlled areas. Initiate Emergency Plan if required, as a result of the surveys.
- ____ 14. Notify Unit II Control Room to isolate auxiliary steam cross connect by closing AS-V-23 and its bypass AS-V-209.
- ____ 15. When on DH Removal, depressurize the RSS to vent header pressure per OP 1104-4.
- ____ 16. If OTSG tube leakage exceeded the limits of Tech. Spec. 3.1.6.3 an unscheduled inservice inspection of the affected OTSG must be conducted prior to startup pursuant to Tech. Spec. 4.19.3.C.1.

ATTACHMENT 1

Criteria to override Containment Isolation Signals

1. Containment isolation valves may be opened to obtain samples in accordance with approved procedures. The isolation valves shall be reclosed after the sample is obtained.
2. Other containment isolation valves automatically closed shall remain closed until the following conditions are met.
 - a. Reactor building pressure is less than 2 psig.
 - b. Containment radiation levels have been assessed based on radiation monitor readings or samples.
 - c. The integrity of the system outside the reactor building has been assessed. (Stable surge tank level, visual inspection or pressure test should be considered to verify integrity).
 - d. The Shift Supervisor or Emergency Director shall give permission to re-open containment isolation valves.
 - e. Installed radiation monitors or portable monitors shall be available to detect any release that may result from opening the valve.