R. Conte

NOTE:

ENCLOSURE 6,(1/3, 2/3, 3/3), pages 114, 115, 116,

ARE NOT INCLUDED WITH THIS COPY.

THREE MILE ISLAND UNIT 1

CLASS 1

CATEGORY A

CONTROLLING PROCEDURE
FOR
OTSG REPAIR TESTING

NUMBER TP 600/2

MTX 600.5.1.7

REVISION 0

PREPARED: Cognizant Engineer C W Talley Date 8/26/83

RESPONSIBLE TECHNICAL REVIEWER:

Signature Ivan D Porter Date 8/26/83 3 pgs

IMPLEMENTATION APPROVAL:

Signature Ivan D Porter for TM HAWKINS Date 8/26/83

O&M DIRECTOR CONCURRENCE:

Signature R G Toole Date 8-26-83

APPROVAL OF TEST RESULTS:

SU & T Representative _____ Date _____

ENCLOSURES:

1. Test Exception and Deficiency List
1A. Questions for Test Exception Acceptability
2. Quality Control Witness Signoff Sheet
3. OP 1102-1, Plant Heatup to 532°F (Modified by TP 600/2)
4. OP 1102-11, Plant Cooldown (Modified by TP 600/2)
5. EP 1202-5, OTSG Tube Leak/Rupture (Modified by TP 600/2)
6. OTSG Repair Testing Sequence
7. Heatup and Cooldown Computer Points
8. OTSG Leak Rate Data Sheets
9. General Emergency Operating Guidelines for HFT Program

TMI UNIT 1

STARTUP AND TEST

NUCLEAR SAFETY/ENVIRONMENTAL IMPACT EVALUATION
DETERMINATION AND REVIEW REQUIREMENTS

CLASS 1 TITLE Controlling Procedure for OTSG Repair Testing NUMBER TP 600/2

CATEGORY A MTX 600.5.1.7

REVISION 0

1. Safety Evaluation

Does this procedure/change

(a) increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety? yes ☐ no ☒

(b) create the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report? yes ☐ no ☒

(c) reduce the margin of safety as defined in the basis for any technical specification? yes ☐ no ☒

2. Environmental Impact Evaluation

Does this procedure/change

(a) possibly involve a significant environmental impact? yes ☐ no ☒

(b) have a significant adverse effect on the environment? yes ☐ no ☒

(c) involve a significant environmental matter or question not previously reviewed and evaluated by the NRC? yes ☐ no ☒

NOTE: If any of the answers to the above are YES, a detailed evaluation MUST be attached.

.Preparer C W Jolly Date 8/26/83

.Section Manager Susan D Porter Date 8/26/83

.Technical Reviewer Susan D Porter Date 8/26/83

.Independent Safety Reviewer M A Nelson Date 8/26/83

MANAGER SU/T (or designee):

. This procedure must be reviewed and commented on by: (check all applicable)

☒ O&M DIRECTOR ☒ Technical Functions ○ NSSS (B&W)

~~☒~~ QC Mod-Ops ☒ QA Mod-Ops ☒ Other Plant Chemistry

Signature Susan D Porter Date 8/26/83

Original to History File

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1.0 PURPOSE

1.1 This procedure provides the sequence of events for the once through steam generator (OTSG) repair program testing. The procedure begins after RCS H_2O_2 cleanup (TP 600/4) is complete and returns the plant to a cold shutdown condition on the decay heat removal (DHR) system.

1.2 As plant conditions permit data will be recorded to satisfy other testing requirements originally associated with TP 700/1. However, under no circumstances will these ancillary tests cause any change in plant conditions established for OTSG testing.

1.3 The general sequence for OTSG repair testing is as follows:

1.3.1 Perform TP 233/3 - EFW Flow Test immediately prior to RCS heatup.

1.3.2 Conduct an RCS heat up to 532°F and perform an RCS pressure boundary leak test at 2285 psig.

1.3.3 Allow an RCS soak at 532°F, 2155 psig for approximately one week.

1.0 PURPOSE (Cont'd.)

1.3.4 Conduct an RCS cooldown to 350°F at a rate of 60°F/Hr using main feedwater.

1.3.5 Conduct a second RCS Heatup to 532°F, 2155 psig and allow approximately eleven days for soak time.

1.3.6 Conduct a second RCS cooldown to 350°F at 90°F/Hr using Main Feedwater in order to approach a 140°F ΔT between the OTSG shell and RCS Tave.

1.3.7 Conduct a third RCS heatup to 532°F, 2155 psig and allow approximately eleven days for soak time.

1.3.8 Conduct a retest of TP 664/1 - PORV Flow Indication Functional Test.

1.3.9 Conduct an RCS cooldown to approximately 130°F, 300 psig at 90°F/Hr using EP-1202-5, OTSG Tube Leak/Rupture.

1.4 During the test sequence, OTSG leakage will be monitored through the use of the Krypton-85 Tracer injected into the Makeup pump suction piping. Additional RCS/OTSG data will be recorded during heatups and cooldowns to improve our understanding of tube loads and to confirm our assumptions used in the tube load analyses.

2.0 REFERENCES

2.1 Vendor Manuals

____ 2.1.1 Not applicable.

2.2 Drawings

____ 2.2.1 Not applicable.

2.3 Procedures

____ 2.3.1 OP 1102-1, Plant Heat Up to 525°F, Rev. 62.

____ 2.3.2 OP 1102-11, Plant Cooldown, Rev. 42.

____ 2.3.3 OP 1101-1, Plant Limits & Precautions, Rev. 15.

____ 2.3.4 SP 1303-8.1, Reactor Coolant System, Rev. 7.

____ 2.3.5 OP 1103-11, Draining and N_2 Blanketing of the RCS, Rev. 16.

____ 2.3.6 OP 1106-16, OTSG Secondary Fill, Drain, and Layup, Rev. 25.

____ 2.3.7 EP 1202-26A, Loss of Steam Generator Feed to Both OTSGs, Rev. 15.

____ 2.3.8 TP 233/3 - EFW Flow Test, Rev. 0.

____ 2.3.9 EP 1202-5, OTSG Tube Leak/Rupture, Rev. 20.

____ 2.3.10 TP 664/1 Retest, PORV Flow Indication Functional Test, Rev. 0.

____ 2.3.11 TP 636/1, Feedwater Valve Leakage Test, Rev. 0.

____ 2.3.12 TP 700/1, Controlling Procedure for Low Power Physics Testing, Rev. 0.

____ 2.3.13 TP 846/1, Incore Thermocouple Test, Rev. 0.

____ 2.3.14 TP 675/1, RCS High Point Vent Functional Test, Rev. 0.

2.0 REFERENCES (Cont'd.)

_____ 2.3.15 TP 600/5, RCS Leak Rate Verification Test, Draft 0.

2.4 Technical Reports

_____ 2.4.1 SP-1101-28-008, Sampling and Analytical Requirements for Primary to Secondary Leak Rate Determination During TMI-1 OTSG Hot Testing, Rev. 0.

_____ 2.4.2 B&W memo date 08-11-83, TMI-1 OTSG Accelerated Cooldown Test.

_____ 2.4.3 Procedure revisions related to Steam Generator Repairs and Emergency Guidelines, T. G. Broughton to R. J. Toole, dated August 19, 1983.

3.0 TIME REQUIRED

3.1 Duration of the OTSG repair test program is expected to be a minimum of five weeks. This estimate is based on idealized test performance and good results throughout the program. Problems encountered during the test program may necessitate additional testing and repairs which could cause significant extensions of the planned schedule.

4.0 PREREQUISITES

4.1 Plant Heat Up to 532°F

4.1.1 Tests

4.1.1.1 TP 600/4 - RCS H_2O_2 Clean Up Procedure, MTX 600.5.1.9, completed.

Signature_____Date_____

4.1.2 Construction Status

4.1.2.1. All Maintenance and Construction job orders necessary to support plant heatup and cooldown have been completed.

Signature _____Date_____

4.1.3 Environmental Conditions

4.1.3.1 No special ambient conditions are required.

Signature_____Date_____

4.1.4 Technical Specifications

4.1.4.1 TSCR #125 approved for OTSG repairs.

Signature_____Date_____

4.1.4.2 SE 120012-011, Rev. 1, approved for OTSG Repair Testing.

Signature_____Date_____

5.0 TEST EQUIPMENT

5.1 Test instrumentation required for the performance of individual tests sequenced by this procedure is listed in Section 5.0 of the individual procedures. The cognizant engineer for the individual tests is responsible for the proper set up, check out, and calibration of these instruments.

6.0 LIMITS AND PRECAUTIONS

6.1 Limits and precautions listed in the individual sequenced procedures shall be observed.

6.2 The OTSG maximum allowable secondary side pressure is 200 psig with the OTSG shell temperature less than 100°F. Proper allowance for elevation differences between the point of measurement and the bottom of the OTSG shell side must be made.

6.3 The RCS Heatup and Cooldown rates shall not exceed 100°F/Hr.

6.4 If total OTSG tube leakage $>$1.0 gpm, the reactor shall be placed in cold shutdown within 36 hours of detection.

6.5 Plant administrative limits and precautions require maintaining the OTSG average tube temperature within 70°F of the average shell temperature during plant cooldown. For the first 90°F/Hr cooldown, this 70°F limit will be relaxed to 140°F. This limit may be approached, but not exceeded.

6.6 General Emergency Operating Procedures Guidelines for HFT/OTSG Testing are contained in Enclosure 9.

6.7 When RCS temperature is less than 500°F, cooling at a rate greater than 100°F/hr. (1.67°F/minute) or HPI on and RCPs off:

a) Stabilize the RCS within the thermal shock operating region and prevent any significant heatup or repressurization, except if a SGTR transient is occurring.

b) Soak for 3 hours and evaluate the severity of the transient.

c) Proceed to cold shutdown at $<$100°F/hr., if required while maintaining system within the thermal shock operating region.

6.0 LIMITS AND PRECAUTIONS (Cont'd.)

6.8 OP 1102-11 Plant Cooldown (Enclosure 4) as modified for this procedure is to be used for all cooldowns, scheduled or unscheduled, for the duration of this test.

6.9 EP 1202-5 (Enclosure 5) as modified for this procedure is to be used only for performance of Section 9.7 of this procedure. Use approved plant procedure EP 1202-5 as directed by Manager of Operations standing order for other than performance of Section 9.7.

6.10 During plant heatup the OTSG shell temperature must be within 60°F of the average tube temperature.

7.0 PLANT STATUS

7.1 No testing that would interfere with OTSG repair testing, other than that sequenced in this procedure or approved by the Pre-Requisite List, is in progress.

Signature_____Date_____

7.2 The primary and secondary plant systems in operational status to support OP 1102-1, Plant Heatup to 532°F (modified by TP 600/2).

Signature_____Date_____

8.0 PREREQUISITE SYSTEM CONDITIONS

8.1 Plant Heatup to 532°F, 2155 psig

8.1.1 Krypton-85 Tracer Injection Modification installed.

Signature_____ Date_____

8.1.2 The OTSG repair testing prerequisite list has been approved.

Signature_____ Date_____

8.1.3 All prerequisite system conditions applicable to plant heatup are established in Enclosure 3, OP 1102-1, Plant Heatup to 532°F modified for TP 600/2.

Signature_____ Date_____

8.1.4 Ensure the Plant Performance Monitoring Program (PPMP) is operational with the computer points listed in Enclosure 7.

Signature_____ Date_____

8.1.5 Krypton-85 injection and sampling procedures are approved.

Signature_____ Date_____

8.2 Prior to commencing Section 9.2 of this procedure the results of TP 233/3 - EFW Flow Test have been reviewed and the EFW System is operable for plant heatup.

Signature_____ Date_____

9.0 TEST METHOD

NOTE: This test procedure is the controlling document for the OTSG repair testing program. It will cover the RCS heat ups, cooldowns, and leak tests done in various plant conditions. At its completion the RCS will be returned to cold shutdown on the DHR system.

Enclosure 6 is a block diagram showing the sequence of events for this procedure. It should be maintained in the Control Room as a quick reference to ensure that all necessary parties can determine the status of the test sequence. The Shift Test Director, (STD), and the Shift Supervisor (SS), are responsible for initialing and dating their respective blocks as they are completed.

Exceptions to this test procedure shall be entered in Enclosure 1 (Exception and Deficiency List). Test exceptions will identify changes to the test procedure which do not change the scope or intent of the procedure.

If a deviation from the sequence is made that requires rescheduling, Enclosure 6 should be marked up to show the current schedule. It is the responsibility of the STD and SS to keep Enclosure 6 up-to-date and to coordinate testing on his shift. This responsibility includes ensuring that prerequisites for all individual tests are satisfied.

9.0 TEST METHOD (Cont'd.)

9.1 Prior to commencing heatup conduct the following tests:

____ 9.1.1 TP 636/1 - Feedwater Valve Leakage Test

____ 9.1.2 TP 233/3 - EFW Flow Test

____ 9.1.3 TP 700/1 - Controlling Procedure for Low Power Physics Testing, Enclosure 8 (RC-P-1A)

____ 9.1.4 TP 700/1 - Controlling Procedure for Low Power Physics Testing Enclosure 12 (RM-13J, LM-38, LM-43C)

____ 9.1.5 TP 800/3 - Baseline Data for Thermal Expansion Checks of Hangers

Section 9.1 Accomplished: SAT_____UNSAT_____

Signature_____Date_____

9.2 First RCS Heatup 532°F

NOTE: Since no reactor startup will take place during the OTSG repair testing, boron concentration should be maintained at the refueling concentration throughout the heatups and cooldowns.

____ 9.2.1 Verify that all heatup prerequisite items up to and including 8.2 have been signed off.

____ 9.2.2 RCS, pressurizer, OTSG, and feedwater chemistry is satisfactory for heatup, per applicable sections of SP 1101-28-001, Rev. 1 and SP 1101-28-002, Rev. 1.

Signature_____Date_____
(Plant Chemistry)

9.0 TEST METHOD (Cont'd.)

_____ 9.2.3 Initiate the PPMP computer data collection (Enclosure 7) ten (10) minutes prior to initiation of the heatup and program to collect data every ten (10) minutes. The time should also be recorded when either RC Pumps or Decay Heat pumps are turned on or off. The data should be taken throughout the heatup until hot standby conditions are reached and at the completion of the heatup print out the data collected. Mark up the computer printouts with the following: step number, TP number, initials, date, page number and attach as part of Enclosure 7.

_____ 9.2.4 Commence plant heatup to 532°F per Enclosure 3 (OP 1102-1, Plant Heatup as modified for TP 600/2).

9.0 TEST METHOD (Cont'd.)

____ 9.2.5 During the plant heatup to 532°F conduct the following testing at the indicated temperature plateaus.

____ 9.2.5.1 RCS at 250°F

____ 9.2.5.1.1 TP 800/3 - Hanger Checks

____ 9.2.5.1.2 TP 700/1 - Enclosure 12

____ 9.2.5.1.3 TP 675/1 - High Point Vents, Section 9.1

____ 9.2.6 At 350°F stop the heatup and inject 16 curies of Krypton-85 (KR-85) into the RCS via the Makeup Tank sample lines (see 8.1.5). Determine Kr-85 concentration in the RCS by sampling after one hour. The remaining 4 curies of Kr-85 are to be added per the direction of the STD.

____ 9.2.7 Commence sampling the RCS and OTSGs in accordance with Enclosure 8 requirements. Record data and perform calculations and plots as required on the forms provided. Continue the Primary-To-Secondary leakage monitoring and sampling program throughout this test.

____ 9.2.8 Continue Plant Heatup to 532°F, 2155 psig and perform leak testing per SP 1303-8.1. When complete, restore the RCS to 532°F and 2155 psig.

____ 9.2.9 Maintain the plant at 532°F, 2155 psig for one (1) week.

_____ 9.2.9.1 Complete Enclosure 5 of TP 700/1 (closeout of PR-T1-038).

_____ 9.2.9.2 Complete Enclosure 12 of TP 700/1 for 532°F (RM-13J, LM-38, LM-43C).

_____ 9.2.9.3 Complete Section 9.2 of TP 675/1, RCS High Point Vent Functional.

_____ 9.2.9.4 Perform Section 9.2 of TP 677/2 (closeout of PR T1-043).

9.0 TEST METHOD (Cont'd.)

_____ 9.2.9.5 Record the data in Enclosure 10 of TP 700/1 (closeout of PR T1-049).

_____ 9.2.9.6 Perform the testing in Enclosure 6 of TP 700/1 (closeout of PR T1-048).

_____ 9.2.9.7 Record the data in Enclosure 7 of TP 700/1 (closeout of PR T1-037).

_____ 9.2.9.8 Record the data in Enclosure 4 of TP 700/1 (closeout of PR T1-035 and T1-050).

_____ 9.2.9.9 Record the data in Enclosure 11 of TP 700/1 (closeout of PR T1-058).

_____ 9.2.9.10 Record the data in Enclosure 9 of TP 700/1 (closeout of PR T1-041).

_____ 9.2.9.11 Record the data in Section 9.0 of TP 846/1, Incore T/C Functional, for 532°F.

_____ 9.2.9.12 Record the data for TP 800/3, Expansion Checks for Hangers at 532°F.

_____ 9.2.9.13 Perform TP 600/5, RCS Hot Leakage Test.

_____ 9.2.9.14 Perform EP 1004-15, Post Accident Inplant Sampling.

_____ 9.2.10 All necessary OTSG tube leakage data has been recorded and attached to this procedure.

Section 9.2 Accomplished: SAT_____UNSAT_____

Signature_____Date_____

9.0 TEST METHOD (Cont'd.)

9.3 First Plant Cool Down

____ 9.3.1 Initiate the PPMP computer data collection (Enclosure 7) every ten (10) minutes prior to initiation of the cooldown and program to collect data every 10 minutes. The time should also be recorded when either RC Pumps or Decay Heat Pumps are turned on or off. The data should be taken throughout the cooldown until Tcold is 350°F. Any additional activities that occur during cooldown that would make a significant change on the OTSG Tube-Shell temperature profile should also be recorded and at the completion of the cooldown print out the data collected. Mark up the computer printouts with the following: step number, TP number, initials, date, page number and attach as part of Enclosure 7.

____ 9.3.2 Commence plant cooldown in accordance with Enclosure 4 (OP 1102-11, Plant Cooldown, as modified for TP 600/2). Cooldown to achieve a cooldown rate of 60 ± 10°F/Hr while not exceeding the 70°F ΔT limit (Step 6.5). Stop the cooldown at 350°F. Maintain RCS pressure as close to 2155 psig as possible in accordance with Enclosure 4. Monitor OTSG Leakage in accordance with Enclosure 8 requirements.

____ 9.3.3 Plant is stable at 350°F. Maintain the plant in this condition until the following tests are completed:

_____ 9.3.3.1 Perform Section 9.1 of TP 846/1, Incore Thermocouple Functional Test.

9.0 TEST METHOD (Cont'd.)

_____ 9.3.3.2 Complete Enclosure 12 of TP 700/1 for 350°F (RM-13J, LM-38, LM-43C).

_____ 9.3.4 All necessary OTSG tube leakage monitoring data has been recorded and attached to this procedure.

Section 9.3 Accomplished: SAT_____UNSAT_____

Signature_____Date_____

9.4 Second Plant Heat Up

_____ 9.4.1 Initiate the PPM computer data collection (Enclosure 7) every ten (10) minutes prior to initiation of the heatup and program to collect data every ten (10) minutes. The time should also be recorded when either RC Pumps or Decay Heat Pumps are turned on or off. The data should be taken throughout the heatup until hot standby conditions are reached. At the completion of the heatup print out the data collected. Mark up the computer printouts with the following: step number, TP number, initials, date, page number and attach as part of Enclosure 7.

_____ 9.4.2 In accordance with Enclosure 3 (OP 1102-1, Plant Heatup, as modified for TP 600/2) perform a plant heatup to 532°F, 2155 psig. Monitor OTSG Tube Leakage in accordance with Enclosure 8 requirements.

_____ 9.4.3 Maintain RCS conditions at 532°F, 2155 psig for eleven (11) dayas.

9.0 TEST METHOD (Cont'd.)

_____ 9.4.4 All necessary OTSG tube leakage monitoring data has been recorded and attached to this procedure.

Section 9.4 Accomplished: SAT_____UNSAT_____

Signature_____Date_____

9.5 Second Plant Cooldown to 350°F, with main feedwater at 90°F/Hr, while maintaining the OTSG Tube-To-Shell Δ T near, but not exceeding 140°F.

_____ 9.5.1 Initiate the PPMP computer data collection (Enclosure 7) ten (10) minutes prior to initiation of the cooldown and program to collect data every ten (10) minutes. The time should also be recorded when either RC Pumps or Decay Heat Pumps are turned on or off. The data should be taken throughout the cooldown until Tcold is 350°F. Any additional activities that occur during cooldown that would make a significant change on the OTSG Tube-Shell temperature profile should also be recorded and at the completion of the cooldown print out the data collected. Mark up the computer printouts with the following: step number, TP number, initials, date, page number and attach as part of Enclosure 7.

_____ 9.5.2 Section 9.5.3 will cooldown to 350°F at a rate of 90 +0-10°F/Hr, while approaching the 140°F ΔT (Step 6.5), in accordance with Enclosure 4 (OP 1102-11, Plant Cooldown, as modified for TP 600/2). Monitor OTSG Tube Leakage in accordance with Enclosure 8 requirements.

9.0 TEST METHOD (Cont'd.)

_____ 9.5.3 To accomplish the desired cooldown rate and approach the 140° ΔT limit proceed as follows:

NOTE: Ensure MFW flow is not interrupted to both steam generator MFW nozzles.

_____ 9.5.3.1 At hot shutdown conditions and four RC pumps running, reduce MFW flow to approximately 32 gpm per OTSG and boil water down to low level setpoint.

NOTE: Place main steam line rupture detection enable/defeat switches (four) in defeat prior to reaching 600 psig.

_____ 9.5.3.2 Secure one RCP and using the startup valves in auto, adjust TB valve setpoint to smoothly decrease each OTSG pressure from 900 to 600 psig in first 30 minutes. This should cause T_{ave} to decrease at approximately 90F/hour.

_____ 9.5.3.3 Monitor (Step 9.5.1) average shell temperature, T_{ave}, and tube-to-shell ΔT every ten (10) minutes, and be sure ΔT never exceeds 140F.

_____ 9.5.3.4 Continue lowering steam pressure so that T_{ave} decreases at 90F/hour. After several minutes, the shell temperature will start to decrease but at a rate less than 90F/hour.

9.0 TEST METHOD (Cont'd.)

NOTE: If a minimum bypass flow of main feedwater has been established to keep the main feedwater nozzles (and flanges) from cycling thermally, the water level in each OTSG may rise above the low level setpoint. This will be acceptable.

_____ 9.5.3.5 When tube-to-shell ΔT reaches 140F, stop reducing steam generator pressure and begin a gradual repressurization of each steam generator.

_____ 9.5.4 All necessary OTSG tube leakage monitoring data has been recorded and attached to this procedure.

Section 9.5 Accomplished: SAT_____UNSAT_____

Signature_____Date_____

9.6 Third Plant Heatup to 532°F, 2155 psig

_____ 9.6.1 Initiate the PPMP computer data collection (Enclosure 7) every ten (10) minutes prior to initiation of the heatup and program to collect data every ten (10) minutes. The time should also be recorded when either RC Pumps or Decay Heat Pumps are turned on or off. The data should be taken throughout the heatup until hot standby conditions are reached and at the completion of the heatup print out the data collected. Mark up the computer printouts with the following: step number, TP number, initials, date, page number and attach as part of Enclosure 7.

9.0 TEST METHOD (Cont'd.)

_____ 9.6.2 In accordance with Enclosure 3 (OP 1102-1, Plant Heatup, as modified for TP 600/2) perform a plant heatup to 532°F, 2155 psig. Monitor OTSG Tube Leakage in accordance with Enclosure 8 requirements.

_____ 9.6.3 Maintain RCS conditions are 532°F, 2155 psig for eleven (11) days.

_____ 9.6.4 At the completion of Step 9.6.3 perform TP 664/1 - PORV Flow Indication Retest to verify PORV operability.

_____ 9.6.5 All necessary OTSG tube leakage monitoring data has been recorded and attached to this procedure.

Section 9.6 Accomplished: SAT_____UNSAT_____

Signature_____Date_____

9.7 Third Plant Cooldown

_____ 9.7.1 Initiate the PPMP computer data collection (Enclosure 7) every ten (10) minutes prior to initiation of the cooldown and program to collect data every ten (10) minutes. The time should also be recorded when either RC Pumps or Decay Heat Pumps are turned on or off. The data should be taken throughout the cooldown until Tcold is below 150°F and the maximum OTSG shell temperature is less than 200°F. Any additional activities that occur during cooldown that would make a significant change on the OTSG Tube-Shell temperature rofile should also be recorded and at the completion of the cooldown print out the data collected.

9.0 TEST METHOD (Cont'd.)

_____ 9.7.1 Cont'd. Mark up the computer printouts with the following: step number, TP number, initials, date, page number and attach as part of Enclosure 7.

_____ 9.7.2 Commence a plant cooldown in accordance with Enclosure 5 (EP 1202-5, OTSG Tube Leak/Rupture, as modified for TP 600/2). Cooldown at 90+0-10°F/Hr or the maximum achievable if it is less than 90°F/Hr. Maintain the OTSG Tube-To-Shell ΔT to $\leq 70°F$. Monitor OTSG Tube Leakage in accordance with Enclosure 8 requirements.

_____ 9.7.3 Put the plant on the decay heat removal system and continue the cooldown to 130°F and 310 psig. Maintain the plant in this condition until further instructions are provided.

_____ 9.7.4 All necessary OTSG tube leakage monitoring data has been recorded and attached to this procedure.

Section 9.7 Accomplished: SAT_____ UNSAT_____

Signature_____ Date_____

10.0 DATA REQUIRED

10.1 All data required by this test will be included in the enclosures as attachments or in the individual test procedures conducted during this sequence.

11.0 ACCEPTANCE CRITERIA

11.1 Acceptance criteria for specific tests listed in Enclosure 6 are contained in Section 11.0 of the individual test procedures or in the appropriate enclosures of this procedure.

TEST PROCEDURE EXCEPTION & DEFICIENCY LIST

ENCLOSURE 1 of TP 600/2

The Exception & Deficiency List consists of the following pages:

1,

Justified/
Completed

E/D No.	Par.	Description/Signature/Date	Justification/Resolution	Sign-off	Date

TEST PROCEDURE EXCEPTION & DEFICIENCY LIST

QUESTIONS FOR TEST EXCEPTION ACCEPTABILITY

ENCLOSURE 1A

Exception vs. STR - applicable to all Test Exceptions

1. Does this change revise the scope of the procedure as approved?
2. Does this change revise the intent of the procedure as approved?

Safety Evaluation Considerations - applicability Category A procedures

3. Does this change increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety?
4. Does this change create the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report?
5. Does this change reduce the margin of safety as defined in the basis for any technical specification?

Environmental Evaluation Considerations - applicability Category B procedures

6. Does this change possibly involve a significant environmental impact?
7. Does this change have a significant adverse effect on the environment?
8. Does this change involve a significant environmental matter or question not previously reviewed and evaluated by the NRC?

ENCLOSURE 2 OF T. P. 600/2

QUALITY CONTROL WITNESS SIGNOFF SHEET

Paragraph

Results witnessed as Satisfactory

_____Sat. _____Unsat.

Signature_____Date_____

1102-1
Revision 62
08/03/83
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USE IN UNIT 1 ONLY

IMPORTANT TO SAFETY
NON-ENVIRONMENTAL IMPACT RELATED

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 OPERATING PROCEDURE 1102-1
PLANT HEATUP TO 532°F
MODIFIED BY TP 600/2

TP 600/2

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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 OPERATING PROCEDURE 1102-1
PLANT HEATUP TO 525°F

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1.0 REFERENCES

1.1 Filling and Venting Reactor coolant (R.C.) System Operating Procedure 1103-2

1.2 Pressurizer Operation Operating Procedure 1103-5

1.3 R.C. Pump Operation Operating Procedure 1103-6

1.4 Decay Heat Removal System 1104-4

1.5 Plant Technical Specifications

1.6 Plant Limits and Precautions Operating Procedure 1101-1

1.7 Once Through Steam Generator (OTSG) Fill, Drain and Layup Operating Procedure 1106-16

1.8 Makeup and Purification System Operating Procedure 1104-2

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1.10 Core Flooding System Operating Procedure 1104-1

1.11 Reactor Protective System Operating Procedure 1105-2

1.12 Turbine Generator Operating Procedure 1106-1

1.13 Main Steam Operating Procedure 1106-14

2.0 LIMITATIONS AND PRECAUTIONS

2.1 Equipment

2.1.1 Reactor Coolant temperature, pressure and heatup rates shall be maintained within the limits specified in Figure I (T.S. 3.1.2.1).

NOTE:	Following each refueling outage, or following any outage in which the RC System was opened, the heatup/cool-down rate shall not exceed 50°F in any one hour (T.S. Fig. 3.1-2).

2.1.2 The pressurizer must not be filled with water to solid (400") water conditions at any time except as required for system hydrostatic tests, emergency procedure and ~~SOP~~ STP. | TP 600/2

2.1.3 The pressurizer maximum allowable heatup rate shall be limited to 100°F/hr. (T.SD. 3.1.2.3). (Temperature shall not change by greater than 100°F within any one hour period).

2.1.4 The pressurizer to loop (hot leg) differential temperature shall be maintained at less than 410°F ΔT.

2.1.5 The once through steam generators maximum allowable secondary pressure when the once through steam generator temperature is below 100°F shall be limited to less than 200 psig (T.S. 3.1.2.2).

2.1.6 The maximum allowable differential between feedwater line temperature and steam generator lower downcomer temperature shall be limited to less than 442°F ΔT.

2.1.7 When reactor coolant temperature is less than 500°F no more than 3 reactor coolant pumps shall be run at one time.

2.1.8 Do not exceed a temperature of 190°F and 100 psig pressure in the reactor coolant system until reactor coolant pump seal injection flow is established to all reactor coolant pumps.

2.1.9 Two steam generators shall be operable whenever the coolant average temperature is above 250°F (T.S. 3.1.1.2).

2.1.10 The temperature differential between the pressurizer and the spray fluid shall always be maintained less than 430°F (T.S. 3.1.2.3). For normal plant heat-up/cool down and power operation, this temperature differential should be maintained at less than 250°F.

2.1.11 If CRA Safety Groups 1-4 are withdrawn prior to heatup due to moderator temperature coefficient being positive and/or deboration during heatup, observe the following:

A. Available shutdown margin with highest worth control rod stuck out must be >1 percent Δ k/k at most reactive condition.

B. The shutdown bypass should be initiated if control rods are to be withdrawn, and the high flux trip setpoint should be reset to 4.25 percent per Operating Procedure 1105-2, Appendix I.

C. Prior to reaching 1720 psig, (the shutdown bypass bistable setpoint), control rods should be inserted until the shutdown bypass has been deactivated and the low pressure bistable has reinitiated at 1900 psig. ~~The high flux trip setpoint should be reset at 104.75 percent when the bypass is cleared per Operating Procedure 1105-2, Appendix I.~~ TP 600/2

2.1.12 The Nuclear Instrumentation will be continuously monitored during any reactivity addition. During withdrawal of control rods, subcritical multiplication will be confirmed and a 1/M plot verse rod index (position) shall be plotted.

2.1.13 During plant heatup following refueling 1/M data should be taken versus temperature at least every 50°F.

2.1.14 A minimum of 107 KW of pressurizer heaters, from each of two pressurizer heater groups shall be operable. Each operable 107 KW of pressurizer heaters shall be capable of receiving power from a 480 volt ES bus via the established manual transfer scheme. (T.S. 3.1.3.4.2)

2.2 Administrative

2.2.1 When reactor coolant temperature is less than 525°F, the reactor shall be maintained subcritical by an amount equal to or greater than the calculated reactivity (0.1 percent $\Delta K/K$) insertion due to depressurization (T.S. 3.1.3.3). TP 600/2

2.2.2 The boron concentration in the reactor coolant system shall not be reduced unless at least one reactor coolant pump or one decay heat removal pump is circulating reactor coolant (T.S. 3.1.1.1B).

In addition, while shutdown, when the RC system boron concentration is being reduced by more than 50 ppm a 1/M plot versus the amount of water added to the RCS must be maintained. Also the source range counts per second must be monitored or recorded continuously when shutdown and decreasing RC system boron concentration.

2.2.3 When operating at reactor coolant pressures less than 450 psig, the low range reactor coolant pressure instrument must be used.

2.2.4 When the reactor is in the heat up or hot shutdown mode, both Decay Heat Removal trains should be operable. Should it be required for one train to be removed from the operable status, the Manager - Plant Operations must be notified, and the priority set to return both trains to operable status as soon as possible (dependent on Decay Heat level).

2.2.5 When reactor power is less than 15 percent FP, do not request a printout of the following computer groups:

Gp. No.	Description
20	Worst Case Thermal Condition
31	Fluid Condition
38	Core Average Thermal Condition
39	Core Map Thermal Condition
40	All Thermal Output
54	Selected Assembly Thermal Condition

2.2.6 If any Safety Limit (defined in Technical Specification 2.1 and 2.2) is exceeded, the shift supervisor shall notify the Operations and Maintenance Director or Duty Superintendent. The reactor shall be shut down. The licensee shall notify the Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurence. Operation shall not be resumed until authorized by the Commission.

2.2.7 If, during operation, the automatic safety system does not function as required, the Operations and Maintenance Director or Duty Superintendent shall be notified. The shift supervisor shall take appropriate action as outlined in the Tech Specs. Note that this appropriate action may include shutting down the reactor:

Examples of "failure to function as required" are:

1. Setpoints exceeding limiting safety system settings
2. Failure of a protection system component in an untripped state.

2.2.8 When a Limiting Condition for Operation (defined in Section 3 of the Technical Specifications) is not met, the shift supervisor shall notify the Operations and Maintenance Director or Duty Superintendent. The reactor shall be shut down or remedial action taken as permitted by the Technical Specifications until the condition can be met.

In the event an LCO is not met and the remedial action permitted by the Tech. Specs. does not correct the situation, the licensee shall notify the Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurrence.

3.0 OPERATING PROCEDURE

3.1 Prerequisites

Indicate satisfactory completion of steps below by initialing each step and sign at end of section.

____1. A report has been received from the Plant Engineering, Operations, and Maintenance departments that all work necessary for heatup has been completed.

NOTE:	The report from the Plant Engineering Department should include verification that all routine Technical Specification Surveillances not included in Enclosure I or II have been performed as scheduled by the Technical Specification Surveillance Program. Any unresolved discrepancies shall be brought to the attention of the Manager - Plant Operations.

____2. Source range (CPS) and intermediate range (AMPS) indication available on strip chart recorder located above console cc. If recorder is out of service may be waived by Shift Supervisor.

3.2 Procedure

Indicate satisfactory completion of steps below by initialing each step and sign name at end of applicable section.

____1. Place all Integrated Control System (ICS) control stations in manual and adjust the manual outputs to zero in accordance with Operating Procedure 1105-4. Verify setpoint stations are set as specified in Operating Procedure 1105-4.

____2. Verify the NDTT switch on "PCR" is in the AUTO position and the PORV and block valve is operable. (This reduces the setpoint for RC-RV-2 (PORV) to 485 psig and verifies operability per T.S. 3.1.12).

NOTE:	Before going to "Defeat" on steam line, break F.W. shutoff system notify S/S or S/F.

____3. Verify or complete the following switch line up at console cc.

a. A STM line break F.W. shutoff system - Defeat

B STM line break F.W. shutoff system - Defeat

A STM line break backup system - Defeat

B STM line break backup system - Defeat

b. Emergency FP enable defeat selector switches - To Defeat (four switches)

____4. Verify or complete the items listed on Encl. 1 (preheatup check list) and Encl. 2 (startup surveillance test checkoff).

NOTE: The sustained voltage should not exceed 506V on the 480V buses and 4400V on the 4160V buses. Changing from tap 3 to tap 4 will result in a 2.5 percent increase in voltage thus prior to the tap change the 480V bus voltage should be ≤ 490V and 4160V bus voltage should be ≤ 4290V.

~~____4.1 If the Aux. transformers are not in the 224 KV tap (tap 4), contact Middletown Line Department to have the taps changed. The transformer tap change should be accomplished per 1107-2.~~ TP 600/2

____5. Verify that the Feedwater chemistry is within required specification as indicated on the water chemistry status sheet.

6. Establish steam generator levels at ~~97 percent to 100 Inches to~~ inches wide range ~~percent~~ on the ~~operating~~ level instruments in accordance with ~~Operating~~ Procedure 1106-16. TP 600/2

NOTE:	Maintain the main feedwater nozzles submerged. At the same time, open the bypass line around the feedwater control valve (FW-V85A/B) fully or use FW-V-16A/B, ~~and control OTSG level by the lower tube sheet drains as required (FW-V86A/B). See Fig. 2 or~~ Open Turbine bypass valves as necessary to control OTSG level.

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7. Fill the reactor coolant system maintaining boron concentration at least at 1 percent $\Delta K/K$ subcritical for 70°F conditions, in accordance with Operating Procedure 1103-2, if necessary.

CAUTION:	Do not exceed a temperature of 190°F or 100 psig pressure in the reactor coolant system until reactor coolant pump seal injection flow is established.

NOTE:	The RCS may be pressurized to 425 psig with N_2 for leak check. After leak check reduce pressure to 30 psig by venting to RDCT via RC-V28.

8. Establish a bubble in the pressurizer in accordance with Operating Procedure 1103-5.

CAUTION:	Prior to starting make up pump, insure RC-RV-2 (PORV) block valve RC-V2 is open and NDTT switch is in auto insure alarm PRF-6-8 is clear. T.S. 3.1.2

CAUTION:	Insure MV-V217 and MU-V16A, B, C and D are closed and their respective breakers are open and PZR level is $\leq$ 220" prior to performing step No. 9. Maintain PZR level $\leq$ 220" until RCS > 275 F (See T.S. 3.1.12.3).

____9. Vent the reactor coolant system in accordance with Operating Procedure 1103-2, if system pressure has been less than 30 psig.

CAUTION: Do not exceed the decay heat maximum pressure as shown in Fig. 1a.

____10. Start a make up pump and establish seal injection flow to all reactor coolant pumps in accordance with Operating Procedure 1104-2. Place pressurizer level control in automatic with setpoint at 100" (25 percent). Establish normal letdown flow. (MU-V5 minimum flow is 10 gpm for valve protection.)

____11. If desired by Manager, Plant Operations, perform MU-V-140 flushing per Operating Procedure 1104-2 Enclosure II.

____12. Pump the R.C. pump oil drain tanks to 55 gal. drums and remove the drums from the reactor building.

13. The following steps enable application of vacuum to the OTSG's during startup, maintain radioactive gas releases to the environment as low as practicable, and at the same time allow the discharge of small concentrations of radioactive gas from the condenser vacuum pumps to be controlled and credited as planned radioactive gas releases.

____a. Prior to proceeding to Step 13 accomplish the following: Insure MS-V 25A/B are tightly closed. Verify that the flange is blanked between MS-V 25A and B and MS-V 24A and B.

_____b. Mark RMA-5 recorder chart as follows: "Vacuum is being established." Follow Emergency Procedure 1202-12 if RMA5 alerts or alarms.

_____c. Prior to drawing vacuum on OTSG's insure nitrogen is isolated to OTSG and feedwater heaters per 1104-26A.

_____14. Take manual control of the turbine bypass valves at console cc and crack open the valves to draw a vacuum on both steam generators.

NOTE:	A vacuum must be maintained on the steam generators until reactor coolant temperature is greater than 220°F.

_____15. If the moderator temperature coefficient is not known to be negative and/or deboration is to be concurrent with heatup, perform the following operations prior to starting heatup. (Starting RC pumps).

_____a. Complete Nuclear Instrumentation Precritical Checks.

_____b. Set high flux trip setpoint to 4.25 Percent per Operating Procedure 1105-2, Appendix I.

_____c. Manually reset the shutdown bypass high pressure trip bistable on each channel (4 total) of the reactor protective system. Notify S/S or S/F.

____d. Initiate the shutdown bypass on each channel (4 total) of the reactor protective system.

: NOTE: This will remove the following trip protection. :

1. Power/Imbalance/Flow
2. Power/Pump
3. Low Pressure
4. Pressure/Temperature

Notify S/S or S/F.

____16. Verify that the RCS boron concentration is maintained at least at the concentration for 1 percent ΔK/K subcritical at 70°F conditions.

____17. Place the following on computer trend recorders until at 0 percent power, 2155 psig and 532°F. Mark the recorders with date, time, and scale, and every scale change and time.

Pt. 512 - Loop A Tcold

Pt. 515 - Loop B Tcold

Pt. 505 - RC pressure

____18. During heatup plot temperature/pressure on Figure No. 1 or 1a every 30 minutes. Mark time of point in plotted curve every 2 hours.

____19. Increase reactor coolant pressure to greater than the net positive suction head (NPSH) requirements for the reactor coolant pumps (See Fig. 1A) and verify at least 280 psig. ΔP across No. 1 seal of the reactor coolant pump to be started.

____20. Place the spray valve control switch in the manual position and verify the spray valve is in the closed position as indicated on console cc.

CAUTION: Maintain pressure within the limits of Fig. 1A with manual control of the pressurizer heaters. Should reactor coolant system pressure approach the NPSH limits specified for reactor coolant pumps on Fig. 1A, stop the reactor coolant pumps.

____21. Start 1 reactor coolant pump in accordance with Operating Procedure 1103-6.

____22. Run RCP simultaneously with Decay Heat Removal pump for at least 10 minutes.

____23. Stop RCP after at least 10 minutes run.

CAUTION: Only one RCP may be run while Decay Heat removal is in operation.

____24a. Run each of the other three reactor coolant pumps one at a time for at least 5 minutes each. When all four (4) RC pumps have been run as specified, leave 1 RC pump running.

____24b. While maintaining the RCS in accordance with Figure 1A for simultaneous operation of the RCP and DHR system, the CRDM's must be vented while RCS temp is between 100°F and 200°F.

~~____25. When all 4 reactor coolant pumps have been run as specified, leave 1 reactor coolant pump running.~~ TP 600/2

____20. Place the spray valve control switch in the manual position and verify the spray valve is in the closed position as indicated on console cc.

CAUTION: Maintain pressure within the limits of Fig. 1A with manual control of the pressurizer heaters. Should reactor coolant system pressure approach the NPSH limits specified for reactor coolant pumps on Fig. 1A, stop the reactor coolant pumps.

____21. Start 1 reactor coolant pump in accordance with Operating Procedure 1103-6.

____22. Run RCP simultaneously with Decay Heat Removal pump for at least 10 minutes.

____23. Stop RCP after at least 10 minutes run.

CAUTION: Only one RCP may be run while Decay Heat removal is in operation.

____24a. Run each of the other three reactor coolant pumps one at a time for at least 5 minutes each. When all four (4) RC pumps have been run as specified, leave 1 RC pump running.

____24b. While maintaining the RCS in accordance with Figure 1A for simultaneous operation of the RCP and DHR system, the CRDM's must be vented while RCS temp is between 100°F and 200°F.

~~____25. When all 4 reactor coolant pumps have been run as specified, leave 1 reactor coolant pump running.~~ TP 600/2

____26. Vent the reactor coolant system in accordance with applicable portion of Operating Procedure 1103-2.

CAUTION: Venting should be done before exceeding 200 F reactor coolant system temperature.

____27. Prior to closing DH-V-1, 2 and 3 notify Electrical Maintenance to set up equipment to monitor and record valve closing current, torque close current and closing time, in accordance with PM-E-13. Then have Electrical Maintenance forward data to electrical engineer.

____28. Secure Decay Heat Removal System and increase Reactor Coolant Pressure. Verify all safety tags are removed from DH-V6A (1A ESV 3B), and DH-V6B (1B ESV 3B). Rack-in and/or close DH-V6A and 6B breakers.

CAUTION: While below 195 F, assure RC Pump Configuration is in accordance with Figure 1A.

____29. Verify that reactor coolant pressure is greater than the required pressure for control rod drive operation (as shown on Fig. 1A) and complete rod programming verification per 1301-9.2 if applicable (T.S. 4.7.2.1).

CAUTION: When reactor coolant temperature is less than 525 F the reactor shall be maintained subcritical by an amount equal to or greater than the calculated reactivity insertion due to depressurization (T.S. 3.1.3.3).

_____30. Verify shutdown margin per Operating Procedure 1103-15. SDM = _____ and withdraw safety rods per Operating Procedure 1105-9.

NOTE:	Plot 1/M vs. rod position during rod withdrawal to insure criticality is not attained on the Safety Groups.

_____30A. Cycle RC-V-1 and RC-V-3 to test operability prior to continuing with heatup.

NOTE:	Test valves one at a time.

CAUTION:	Maintain system heat up rate less than the limits specified on Figure 1.

CAUTION:	Limit the pressurizer heat up rate to 100 F in any one hour and the pressurizer to loop differential temperature to less than 410°F ΔT.

CAUTION:	Limit the temperature differential between the pressurizer and spray fluid to less than 430°F (T.S. 3.1.2.3).

CAUTION:	Before starting the 2nd RC Pump in any one loop, temperature must be greater than 195°F.

_____31. Start the 2nd Reactor Coolant pump per 1103-6.

_____32. Start a 3rd reactor coolant pump and commence reactor coolant system heatup. Energize all pressurizer heaters, control the spray valve manually as necessary to maintain pressure within the boundaries of Figure 1.

____33. During system heatup compensate for increasing pressurizer level due to the reactor coolant system expansion by adjusting letdown flow as necessary, and diverting letdown flow to the selected bleed tank as necessary to maintain makeup tank level all in accordance with Operating Procedure 1104-2.

CAUTION: Maintain Pressurize level ≤ 220".

~~NOTE: If adequate letdown is not possible, reduce the seal flow control valve controller setpoint accordingly, normal setpoint is 32 gpm. Do not set less than 22 gpm.~~	TP 600/2

NOTE: This arrangement assists in maintaining outflow from the pressurizer to the RCS piping during heatup to minimize thermal cycles in the pressurizer surge line nozzles. The 10 gpm makeup flow provides some control over increasing pressurizer level, while the operator increases letdown flow. The outflow is obtained by the amount of bypass spray flow.

CAUTION: Do not feed the steam generators unless the feedwater line to steam generator lower downcomer temperatures are maintained at less than a 442°F ΔT.

____34. Maintain the main feedwater nozzles submerged by opening the bypass valves around the feedwater control valves (FW-V85A/B) or by using FW-V-16A/B ICS control stations and ~~controlling~~ maintaining OTSG level per Fig. 2 ~~between 97-100 percent inches~~ on the ~~operating~~ wide range ~~with lower tube sheet drains FW-V-86A/B as required (See Figure 2)~~, ~~or use~~ with Turbine Bypass Valves MS-V-3A-F, ~~as necessary to reduce OTSG level.~~ TP 600/2

____35. Establish reactor coolant chemistry in accordance with the recommendations of the water chemistry department.

____36. Establish a hydrogen overpressure in the makeup tank in accordance with Operating Procedure 1102-12.

____37. Prior to exceeding 300 psig and 200°F in the reactor coolant system accomplish the following:

____a. Establish containment integrity in accordance with Operating Procedure 1101-3 (T.S. 3.6).

____b. Prohibit reactor building crane operation over the steam generator compartments (T.S. 3.12.3).

____c. The minimum shift operations manning shall be upgraded to at least the following:

One (1) Shift Supervisor - SRO qualified

One (1) Shift Foreman - SRO qualified

Three (3) Control Room Operators - at least two RO qualified

Five (5) Auxiliary Operators

One (1) Shift Technical Advisor

A minimum of 1 SRO (or RO qualified and SRO trained) RO must be in the Control Room at all times when the RCS is greater than 200°F.

____d. Assure Normal/Defeat switches on PRF are in Normal position for RM-G-16, 17, 18, 20, 21 and RM-L-1. If not in Normal notify Shift Supervisor.

_____38. When R.C. temp is >220°F and both OTSG lower downcomer temperatures are greater than 220°F the requirement to maintain a vacuum in the OTSG's is no longer in effect. The Turbine Bypass Valves may be placed in automatic at this time if desired.

_____39. Prior to exceeding 250°F reactor coolant temperature verify that the following technical specification requirements are met. (T.S. 3.4 and T.S. 3.5.2)

_____a. Three independent EFW pumps and associated flow paths shall be operable with:

_____i Two EFW pumps, each capable of being powered from an OPERABLE emergency bus, and one EFW pump capable of being powered from an OPERABLE steam supply system.

_____ii Four of six turbine bypass valves are OPERABLE.

_____iii A minimum of 150,000 gal. of condensate is available in each of the condensate storage tanks.

CO-T1A Level_____(Console cc)

CO-T1B Level_____(Console cc)

Minimum level is 11.5 ft. | TP 600/2

____iv With one pump or flow path* inoperable, restore the inoperable pump or flow path to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 12 hours. With more than one EFW pump or flow path* inoperable, restore the inoperable pumps or flow paths* to OPERABLE status or be subcritical within 1 hour, in at least HOT SHUTDOWN within the next 6 hours, and in COLD SHUTDOWN within the following 6 hours.

____b. ~~If all eighteen main steam safety valves are inoperable, reduce the maximum overpower trip setpoint in accordance with T.S. 3.4.2.~~ | TP 600/2

____c. The following minimum instrument channels are operable IAW T.S. 3.5.2.

i one saturation margin monitor

ii one safety valve differential pressure monitor per discharge line

iii one PORV position monitor

iv one EFW flow monitor per flow path

v one pressurizer level monitor

____40. When steam generator temperature is 250°F, cycle the steam valves designated in Operating Procedure 1106-14. |

NOTE: Perform the following operations at the specified time during startup:

____41. When RC temp is >275°F establish core flood tank levels and pressure in accordance with Operating Procedure 1104-1.

____42. Prior to exceeding 425 psig place and after verifying MU-V-16A/B/C/D and MU-V-217 are closed (see T.S. 3.1.12) the NDTT selector switch in the OFF position. This restores the setpoint for RC-RV-2 (PORV) to its normal value of 2450 psig.

____43. SF/SS have tags removed from BS-P-1A/B and the following valves:

~~BS-V-17A/B~~, BS-V-49A/B, and BS-V-1A/B

44. Open and lock open the following valves:

____~~BS-V-17A~~ ____~~BS-V-17B~~

____BS-V-49A ____BS-V-49B

45. Verify the following valves closed and energized:

____BS-V-1A ____BS-V-1B

____BS-V-2A ____BS-V-2B

____BS-V-~~4A~~3A ____BS-V-~~4B~~3B

~~46. Verify the following valves closed and energized:~~

~~____BS-V-1A~~ ~~____BS-V-1B~~

~~____BS-V-2A~~ ~~____BS-V-2B~~

____47. Rack in breakers for BS-P-1A and B.

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NOTE: Above 450 psig use the wide range indication for pressure control.

____A. With RCS pressure between 500 and 649 psig, conduct Core Flood and Decay Heat check valve leakage tests as required by SP 1300-3T. "N/A" this step if SP 1300-3T was performed within the previous 9 months, or the plant has been in COLD shutdown less than 72 hours.

____48. When Reactor Coolant pressure exceeds 570 psig and each L.P.I. channel has an "enable permit" light, reset the L.P.I. Trip actuation logic by pushing each of the six "Enable/channel reset" pushbuttons. (RC-4A, 5A, 6A on CC and RC-4B, 5B, 6B on CR).

NOTE: Even though there are no "Fully enabled" lights on for either L.P.I. Actuation System, L.P.I. actuation is armed and would actuate if RCS pressure drops to 540 psig.

____49. When reactor coolant pressure is greater than 650 psig, but prior to reaching 700 psig, place the core flooding system in operation in accordance with Operating Procedure 1104-01.

____50. Reset the low pressure injection bistable output memory lights at the bistable cabinets (3).

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____51. When the reactor coolant pressure is greater than ~~900~~ psig, verify automatic reset of the low pressure injection actuation system, by observing the "Fully enabled" lights on both L.P.I. channels are on (six lights).

TP 600/

____52. When RCS Temp. rises above 320° F, insure the breakers for MU-V-217 and MU-V-16A, B. C. and D are closed: RC-V-2 may be closed to limit RCS leakage.

CAUTION:	The No. 1 seal bypass valve (MU-V38) should remain closed unless:

a. R.C.P. radial bearing and/or No. 1 seal leakoff temperature are approaching their alarm setpoint of 225°F.

NOTE:	It should only then be opened if No. 1 seal leak off is < 1 gpm and RCS pressure is > 100 psig and < 1,000 psig. If 225°F is reached on radial bearing or seal water temperature and R.C.S. pressure is >1,000 psig stop that R.C. pump.

CAUTION:	During boron concentration reductions, flow in the reactor coolant system must be maintained (T.S. 3.1.1.1.B).

____53. ~~If the RCS boron concentration is greater than required for 1 percent ΔK/K subcritical at 70°F conditions, deborate as necessary in accordance with Operating Procedures 1104-2 and 1103-4 to the appropriate concentration for 1 percent ΔK/K subcritical at 70°F. In addition, while shutdown, when the RC system boron concentration is being reduced by more than 50 ppm a 1/M plot versus the amount of water added to the RCS must be maintained. Also, the source range counts per second must be monitored or recorded continuously when shutdown and decreasing RC system boron concentration.~~ TP 600/2

____54. When steam generator pressure is approximately 150 psig, start a condensate booster pump in accordance with Operating Procedure 1106-2.

____55. When Reactor Coolant Pressure exceeds 1670 psig and each H.P.I. has an "enable permit" light, reset the H.P.I. Trip actuation logic by pushing each of the six "Enable/channel reset" pushbuttons. (RC-1A, 2A, 3A on CC and RC-1B, 2B, 3B on CR).

NOTE:	Even though there are no "Fully Enabled" lights on for either H.P.I. actuation system, H.P.I. actuation is armed and would actuate if RCS pressure drops to 1640 psig.

NOTE:	Reactor Trip Isolation will occur during the next in step.

____56. Prior to reactor coolant pressure reaching 1720 psig, insert all control rods, "manually trip reactor" then increase reactor coolant pressure greater than 1900 psig and accomplish the following:

____a. Reset all RPS cabinet bistables that are tripped except the shutdown bypass bistable.

NOTE:	Ensure Enclosure III of OP 1102-2 is done.

____b. Place the shutdown bypass switches (4) on each reactor protective panel to the normal position.

____c. Realign the valves as needed that were closed by Reactor Trip Isolation.

____d. ~~Reset the high flux trip points to 104.75 percent in accordance with Operating Procedure 1105-2, Appendix I.~~ TP 600/2

____e. Withdraw the safety rods. Verify subcritical multiplication per 2.1.14 also plot 1/M vs. rod position. Notify Shift Supervisor, Shift Foreman.

____57. Reset the High Pressure Injection bistable output memory lights at the bistable cabinets (3).

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____58. When reactor coolant pressure is greater than ~~1750~~ psig, verify automatic reset of the high pressure injection actuation system, by observing the "Fully Enabled" lights on both H.P.I. channels are on (six lights).

____59. When RC temperature reaches 380°F commence hard bubble degassification in accordance with Operating Procedure 1102-12.

____60. ~~When steam generator pressure is approximately 350 psig, open MS-V1A, B, C and D to the STARTUP position using the local STARTUP POSITION pushbutton on the Jog Controls. Warming of the turbine valve chest may commence in accordance with Operating Procedure 1105-1.~~ TP 600/2

____61. Place the turbine bypass valve control stations in automatic after turbine valve chest warming is commenced (if not already in automatic) per Operating Procedure 1105-4.

____62. When steam generator pressure is approximately 500 psig, start a feedwater pump on auxiliary boiler steam in accordance with Operating Procedure 1106-3.

____63. When reactor coolant pressure is approximately 2100 psig, place the pressurizer heaters and spray to automatic.

____64. ~~When steam generator pressure reaches 800 psig, open T.D. 1A thru 1D and cycle the valves listed in Operating Procedure 1106-14.~~ TP 600/2

____65. Conduct hot leak test if applicable (T.S. 4.3.2) per 1303-8.1.

____66. Continue plant heatup to a reactor coolant temperature of approximately 500°F.

____67. Complete the following switch lineup at console cc:

(Insure OTSG pressure is greater than 600 psig.)

A STM line break F.W. Shutoff System - Enable

B STM line break F.W. Shutoff System - Enable

A STM line break Backup System - Enable

B STM line break Backup System - Enable

Notify Shift Supervisor, Shift Foreman

____68. When reactor coolant temperature is above 500°F, start the fourth reactor coolant pump and continue heatup to 532 ~~525~~°F. TP 600/2

____69. Conduct Reactor Building walk-through inspection for leaks, with attention to possible problem area (e.g., DH-V-1, pump seals, etc.). Provide the Manager of Plant Operations, a list of any discrepancies.

____70. Conduct rod drop testing if applicable (T.S. 4.7.1.1) per 1303-11.1. Maintain boron concentration at least at concentration needed for 1 percent ΔK/K subcritical at 70°F condition while the RCS is below 525°F. When the RCS is equal to or greater than 525°F, boron concentration may be reduced, but must be maintained at least at the flooded nozzle concentration per Figure 3.

____71. Select ~~Enable~~ Defeat on the (4) Emergency Feedwater Enable-Start-Defeat Selector Switches. Insure control switches for EF-P-2A and 2B are in the Normal-After-Stop position. TP 600/2

CAUTION: The Emergency Feedwater Auto-Start-Defeat Selector Switches must be in Auto prior to ending the Plant Heat-Up and prior to commencing the Plant-Start-Up Procedure.

____72. ~~Transfer the turbine gland sealing steam to the main steam system in accordance with Operating Procedure 1106-10 (Accomplish only if possible to do without causing RCS cooldown.)~~ TP 600/2

____73. When heat up is complete, remove charts from computer, time, date, and attach to end of this signed off procedure.

____74. If this heat-up followed a refueling outage, Control Rod Drop Testing (SP 1303-11.1) shall be performed (T.S. 4.7.1.1).

____75. ~~When this procedure is complete and this step and all other steps in this procedure are signed off, forward to the current operating procedure files and remove outdated procedure. Forward outdated signed off procedure to the operations clerk~~. TP 600/2

Performed by _____ Date _____
Signature

SRO/RO Reviewed by _____ Date _____
Signature

Final Conditions

Reactor coolant temperature is equal to or greater than ~~525~~ 532°F. | TP 600/2

Boron concentration is at least at the flooded nozzle concentration per Figure 3. Four reactor coolant pumps are in operation. The reactor coolant system is at normal operating pressure with heater and spray controls in automatic. One main feed pump is in operation on aux. steam. All ICS control stations are in hand except the turbine bypass valves. Turbine valve chest warming may or may not be in progress or is complete. Begin daily performance of 1303-1.1 at this time per Tech Spec. and 3.1.6.

NOTE:	Reactor coolant pump configuration may be adjusted as directed by the Shift Foreman at this time. The FW startup control valves will remain on manual control and OTSG level will be maintained between ~~97 and 100 percent (operating range).~~ Per Fig. 2 ~~and Inches (Wide Range)~~

| TP 600/2

ENCLOSURE I OPERATING PROCEDURE 1102-1

Pre-Heatup Check List

Overall Support Systems

1. 230 KV substation buses 4 and 8 energized. _____

2. Aux. transformer 1A and 1B disconnects closed.

   S1A-08 _____

   S1B-04 _____

3. Verify a current normal electrical system lineup per Operating Procedure 1107-1. _____

4. Verify a current emergency electrical system lineup per Operating Procedure 1107-2, and emergency power is available. _____

5. Nuclear service river water system is in operation per Operating Procedure 1104-30. _____

6. Secondary services river water system is in operation per Operating Procedure 1104-31. _____

7. Nuclear services closed cooling water system is in operation per Operating Procedure 1104-11. _____

8. Secondary services closed cooling water system is in operation per Operating Procedure 1104-12. _____

9. Instrument and control air system is in operation per Operating Procedure 1104-25. _____

10. Place one or more circulating water pumps in operation per Operating Procedure 1104-9. _____

11. The LWD Systems in operation as needed per Operating Procedure 1104-29. _____

12. Gaseous waste disposal system is in operation per Operating Procedure 1104-27. _____

13. All the below listed auxiliary systems are operable and in service as needed.

A. Spent fuel cooling Operating Procedure 1104-6 _____

B. Aux. and Fuel Handling Building Ventilation - Operating Procedure 1104-15A-C _____

C. Control Room Tower Vent - Operating Procedure 1104-19 _____

D. Cycle makeup pretreatment Operating Procedure 1104-22 _____

E. Demineralized water Operating Procedure 1104-23 _____

F. Misc. support building vent. Operating Procedure 1104-24A-M _____

G. Solid waste disposal - Operating Procedure 1104-28 _____

H. Screen house equipment Operating Procedure 1104-33 _____

I. Circ water chlor. and chem. feed Operating Procedure 1104-35 _____

J. River water chlor. 1104-36 _____

K. Mech. draft cooling tower Operating Procedure 1104-37 _____

L. Sump pump and drainage Operating Procedure 1104-40 _____

M. Station service air Operating Procedure 1104-42 _____

N. Nuclear plant sampling Operating Procedure 1104-43 _____

O. Turbine plant sampling Operating Procedure 1104-44 _____

P. Fire service water Operating Procedure 1104-45 _____

Q. Heat tracing Operating Procedure 1104-46 _____

R. Screen house vent and river water - Operating Procedure 1104-48 _____

S. Domestic water Operating Procedure 1104-49 _____

T. Sludge facility and industrial waste Operating Procedure 1104-50 _____

Secondary Systems

14. Start the turbine auxiliaries and place the turbine on the turning gear per Operating Procedure 1106-1. _____

15. Start the feed pump turbine's auxiliaries and place both main feed pumps on their turning gears per Operating Procedure 1106-3. _____

16. Verify a current valve lineup for the feed system per Operating Procedure 1106-3. _____

17. Verify a current valve lineup for the condensate system per Operating Procedure 1106-2. _____

18. Start both auxiliary boilers and warm up the auxiliary steam header per Operating Procedure 1106-4. _____

19. Verify a current valve lineup for extraction steam, feed water heater vents and drains per Operating Procedure 1106-12. _____

20. Start one condensate pump and perform the feed water cleanup for both heater trains per Operating Procedure 1106-2. _____

Train A _____

Train B _____

21. Place powdex units in service per Operating Procedure 1106-13. _____

22. Place gland steam system in operation per Operating Procedure 1106-10. _____

23. Establish vacuum in the main and feed pump condensers per Operating Procedure 1106-15. _____

24. Place condensate chemical feed system in operation per Operating Procedure 1104-3. _____

25. Complete a valve lineup on the emergency feed system per Operating Procedure 1106-6. _____

26. Complete a valve lineup on the main steam system per Operating Procedure 1106-14. (Main Steam Lines drained and pipe hangers not pinned).

NOTE:	Main Steam line hanger pins and blocks are installed/ removed by maintenance per 1410-Y-69.

_____

27. Place the isolated phase bus duct cooling system in operation per Operating Procedure 1106-11. _____

28. Insure the following valves are set up for automatic operation by checking that the valve operation is in the neutral position, the pin is removed, (or the handwheel is locked in the full open position) the air equalizing valve is close, the air supply is valved in and the control box man/auto lever is in auto.

A. MS-V-3A _____

B. MS-V-3B _____

C. MS-V-3C _____

D. MS-V-3D _____

E. MS-V-3E _____

F. MS-V-3F _____

G. MS-V-4A _____

H. MS-V-4B _____

I. EF-V-30A _____

J. EF-V-30B _____

K. FW-V-16A _____

L. FW-V-16B _____

M. FW-V-17A _____

N. FW-V-17B _____

O. MS-V-6 _____

P. MS-V-13A _____

Q. MS-V-13B _____

29. Insure Instrument air is valved in to the air speed changers for:

A. FW-P-1A (IA-V-990) _____

B. FW-P-1B (IA-V-987) _____

C. Insure EF-P-1 governor is reset. _____

30. Insure that the white lights labeled "MS-V4A/B ICS Control" and "MS-V3A-F ICS Control" are illiminated on ICS/NNI power monitor cabinet._____

31. Insure NORMAL-EMERGENCY selector switches for MS-V4A and EF-V30A located in the ESAS room are in the NORMAL position. _____

32. Insure NORMAL-EMERGENCY selector switches for MS-V4B and EF-V30B located near the Remote Shutdown Panel are in the NORMAL position. _____

33. Insure the System Control/Manual Loader Selector Switches on console CL and CC for EF-V30A/B are in the normal position. _____

Reactor Building Systems

30. Place fluid block system in operation per Operating Procedure 1104-20 _____

31. Place penetration pressurization system in operation per Operating Procedure 1104-21. _____

32. Place penetration cooling system in operation per Operating Procedure 1104-16. _____

33. Place reactor building ventilation systems in operation per Operating Procedure 1104-14A through F. _____

34. Place control rod drive service structure ventilation in service as follows:

    (1) Close or verify closed breakers 12, 13, and 14 on Panel D-8. _____

    (2) Close or verify closed breaker 25 on panel CV-3 (breaker for ind. lights) _____

    (3) Close or verify closed 12 breakers on the "D" ring on west side of the refueling canal. _____

    (4) Verify 12 indicating lights for head vent fans are on (mounted on "D" ring). _____

35. Verify a current valve lineup exists on R.B. spray system and verify that the system is in emer. standby mode per Operating Procedure 1104-5. _____

36. Verify a current valve lineup exists on reactor building emergency cooling river water system and verify the system is in standby per Operating Procedure 1104-38. _____

Primary Support System

37. Decay heat river water system is in operation per Operating Procedure 1104-32. _____

38. Decay heat closed cooling water system is in operation per Operating Procedure 1104-13. _____

39. Decay heat removal system is in operation per Operating Procedure 1104-4. _____

40. Place intermediate cooling system in operation per Operating Procedure 1104-8. _____

41. Verify that a current valve lineup exists on the makeup and purification system per Operating Procedure 1104-2. _____

42. Verify a current valve lineup on the nitrogen supply system per Operating Procedure 1104-26. _____

43. Verify that a current valve lineup exists on the chemical addition system per Operating Procedure 1104-47B. _____

44. Verify low range pressure instrument RC3-PT5 is valved into the primary system. _____

45. Verify a minimum volume of 16 feet of free space in the reactor coolant bleed tanks. _____

Instrumentation Systems

46. Verify that the pressurizer heater lo-lo level cut out is not overridden (Key switch in the ICS/NNI power monitor cabinet is in the normal position and alarm on PRF1-3-6 is clear). _____

47. The following instrumentation systems are in the conditions specified below:

NI

A. At least one source range instrument, NI-1/NI-2 (circle applicable instrument), has a current test 1303-7.2 and reads greater that 2 cps. _____cps _____

B. At least one intermediate range instrument, NI-3/NI-4 (circle applicable instrument), has a current test 1303-7.1 _____

C. At least two power range instruments, NI-5/NI-6/NI-7/ NI-8 (circle applicable instruments) have current 1303-4.1 tests, and their trip setpoint is 4.25 percent per section 6,5,8,2 _____

D. All 4 shutdown bypass switches are in the bypass position. _____

REACTOR PROTECTION SYSTEM

E. At least two of the shutdown bypass channels have section 6.8 of test 1303-4.1 current. _____

F. Verify below listed RPS signal jacks are connected to operating channels.

1	R.C. Pressure - channel ____	4.	Flux Recorder - channel ____
2	R.C. Flow - channel ____	5.	R.C. Flow "A" - channel ____
3	Reactor Flux - channel ____	6.	R.C. Flow "B" - channel ____

ESAS

48. At least 2 analog channels for the engineered safety

features listed below have current tests as noted.

(T.S. - 3.5.- 1)

A. Makeup and purification system (H.P. Injection Mode)

Reactor Coolant Pressure Instrument Channels-

1303-4.11

Reactor Building 4 psig Instrument Channels - 1303-4.13 _____

Manual pushbutton - 1303-5.2, and 1303-4.11. _____

B. Decay Heat System (L.P. Injection Mode)

Reactor Coolant Pressure Instrument Channels -

1303-4.11 _____

C. Reactor Building Isolation and Reactor Building

Cooling System (1303-4.13.)

Reactor Building 4 psig Instrument Channels -

1303-5.1. _____

Manual pushbutton - 1303-5.1. _____

D. Reactor Building Spray System

Reactor Building 30 psig Instrument Channels 1303-4.14. _____

Spray Pump Manual Switches 1303-5.2, and 1303-4.11. _____

NNI

49. The following minimum non nuclear instrumentation is in service:

A. 1 reactor coolant flow channel per loop. _____

B. 1 wide range and 1 narrow range Tc channel per loop. _____

C. 1 pressurizer level channel. _____

D. 1 pressurizer temperature channel. _____

E. 1 wide range and 1 narrow range pressure channel. _____

F. 1 main steam pressure channel per steam generator. _____

G. 1 main turbine throttle pressure channel per steam generator. _____

H. 1 startup, 1 operating, and 1 full range steam generator level instrument per steam generator. _____

50. Review the "Firewall Breaching Notification" _____

Log in the Control Room and notify the Manager - Plant Operations of any that will require a fire watch as plant heat up commences. (Ref. 1420-FB-1)

51. Physically verify positions and lock status of all valves on the Locked Valve List. Any discrepancies between the Locked Valve List and the actual valve/lock position shall be noted to the Shift Foreman and either corrected or logged in the Locked Valve Log.

_____
Signature

52. Verify 1105-3 "Safeguards Actuation System" System lineup is correct.

53. Shift Foreman/Supervisor verify whether a 100°F or 50°F maximum temperature change in any one hour type heat-up is to be performed. Note that a 50° HU/CD limit required for RCS inservice leak and hydrostatic tests.

_____
≤ 100°F Change in any one hour type heat-up

SF/SS Initial

_____
≤ 50°F Change in any one hour type heat-up

SF/SS Initial

ENCLOSURE 1 Checklist Complete:

Performed By _____ Date _____
Signature

Reviewed By SRO or RO License _____ Date _____
Signature

Enclosure II Operating Procedure 1102-1

Startup Surveillance Procedure Checkoff

1. Prior to each Startup verify that each of the following surveillance requirements have been performed. Procedure data must be < 24 months old unless otherwise stated).

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1302-5.1 and 5.5	4.1.1.7 4.1.1.11	RC Temp. Ch./Press-Temp Comparator Calibration	
1302-5.2 and 5.3	4.1.1.8 4.1.1.9	High and Low R.C. Press. Channel Calibration	
1302-5.4	4.1.1.10	Flux - R.C. Flow Comparator Calibration	
1302-5.6	4.1.1.12	Pump Flux Comparator and R.C. Pump Power Monitors Calibration	
1302-5.7	4.1.1.13	High Reactor Building Pressure Channel Calibration	
1302-5.8	4.1.1.15 4.1.1.17	High and Low Pressure Inj. Analog Channels Calibration	
1302-5.10	4.1.1.19	Reactor Building Emergency Cooling and Isol. Sys. Analog Ch - 4 PSIG - Calibration	
1302-5.11	4.1.1.21	Reactor Building Spray Sys. Ch. - 30 PSIG Ch. Calibration	

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1302-5.12	4.1.1.22 4.1.1.26	Pressurizer Temperature and Level Channels Calibration	
1302-5.13	4.1.1.23 4.1.1.24	Control Rod Absolute and Relative Position Calibration	*
1302-5.15	4.1.1.25	Core Flood Tanks Pressure and Level Channels Calibration	
1302-5.17	4.1.1.27	Make-Up Tank Level Channel Calibration	
1302-5.18	4.1.1.29	High and Low Pressure Inj. Sys. Flow Channels Calibration	
1302-5.19	4.1.1.30	B.W.S.T. Level Ind. Calib.	
1302-5.20	4.1.1.31	B.A.M.T. Level and Temp. Channel Calibration	*
1302-5.21	4.1.1.32	Recl. B.A.T. Level and Temp. Channel Calibration	*
1302-5.22	4.1.1.33	Containment Temp. Channel Calibration	
1302-5.23	4.1.1-40	NaOH Tank/BWST ΔP Indicator	
1301-13.1	4.1.1.35	Emergency Equipment Readiness	
1302-5.24	ETS 5.5.1	Environmental Monitors Calibration	
1302-5.25	4.1.1.37	Reactor Bldg. Sump Level Channel Calibration	

* Deleted for TP 600/2
Only Required for Criticality

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1302-5.26	4.1.1.38	O.T.S.G. Water Level Channel Calibration	
1302-5.28	4.1.1.41	Sodium Hydroxide Tk. Level Channel Calib.	
1302-5.29	4.4.3.3	Hydrogen Detector Calibration	*
1302-5.30	4.1.1.42	Diesel Gen. Prot. Relays Calibration	
1302-5.31A	3.5.3.1	4160V D and E Bus Degraded Grid under Voltage Relay System Calibration	
1302-5.31B	3.5.3.1	4160V D and E Bus Loss of Voltage Relay System Calibration	
1302-5.31C	3.5.3.1	4160V D Bus Loss of Voltage/ Degraded Grid Auxiliary Timer Calibration	
1302-5.31D	3.5.3.1	4160V E Bus Loss of Voltage/ Degraded Grid Auxiliary Timer Calibration	
1303-11.19E	4.1.1.39	Turbine Overspeed Trip Test (Data < 12 mos. old)	*
1303-11.2	4.1.2.3	Pressurizer Safety Valves Setpoint (50 Percent Tested)	

* Deleted for TP 600/2
Only Required for Criticality

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1303-11.3	4.1.2.4	Main Steam Safety Valves Setpoint (25 percent Tested)	
1303-5.5	4.12.1	Control Room Emergency Filtering System (Data must be < 12 mos. old and system operation less than 720 hrs since last surv.	
1303-11.25	4.4.1.2.1.A.1 4.4.1.2.1.A.2	Local Leak Rate Test-Personnel and Emergency Air Lock Outer Door Seals (Once every 6 months or within 72 hrs. of opening when Cont. Int. is required.	
1303-11.18E3	4.4.1.2.1.B.1 4.4.1.2.1.B.2	CM-V1, 2, 3 and 4 and HP-V1, 6 Local Leak Rate Test	
1303-11.23	4.4.1.2.1.C.1 through 4.4.1.2.1.C.7	Fluid Block System Local Leak Rate Test	
1303-11.18D	4.4.1.2.1.A.4	Reactor Bldg. Purge Isolation Valves Local Leak Rate Test (Data Date must be < 1 year old)	
1303-11.18 E10,11	4.4.1.2.1.A.5	Blind Flange Local Leak Rate Test	
1303-11.18E5	4.4.1.2.1.A.3	Fuel Transfer Tube Seals Local Leak Rate Test	
1303-11.24	4.4.1.2.1.A.3	Eqpt. Hatch Seal Local Leak Rate Test (Every other Refueling)	
1303-5.1	4.4.1.3	R.B. Isolation Valves Test - (Addressing the valves not testable during operation)	

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1301-8.1	4.4.1.4	Rx. Bldg. Annual Inspection (Data Must Be < 1 year old)	
1303-11.10	4.5.1.1 4.5.3.1.A 4.6.1.B.	E.S. Emerg. Loading and Pwr. Transfer Test	*
1303-11.8	4.5.2.1	Hi Pressure Injection	
1303-11.54	4.5.2.2	Low Pressure Injection	
1303-5.10	4.12.2.2.a	R.B. Purge Filter Air flow Test. (Data mst be < 18 mos old and system operated < 720 hrs since last surv.)	
1303-11.39	4.9.1.4	Emergency Feedwater Pump Automatic Start	
1301-10.1	FSAR 3.3.4	Internal Vent Valves Inspect and Exercise	*
1303-9.9	4.17.4	Func. Testing of Hydraulic Snubbers	
1303-10.1	3.8.9	R.B. Purge System	*
1303-4.1b	4.12.1.3	Radiation Monitoring System	
1303-5.7	4.12.2.2.e	R.B. Purge Air Treatment Operation Test of Fans AH-E-7A and 7B Data must be <18 mo. old	
1303-5.9	4.12.2.1	R.B. Purge Air Treatment Filter (AH-F-1) Differential Pressure Test Data must be <18 mo. old	

*Deleted for TP 600/2
Only Required for Criticality

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1303-5.8	4.12.3.2.a 4.12.3.2.d 4.12.3.1	Aux and Fuel Handling Exhaust Air Treatment Fan and Filter Test Data must be <18 mo. old	*
1303-6.1	4.4.1.1.15	ILRT Data must be <3.3 yrs. old	
1303-6.2	4.4.3.1	Hydrogen Purge System Data must be <3.3 yrs. old	*
1303.12.3	4.5.2.1a 4.5.2.2a	HPI/LPI System Vent	
1300-3T	4.2.6	DH-V-22A/B; CF-V-4,5A/B Leak Check	
1300-4B	4.19	OTSG Eddy Current Testing	
1301-9.7	4.1.2.10.A	Pump House Floor Intake Silt Accumulation	
1302-5.33		CK/Calib of MDCT Temp Loops	
1303-11.4	Table 4.1-2 Item 5	Refueling System Interlocks	N/A
1303-11.6	Table 4.1-2 Item 9	Spent Fuel Cooling System Funct. Test	
1303-12.5	4.18.4.1.b	CO_2 System Function	
1303-12.16	4.18.5.1.b	Halon System Functional	

*Deleted for TP 600/2
Only Required for Criticality

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1303-12.9	4.18.7.1	Fire Barrier Seals	
1303-11.28	Restart Report Commitment	LWDS Leak Check	
1303-11.29	Restart Report Commitment	Waste Gas Sys. Leak Check	
1303-11.30	Restart Report Commitment	RCS Sample Sys. Leak Check	
1303-11.31	Restart Report Commitment	H_2 Recombiner Pipe Leak Check	
1303-11.50	Restart Report Commitment	RB Spray Sys. Leak Check	
1303-11.42	4.9.1.6	EFW Flow Test From Condensate Storage Tank (Prior to startup, following a re-fueling Shutdown or a cold shutdown greater than 30 days)	
1300-3R	4.2.1	ISI Tests on MS, MU, RC and NS Systems	
1300-3P	4.2.1	ISI Tests on CF, CA, FB, DH, WDL Systems	
1300-3S	4.2.1	CA-P-1A/B Functional Test	*
1302-5.34	4.1-1, 45	Rx Trip on loss of MFW/ Main Turbine	*
1302-6.14	4.1-1, 47a	Calib. of D/P Mon. on PORV and Code Safeties	

*Deleted for TP 600/2
Only Required for Criticality

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1302-6.13	4.1-1, 47b	Calib. of Accoustic Mon. on PORV	
1302-6.16	4.1-1, 48	Calib. of PORV Set Point	
1302-6.6	4.1-1, 49	Calib. Sat. Margin Motor	
1302-6.3	4.1-1, 50	Calib. EFW Flow Channel	
1302-6.17	4.1-1, 51	EFW Initiation (Refueling Calib.)	
1303-11.21	4.5.2.3	Core Flooding System Operability Test	*
1303-11.9	4.5.3.1.B	Rx Bldg. Emerg. Clg. and Isolation Sys. Valves and Coolers Operability Test	
1303-11.16	4.5.4.2	Decay Heat Removal System Leak Test	
1301-8.2	4.6.1.C	Diesel Generator Annual Insp. (Data must be < 1 year old)	
1303-11.11	4.6.2.D	Station Batteries Load Test	
1301-9.2	4.7.2.2	Control Rod Power and Instrumentation Cable Verification	

*Deleted for TP 600/2
Only Required for Criticality

Surveillance Proc. Number	T.S. Paragraphs Applicable	Title of Procedure	Initials of Checker
1303-11.13	4.12.1.2.a	Control Room Filtering System Test (Data must be < 12 mos old and operated < 720 hrs since last surv.	*
1303-11.22	4.8.2	Main Steam Isolation Valves Closure Time Test	
1303-11.14	Table 4.1-2 Item 8 4.12.2.2.a 4.4.3.2	Reactor Bldg. Purge Exhaust Sp (Data must be < 18 mos old and system operated < 720 hrs since last surv.)	*
1302-3.1	Table 4.1-1 Item 19.e	Reactor Building Purge Line High Radiation	
1302-16	Table 4.1-1 Item 19.f	Line Break Isolation Signal (ICCW and NSCCW)	
1303-11.55	4.6.3	Pressurizer Heater Power Transfer	

Enclosure II Performed By _____ _____
Signature Date

Reviewed by SRO
or RO License _____ _____
Signature Date

*Deleted for TP 600/2
Only Required for Criticality

ENCLOSURE III OPERATING PROCEDURE 1102-1

Heat-Up Exception and Deficiency List

Operating Procedure No. 1102-1 Name Pre-Heatup Checklist

Date Data Taken _____

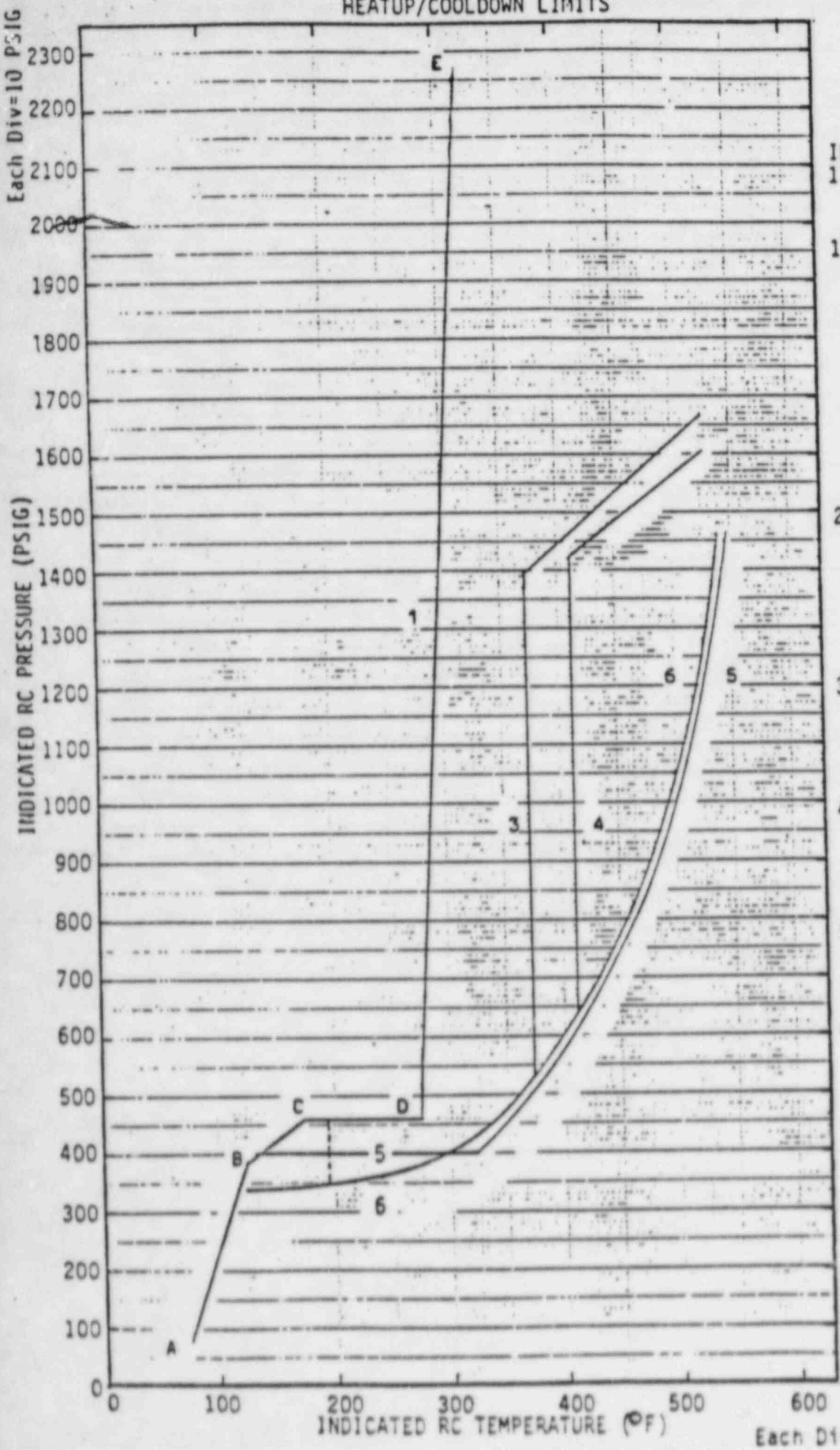
Date Completed and/or Justified _____

No.	E/D	Par	Description Initial/Date	Resolution	Signoff	Date

Performed By _____ Date _____
Signature

Reviewed By SRO
or RU Licnese _____ Date _____
Signature

FIGURE 1
HEATUP/COOLDOWN LIMITS



INSTRUMENT ERROR OF 50 PSIG
12°F IS INCLUDED FOR ALL CUF

1. Tech. Spec. 3.1.2 Heatup and cooldown limitations to 5 EFPY. (Plus additional 25 psig inst. error)

POINT	TEMP	PRESS
A	75	80
B	125	385
C	175	460
D	275	460
E	320	2250

2. Allowable RC Pump combinations.
   Above 195 F — All
   Below 195 F — 1-A.1-B; 0-A,1-B; 1-A,0-B,

3. Minimum RC pressure to maintain compression for on fuel clad,(Natural Ci OP 1101-1 Fig. 1.0-5.11

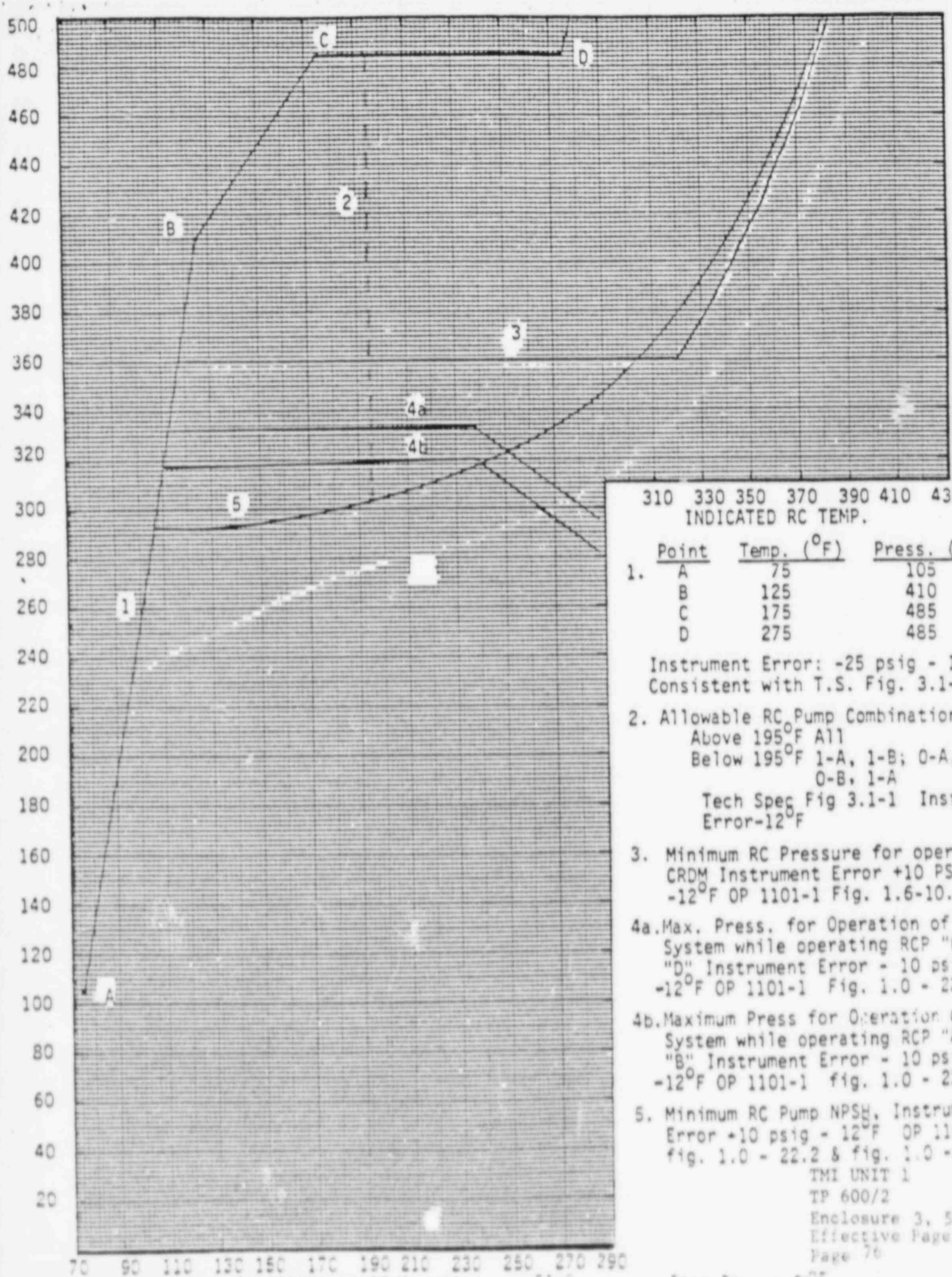
4. Minimum RC pressure to maintain compression for on fuel clad,(Forced Flc OP 1101-1 Fig. 1.0-5.10

5. Minimum pressure for control rod drive operation OP 1101-1 Fig. 1.0-23.1A

6. Minimum RC Pump NPSH. OP 1101-1 Fig. 1.0-5.6

Note: Heat up and Cooldown rates shall not exceed 100° in any one hour, except that during RCS Inservice Leak and Hydrostatic Test, maximum heat up and cooldown rate shall not exceed 50° F in any one hour

FIGURE 1A
HEATUP/COOLDOWN LIMITATIONS



	Point	Temp. (^{o}F)	Press. (psig
1.	A	75	105
	B	125	410
	C	175	485
	D	275	485

Instrument Error: -25 psig - 12^{o}F
Consistent with T.S. Fig. 3.1-1

2. Allowable RC Pump Combination
   Above 195^{o}F All
   Below 195^{o}F 1-A, 1-B; 0-A, 1-B
   0-B, 1-A
   Tech Spec Fig 3.1-1 Instrume
   Error-12^{o}F

3. Minimum RC Pressure for operatin
   CRDM Instrument Error +10 PSIG
   -12^{o}F OP 1101-1 Fig. 1.6-10.1.

4a. Max. Press. for Operation of DH
   System while operating RCP "C" or
   "D" Instrument Error - 10 psig,
   -12^{o}F OP 1101-1 Fig. 1.0 - 22.3

4b. Maximum Press for Operation of DH
   System while operating RCP "A" or
   "B" Instrument Error - 10 psig,
   -12^{o}F OP 1101-1 fig. 1.0 - 22.2

5. Minimum RC Pump NPSH, Instrument
   Error +10 psig - 12^{o}F OP 1101-1
   fig. 1.0 - 22.2 & fig. 1.0 - 05.

FIGURE 2

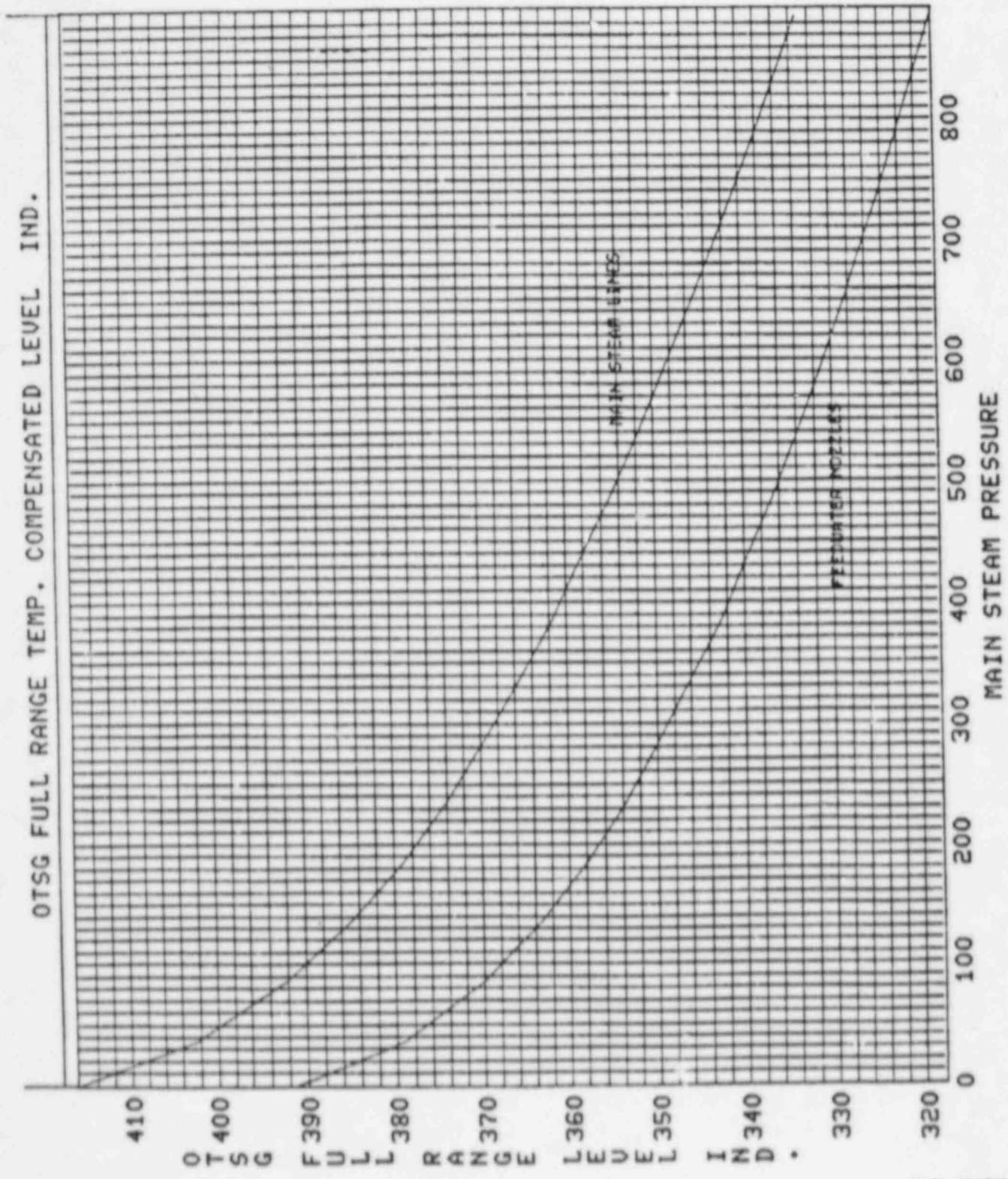
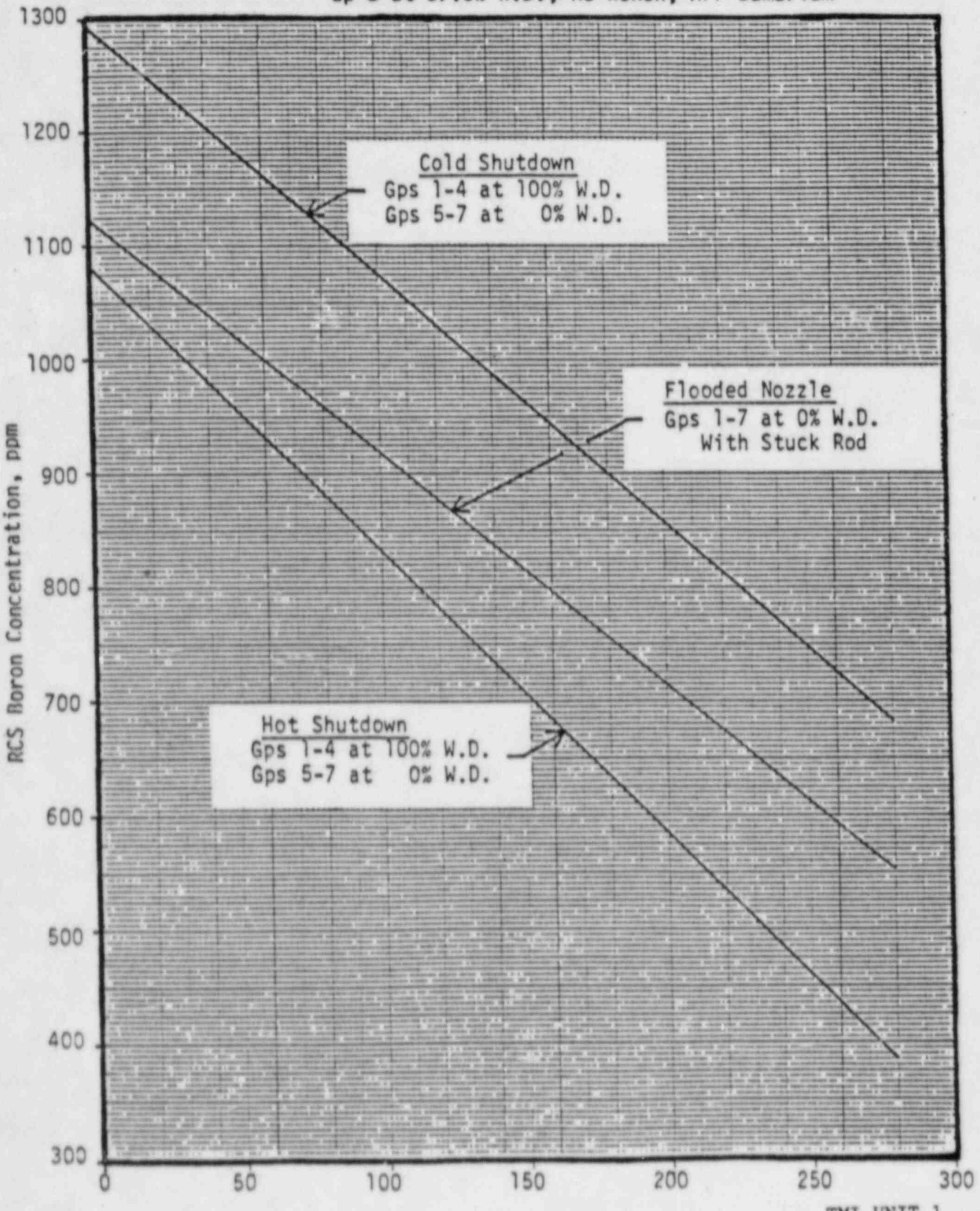

OTSG FULL RANGE TEMP. COMPENSATED LEVEL IND.
OTSG FULL RANGE LEVEL IND.
410
400
390
380
370
360
350
340
330
320
0
100
200
300
400
500
600
700
800
MAIN STEAM PRESSURE
MAIN STEAM LINES
FEEDWATER NOZZLES

Figure 3 1% Shutdown Boron Concentration for Cycle 5

Gp 8 at 37.5% W.D., No Xenon, HFP Samarium



IMPORTANT TO SAFETY
NON-ENVIRONMENTAL IMPACT RELATED

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 OPERATING PROCEDURE 1102-11
PLANT COOLDOWN

MODIFIED BY TP 600/2

TP 600/2

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21.0	35						
22.0	35						

M. A. Nelson — Signature/Title — 5/20/83 — Date

R. J. Toole — Signature/Title — 5-20-83 — Date

Document ID: 0025T

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 OPERATING PROCEDURE 1102-11
PLANT COOLDOWN

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1.0 REFERENCES

1.1 Drawings

1. Reactor Coolant System, GAI-C-302-650; B and W 27617F
2. Makeup and Purification System GAI-C-302-660/661; B and W 27551F
3. Decay Heat Removal System GAI-C-302-640; B and W 27554F
4. RCP Motor Process and Inst. B and W-20702F

1.2 Applicable Operating Procedures

1. Operating Procedure 1103-5 Pressurizer Operation
2. Operating Procedure 1103-6 Reactor Coolant Pump Operation
3. Operating Procedure 1104-4 Decay Heat Removal Operation
4. Operating Procedure 1202-16 R.C. Pump and Motor Emergencies
5. Operating Procedure 1104-2 Makeup and Purification Operation
6. Operating Procedure 1105-2 Reactor Protection System
7. Operating Procedure 1106-5 Turbine Bypass Operation
8. Operating Procedure 1102-13 Decay Heat Removal by OTSG
9. Operating Procedure 1106-16 OTSG Secondary Fill, Drain and Layup
10. Operating Procedure 1101-1 Plant Limits and Precautions

1.3 Curves

1. Figure 1 Heat-Up and Cooldown Limitations - Wide Range
2. Figure 1A Heat-Up and Cooldown Limitations - Narrow Range
3. Figure 2 OTSG Level Control
4. Figure 3 Boron Shutdown Curve

2.0 LIMITS AND PRECAUTIONS

CAUTION: ~~If plant cooldown is in preparation for the refueling outage, RCS boration should be in progress towards the refueling boron concentration.~~
~~DO NOT FLOOD THE FEEDWATER NOZZLES UNTIL the RCS boron concentration is greater than the flooded nozzle concentration on Figure 3. Regard all other sections of the following plant cooldown procedure.~~ TP 600/2

CAUTION: Voids may occur in the Reactor Vessel head while depressurizing the RCS due to head water temperature being higher than RCS temperature. This condition may be evidenced by a large rapid increase in pressurizer level while reducing RCS pressure even though an adequate saturation margin is indicated between TH and RCS Pressure. Should this condition occur RCS Pressure must be increased to collapse the bubble in the vessel head and return pressure control to the pressurizer. Reference IE Circular 80-15.

2.1 Equipment

1. Reactor Coolant Temperature, Pressure and Cooldown Rates shall be maintained within limits specified in Figure 1 and 1A.
2. Pressurizer Maximum Cooldown Rate is 100°F in any one hour.
3. The pressurizer to loop differential temperature shall be maintained less than 410°F.
4. Secondary side of the steam generator shall not be pressurized above 200 PSIG if the temperature of the steam generator shell is below 100°F.
5. Seal water injection flow is required to all reactor coolant pumps when reactor coolant temperature is above 190°F and pressure is above 100 PSIG.

6. During cooldown and depressurization, the number one seal bypass valve should remain closed unless RCP bearing temperature (seal inlet temp.) or No. 1 seal leak-off temperature approaches their alarm setpoints. It should only be used then if No. 1 seal leakoff is < 1 gpm and RCS pressure is < 1000 psig. Do not open No. 1 seal bypass unless No. 1 leak off valve is open.

7. Do not operate RCP with less than .2 GPM seal leak off.

8. Limit DHR cooler differential temperature $\overline{<}$ 200°F between inlet shell side TI252, 253 local and inlet tube side, DH6TI 1 and 2.

9. When cooling down the Reactor Coolant System ~~under other than normal conditions (normal - two operating OTSG's),~~ the maximum allowable temperature difference between the calculated average OTSG shell and its associated cold leg reactor coolant loop ~~average~~ temperature is 70°F. TP 600/2

10. If either RC-V-2 and/or RC-V-3 are closed, the valves should be cycled every 100°F during the cooldown until you have reached 140°F.

NOTE: Ensure compliance with Tech Spec 3.1.12.

CAUTION: If cycled by use of their handwheel do not over torque the valve.

CAUTION: Valve may have to be cycled more frequently to maintain proper pressure/temperature relationship.

2.2 Administrative

1. When the reactor coolant system has been shutdown and depressurized, isolate the borated water storage tank from decay heat removal system by checking closed or closing DH-V-5A and 5B. Also isolate the sodium hydroxide storage tank from the decay heat removal system by checking as closed or close BS-V-2A and B.

2. The active means of decay heat removal may be interrupted providing the following limits are not exceeded.

   A. Reactor coolant temp. and pressure are within limits of cooldown curve Figure 1 and 1A.

   B. Pressurizer level above 100".

3. Verify that MU-V-217 and MU-V-16 A, B, C, and D are closed and their respective breakers open prior to reducing RCS Temp to $\leq$ 320°F if RC-V-2 is closed. If RC-V-2 is and will remain open this step need not be completed until RCS is $\leq$ 275°F.

4. Ensure cooldown rates are limited to those specified in heatup and cooldown curve. In the temp. range of 260°F to 175°F as read by the wide range temp. indicator (RC 5ATI-1 and RC 5B-TI-1) on console center, a max., step temp. change of 75°F is allowable followed by a one hour minimum hold of temp. If the step change is taken below 250°F RC temp., the maximum allowable step change shall be that which yields a final temp. of 175°F. The step change should be controlled to prevent exceeding the 70°F shell-tube ΔT limit. | TP 600/2

5. When the Reactor is in the cooldown mode, both decay heat removal trains should be operable. Should it be required for one train to be removed from operable status, the Manager - Plant Operations must be notified, and the priority set to return both trains to operability as soon as possible (dependent on decay heat level).
6. When the DHR system is in operation without any RCP's operating indicated DHR return temp. (DH2-TI-1 and 2 on CC) will be used as the RCS temp.
7. Prior to plant cooldown verify that correct amount and concentration of boric acid is available for injection into the MU-RC system to provide required shutdown margin at cold conditions.
8. When adding makeup water to MU-RC system insure that the water quality is within limits set forth in plant chemical manual.
9. During boration verify boron concentration every 30 PPM.
10. When reactor power is less than 15 percent FP, do not request a printout of the following computer groups:

Gp. NO.	Description
20	Worst Case Thermal Condition
31	Fluid Condition
38	Core Average Thermal Condition
39	Core Map Thermal Condition
40	All Thermal Output
54	Selected Assembly Thermal Condition

11. If any Safety Limit (defined in Technical Specification 2.1 and 2.2) is exceeded, the shift supervisor shall notify the Ops. and Maint. Director. The reactor shall be shut down. The licensee shall notify the Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurrence. Operation shall not be resumed until authorized by the Commission.

12. If, during operation, the automatic safety system does not function as required, the Ops. and Maint. Director shall be notified. The shift supervisor shall take appropriate action as outlined in the Tech Specs. Note that this appropriate action may include shutting down the reactor:
Examples of "failure to function as required" are: (1) Setpoints exceeding limiting safety system settings (2) failure of protection system component in an untripped state.

13. When a Limiting Condition for Operation (defined in section 3 of the Technical Specifications) is not met, the shift supervisor shall notify the Ops. and Maint. Director. The reactor shall be shut down or remedial action taken as permitted by the Technical Specifications until the condition can be met. In the event an LCO is not met and the remedial action permitted by the Tech. Specs. does not correct the situation, the licensee shall notify the Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurrence.

14. Manning Requirements shall be in compliance with Administrative Procedure 1029.

15. The boron requirements necessary to maintain the required shutdown margin shall be considered to insure that an adequate boron concentration will be maintained prior to placing any Makeup and Purification demineralizer in service.

3.0 OPERATING PROCEDURE

3.1 Prerequisites for Cooldown

(Indicate satisfactory completion of steps below by initiating next to each step and sign name at end of applicable section).

_____1. Reactor coolant at 1 percent ΔK/K S/D boron concentration at 70°F and with one reactor coolant pump secured (three running) ~~per loop~~ and necessary safety rods withdrawn. TP 600/2

_____2. Degassing of reactor coolant system is complete in accordance with plant shutdown as per Operating Procedure 1102-10. If additional degas is needed during cooldown refer to degas Operating Procedure 1102-12.

_____3. Heat dissipation using steam generators is in progress using turbine bypass valves.

_____4. Sufficient boric acid solution and reactor grade water available to makeup for reactor coolant system during cooldown. Required final boron concentration determined

as per Operating Procedure 1103-4 and Figure 3. The combination of borated and demineralized water to effect makeup has been determined, also verify available boric acid solution is sufficient to maintain shutdown margin.

NOTE: ~~If the RCS is to be opened to R.B. atmosphere, i.e., safety valve removed, head off, etc., and containment integrity not maintained, it will be necessary to borate to refueling shutdown concentration.~~ TP 600/2

_____5. Pressurizer level indicator/controller is in auto, set to maintain pressurizer level at 220".

_____6. Let down flow from RCS is secured.

_____7. Verify or place all four emergency feedwater enable/defeat selector switches in defeat with the permission of the SS or SF.

_____8. OTSG level maintained ~~between 97 and 100 percent~~ Per Fig. 2 ~~and ____ Inches~~ on ~~operate~~ wide range level indication to keep main F.W. nozzles submerged. TP 600/

3.2 Cooldown

_____1. Lineup borated and demineralized water addition systems to make up to MU system during cooldown. Perform the following operations while cooling down.

_____A. Add borated water as required to maintain MU tank normal level.

____B. When required boron addition is completed, add demineralized or borated RC bleed in batches. If adding water of lesser boron concentration than that of reactor coolant system evaluate effects by monitoring source range instrumentation.

NOTE: Boration and concentration makeup should be complete prior to placing DHR in operation.

____2. Turn pressurizer heaters off except for Sections 9.3 and 9.5. | TP 600/2

____3. Place the steam line rupture detection enable/defeat switches (four) in defeat, with the permission of the SS and SF.

____4. Place the following on computer trend recorders until cooldown is complete. Mark the recorders with date, time, and scale, and every scale change and time. When cooldown is complete, remove chart paper, date, time and attach to signed off procedure. During cooldown plot temperature/pressure in Figure 1 or 1A every ~~30~~ 10 minutes. | TP 600/2

Mark time of point in curve every 2 hours.

Pt 512 Loop A Tcold

Pt 515 Loop B Tcold

Pt 505 RC pressure

NOTE: If either RC-V-2 and/or RC-V-3 are closed, the valves should be cycled every 100°F during the cooldown until you have reached 140°F. Ensure compliance with Tech Spec 3.1.12.

CAUTION: If cycled by use of their handwheel care shall be exercised such that you do not over torque the valve.

CAUTION: Valve may have to be cycled more frequently to maintain proper pressure/temperature relationship.

_____5. Place turbine bypass valves in manual and adjust bypass valves and pressurizer spray valve to maintain cooldown rate and observe temp. and pressure limits of Figure 1. Do not exceed a cooldown rate of 100°F/HR (1.6°F/min.)

NOTE: Maintain pressurizer level at 220" without exceeding the capacity of the makeup system.

CAUTION: Maintain feedwater nozzles submerged throughout this procedure except for 90°/HR cooldown per 600/2 Section 9.5.	TP 600/2

_____6. Start Aux. boilers in preparation for supplying gland sealing steam, if not already in operation.

_____7. At 1975 PSIG (RCS) stop cooldown and maintain steady RCS temp. and pressure. When steady conditions are met, insert safety rod groups that are still withdrawn and verify group 8 at ~ 27 percent. ~~If refueling of reactor is to follow, fully insert rod group 8.~~ TP 600/2

NOTE: Inserting rod group 8 may add reactivity and a small increase in countrate may be observed.

NOTE: Reactor trip isolation will occur during the next step.

____8. Trip control rod drive breakers and depressurize to less than 1720 PSIG using spray valve.

____9. At less than 1720 PSIG place all four reactor protective channels in shutdown bypass.

____~~10. Reset RPS high flux trip point to 4.25 per cent as per Operating Procedure 1105-2, Appendix I, and realign the valves as needed that were closed by Reactor Trip Isolation.~~

____11. ~~Withdraw the group 1 safety rods (or all 4 groups) to full out position. Verify subcritical multiplication and plot 1/M vs. Rod position during rod withdrawal to insure criticality is not attained on the safety group. Maintain cold shutdown boron concentration per figure 3.~~ TP 600/2

1725 TCN 1-83-123

____12. At < ~~1750~~ PSIG >1640 PSIG bypass high pressure injection, with the permission of the SS or SF.

____13. If RC-V-2 is closed and the RCS is at ~~325~~ 320°F, close MU-V-217, MU-V-16A, B, C, D and open and tag their respective breakers. TP 600/2

____14. Continue cooldown as defined in Fig. 1 and Reset Pressurizer Level control setpoint to 100" (25 per cent) prior to reducing RCS Temp. to 275°F.

____15. At 500 PSIG STM pressure open FW-V-6 to bypass running feed water pump and then secure feed water pump per Operating Procedure 1106-3.

875 TCN 1-83-123

____16. At <~~900~~ >540 PSIG (RCS) bypass low pressure injection, with the permission of the SS or SF. TP 600/2

_____17. a. At 700 PSIG (RCS) insure core flood valves CF-V-1A and 1B are shut, with the permission of the SS or SF.

_____b. Open and tag the power supplies to CF-V-1A and CF-V-1B.

_____18. Place gland sealing stm. on aux. steam as per 1106-10, if not already completed OPEN AS-V-17 to supply aux. stm. to aux. bldg.

_____19. At 150 PSIG steam pressure, open CO-V-1 and stop cond. booster pump per Operating Procedure 1106-2.

_____20. At less than 500 PSIG (RCS) rack out reactor building spray pumps A and B to prevent unnecessary actuation.

_____21. Close and tag the following valves:

_____ BS-V-49A _____ BS-V-49B

_____ BS-V-1A _____ BS-V-1B

_____22. SF/SS submit tagging application for BS-P-1A/B and the valves in step 21.

: NOTE: Switch to low range pressure indication at 450 psig to control pressure. :

_____23. At 380 PSIG (RCS) line up reactor coolant pump seal leak off to Aux. Building drains per Operating Procedure 1104-2, if required to maintain RC Pump seal operating limits.

_____24. At 380 PSIG (RCS) insert safety rod groups which are withdrawn. Insure a 1 per cent Δk/k shutdown margin by verifying RCS boron concentration is greater than the concentration required for cold shutdown from Figure 3.

____25. Deenergize the CRDM's by the following:

CAUTION: The below listed switches cannot be operated under load.

____a. Red tag off the DC disconnect switches for each main and secondary regulating and auxiliary power supply cabinet. (Total of 10 switches located in rear of respective cabinet).

____b. Red tag off the AC disconnect switches that feed the DC hold main and secondary cabinets. (Total of 6 switches located above cabinets).

____c. Put a caution note on tagging application that tags on AC and DC disconnect switches cannot be cleared without permission of operations and maintenance management until the system is ready to be returned to normal service.

____26. At 275°F verify RCS pressure is less than 425 psig and decreasing, then place the NDTT auto/off control switch for RC-RV-2 (PORV) in AUTO to actuate the 485 PSIG relief setpoint. Insure PRF-6-8 alarm is clear.

____27. At 275°F in the RCS, verify or close MU-V-217 and MU-V-16A/B/C/D and open and tag their respective breakers. Continue to maintain PZR level at 100".

NOTE: Auxiliary Transformer tap change may be omitted if the shutdown is of short duration and 4Kv bus voltage does not exceed 4400v.

____28. Contact the Middletown line department to have the auxiliary transformer taps changed to tap 3. The tap change should be accomplished per Operating Procedure 1107-2.

____29. Shift to 1 R.C. pump in operation if not already done. This is accomplished by using Operating Procedure 1103-6.

____30. When the RCS is less than 200°F the minimum shift operations manning requirements shall be:

a. 1 Shift Supervisor (SRO)

*1 Shift Foreman

2 Control Room Operators (at least 1 RO)

4 Auxiliary Operators

*May be waived by the Manager, Plant Operations TMI-1

b. A minimum of 1 SRO or 1 RO must be in the Control Room at all times when the RCS is less than 200°F.

____31. Insure that the BWST is not on recirc. using a Reactor Building Spray Pump, BS-P-1A or B. With pressure controlled at 300-325 PSIG, place decay heat system in operation per Operating Procedure 1104-4.

NOTE: Prior to starting Decay Heat Removal System, insure that Mechanical Draft Cooling Tower is in operation with stable efficient temperature. After starting Decay Heat, monitor effluent temperature and ΔT closely. Insure that tower operation and/or RCS cooldown rate will not change station ΔT at a rate greater than 5°F in any one hour. Observe other station ΔT limits as specified in OP 1104-37.

NOTE: Ensure a two hour hold period has been accomplished at RCS temperature conditions that permit initiation of the decay heat removal system.

____32. Maintain a ~~one~~ two hour hold per 1104-4 to compensate for step decrease experienced by the reactor vessel when DH system cooling is initiated. TP 600/2

: CAUTION: DH-V-64 should be closed and RC-V-4 should be opened first to insure DH-V-67 (relief valve) does not lift when RCS pressure is >275 psig. DH-V-64 should only be throttled open with RC-V-4 fully open. When RCS pressure is <275 psig, DH-V-64 can be fully opened and pressure control established by using RC-V-4. :

____33. During the ~~two~~ one hour hold per 1104-4 with both the decay heat system and RC pump running, align the DHRS valves to change the pressurizer spray control from RC-V-1 to the Quench spray valve RC-V-4. TP 600/2

____34. When satisfactory reactor coolant system pressure control can be maintained by RC-V-4 only insure pressurizer level is maintained at 100 inches and RCS temp. is < ~~200~~ 140°F, then shutdown the last RCP per Operating Procedure 1103-6 and line RCP seal leak off back to the make up tank (if it was directed to the Aux. Bldg Sump). TP 600/2

____35. Slowly open the auxiliary spray throttle valve DH-V-64 to the pressurizer until a temperature increase is detected in the pressurizer surge line. Adjust the auxiliary spray throttle valve (in the close direction) until the temperature returns to its previous value. While depressurizing the R.C. system to less than 125 PSIG as

read on 0-500 PSIG R.C. low range indicator, maintain a constant or slowly increasing pressurizer level.

NOTE:	Hot pressurizer water out surge into the hot leg during depressurization could induce voids in the RCS that will be noticed by a sudden increase of the pressurizer level.

NOTE:	Do not exceed a cooldown rate of 100°F in any one hour in the pressurizer.

NOTE:	This spray adjustment is to prevent pressurizer outsurge into the R.C. hot leg. The pressurizer surge temperature should be monitored closely throughout the continuation of cooldown. If the surge line temperature increases again, adjust the auxiliary spray throttle valve (in the close direction) until the temperature returns to its previous value.

_____36. Close the turbine bypass valves.

_____37. After Decay Heat Removal System is in service, steam generator wet or dry layup may be initiated per Operating Procedure 1106-16.

_____38. Continue cooldown using DHR not to exceed 50°F in any one hour.

_____39. When below 200 psig and before securing make-up system, perform MU-V-140 flushing per Operating Procedure 1104-2 Enclosure II and MU-V-109B flushing per Operating Procedure 1104-2 Enclosure III, if desired by the Manager, Plant Operations.

_____40. Secure RCP seal injection when below 190°F and 100 PSIG and secure make up system per Operating Procedure 1104-2

if plant shutdown is to be of a long duration or maintenance is to be performed.

____41. Rack out, blue tag and install locks on the breakers for the make up pumps (lock is to be placed into racking rod) to prevent inadvertent starts which could overpressurize the R.C.S.

____42. To prevent inadvertent flooding from the BWST to the Reactor Building sump, red tag closed DH-V-6 A and B and red tag open their respective breakers. These tags may temporarily be cleared and DH-V-6 A and B opened as required to perform maintenance or testing per approved procedures.

____43. Install fire service spool piece upstream of FS-V-367 if required by Manager of Plant Operation.

____44. At 140°F RC system temp., ~~and~~ 40 ± 5 psig steam bubble in the pressurizer, cooldown is considered complete. DHR system operation should be continued, however, to further reduce coolant temp. for personnel comfort and safety during refueling or maintenance, in accordance with Operating Procedure 1103-11. TP 600/2

the highest OTSG Shell Temp. < 190°F

NOTE: The RCS shall not be depressurized below 40 ± 5 psig unless all of the above are met.

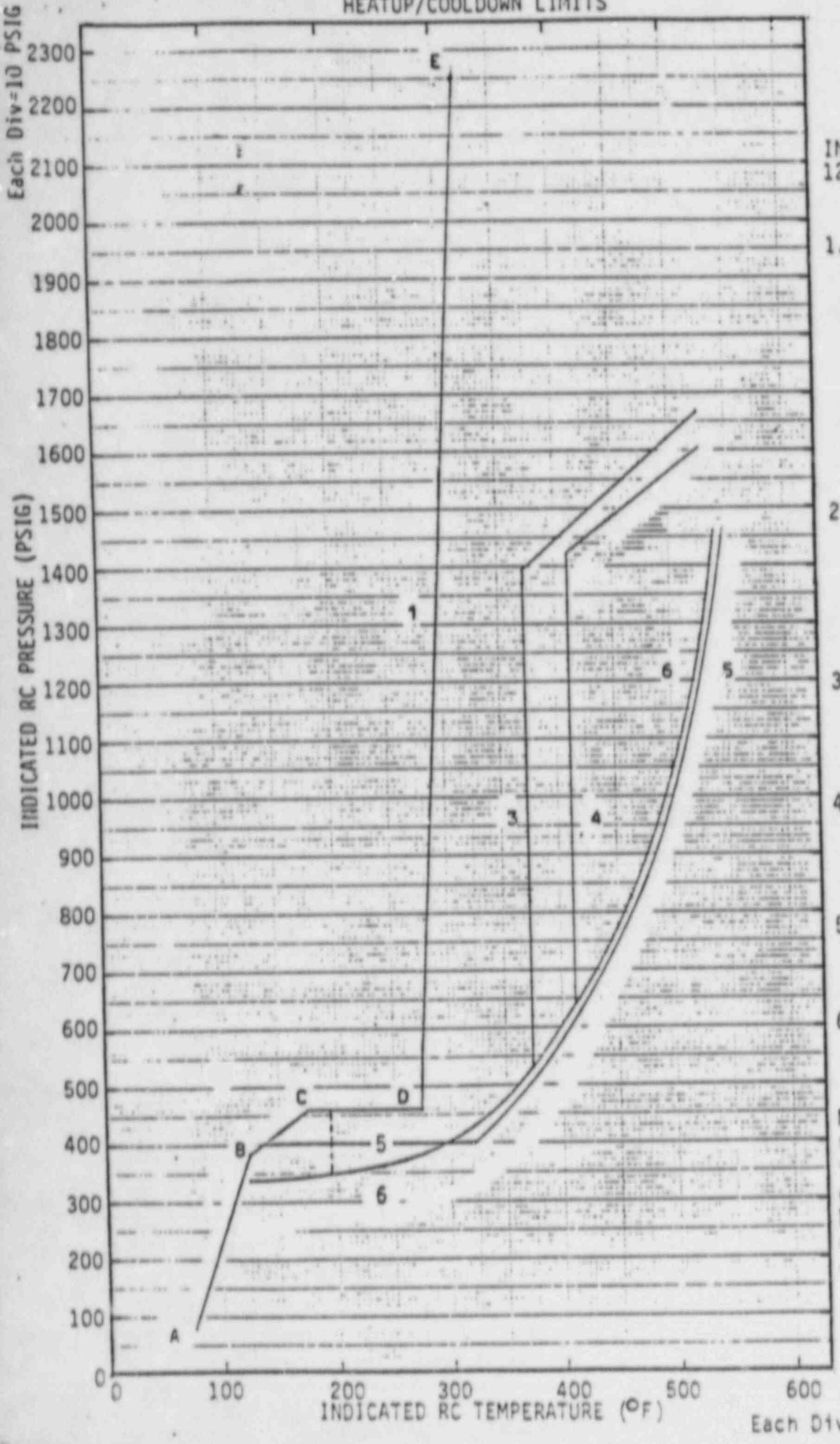
____45. Secure all support systems when no longer required.

NOTE: The reactor head ventilation fans should be turned off to avoid bearing wear for any extended outage.

Performed By _____ Date _____
Signature

Reviewed By SRO or RO License _____ Date _____
Signature

FIGURE 1
HEATUP/COOLDOWN LIMITS



INSTRUMENT ERROR OF 50 PSIG &
12°F IS INCLUDED FOR ALL CURV

1. Tech. Spec. 3.1.2 Heatup and cooldown limitations to 5 EFPY. (Plus additional 25 psig inst. error)

POINT	TEMP	PRESS
A	75	80
B	125	385
C	175	460
D	275	460
E	320	2250

2. Allowable RC Pump combinations.

Above 195 F	All
Below 195 F	1-A,1-B;
	0-A,1-B;
	1-A,0-B,

3. Minimum RC pressure to maintain compression forc on fuel clad,(Natural Ci OP 1101-1 Fig. 1.0-5.11

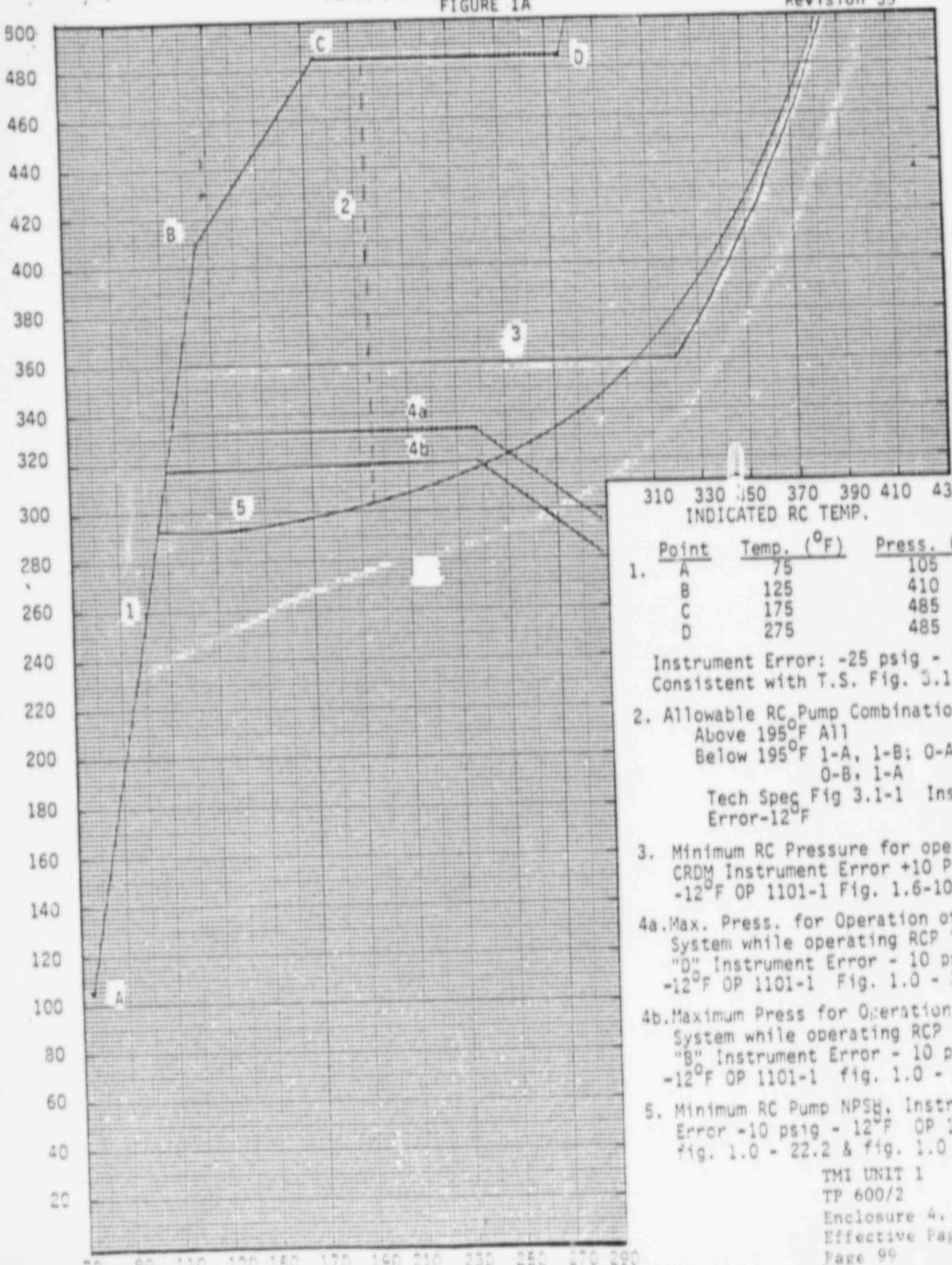
4. Minimum RC pressure to maintain compression forc on fuel clad,(Forced Flo OP 1101-1 Fig. 1.0-5.10

5. Minimum pressure for control rod drive operation OP 1101-1 Fig. 1.0-23.1A

6. Minimum RC Pump NPSH. OP 1101-1 Fig. 1.0-5.6

Note: Heat up and Cooldown rates shall not exceed 100° in any one hour, except that during RCS Inservice Leak and Hydrostatic Test, maximum heat up and cooldown rate shall not exceed 50° F in any one hour

HEATUP/COOLDOWN LIMITATIONS
FIGURE 1A



Point	Temp. (°F)	Press. (psi
A	75	105
B	125	410
C	175	485
D	275	485

1. Instrument Error: -25 psig - 12°
   Consistent with T.S. Fig. 3.1-1

2. Allowable RC Pump Combination
   Above 195°F All
   Below 195°F 1-A, 1-B; 0-A, 1
   0-B, 1-A
   Tech Spec Fig 3.1-1 Instru
   Error-12°F

3. Minimum RC Pressure for operat
   CRDM Instrument Error +10 PSIG
   -12°F OP 1101-1 Fig. 1.6-10.1.

4a. Max. Press. for Operation of DH
   System while operating RCP "C"
   "D" Instrument Error - 10 psig,
   -12°F OP 1101-1 Fig. 1.0 - 22.

4b. Maximum Press for Operation of
   System while operating RCP "A"
   "B" Instrument Error - 10 psig
   -12°F OP 1101-1 fig. 1.0 - 22.

5. Minimum RC Pump NPSH, Instrume
   Error -10 psig - 12°F OP 1101
   fig. 1.0 - 22.2 & fig. 1.0 - 3

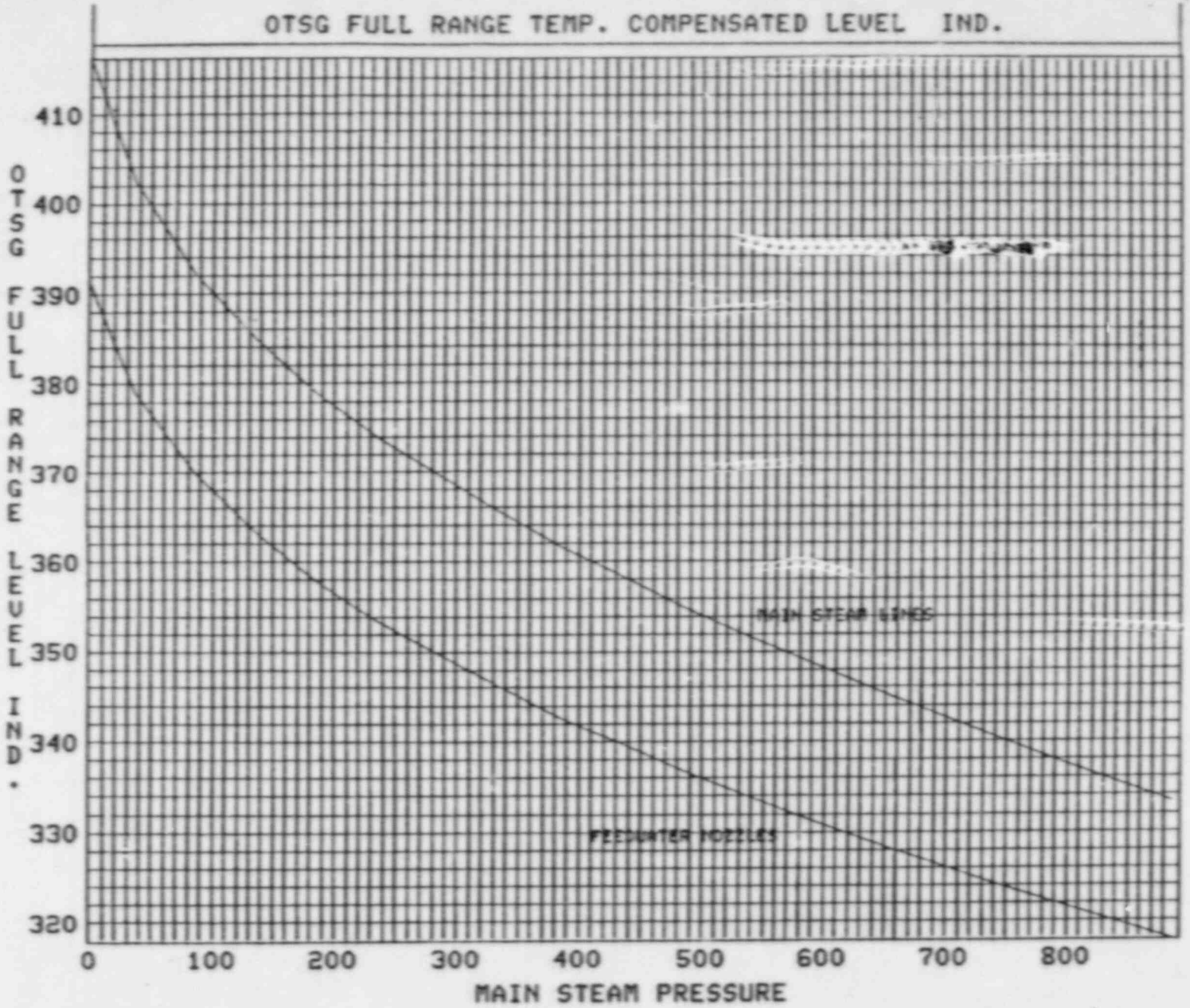
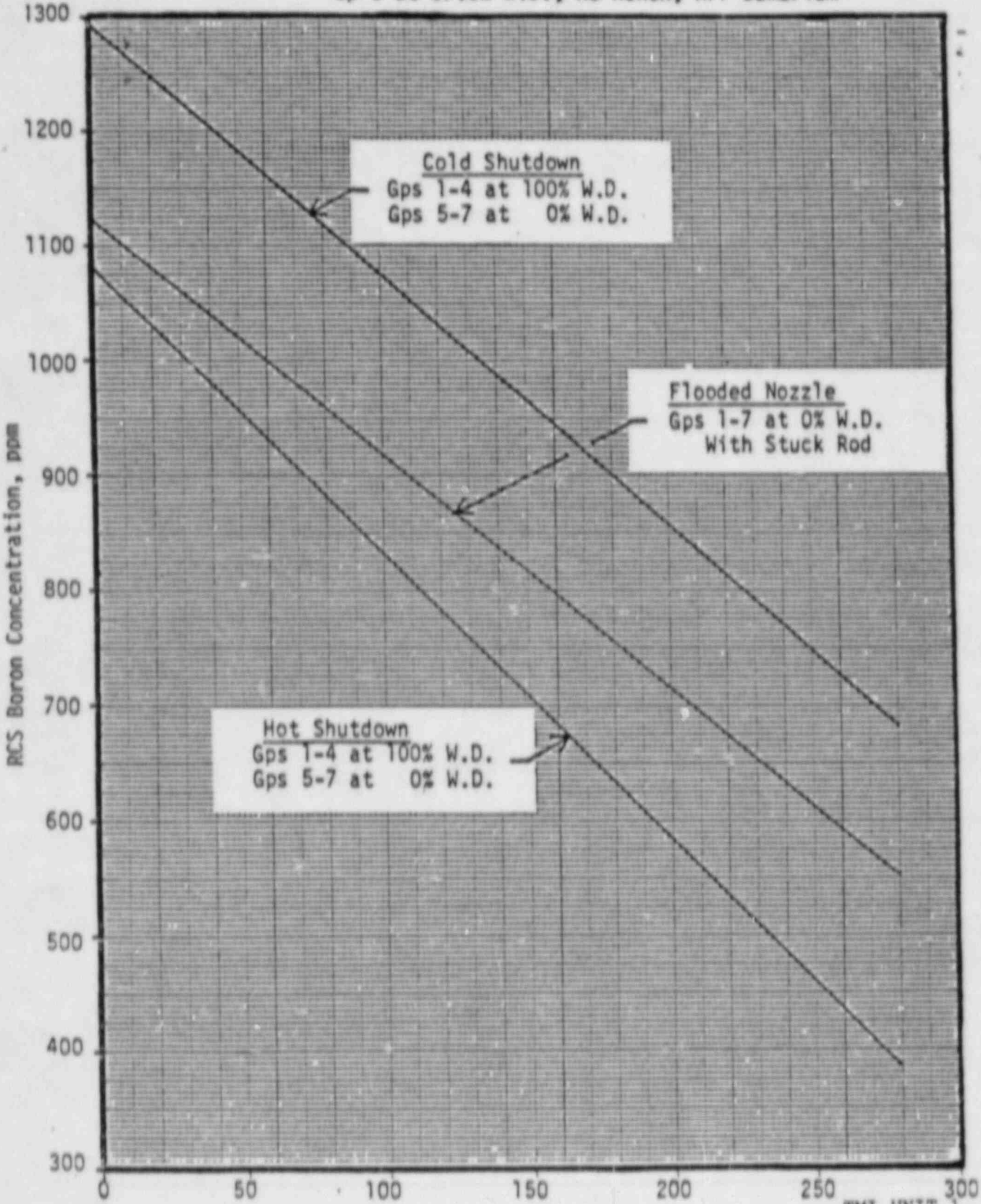

OTSG FULL RANGE TEMP. COMPENSATED LEVEL IND.
OTSG FULL RANGE LEVEL IND.
410
400
390
380
370
360
350
340
330
320
0
100
200
300
400
500
600
700
800
MAIN STEAM PRESSURE
MAIN STEAM LINES
FEEDWATER NOZZLES

FIGURE 2

Figure 3 1% Shutdown Boron Concentration for Cycle 5

Cp 8 at 37.5% W.D., No Xenon, HFP Samarium



IMPORTANT TO SAFETY
ENVIRONMENTAL IMPACT RELATED

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-5
OTSG TUBE LEAK/RUPTURE
MODIFIED FOR TP 600/2
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7.0	20						
8.0	19						
~~9.0~~	~~19~~						
~~10.0~~	~~19~~						
~~11.0~~	~~19~~						
~~12.0~~	~~20~~						
~~13.0~~	~~21~~						
~~14.0~~	~~21~~						
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19.0	19						

PAGES REMOVED PER TP 600/2

M. A. Nelson — 7/29/83
Signature — Date

R. J. Toole — 7-29-83
Signature — Date

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

NOTE: For guidance within this Emergency procedure an OTSG tube leak is defined as a > 1 and < 50 gpm failure, while a rupture is ≥ 50 gpm failure.

Section I: Subcooling Margin is ≥ 25°F

1.0 SYMPTOMS

PLANT INITIAL CONDITIONS | TP 600/2

~~*A. RM-A5 off-gas monitor alarm/alert/increased count rate, indicating an OTSG tube leak > 1 gpm.~~

~~*B. Secondary sample analysis indicates activity in the secondary side.~~

~~*C. Increase count rate on Steam Line Radiation Monitors.~~

~~D. Possible increase of water level in damaged OTSG.~~

~~E. Decreasing reactor coolant pressure.~~

~~F. Decrease in pressurizer level.~~

~~G. Make-up tank level decreasing.~~

~~H. Make-up flow increasing.~~

I. Possible Reactor/~~Turbine~~ Trip Isolation | TP 600/2

*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.

3. ~~Possible Reactor trip Isolation~~ | TP 600/2

B. Manual Action

(An asterisk indicates a key parameter which requires reverification as a follow-up action.)

1. If subcooling margin decreases to < 25°F, immediately verify or trip the Reactor and the Reactor Coolant Pumps; initiated full HPI and proceed to Section II.

~~2. If a reactor trip occurs without loss of subcooling margin, verify Reactor and Turbine Trip and proceed to step 6 of Section I Follow-Up Action.~~

~~*3. If any one of the below conditions exist, immediately begin reducing load at the indicated rate of change.~~

TP 600/2

~~a. Make-up tank level is decreasing at greater than 10 gpm (1 inch/3 minutes) - reduce load at 10 percent per minute.~~

~~b. RH-A-5 grab sample indicates ≥ 1 gpm OTSG tube leak - reduce load at the rate specified by the Shift Supervisor.~~

~~*4. Close MU-V-3 and start an additional make-up pump and open MU-V-217 as necessary to maintain pressurizer level greater than 200 inches.~~

~~5. If 200" in the pressurizer cannot be maintained with MU-V-217 open, trip the reactor and initiate HPI.~~

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: 1) expeditiously cool down and depressurize the unit to atmospheric pressure, 2) minimize possibility of lifting steam relief valves, 3) limit radioactive releases outside containment, and 4) limits OTSG tube tensile stresses. This is accomplished by steaming both OTSG's to conduct a rapid cooldown within the limits specified in the procedure.

_____1. Re-verify those immediate manual actions marked by an asterisk using alternative instruments if available.

NOTE: Refer to Table 1 for Emergency Action level Declaration guidance.

_____2. Continue to reduce power to less than 20 percent at the selected load reduction rate. Consult OP 1102-10, Plant shutdown for guidance.

NOTE: When removing the first main feed pump (40 percent pwr), 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-133 and CS-137 sample results.

_____4. At < 15 percent PWR take the turbine to manual and unload to "0" MWE. Verify that the turbine bypass valves automatically control header pressure below safety valve setpoints. At "0" MWE trip to turbine closely monitoring HDR pressure. Observe Turbine stop valves closed.

CAUTION: When the turbine is tripped it may be necessary to take manual control of turbine bypass valves to maintain secondary pressure below the main steam safety valve setpoints.

TP 600/2

CAUTION: ~~The following power reduction and Rx Trip will cause a significant RCS shrinkage, insure sufficient make-up to maintain pressurizer level > 200"~~

5. ~~Continue reducing Rx Pwr to < 5 percent by sequentially driving all regulating groups into the core by manual control of the diamond. When < 5 percent reactor power, take manual control of the turbine bypass valves and then trip the Reactor. Immediately adjust TBV closed to control the initial cool down following Reactor trip and control OTSG pressure to prevent safety valve operation.~~

TP 600/2

6. With manual control of turbine bypass valves commence plant cooldown at < 100°F/HR (1.6°F/min-Refer to OP 1102-11 for additional guidance).

NOTE: Refer to OP 1102-16 for additional guidance if RCP's are not available. Pressurizer vents may be used for RCS pressure control.

TP 600/2

7. After RCS < 350°F, minimize subcooling margin above 25°F by ~~Turn off PZR Heaters and manually start pressurizer spray~~ turbing off PZR Heaters and manually starting pressurizer spray to depressurize RCS and reduce the subcooled margin to ≥ 25°F as soon as possible. Minimize subcooling margin > 25°F to reduce leak rate into a ruptured OTSG. The Pressurizer Vent may be used as necessary to reduce

TP 600/2

monitor
subcooling margin; ~~as long as~~ RC Drain Tank pressure ~~is controlled~~ to ensure the rupture disk does not fail.

TP 600/2 NOTE: Assume Tube Leak < 50 gpm until below fuel pin compression limit.

NOTE: Minimizing subcooling margins above 25°F will cause RCS temp/press to viclate the fuel pin compression curve (OP 1102-11). This is acceptable during rupture emergencies, but requires Engineering Evaluation prior to next heat up. For other than tube rupture, fuel pin compression curves should not be violated.

TP 600/2

____8. When the RCS has been cooled to <540°F and the subcooled margin is ≤50F reduce RCP's to one per loop. RCP's must be reduced to <4 RCP's before RCS temp is decreased below 500°F.

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

____9. Monitor tube to shell ΔT and maintain it less than 70°F. If this limit is approached while steaming, reduce or secure the cooldown rate as necessary.

____10. Steam both OTSG's to reduce RCS to less than 540° F.

____11. ~~Confirm affected OTSG by sampling (refer to attachment 1 to override containment isolation).~~ TP 600/2

____12. With RCS hotleg and incore thermocouples temperatures less than 540°F, only isolate the affected OTSG if BWST level is < 21 ft. or off-site dose projections approach 50 mr/hr whole body or 250 mr/hr thyroid.

____13. If required to isolate the affected OTSG, close the following:

NOTE: Assure MFP is being fed from unaffected OTSG or Auxiliary Steam. Assure gland steam is from the Aux. Boiler.

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

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-92

MS-V-89 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: Assure MFP is being fed from unaffected OTSG or Aux. Steam as necessary. Assure gland steam is from Aux. Boiler.

TP 600/2

_____14. If both OTSG's are required to be isolated and can no longer be used as a heat sink proceed to EP 1202-39.

NOTE:	If OTSG pressure cannot be maintained <1000 psig, protect against any challenge to the MS Code safety valves by opening the Turbine Bypass and/or Atmospheric Dump Valves.

_____15. Affected OTSG must be steamed without exceeding the ~~To Inches~~ OTSG level per cooldown rate limits to maintain ~~less than 95 percent on~~ Fig. 2 wide Levels ~~operate~~ range and less than 70°F tube to shell ΔT, unless either the BWST < 21 Ft or off-site dose projections either approach 50 mr/hr whole body or 250 mr/hr thyroid.

TP 600/2

TP 600/2

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/pinning of the MS hangers, an engineering evaluation of the structural integrity of the MS lines must be performed prior to resuming normal operations.

____16. Maintain $\leq$ 100° F/hr. (1.6°F/min) cooldown rate by steaming both OTSG's. If the cooldown rate is >100°F/hr (1.6°F/min) ~~due to three pump HPI cooling~~, secure the non-ES selected MU pump and observe HPI throttling criteria below for the two ES selected MU pumps.

TP 600/2

____17. If RCS pressure is being controlled and an adequate subcooling margin exists, bypass ESAS at normal bypass pressure setpoints.

____18. If ESAS Actuates, verify ES component actuation and follow the below HPI throttling criteria:

Bypass the ESAS signal and throttle HPI only if one or more of the following criteria are met:

A. HPI must be throttled to prevent pump runout (550 gpm/pump).

NOTE:	Do not throttle to less than 500 gpm/pump unless one of the below criteria (B, C or D) is met.

B. HPI must be throttled to prevent violation of the applicable brittle fracture/thermal shock curve limitations.

C. HPI may be throttled if LPI flow is greater than 1000 gpm in each line and stable for 20 minutes.

D. HPI may be throttled if the required subcooling margin of $\geq$ 25°F exists and pressurizer level is established > 0".

NOTE:	The margin to saturation is determined by the saturation margin meter and/or the average of the 5 highest operable incore thermocouples.

_____19. Notify Radiological Controls of the shutdown due to OTSG tube leak and to continue to survey the Intermediate and Turbine Buildings to determine the need for controlled areas. Initiate Emergency Plan if required, as a result of the surveys.

_____20. Notify Unit II Control Room to isolate auxiliary steam cross connect by closing AS-V-23 and its bypass AS-V-209.

_____21. For other than tube rupture, refer to NPSH curve in Figure 1 and 1A of 1102-11. Refer to Figure 1 and 1A attached for rupture emergency NPSH limits for RCP operation.

_____22. When on DH Removal, depressurize RCS to vent header pressure per OP 1104-4.

_____23. When time permits, initiate performance of condenser partition factor Surveillance Test No. 1301-9.6.

_____24. 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.

TABLE 1

EMERGENCY ACTION LEVEL DECLARATION CRITERIA

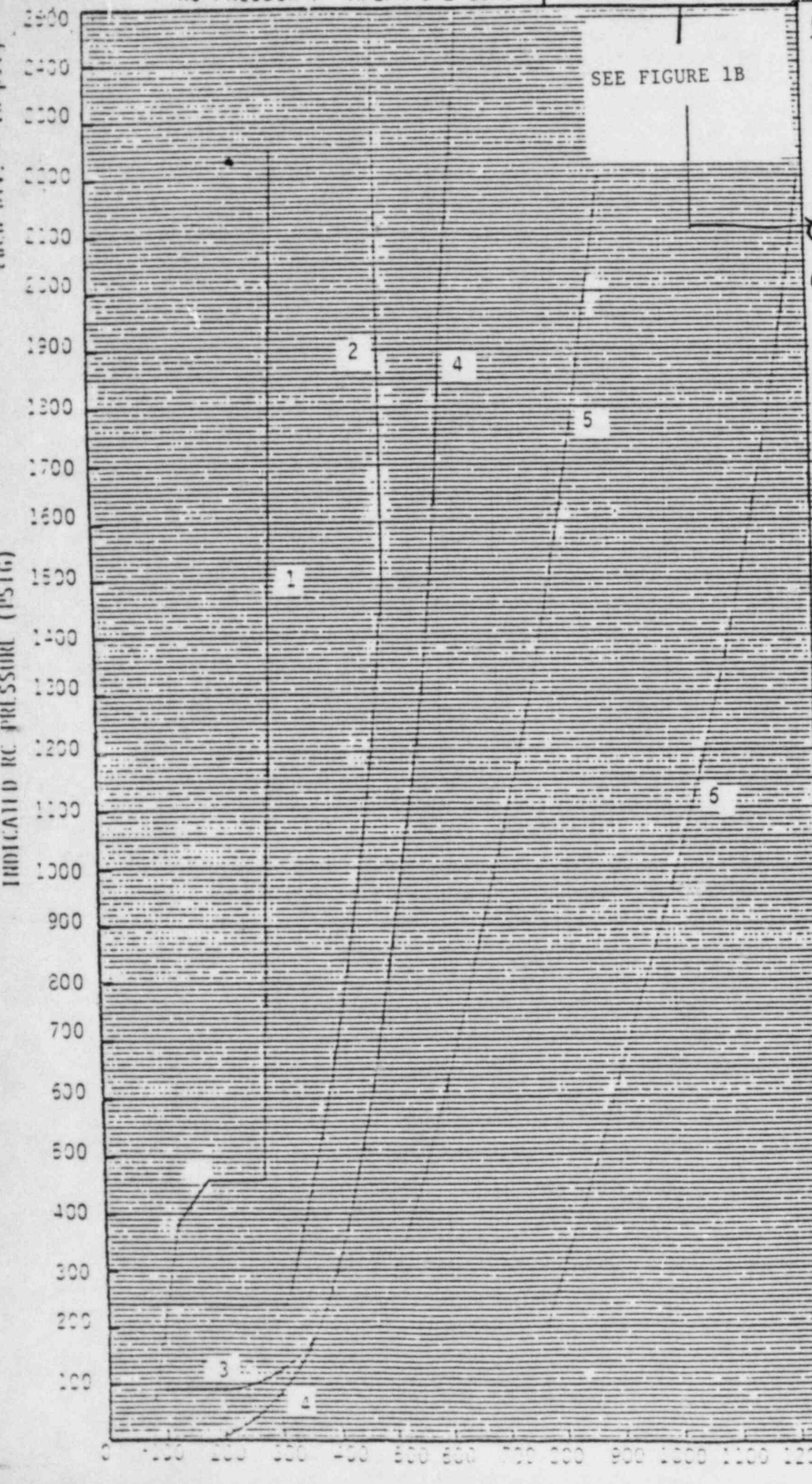
Condition	Unusual Event	Alert	Site	General
Tube Leak Alone	1 gpm - 50 gpm	≥ 50 gpm	Any Tube Leak and Saturation < 25° Subcooled	N/A
Steam Generator Tube Leak Plus - Loss of Off-site Power	N/A	1 gpm - 50 gpm	≥ 50 gpm	N/A
Steam Generator Tube Leak Plus - Steam Line Break	N/A	1 gpm - 50 gpm	≥ 50 gpm	N/A
Steam Generator Tube Leak Plus - Loss of Condenser	N/A	1 gpm - 50 gpm	≥ 50 gpm	N/A
Steam Generator Tube Leak With 1 percent Failed Fuel	N/A	N/A	≥ 50 gpm	N/A
RMA-5 Low Range	High Alarm	N/A	N/A	N/A
RMA-5 High Range	N/A	Alert Alarm*	High Alarm**	

* Based on 10mR/hr at site boundary.

**Based on 50mR/hr whole body or 250 mr/hr thyroid at site boundary.

FIGURE 1

RC PRESSURE/TEMPERATURE LIMITS



CURVE DESCRIPTIONS

Instrument error of 50 psi & 12°F is included for all curves except RCP NPSH.

1. Tech. Spec. 3.1.2 Heatup & Cooldown limitations ± 5 EFPY.
2. Thermal Shock Curve.
3. Emergency NPSH Curve for 2 RCP Operation.
4. 25°F Subcooling Margin
5. T Clad less than 1400°F.
6. T Clad less than 1300°F.

REQUIREMENTS

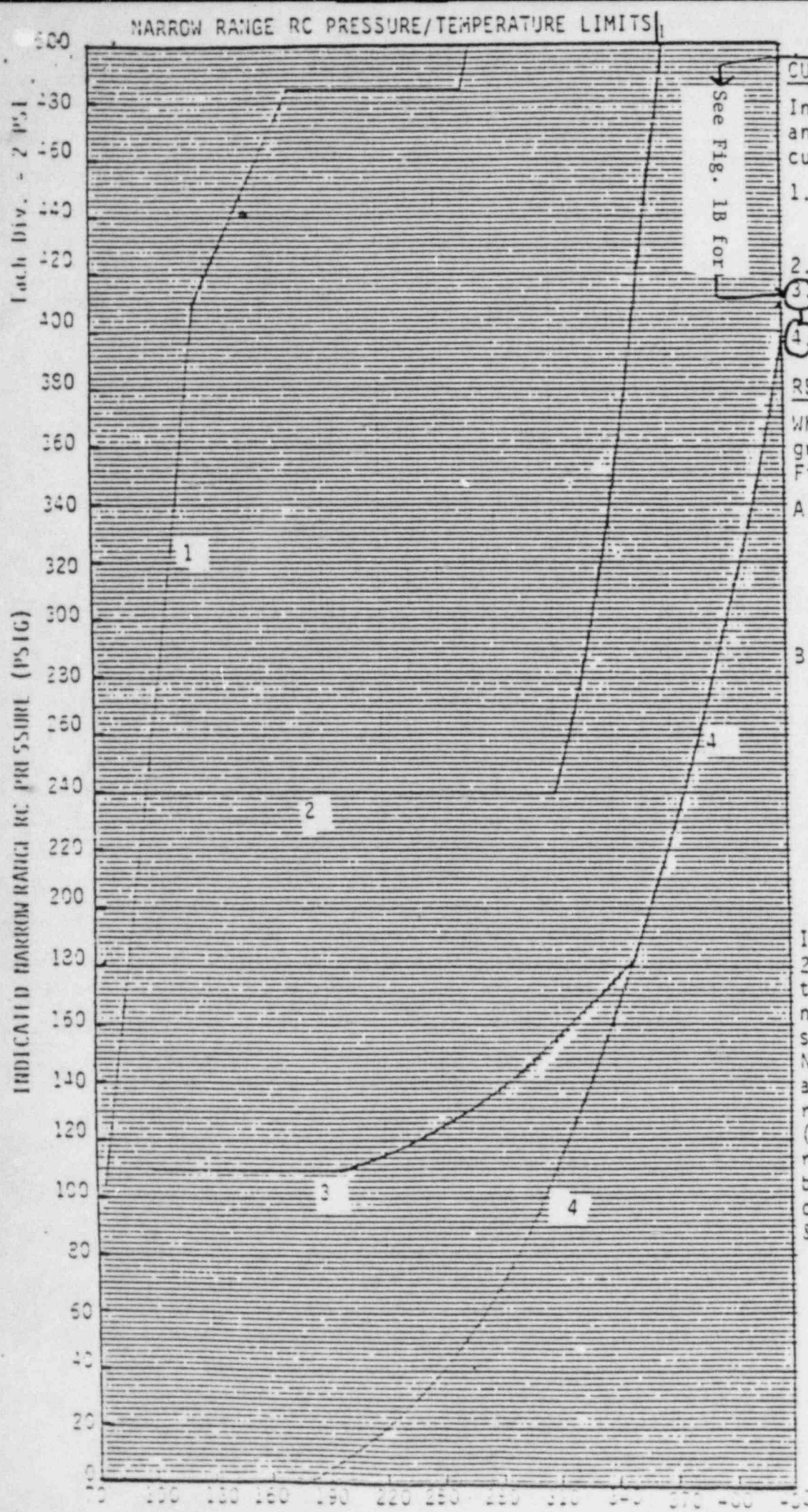
When indicated RCS pressure is less than 500 psig refer to Fig. 1A.

A. During Emergency Conditions maintain RCS pressure/temperature between curves No. 2 & No. 1 (Acceptable operating region for preventing thermal shock).

B. Thermal Shock Preventic Guidance.

1. With RCP's off & HPI on maintain RCS pressure/temperature between curves No. 2 & No. 1.
2. During any cooldown maintain less than 100°F/hr. (1.6°F/min

If either statement No. 1 or No. 2 above is violated stabilize the plant and depressurize as necessary to maintain RCS pressure/temperature between curve No. 2 and No. 1. Do not cause any significant heat or repressurization. If possible (i.e. non loca non OTSG tube rupture), a 3 hr. hold should be maintained at the stabilized condition between curves 2 and No. 1 of Fig. 1 and 1A.



CURVE DESCRIPTIONS

Instrument error of 10 psig and 10°F is included for all curves.

1. Tech. Spec. 3.1.2 Heatup & Cooldown limitations to 5 EFPY.
2. Thermal Shock Curve.
3. Emergency NPSH Curve for 2 RCP Operation.
4. 25°F Subcooling Margin.

REQUIREMENTS

When indicated RCS pressure is greater than 500 psig refer to Fig. 1.

A. During Emergency Conditions maintain RCS pressure/temperature between curves No. 2 & No. 4 (acceptable operating region for preventing thermal shock).

B. Thermal Shock Prevention Guidance.

1. With RCP's off & HPI on maintain RCS pressure temperature between curves No. 2 & No. 4.
2. During any cooldown maintain less than 100°F/hr. (1.6°F/min) cooldown rate.

If either statement No. 1 or 2 above is violated, stabilize the plant and depressurize as necessary to maintain RCS pressure/temperature between curve No. 2 and No. 4. Do not cause any significant heatup or repressurization. If possible (i.e. non loca, non OTSG tube rupture), a 3 hr. hold should be maintained at the stabilized condition between curves No. 2 & No. 4 of Fig. 1 and 1A.

FIGURE 1B | TP 600/2

RCP NPSH Curves

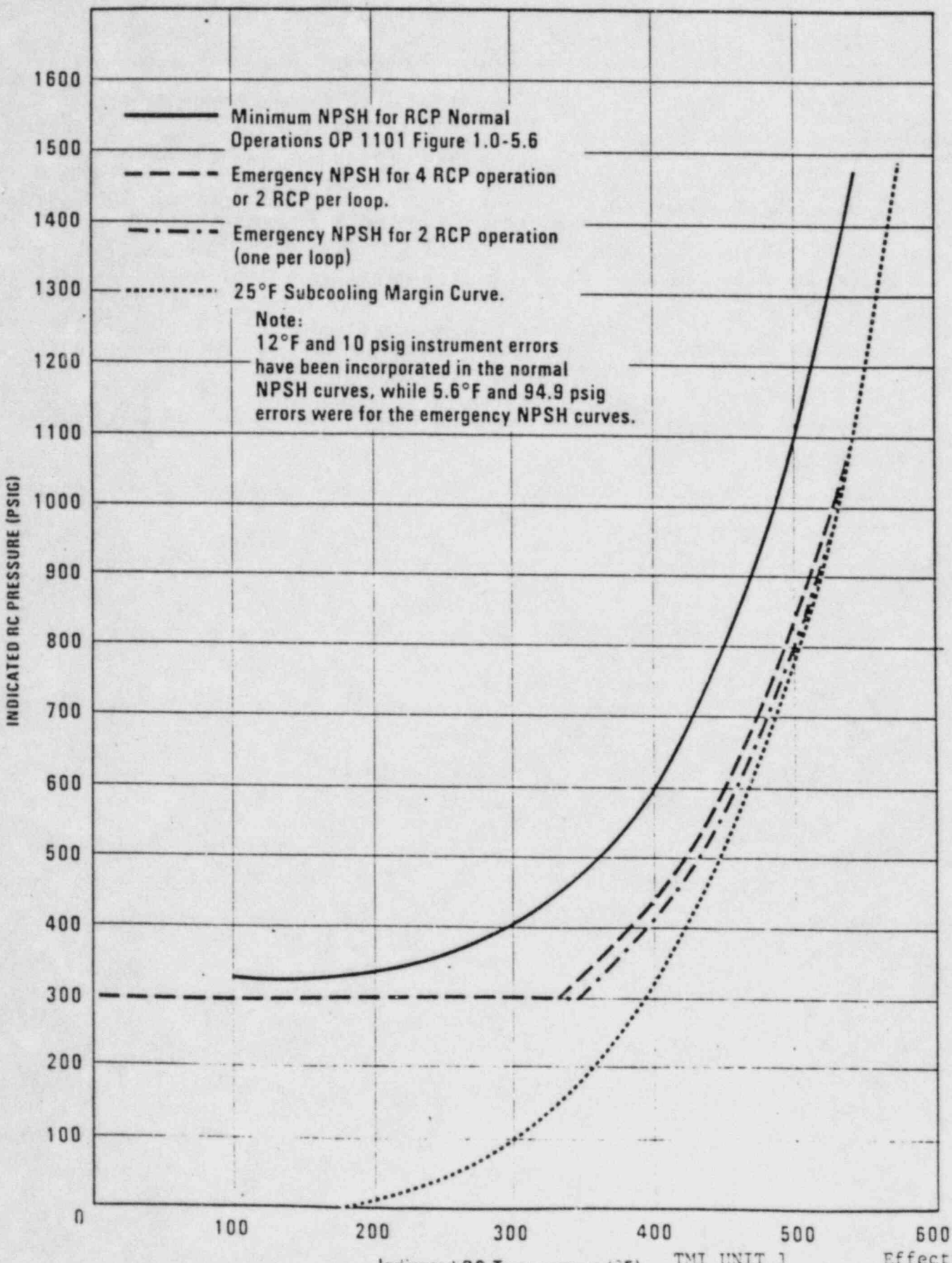
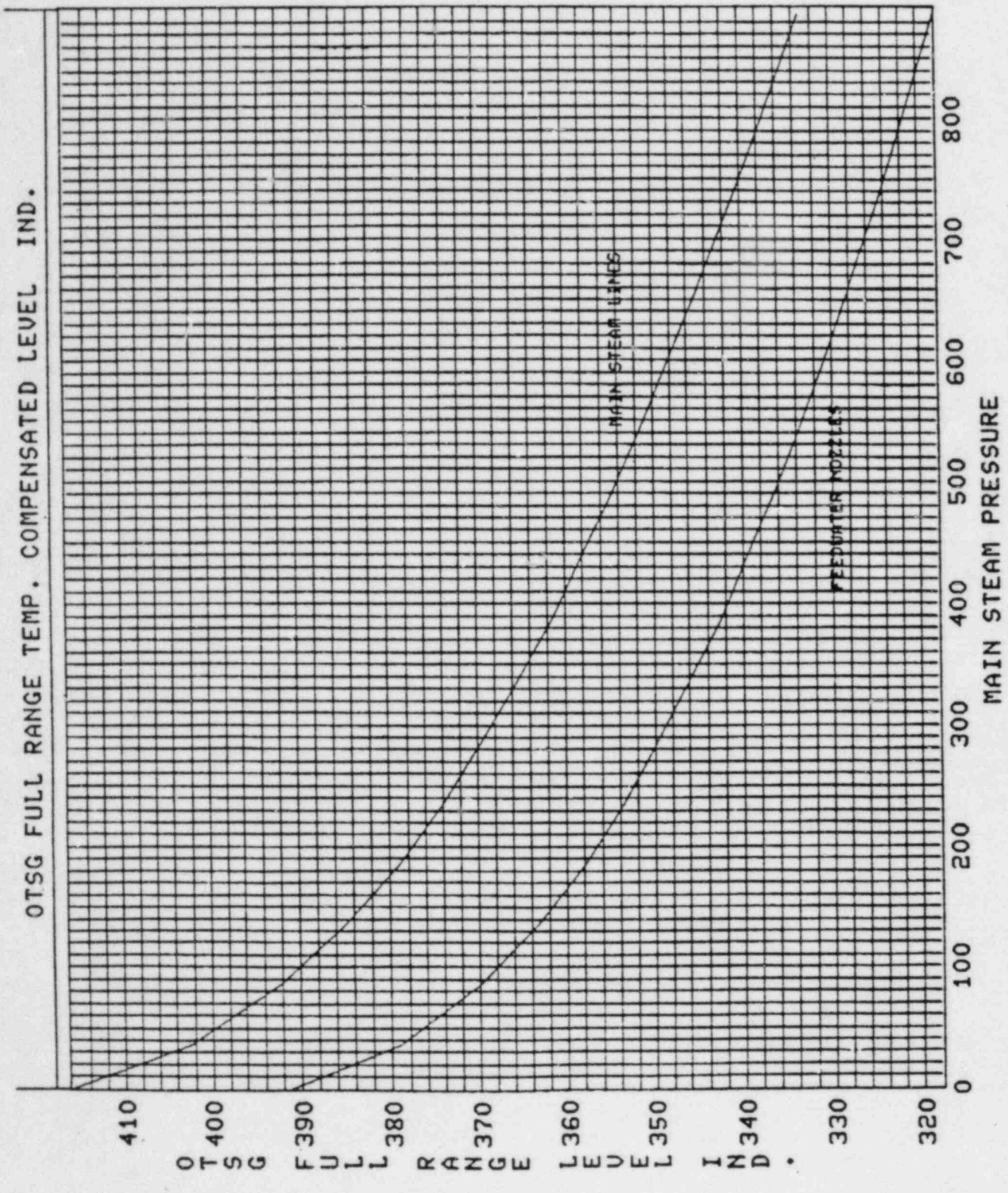


FIGURE 2


OTSG FULL RANGE TEMP. COMPENSATED LEVEL IND.
OTSG FULL RANGE LEVEL IND.
410
400
390
380
370
360
350
340
330
320
0
100
200
300
400
500
600
700
800
MAIN STEAM PRESSURE
MAIN STEAM LINES
FEEDWATER NOZZLES

ENCLOSURE 7

HEATUP AND COOLDOWN COMPUTER POINTS

Computer Point	Description
401	RCS Tcold Loop A
405	RCS Thot Loop A
403	RCS Tcold Loop B
407	RCS Thot Loop B
505	RCS Pressure
556	OTSG A Pressure
557	OTSG B Pressure
0001	OTSG A Wide Range Level
0004	OTSG B Wide Range Level
570	OTSG A Downcomer Temp. (Upper)
551	OTSG A Downcomer Temp. (Lower)
572	OTSG B Downcomer Temp. (Upper)
552	OTSG B Downcomer Temp. (Lower)
541	OTSG A Shell Temp. EL 300
542	OTSG A Shell Temp. EL 310
543	OTSG A Shell Temp. EL 320
544	OTSG A Shell Temp. EL 330
545	OTSG A Shell Temp. EL 340
546	OTSG B Shell Temp. EL 300

HEATUP AND COOLDOWN COMPUTER POINTS

Computer Point	Description
547	OTSG B Shell Temp. EL 310
548	OTSG B Shell Temp. EL 320
549	OTSG B Shell Temp. EL 330
550	OTSG B Shell Temp. EL 340
C4015	OTSG A Tube-Shell ΔT (Avg.)
C4016	OTSG B Tube-Shell ΔT (Avg.)
C4000	Heatup/Cooldown Rate (5 Min. Avg.)
C4002	Heatup/Cooldown Rate (1 Min. Avg.)

Computer Printout Sheets To Be Attached

ENCLOSURE 8

GPUNC Specification 1101-28-008, Rev. 0, is being issued to define the OTSG Leakrate Monitoring Program during hot testing. The parameters being measured and the sampling frequencies are as follows:[2]

Parameter	Sample Location	Frequency	Data Sheet #
Krypton-85	RMA-5L (offgas monitor)	Continuous[1] - Counts/minute to be logged every 15 minutes during cooldown and every 30 minutes during steady state. Leakrate calculations must be performed at these times.	1
	RCS	Daily	2
		One hour ± 30 minutes after each addition of the radioactive tracer (Krypton-85)	2
		One hour ± 30 minutes after each large addition of water (2000 gallons or more) to the RCS during the OTSG hot testing	2
	MU Tank (Gas space)	Following each RCS sampling after a Kr-85 injection	2
Boron	OTSG	Daily	3A/3B
Tritium	OTSG	Daily	3A/3B
	Hotwell	Daily	2
Gamma	OTSG and Hotwell	Daily	2
Isotopic	RMA-5L (Grab sample)	1 Hour (Cooldowns)	2
Analysis	RMA-5L (Grab sample)	4 Hours (Steady State)	2
	RMA-5L (Grab sample)	Every 2 gph or more increase over a period of 4 hours or less as calculated from the RMA-5L (offgas monitor) count rate.	2

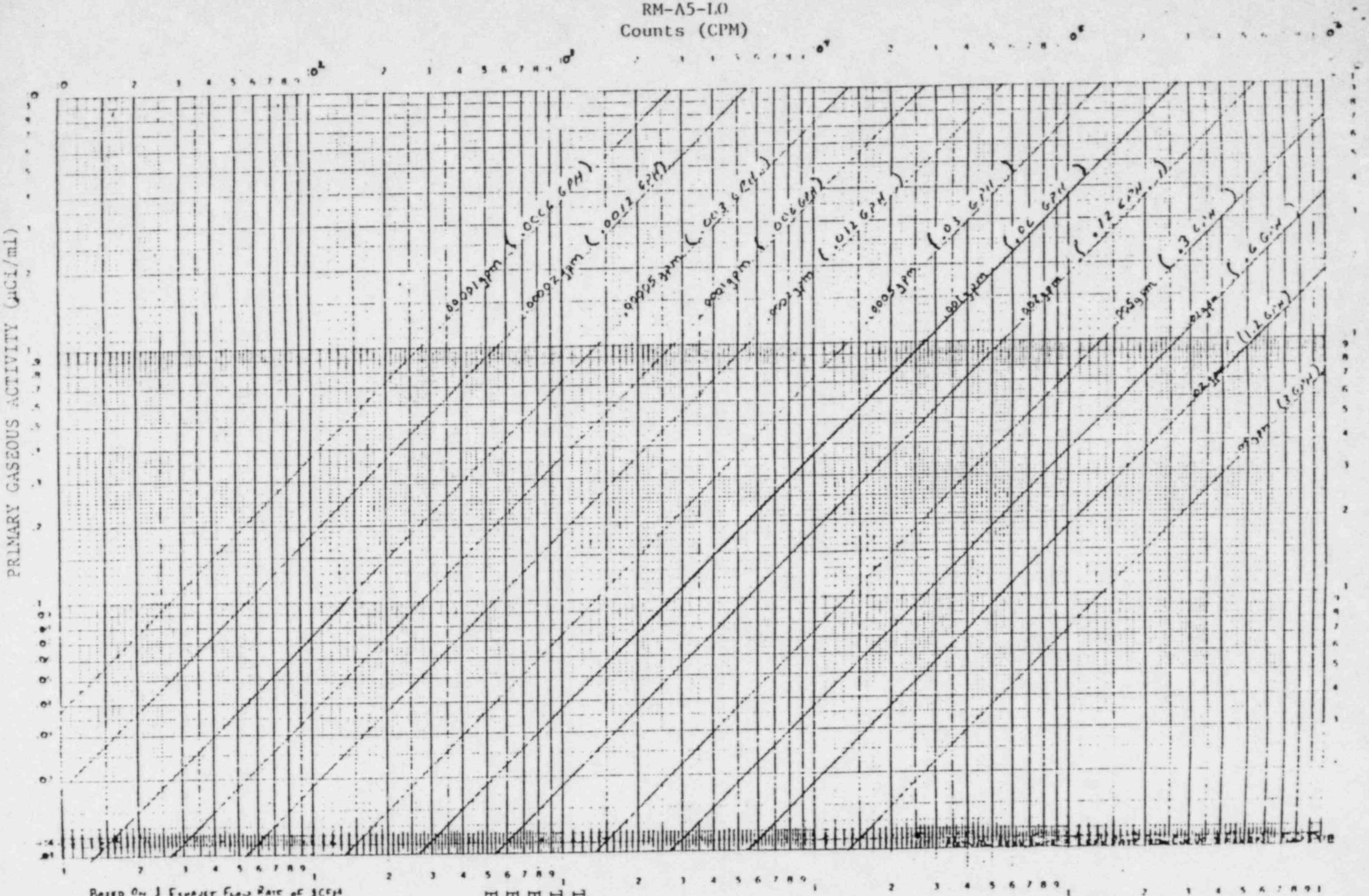
DATA SHEET 4 - Primary to Secondary Leak Rate Calculations.
Fill out Data Sheet and Compute P/S Leak Rates whenever Kr-85 grab samples at RM-A-5 Low are taken.

[1]Log the average count rate for the 15 minutes (30 minutes during steady state) since the last reading, on Data Sheet 1 and compute the primary to secondary leak rate using the most recent RCS Kr-85 activity, condenser vacuum pump exhaust flow rate, and the primary to secondary leak rate graph.

[2]OTSGs must also be analyzed for parameters in accordance with SP 1101-28-002, Rev. 1.

DATA SHEET 1 - ATTACHMENT PRIMARY-TO-SECONDARY LEAK RATE GRAPH

RM-A5-1.0
Counts (CPM)



TMI UNIT 1
TP 600/2
Encl. 8, 2/
Eff. Pg. 0
Page 120

DATA SHEET NO. 1
RM-A5 (LOW)
OTSG HOT TESTING

Date_____

Shift 11-7, 7-3, 3-11
(Circle)

Time	CPM RM-A5 Low	RCS KR-85 Activity	P/S Leakrate @ 1 SCFM	Cond. Vac. Flow SCFM*	Corrected P/S Leakrate = Leakrate @ 1 SCFM x Cond. Vac Tot. Flow

Shift Supr./Shift Foreman Signature_____

*Record total flow every 4 hours. Increase frequency when RM-A-5Lo count rate increase 20 cpm for > 30 minutes.

OTSG HOT TEST

DATA SHEET NO. 2

Date	Time	Location	Sample Type	Sample Volume	Initials	Vacuum Pump Flow Rate	Counting Instr. I.D.	Dectector No.	Counting Geometry	Computer Library No.	Kr-85 uCi/ml								

OTSG HOT TEST

DATA SHEET NO. 3A

OTSG A

Date	Time	pH	Cat. Cond. μmho/cm	Chloride ppm	Sodium ppm	Sulfate ppn	Silica ppm	Tritium uCi/cc	Kr-85 μCi/cc	Gross B μ	BORON PPM								

OTSG HOT TEST

DATA SHEET NO. 3B

OTSG B

Date	Time	pH	Cat. Cond. µmho/cm	Chloride ppm	Sodium ppm	Sulfate ppm	Silica ppm	Tritium µC/cc	Kr-85 uCi/cc	Gross B µ	Boron ppm								

OTSG HOT TESTING
DATA SHEET NO. 4
LEAK RATE CALCULATION

$$\text{P/S Leak Rate} = LR = \frac{(As, \frac{uCi}{cc}) \times (Fv, \frac{ft^3}{min.}) \times (60 \frac{min.}{hour}) \times (28320 \frac{cc}{ft^3})}{(Ap \frac{uCi}{ml}) \times (3785 \frac{ml}{gal})}$$

As, $\frac{uCi}{cc}$ = Krypton ^{85} Activity in Secondary at RMA5 (low).

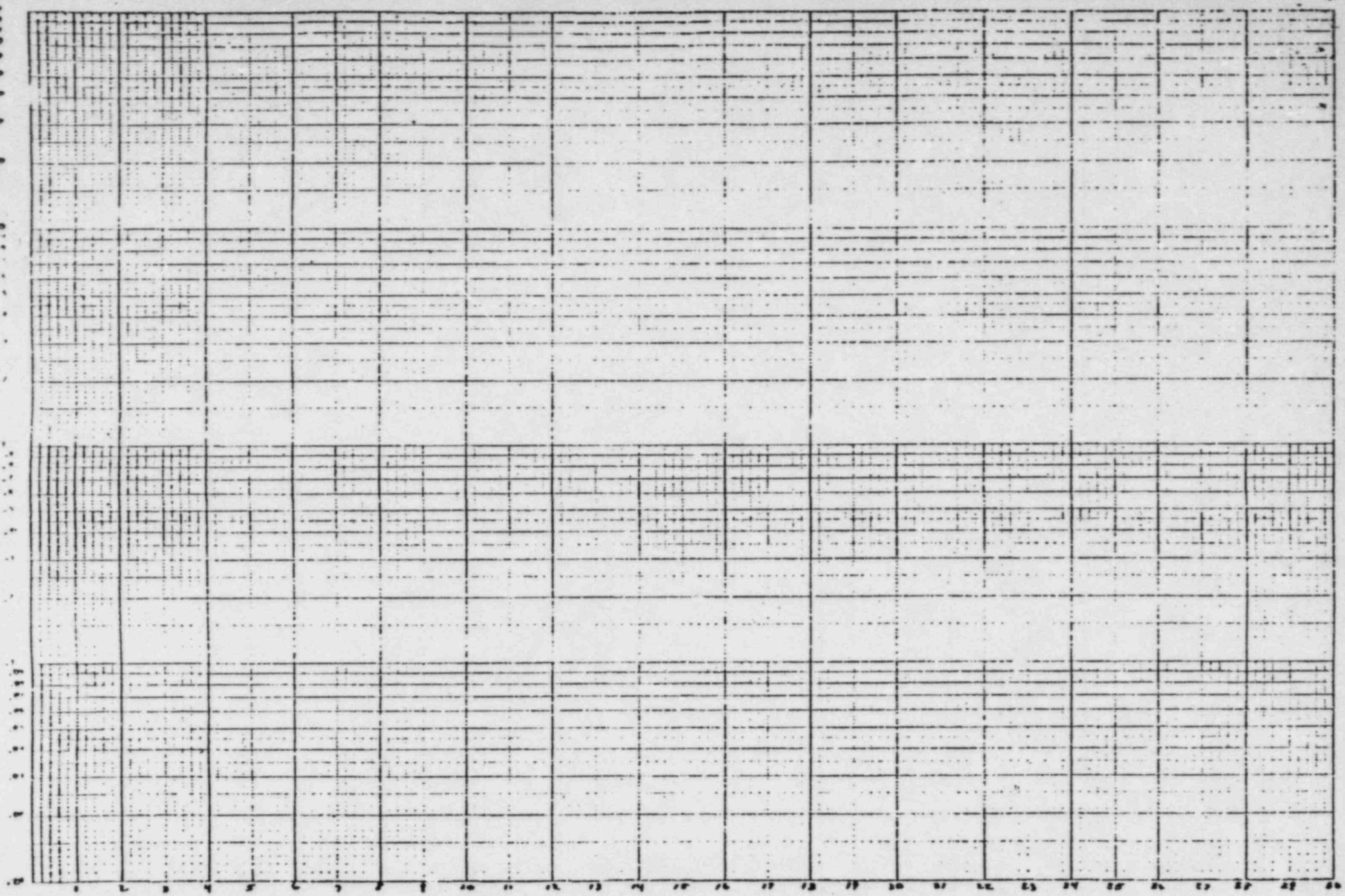
Fv, $\frac{ft^3}{min}$ = Condenser Vacuum Pumps Combined Flow Rate at Time of RMA5 (low) Sample.

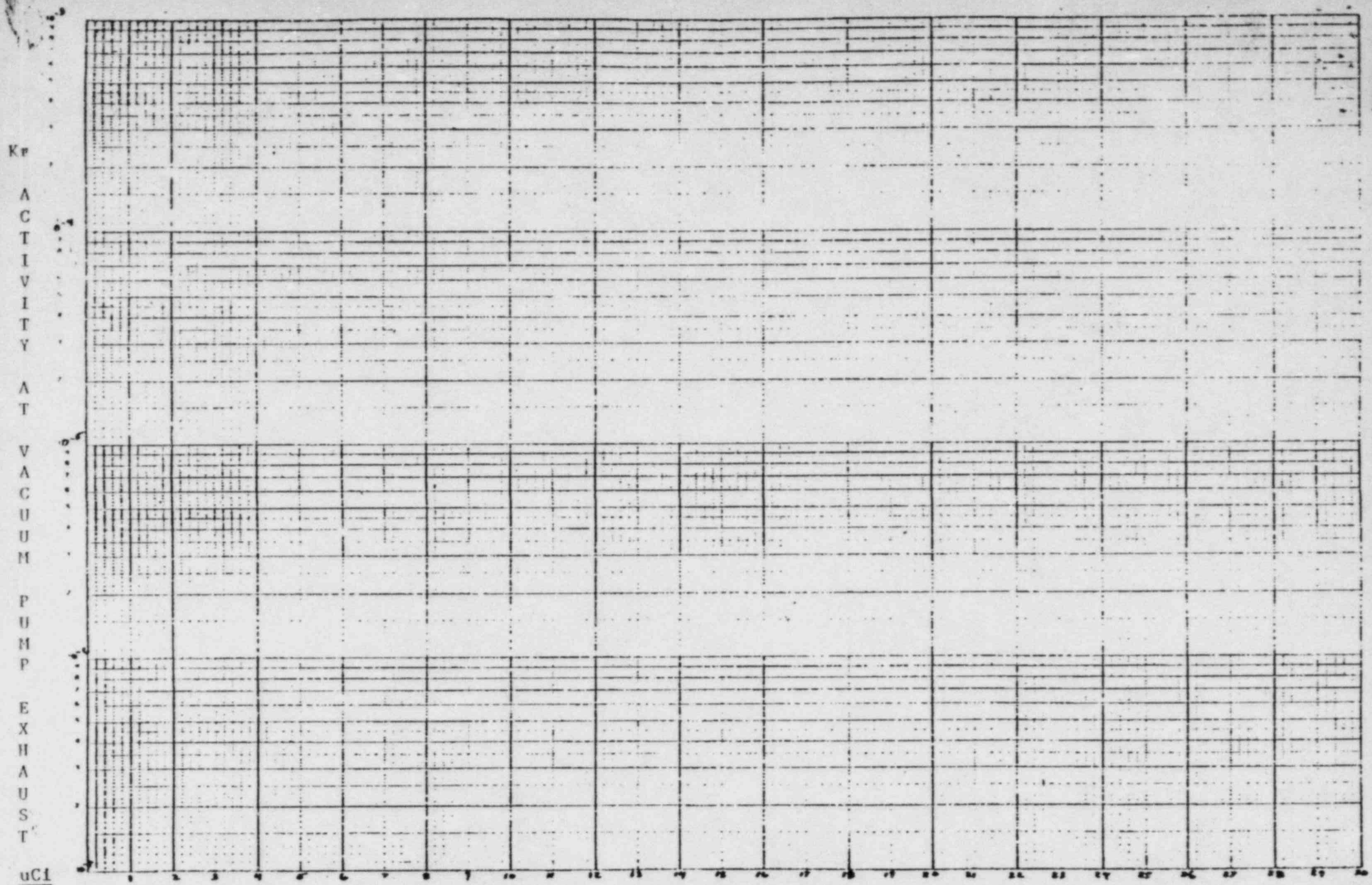
Ap, $\frac{uC}{ml}$ = Krypton ^{85} Activity in the RCS at Time of RMA5 (low) Sample.

As	Time/Date RMA5 Sample	Fv	Ap	Time/Date RCS Sample	P/S LR

OTSG HOT TESTING
DATA SHEET NO. 4 (CONT'D.)
LEAK RATE CALCULATION

As	Time/Date RMA5 Sample	Fv	Ap	Time/Date RCS Sample	P/S LR


P/S
LEAKRATE
CPH
Time Days After Kr Injection



TMI UNIT 1
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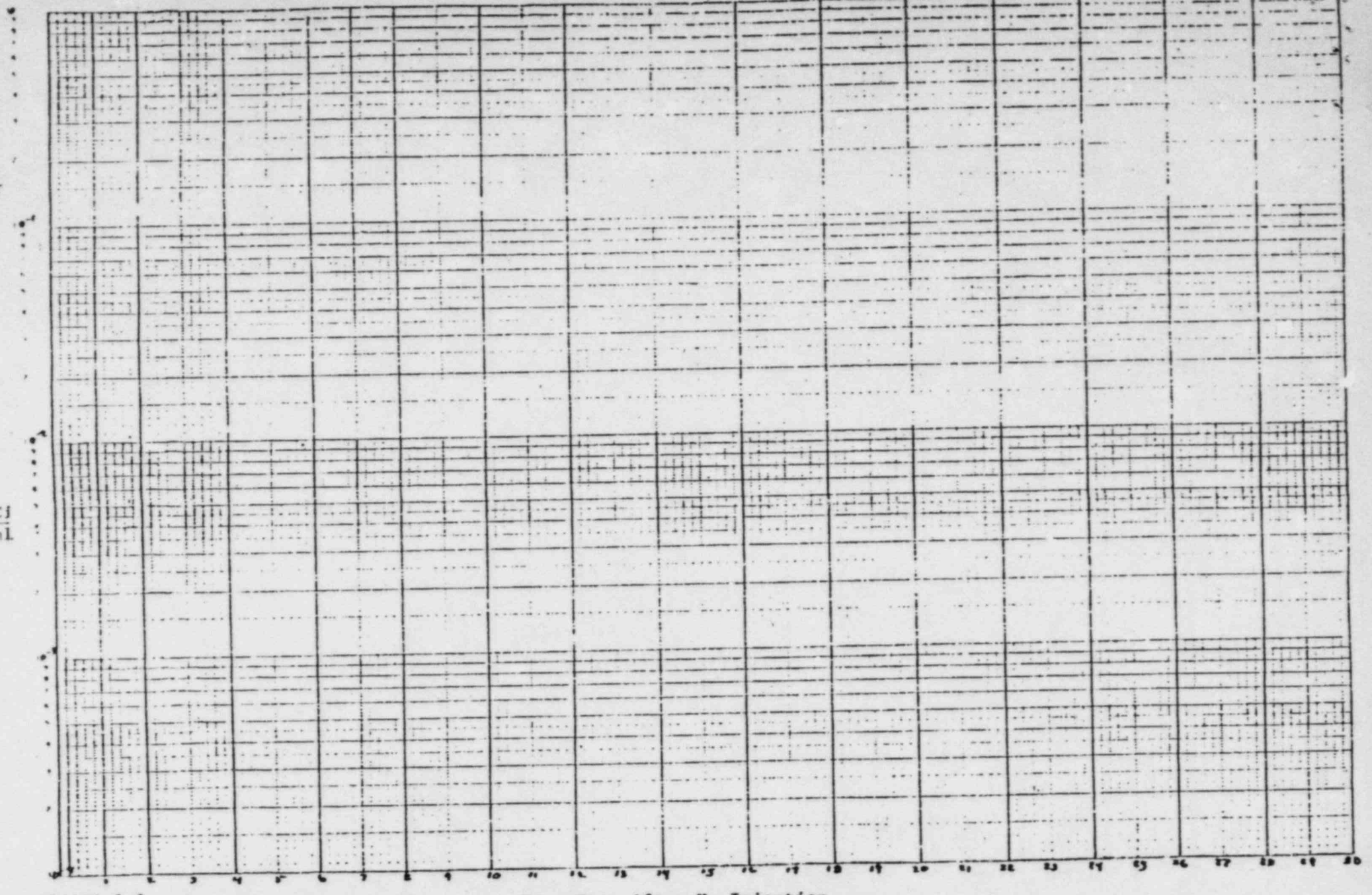

Kr ACTIVITY RCS uCi/ml
Time Days After Kr Injection

ENCLOSURE 9

GENERAL EMERGENCY OPERATING GUIDELINES

FOR HOT FUNCTIONAL TESTING PROGRAM

INTRODUCTION

A review has been conducted of the 1200 series emergency procedures in order to determine their applicability during the hot functional testing program. During this program, the plant will be at operating pressure and temperature on RC pump heat without core decay heat. The review concluded that there was a small number of concerns, which were prevalent in many procedures, which would be accommodated for by a series of general emergency operating guidelines which would be applicable for hot functional testing. This obviates the need for a large number of specific procedure changes and is more effective because the guidelines would be incorporated directly into the startup and test procedures.

GUIDELINES

A. In order to avoid excessive cooldown rates for any condition which results in initiation of EFW, if the turbine driven EFW pump initiates, immediately isolate SG steam supply to the EFW turbine.

B. ICC and Natural Circulation procedures are not applicable during HFT. (Guidance regarding actions to be taken following a sustained loss of RC pumps will be provided separately). See Item D.

C. Feed and bleed cooling should not be used for cooling the plant during HFT.

1. Upon loss of all feedwater, trip one RCP in each loop and control RCS temperature using makeup and letdown.

2. References to initiation in all other emergency procedures (e.g. LOCA, tube rupture and steam line break) should not be followed.

D. See next page.

ENCLOSURE 9

D. GUIDELINES FOR LOSS OF REACTOR COOLANT PUMPS

DURING HOT PRE-CRITICAL TESTING

Because there will be only about 60 Kw of decay heat during hot pre-critical testing, the reactor coolant will not heat up after a loss of reactor coolant pump flow. The following guidelines are recommended to stablize the system and prevent overcooling and/or saturation in the RCS.

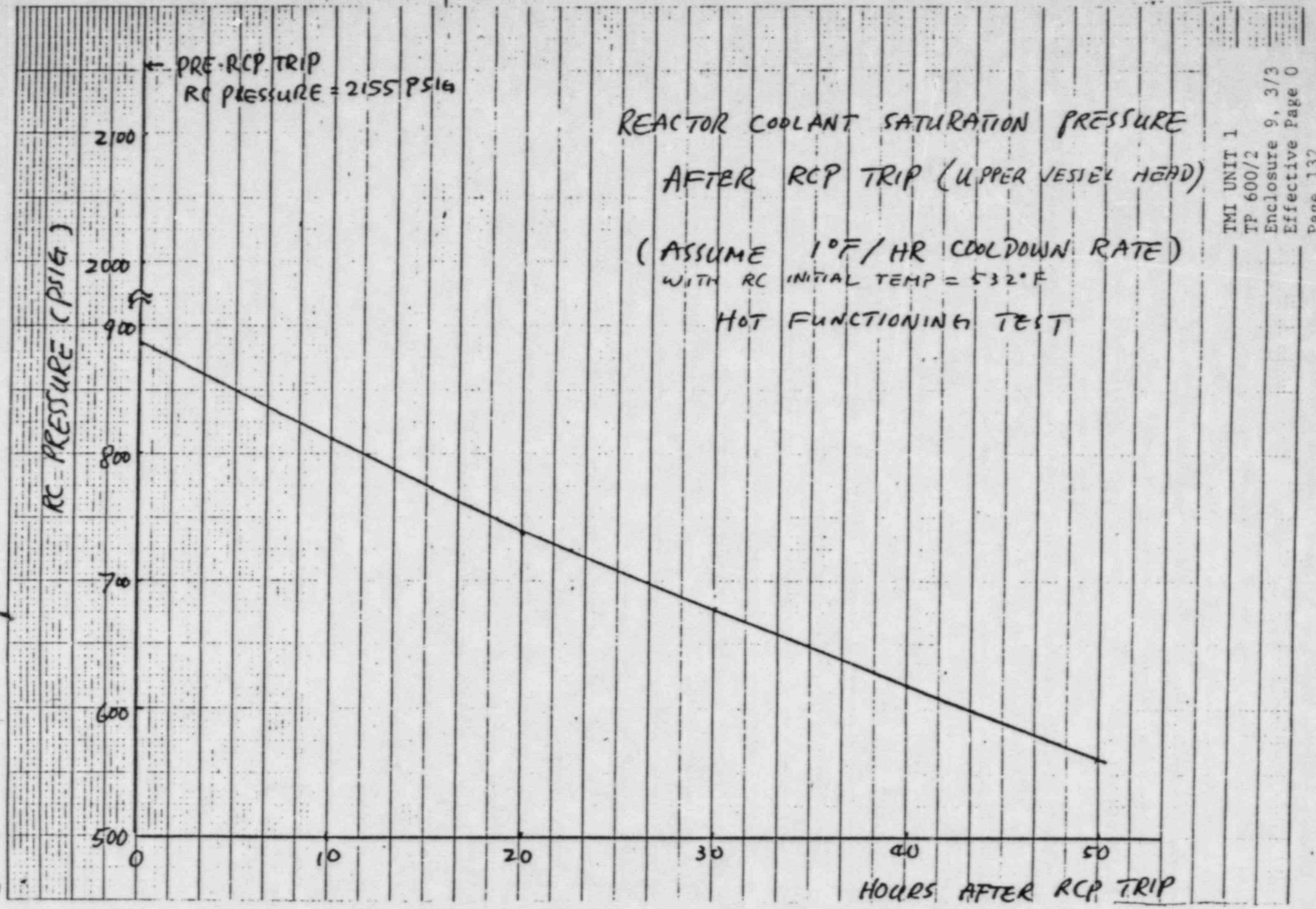
1. If loss of RC pumps results in auto initiation of the turbine driven and motor driven EFW pumps, immediately isolate steam supply to the turbine driven pump and turn off the motor driven pumps. Verify EFW-V-30A/B are shut and no flow is injected into the OTSG's.

2. Reduce cold water addition to the RCS to that required to maintain normal pressurizer level and balance seal injection flow by reducing letdown to a minimum and controlling level with makeup flow. Use pressurizer heaters to maintain RC pressure. If no offsite power is available, the pressurizer heaters should be loaded on ES bus according to the existing procedure. Do not let RC pressure decrease below the attached curve in order to prevent void formation in the reactor vessel head.

This establishes a stable condition which can be maintained for a sustained period of time (on the order of 2 days). If loss of offsite power and/or inability to start the RC pumps persists for an extended period, uneven heat loss at various locations of the RCS may result in more significant stratification, i.e., uneven temperature distribution throughout the RCS. This is an undesirable condition because it will produce thermal stress to the vessel and piping. The following guidelines apply to this situation. Additional details will be provided by Tech Functions if such a condition should result:

1. Maintain pressure above the attached curve and maintain pressurizer level.

2. Monitor the temperatures at the incore thermocouples, hot legs, and cold legs. If a difference between any two locations exceeds 50°F, and if the OTSG temperature is higher than the RCS, use the turbine bypass valves (or atmospheric dump valves if condenser not available) to gradually depressurize the OTSG until the gradient diminishes. Terminate SG cooling if the gradient increases.


REACTOR COOLANT SATURATION PRESSURE
AFTER RCP TRIP (UPPER VESSEL HEAD)
(ASSUME 1°F/HR COOLDOWN RATE)
WITH RC INITIAL TEMP = 532°F
HOT FUNCTIONING TEST
← PRE-RCP TRIP
RC PRESSURE = 2155 PSIG
RC PRESSURE (PSIG)
2100
2000
900
800
700
600
500
0
10
20
30
40
50
HOURS AFTER RCP TRIP