AP 1001

Figure 1001-8

Three Mile Island Nuclear Station
Special Operating Procedure (Rev 1)

SIDE 1

SOP No. 2-39
(From SOP Log Index)

Unit No. 2

Date 5-23-79

NOTE: Instructions and guidelines in AP 1001 must be followed when completing this form.

1. Title Natural Circulation Operation

2. Purpose (Include purpose of SOP) Provide guidance for operating the unit with the RCS in a natural circulation mode.
(Rev 1) Revises pages 6, 9 per B&W ltr no 6EIC/IPC-012 (5-14-79).

3. Attach procedure to this form written according to the following format.
   A. Limitations and Precautions
      1. Nuclear Safety
      2. Environmental Safety
      3. Personnel Safety
      4. Equipment Protection
   B. Prerequisites
   C. Procedure

Attached

4. Generated by TSPG Date 5-23-79

Duration of SOP - Shall be no longer than 90 days from the effective date of the SOP or (a) or (b) below — whichever occurs first.

(a) SOP will be cancelled by incorporation into existing or new permanent procedure submitted by _____ ☑

(b) SOP is not valid after _____ ☐
(Fill in circumstances which will result in SOP being cancelled)

6. (a) Is the procedure Nuclear Safety Related?
If "yes", complete Nuclear Safety Evaluation. (Page 2 of this Form) . . . . . Yes ☐ No ☐

(b) Does the procedure affect Environmental Protection?
If "yes", complete Environmental Evaluation. (Page 3 of this Form) . . . . . Yes ☐ No ☐

(c) Does the procedure affect radiation exposure to personnel? . . . . . Yes ☐ No ☐

NOTE: If all answers are "no", the change may be approved by the Shift Supervisor. If any questions are answered "yes", the change must be approved by the Unit Superintendent.

7. Review and Approval

AIA&A — Approved — Shift Supervisor _____

B&W — Reviewed — List members of PORC contacted J.B. Paulk 5/24/79 Date; W.E. Potts 5/24/79 Date; R. Edwards 5/24/79 Date; T.E. Marsh 5/24/79 Date

NRC — if req'd

Approved - Unit Superintendent E.H. Smith 5/24/79 Date

8. SOP is Cancelled

_____ Shift Supervisor/Shift Foreman _____ Date

TMI-83 Rev. 8/77

NATURAL CIRCULATION OPERATION

1.0 PURPOSE

To describe the expected plant conditions and the normal plant control methods while in natural circulation and to describe actions required when natural circulation, level control, pressure control, or reactivity control is lost.

2.0 REFERENCES

2.1 EP-34, Loss of Natural Circulation.

2.2 EP-29, Loss of Condenser Vacuum.

2.3 Z-63, Solid Pressurizer Operation.

2.4 EP-21, Loss of Pressurizer Level Indication.

2.5 Z-58, Core Flood Tank Float.

2.6 Z-115, DHR Pump Float.

2.7 EP-16, Loss of Source Range Instrumentation.

3.0 LIMITS AND PRECAUTIONS

3.1 The OTSG level(s) should be maintained at 400" to 430" on the operating OTSG(s). Non-operating OTSG should be maintained at 95 $\pm$3%.

3.2 If both OTSG's are being steamed, their respective turbine bypass valves should be opened equally.

3.3 Seal Injection and letdown should be balanced so that a MU pump can be run continuously (with MU-V18 shut) to maintain pressurizer level by EP-21.

3.4 RCS pressure should be maintained at least 100 psi above saturation pressure for the third hottest in-core thermocouple or the hottest T_H, whichever is more limiting.

3.5 Makeup water to be added to the primary system should be maintained as high as possible but below 150°F or the operating loop(s) T_C, whichever is lower.

3.6 All makeup to the Makeup Tank should be de-aerated (degassed). Makeup boron concentration shall be such as to maintain the required RCS boron concentration.

3.7 If the pressurizer is solid and pressurizer heaters are available, the pressurizer water temperature should be maintained as specified in Z-63.

3.8 Steady state operation within the following limits is considered to be demonstration of satisfactory natural circulation.

3.8.1 Operating OTSG(s) loop ΔT less than $20^{o}F$.

3.8.2 Hottest in-core thermocouple less than $350^{o}F$.

3.8.3 No incore thermocouple increasing by more than $30^{o}F$ in one hour.

3.8.4 No steadily increasing T_H for operating OTSG(s) over an eight (8) hour period.

4.0 PREREQUISITES

4.1 RCS is being cooled by natural circulation in a steady state mode.

4.2 The RCS is being maintained within the requirements of Section 3.0.

5.0 SPECIAL EQUIPMENT

5.1 Enhanced incore thermocouple readouts.

5.2 Special pressurizer level determination instrument.

5.3 Any other special instrumentation installed to provide the operator information on the conditions of the RCS and supporting systems.

6.0 METHOD

6.1 Flow control.

6.1.1 Maintain natural circulation in at least one RCS loop by steaming either or both steam generators. If natural circulation is lost (see para. 3.8), go to EP-34 until steady state natural circulation conditions are re-established. As a result of implementing EP-34, the steady state natural circulation conditions may differ from those specified by 3.0. In this case, new values for affected portions of 3.0 will be defined by R. C. Arnold (J. G. Herbein).

6.1.2 If condenser vacuum is lost, go to EP-29.

6.2 Pressurizer level control.

6.2.1 Maintain pressurizer level 375"±25" in accordance with EP-21.

6.3 Pressure control.

6.3.1 Maintain primary system pressure at the ordered value ±50 psi using a steam bubble and pressurizer heaters.

6.3.2 If primary system pressure cannot be properly maintained (due to insufficient heater capacity or other cause), take the primary system solid and maintain a solid condition in accordance with Procedure Z-63.

6.3.3 If primary system pressure cannot be properly maintained in the solid plant condition, contact R. C. Arnold or J. G. Herbein for further instructions regarding the use of one of the alternate pressure control methods described in Z-58, Core Flood Tank Float, Z-115, DH Pump Float or the standby pressure control system (if installed).

6.4 Reactivity Control Rev 1

6.4.1 Monitor source range instruments to ensure adequate shutdown margin.

6.4.2 If source range indication is lost, refer to EP-16.

6.4.3 Count Rate

6.4.3.1 No sustained positive startup rate is acceptable.

6.4.3.1.1 Notify B&W.

6.4.3.1.2 Confirm Detector reading per Attachment 1.

6.4.3.2 The count rate doubles in an hour or less.

6.4.3.2.1 Immediately initiate boration and feed until the RCS Boron Concentration is increased by 200 ppm boron, and immediately notify B&W.

6.4.3.2.2 Confirm Detector reading per Attachment 1.

6.4.3.3 The count rate doubles in greater than an hour.

6.4.3.3.1 Immediately contact B&W.

6.4.3.3.2 Confirm Detector reading per Attachment 1.

7.0 APPLICABILITY

7.1 When the core is being cooled by steady state natural circulation of the RCS.

7.2 When the limits of 3.8 are satisfied.

Rev 1

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ATTACHMENT 1

CONFIRMATION OF INCREASING SOURCE RANGE DETECTOR COUNT RATE

SIGNALS DOUBLE IN ONE HOUR OR LESS CAN BE CONFIRMED BY:

1. CHECKING NUMBER OF COUNTS IN A 100 SECOND PERIOD ON NI-1 AND COMPARING THE READING TO PREVIOUS NI-1 COUNTS PER 100 SECOND PERIOD.

2. CHECKING NI-3 FOR SIGNAL INCREASE.

3. CHECKING NI-5 FOR SIGNAL INCREASES.

4. CHECKING NI-1 ELECTRICAL STATUS BY VISUAL MONITORING AND CHECKING LOCAL AND REMOTE DISPLAYS FOR AGREEMENT. THE ELECTRICAL STATUS IS DETECTOR POWER SUPPLY VOLTS, COUNT RATE INDICATION ON MODULE, VOLTS TO OPERATORS INDICATOR, VOLTS TO OPERATOR RECORDER.