

I. PURPOSE

The purpose of this procedure is to provide guidelines for the safe operation of the Reactor.

II. PRE-STARTUP CHECKS

A pre-startup checklist shall be completed prior to each reactor startup, except following a brief reactor shutdown for experiment handling or scram recovery. The first checklist completed for any operating week must include special instrumentation tests and scram tests. An abbreviated pre-startup checklist shall be performed during the remainder of that calendar week.

1. Complete Procedure 2002, "Weekly Reactor Pre-startup Checklist," or Procedure 2003, "Daily Reactor Pre-startup Checklist."
2. Use Procedure 2500, "Containment Building Health Physics Procedures," for process room entry.
3. Pre-startup checklist questions on process systems shall be answered "yes" when:
 - a. Maintenance has been performed on the respective system.
 - b. Operator performing field checks has been off duty for five successive days.

III. NORMAL OPERATION

A. Normal Startup

1. Procedural Limits

- a. Shim control blades will be maintained in a bank with a maximum angle of 5° between the highest and lowest blade positions. This limit may be exceeded for special tests if reactor power is 50 kw or less.
- b. Except for specially written and approved test procedures, the minimum period during startup shall be 20 seconds.

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III. NORMAL OPERATION (continued)

- c. The regulating rod may be positioned between 5" and 7" during startup; special tests may require other positions.
2. Make appropriate log entries and chart entries, including time of startup.
3. Using the public address (P.A.) system, make an announcement that the reactor is being started up.
4. Observing all nuclear instrumentation, begin withdrawal of the shim control blades. Pause as often as necessary to comfortably observe the instrumentation or as directed by S.R.O. on duty.
5. As criticality is approached, observe period meters closely for changes in period.
6. Follow the power rise carefully on the power level recorder. Whenever the power level recorder approaches full scale, use the range switches on the picoammeters to downscale the recorder.
7. When the reactor is super-critical, establish an indicated period of 30 to 60 seconds.
8. When the ${}^6\text{LCRM}$ reaches 10^5 CPS and before it exceeds 10^6 CPS, turn off the high voltage.
9. As the reactor power approaches the desired operating level, begin to lengthen the period. Energize the auto-controller. Stabilize the reactor at the desired power using either the shim blades or the regulating rod. If automatic control is desired, insure that the auto-controller is set for the proper point. With less than 3% deviation indicated, place the mode selector switch to "Auto."
10. Notify Nuclear Research Center personnel of the reactor operating power, using the P.A. system.

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III. NORMAL OPERATION (continued)

11. Record in the log book the time of reaching power and the power level. Note on the Log N and power level charts the time and power level.
12. Log the following Initial Critical Data: Each shim blade position, regulating rod position, flux amplifier readings and gain pot settings, and picoammeter readings.
13. After thermal equilibrium is established, log Equilibrium Operating Data.
14. For reactor operating times of one hour or more, initiate routine data sheets.

B. Power Level Changes

1. Procedural Limits

- a. Power level changes may be made in manual or automatic mode of operation.
- b. When changing power do not go below a 20 second period except for specially written and approved tests.
- c. When changing power in the automatic mode, do not exceed a 5% deviation on the servo deviation meter.
- d. When changing power in the manual mode turn off the auto-controller for changes in excess of 10%.

2. Announce over the P.A. system that power has been changed; indicate new power.

3. When stabilized at new power level, record on charts and in log book time and new power level.

C. Normal Shutdown

1. Limitations

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III. NORMAL OPERATION (continued)

- a. During normal shutdown, use caution not to exceed the negative period trip point.
- b. One or more shim blades may be driven in simultaneously as long as the negative trip point is not exceeded.
2. Insure regulating rod is in "Manual" and auto-controller is deenergized.
3. Drive shim blades in until the bank position is 5° or less at which time the clutches may be deenergized. Observe that power level is decreasing.
4. Enter time of shutdown in log book and on charts.
5. Cooldown reactor 30 min. for previous operation between 100 kw and 1000 kw; 8 hours for operation greater than 1000 MW. Operation at power levels of less than 100 kw requires no cooldown.
6. Complete shutdown checklist, Procedure 2005, if reactor is to remain shutdown for more than 8 hours. Use Procedure 2500 for process room entry.

D. Emergency Shutdown

The emergency shutdown is accomplished by performing coded action ABLE (see Procedure 5000) which is as follows:

1. Press SCRAM and SHUTDOWN buttons; check that flux is decreasing by observing the power level recorder, the log N recorder, the flux amplifier meters, and the fuel element temperature recorder.
2. If flux is not decreasing, press the open button for the drain valves and the individual open buttons for the clutch magnet circuits.

If the reactor is to remain shutdown for more than 8 hours, the Shutdown Checklist, Procedure 2005, should be completed.