

REACTIVITY CONTROL SYSTEMS

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

GROUP HEIGHT

LIMITING CONDITION FOR OPERATION

3.1.3.1 All full length (shutdown and control) rods which are inserted in the core, shall be OPERABLE and positioned within ± 12 steps (indicated position determined in accordance with Specification 3.1.3.2) corresponding to the group demand counter position within one hour after rod motion.

APPLICABILITY: MODES 1* and 2*

ACTION:

- a. With one or more full length rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.
- b. With more than one full length rod inoperable or misaligned from the demand position by more than ± 12 steps (indicated position determined in accordance with Specification 3.1.3.2), be in HOT STANDBY within 6 hours.
- c. With one full length rod inoperable due to causes other than addressed by ACTION a, above, or misaligned from its demand position by more than ± 12 steps (indicated position determined in accordance with Specification 3.1.3.2), POWER OPERATION may continue provided that within one hour either:
 1. The rod is restored to OPERABLE status within the above alignment requirements, or
 2. The remainder of the rods in the bank with the inoperable rod are aligned to within ± 12 steps of the inoperable rod while maintaining the rod sequence and insertion limits of Figures (3.1-1) and (3.1-2); the THERMAL POWER level shall be restricted pursuant to Specification (3.1.3.6) during subsequent operation, or
 3. The rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:
 - a) A reevaluation of each accident analysis of Table 3.1-1 is performed within 5 days; this reevaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.

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LIMITING CONDITION FOR OPERATION (Continued)

- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.
- c) A power distribution map is obtained from the movable incore detectors and $F_0(Z)$ and $F_{\Delta H}$ are verified to be within their limits within 72 hours.
- d) The THERMAL POWER level is reduced to less than or equal to 75% of RATED THERMAL POWER within one hour and within the next 4 hours the high neutron flux trip setpoint is reduced to less than or equal to 85% of RATED THERMAL POWER. THERMAL POWER shall be maintained less than or equal to 75% of RATED THERMAL POWER until compliance with ACTIONS 3.1.3.1.c.3.a and 3.1.3.1.c.3.c above are demonstrated.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full length rod shall be determined to be within + 12 steps (indicated position) of the group demand position at least once per 12 hours (allowing for one hour thermal soak after rod motion) except during time intervals when the Rod Position Deviation Monitor is inoperable, then verify the group positions at least once per 4 hours.

4.1.3.1.2 Each full length rod not fully inserted in the core shall be determined to be OPERABLE by movement of at least 10 steps in any one direction at least once per 31 days.

*See Special Test Exceptions 3.10.2 and 3.10.4

TABLE 3.1-1

ACCIDENT ANALYSES REQUIRING REEVALUATION
IN THE EVENT OF AN INOPERABLE FULL OR PART
LENGTH ROD

Rod Cluster Control Assembly Insertion Characteristics

Rod Cluster Control Assembly Misalignment

Loss Of Reactor Coolant From Small Ruptured Pipes Or From Cracked
Large Pipes Which Actuates The Emergency Core Cooling System

Single Rod Cluster Control Assembly Withdrawal At Full Power

Major Reactor Coolant System Pipe Ruptures (Loss Of Coolant Accident)

Major Secondary System Pipe Rupture

Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control
Assembly Ejection)

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEMS-OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2 The shutdown and control individual rod position indication system and the demand position indication system shall be OPERABLE and capable of determining the actual and demanded control rod positions, respectively, as follows:

Analog rod position, within one hour after rod motion (allowance for thermal soak); ± 12 steps.

Group Demand Counters; ± 2 steps

The actual analog rod position shall be determined by direct analog indication or, as a backup, by measurement of channel detector primary voltages. If a rod position indicator exceeds the allowed deviation specified above, rod positions for the affected rods shall be determined by measuring detector primary voltages, as follows:

- a. Immediately
- b. If associated rods move greater than 6 steps (greater than 12 steps if all rods in the group have been determined to be within 6 steps of the group demand indicator by primary voltage measurements within the previous 4 hours)
- c. At 4 hour intervals if the affected rod(s) are not fully inserted or withdrawn
- d. At 24 hour intervals if the affected rod(s) are fully inserted or withdrawn.

REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (continued)

When the rod position indicator channel is INOPERABLE, the position of not more than three control rods per bank which are not fully inserted or fully withdrawn may be determined by use of the detector primary voltage measurements.*

APPLICABILITY: MODES 1 and 2*

ACTION:

- a. With a maximum of three analog rod position indicators per bank INOPERABLE, either:
 1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors at least once per 8 hours and within one hour after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or
 2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.
- b. With a maximum of one group demand position indicator per bank INOPERABLE, either:
 1. Verify that all rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 12 steps (corrected indicated position) of each other at least once per 8 hours, or
 2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.2.1 Each analog rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system agree within 12 steps (allowing for one hour thermal soak after rod motion) at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system at least once per 4 hours. For any INOPERABLE channel, no repairs or adjustments shall be permitted without being followed immediately by a full range calibration.

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

4.1.3.2.2 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

*For Core PHYSICS TESTING in Mode 2, primary detector voltage measurements may be used to determine the position of rods in shutdown banks A and B and control banks A and B for the purpose of satisfying Specification 3.1.3.2. During Mode 2 operations, rod position indicators for shutdown banks A and B and control banks A and B may deviate from the group demand indicators by greater than ± 12 steps during reactor startup and shutdown operations, while rods are being withdrawn or inserted. If the rod position indicators for shutdown banks A and B and control banks A and B deviate by greater than ± 12 steps from the group demand indicator, rod withdrawal or insertion may continue until the desired group height is achieved. When the desired group height is achieved, a one hour soak time is allowed to permit stabilization of the rod position analog indicators.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM-SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.3.3 The group demand position indicator shall be OPERABLE and capable of determining within ± 2 steps the demand position for each shutdown or control rod not fully inserted.

APPLICABILITY: MODE 3 with the Reactor Trip Breakers closed

ACTION:

With less than the above required group demand position indicator(s) OPERABLE, verify the ACTION requirements of 3.1.3.2.b are met, or, immediately open the reactor trip system breakers.

SURVEILLANCE REQUIREMENTS

4.1.3.3 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

REACTIVITY CONTROL SYSTEMS

ROD DROP TIME

LIMITING CONDITION FOR OPERATION

3.1.3.4 The individual full length (shutdown and control) rod drop time from the fully withdrawn position shall be ≤ 2.2 seconds from beginning of decay of stationary gripper coil voltage to dashpot entry with:

- a. $T_{avg} \geq 541^{\circ}\text{F}$, and
- b. All reactor coolant pumps operating.

APPLICABILITY: MODE 3.

ACTION:

- a. With the drop time of any full length rod determined to exceed the above limit, restore the rod drop time to within the above limit prior to proceeding to MODE 1 or 2.
- b. With the rod drop times within limits but determined with 2 reactor coolant pumps operating, operation may proceed provided THERMAL POWER is restricted to:
 1. $\leq 61\%$ of RATED THERMAL POWER when the reactor coolant stop valves in the nonoperating loop are open, or
 2. $\leq 66\%$ of RATED THERMAL POWER when the reactor coolant stop valves in the nonoperating loop are closed.

SURVEILLANCE REQUIREMENTS

4.1.3.4 The rod drop time of full length rods shall be demonstrated through measurement prior to reactor criticality:

- a. For all rods following each removal of the reactor vessel head,
- b. For specifically affected individual rods following any maintenance on or modification to the control rod drive system which could affect the drop time of those specific rods, and
- c. At least once per 18 months.

REACTIVITY CONTROL SYSTEMS

SHUTDOWN ROD INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown rods shall be fully withdrawn.

APPLICABILITY: MODES 1* and 2*#

ACTION:

With a maximum of one shutdown rod not fully withdrawn, except for surveillance testing pursuant to Specification (4.1.3.1.2), within one hour either:

- a. Fully withdraw the rod, or
- b. Declare the rod to be inoperable and apply Specification (3.1.3.1).

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown rod shall be determined to be fully withdrawn by use of the group demand counters, and verified by the analog rod position indicators within one hour after rod motion.

- a. Prior to withdrawal of any rods in control banks A, B, C or D during an approach to reactor criticality, and
- b. At least once per 12 hours thereafter.

* See Special Test Exceptions 3.10.2 and 3.10.4

With $K_{eff} \geq 1.0$

REACTIVITY CONTROL SYSTEMS

CONTROL ROD INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.6 The control banks shall be limited in physical insertion as shown in Figures (3.1-1) and (3.1-2).

APPLICABILITY: MODES 1* and 2*#.

ACTION:

With the control banks inserted beyond the above insertion limits, except for surveillance testing pursuant to Specification (4.1.3.1.2), either:

- a. Restore the control banks to within the limits within two hours, or
- b. Reduce THERMAL POWER within two hours to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the group position using the above figures, or
- c. Be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The position of each control bank shall be determined to be within the insertion limits at least once per 12 hours, by use of the group demand counters and verified by the analog rod position indicators, except during time intervals when the Rod Insertion Limit Monitor is inoperable, then verify the individual rod positions at least once per 4 hours.

*See Special Test Exception 3.10.2 and 3.10.4

#With $K_{eff} \geq 1.0$

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM-SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.3.3 The group demand position indicator shall be OPERABLE and capable of determining within ± 2 steps the demand position for each shutdown or control rod not fully inserted.

APPLICABILITY: MODE 3 with the Reactor Trip Breakers closed

ACTION:

With less than the above required group demand position indicator(s) OPERABLE, verify the ACTION requirements of 3.1.3.2.b are met, or, immediately open the reactor trip system breakers.

SURVEILLANCE REQUIREMENTS

4.1.3.3 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.2 BORATION SYSTEMS (continued)

The boration capability of either system is sufficient to provide a SHUT-DOWN MARGIN from all operating conditions of 1.0% $\Delta k/k$ after xenon decay and cooldown to 200°F. The maximum boration capability requirements occur at EOL from full power equilibrium xenon conditions and requires 11,336 gallons of 7000 ppm borated water from the boric acid storage tanks or 49,917 gallons of 2000 ppm borated water from the refueling water storage tank.

With the RCS temperature below 200°F, one injection system is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity change in the event the single injection system becomes inoperable.

The boration capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% $\Delta k/k$ after xenon decay and cooldown from 200°F to 140°F. This condition requires either 5000 gallons of 7000 ppm borated water from the boric acid storage tanks or 175,000 gallons of 2000 ppm borated water from the refueling water storage tank.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of rod misalignment on associated accident analyses. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits. OPERABLE condition for the analog rod position indicators is defined as being capable of indicating rod position to within ± 12 steps of the associated group demand indicator. The specifications of this section permit a one hour stabilization period after rod motion to permit stabilization of known thermal drift in the rod position analog instruments. The use of rod position indication primary voltage measurements is permitted as a backup to direct reading of the analog indicators. Comparison of the group demand indicator to the calibration curve is sufficient to allow determination that a control rod is indeed misaligned from its bank when primary voltage measurements are used. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the analog rod position indicators (after thermal soak after rod motion) is sufficient verification that the control rods are above the insertion limits.

