

REACTIVITY CONTROL SYSTEMS

BORON DILUTION

LIMITING CONDITION FOR OPERATION

3.1.1.2 The flow rate of reactor coolant through the Reactor Coolant System shall be \geq 2800 gpm whenever a reduction in Reactor Coolant System boron concentration is being made. 

APPLICABILITY: All MODES.

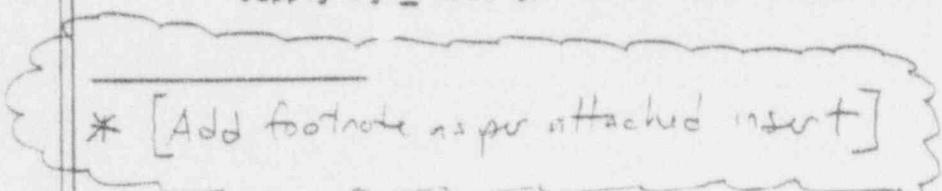
ACTION:

With the flow rate of reactor coolant through the Reactor Coolant System $<$ 2800 gpm, immediately suspend all operations involving a reduction in boron concentration of the Reactor Coolant System.

SURVEILLANCE REQUIREMENTS

4.1.1.2 The flow rate of reactor coolant through the Reactor Coolant System shall be determined to be \geq 2800 gpm within one hour prior to the start of and at least once per hour during a reduction in the Reactor Coolant System boron concentration by either:

- a. Verifying at least one reactor coolant pump is in operation, or
- b. Verifying that at least one DHR pump is in operation and supplying \geq 2800 gpm to the Reactor Coolant System.


* [Add footnote as per attached insert]

Insert to 3/4.1.1.2

In MODE 6 the Reactor Coolant System (RCS) boron concentration may be greater than the boron concentration of water available for addition. If the flowrate of reactor coolant through the RCS is less than 2800 gpm, water of lower boron concentration than the existing RCS concentration may be added to the RCS provided that the boron concentration of the water to be added is equal to or greater than the boron concentration corresponding to the more restrictive reactivity condition specified in Specification 3.9.1.

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition. During Modes 1 and 2 the SHUTDOWN MARGIN is known to be within limits if all control rods are OPERABLE and withdrawn to or beyond the insertion limits.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration and RCS T_{avg} . The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature. The SHUTDOWN MARGIN required is consistent with FSAR safety analysis assumptions.

3/4.1.1.2 BORON DILUTION

A minimum flow rate of at least 2800 GPM provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual through the Reactor Coolant System in the core during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 2800 GPM will circulate an equivalent Reactor Coolant System volume of 12,110 cubic feet in approximately 30 minutes. The reactivity change rate associated with boron concentration reduction will be within the capability for operator recognition and control.

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT

The limitations on moderator temperature coefficient (MTC) are provided to ensure that the assumptions used in the accident and transient analyses remain valid through each fuel cycle. The surveillance requirement for measurement of the MTC each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup. The confirmation that the measured MTC value is within its limit provides assurance that the coefficient will be maintained within acceptable values throughout each fuel cycle.

[Add new paragraph as per attached insert]

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Insert to Bases 3/4.1.1.2

In MODE 6, the RCS boron concentration is typically somewhat higher than the minimum boron concentration required by Specification 3.9.1, and could be higher than the boron concentration of normal sources of water addition. At reduced inventory conditions in the RCS, in order to reduce the possibility of vortexing, the flowrate through the decay heat system may be procedurally restricted to somewhat less than 2800 gpm. In this situation, if water with a boron concentration equal to or greater than the boron concentration required by Specification 3.9.1, is added to the RCS, the RCS is assured to remain above the Specification 3.9.1 requirement, and a flowrate of less than 2800 gpm is not of concern.

3/4.9 REFUELING OPERATIONS

INFORMATION ONLY

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 The boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met:

- a. Either a K_{eff} of 0.95 or less, which includes a 1% $\Delta k/k$ conservative allowance for uncertainties, or
- b. A boron concentration of ≥ 1800 ppm, which includes a 50 ppm conservative allowance for uncertainties.

APPLICABILITY: MODE 6.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at ≥ 10 gpm of 8750 ppm boric acid solution or its equivalent until K_{eff} is reduced to ≤ 0.95 or the boron concentration is restored to ≥ 1800 ppm, whichever is the more restrictive. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

- a. Removing or unbolting the reactor vessel head, and
- b. Withdrawal of any safety or regulating rod in excess of 3 feet from its fully inserted position within the reactor pressure vessel.

4.9.1.2 The boron concentration of the reactor pressure vessel and the refueling canal shall be determined by chemical analysis at least once each 72 hours.

3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volumes having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analysis.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.4 CONTAINMENT PENETRATIONS

The requirements on containment penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure requirements are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during CORE ALTERATIONS.