

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be $\geq 1\% \Delta k/k$.

APPLICABILITY: MODES 1, 2*, 3, 4 and 5.

ACTION:

With the SHUTDOWN MARGIN $< 1\% \Delta k/k$, immediately initiate and continue boration at > 180 ppm of 7875 ppm boron or its equivalent, until the required SHUTDOWN MARGIN is restored.

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SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be $\geq 1\% \Delta k/k$:

- a. Within one hour after detection of an inoperable control rod(s) and at least once per 12 hours thereafter while the rod(s) is inoperable. If the inoperable control rod is immovable or untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable control rod(s).
- b. When in MODES 1 or 2[#], at least once per 12 hours, by verifying that regulating rod groups withdrawal is within the limits of Specification 3.1.3.6.
- c. When in MODE 2^{##} within 4 hours prior to achieving reactor criticality by verifying that the predicted critical control rod position is within the limits of Specification 3.1.3.6.
- d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading by consideration of the factors of e. below, with the regulating rod groups at the maximum insertion limit of Specification 3.1.3.6.

[#]With $K_{eff} \geq 1.0$.

^{##}With $K_{eff} < 1.0$.

* See Special Test Exception 3.10.4.

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REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- e. When in MODES 3, 4 or 5, at least once per 24 hours by consideration of the following factors:
1. Reactor coolant system boron concentration,
 2. Control rod position,
 3. Reactor coolant system average temperature,
 4. Fuel burnup based on gross thermal energy generation,
 5. Xenon concentration, and
 6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within $\pm 1\% \Delta k/k$ at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.1.1.e, above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 Effective Full Power Days after each fuel loading.

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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 limit.

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.

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.

3/4.1.1.3 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.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.8 As a minimum, one of the following borated water sources shall be OPERABLE:

a. A boric acid addition system with:

1. A minimum available borated water volume of ⁷⁰⁰~~600~~ gallons,
2. Between 7875 and 13,125 ppm of boron, and
3. A minimum solution temperature of 105°F.

b. The borated water storage tank (BWST) with:

1. A minimum available borated water volume of 3,000 gallons,
2. A minimum boron concentration of ²¹⁰⁰~~1000~~ ppm, and
3. A minimum solution temperature of 35°F.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no borated water sources OPERABLE, suspend all operations involving CORE ALTERATION or positive reactivity changes until at least one borated water source is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

4.1.2.8 The above required borated water source shall be demonstrated OPERABLE:

a. At least once per 7 days by:

- 2 X. Verifying the boron concentration of the water, and
- 1 X. Verifying the available borated water volume of the source, and

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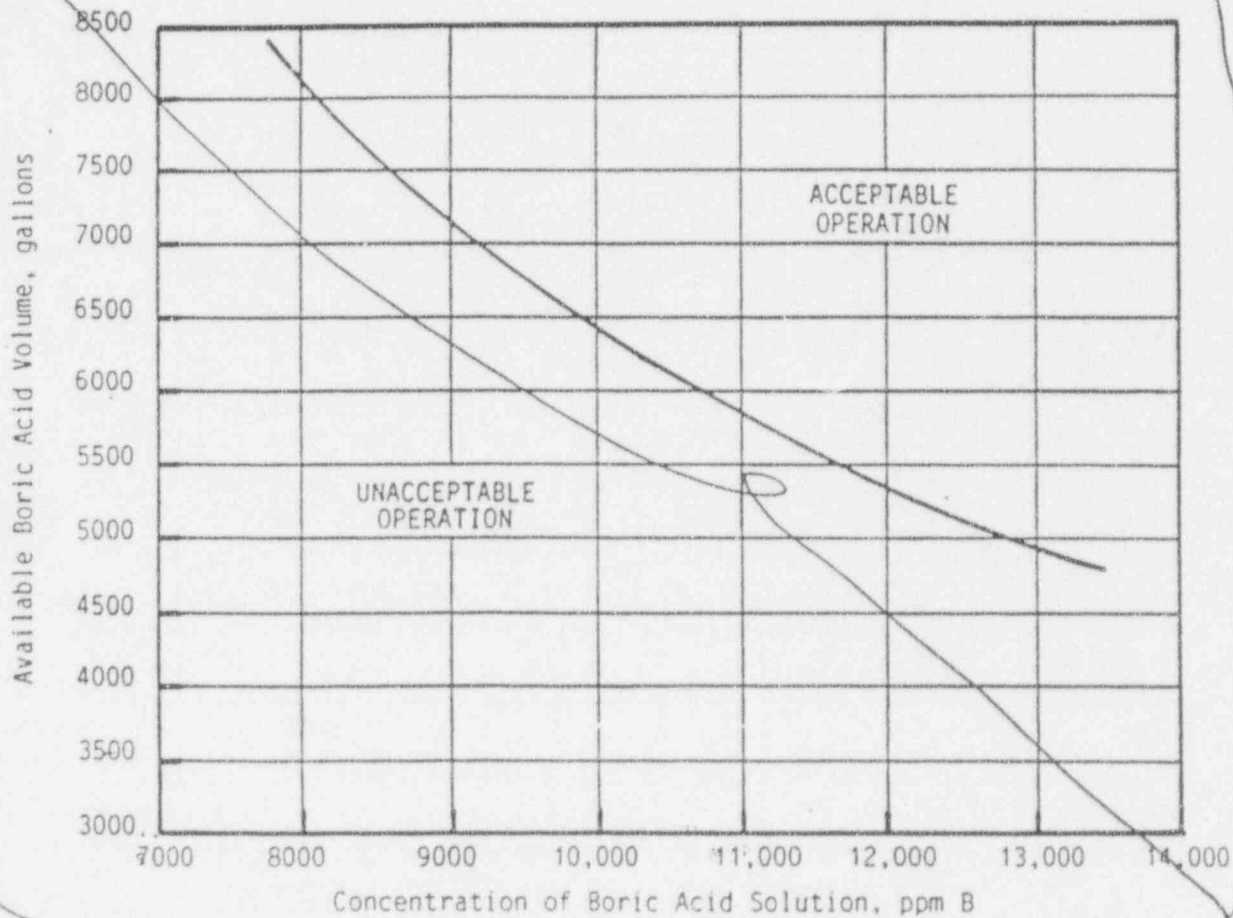
REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

3. Verifying the boric acid addition system solution temperature when it is the source of borated water.
 - b. At least once per 24 hours by verifying the BWST temperature when it is the source of borated water and the outside air temperature is $< 35^{\circ}\text{F}$.

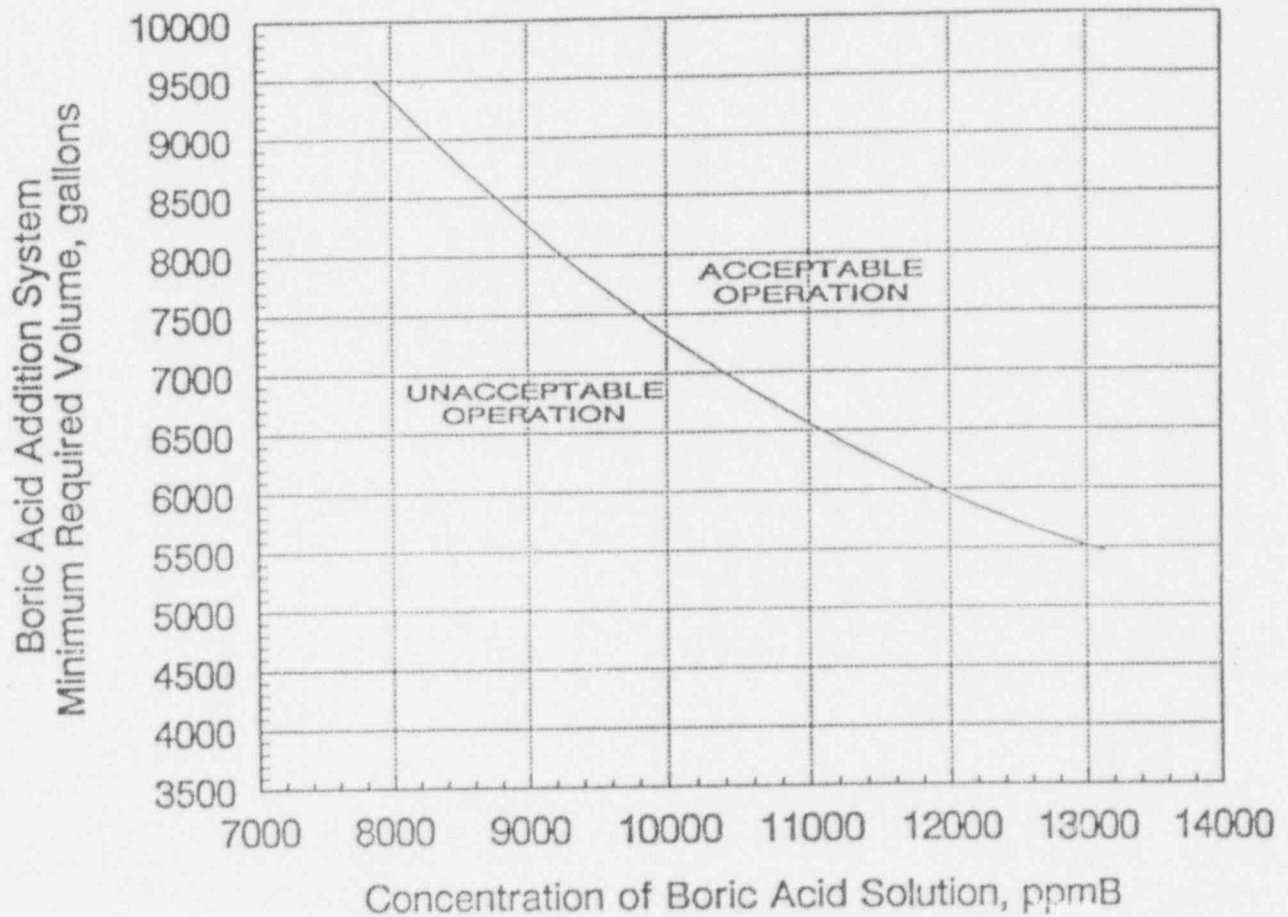
Figure 3.1-1 Minimum Boric Acid Tank Available Volume as Function of Stored Boric Acid Concentration -- Davis-Besse 1

Replace with attached Figure (next page)



Replacement Figure 3.1-1

Figure 3.1-1
Boric Acid Addition System
Minimum Required Volume
as a Function of Boric Acid Concentration
Required in Modes 1-4



REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.9 Each of the following borated water sources shall be OPERABLE:

a. The boric acid addition system ^(BAAS) with:

1. A minimum available borated water volume in accordance with Figure 3.1-1,
2. Between 7875 and 13,125 ppm of boron, and
3. A minimum solution temperature of 105°F.

b. The borated water storage tank (BWST) with:

1. An available borated water volume of between 482,778 and 550,000 gallons,
2. Between ²¹⁰⁰1800 and 2200 ppm of boron, and
3. A minimum solution temperature of 35°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the boric acid addition system ^(BAAS) inoperable, restore the ^{BAAS} storage system to OPERABLE status within 72 hours or be in at least HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to 1% Δk/k at 200°F within the next 6 hours; restore the ~~boric acid addition system~~ ^{BAAS} to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the borated water storage tank inoperable, restore the tank to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

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INSERT (3/4.1.2.9 Action)

- b. With the BWST inoperable because of boron concentration or temperature not within limits, restore the BWST to OPERABLE status within 8 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.
- c. With the BWST inoperable for reasons other than boron concentration or temperature not within limits, restore the BWST to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS

4.1.2.9 Each borated water source shall be demonstrated OPERABLE:

a. At least once per 7 days by:

2. Verifying the boron concentration in each water source, and
1. Verifying the available borated water volume of each water source, and
3. Verifying the ^{BAAS}boric acid addition system solution temperature.

b. At least once per 24 hours by verifying the BWST temperature when the outside air temperature is < 35°F.

REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the reactor coolant system average temperature less than 525°F. This limitation is required to ensure (1) the moderator temperature coefficient is within its analyzed temperature range, (2) the protective instrumentation is within its normal operating range, (3) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and (4) the reactor pressure vessel is above its minimum RT_{NDT} temperature.

3/4.1.2. BORATION SYSTEMS

The boron injection system ensures that negative reactivity control is available during each mode of facility operation. The components required to perform this function include (1) borated water sources, (2) makeup or DHR pumps, (3) separate flow paths, (4) boric acid pumps, (5) associated heat tracing systems, and (6) an emergency power supply from operable emergency busses.

With the RCS average temperature above 200°F, a minimum of two separate and redundant boron injection systems are provided to ensure single functional capability in the event an assumed failure renders one of the systems inoperable. Allowable out-of-service periods ensure that minor component repair or corrective action may be completed without undue risk to overall facility safety from injection system failures during the repair period. *INSERT (next page)*

The boration capability of either system is sufficient to provide a SHUTDOWN MARGIN from all operating conditions of 1.0% $\Delta k/k$ after xenon decay and cooldown to 200°F. The maximum boration capability requirement occurs from full power equilibrium xenon conditions and requires the equivalent of either ~~7373 gallons of 8742 ppm borated water from the boric acid storage tanks or 52,726 gallons of 1800 ppm borated water from the borated water storage tank.~~

The requirement for a minimum available volume of 482,778 gallons of borated water in the ~~borated water storage tank~~ ensures the capability for borating the RCS to the desired level. The specified quantity of borated water is consistent with the ECCS requirements of Specification 3.5.4; therefore, the larger volume of borated water is specified. *BWST*

With the RCS temperature below 200°F, one injection system is acceptable without single failure consideration on the basis of the

9071 gallons of 7875 ppm borated water from the boric acid addition system (BAAS) or 75,300 gallons of 2100 ppm borated water from the BWST.

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INSERT (Bases 3/4.1.2)

With either the borated water storage tank (BWST) boron concentration or BWST borated water temperature not within limits, the condition must be corrected in eight hours. The eight hour limit to restore the temperature or boron concentration to within limits was developed considering the time required to change boron concentration or temperature and assuming that the contents of the BWST are still available for injection.

REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.2 BORATION SYSTEMS (Continued)

stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity changes in the event the single injection system becomes inoperable.

The boron capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1X $\Delta k/k$ after xenon decay and cooldown from 200°F to 70°F. This condition requires either 600 gallons of 7875 ppm borated water from the boric acid storage system or 3,000 gallons of 1800 ppm borated water from the borated water storage tank.

The bottom 4 inches of the borated water storage tank are not available, and the instrumentation is calibrated to reflect the available volume. All boric acid tank volume is available. The limits on water volume, and boron concentration ensure a pH value of between 7.0 and 11.0 of the solution recirculated within containment after a design basis accident. The pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion cracking on mechanical systems and components.

The OPERABILITY of one boron injection system during REFUELING ensures that this system is available for reactivity control while in MODE 6.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section (1) ensure that acceptable power distribution limits are maintained, (2) ensure that the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of a rod ejection accident. 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.

The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original criteria are met. For example, misalignment of a safety or regulating rod requires a restriction in THERMAL POWER. The reactivity worth of a misaligned rod is limited for the remainder of the fuel cycle to prevent exceeding the assumptions used in the safety analysis.

The position of a rod declared inoperable due to misalignment should not be included in computing the average group position for determining the OPERABILITY of rods with lesser misalignments.

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

CORE FLOODING TANKS

LIMITING CONDITION FOR OPERATION

3.5.1 Each reactor coolant system core flooding tank ^(CFT) shall be OPERABLE with:

- a. The isolation valve open,
- b. A contained borated water volume between 7555 and 8004 gallons of borated water,
- c. Between ²¹⁰⁰~~1800~~ and 3500 ppm of boron, and
- d. A nitrogen cover-pressure of between 575 and 625 psig.

APPLICABILITY: MODES 1, 2 and 3*.

ACTION:

- INSERT (next page)*
- a. With one core flooding tank inoperable, except as a result of a closed isolation valve, restore the inoperable tank to OPERABLE status within one hour or be in HOT SHUTDOWN within the next 12 hours.
 - b. With any core flooding tank inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in HOT STANDBY within one hour and be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each core flooding tank shall be demonstrated OPERABLE:

- a. At least once per 12 hours by:
 - 1. Verifying the contained borated water volume and nitrogen cover-pressure in the tanks, and
 - 2. Verifying that each tank isolation valve is open.

*With Reactor Coolant pressure > 800 psig.

INSERT (3/4.5.1 Action)

- a. With one CFT inoperable because of boron concentration not within limits, restore the inoperable CFT to OPERABLE status within 72 hours or be in HOT STANDBY within the next 6 hours and reduce the RCS pressure to less than 800 psig within the following 12 hours.
- b. With any CFT inoperable for reasons other than boron concentration not within limits, restore the CFT to OPERABLE status within one hour or be in HOT STANDBY within the next 6 hours and reduce the RCS pressure to less than 800 psig within the following 12 hours.

EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- b. At least once per 31 days and within 6 hours of each solution volume increase of ≥ 80 gallons by verifying the boron concentration of the ^{CFT} tank solution.
- c. At least once per 31 days by verifying that power to the isolation valve operator is disconnected by locking the breakers in the open position.
- d. At least once per 18 months by verifying that each core flooding tank isolation valve opens automatically and is interlocked against closing whenever the Reactor Coolant System pressure exceeds 800 psig.

that is not the result of addition from the borated water storage tank (BWST),

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EMERGENCY CORE COOLING SYSTEMS

ECCS SUBSYSTEMS - T_{avg} \geq 280°F

LIMITING CONDITION FOR OPERATION

3.5.2 Two independent ECCS subsystems shall be OPERABLE with each subsystem comprised of:

- a. One OPERABLE high pressure injection (HPI) pump.
- b. One OPERABLE low pressure injection (LPI) pump.
- c. One OPERABLE decay heat cooler, and
- d. An OPERABLE flow path capable of taking suction from the borated water storage tank (BWST) on a safety injection signal and manually transferring suction to the containment sump during the recirculation phase of operation.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

- a. With one ECCS subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.
- b. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

SURVEILLANCE REQUIREMENTS

4.5.2 Each ECCS subsystem shall be demonstrated OPERABLE:

- a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed or otherwise secured in position, is in its correct position.

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SURVEILLANCE REQUIREMENTS (Continued)

- b. At least once per 18 months, or prior to operation after ECCS piping has been drained by verifying that the ECCS piping is full of water by venting the ECCS pump casings and discharge piping high points.
- c. By a visual inspection which verifies that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment emergency sump and cause restriction of the pump suction during LOCA conditions. This visual inspection shall be performed:
 1. For all accessible areas of the containment prior to establishing CONTAINMENT INTEGRITY, and
 2. Of the areas affected within containment at the completion of each containment entry when CONTAINMENT INTEGRITY is established.
- d. At least once per 18 months by:
 1. Verifying that the interlocks:
 - a) Close DH-11 and DH-12 and deenergize the pressurizer heaters, if either DH-11 or DH-12 is open and a simulated reactor coolant system pressure which is greater than the trip setpoint (<438 psig) is applied. The interlock to close DH-11 and/or DH-12 is not required if the valve is closed and 480 V AC power is disconnected from its motor operators.
 - b) Prevent the opening of DH-11 and DH-12 when a simulated or actual reactor coolant system pressure which is greater than the trip setpoint (<438 psig) is applied.
 2. a) A visual inspection of the containment emergency sump which verifies that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of structural distress or corrosion.
 - b) Verifying that on a Borated Water Storage Tank (BWST) Low-Low Level interlock trip, with the motor operators for the BWST outlet isolation valves and the containment emergency sump recirculation valves energized, the BWST Outlet Valve HV-DH7A (HV-DH7B) automatically close in ≤ 75 seconds after the operator manually pushes the control switch to open the Containment Emergency Sump Valve HV-DH9A (HV-DH9B) which should be verified to open in ≤ 75 seconds.
 3. Verifying a total leak rate ≤ 20 gallons per hour for the LPI system at:
 - a) Normal operating pressure or hydrostatic test pressure of > 150 psig for those parts of the system downstream of the pump suction isolation valve, and
 - b) > 45 psig for the piping from the containment emergency sump isolation valve to the pump suction isolation valve.

EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

4. Verifying that a minimum of 72 cubic feet of ~~solid granular~~ trisodium phosphate dodecahydrate (TSP) is contained within the TSP storage baskets. ①
5. Verify that a representative sample of TSP from a TSP storage basket has a density of ≥ 53 lbs/cu ft.
6. Verifying that when a representative sample of 0.25 ± 0.05 lbs of TSP from a TSP storage basket is submerged, without agitation, in 50 ± 5 gallons of $180 \pm 10^\circ\text{F}$ borated water from the BWST, the pH of the mixed solution is raised to > 6 within 4 hours. ②
- e. At least once per 18 months, during shutdown, by ← INSERT (next page)
 1. Verifying that each automatic valve in the flow path actuates to its correct position on a safety injection test signal.
 2. Verifying that each HPI and LPI pump starts automatically upon receipt of a SFAS test signal.
- f. By performing a vacuum leakage rate test of the watertight enclosure for valves DH-11 and DH-12 that assures the motor operators on valves DH-11 and DH-12 will not be flooded for at least 7 days following a LOCA:
 1. At least once per 18 months.
 2. After each opening of the watertight enclosure.
 3. After any maintenance on or modification to the watertight enclosure which could affect its integrity.
- g. By verifying the correct position of each mechanical position stop for valves DH-14A and DH-14B.
 1. Within 4 hours following completion of the opening of the valves to their mechanical position stop or following completion of maintenance on the valve when the LPI system is required to be OPERABLE
 2. At least once per 18 months.

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INSERT (SR 4.5.2.d.6)

6. Verifying that when a representative sample of TSP from a TSP storage basket is submerged, without agitation, in at least one liter of $180 \pm 10^{\circ}\text{F}$ borated water from the BWST, such that the resulting concentration of TSP is less than 0.84 grams per liter, the pH of the mixed solution is raised to ≥ 7 (measured at 77°F) within 4 hours.

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EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- h. By performing a flow balance test, during shutdown, following completion of modifications to the HPI or LPI subsystems that alter the subsystem flow characteristics and verifying the following flow rates:

HPI System - Single Pump

Injection Leg 1-1 \geq 375 gpm at 400 psig*
Injection Leg 1-2 \geq 375 gpm at 400 psig*

Injection Leg 2-1 \geq 375 gpm at 400 psig*
Injection Leg 2-2 \geq 375 gpm at 400 psig*

LPI System - Single Pump

Injection Leg 1 \geq 2650 gpm at 100 psig**
Injection Leg 2 \geq 2650 gpm at 100 psig**

* Reactor coolant pressure at the HPI nozzle in the reactor coolant pump discharge.

** Reactor coolant pressure at the core flood nozzle on the reactor vessel.

EMERGENCY CORE COOLING SYSTEMS

BORATED WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The borated water storage tank (BWST) shall be OPERABLE with:

- a. An available borated water volume of between 482,778 and 550,000 gallons,
- b. Between ²¹⁰⁰~~1800~~ and 2200 ppm of boron, and
- c. A minimum water temperature of 35°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

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With the borated water storage tank inoperable, restore the tank to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The BWST shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 1. Verifying the available borated water volume in the tank,
 2. Verifying the boron concentration of the water.
- b. At least once per 24 hours by verifying the water temperature when outside air temperature <35°F.

INSERT (3/4.5.4 Action)

- a. With the BWST inoperable because of boron concentration or temperature not within limits, restore the BWST to OPERABLE status within 8 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.
- b. With the BWST inoperable for reasons other than boron concentration or temperature not within limits, restore the BWST to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

BASES

3/4.5.1 CORE FLOODING TANKS

The OPERABILITY of each core flooding tank ensures that a sufficient volume of borated water will be immediately forced into the reactor vessel in the event the RCS pressure falls below the pressure of the tanks. This initial surge of water into the vessel provides the initial cooling mechanism during large RCS pipe ruptures.

The limits on volume, boron concentration and pressure ensure that the assumptions used for core flooding tank injection in the safety analysis are met.

The tank power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these tank isolation valves fail to meet single failure criteria, removal of power to the valves is required.

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The limits for operation with a core flooding tank inoperable for any reason except an isolation valve closed minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional tank which may result in unacceptable peak cladding temperatures. If a closed isolation valve cannot be immediately opened, the full capability of one tank is not available and prompt action is required to place the reactor in a mode where this capability is not required.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two independent ECCS subsystems with RCS average temperature $> 280^{\circ}\text{F}$ ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the core flooding tanks is capable of supplying sufficient core cooling to maintain the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long term core cooling capability in the recirculation mode during the accident recovery period.

INSERT (New Paragraphs, Bases 3/4.5.1)

The one hour limit for operation with a core flooding tank (CFT) inoperable for reasons other than boron concentration not within limits minimizes the time the plant is exposed to a possible LOCA event occurring with failure of a CFT, which may result in unacceptable peak cladding temperatures.

With boron concentration for one CFT not within limits, the condition must be corrected within 72 hours. The 72 hour limit was developed considering that the effects of reduced boron concentration on core subcriticality during reflood are minor. Boiling of the ECCS water in the core during reflood concentrates the boron in the saturated liquid that remains in the core. In addition, the volume of the CFTs is still available for injection. Since the boron requirements are based on the average boron concentration of the total volume of both CFTs, the consequences are less severe than they would be if the contents of a CFT were not available for injection.

The completion times to bring the plant to a MODE in which the Limiting Condition for Operation (LCO) does not apply are reasonable based on operating experience. The completion times allow plant conditions to be changed in an orderly manner and without challenging plant systems.

CFT boron concentration sampling within 6 hours after an 80 gallon volume increase will identify whether inleakage from the RCS has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water inventory is from the borated water storage tank (BWST), because the water contained in the BWST is within CFT boron concentration requirements.

EMERGENCY CORE COOLING SYSTEMS

BASES

With the RCS temperature below 280°F, one OPERABLE ECCS subsystem is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the limited core cooling requirements.

The Surveillance Requirements provided to ensure OPERABILITY of each component ensures that, at a minimum, the assumptions used in the safety analyses are met and that subsystem OPERABILITY is maintained. The decay heat removal system leak rate surveillance requirements assure that the leakage rates assumed for the system during the recirculation phase of the low pressure injection will not be exceeded.

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Surveillance requirements for throttle valve position stops and flow balance testing provide assurance that proper ECCS flows will be maintained in the event of a LOCA. Maintenance of proper flow resistance and pressure drop in the piping system to each injection point is necessary to: (1) prevent total pump flow from exceeding runout conditions when the system is in its minimum resistance configuration, (2) provide the proper flow split between injection points in accordance with the assumptions used in the ECCS-LOCA analyses, and (3) provide an acceptable level of total ECCS flow to all injection points equal to or above that assumed in the ECCS-LOCA analyses.

Containment Emergency Sump Recirculation Valves DH-9A and DH-9B are de-energized during MODES 1, 2, 3 and 4 to preclude postulated inadvertent opening of the valves in the event of a Control Room fire, which could result in draining the Borated Water Storage Tank to the Containment Emergency Sump and the loss of this water source for normal plant shutdown. Re-energization of DH-9A and DH-9B is permitted on an intermittent basis during MODES 1, 2, 3 and 4 under administrative controls. Station procedures identify the precautions which must be taken when re-energizing these valves under such controls.

Borated Water Storage Tank (BWST) outlet isolation valves DH-7A and DH-7B are de-energized during MODES 1, 2, 3, and 4 to preclude postulated inadvertent closure of the valves in the event of a fire, which could result in a loss of the availability of the BWST. Re-energization of valves DH-7A and DH-7B is permitted on an intermittent basis during MODES 1, 2, 3, and 4 under administrative controls. Station procedures identify the precautions which must be taken when re-energizing these valves under such controls.

3/4.5.4 BORATED WATER STORAGE TANK

← INSERT (next page)

The OPERABILITY of the borated water storage tank (BWST) as part of the ECCS ensures that a sufficient supply of borated water is available for injection by the ECCS in the event of a LOCA. The limits on BWST minimum volume and boron concentration ensure that 1) sufficient water is available within containment to permit recirculation cooling flow to the core, and 2) the reactor will remain subcritical in the cold condition following mixing of the BWST and the RCS water volumes with all control rods inserted except for the most reactive control assembly. These assumptions are consistent with the LOCA analysis.

The bottom 4 inches of the ^{BWST} borated water storage tank are not available, and the instrumentation is calibrated to reflect the available volume. The limits on water volume, and boron concentration ensure a pH value of between 7.0 and 11.0 of the solution sprayed within the containment after a design basis accident. The pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion cracking on mechanical systems and components.

INSERT (New Paragraphs, Bases 3/4.5.2 and 3/4.5.3)

The function of the trisodium phosphate dodecahydrate (TSP) contained in baskets in the containment normal sump is to neutralize the acidity of the post-LOCA borated water mixture prior to establishing containment emergency sump recirculation. The borated water storage tank (BWST) borated water has a nominal pH value of approximately 5. Raising the borated water mixture to a pH value of 7 will ensure that chloride stress corrosion does not occur in austenitic stainless steels in the event that chloride levels increase as a result of contamination on the surfaces of the reactor containment building. Also, a pH of 7 is assumed for the containment emergency sump for iodine retention and removal post-LOCA by the containment spray system.

The Surveillance Requirements (SR) associated with TSP ensure that the minimum amount and density of TSP is stored in the baskets, and that the TSP in the baskets is sufficient to provide adequate, post-LOCA, long-term pH adjustment.

INSERT (Bases 3/4.5.4)

The OPERABILITY of the borated water storage tank (BWST) as part of the ECCS ensures that a sufficient supply of borated water is available for injection by the ECCS in the event of a LOCA. The limits on the BWST minimum volume and boron concentration ensure that:

- 1) sufficient water is available within containment to permit recirculation cooling flow to the core following manual switchover to the recirculation mode, and
- 2) The reactor will remain at least $1\% \Delta k/k$ subcritical in the cold condition at 70°F, xenon free, while only crediting 50% of the control rods' worth following mixing of the BWST and the RCS water volumes.

These assumptions ensure that the reactor remains subcritical in the cold condition following mixing of the BWST and the RCS water volumes.

With either the BWST boron concentration or BWST borated water temperature not within limits, the condition must be corrected in eight hours. The eight hour limit to restore the temperature or boron concentration to within limits was developed considering the time required to change boron concentration or temperature and assuming that the contents of the BWST are still available for injection.

SPECIAL TEST EXCEPTIONS

SHUTDOWN MARGIN



LIMITING CONDITION FOR OPERATION

3.10.4 The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 may be suspended for measurement of control rod worth and shutdown margin provided:

- a. Reactivity equivalent to at least the highest estimated control rod worth is available for trip insertion from OPERABLE control rod(s), and
- b. All axial power shaping rods are withdrawn to at least 35% (indicated position) and OPERABLE.

APPLICABILITY: MODE 2.

ACTION:

- a. With any safety or regulating control rod not fully inserted and with less than the above reactivity equivalent available for trip insertion or the axial power shaping rods not within their withdrawal limits, immediately initiate and continue boration at 25 ~~> 18~~ gpm of 7875 ppm boric acid solution or its equivalent until the SHUTDOWN MARGIN required by Specification 3.1.1.1 is restored. 
- b. With all safety or regulating control rods fully inserted and the reactor subcritical by less than the above reactivity equivalent, immediately initiate and continue boration at 25 ~~18~~ gpm of 7875 ppm boric acid solution or its equivalent until the SHUTDOWN MARGIN required by Specification 3.1.1.1 is restored. 

SURVEILLANCE REQUIREMENTS

4.10.4.1 The position of each safety, regulating, and axial power shaping rod either partially or fully withdrawn shall be determined at least once per 2 hours.

4.10.4.2 Each safety or regulating control rod not fully inserted shall be demonstrated capable of full insertion when tripped from at least the 50% withdrawn position within 24 hours prior to reducing the SHUTDOWN MARGIN to less than the limits of Specification 3.1.1.1.

**THIS PAGE PROVIDED
FOR INFORMATION ONLY**

3/4.10 SPECIAL TEST EXCEPTIONS

BASES

3/4.10.1 GROUP HEIGHT, INSERTION AND POWER DISTRIBUTION LIMITS

This special test exception permits individual control rods to be positioned outside of their specified group heights and insertion limits and to be assigned to other than specified control rod groups, and permits AXIAL POWER IMBALANCE and QUADRANT POWER TILT limits to be exceeded during the performance of such PHYSICS TESTS as those required to 1) measure control rod worth, 2) determine the reactor stability index and damping factor under xenon oscillation conditions and 3) calibrate AXIAL POWER IMBALANCE and QUADRANT POWER TILT instrumentation.

3/4.10.2 PHYSICS TESTS

This special test exception permits PHYSICS TESTS to be performed at less than or equal to 5% of RATED THERMAL POWER and is required to verify the fundamental nuclear characteristics of the reactor core and related instrumentation.

3/4.10.3 REACTOR COOLANT LOOPS

This special test exception permits reactor criticality under various flow conditions and is required in order to perform certain startup and PHYSICS TESTS while at low THERMAL POWER levels.

3/4.10.4 SHUTDOWN MARGIN

This special test exception provides that a minimum amount of control rod worth is immediately available for reactivity control when tests are performed for control rod worth measurement. This special test exception is required to permit the periodic verification of the actual versus predicted core reactivity condition occurring as a result of fuel burnup or fuel cycling operations.