

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

SAFETY INJECTION TANKS (SIT)

ADD

LIMITING CONDITION FOR OPERATION

3.5.1 Each reactor coolant system safety injection tank shall be OPERABLE with:

- a. The isolation valve open,
- b. Between 1090 and 1170 cubic feet of borated water,
- c. A minimum boron concentration of 1720 PPM, and
- d. A nitrogen cover-pressure of between 200 and 250 psig.

APPLICABILITY: MODES 1, 2 and 3.\*

ACTION:

~~a. With one safety injection 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 8 hours.~~

~~b. With one safety injection 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 8 hours.~~

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REPLACE WITH INSERT-B

SURVEILLANCE REQUIREMENTS

4.5.1 Each safety injection tank shall be demonstrated OPERABLE:

- a. At least once per 12 hours by:
  - 1. Verifying ~~the water level~~ *borated water volume* and nitrogen cover-pressure in the tanks, and *are within their limits*
  - 2. Verifying that each safety injection tank isolation valve is open.

\* With pressurizer pressure  $\geq$  1750 psia.

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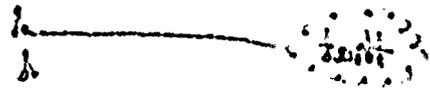


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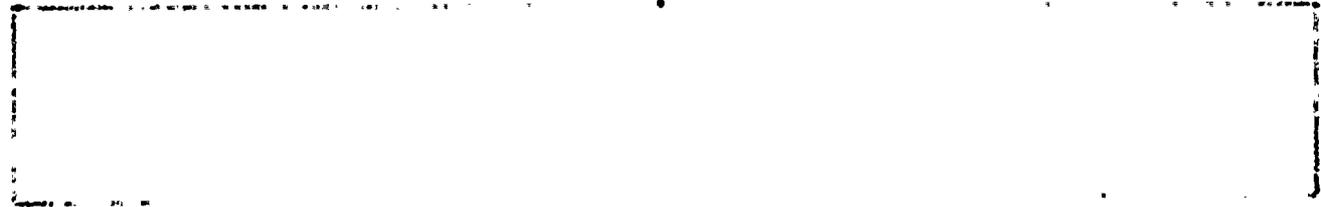
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Safety Injection Tank AOT Extension

INSERT - A

- a. With one SIT inoperable due to boron concentration not within limits, or due to an inability to verify the required water volume or nitrogen cover-pressure, restore the inoperable SIT to OPERABLE status within 72 hours; otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

INSERT - B

- b. With one SIT inoperable due to reasons other than those stated in ACTION-a, restore the inoperable SIT to OPERABLE status within 24 hours; otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.



EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least <sup>once</sup> per 31 days and within 6 hours after each solution volume increase of  $\geq 1\%$  of tank volume by verifying the boron concentration of the safety injection tank solution. This <sup>latter</sup> surveillance is not required when the volume increase makeup source is the RWT and the RWT has not been diluted since verifying that the RWT boron concentration is equal to or greater than the safety injection tank boron concentration limit. Add

c. At least once per 31 days when the RCS pressure is above 1750 psia, by verifying that power to the isolation valve operator is removed by maintaining the breaker open under administrative control.

d. At least once per 18 months by verifying that each safety injection tank isolation valve opens automatically under each of the following conditions ~~make it~~:

1. When the RCS pressure exceeds 350 psia, and
  2. Upon receipt of a safety injection test signal.
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### 3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

#### BASES

#### 3/4.5.1 SAFETY INJECTION TANKS

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

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

~~The limit of one hour for operation with an inoperable safety injection tank minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional safety injection tank which may result in unacceptable peak cladding temperatures.~~

REPLACE  
WITH  
INSERT-C

#### 3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two separate and independent ECCS subsystems 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 safety injection tanks is capable of supplying sufficient core cooling to limit 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.

The Surveillance Requirements provided to ensure OPERABILITY of each component ensure that at a minimum, the assumptions used in the accident analyses are met and that subsystem OPERABILITY is maintained.

The limitations on HPSI pump operability when the RCS temperature is  $\leq 270^{\circ}\text{F}$  and  $\leq 236^{\circ}\text{F}$ , and the associated Surveillance Requirements provide additional administrative assurance that the pressure/temperature limits (Figures 3.4-2a and 3.4-2b) will not be exceeded during a mass addition transient mitigated by a single PORV.

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INSERT - C

The limit of 72 hours for operation with an SIT that is inoperable due to boron concentration not within limits, or due to the inability to verify liquid volume or cover-pressure, considers that the volume of the SIT is still available for injection in the event of a LOCA. If one SIT is inoperable for other reasons, the SIT may be unable to perform its safety function and, based on probability risk assessment, operation in this condition is limited to 24 hours.

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ATTACHMENT 4

ST. LUCIE UNIT 2 MARKED-UP TECHNICAL SPECIFICATION PAGES

Page 3/4 5-1

INSERT-A/INSERT-B

Page 3/4 5-2

Page B 3/4 5-1

INSERT - C

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3/4.5.1 SAFETY INJECTION TANKS (SIT) ← ADD

LIMITING CONDITION FOR OPERATION

3.5.1 Each Reactor Coolant System safety injection tank shall be OPERABLE with:

- a. The isolation valve open,
- b. A contained borated water volume of between 1420 and 1556 cubic feet,
- c. A boron concentration of between 1720 and 2100 ppm of boron, and
- d. A nitrogen cover-pressure of between 500 and 650 psig.

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

ACTION:

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a. ~~With one safety injection tank inoperable, except as a result of a closed isolation valve, restore the inoperable tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.~~

REPLACE  
w/  
INSERT-B

b. ~~With one safety injection tank inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in at least HOT STANDBY within 1 hour and be in HOT SHUTDOWN within the next 12 hours.~~

SURVEILLANCE REQUIREMENTS

4.5.1.1 Each safety injection tank shall be demonstrated OPERABLE:

- a. At least once per 12 hours by:

that

- 1. ~~Verifying (by the absence of alarms) the contained borated water volume and nitrogen cover-pressure in the tanks, and~~ <sup>insert</sup> *are within their limits*
- 2. Verifying that each safety injection tank isolation valve is open.

\*With pressurizer pressure greater than or equal to 1750 psia. When pressurizer pressure is less than 1750 psia, at least three safety injection tanks shall be OPERABLE, each with a minimum pressure of 235 psig and a maximum pressure of 650 psig and a contained water volume of between 1250 and 1556 cubic feet with a boron concentration of between 1720 and 2100 ppm of boron. With all four safety injection tanks OPERABLE, each tank shall have a minimum pressure of 235 psig and a maximum pressure of 650 psig and a contained water volume of between 833 and 1556 cubic feet with a boron concentration of between 1720 and 2100 ppm of boron. In MODE 4 with pressurizer pressure less than 276 psia, the safety injection tanks may be isolated.

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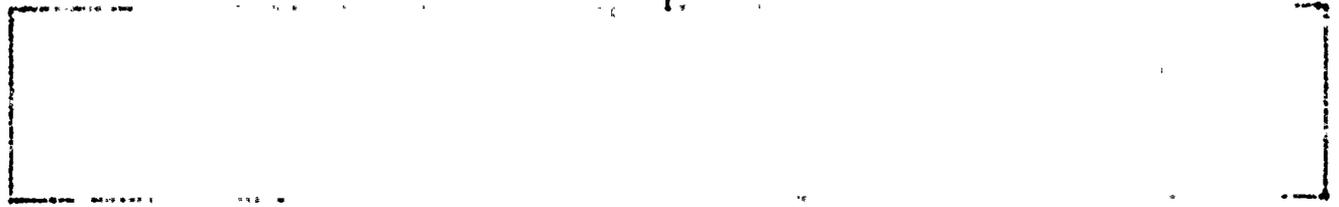
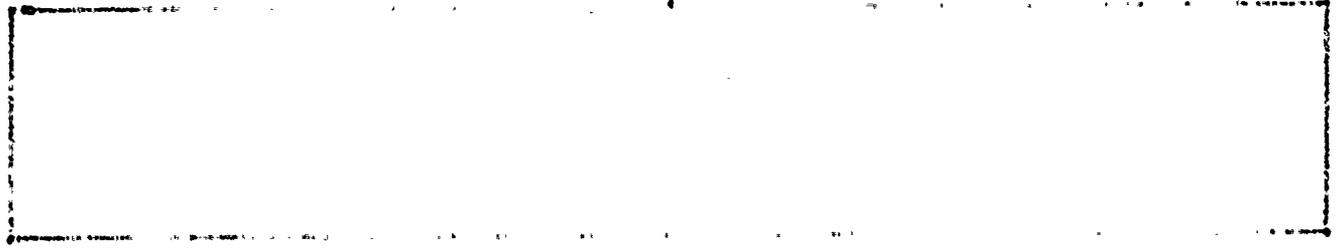
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INSERT - A

- a. With one SIT inoperable due to boron concentration not within limits, or due to an inability to verify the required water volume or nitrogen cover-pressure, restore the inoperable SIT to OPERABLE status within 72 hours; otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

INSERT - B

- b. With one SIT inoperable due to reasons other than those stated in ACTION-a, restore the inoperable SIT to OPERABLE status within 24 hours; otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.



EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least <sup>once</sup> per 31 days and within 6 hours after each solution volume increase of greater than or equal to 1% of tank volume by verifying the boron concentration of the safety injection tank solution. <sup>latter</sup> This surveillance is not required when the volume increase makeup source is the RWT and the RWT has not been diluted since verifying that the RWT boron concentration is equal to or greater than the safety injection tank boron concentration limit.

c. At least once per 31 days when the RCS pressure is above 700 psia, by verifying that power to the isolation valve operator is disconnected by maintaining the breaker open by administrative controls.

d. At least once per 18 months by verifying that each safety injection tank isolation valve opens automatically under each of the following conditions:

1. When an actual or simulated RCS pressure signal exceeds 515 psia, and
2. Upon receipt of a safety injection test signal.

~~4.5.1.2 Each safety injection tank water level and pressure channel shall be demonstrated OPERABLE:~~

- ~~a. At least once per 31 days by the performance of a CHANNEL FUNCTIONAL TEST.~~
- ~~b. At least once per 18 months by the performance of a CHANNEL CALIBRATION.~~

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### 3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

#### BASES

#### 3/4.5.1 SAFETY INJECTION TANKS

The OPERABILITY of each of the Reactor Coolant System (RCS) safety injection tanks ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs in the event the RCS pressure falls below the pressure of the safety injection tanks. This initial surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures.

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

The safety injection 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 safety injection tank isolation valves fail to meet single failure criteria, removal of power to the valves is required.

~~The limits for operation with a safety injection 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 safety injection tank which may result in unacceptable peak cladding temperatures. If a closed isolation valve cannot be immediately opened, the full capability of one safety injection tank is not available and prompt action is required to place the reactor in a mode where this capability is not required.~~

REPLACES  
WITH  
INSERT-C

#### 3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two separate and independent ECCS subsystems 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 safety injection tanks is capable of supplying sufficient core cooling to limit the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double-ended break of the largest RCS hot leg pipe downward. In addition, each ECCS subsystem provides long-term core cooling capability in the recirculation mode during the accident recovery period.

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INSERT - C

The limit of 72 hours for operation with an SIT that is inoperable due to boron concentration not within limits, or due to the inability to verify liquid volume or cover-pressure, considers that the volume of the SIT is still available for injection in the event of a LOCA. If one SIT is inoperable for other reasons, the SIT may be unable to perform its safety function and, based on probability risk assessment, operation in this condition is limited to 24 hours.

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L-95-134

ENCLOSURE

Joint Applications Report

for .

SAFETY INJECTION TANK AOT/STI EXTENSION

CE NPSD-994, Final Report CEOG Task 836; May, 1995,  
with PSL1 and PSL2 corrections to Table 6.3.2-1

**ATTACHMENT A**

**"Mark-up" of NUREG-1432 SECTIONS 3.5.1 & B 3.5.1**

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.1 Safety Injection Tanks (SITs)

LCO 3.5.1 [Four] SITs shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,  
MODE 3 with pressurizer pressure  $\geq$  [700] psia.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SIT inoperable due to boron concentration not within limits.	A.1 Restore boron concentration to within limits.	72 hours
<i>INSERT A</i> C <del>/</del> . One SIT inoperable for reasons other than Condition A <i>or B</i>	C <del>/</del> .1 Restore SIT to OPERABLE status.	<del>1 hour</del> 24 hours
D <del>/</del> . Required Action and associated Completion Time of Condition A or B not met. <i>or C</i>	D <del>/</del> .1 Be in MODE 3. AND D <del>/</del> .2 Reduce pressurizer pressure to < [700] psia.	6 hours 12 hours
E <del>/</del> . Two or more SITs inoperable.	E <del>/</del> .1 Enter LCO 3.0.3.	Immediately

INSERT A

B. One SIT inoperable due to inability to verify level or pressure.	B.1 Restore SIT to OPERABLE status.	.72 hours
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BASES

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ACTIONS

A.1 (continued)

injection. Thus, 72 hours is allowed to return the boron concentration to within limits.

INSERT AA →

INSERT AB →

~~B.1~~  
 If one SIT is inoperable, for a reason other than boron concentration, the SIT must be returned to OPERABLE status within 1 hour. In this Condition, the required contents of three SITs cannot be assumed to reach the core during a LOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 1 hour Completion Time to open the valve, remove power to the valve, or restore the proper water volume or nitrogen cover pressure ensures that prompt action will be taken to return the inoperable accumulator to OPERABLE status. The Completion Time minimizes the exposure of the plant to a LOCA in these conditions.

~~D.1 and D.2~~

If the SIT cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to < 700 psia within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

~~E.1~~

If more than one SIT is inoperable, the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

(continued)

## INSERT AA

### B.1

Section 7.4 of Reference 5, NUREG-1366, discusses surveillance requirements in technical specifications for the instrument channels used in the measurement of water level and pressure in SITs.

The following statement is made in Section 7.4 of Reference 5:

"The combination of redundant level and pressure instrumentation [for any single SIT] may provide sufficient information so that it may not be worthwhile to always attempt to correct drift associated with one instrument [with resulting radiation exposures during entry into containment] if there were sufficient time to repair one in the event that a second one became inoperable. Because these instruments do not initiate a safety action, it is reasonable to extend the allowable outage for them. The [NRC] staff, therefore, recommends that an additional condition be established for the specific case, where "One accumulator [SIT] is inoperable due to the inoperability of water level and pressure channels," in which the completion time to restore the accumulator to operable status will be 72 hours. While technically inoperable, the accumulator would be available to fulfill its safety function during this time and, thus, this change would have a negligible increase in risk."

## INSERT AB

### C.1

If one SIT is inoperable, for a reason other than boron concentration or the inability to verify level or pressure, the SIT must be returned to OPERABLE status within 24 hours. In this Condition, the required contents of three SITs cannot be assumed to reach the core during a LOCA as is assumed in Appendix K to 10 CFR 50.

Reference 6 provides a series of deterministic and probabilistic findings that support 24 hours as being either "risk beneficial" or "risk neutral" in comparison to shorter periods for restoring the SIT to OPERABLE status. Reference 6 discusses best-estimate analysis that confirmed that, during large-break LOCA scenarios, core melt can be prevented by either operation of one Low Pressure Safety Injection (LPSI) pump or the operation of one High Pressure Safety Injection (HPSI) pump and a single SIT. Reference 6 also discusses plant-specific probabilistic analysis that evaluated the risk-impact of the 24 hour recovery period in comparison to shorter recovery periods.

BASES (continued)

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SURVEILLANCE  
REQUIREMENTS

SR 3.5.1.1

Verification every 12 hours that each SIT isolation valve is fully open, as indicated in the control room, ensures that SITs are available for injection and ensures timely discovery if a valve should be partially closed. If an isolation valve is not fully open, the rate of injection to the RCS would be reduced. Although a motor operated valve should not change position with power removed, a closed valve could result in not meeting accident analysis assumptions. A 12 hour Frequency is considered reasonable in view of other administrative controls that ensure the unlikelihood of a mispositioned isolation valve.

SR 3.5.1.2 and SR 3.5.1.3

SIT borated water volume and nitrogen cover pressure should be verified to be within specified limits every 12 hours in order to ensure adequate injection during a LOCA. Due to the static design of the SITs, a 12 hour Frequency usually allows the operator sufficient time to identify changes before the limits are reached. Operating experience has shown this Frequency to be appropriate for early detection and correction of off normal trends.

SR 3.5.1.4

Thirty-one days is reasonable for verification to determine that each SIT's boron concentration is within the required limits, because the static design of the SITs limits the ways in which the concentration can be changed. The 31 day Frequency is adequate to identify changes that could occur from mechanisms such as stratification or inleakage. Sampling the affected SIT within 6 hours after a 1% volume increase will identify whether inleakage has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water is from the RWT, because the water contained in the RWT is within the SIT boron concentration requirements. This is consistent with the recommendations of NUREG-1366 (Ref. 5).

↑  
INSERT AC

(continued)

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, Reference 6, and Reference 7.

BASES

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SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.1.5

Verification every 31 days that power is removed from each SIT isolation valve operator when the pressurizer pressure is  $\geq 2000$  psia ensures that an active failure could not result in the undetected closure of an SIT motor operated isolation valve. If this were to occur, only two SITs would be available for injection, given a single failure coincident with a LOCA. Since installation and removal of power to the SIT isolation valve operators is conducted under administrative control, the 31 day Frequency was chosen to provide additional assurance that power is removed.

This SR allows power to be supplied to the motor operated isolation valves when RCS pressure is  $< 2000$  psia, thus allowing operational flexibility by avoiding unnecessary delays to manipulate the breakers during unit startups or shutdowns. Even with power supplied to the valves, inadvertent closure is prevented by the RCS pressure interlock associated with the valves. Should closure of a valve occur in spite of the interlock, the SI signal provided to the valves would open a closed valve in the event of a LOCA.

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REFERENCES

1. IEEE Standard 279-1971.
2. FSAR, Section [6.3].
3. 10 CFR 50.46.
4. FSAR, Chapter [15]. *December 1992*
5. ~~Draft~~ NUREG-1366, ~~February 1990~~.

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6. NRC Generic Letter 93-05, "Line-Item Technical Specifications Improvements To Reduce Surveillance Requirements For Testing During Power Operations," September 27, 1993
7. CE NPSD-994, "CEOG Joint Applications Report for Safety Injection Tank AOT/STI Extension," April 1995.