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**3.3 EMERGENCY CORE COOLING, REACTOR BUILDING EMERGENCY COOLING AND REACTOR BUILDING SPRAY SYSTEMS (Contd.)**

- b. **CFT** boron concentration shall not be less than 2,270 ppm boron. Specification 3.3.2.1 applies.
- c. The electrically operated discharge valves from the **CFT** will be assured open by administrative control and position indication lamps on the engineered safeguards status panel. Respective breakers for these valves shall be open and conspicuously marked. A one hour time clock is provided to open the valve and remove power to the valve. Specification 3.0.1 applies.
- d. DELETED
- e. **CFT** vent valves CF-V-3A and CF-V-3B shall be closed and the breakers to the **CFT** vent valve motor operators shall be tagged open, except when adjusting core flood tank level and/or pressure. Specification 3.0.1 applies.

**3.3.1.3 Reactor Building Spray System and Reactor Building Emergency Cooling System**

The following components must be OPERABLE:

- a. Two reactor building spray pumps and their associated spray nozzles headers and two reactor building emergency cooling fans and associated cooling units (one in each train). Specification 3.0.1 applies.
- b. The sodium hydroxide (NaOH) tank shall be maintained at 8 ft.  $\pm 6$  inches lower than the BWST level as measured by the BWST/NaOH tank differential pressure indicator. The NaOH tank concentration shall be 10.0  $\pm .5$  weight percent (%). Specification 3.3.2.1 applies.
- c. All manual valves in the discharge lines of the **NaOH** tank shall be locked open. Specification 3.3.2.1 applies.

**3.3.1.4 Cooling Water Systems - Specification 3.0.1 applies.**

- a. Two nuclear service closed cycle cooling water pumps must be OPERABLE.
- b. Two nuclear service river water pumps must be OPERABLE.
- c. Two decay heat closed cycle cooling water pumps must be OPERABLE.
- d. Two decay heat river water pumps must be OPERABLE.
- e. Two reactor building emergency cooling river water pumps must be OPERABLE.

**3.3.1.5 Engineered Safeguards Valves and Interlocks Associated with the Systems in Specifications 3.3.1.1, 3.3.1.2, 3.3.1.3, 3.3.1.4 are OPERABLE. Specification 3.0.1 applies.**

### **3.3 EMERGENCY CORE COOLING, REACTOR BUILDING EMERGENCY COOLING AND REACTOR BUILDING SPRAY SYSTEMS (Contd.)**

- 3.3.2 Maintenance or testing shall be allowed during reactor operation on any component(s) in the makeup and purification, decay heat, RB emergency cooling water, RB spray, BWST level instrumentation, or cooling water systems which will not remove more than one train of each system from service. Components shall not be removed from service so that the affected system train is inoperable for more than 72 consecutive hours. If the system is not restored to meet the requirements of Specification 3.3.1 within 72 hours, the reactor shall be placed in a HOT SHUTDOWN condition within six hours.
- 3.3.2.1 If the CFT boron concentration is outside of limits, or NaOH tank is outside the limits of 3.3.1.3.b or any manual valve in the NaOH tank discharge lines are not locked open, restore the system to operable status within 72 hours. If the system is not restored to meet the requirements of Specification 3.3.1 within 72 hours, the reactor shall be placed in a HOT SHUTDOWN condition within six hours.
- 3.3.3 Exceptions to 3.3.2 shall be as follows:
- a. Both **CFTs** shall be **OPERABLE** at all times.
  - b. Both the motor operated valves associated with the **CFTs** shall be fully open at all times.
  - c. One reactor building cooling fan and associated cooling unit shall be permitted to be out-of-service for seven days.
- 3.3.4 Prior to initiating maintenance on any of the components, the duplicate (redundant) component shall be verified to be **OPERABLE**.

#### **Bases**

The requirements of Specification 3.3.1 assure that, before the reactor can be made critical, adequate engineered safety features are operable. Two engineered safeguards makeup pumps, two decay heat removal pumps and two decay heat removal coolers (along with their respective cooling water systems components) are specified. However, only one of each is necessary to supply emergency coolant to the reactor in the event of a loss-of-coolant accident. Both **CFTs** are required because a single **CFT** has insufficient inventory to reflood the core for hot and cold line breaks (Reference 1).

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 (Reference 2). 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 at least one percent subcritical following a Loss-of-Coolant Accident (LOCA).

The contained water volume limit of 350,000 gallons includes an allowance for water not usable because of tank discharge location and sump recirculation switchover setpoint. The limits on contained water volume, NaOH concentration and boron concentration ensure a pH value of

### 3.3 EMERGENCY CORE COOLING, REACTOR BUILDING EMERGENCY COOLING AND REACTOR BUILDING SPRAY SYSTEMS (Contd.)

#### Bases (Contd.)

between 8.0 and 11.0 of the solution sprayed within containment after a design basis accident. The minimum pH of 8.0 assures that iodine will remain in solution while the maximum pH of 11.0 minimizes the potential for caustic damage to mechanical systems and components. Redundant heaters maintain the borated water supply at a temperature greater than 40°F.

**Maintaining MUT pressure and level within the limits of Fig 3.3-1 ensures that MUT gas will not be drawn into the pumps for any design basis accident. Preventing gas entrainment of the pumps is not dependent upon operator actions after the event occurs. The plant operating limits (alarms and procedures) will include margins to account for instrument error.**

The post-accident reactor building emergency cooling may be accomplished by three emergency cooling units, by two spray systems, or by a combination of one emergency cooling unit and one spray system. The specified requirements assure that the required post-accident components are available.

The iodine removal function of the reactor building spray system requires one spray pump and sodium hydroxide tank contents.

The spray system utilities common suction lines with the decay heat removal system. If a single train of equipment is removed from either system, the other train must be assured to be operable in each system.

When the reactor is critical, maintenance is allowed per Specification 3.3.2 and 3.3.3 provided requirements in Specification 3.3.4 are met which assure operability of the duplicate components. The specified maintenance times are a maximum. Operability of the specified components shall be based on the satisfactory completion of surveillance and inservice testing and inspection required by Technical Specification 4.2 and 4.5.

The allowable maintenance period of up to 72 hours may be utilized if the operability of equipment redundant to that removed from service is verified based on the results of surveillance and inservice testing and inspection required by Technical Specification 4.2 and 4.5.

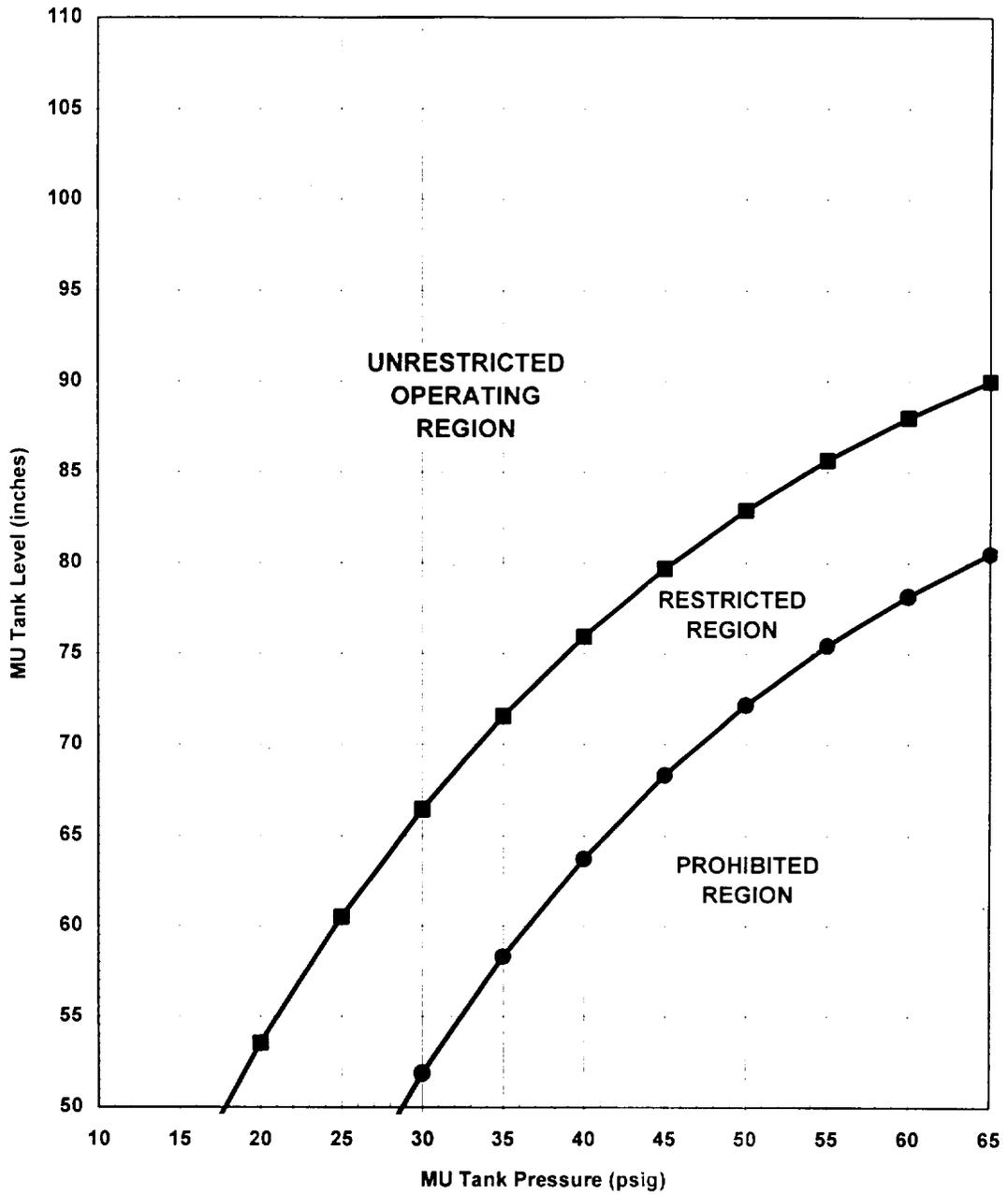
In the event that the need for emergency core cooling should occur, operation of one makeup pump, one decay heat removal pump, and both core flood tanks will protect the core. In the event of a reactor coolant system rupture their operation will limit the peak clad temperature to less than 2,200 °F and the metal-water reaction to that representing less than 1 percent of the clad.

Two nuclear service river water pumps and two nuclear service closed cycle cooling pumps are required for normal operation. The normal operating requirements are greater than the emergency requirements following a loss-of-coolant.

#### REFERENCES

- (1) UFSAR, Section 6.1 - "Emergency Core Cooling System"
- (2) UFSAR, Section 14.2.2.3 - "Large Break LOCA"

**FIGURE 3.3-1**  
**Makeup Tank Pressure vs Level Limits**  
(Instrument Error NOT Included)



## 4.1 OPERATIONAL SAFETY REVIEW

### Applicability

Applies to items directly related to safety limits and limiting conditions for operation.

### Objective

To specify the minimum frequency and type of surveillance to be applied to unit equipment and conditions.

### Specification

- 4.1.1 The minimum frequency and type of surveillance required for reactor protection system, engineered safety feature protection system, and heat sink protection system instrumentation when the reactor is critical shall be as stated in Table 4.1-1.
- 4.1.2 Equipment and sampling test shall be performed as detailed in Tables 4.1-2, 4.1-3, and 4.1-5.
- 4.1.3 Each post-accident monitoring instrumentation channel shall be demonstrated OPERABLE by the performance of the check, test and calibration at the frequencies shown in Table 4.1-4.
- 4.1.4 Each remote shutdown system function shown in Table 3.5-4 shall be demonstrated OPERABLE by the performance of the following check, test, and calibration:
  - a) Perform CHANNEL CHECK for each required instrumentation channel that is normally energized every 31 days.
  - b) Verify each required control circuit and transfer switch is capable of performing the intended function every refueling interval.
  - c) Perform CHANNEL CALIBRATION for each required instrumentation channel every refueling interval (excludes source range flux).

### Bases

### Check

Failures such as blown instrument fuses, defective indicators, or faulted amplifiers which result in "upscale" or "downscale" indication can be easily recognized by simple observation of the functioning of an instrument or system. Furthermore, such failures are, in many cases, revealed by alarm or annunciator action. Comparison of output and/or state of independent channels measuring the same variable supplements this type of built-in surveillance. **The acceptance criteria for the daily check of the Makeup Tank pressure instrument will be maintained within the error used to develop the plant operating limit.** Based on experience in operation of both conventional and nuclear systems, when the unit is in operation, the minimum checking frequency stated is deemed adequate for reactor system instrumentation.

TABLE 4.1-1 (Continued)

<u>CHANNEL DESCRIPTION</u>	<u>CHECK</u>	<u>TEST</u>	<u>CALIBRATE</u>	<u>REMARKS</u>
27. Makeup Tank <b>Instrument Channels:</b>				
<b>a. Level</b>	D(1)	NA	R	(1) When Makeup and Purification System is in operation.
<b>b. Pressure</b>	D(1)	NA	R	
28. Radiation Monitoring Systems*				
a. RM-G6 (FH Bridge #1 Aux)	W(1)(2)	M(2)	Q(2)	(1) Using the installed check source when background is less than twice the expected increase in cpm which would result from the check source alone. Background readings greater than this value are sufficient in themselves to show that the monitor is functioning.
b. RM-G7 (FH Bridge #2 Main)	W(1)(2)	M(2)	Q(2)	
c. RM-G9 (FH Bridge-FH Bldg)	W(1)(3)	M(3)	E(3)	
d. RM-A2P (RB Atmosphere particulate)	W(1)(4)	M(4)	E(4)	
e. RM-A2I (RB Atmosphere iodine)	W(1)(4)	M(4)	Q(4)	
f. RM-A2G (RB Atmosphere gas)	W(1)(4)	M(4)	E(4)	
				(2) RM-G6 and RM-G7 operability requirements are given in T.S. 3.8.1. Surveillances are required to be current only when handling irradiated fuel.
				(3) RM-G9 operability requirements are given in T.S. 3.8.1.
				(4) RM-A2 operability requirements are given in T.S. 3.1.6.8
29. High and Low Pressure Injection Systems: Flow Channels	N/A	N/A	R	

\* Includes only monitors indicated under this item. Other T.S. required radiation monitors are included in specifications 3.5.5.2, 4.1.3, Table 3.5-1 item C.3.f, and Table 4.1-1 item 19e.

TABLE 4.1-1 (Continued)

<u>CHANNEL DESCRIPTION</u>	<u>CHECK</u>	<u>TEST</u>	<u>CALIBRATE</u>	<u>REMARKS</u>
30. Borated Water Storage Tank Level Indicator	W	NA	R	
31. DELETED				
32. DELETED				
33. Containment Temperature	NA	NA	F	
34. Incore Neutron Detectors	M(1)	NA	NA	(1) Check functioning; including functioning of computer readout or recorder readout when reactor power is greater than 15%.
35. Emergency Plant Radiation Instruments	M(1)	NA	F	(1) Battery Check.
36. (DELETED)				
37. Reactor Building Sump Level	NA	NA	R	