ATTACHMENT 1

EXISTING TECHNICAL SPECIFICATIONS

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1
TECHNICAL SPECIFICATIONS
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3.3 SAFETY INJECTION AND CONTAINMENT SPRAY SYSTEMS

3.3.1 OPERATING STATUS

APPLICABILITY: Applies to the operating status of the Safety Injection and Containment Spray Systems.

OBJECTIVE: To define those conditions necessary to ensure availability of the Safety Injection and Containment Spray Systems.

SPECIFICATION: A. The reactor shall not be made or maintained critical unless the following conditions are met. In addition, the reactor coolant system temperature shall not be increased above 200•F unless the containment spray system, the refueling water storage tank and the associated valves and interlocks are operable.

(1) Safety Injection Systems

a. Refueling tank water storage and boron concentration comply with Specification 3.3.3.

b. ESF Switchover automatic trip channel is OPERABLE with the setpoint less than or equal to 20% and greater than or equal to 18% of RWST level.

c. Two safety injection pumps are OPERABLE.

d. Two feed water pumps are OPERABLE.

e. Two recirculation pumps are OPERABLE, except as indicated in item D below.

f. The recirculation heat exchanger is OPERABLE.

g. Two charging pumps are OPERABLE.

h. Two component cooling water pumps are OPERABLE.

i. Two saltwater cooling pumps are OPERABLE. The reactor may be maintained critical with one saltwater cooling pump provided the auxiliary saltwater cooling pump or two screen wash pumps are available as backup. Return the inoperable pump to operable status within 72 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the next 30 hours. The backup pump(s) shall be demonstrated operable by test within 1 hour of declaring the saltwater cooling pump inoperable.

j. A minimum of 5400 pounds of anhydrous trisodium phosphate is stored in the containment sump in racks provided.

(2) Containment Spray System

a. Two refueling water pumps are OPERABLE.

b. Two hydrazine additive pumps are OPERABLE.

c. Hydrazine tank level and hydrazine concentration comply with Specification 3.3.4.

(3) Valves and interlocks associated with each of the above systems are OPERABLE.

(4) Effective leakage from the recirculation loop outside the containment shall be less than 625 cc/hr as calculated from the following formula.

$$\text{Effective Leakage} = a_1 \times L_1 + a_2 \times L_2 + a_3 \times L_3$$

where,

L_1 = pump and valve leakage which drains to auxiliary building sump

L_2 = valve leakage in auxiliary building or doghouse

L_3 = valve leakage outside

a_1 = iodine release factor for leakage in auxiliary building sump

a_2 = iodine release factor for leakage in auxiliary building or doghouse

a_3 = iodine release factor for leakage outside the auxiliary building or doghouse

If effective leakage from the recirculating loop outside the containment exceeds 625 cc/hr, make necessary repairs to limit leakage to 625 cc/hr. within 72 hours or be in COLD SHUTDOWN within the next 36 hours.

B. During critical operation or when the reactor coolant system temperature is above 200°F, as appropriate per Item A above, maintenance shall be allowed on any one of the following items at any one time:

(1) One motor-operated valve at a time (MOV 1100B or 1100D) in the recirculation loop upstream of the charging pump suction header for a period of time not longer than 72 consecutive hours.

(2) One refueling water pump and/or its associated discharge valve at a time, for a period not longer than 72 consecutive hours.

(3) One hydrazine pump and/or its associated discharge valve (SV600 or 601) at a time, for a period of time not longer than 72 consecutive hours.

(4) One charging pump for a period of time not longer than 72 consecutive hours.

(5) One of the two required component cooling water pumps for a period of time not longer than 72 consecutive hours.

(6) One of the two saltwater cooling pumps with the auxiliary saltwater cooling pump or screen wash pumps available as backup for a period of time not longer than 72 consecutive hours. The backup pump(s) shall be demonstrated operable by test within 1 hour of declaring the saltwater pump inoperable.

(7) One train of ESF switchover automatic trip for a period of time not to exceed 72 consecutive hours.

C. Prior to initiating maintenance on any of the components, the duplicate (redundant) component shall be tested to demonstrate availability.

D. In the event of a failure of a recirculating pump, plant operation may continue provided operability of the remaining pump and its associated motive and control power are satisfactorily demonstrated on a daily basis, including verification that the containment spray bypass valves (CV517 and 518) are closed.

<u>BASIS</u>: The requirements of Specification A assure that before the reactor can be made critical, or before the reactor coolant system heatup is initiated, adequate engineered safeguards are OPERABLE. The limit of 625 cc/hr for the recirculation loop leakage ensures that the combined 0-2 hr EAB thyroid dose due to recirculating loop leakage and containment leakage will not exceed the limits of 10 CFR 100. The formula for determining the leakage incorporates consideration of the significance of leakage in different plant areas. The iodine release factor adjusts actual pump or valve leakage to account for the fraction of the iodine in the leakage which would actually be released to the atmosphere. The iodine release factors in the auxiliary building sump, the auxiliary building or doghouse, and outside are 0.05, 0.5, and 1.0, respectively.

When the reactor is critical or the reactor coolant system temperature is above 200•F, maintenance is allowed per Specifications B and C providing requirements in Specification C are met which assure OPERABILITY of the redundant component. The specified maintenance times are a maximum, and maintenance work will proceed with diligence to return the equipment to an operable condition as promptly as possible. OPERABILITY of the specified components shall be based on the results of Specification No. 4.2.

The allowable maintenance periods are based upon the repair of certain specific items. Based on the demonstration that equipment redundant to that removed from service is OPERABLE, it is reasonable to maintain the reactor at power over this short period of time.

In the unlikely event that the need for safety injection should occur:

-- functioning of one train will protect the core.[1][2][3][4] Containment sprays alone, however, will maintain containment pressure under design pressure.[5]

-- functioning of one of the two hydrazine additive pumps and associated discharge valve will effect introduction of hydrazine into containment spray water. This provides for absorption of airborne fission products and reduction of the thyroid doses associated with the maximum hypothetical accident to within 10 CFR 100 limits.

-- dissolution of 5400 pounds of anhydrous trisodium phosphate stored in the sump will ensure that the pH of the water in the sump will be greater than 7 within four (4) hours, so as to prevent chloride stress corrosion cracking of systems and components exposed to the circulating sump water.

In the event of inoperability of a recirculation pump, plant operation may continue since either pump is sufficient and a daily OPERABILITY demonstration of the remaining pump and its associated motive and control power provides assurance that it will be OPERABLE if required.

The switchover from injection to recirculation modes is a two part process, which consists of the automatic termination of the flow from SI/FW pumps including automatic pump trip and automatic closures of MOV's 850 A, B and C followed by manual realignment to recirculation from the containment sump. The automatic trip setpoint is bounded by the minimum water level in the sump to support recirculation for long term post-LOCA cooling and the minimum RWST level to support charging and containment spray during the manual realignment. The setpoint analysis conservatively determined the automatic trip setpoint to be 20% of the RWST level. The automatic trip setpoint is the result of the combination of the worst single active failure considering SIS and SISLOP conditions.

REFERENCES:

(1) Final Engineering Report and Safety Analysis, Paragraph 10.1.

(2) Final Engineering Report and Safety Analysis, Paragraph 5.1.

(3) "San Onofre Nuclear Generating Station," report forwarded by letter dated December 29, 1971, from Jack B. Moore to Director, Division of Reactor Licensing, USAEC, subject: Emergency Core Cooling System Performance, San Onofre Nuclear Generating Station, Unit 1.

(4) USAEC Safety Evaluation of ECCS Performance Analysis for San Onofre Unit 1, forwarded by letter dated March 6, 1974, from Mr. Donald J. Skovholt to Mr. Jack B. Moore.

(5) Supplement No. 1 to the Final Engineering Report and Safety Analysis, Section 5, Question 3c.

3.3.2 SHUTDOWN STATUS

APPLICABILITY: Applies to piping connections between the feedwater condensate system and the reactor coolant system.

OBJECTIVE: To preclude injection of feedwater condensate into the reactor coolant system when the reactor is shut down and to preclude the potential for overpressurization when water solid.

SPECIFICATION: A. When reactor fuel assemblies are in the vessel and the reactor coolant pressure is less than 500 psig, two "positive barriers" shall be provided between the feedwater condensate system and the piping connections to the reactor coolant system. Additionally, when the reactor coolant system is water solid at less than 500 psig, two positive barriers shall be provided between the safety injection system and piping connections to the reactor coolant system. A "positive barrier" is defined as follows:

(1) Motor Operated Valves

When closed and tagged with supply breakers open, except that power may be restored during no-flow tests of the safety injection system (Specification No. 4.2).

(2) Pneumatic/Hydraulic Operated Valves

When closed and the condition tagged with the respective hydraulic block valve closed except that they may be opened during no-flow tests of the safety injection system (Specification No. 4.2).

(3) Manually Operated Valves

When closed and condition tagged.

(4) Feedwater Pump (Overpressurization Protection Only)

When shutdown with the breaker in the racked out condition.

BASIS: Under normal conditions, system operational interlocks assure that injection of feedwater condensation to the reactor by the safety injection system cannot occur.[1] These interlocks include:

1. Actuation of the safety injection relay which de-energizes the condensate and heater drain pumps and closes the flow path for condensate, thereby preventing injection of feedwater into the coolant system.

2. Interlocks between the condensate isolation valves at the feedwater pump suction and the safety injection header isolation valves at the pump ~~discharge~~ which prevent the opening of the one valve unless the other is closed.

Below 500 psig the Safety Injection System may be removed from service. Below 400 psig the feedwater system may be removed from service. During these low pressure shutdown reactor coolant system conditions, the interlocks may be overridden for maintenance and/or tests of components of these systems. However, it is still necessary to prevent intrusion of feedwater condensate or safety injection water into the reactor coolant system. Injection of feedwater has the potential to dilute the system and create a potential for a reactivity excursion. Injection of either safety injection water or feedwater, especially during water solid operations, creates the potential for pressurizing above limits established by 10 CFR 50 Appendix G and as reflected in Technical Specification 3.1.3.

The "two positive barriers" required by this specification provide protection of the Reactor Coolant System against boron dilution and overpressurization when in the low pressure and low temperature conditions. Two positive barriers are provided in each potential path between the Feedwater Condensate System, Safety Injection System and the RCS. During period of no-flow testing, an exception is provided on two of the positive barriers to allow the components involved in the test to perform their test functions while the remaining positive barriers (nos. 3 and 4) remain in effect.

Tagged, as used above, means tagged in accordance with current Southern California Edison Company procedures for tagging of equipment which must not be operated.

REFERENCE: (1) Final Engineering Report and Safety Analysis, Paragraph 5.1.

3.3.3 MINIMUM BORON CONCENTRATION IN THE REFUELING WATER STORAGE TANK (RWST) AND SAFETY INJECTION (SI) LINES AND MINIMUM RWST WATER VOLUME

APPLICABILITY: MODES 1, 2, 3 and 4; or as described in Specification 3.2.

OBJECTIVE: To ensure immediate availability of borated water from the RWST for safety injection, containment spray or emergency boration.

SPECIFICATION:

a. The RWST shall be OPERABLE with a level of at least plant elevation 50 feet of water having a boron concentration of not less than 3750 ppm and not greater than 4300 ppm.

b. The safety injection (SI) lines from the RWST to MOV 850 A, B and C, with the exception of lines common to the feedwater system, shall be OPERABLE with a boron concentration of not less than 1500 ppm and not greater than 4300 ppm.

ACTION:

A. With the refueling water storage tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

B. With one or both SI lines inoperable due to boron concentration of less than 1500 ppm, restore the SI lines to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and COLD SHUTDOWN within the next 30 hours.

BASIS: The refueling water storage tank serves three purposes; namely:

(1) As a reservoir of borated water for accident mitigation purposes,

(2) As a reservoir of borated water for flooding the refueling cavity during refueling.

(3) As a deluge for fires in containment.

Approximately 220,000 gallons of borated water is required to provide adequate post-accident core cooling and containment spray to maintain calculated post-accident doses below the limits of 10 CFR 100(1). The refueling water storage tank filled to elevation 50 feet represents in excess of 240,000 gallons.

A boron concentration of 3750 ppm in the RWST and 1500 ppm in the SI lines is required to meet the requirements of postulated steam line break.(2)(4) A maximum boron concentration of 4300 ppm ensures that the post-accident containment sump water is maintained at a pH between 7.0 and 7.5(3).

The refueling tank capacity of 240,000 gallons is based on refueling volume requirements and includes an allowance for water not useable because of tank discharge line location.

Sustained temperatures below 32•F do not occur at San Onofre. At 32•F, boric acid is soluble up to approximately 4650 ppm boron. Therefore, no special provisions for temperature control to avoid either freezing or boron precipitation are necessary.

<u>References</u>:

(1) Enclosure 1 "Post-Accident Pressure Reanalysis, San Onofre Unit 1" to letter dated January 19, 1977 in Docket No. 50-206.

(2) "Steam Line Break Accident Reanalysis, San Onofre Nuclear Generating Station, Unit 1, October 1976" submitted by letter dated December 30, 1976 in Docket No. 50-206.

(3) Additional information, San Onofre, Unit 1 submitted by letter dated March 24, 1977 in Docket No. 50-206.

(4) Reload Safety Evaluation, San Onofre Nuclear Generating Station, Unit 1, Cycle 10, edited by J. Skaritka, Revision 1, Westinghouse, March 1989

3.3.4 MINIMUM SOLUTION VOLUME HYDRAZINE CONCENTRATION IN THE HYDRAZINE TANK

APPLICABILITY: Applies to the inventory of spray additive solution.

OBJECTIVE: To insure availability of containment spray additive solution of required quality.

SPECIFICATION: When the reactor coolant system temperature is above 200•F, the hydrazine tank shall contain not less than 150 gallons of aqueous solution having a concentration of not less than 21 wt% N_2H_4.

BASIS: The hydrazine tank serves the purpose of acting as a reservoir of aqueous hydrazine solution for post-accident iodine removal.

100 gallons of N_2H_4 solution are required to reduce airborne iodine concentration in the event of a loss of coolant accident. By adding a 50% margin to this figure to enshire that NPSH to the spray addition pumps is maintained at all times, a total of 150 gallons is required. This amount fulfills requirements for safety injection operations.

3.3.5 PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

APPLICABILITY: Applies to the operational status of the primary coolant system pressure isolation valves during MODES 1, 2, 3.

OBJECTIVE: To increase the reliability of primary coolant system pressure isolation valves thereby reducing the potential of an intersystem loss of coolant accident.

SPECIFICATION: 1. The integrity of all pressure isolation valves listed in Table 3.3.5-1 shall be demonstrated by Specification 4.2.2. Valve leakage shall not exceed the amounts indicated in Table 3.3.5-1.

ACTION: 2. If Specification 1 cannot be met, an orderly shutdown shall be initiated and the reactor shall be in the COLD SHUTDOWN condition within 24 hours.

TABLE 3.3.5-1

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

System	Valve No.	Maximum[*] Allowable Leakage
Safety Injection		
Loop A, cold leg	867a	≤5.0 GPM
Loop B, cold leg	867b	≤5.0 GPM
Loop C, cold leg	867c	≤5.0 GPM

Footnote:

[*]1. Leakage rates less than or equal to 1.0 gpm are considered acceptable.

2. Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered acceptable if the latest measured rate has not exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

3. Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered unacceptable if the latest measured rate exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

4. Leakage rates greater than 5.0 gpm are considered unacceptable.

3.5.5 CONTAINMENT ISOLATION INSTRUMENTATION

APPLICABILITY: Applies to instrumentation which actuates the containment sphere isolation valves, containment sphere purge and exhaust valves, and containment sphere instrumentation vent header valves.

OBJECTIVE: To ensure reliability of the containment sphere isolation provisions.

SPECIFICATION: The instrumentation channels shown in Table 3.5.5-1 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.5.5-2.

ACTION:

A. With an instrumentation channel trip setpoint less conservative than the Allowable Values column of Table 3.5.5-2, declare the channel inoperable and apply the applicable ACTION requirement of Table 3.5.5-1 until the channel is restored to OPERABLE status with the trip setpoint adjusted consistent with the Trip Setpoint Value.

B. With an instrumentation channel inoperable, take the ACTION shown in Table 3.5.5-1.

BASIS: The OPERABILITY of these instrumentation systems ensure that 1) the associated action will be initiated when the parameter monitored by each channel or combination thereof reaches its setpoint, 2) the specified coincidence logic is maintained, 3) sufficient redundancy is maintained to permit a channel to be out of service for testing or maintenance, and 4) sufficient system functional capability is available from diverse parameters.

The OPERABILITY of these systems is required to provide the overall reliability, redundancy, and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions. The integrated operation of each of these systems is consistent with the assumptions used in the accident analyses.

REFERENCES:

(1) NRC letter dated July 2, 1980, from D. G. Eisenhut to all pressurized water reactor licensees.

TABLE 3.5.5-1

CONTAINMENT ISOLATION INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
Containment Isolation (Valves listed in Table 3.6.2-1)					
a) Manual	2	1	2	1, 2, 3, 4	11
b) Containment Pressure-High	3/train	2/train	2/train	1, 2, 3	9
c) Sequencer Subchannels	2/sequencer	2/sequencer	2/sequencer	1, 2, 3, 4	8
d) Safety Injection					
1) Containment Pressure-High	3/train	2/train	2/train	1, 2, 3	9*
2) Pressurizer Pressure-Low	3/train	2/train	2/train	1, 2, 3	9*
Purge and Exhaust Isolation (POV-9, POV-10, CV-10, CV-40, CV-116)					
a) Manual	1	1	1	1, 2, 3, 4	10
b) Containment Radioactivity-High	1	1	1	1, 2, 3, 4	10

TABLE 3.5.5-1 (Continued)

TABLE NOTATION

ACTION STATEMENTS

* The provisions of Specification 3.0.4 are not applicable.

ACTION 8 - With the number of OPERABLE channels one less than the Total Number of Channels, be in HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing .er Specification 4.1.4.

ACTION 9 - With the number of OPERABLE channels one less than the Total Number of Channels, operation may proceed until performance of the next required CHANNEL FUNCTIONAL TEST provided the inoperable channel is placed in the tripped condition within 8 hours.

ACTION 10 - With less than the Minimum Channels OPERABLE, operation may continue provided the containment purge and exhaust valves (POV-9 & POV-10) are maintained closed.

ACTION 11 - With the number of OPERABLE Channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

4.2 SAFETY INJECTION AND CONTAINMENT SPRAY SYSTEM

4.2.1 SAFETY INJECTION AND CONTAINMENT SPRAY SYSTEM PERIODIC TESTING

APPLICABILITY: Applies to testing of the Safety Injection System and the Containment Spray System.

OBJECTIVE: To verify that the Safety Injection System and the Containment Spray System will respond promptly and properly if required.

SPECIFICATION: I. System Tests

A. Hot Safety Injection System Test

(1) When the plant is planned to be shutdown from MODE 1 operation and is planned to enter MODE 5 operation, a Hot SIS Test shall be performed in MODE 3 while RCS pressure is above 1500 psi but not more often than once every 9 months. The test shall include a determination of the force required to open valves NV 851 A and B and the margin of available actuation force.

(2) The test will be considered satisfactory if:

(a) control board indication and visual observations indicate all components have operated and sequenced properly. That is, the appropriate pumps have started and/or stopped and started, and all valves have completed their travel.

(b) the measured actuator force for both the HV-851 A and B valves is equal to or less than 10,000 lb_f.*

(3) If the measured actuator force of either HV-851 A or B is between 10,000 and 22,000 lb_f, the HV-851 A and B valves shall be considered OPERABLE but the future testing interval shall be accelerated as determined by the following equation:

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*Upon receipt of satisfactory data from continuing testing and analysis, the NRC staff will consider a request from Southern California Edison Company to change this number to more accurately reflect existing conditions.

$$T = T_L \frac{(22{,}000 - F)}{12{,}000}$$

where: T = maximum time in days of operation allowed before next surveillance test is required

T_L = time in days of operation since the last surveillance test

F = measured actuator force

(4) If the measured actuator force of either HV-851 A or B is greater than 22,000 lb_f, test results shall be reported to the NRC pursuant to Specification 6.9.2 along with proposed corrective actions. NRC approval shall be obtained prior to returning the unit to service.

B. Trisodium Phosphate Test

(1) A test of the trisodium phosphate additive shall be conducted once every refueling to demonstrate the availability of the system. The test shall be performed in accordance with the following procedure:

(a) The three (3) storage racks are visually observed to have maintained their integrity.

(b) The three (3) racks, each with a storage capacity of 1800 pounds of anhydrous trisodium phosphate additive, are visually observed to be full.

(c) Trisodium phosphate from one of the sample storage racks inside containment shall be submerged without agitation, in 25±0.5 gallons of 150°F to 175°F distilled water borated to 3900±100 ppm boron.

(2) The test shall be considered satisfactory if the racks have maintained their integrity, the racks are visually observed to be full, and the trisodium phosphate dissolves to the extent that a minimum pH of 7.0 is reached within 4 hours of the start of the test.

C. Containment Spray System Test

(1) During reactor shutdown at intervals not longer than the normal plant refueling intervals, a "no-flow" system test shall be conducted to demonstrate proper availability of the system. The test shall be performed either by closing a manual valve in the system or electrically disabling the refueling water pumps and initiating the system by tripping the normal actuation instrumentation.

(2) The test will be considered satisfactory if visual observations indicate all components have operated satisfactorily.

(3) At least once every second refueling outage an air flow test shall be performed to demonstrate the absence of blockage at each containment spray nozzle.

II. Component Tests

A. Pump Tests

(1) In addition to the above test, the safety injection, recirculation, spray additive and refueling water pumps shall be started at intervals not to exceed one month to verify that they are in satisfactory running order.

(2) Acceptable levels of performance shall be as follows:

(1) The safety injection pumps shall reach and be capable of maintaining 95% of their rated shutoff head within 10 seconds after starting.

(2) The refueling water pumps shall be capable of maintaining 90% of their rated shutoff head.

(3) The recirculation pumps shall be run dry. Proper starting of the pump is confirmed by observation of the running current on the ammeter.

(4) The spray additive pumps shall be capable of maintaining their rated flow at a discharge pressure not less than 90% of their rated discharge pressure.

B. Leakage Testing

(1) The recirculation loop outside containment (including the Containment Spray System) shall be pressurized at a pressure equal to or greater than the operating pressure under accident conditions at intervals not to exceed the normal plant refueling interval. Visual inspections for leakage shall be made and if leakage can be detected, measurements of such leakage shall be made. In addition, pumps and valves of the recirculation loop outside containment which are used during normal operation, shall be visually inspected for leakage at intervals not to exceed once every six months. If leakage can be detected, measurements of such leakage shall be made.

(2) The non-redundant Containment Spray System piping shall be visually inspected at intervals not to exceed the normal plant refueling interval. Observations made as part of compliance with Paragraph C, above, or Paragraph I.C(2) of Technical Specification 4.2 will be acceptable as visual inspection of portions of non-redundant Containment Spray System piping.

C. RWST Low Level Trips

Monthly, perform a CHANNEL TEST and every refueling interval, perform a CHANNEL CALIBRATION, of the SI/Feedwater Pump trip and the MOV 850A, 850B and 850C automatic closure on low-low Refueling Water Storage Tank level.

BASIS: The Safety Injection System is a principal plant safeguard. It provides means to insert negative reactivity and limits core damage in the event of a loss of coolant or steam break accident. (1)(2)(3)

Preoperational performance tests of the components are performed in the manufacturer's shop. An initial system flow test demonstrates proper dynamic functioning of the system. Thereafter, periodic tests demonstrate that all components are functioning properly. For these tests, flow through the system is generally not required. However, in the case of the "Hot SIS Test," actual conditions of an SI event are simulated. This test is performed to assure that long-term set of the valve seat faces on HV-851 A and B has not caused the valves to become inoperable. The test is required to be performed as the plant is shutting down from MODE 1 in order to assure that the valves have not been disturbed (i.e., the long-term set is still in effect) and that full dynamic conditions that would occur during an actual SI event are simulated. When possible the test should be performed prior to stopping the feedwater pumps (this is not a requirement). This will further assure that the valves will be in the same condition as when required for an actual Safety Injection event since the discharge pressure of the feedwater pumps acting on the valves will keep them seated even considering any backpressure built up in the downstream SI header. Theequation used to determine future intervals if actuator force is between 10,000 lb_f and 22,000 lb_f is developed by shortening the interval in direct proportion to the degree to which the force exceeds 10,000 lb_f. During the test, all components are verified to have operated and sequenced properly.

The tests required in this specification will demonstrate that all components which do not normally and routinely operate will operate properly and in sequence if required. The portion of the Recirculation system outside the containment sphere is effectively an extension of the boundary of the containment. The measurement of the recirculation loop leakage ensures that the calculated EAB 0-2 hr. thyroid dose does not exceed 10 CFR 100 limits.

The trisodium phosphate stored in storage racks located in the containment is provided to minimize the possibility of stress corrosion cracking of metal components during operation of the ECCS following a LOCA. The trisodium phosphate provides this protection by dissolving in the sump water and causing its final pH to be raised to 7.0 - 7.5. The requirement to dissolve trisodium phosphate from one of the sample storage racks in distilled water heated and borated, to the extent recirculating post LOCA sump water is projected to be heated and borated, provides assurance that the stored trisodium phosphate will dissolve as required following a LOCA. The sample storage racks are sized to contain 0.5 pounds of trisodium phosphate. Trisodium phosphate stored in the sample storage racks has a surface area to volume ratio of 1.33 whereas the trisodium phosphate stored in the main racks has a surface area to volume ratio of 1.15.

Visual inspection of the non-redundant piping in the Containment Spray System provides additional assurance of the integrity of that system.

Surveillance testing of the RWST low-low level main feedwater/safety injection pump trips and automatic closure of MOV 850A, 850B and 850C valves will ensure that these components will be available to complete their safety functions if required.

REFERENCES:

(1) Final Engineering Report and Safety Analysis, Paragraph 5.1.

(2) "San Onofre Nuclear Generating Station", report forwarded by letter dated December 29, 1971 from Jack B. Moore to Director, Division of Reactor Licensing, USAEC, subject: Emergency Core Cooling System Performance, San Onofre Nuclear Generating Station, Unit 1.

(3) USAEC Safety Evaluation of ECCS Performance Analysis for San Onofre Unit 1, forwarded by letter dated March 6, 1974 from Mr. Donald J. Skovholt to Mr. Jack B. Moore.

(4) Letter, K. P. Baskin, SCE, to D. M. Crutchfield, NRC, dated October 16, 1981.

ATTACHMENT 2

PROPOSED TECHNICAL SPECIFICATIONS

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3.3 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.3.1 ECCS SUBSYSTEMS - RCS PRESSURE ≥ 600 psig

APPLICABILITY: MODES 1, 2, and 3 above or equal to 600 psig

OBJECTIVE: To define those conditions necessary to ensure availability of the Safety Injection and Recirculation Systems.

SPECIFICATION:

a. Two Safety Injection System (SIS) pump trains, capable of automatic actuation, shall be OPERABLE* with each train comprised of:

1. One safety injection pump,
2. One feedwater pump,
3. Low-Low RWST level automatic trip with a setpoint of 20% (+0% -2%).

b. Three safety injection flow paths, capable of automatically injecting borated water to the reactor coolant system, shall be OPERABLE and capable of automatic closure on the Low-Low RWST level trip.

c. Two Recirculation System pump trains shall be OPERABLE with each train comprised of:

1. One recirculation pump,
2. One charging pump,
3. One refueling water pump.

d.

1. Three cold leg recirculation flow paths shall be OPERABLE.
2. The alternate and normal hot leg recirculation flow paths shall be OPERABLE.
3. The common recirculation heat exchanger shall be OPERABLE.

* The automatic safety injection actuation may be manually blocked at, or below 1900 psig.

e. Effective leakage from the recirculation loop outside the containment shall be less than 625 cc/hr as calculated from the following formula:

Effective Leakage= $a_1 \times L_1 + a_2 \times L_2 + a_3 \times L_3$

where,

L_1 = pump and valve leakage which drains directly to auxiliary building sump.

L_2 = valve leakage in auxiliary building or containment penetration room which does not drain directly to the auxiliary building sump.

L_3 = valve leakage outside the auxiliary building, or containment penetration room which does not drain directly to auxiliary building sump.

a_1 = iodine release factor for leakage directly to auxiliary building sump (0.05).

a_2 = iodine release factor for leakage inside the auxiliary building or containment penetration room (0.5).

a_3 = iodine release factor for leakage outside the auxiliary building or containment penetration room (1.0).

f. An pH control system containing a minimum of 5400 pounds of anhydrous trisodium phosphate stored in the racks located in the containment shall be OPERABLE.

ACTION:

A. With one pump train of the SIS inoperable, restore the inoperable train to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and less than 600 psig within the following 6 hours.

B. With one safety injection flow path inoperable, restore the inoperable flow path to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and less than 600 psig within the following 6 hours.

C. With one pump train of the Recirculation System inoperable, restore the inoperable train to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and less than 600 psig within the following 6 hours.

D. With one cold leg recirculation flow path inoperable, return the inoperable flow path to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and less than 600 psig within the following 6 hours.

E. With one hot leg recirculation flow path inoperable, return the inoperable flow path to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and less than 600 psig within the following 6 hours.

F. With less than any one of the following operable:

One pump train of SIS
Two SI flow paths
One recirculation system pump train
Two cold leg injection paths
One hot leg recirculation path
The recirculation heat exchanger

action shall be initiated within one hour to place the unit in a mode where the specification does not apply, or be in HOT STANDBY within the next 6 hours, and COLD SHUTDOWN within the following 30 hours.

G. With the pH control system inoperable, restore the racks to a full condition within 72 hours or be in COLD SHUTDOWN within the next 36 hours.

H. If the effective leakage from the recirculation loop outside the containment exceeds 625 cc/hr, make necessary repairs to limit leakage to 625 cc/hr within 72 hours or be in HOT STANDBY within the next 6 hours, and COLD SHUTDOWN within the following 30 hours.

BASIS: The requirements of this specification assure the Emergency Core Cooling System is OPERABLE. The flow paths and pump trains for the safety injection system are separated to reflect electrical train alignment, and to reflect the SONGS 1 common header configuration. Specific MODE operability requirements for ECCS valves and required flow indicators are provided in Technical Specification 3.3.8, "Status of ECCS Components." The following describes the train alignment:

Two Safety Injection Pump Trains

	Train A	Train B
Safety Injection Pump	G-50B	G-50A
Feedwater/SI Pump	G-3B	G-3A

Associated Pump Train Flow Path Valves

	Train A	Train B
Condensate Isolation	HV-852B HV-854B	HV-852A HV-854A
SI Suction	HV-853B	HV-853A
SI Discharge	HV-851B	HV-851A
RWST Recirculation	CV-875B	CV-875A
Condensate Recirc.	CV-37	CV-36
Feedwater Isolation	MOV-20, MOV-22	MOV-21
Feedwater Control	FCV-456	FCV-457, FCV-458

The recirculation valves (CV-875A, CV-875B, CV-36, CV-37) and the feedwater bypass control valves (CV-142, CV-143, CV-144) prevent flow diversion from the SI path. There are redundant isolation valves on each feedwater path. The valves are paired on opposite electrical trains with the main feedwater control valves to provide redundant isolation. The bypass valves have redundant power supplies and are actuated to close by both electrical trains. Also refer to Table 3.3.8-1, "Status of Components."

Three Safety Injection Flow Paths

The three flow paths and associated valves, e.g., MOVs-850A (Train B), 850B (Train A), and 850C (Uninterruptible Power Supply, UPS), are available to inject borated water into the RCS. The SI flow path is common to both SI pump trains, and MOV-850C can be considered to operate with either train, since its power supply is independent. The MOV-850 valves automatically open for safety injection and are automatically closed by the low-low RWST level trip.

The safety analysis for Main Steam Line Break (MSLB) and Loss of Coolant Accident (LOCA) (UFSAR Sections 15.2 and 15.16) is based on flow from one path. The flow from a second path is assumed blocked by failure of the injection valve to open. The third path is assumed to be blocked during a MSLB due to a common-cause power supply failure, or spilling directly to the break during a LOCA.

Two Recirculation Pump Trains

	Train A	Train B
Recirculation Pump	G-45A	G-45B
Refueling Water Pump	G-27N	G-27S
Charging Pump	G-8B	G-8A

Recirculation System Associated Valves

	Train A	Train B
Recirc Pump Discharge	MOV-866A	MOV-866B
RWST to Charging	MOV-1100B	MOV-1100D
Charging to Cold Legs	MOV-19	MOV-18
CCW to Recirc. Hx	CV-737A, CV-737B	

The redundant CCW valves (CV-737A & CV-737B) to the Recirculation Heat Exchanger are powered from electrically independent divisions of Train A and therefore are considered common to Train A. Both valves fail open to the conservatively safe position.

Three Cold Leg Recirculation Paths

Valves FCV-1115D, FCV-1115E, FCV-1115F can be powered from either Train A or B. These direct the common header to the loop injection valves, MOV-356 (Loop A, Train A), MOV-357 (Loop B, Train B), MOV-358 (Loop C, UPS). Alternate cold leg paths may be available through the normal charging path to RCS Loop A, or via seal injection. These alternate paths are not credited in the safety analysis, and therefore are not included in the specifications.

Two Redundant Hot Leg Recirculation Paths

Normal Hot Leg Recirculation Path

	Train A	A/B	Train B
Recirc. to Charging	MOV-1100B		MOV-1100D
Charging Discharge		FCV-1112	
Aux. PZR Spray		CV-305	

Alternate Hot Leg Recirculation Path

	Train A	Train B
RHR Hx Valves	MOV-822A	MOV-822B
Loop C Hot Leg	MOV-813	MOV-814

The normal hot leg recirculation path directs flow from the recirculation pump discharge common header through the recirculation heat exchanger. Flow is through either of two parallel valves, MOV-1100B and MOV-1100D, to the charging pumps. A common discharge header supplies flow to the hot leg via auxiliary pressurizer spray. The normal path valves which are not redundant (such as FCV-1112 and CV-305) may be powered from either electrical train to operate with a failure of either the Train A or Train B electrical power.

The recirculation pump discharge valves, MOV-866A and MOV-866B are equipped with a power lockout feature. The power lockout assures the valves will not spuriously open before the proper conditions exist for recirculation. This prevents the recirculation lines from being pressurized with air and steam which could gas-bind the charging pumps and disable the refueling water pumps by closing the RWST check valve to the containment spray system.

The alternate hot leg path serves as a back-up to the normal hot leg recirculation flow path in the event of a mechanical failure of either FCV-1112 or CV-305. The path takes flow from the recirculation heat exchanger and the refueling water pumps through either of two RHR heat exchangers via either MOV-822A or MOV-822B. Manual bypass valve RHR-004 (which is locked open) allows flow around the RHR pumps, and through the RHR isolation valves, MOV-813 and MOV-814, to the Loop C hot leg. The alternate path requires both electrical trains (Train A and B) to operate the series isolation valves. The motor operators for valves MOV-822A and MOV-822B are presently not qualified for submergence; therefore a minimum of one of these valves must be maintained de-energized in the open position, as specified by Table 3.3.8-1.

Recirculation Boundary Valves

To prevent flow diversion, valves which interconnect the recirculation paths with other systems are required to be operable or closed. Table 3.3.8-1, "Status of Components," lists the operability requirements for these valves. Flow Indicator FIT-1112 is used to evaluate normal hot leg recirculation flow from the charging system. Flow Indicators FI-3114A, FI-2114B, FI-2114C, indicate the flow to each cold leg. The letdown containment isolation valves receive isolation actuation from both trains, however they are powered from a single train and fail closed. The following are flow diversion valves:

VCT Charging Isolation	MOV-1100C
PZR Spray Control valves	PCV-430C, PCV-430H
Letdown Orifice Isolation	CV-202, CV-203, CV-204
RCS Filter/Blender Isolation	CV-406A, CV-406B
Loop A Cold Leg Charging	CV-304
VCT Bypass	CV-410, CV-411
Letdown Containment Isolation	CV-525, CV-526
RCP Seal Return Isolation	CV-527, CV-528
CVCS to Sample System	CV-2145
RHR to Loop A Cold Leg	MOV-833, MOV-834

Basis for Operation of ECCS

In the unlikely event that the need for safety injection or containment spray should occur during a time of component inoperability:

-- functioning of one train of the safety injection, recirculation and CCW systems will protect the core.[(1)(2)(3)(4)]

-- dissolution of 5400 pounds of anhydrous trisodium phosphate stored in the sump will ensure that the pH of the water in the sump will be greater than 7 within four (4) hours, so as to prevent chloride stress corrosion cracking of systems and components exposed to the circulating sump water.

The limit of 625 cc/hr for the recirculation loop leakage ensures that the combined 0-2 hour EAB thyroid dose due to recirculation loop leakage and containment leakage will not exceed the limits of 10 CFR 100. The formula for determining the leakage incorporates consideration of the significance of leakage in different plant areas. The iodine release factor adjusts actual pump or valve leakage to account for the fraction of the iodine in the leakage which would actually be released to the atmosphere. The iodine release factors in the auxiliary building sump, the auxiliary building or containment penetration room, and outside are 0.05, 0.5, and 1.0, respectively.

The Recirculation System provides long term post-LOCA cooling and prevents boron precipitation. The system consists of the recirculation heat exchanger, pumps, valves, and multiple flow paths. There are two main flow paths: the cold leg recirculation flow paths for normal sump recirculation through the cold legs (via MOVs-356,357,358), and the normal and alternate hot leg recirculation flow paths. The alternate hot leg flow path is unique in that the components rely on both electrical trains. The alternate hot leg recirculation path serves as a back-up to the normal hot leg recirculation flow path.

The switchover from injection to recirculation modes is a two part process. This is accomplished by the automatic termination of the flow from the safety injection/feedwater pumps and by automatic pump trip and automatic closure of MOV-850 A, B, and C. The realignment to recirculation from the containment sump is accomplished manually. The automatic RWST level trip setpoint is limited by the minimum water level in the sump required for long term post-LOCA cooling and the minimum RWST level to support charging and containment spray during the manual realignment. The setpoint analysis conservatively determined the automatic trip setpoint to be between 18% and 20% of the RWST level. The automatic trip setpoint is the result of the combination of the worst single active failure considering SIS and SISLOP conditions.

<u>References</u>:

(1) Updated Final Engineering Report and Safety Analysis, Section 6.3.

(2) Updated Final Engineering Report and Safety Analysis, Section 15.

(3) "San Onofre Nuclear Generating Station," report forwarded by letter dated December 29, 1971, from Jack B. Moore to Director, Division of Reactor Licensing, USAEC, Subject: Emergency Core Cooling System Performance, San Onofre Nuclear Generating Station, Unit 1.

(4) USAEC Safety Evaluation of ECCS Performance Analysis for San Onofre Unit 1, forwarded by letter dated March 6, 1974, from Mr. Donald J.Skovholt to Mr. Jack B. Moore.

3.3.2 ECCS SUBSYSTEMS - RCS PRESSURE < 600 psig

APPLICABILITY: MODE 3 below 600 psig and MODE 4

OBJECTIVE: To define conditions necessary to ensure availability of the emergency core cooling system to protect the core in low pressure and temperature conditions.

SPECIFICATION:

a. One train of charging and two redundant discharge flow paths shall be OPERABLE for cold leg injection, and cold leg recirculation, comprised of:

   1. One charging pump,

   2. Flow path realignment valves MOV-1100C and either MOV-1100B, or MOV-1100D,

   3. Two of three cold leg injection paths via either MOV-356/FCV-1115D, MOV-357/FCV-1115E, or MOV-358/FCV-1115F.

b. One train of the Recirculation System shall be OPERABLE with:

   1. One recirculation pump powered from the same train as the operable charging pump,

   2. One refueling water pump.

c. One hot leg recirculation path, consisting of the primary path or alternate path shall be OPERABLE.

d. The recirculation heat exchanger shall be OPERABLE.

ACTION:

A. With no train of cold leg injection OPERABLE, restore one train to OPERABLE status within 1 hour, or be in COLD SHUTDOWN within the next 20 hours.

B. With no train of the Recirculation System OPERABLE, restore the Recirculation System to OPERABLE status within 1 hour, or be in COLD SHUTDOWN within the next 20 hours.

C. With the hot leg recirculation path inoperable, restore the hot leg recirculation path to OPERABLE status within 1 hour, or be in COLD SHUTDOWN within the next 20 hours.

D. With the recirculation heat exchanger inoperable, restore the heat exchanger to OPERABLE status within 1 hour, or be in COLD SHUTDOWN within the next 20 hours.

BASIS: The basis for Specification 3.3.1, describes the train alignment and flow paths.

The isolation of the primary safety injection flow path is completed by the time the RCS pressure has been reduced to 500 psig to protect the reactor vessel from exceeding 10 CFR 50 Appendix G pressure-temperature limits caused by potential low temperature overpressurization events. The primary safety injection flow path may be isolated starting at an RCS pressure of 600 psig. A pressure of 600 psig was chosen to provide a 100 psi margin and allow sufficient time for the operators to establish the specified positive barriers required by Specification 3.3.3.

When the RCS pressure is less than 600 psig, one operable cold leg injection train, consisting of a charging pump and associated flow path with manual actuation, is provided, as described in the UFSAR Section 6.3. The cold leg injection path is not required by the safety analysis; however, it is being provided to conform with the provisions of the Standard Technical Specifications for Westinghouse plants. A minimum of two cold leg discharge flow paths to separate RCS loops is required. The selected loops should be through two of either FCV-1115D, FCV-1115E, FCV-1115F and corresponding valves MOV-356, MOV-357, or MOV-358. Since both refueling water pumps are required to be OPERABLE in Modes 1 through 4, by Technical Specification 3.3.5, and both supply a common header, a requirement to train align these pumps has not been included in this specification.

Single failure consideration is not a concern due to the stable reactivity condition of the reactor and the limited core cooling requirements. This is consistent with the Standard Technical Specifications Basis for the ECCS components in MODE 4 and provides an operational band to establish positive barriers specified in Section 3.3.3. This specification is consistent with the charging pump operability requirement in Section 3.2.

References: 1) UFSAR Section 6.3.

3.3.3 ISOLATION OF FEEDWATER/SAFETY INJECTION FROM REACTOR COOLANT SYSTEM

APPLICABILITY: MODE 3 below 500 psig, Modes 4, 5 and 6.

OBJECTIVE: To preclude injection of feedwater/condensate into the reactor coolant system when the reactor is shut down and to preclude the potential for overpressurization when water solid.

SPECIFICATION: When reactor fuel assemblies are in the vessel and the reactor coolant pressure is less than 500 psig, two "positive barriers" shall be provided between the feedwater/condensate system and the piping connections to the reactor coolant system.

Additionally, when the reactor coolant system is water solid at less than 500 psig, two positive barriers shall be provided between the safety injection system and piping connections to the reactor coolant system.

A "positive barrier" is defined as follows:

(1) Motor Operated Valves

When closed and tagged with supply breakers open, except that power may be restored during no-flow tests of the safety injection system (Specification 4.2.F.2).

(2) Pneumatic/Hydraulic Operated Valves

When closed and condition tagged, with the respective hydraulic actuated block valves closed, or otherwise blocked closed, except that they may be opened during no-flow tests of the safety injection system (Specification 4.4.F.2).

(3) Manually Operated Valves

When closed and condition tagged.

(4) Feedwater Pump (Overpressurization Protection Only)

When shutdown with the breaker racked out, or in the test position.

ACTION: With less than the required two "positive barriers" between the feedwater/condensate system, or safety injection system, and the piping connections to the reactor coolant system, verify the status of the remaining "positive barrier" once per shift and initiate action to restore the barrier(s) as soon as possible.

BASIS: Under normal conditions, system operational interlocks assure that injection of feedwater/condensate into the reactor by the safety injection system cannot occur.[1] These interlocks include:

1. Actuation of the safety injection system which de-energizes the condensate and heater drain pumps and closes the flow path for condensate, thereby preventing injection of feedwater into the reactor coolant system.

2. Interlocks between the condensate isolation valves at the feedwater pump suction and the safety injection header isolation valves at the pump discharge which prevent the opening of the header isolation valve unless the pump condensate suction valve is closed.

Below 600 psig the Safety Injection and Feedwater Pumps may be removed from service in accordance with Specification 3.3.2. A band of 100 psi is provided to allow the operators time to isolate the pumps prior to reaching the 500 psig limit of the Specification. With the reactor coolant system in a low pressure shutdown condition, the interlocks may be overridden for maintenance and/or tests of components of these systems. However, it is still necessary to prevent intrusion of feedwater condensate or safety injection water into the reactor coolant system. Injection of feedwater has the potential to dilute the system and create a potential for a reactivity excursion. Injection of either safety injection water or feedwater, especially during water solid operations, creates the potential for pressurizing above limits established by 10 CFR 50 Appendix G and as reflected in Technical Specification 3.1.3.

The "two positive barriers" required by this specification provide protection of the Reactor Coolant System against boron dilution and overpressurization when in the low pressure and low temperature conditions. Two positive barriers are provided in each potential path between the Feedwater Condensate System, Safety Injection System and the RCS. During periods of no-flow testing, an exception is provided on two of the positive barriers to allow the components involved in the test to perform their test functions while the remaining positive barriers (nos. 3 and 4) remain in effect.

Tagged, as used above, means tagged in accordance with current Southern California Edison Company procedures for tagging of equipment which must not be operated.

Reference: (1) Updated Final Engineering Report and Safety Analysis, Section 6.3.2.8.

3.3.4 MINIMUM BORON CONCENTRATION IN THE REFUELING WATER STORAGE TANK (RWST) AND SAFETY INJECTION (SI) LINES AND MINIMUM RWST WATER VOLUME

APPLICABILITY: MODES 1, 2, 3 and 4; or as described in Specification 3.2.

OBJECTIVE: To ensure immediate availability of borated water from the RWST for safety injection, containment spray or emergency boration.

SPECIFICATION:

a. The RWST shall be OPERABLE with a level of at least plant elevation 50 feet of water having a boron concentration of not less than 3750 ppm and not greater than 4300 ppm.

b.* The safety injection (SI) lines from the RWST to MOV-850 A, B and C, with the exception of lines common to the feedwater system, shall be OPERABLE with a boron concentration of not less than 1500 ppm and not greater than 4300 ppm.

ACTION:

A. With the refueling water storage tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

B.* With one or more SI lines inoperable due to boron concentration of less than 1500 ppm, restore the SI lines to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

* This is not required when the SI lines are isolated from the RCS under specification 3.3.3.

BASIS: The refueling water storage tank serves three purposes; namely:

(1) As a reservoir of borated water for accident mitigation purposes,

(2) As a reservoir of borated water for flooding the refueling cavity during refueling,

(3) As a deluge for fires in containment.

Approximately 220,000 gallons of borated water are required to provide adequate post-accident core cooling and containment spray to maintain calculated post-accident doses below the limits of 10 CFR 100[1]. The refueling water storage tank filled to elevation 50 feet represents in excess of 240,000 gallons.

A boron concentration of 3750 ppm in the RWST and 1500 ppm in the SI lines is required to meet the requirements of a postulated steam line break[2][4]. A maximum boron concentration of 4300 ppm ensures that the post-accident containment sump water is maintained at a pH between 7.0 and 7.5[3].

The refueling tank capacity of 240,000 gallons is based on refueling volume requirements and includes an allowance for water not useable because of tank discharge line location.

Sustained temperatures below 32°F do not occur at San Onofre. At 32°F, boric acid is soluble up to approximately 4650 ppm boron. Therefore, no special provisions for temperature control to avoid either freezing or boron precipitation are necessary. The boron concentration is no longer required to be maintained when the SI lines are isolated from the RCS and two "positive barriers" are established in accordance with Section 3.3.3.

References: (1) Enclosure 1 "Post-Accident Pressure Reanalysis, San Onofre Unit 1" to letter dated January 19, 1977 in Docket No. 50-206.

(2) "Steam Line Break Accident Reanalysis, San Onofre Nuclear Generating Station, Unit 1, October 1976" submitted by letter dated December 30, 1976 in Docket No. 50-206.

(3) Additional information, San Onofre, Unit 1 submitted by letter dated March 24, 1977 in Docket No. 50-206.

(4) Reload Safety Evaluation, San Onofre Nuclear Generating Station, Unit 1, Cycle 10, edited by J. Skaritka, Revision 1, Westinghouse, March 1989.

3.3.5 CONTAINMENT SPRAY SYSTEM

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

OBJECTIVE: To ensure availability of the containment spray system for containment energy and iodine removal in accident conditions.

SPECIFICATION:

a. Two trains of the Containment Spray System components shall be OPERABLE with:

   1. One train comprised of refueling water pump G-27N, valves CV-517 (maintained in the OPEN position*) and CV-82, and associated flow path;

   2. One train comprised of refueling water pump G-27S, valves CV-518 (maintained in the OPEN position*) and CV-114, and associated flow path.

b. Two trains of the Containment Spray Additive System shall be OPERABLE, with each train comprised of:

   1. One hydrazine additive pump,

   2. Associated flow path and valves.

c. The hydrazine additive tank containing not less than 150 gallons of aqueous solution having a concentration of not less than 21 wt% N_2H_4 shall be OPERABLE.

d. CV-92 shall be maintained in the CLOSED position with power locked out by redundant switches.**

e. MOV-883 shall be OPERABLE (maintained in the OPEN position) with power locked out by redundant switches.

* Each valve, CV-517 and CV-518, must be OPERABLE and capable of remote-manual closure.

** Refer to Specification 3.14.2, "Fire Protection."

ACTION:

A. With one train of the Containment Spray System inoperable, restore the inoperable train to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

B. With one train of the Containment Spray Additive System inoperable, restore the inoperable train to OPERABLE status within 72 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 hydrazine additive tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

D. With MOV-883 inoperable and/or CV-92 not closed as required, restore the valve(s) to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

E. With no train of the Containment Spray System or of the Containment Spray Additive System operable, restore one train to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

BASIS: The containment spray system is required to maintain the containment peak pressure below the design containment pressure in the limiting design basis accidents. The design basis MSLB inside the containment is the limiting accident for containment integrity. The containment spray system will maintain containment pressure under the design pressure for the design basis MSLB.

The Specification requires the components to be train aligned as follow:

Two Containment Spray System Trains

	Train A	Train B
Refueling Water Pump	G-27N	G-27S
Flow Limiting Valves	CV-517	CV-518
Containment Spray Valves	CV-82	CV-114

Two Containment Spray Additive System Trains

	Train A	Train B
Hydrazine Pump	G-200A	G-200B
Valves	SV-600	SV-601

Functioning of one of the two hydrazine additive pumps and the associated discharge valve will inject hydrazine into the containment spray water. This provides for absorption of airborne fission products and reduction of the thyroid doses associated with the maximum hypothetical accident to within 10 CFR 100 limits.

The containment spray system consists of two redundant trains which satisfy the single failure criterion. At least one containment spray flow limiter valve, CV-517 or CV-518, must be open during the initial containment spray mode to pass the design flow rate of the containment spray system. Since the flow limiting valves require non-safety related instrument air to open, the flow limiting valves are required to be maintained in the open position to assure the valves will be in the correct position for containment spray. For operation during the recirculation phase both valves are closed. Instrument air is not required to close the valves. One of the two valves is permitted to be inoperable in the open position, under Table 3.3.8-1, for 72 hours, providing both recirculating water pumps are operable. Both pumps are needed in this alignment to assure adequate flow to the charging pumps.

MOV-883 is the isolation valve for the common flow path from the refueling water storage tank to the containment spray system. It must remain open during injection mode and be capable of closure for recirculation mode. Single failure susceptibility of MOV-883 due to spurious closure which would result in loss of refueling water supply to the containment spray system is precluded by redundant lockout of both the control and motive power. Therefore, inoperability of a redundant power lockout switch for this valve will require an entry into a 1-hour action statement. Similarly, single failure susceptibility of CV-92 which would divert containment spray flow to the fire spray header in the containment, is precluded by redundant lockout of power. Again, an entry into a 1-hour action statement is required since CV-92 affects both trains. Such configuration is permitted in the Standard Review Plan BTP ICSB 18.

The hydrazine tank is a reservoir of aqueous hydrazine solution for post-accident iodine removal. 100 gallons of 15% N_2H_4 solution satisfies the current analysis assumptions of hydrazine for two hours with both pumps running to reduce airborne iodine concentration in the event of a loss of coolant accident. A total of at least 150 gallons 21 wt%, or greater, N_2H_4 is maintained, i.e., 50% margin, to ensure that NPSH is maintained to the spray addition pumps and proper concentration exists at all times. Therefore, this amount fulfills requirements for safety injection operations.

Reference: (1) Amendment 52 to Final Safety Analysis, San Onofre Nuclear Generating Station, Unit 1, December 1975.

3.3.6 PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

APPLICABILITY: MODES 1, 2, and 3.

OBJECTIVE: To verify the operation of the primary coolant system pressure isolation valves and thereby reduce the potential of an intersystem loss of coolant accident.

SPECIFICATION: The integrity of all pressure isolation valves listed in Table 3.3.6-1 shall be demonstrated OPERABLE by Specification 4.2.2. Valve leakage shall not exceed the amounts indicated in Table 3.3.6-1.

ACTION: If the Specification cannot be met, an orderly shutdown shall be initiated and the reactor shall be in the COLD SHUTDOWN condition within 24 hours.

BASIS: The check valves specified in Table 3.3.6-1 are located in the safety injection lines in series with MOV-850A, B and C, and provide isolation to prevent any RCS backflow to the safety injection system. These valves, therefore, reduce the RCS leakage and the potential of a loss of coolant accident between the systems.

TABLE 3.3.6-1

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

System	Valve No.	Maximum[a] Allowable Leakage
Safety Injection		
Loop A, cold leg	SIS-003	$\leq$5.0 GPM
Loop B, cold leg	SIS-010	$\leq$5.0 GPM
Loop C, cold leg	SIS-004	$\leq$5.0 GPM

Footnote:

[a]1. Leakage rates less than or equal to 1.0 gpm are considered acceptable.

2. Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered acceptable if the latest measured rate has not exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

3. Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered unacceptable if the latest measured rate exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

4. Leakage rates greater than 5.0 gpm are considered unacceptable.

3.3.7 COMPONENT COOLING WATER SYSTEM

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

OBJECTIVE: To ensure availability of the Component Cooling Water System (CCW) which acts as a heat sink for the ECCS.

SPECIFICATION: Two independent trains of the Component Cooling Water System shall be OPERABLE with each train comprised of:

1. One CCW pump:
   Train A - G-15A
   Train B - either G-15B or G-15C,

2. One CCW heat exchanger,

3. One saltwater cooling pump.

ACTION:

A. With one train of the CCW System inoperable, except as provided by Action B below, restore the inoperable train to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

   Note: The removal from service of a saltwater pump requires that either the auxiliary saltwater pump, or two screen wash pumps are available as a backup, and have been demonstrated operable by test within 1 hour of declaring the saltwater cooling pump inoperable.

B. One CCW heat exchanger is permitted to be removed from service for 31 days providing:

   1. The OPERABLE CCW heat exchanger outlet valve, MOV-720A or MOV-720B is open with the supply breaker open.

   2. The out of service CCW heat exchanger is isolated on both the tube and shell side.

   3. Inlet cross-tie valve SWC-300 is placed in the open position.

C. With no train of the CCW System operable, restore one train to OPERABLE status within 1 hour or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

BASIS: The OPERABILITY of the component cooling water system ensures that sufficient cooling capacity is available for continued operation of the safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

The alignment of the CCW System is as follows:

Component Cooling Water System Alignment

	Train A	Train B
CCW Pumps	G-15A	G-15B or G-15C
Saltwater Pumps	G-13A	G-13B
CCW Hx	E-20A	E-20B
CCW Hx Outlet	MOV-720A	MOV-720B

Normally the CCW system is operated train aligned. To extend the time the CCW heat exchangers may be out of service, a valve alignment may be made to provide cooling using a single heat exchanger. The CCW heat exchanger being removed from service is fully isolated, and the cross-tie valve, SWC-300, on the saltwater header is opened. With SWC-300 open, both trains of saltwater pumps are available to supply the operable CCW heat exchanger. The CCW discharge valve on the operable CCW heat exchanger is failed open to assure that it cannot be closed.

3.3.8 STATUS OF ECCS COMPONENTS

APPLICABILITY: MODES 1, 2, 3, and 4, except as shown in Table 3.3.8-1.

Note: The provisions of specifications 3.0.3 and 3.0.4 do not apply.

OBJECTIVE: To define specific components required to ensure the operability of the ECCS flow paths as specified in Section 3.3.

SPECIFICATION: The components listed in Table 3.3.8-1 shall be maintained as listed under "STATUS." The column labeled, "FLOW PATH," shall be used to determine operability requirements to satisfy specifications (a) and (b).

The ECCS shall be maintained operable as follows:

a. MODES 1,2 and 3 ≥ 600 psig

The following flow paths shall be OPERABLE:

Flow Path	Trains
Safety Injection	A AND B
Cold Leg Recirculation	A AND B
Hot Leg Recirculation	Normal AND Alternate
Containment Spray	A AND B
Component Cooling Water	A AND B

b. MODES 3 (below 600 psig) and MODE 4

The following flow paths shall be OPERABLE:

	Flow Path	Trains
1.	Containment Spray	A AND B
	Component Cooling	A AND B
2.	Cold Leg Injection	A or B
	Cold Leg Recirculation	A or B
	Hot Leg Recirculation	Normal or Alternate

c. The common and diversion flow path components shall be maintained operable.

ACTION:

A. With one less than the minimum number of trains for each flow path specified by (a) above, restore the inoperable train to OPERABLE status within 72 hours, or be in at least HOT STANDBY within the next 6 hours and in MODE 3 with an RCS pressure of less than 600 psig within the following 6 hours.

B.1. With only one of two required trains OPERABLE, as specified by (b.1) above, restore the inoperable train to OPERABLE status within 72 hours, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the next 30 hours.

B.2. If the single required train for each flow path specified by (b.2) above is not OPERABLE, restore the inoperable train to OPERABLE status within one hour or be in COLD SHUTDOWN within the next 20 hours.

C. Common or Diversion components are independent of train alignment for the purpose of this Specification. If a Common and/or Diversion component is inoperable, enter Action Statement A, B, or D as appropriate to the mode of operation.

D. For valves MOV-883, CV-92, CV-2145, CV-406A, CV-406B and MOV-1100C (applies to MOV-1100C in MODE 3 <600 psig and MODE 4 only), restore the valve to the required status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

BASIS:

Maintaining the ECCS paths operable requires that the components which comprise the flow paths be operable, or in the correct position for operation. Specifications (a) and (b) define the number of trains required for each ECCS flow path, according to mode of operation. The train operability requirements are based on the requirements contained in section 3.3 of the Technical Specifications.

Table 3.3.8-1 provides specific operability requirements for components which make up the ECCS flow paths. The table provides the operator with a single listing of valves and components. The table listing is intended to reduce the potential for misassigning components to flow paths, since many of the components share common flow paths and functions. The bases for the specifications in section 3.3 provide additional information regarding the function of the components within the flow paths. Because many of these components are also covered under the other specifications in section 3.3, it is important to refer to the other subsections of 3.3 to ensure the most limiting action is implemented.

Train alignment is based on the flow path requirements, and does not necessarily correspond to the electrical alignment because of the common header arrangement, and the distinction between the alternate hot leg and normal hot leg paths.

MOV-850C and MOV-358 are listed as "UPS" train valves as these have an Uninterruptible Power Supply (UPS), and therefore, are not dependant on either electrical train. Both of these valves are on a common header. Due to the independent electrical supply, it is not required to train align these valves for electrical single failure considerations. These valves are treated as common valves, as described below. Since these valves are not electrically trained aligned they can be paired with either Train A or B. However, as these valves are also part of the safety injection and cold leg recirculation paths, respectively, removal from service of these valves is also subject to Technical Specifications 3.3.1.b, or 3.3.1.d.

Components which have a "COM" in the flow path column are common to both trains. Common components are treated as affecting a single train for entry into the action statements. After the action statement has been entered the removal from service of other components must be completed within the time limit specified from time the first component was removed from service, and restricted to a single train, or other common or diversion components. The common valves which are treated as affecting a single train are redundant, or otherwise protected from single failure. Common valves which are not protected from single failure, or would cause a flow path to be inoperable, are specifically listed under Action Statement (D) with a one hour time limit.

"DIV," is used to distinguish between common flow path valves and those valves which prevent flow diversion from the flow paths listed. The action requirements are the same as for the common valves, however, the distinction has been made to clarify the purpose of these valves. Diversion valves do not constitute a separate train, but may affect one, or both trains. Flow path diversion valves, in general, do not cause both trains to become inoperable because sufficient redundancy exists to allow isolation of the pathway. After the action statement has been entered, the removal from service of other components must be completed within the time limit specified from time the first component was removed from service, and restricted to a single train, or other diversion, or common components. Those valves which do not have redundant isolation capability are listed under one hour Action Statement (D).

"ALT," and "HLR," designates the alternate and normal trains of hot leg recirculation since these are not aligned with the "A" and "B" electrical trains.

Power locked valves, MOV-883, MOV 866A & B, and CV-92 are equipped with redundant switches from the control room and starter relays which permit the power to be locked out without physically disabling the operability of the valve. Deactivated valves have the power supply removed, or the valve has been physically restrained from operating.

Table 3.3.8-1

Status of Components

Valve	Status	Flow Path	Train
MOV-883	Operable-Open (PL)	SI,CS	COM
HV-851B	Operable[1]	SI	A
HV-852B	Operable[1]	SI	A
HV-853B	Operable[1]	SI	A
HV-854B	Operable[1]	SI	A
CV-36	Operable[1] or Isolated	SI	B
CV-37	Operable[1] or Isolated	SI	A
CV-875A	Operable[1]	SI	B
CV-875B	Operable[1]	SI	A
HV-851A	Operable[1]	SI	B
HV-852A	Operable[1]	SI	B
HV-853A	Operable[1]	SI	B
HV-854A	Operable[1]	SI	B
MOV-850A	Operable[1]	SI	B
MOV-850B	Operable[1]	SI	A
MOV-850C	Operable[1]	SI	COM (UPS)
MOV-880	Operable or Closed (DA)	CS,CLR	COM
MOV-1100B	Operable	CLR,HLR	A
MOV-1100D	Operable	CLR,HLR	B
MOV-1100C	Operable or Closed (DA)	CLR,SI	COM
FCV-1112	Operable[5]	CLR,SI,HLR	COM
FIT-1112	Operable*	CLR,SI,HLR	COM
MOV-18	Operable[2]	SI, CLR	B
MOV-19	Operable[2]	SI, CLR	A
FCV-1115D	Operable[3]	SI, CLR	COM
FCV-1115E	Operable[3]	SI, CLR	COM
FCV-1115F	Operable[3]	SI, CLR	COM

[1] Not required in Mode 3 <600 psig and Mode 4

[2] Or 1 of 2 parallel valves OPEN (DA)

[3] Only 2 of 3 Required when in Mode 3 < 600 psig and Mode 4

[4] Or 1 of 2 valves CLOSED (DA)

[5] Can be closed from controller

[6] If failed open apply Action Statement D

[7] 1 of 2 failed open (72 hours) if both recirculating water pumps operable, otherwise apply Action Statement D.

SI= Safety Injection
CLR= Cold Leg Injection/Recirculation
HLR= Hot Leg Recirculation
ALT HLR= Alternate Hot Leg Recirculation
CS= Containment Spray
CCW= Component Cooling Water
PL= Power Locked Out
DIV= Diversion
DA= Deactivated
COM= Common
UPS= Uninterruptible Power Supply
* or alternate method available

Table 3.3.8-1

Status of Components

Valve	Status	Flow Path	Train
FI-3114A	Operable[3]	CLR	COM
FI-2114B	Operable[3]	CLR	COM
FI-2114C	Operable[3]	CLR	COM
MOV-356	Operable[3]	CLR, SI	A
MOV-357	Operable[3]	CLR, SI	B
MOV-358	Operable[3]	CLR, SI	COM (UPS)
PCV-430C	Operable(can be closed)	HLR	DIV
PCV-430H	Operable (can be closed)	HLR	DIV
MOV-20	Operable or Closed	SI	A
FCV-457	Operable or Closed	SI	B
MOV-21	Operable or Closed	SI	B
FCV-456	Operable or Closed	SI	A
MOV-22	Operable or Closed	SI	A
FCV-458	Operable or Closed	SI	B
CV-142	Operable or Closed	SI	DIV
CV-143	Operable or Closed	SI	DIV
CV-144	Operable or Closed	SI	DIV
CV-202	Operable or Closed(DA)	ALT HLR,CLR	DIV
CV-203	Operable or Closed(DA)	ALT HLR,CLR	DIV
CV-204	Operable or Closed(DA)	ALT HLR,CLR	DIV
CV-406A	Operable[4]	SI,CLR,ALT HLR	COM
CV-406B	Operable[4]	SI,CLR,ALT HLR	COM
CV-305	Operable	CLR, HLR	COM
CV-304	Operable	CLR, HLR	COM
CV-410	Operable[4]	CLR, HLR	DIV
CV-411	Operable[4]	CLR, HLR	DIV

[1] Not required in Mode 3 <600 psig and Mode 4

[2] Or 1 of 2 parallel valves OPEN (DA)

[3] Only 2 of 3 Required when in Mode 3 < 600 psig and Mode 4

[4] Or 1 of 2 valves CLOSED (DA)

[5] Can be closed from controller

SI= Safety Injection
CLR= Cold Leg Injection/Recirculation
HLR= Hot Leg Recirculation
ALT HLR= Alternate Hot Leg Recirculation
CS= Containment Spray
CCW= Component Cooling Water
PL= Power Locked Out
DIV= Diversion
DA= Deactivated
COM= Common
UPS= Uninterruptible Power Supply
* or alternate method available

If failed open apply Action Statement D

1 of 2 failed open (72 hours) if both recirculating water pumps operable, otherwise apply Action Statement D.

Table 3.3.8-1

Status of Components

Valve	Status	Flow Path	Train	
CV-527	Operable[4]	SI, CLR,HLR	DIV	See TS 3.6.2
CV-528	Operable[4]	SI, CLR,HLR	DIV	See TS 3.6.2
CV-2145	Operable or Closed(DA)	SI,CLR,HLR	DIV	
MOV-866A	Operable (PL)[6]	CLR, HLR	A	
MOV-866B	Operable (PL)[6]	CLR, HLR	B	
MOV-813	Operable	ALT HLR	ALT HLR	
MOV-814	Operable	ALT HLR	ALT HLR	
MOV-833	Operable[4]	ALT HLR	ALT HLR	
MOV-834	Operable[4]	ALT HLR	ALT HLR	
MOV-822A	and/or 822B DA OPEN[1]	ALT HLR	ALT HLR	
MOV-822B	and/or 822A DA OPEN[1]	ALT HLR	ALT HLR	
CV-525	Operable[4]	ALT HLR	ALT HLR	See TS 3.6.2
CV-526	Operable[4]	ALT HLR	ALT HLR	See TS 3.6.2
CV-517	Operable and Open[7]	CS,ALT HLR,CLR	A	
CV-518	Operable and Open[7]	CS,ALT HLR,CLR	B	
SV-82	Operable	CS	A	
SV-114	Operable	CS	B	
CV-92	Operable and Closed(PL)	CS	COM	
SV-600	Operable	CS	A	
SV-601	Operable	CS	B	
CV-737A	Operable[2]	CCW	COM	
CV-737B	Operable[2]	CCW	COM	
MOV-720A	Operable	CCW	B	See TS 3.3.7
MOV-720B	Operable	CCW	A	See TS 3.3.7

SI= Safety Injection
CLR= Cold Leg Injection/Recirculation
HLR= Hot Leg Recirculation
ALT HLR= Alternate Hot Leg Recirculation
CS= Containment Spray
CCW= Component Cooling Water
PL= Power Locked Out
DIV= Diversion
DA= Deactivated
COM= Common
UPS= Uninterruptible Power Supply
* or alternate method available

1 Not required in Mode 3 <600 psig and Mode 4

2 Or 1 of 2 parallel valves OPEN (DA)

3 Only 2 of 3 Required when in Mode 3 < 600 psig and Mode 4

4 Or 1 of 2 valves CLOSED (DA)

5 Can be closed from controller

6 If failed open apply Action Statement D

7 1 of 2 failed open (72 hours) if both recirculating water pumps operable, otherwise apply Action Statement D.

3.5.5 CONTAINMENT ISOLATION INSTRUMENTATION

APPLICABILITY: Applies to instrumentation which actuates the containment sphere isolation valves, containment sphere purge and exhaust valves, and containment sphere instrumentation vent header valves.

OBJECTIVE: To ensure reliability of the containment sphere isolation provisions.

SPECIFICATION: The instrumentation channels shown in Table 3.5.5-1 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.5.5-2.

ACTION:

A. With an instrumentation channel trip setpoint less conservative than the Allowable Values column of Table 3.5.5-2, declare the channel inoperable and apply the applicable ACTION requirement of Table 3.5.5-1 until the channel is restored to OPERABLE status with the trip setpoint adjusted consistent with the Trip Setpoint Value.

B. With an instrumentation channel inoperable, take the ACTION shown in Table 3.5.5-1.

BASIS: The OPERABILITY of these instrumentation systems ensure that 1) the associated action will be initiated when the parameter monitored by each channel or combination thereof reaches its setpoint, 2) the specified coincidence logic is maintained, 3) sufficient redundancy is maintained to permit a channel to be out of service for testing or maintenance, and 4) sufficient system functional capability is available from diverse parameters.

The OPERABILITY of these systems is required to provide the overall reliability, redundancy, and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions. The integrated operation of each of these systems is consistent with the assumptions used in the accident analyses.

REFERENCES: (1) NRC letter dated July 2, 1980, from D. G. Eisenhut to all pressurized water reactor licensees.

TABLE 3.5.5-1

CONTAINMENT ISOLATION INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
Containment Isolation (Valves listed In Table 3.6.2-1)					
a) Manual	2	1	2	1, 2, 3, 4	11
b) Containment Pressure-High	3/train	2/train	2/train	1, 2, 3	9
c) Sequencer Subchannels	2/sequencer	2/sequencer	2/sequencer	1, 2, 3, 4	8
d) Safety Injection					
1) Containment Pressure-High	3/train	2/train	2/train	1, 2, 3	9*
2) Pressurizer Pressure-Low	3/train	2/train	2/train	1, 2, 3	9*
Purge and Exhaust Isolation (POV-9, POV-10, CV-10, CV-40, CV-116)					
a) Manual	1	1	1	1, 2, 3, 4	10
b) Containment Radioactivity-High	1	1	1	1, 2, 3, 4	10

TABLE 3.5.5-1 (Continued)

TABLE NOTATION

ACTION STATEMENTS

* The provisions of Specification 3.0.4 are not applicable.

ACTION 8 - With the number of OPERABLE channels less than the Minimum Number of Channels, restore the inoperable channels to OPERABLE status within 72 hours, or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.1.4.

ACTION 9 - With the number of OPERABLE channels one less than the Total Number of Channels, operation may proceed until performance of the next required CHANNEL FUNCTIONAL TEST provided the inoperable channel is placed in the tripped condition within 8 hours.

ACTION 10 - With less than the Minimum Channels OPERABLE, operation may continue provided the containment purge and exhaust valves (POV-9 & POV-10) are maintained closed.

ACTION 11 - With the number of OPERABLE Channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

TABLE 3.5.5-2

CONTAINMENT ISOLATION INSTRUMENTATION TRIP SET POINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
Containment Isolation		
a) Manual	Not Applicable	Not Applicable
b) Containment Pressure-High	$\leq$ 1.4 psig	$\leq$ 2.0 psig
c) Sequencer Subchannels	Not Applicable	Not Applicable
d) Safety Injection		
1) Containment Pressure-High	$\leq$ 1.4 psig	$\leq$ 2.0 psig
2) Pressurizer Pressure-Low	$\geq$ 1735 psig	$\geq$ 1675 psig
Purge and Exhaust Isolation		
a) Manual	Not Applicable	Not Applicable
b) Containment Radioactivity-High	$\leq$ 2 x Background	$\leq$ 2.5 x Background

4.2 SAFETY INJECTION AND CONTAINMENT SPRAY SYSTEM

4.2.1 SAFETY INJECTION AND CONTAINMENT SPRAY SYSTEM PERIODIC TESTING

APPLICABILITY: Applies to testing of the Safety Injection System and the Containment Spray System.

OBJECTIVE: To verify that the Safety Injection System and the Containment Spray System will respond promptly and properly if required.

SPECIFICATION: I. System Tests

A. Hot Safety Injection System Test

(1) When the plant is planned to be shutdown from MODE 1 operation and is planned to enter MODE 5 operation, a Hot SIS Test shall be performed in MODE 3 while RCS pressure is above 1500 psi but not more often than once every 9 months. The test shall include a determination of the force required to open valves NV 851 A and 8 and the margin of available actuation force.

(2) The test will be considered satisfactory if:

(a) control board indication and visual observations indicate all components have operated and sequenced properly. That is, the appropriate pumps have started and/or stopped and started, and all valves have completed their travel.

(b) the measured actuator force for both the HV-851 A and B valves is equal to or less than 10,000 lb_f.*

(3) If the measured actuator force of either HV-851 A or B is between 10,000 and 22,000 lb_f, the HV-851 A and B valves shall be considered OPERABLE but the future testing interval shall be accelerated as determined by the following equation:

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*Upon receipt of satisfactory data from continuing testing and analysis, the NRC staff will consider a request from Southern California Edison Company to change this number to more accurately reflect existing conditions.

$$T = T_L \frac{(22,000 - F)}{12,000}$$

where: T = maximum time in days of operation allowed before next surveillance test is required

T_L = time in days of operation since the last surveillance test

F = measured actuator force

(4) If the measured actuator force of either HV-851 A or 8 is greater than 22,000 lb_f, test results shall be reported to the NRC pursuant to Specification 6.9.2 along with proposed corrective actions. NRC approval shall be obtained prior to returning the unit to service.

B. Trisodium Phosphate Test

(1) A test of the trisodium phosphate additive shall be conducted once every refueling to demonstrate the availability of the system. The test shall be performed in accordance with the following procedure:

(a) The three (3) storage racks are visually observed to have maintained their integrity.

(b) The three (3) racks, each with a storage capacity of 1800 pounds of anhydrous trisodium phosphate additive, are visually observed to be full.

(c) Trisodium phosphate from one of the sample storage racks inside containment shall be submerged without agitation, in 25±0.5 gallons of 150°F to 175°F distilled water borated to 3900±100 ppm boron.

(2) The test shall be considered satisfactory if the racks have maintained their integrity, the racks are visually observed to be full, and the trisodium phosphate dissolves to the extent that a minimum pH of 7.0 is reached within 4 hours of the start of the test.

C. Containment Spray System Test

(1) During reactor shutdown at intervals not longer than the normal plant refueling intervals, a "no-flow" system test shall be conducted to demonstrate proper availability of the system. The test shall be performed either by closing a manual valve in the system or electrically disabling the refueling water pumps and initiating the system by tripping the normal actuation instrumentation.

(2) The test will be considered satisfactory if visual observations indicate all components have operated satisfactorily.

(3) At least once every second refueling outage an air flow test shall be performed to demonstrate the absence of blockage at each containment spray nozzle.

D. Inspection of Containment

Perform a visual inspection verifying that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment sump and cause restriction of the recirculation pump suction inlet or sump 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.

At refueling intervals:

Perform a visual inspection of the containment and recirculation sumps as specified above. Additionally verify that the sump components show no evidence of structural distress or abnormal corrosion.

II. <u>Component Tests</u>

A. Pump Tests

(1) In addition to the above test, the safety injection, recirculation, spray additive and refueling water pumps shall be started at intervals not to exceed one month to verify that they are in satisfactory running order.

(2) Acceptable levels of performance shall be as follows:

(1) The safety injection pumps shall reach and be capable of maintaining 95% of their rated shutoff head within 10 seconds after starting.

(2) The refueling water pumps shall be capable of maintaining 90% of their rated shutoff head.

(3) The recirculation pumps shall be run dry. Proper starting of the pump is confirmed by observation of the running current on the ammeter.

(4) The spray additive pumps shall be capable of maintaining their rated flow at a discharge pressure not less than 90% of their rated discharge pressure.

B. Leakage Testing

(1) The recirculation loop outside containment (including the Containment Spray System) shall be pressurized at a pressure equal to or greater than the operating pressure under accident conditions at intervals not to exceed the normal plant refueling interval. Visual inspections for leakage shall be made and if leakage can be detected, measurements of such leakage shall be made. In addition, pumps and valves of the recirculation loop outside containment which are used during normal operation, shall be visually inspected for leakage at intervals not to exceed once every six months. If leakage can be detected, measurements of such leakage shall be made.

(2) The non-redundant Containment Spray System piping shall be visually inspected at intervals not to exceed the normal plant refueling interval. Observations made as part of compliance with Paragraph C, above, or Paragraph I.C(2) of Technical Specification 4.2 will be acceptable as visual inspection of portions of non-redundant Containment Spray System piping.

C. RWST Low Level Trips

Monthly, perform a CHANNEL TEST and every refueling interval, perform a CHANNEL CALIBRATION, of the SI/Feedwater Pump trip and the MOV 850A, 850B and 850C automatic closure on low-low Refueling Water Storage Tank level.

D. Testing ECCS Valves

(1) At least once every 31 days verify that each valve (manual, power operated or automatic) which is not locked, sealed, or otherwise secured in position, is in the correct position.

(2) At least once every 31 days verify that the power supply breaker for either MOV-822A or MOV-822B is open when in MODES 1, 2 or 3 with the RCS pressure greater than or equal to 600 psig.

(3) At least once per 18 months, during shutdown, by verifying that each automatic valve in the flow path actuates to its correct position on a safety injection test signal.

BASIS: The Safety Injection System is a principal plant safeguard. It provides means to insert negative reactivity and limits core damage in the event of a loss of coolant or steam break accident.[(1)(2)(3)] The inspections and tests are to assure the availability of the components and the equipment for safety injection, cold leg recirculation, hot leg recirculation, alternate hot leg recirculation and containment spray.

Preoperational performance tests of the components are performed in the manufacturer's shop. An initial system flow test demonstrates proper dynamic functioning of the system. Thereafter, periodic tests demonstrate that all components are functioning properly. For these tests, flow through the system is generally not required. However, in the case of the "Hot SIS Test," actual conditions of an SI event are simulated. This test is performed to assure that long-term set of the valve seat faces on HV-851 A and B has not caused the valves to become inoperable. The test is required to be performed as the plant is shutting down from MODE 1 in order to assure that the valves have not been disturbed (i.e., the long-term set is still in effect) and that full dynamic conditions that would occur during an actual SI event are simulated. When possible the test should be performed prior to stopping the feedwater pumps (this is not a requirement). This will further assure that the valves will be in the same condition as when required for an actual Safety Injection event since the discharge pressure of the feedwater pumps acting on the valves will keep them seated even considering any backpressure built up in the downstream SI header. The equation used to determine future intervals if actuator force is between 10,000 lb_f and 22,000 lb_f is developed by shortening the interval in direct proportion to the degree to which the force exceeds 10,000 lb_f. During the test, all components are verified to have operated and sequenced properly.

The tests required in this specification will demonstrate that all components which do not normally and routinely operate will operate properly and in sequence if required. The monthly verification assures that one of the RHR heat exchanger valves (MOV-822A or MOV-822B) is de-energized. Because the valves are located in the containment, and are not environmentally qualified, one valve is requried to be open with the power removed. It is not required to physically verify the valve position, since access to the containment is limited. The In-Service Test Program is used to verify required ECCS valves are operable. The portion of the Recirculation system outside the containment sphere is effectively an extension of the boundary of the containment. The measurement of the recirculation loop leakage ensures that the calculated EAB 0-2 hr. thyroid dose does not exceed 10 CFR 100 limits.

The trisodium phosphate stored in storage racks located in the containment is provided to minimize the possibility of stress corrosion cracking of metal components during operation of the ECCS following a LOCA. The trisodium phosphate provides this protection by dissolving in the sump water and causing its final pH to be raised to 7.0 - 7.5. The requirement to dissolve trisodium phosphate from one of the sample storage racks in distilled water heated and borated, to the extent recirculating post LOCA sump water is projected to be heated and borated, provides assurance that the stored trisodium phosphate will dissolve as required following a LOCA. The sample storage racks are sized to contain 0.5 pounds of trisodium phosphate. Trisodium phosphate stored in the sample storage racks has a surface area to volume ratio of 1.33 whereas the trisodium phosphate stored in the main racks has a surface area to volume ratio of 1.15.

Visual inspection of the non-redundant piping in the Containment Spray System provides additional assurance of the integrity of that system.

Surveillance testing of the RWST low-low level main feedwater/ safety injection pump trips and automatic closure of MOV 850A, 850B and 850C valves will ensure that these components will be available to complete their safety functions if required.

<u>REFERENCES</u>:

(1) Final Engineering Report and Safety Analysis, Section 6.3

(2) "San Onofre Nuclear Generating Station", report forwarded by letter dated December 29, 1971 from Jack B. Moore to Director, Division of Reactor Licensing, USAEC, subject: Emergency Core Cooling System Performance, San Onofre Nuclear Generating Station, Unit 1.

(3) USAEC Safety Evaluation of ECCS Performance Analysis for San Onofre Unit 1, forwarded by letter dated March 6, 1974 from Mr. Donald J. Skovholt to Mr. Jack B. Moore.

(4) Letter, K. P. Baskin, SCE, to D. M. Crutchfield, NRC, dated October 16, 1981.

Reference Drawings:

1. Safety Injection System - Safety Injection highlighted
   Figure I-2

2. Safety Injection System - Cold Leg Recirculation highlighted
   Figure I-2

3. Safety Injection System - Hot Leg Recirculation highlighted
   Figure I-2

4. Recirculation System - Figure II-1A

5. Alternate Hot Leg Recirculation

6. Containment Spray System - Figure III-1A

7. Containment Spray Hydrazine Addition System - Figure III-1B

8. Logic Diagram Containment Isolation System - Drawing 451355

9. Sequencer Logic Diagram - Drawing 5149180

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ALTERNATE HOT LEG RECIRCULATION