SURVEILLANCE REQUIREMENTS (Continued)

2. Verifying that each ECCS subsystem is aligned to receive electrical power from separate OPERABLE emergency buses.

d. By a visual inspection which verifies that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment sump and cause restriction of the pump suctions 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.

e. At least once per 18 months by:

1. A visual inspection of the containment sump and verifying that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of structural distress or corrosion.

f. At least once per 18 months by:

1. Cycling each power operated (excluding automatic) valve in the flow path through at least one complete cycle of full travel.

2. Verifying that each automatic valve in the flow path actuates to its correct position on a safety injection signal.

3. Verifying that the centrifugal charging pump and low head safety injection pumps start automatically upon receipt of a safety injection signal.

g. The containment recirculation spray subsystem shall be demonstrated OPERABLE per the applicable portions of Specification 4.6.2.2.

3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS

CONTAINMENT QUENCH SPRAY SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.1 Two separate and independent containment quench spray subsystems shall be OPERABLE.

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

ACTION:

With one containment quench spray subsystem inoperable, restore the inoperable subsystem 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.

SURVEILLANCE REQUIREMENTS

4.6.2.1 Each containment quench spray subsystem shall be demonstrated OPERABLE:

a. At least once per 31 days by:

   1. Verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

   2. Verifying the temperature of the borated water in the refueling water storage tank is within the limits of Specification 3.1.2.8.b.3.

b. By verifying, at the frequency specified in the Inservice Testing Program, that each quench spray pump's developed head at the flow test point is greater than or equal to the required developed head as specified in the Inservice Testing Program and the Containment Integrity Safety Analysis.

c. At least once per 18 months by:

   1. Cycling each power operated (excluding automatic) valve in the flow path through at least one complete cycle of full travel.

SURVEILLANCE REQUIREMENTS (Continued)

d. Verify, at the frequency specified in the Inservice Testing Program, that each recirculation spray pump's developed head at the flow test point is greater than or equal to the required developed head as specified in the Inservice Testing Program and the Containment Integrity Safety Analysis.

e. At least once per 18 months by:

1. Cycling each power operated (excluding automatic) valve in the flow path through at least one complete cycle of full travel.

2. Verifying that each automatic valve in the flow path actuates to its correct position on a test signal.

3. Initiating flow through each Service Water subsystem and its two associated recirculation spray heat exchangers, and verifying a flow rate of at least 11,000 gpm.

f. At least once per 10 years by performing an air or smoke flow test through each spray header and verifying each spray nozzle is unobstructed.

CHEMICAL ADDITION SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.3 The chemical addition system shall be OPERABLE with:

a. A chemical addition tank containing at least 8500 gallons of between 23 and 25 percent by weight NaOH solution, and

b. Two chemical injection subsystems each capable of adding NaOH solution from the chemical addition tank to a containment quench spray system pump flow.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With one chemical addition subsystem inoperable, restore the subsystem to OPERABLE status within 72 hours or be in HOT STANDBY within the next 6 hours; restore the chemical addition subsystem to OPERABLE status within the next 48 hours or be in COLD SHUTDOWN within the next 36 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.3 The chemical addition system shall be demonstrated OPERABLE:

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

b. By verifying that on recirculation flow, each injection pump develops a flow between 40 and 60 gpm when tested pursuant to Specification 4.0.5.

c. At least once per 6 months by:

1. Verifying the contained solution volume in the tank, and

2. Verifying the concentration of the NaOH solution by chemical analysis.

d. At least once per 18 months by:

1. Cycling each valve in the chemical addition system flow path through at least one complete cycle of full travel.

2. Verifying that each automatic valve in the flow path actuates to its correct position on a test signal.

3. Verifying that each chemical injection pump starts automtically on a test signal.

SURVEILLANCE REQUIREMENTS (Continued)

4.6.3.1.2 Each containment isolation valve shall be demonstrated OPERABLE* at least once per 18 months by:

a. Verifying that on a Phase A containment isolation test signal each Phase A isolation valve actuates to its isolation position.

b. Verifying that on a Phase B containment isolation test signal, each Phase B isolation valve actuates to its isolation position.

c. Verifying that on a Containment Purge and Exhaust isolation signal, each Purge and Exhaust valve actuates to its isolation position.

d. Cycling each power operated or automatic valve through at least one complete cycle of full travel and measuring the isolation time pursuant to Specification 4.0.5.

e. Cycling each weight or spring loaded check valve not testable during plant operation, through one complete cycle of full travel and verifying that each check valve remains closed when the differential pressure in the direction of flow is < 1.2 psid and opens when the differential pressure in the direction of flow is ≥ 1.2 psid but less than 6.0 psid.

f. Cycling each manual valve not locked, sealed or otherwise secured in the closed position through at least one complete cycle of full travel.

* Locked or sealed closed valves may be opened on an intermittent basis under administrative control.

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3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS (Continued)

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point on the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the ECCS Flow Analysis. The term "required developed head" refers to the pump performance at a given flow point that is assumed in the ECCS Flow Analysis. This is possible since the analysis assumes the pump delivers different flows at different times during accident mitigation. These multiple points are represented by a curve. The values at various flow points are defined by the Minimum Operating Point (MOP) curve in the Inservice Testing (IST) Program. The verification that the pump's developed head at the flow test point is greater than or equal to the required developed head is performed by using the MOP curve. Surveillance requirements are specified in the IST Program, which encompasses Section XI of the ASME Code. Section XI of the ASME Code provides the activities and frequencies necessary to satisfy the requirements.

The 18-month surveillance interval is consistent with expected length of fuel cycles and allows for component testing to be performed during plant shutdown conditions if necessary to avoid a plant transient that could occur if the component were tested at power. However, for those components that may be safely tested at power, the 18-month surveillance may be met by performing the required testing at power.

The limitation for a maximum of one charging pump to be OPERABLE and the surveillance requirement to verify all charging pumps except the required OPERABLE pump to be inoperable below 350°F provides assurance that a mass addition pressure transient can be relieved by the operation of a single PORV.

3/4.6.2.1 and 3/4.6.2.2 CONTAINMENT QUENCH AND RECIRCULATION SPRAY SYSTEMS (Continued)

on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance.

Verifying that each recirculation spray system pump's developed head at the flow test point is greater than or equal to the required developed head ensures that recirculation spray system pump performance has not degraded during the cycle. The term "required developed head" refers to the value that is assumed in the Containment Integrity Safety Analysis for the recirculation spray pump's developed head at a specific flow point. This value for the required developed head at a flow point is defined as the MOP in the IST Program. The verification that the pump's developed head at the flow test point is greater than or equal to the required developed head is performed by using a MOP curve. The MOP curve is contained in the IST Program and was developed using the required developed head at a specific flow point as a reference point. From the reference point, a curve was drawn which is a constant percentage below the current pump performance curve. Based on the MOP curve, a verification is performed to ensure that the pump's developed head at the flow test point is greater than or equal to the required developed head. Flow and differential head are normal test parameters of centrifugal pump performance required by Section XI of the ASME Code. Since the recirculation spray system pumps cannot be tested with flow through the spray headers, they are tested on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance.

The ten year surveillance interval for performing an air or smoke flow test through each spray header is considered adequate for detecting obstruction of the nozzles due to the passive design of the spray header and the header's components being constructed with stainless steel.

The 18-month surveillance interval is consistent with expected length of fuel cycles and allows for component testing to be performed during plant shutdown conditions if necessary to avoid a plant transient that could occur if the component were tested at power. However, for those components that may be safely tested at power, the 18-month surveillance may be met by performing the required testing at power.

3/4.6.2.3 CHEMICAL ADDITION SYSTEM

The OPERABILITY of the chemical addition system ensures that sufficient NaOH is added to the containment spray in the event of a LOCA. The limits on NaOH minimum volume and concentration, ensure that 1) the iodine removal efficiency of the spray water is maintained because of the increase in pH value, and 2) corrosion effects on components within containment are minimized. These assumptions are consistent with the iodine removal efficiency assumed in the accident analyses.

The 18-month surveillance interval is consistent with expected length of fuel cycles and allows for component testing to be performed during plant shutdown conditions if necessary to avoid a plant transient that could occur if the component were tested at power. However, for those components that may be safely tested at power, the 18-month surveillance may be met by performing the required testing at power.

3/4.6.3 CONTAINMENT ISOLATION VALVES

The OPERABILITY of the containment isolation valves ensures that the containment atmosphere will be isolated from the outside environment in the event of a release of radioactive material to the containment atmosphere or pressurization of the containment. Containment isolation within the time limits specified ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for both a LOCA and major secondary system breaks.

The opening of locked or sealed closed containment isolation valves on an intermittent basis under administrative control includes the following considerations: (1) stationing an operator, who is in constant communication with the control room, at the valve controls, (2) instructing this operator to close these valves in an accident situation, and (3) assuring that environmental conditions will not preclude access to close the valves and that this action will prevent the release of radioactivity outside the containment.

The 18-month surveillance interval is consistent with expected length of fuel cycles and allows for component testing to be performed during plant shutdown conditions if necessary to avoid a plant transient that could occur if the component were tested at power. However, for those components that may be safely tested at power, the 18-month surveillance may be met by performing the required testing at power.

3/4.6.4 COMBUSTIBLE GAS CONTROL

The OPERABILITY of the equipment and systems required for the detection and control of hydrogen gas ensures that this equipment

3/4.6.4 COMBUSTIBLE GAS CONTROL (Continued)

will be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA conditions. Either recombiner unit is capable of controlling the expected hydrogen generation associated with 1) zirconium-water reactions, 2) radiolytic decomposition of water, and 3) corrosion of metals within containment. These hydrogen control systems are consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a LOCA."

The hydrogen recombiner system is designed to maintain the hydrogen concentration in the containment structure below 4 volume percent following a LOCA. The required system flow rate (42 scfm) is the flow at post LOCA containment conditions (13 psia and 130°F) assumed in the design analysis to assure the hydrogen concentration is maintained below 4 volume percent following a LOCA.

The equation specified below shall be used when performing Surveillance 4.6.4.2.b.3 to correct the flow measured under test conditions to the corresponding flow at design basis post accident containment conditions of 13 psia and 130°F.

$$scfm_{PA} = scfm_{Test}(0.00154)\frac{T_C}{P_{Blower}}\left(1+2682.45\frac{P_C}{T_C^2}\right)\left(13-0.022T_C\left(1-\frac{P_{Blower}}{P_C}\right)\right)$$

where:

T_C = average containment temperature during testing (°R)

P_{Blower} = blower suction pressure during testing (psia)

P_C = containment pressure during testing (psia)