MISCELLANEOUS DEFINITIONS

Operable - Operability

A system, subsystem, train, component or devise shall be OPERABLE or have OPERABILITY when it is capable of performing its specified functions(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem train, component or device to perform its function(s) are also capable of performing the related support functions(s).

In Operation

A system or component is in operation if it is performing its design function.

CEA's

All full length shutdown and regulating control rods.

Non-trippable (NT) CEA's

CEA's which are non-trippable.

Containment Integrity

Containment integrity is defined to exist when all of the following are met:

(1) All nonautomatic containment isolation valves which are not required to be open during accident conditions and blind flanges are closed.

(2) The equipment hatch is properly closed and sealed.

(3) ~~At least one door in~~ The personnel air lock is ~~properly sealed and closed.~~ operable pursuant to Specification 2.6(1)b.

(4) All automatic containment isolation valves are operable, ~~or~~ locked closed, or deactivated (or isolated by locked closed valves or blind flanges as permitted by limiting condition for operation).

(5) The uncontrolled containment leakage satisfies Specification 3.5.

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Applicability

Applies to the reactor containment system.

Objective

To assure the integrity of the reactor containment system.

Specifications

(1) Containment Integrity

a. Containment integrity shall not be violated unless the reactor is in the a cold or refueling shutdown condition. Without containment integrity, restore containment integrity within one hour or be in at least hot shutdown within the next 6 hours, in at least subcritical and <300°F within the next 6 hours and in cold shutdown within the following 30 hours. Normally locked or sealed-closed valves (except for PCV-742A/B/C/D) may be opened intermittently under administrative control without constituting a violation of containment integrity.

b. The personnel air lock shall be operable unless the reactor is in a cold or refueling shutdown condition. Both doors shall be closed except when the air lock is being used for normal transit, then at least one air lock door shall be closed. The entire air lock assembly leakage rate shall be in accordance with Specification 3.5(4).

(i). With one personnel air lock door inoperable:

a. Maintain at least the operable air lock door closed and either restore the inoperable air lock door to operable status within 24 hours or lock the operable air lock door closed. Entry and exit is permissible to perform repairs of the affected air lock components without constituting a violation of containment integrity.

b. Operation may then continue until performance of the next required entire air lock assembly leakage test provided that the operable air lock door is verified to be locked closed at least once per 31 days.

c. Otherwise, be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours.

d. Entry into another operational mode or specified condition is allowed if the provisions stated in 2.6(1)b.(i)a. above are met.

(ii). With the personnel air lock inoperable, except as the result of an inoperable air lock door, maintain at least one air lock door closed; restore the inoperable air lock to operable status within 24 hours or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours.

~~b.~~ c. Containment integrity shall not be violated when the reactor vessel head is removed if the boron concentration is less than refueling concentration.

~~c.~~ d. Except for testing one CEDM at a time, positive reactivity changes shall not be made by CEA motion or boron dilution unless the containment integrity is intact.

~~d. Prior to the reactor going critical after a refueling outage an administrative check will be made to confirm that all "locked closed" manual containment isolation valves are closed and locked.~~

e. The containment purge isolation valves will be locked closed unless the reactor is in a cold or refueling shutdown condition.

(2) Internal Pressure

The internal pressure shall not exceed 3 psig (except for containment leak rate tests).

(3) Hydrogen Purge System

a. Minimum Requirements

The reactor shall not be made critical unless all of the following requirements are met:

1. The containment isolation valves VA-280 and VA-289 shall be locked closed.

2. VA-80A and VA-80B with associated valves and piping to include VA-82 filters, are operable.

b. Modification of Minimum Requirements

After the reactor has been made critical, the minimum requirements may be modified to allow either or both of the following statements (i,ii) to be applicable at any one time. If the operability of the component(s) is not restored to meet the minimum requirements within the time specified below, the reactor shall be placed in a hot shutdown condition within six hours.

(i) One of the hydrogen purge fans, VA-80A or VA-80B, with associated valves and piping, may be inoperable provided the fan is restored to operable status within 30 days.

(ii) The hydrogen purge filter system, VA-82, may be inoperable provided the system is restored to operable status with 72 hours.

Basis

The reactor coolant system conditions of cold shutdown assure that no steam will be formed and, hence, there would be no pressure buildup in the containment if the reactor coolant system ruptures. The shutdown margins are selected based on the type of activities that are being carried out. The refueling boron concentration provides a shutdown margin which precludes criticality under any circumstances. Each CEDM must be tested and some have two CEA's attached.

Regarding internal pressure limitations, the containment design pressure of 60 psig would not be exceeded if the internal pressure before a major loss-of-coolant accident were as much as 3 psig.[1] The containment integrity will be protected if the visual check of all "locked closed" manual isolation valves to verify them closed is made prior to plant start-up after an extended outage where one or more valves could inadvertently be left open. Operation of the purge isolation valves is prevented during normal operations due to the size of the valves (42 inches) and a concern about their ability to close against the differential pressure that could result from a LOCA or MSLB. Specification 2.6(1)a applies when both doors of the PAL are declared inoperable, or the entire air lock assembly leakage exceeds the requirements of Specification 3.5(4). Specification 2.6(1)b(ii) applies when mechanisms other than a door, such as the inner door equalizing valve, are declared inoperable.

The Hydrogen Purge System is required to be operable in order to control the quantity of combustible gases in containment in a post-LOCA condition.[2] The containment integrity will be protected by ensuring the penetration valves VA-280 and VA-289 are "locked closed" while HCV-881 and HCV-882 are normally closed during power operation. The applicable surveillance testing requirements of Table 3-5 will ensure that the system is capable of performing its design function. The blowers (VA-80A and VA-80B), associated valves, and piping are single failure proof, have been designed as a Seismic Class I System, and are redundant to the VA-82 filter header.

VA-80A or VA-80B with the associated valves and piping may be inoperable for 30 days. The redundancy of the blowers allows one blower with associated valves and piping to be removed from operation while the other train has the capability to provide 100% hydrogen control.

References

(1) USAR, Section 14.16; Figure 14.16-2
(2) Regulatory Guide 1.7 (1971)
(3) USAR, Section 14.17
(4) Engineering Study 86-10, Calculation 53

3.0 **SURVEILLANCE REQUIREMENTS**
3.5 Containment Test

Applicability

Applies to containment leakage and structural integrity.

Objective

To verify that the:

(1) Locked closed manual containment isolation valves are closed and locked,

~~(1)~~ (2) potential leakage from containment is within acceptable limits, and

~~(2)~~ (3) structural performance of all important components in the containment prestressing system is acceptable.

Specifications

(1) Prior to the reactor going critical after a refueling outage, and at least once per 31 days thereafter, an administrative check will be made to confirm that all "locked closed" manual containment isolation valves are closed and locked. Valves, blind flanges, and deactivated automatic valves which are located inside the containment and are locked, sealed or otherwise secured in the closed position shall be verified closed during each cold shutdown except that such verification need not be performed more often than once per 92 days.

~~(1)~~ (2) Containment Building Leak Rate Tests

Tests shall be conducted to assure that leakage of the primary reactor containment and associated systems is maintained within allowable leakage rate limits. Periodic surveillance shall be performed to assure proper maintenance and leak repair of the containment structure and penetrations during the plant's operating life.

Definitions of terms used in the leak rate testing specifications:

Leakage Rate - for test purposes is that leakage of containment air which occurs in a unit of time. Stated as a percentage of weight of the original content of containment air at the leakage rate test pressure that escapes to the outside atmosphere during a 24 hour test period.

Maximum Allowable Leakage Rate (L_a) - the design basis leakage rate of 0.1% by weight of the containment atmosphere per 24 hours at a pressure of 60 psig.

Overall Integrated Leakage Rate - that leakage rate which is obtained from a summation of leakage through all potential leakage paths including containment welds, valves, fittings, and components which penetrate containment.

Acceptable Criteria - the standard against which test results are to be compared for establishing the functional acceptability of the containment as a leakage limiting boundary.

~~(2)~~ (3) Integrated Leak Rate Test (Type A Test)

a. Introduction

Type A tests are intended to measure the reactor containment overall integrated leakage rate at periodic intervals.

b. Pretest Requirements

A general inspection of the accessible interior and exterior surfaces of the containment structures and components shall be performed prior to any Type A test to uncover any evidence of structural deterioration which may affect either the containment structural integrity or leak-tightness. If there is evidence of structural deterioration, the Type A tests shall not be performed until corrective action is taken in accordance with repair procedures, non-destructive examinations, and tests as specified in the applicable code specified in 10 CFR Part 50.55a at the commencement of repair work. Such structural deterioration and corrective actions taken shall be reported as part of the Type A test report.

During the period between the initiation of the containment inspection and performance of the Type A test, no repairs or adjustments shall be made so that the containment can be tested in as close to the "as is" condition as practical. During the period between the completion of one Type A test and the initiation of the containment inspection for the subsequent Type A test, repairs or adjustments shall be made to components whose leakage exceeds that specified in the Technical Specifications as soon as practical after identification. This requirement is interpreted not to preclude performance of Type B and Type C testing and required repairs prior to initiation of the containment inspection and the performance of the Type A test.

If during a Type A test, potentially excessive leakage paths are identified which interfere with satisfactory completion of the test, or which result in the Type A test not meeting the acceptance criteria, the Type A test shall be temporarily suspended. Thereafter, repairs and/or adjustments to equipment shall be made and the Type A test resumed. The corrective action taken, the change in leakage rate resulting from the repairs and overall integrated leakage determined from the Type A and local leak rate tests shall be included in a report submitted to the Commission.

Closure of containment isolation valves for the Type A test shall be accomplished by normal operation and without any preliminary exercising or adjustments (e.g., no tightening of valve after closure by valve monitor). Repairs of maloperating or leaking valves shall be made necessary. Information on any valve closure malfunction or valve leakage that requires corrective action before the test, shall be included in the Type A Leak Test Report submitted to the Commission.

The containment test conditions shall stabilize for a period of approximately 4 hours prior to the start of the leakage rate test.

Those portions of the fluid systems that are part of the reactor coolant pressure boundary and are open directly to the containment atmosphere under post-accident conditions and become an extension of the boundary of the containment shall be opened or vented to the containment atmosphere prior to and during the test. Portions of closed systems inside containment that penetrate containment and rupture as a result of a loss of coolant accident shall be vented to the containment atmosphere. All vented systems shall be drained of water or other fluids to the extent necessary to assure exposure of the system containment isolation valves to containment air test pressure and to assure they will be subjected to the post-accident differential pressure. Systems that are required to maintain the plant in a safe condition during the test shall be operable in their normal mode, and need not be vented. Systems that are normally filled with water and operating under post-accident conditions, such as the containment heat removal system and the component cooling water system, need not be vented. However, the containment isolation valves in the systems defined in this section shall be tested in accordance with Section 3.5(45). The measured leakage rate from these tests shall be reported to the Commission.

c. Test Methods

All Type A tests shall be conducted in accordance with the provisions of 10 CFR Part 50, Appendix J.

The accuracy of any Test A shall be verified by a supplemental test. The supplemental test method selected shall be conducted for sufficient duration to establish accurately the change in leakage rate between the Type A test and the supplemental Type A test. Results from the supplemental test are acceptable provided the difference between the supplemental test data and the Type A test data is within 0.25 L_a. If results are not within 0.25 L_a, the reason shall be determined, corrective action taken, and a successful supplemental test performed.

Test leakage rates shall be calculated using absolute values corrected for instrument error.

d. Acceptance Criteria

The maximum allowable leakage rate shall not exceed 0.1%.

The total measured leakage rate at a pressure of 60 psig shall be less than 0.75 L_a. If local leakage measurements are taken to effect repairs in order to meet 0.75 L_a acceptance criteria, these measurements shall be taken at a pressure of 60 psig.

If two consecutive Type A tests fail to meet the acceptance criteria, notwithstanding the requirements of the testing frequency, a Type A test shall be performed at each refueling outage or approximately every 18 months, whichever occurs first, until two consecutive Type A tests meet the acceptance criteria, after which time the normal testing frequency schedule may be resumed.

e. Testing Frequency

A set of three Type A tests shall be performed, at approximately equal intervals during each 10 year service period. The third test of each set shall be conducted when the plant is shutdown for the 10-year in-service inspections.

The performance of Type A tests shall be limited to periods when the plant facility is non-operational and secured in the shutdown condition under administrative control and in accordance with the safety procedures defined in the license.

~~(3)~~ (4) Containment Penetrations Leak Rate Tests (Type B Tests)

a. Introduction

Type B tests are intended to detect local leaks and to measure leakage across each pressure-containing or leakage limiting boundary for the containment penetrations.

b. Test Methods

Type B tests shall be performed by local pneumatic pressurization of the containment penetrations, either individually or in groups, at a pressure of 60 psig.

Examination shall be performed by halide leak-detection method or by other equivalent test methods such as measurement of the rate of makeup required to maintain the test volume at 60 psig.

c. Acceptance Criteria

The combined leakage rate of all penetrations and valves subject to Type B and Type C tests shall be less than or equal to 0.6 L_a.

If at any time it is determined that a leakage rate is greater than 0.6 L_a, repairs shall be initiated immediately. If repairs are not completed and conformance to the acceptance criteria is not demonstrated within 48 hours, the reactor shall be shut down and depressurized until repairs are completed and the local leakage meets this acceptance criteria.

The results of personnel access lock door seal tests at 5 psig shall not exceed .01 L_a.

d. Testing Frequency

Type B tests shall be performed during each refueling outage, or other convenient intervals, but in no case at intervals greater than 2 years, except the personnel access lock (PAL) which will be tested as follows:

(i) Every six months the entire PAL assembly shall be leak tested at 60 psig.

(ii) If the PAL is opened during periods when containment integrity is not required, the PAL door seals shall be leak tested at 5 psig at the end of such periods and the entire PAL assembly shall then be leak tested at 60 psig within two weeks of achieving the required condition for containment integrity.

(iii) If the PAL is opened during the interval between the six-month tests when containment integrity is required, the PAL door seals shall be leak tested at a pressure not less than 5 psig within 72 hours. If the PAL is opened more frequently than once per 72 hours, the door seals shall be leak tested at a pressure of 5 psig at least once every 72 hours during the period of frequent openings.

e. Penetrations to be Tested [1]

(i) Equipment Hatch

(ii) Personnel Access Lock

(iii) Mechanical Penetrations M-1 through M-99

(iv) Fuel Transfer Tube (Mechanical Penetration M-100)

(v) Electrical Penetrations

A-1	B-9	D-6	F-2	E-HCV-383-3A
A-2	B-10	D-7	F-4	E-HCV-383-3B
A-4	B-11	D-8	F-5	E-HCV-383-4A
A-5	C-1	D-9	F-6	E-HCV-383-4B
A-6	C-2	D-10	F-7	
A-7	C-4	D-11	F-8	
A-8	C-5	E-1	F-9	
A-9	C-6	E-2	F-10	
A-10	C-7	E-4	F-11	
A-11	C-8	E-5	G-1	
B-1	C-9	E-6	G-2	
B-2	C-10	E-7	G-3	
B-4	C-11	E-8	G-4	
B-5	D-1	E-9	H-1	
B-6	D-2	E-10	H-2	
B-7	D-4	E-11	H-3	
B-8	D-5	F-1	H-4	

~~(4)~~ (5) Containment Isolation Valves Leak Rate Tests (Type C Tests)

a. Introduction

Type C tests are intended to measure containment isolation valve leakage rates.

b. Test Methods

Type C tests shall be performed by local pressurization with air or nitrogen at a pressure of 60 psig. The pressure shall be applied in the same direction as that when the valve would be required to perform its safety function, unless it can be determined that the results from the tests for a pressure applied in a different direction will provide equivalent or more conservative results. Each valve to be tested shall be closed by normal operation and without any preliminary exercising or adjustments (e.g., no tightening of valve after closure by valve motor).

c. Acceptance Criteria

The combined leakage rate of all penetrations and valves subject to Type B and Type C tests shall be less than or equal to 0.6 L_a. For the purge isolation valve tests, the measured purge valve leakage rate shall be substituted for the purge valve leakage rate from the last complete Type B and C test and the total leak rate recomputed.

Leakage of the containment air purge isolation valves shall not exceed 18,000 standard cubic centimeters per minute (SCCM). If the leakage rate is determined to be greater than 18,000 SCCM, repairs shall be initiated immediately in order to meet this acceptance criterion.

If at any time it is determined that a leakage rate is greater than 0.6 L_a, repairs shall be initiated immediately. If repairs are not completed and conformance to the acceptance criteria is not demonstrated within 48 hours, the reactor shall be shut down and depressurized until repairs are completed and the local leakage meets this acceptance criteria.

d. Testing Frequency

Type C tests shall be performed during each refueling outage, or other convenient intervals, but in no case at intervals greater than 2 years. The containment purge isolation valves shall also be leakage tested prior to bringing the reactor out of each cold or refueling shutdown but in no case at intervals greater than nine months. If the purge valves are opened during cold or refueling shutdown, the leak test shall be performed after the purge valves are closed for the last time.

e. Penetrations to be Tested[(1)]

M-2	M-31	M-52	IA-3092
M-7	M-38	M-53	IA-3093
M-8	M-39	M-57	IA-3094
M-11	M-40	M-58	
M-14	M-42	M-69	
M-15	M-43	M-73	
M-18	M-44	M-74	
M-19	M-45	M-79	
M-20	M-46	M-80	
M-22	M-47	M-87	
M-24	M-48	M-88	
M-25	M-50	M-HCV-383-3	
M-30	M-51	M-HCV-383-4	

~~(5)~~ (6) Special Testing Requirements

Any major modification or replacement of a component which is part of the containment boundary shall be followed by either Type A, Type B, or Type C tests as applicable for the area affected by the modification and shall meet the applicable acceptance criteria. Minor modifications, or replacements, performed directly prior to the conduct of a scheduled Type A test do not require a separate test.

~~(6)~~ (7) Report on Test Results

Leak rate tests shall be the subject of a summary technical report submitted to the Commission approximately 3 months after the conduct of each test. The report shall be titled "Reactor Containment Building Integrated Leak Rate Test."

The report shall contain an analysis and interpretation of the Type A test results and a summary analysis of periodic Type B and Type C tests that were performed since the last Type A test.

Leakage test results from Type A, B, and C tests that failed to meet the applicable acceptance criteria shall be reported in a separate summary report approximately 3 months after the conduct of these tests. The Type A test report shall include an analysis and interpretation of the test data, the least-squares fit analysis of the test data (Type A tests only), the instrumentation error analysis (Type A tests only), and the structural conditions of the containment or components, if any, which contributed to the failure in meeting the acceptance criteria. Results and analyses of the supplemental verification test employed to demonstrate the validity of the leakage rate test measurements shall also be included.

~~(7)~~ (8) Surveillance for Prestressing System

a. Sample Selection

The 210 dome tendons and 616 helical wall tendons shall be periodically inspected for symptoms of material deterioration or prestressing force reduction. Inspections shall be performed on four dome tendons, one from each layer and the control dome tendon, and ten helical wall tendons, five of each orientation including one control tendon in each orientation.

The tendons to be inspected shall be randomly selected from the tendons which have not been tested in previous surveillances, except for the control tendons which shall be included in each surveillance sample selection to develop a historical trend in order to correlate the observed data.

b. Visual Inspection

The following visual inspections shall be performed:

(i) The exterior surface of the containment shall be visually examined to detect areas of large spall, severe scaling, D-cracking in areas of 25 square feet or more, grease leakage and other significant structural deterioration or disintegration.

(ii) For each surveillance tendon, selected in accordance with 3.5(~~7~~8)a., the tendon anchorage assembly hardware shall be visually inspected for signs of abnormal material behavior or wear.

(iii) The concrete surrounding the visually inspected tendon anchorages shall be visually inspected for signs of significant structural deterioration.

(iv) The bottom grease caps of all helical wall tendons shall be visually inspected to detect grease leakage or grease cap deformations. Removal of the grease caps is not necessary for this inspection.

c. Prestress Monitoring Tests

Liftoff tests shall be performed on each tendon selected in accordance with 3.5(~~7~~8)a. to monitor prestress. Additionally, the tests shall include the following:

(i) Two helical wall tendons, one of each orientation, and one dome tendon, each randomly selected from their respective groups of surveillance tendons, shall be detensioned and inspected for broken or damaged wires. The control tendons shall NOT be included as tendons to be detensioned.

(ii) During retensioning, simultaneous elongation and jacking force measurements shall be made at a minimum of three approximately equally spaced levels of force between zero and the lock-off force. The two intermediate stress levels shall be as near as practical to the values shown on the initial stressing records for the respective tendon.

d. Tendon Material Tests and Inspections

One wire from each of two helical wall tendons, one of each orientation, and one dome tendon, shall be removed for the following tests and examinations:

(i) Each removed wire shall be examined over its entire length for any evidence of corrosion or other deterioration.

(ii) Tensile tests shall be made on at least three samples of each wire, one cut from each end and one cut from midlength. The samples shall be the maximum length practical for testing and the guage length for elongation shall be in accordance with ASTM E8 "Standard Test Methods for Tension Testing of Metallic Materials." The following information shall be obtained from each test:

(a) Yield Strength,

(b) Ultimate tensile strength, and

(c) Elongation at ultimate tensile strength.

The tendons detensioned in accordance with 3.5(~~7~~8)c.(i) may be the tendons from which the sample wires are removed. The control tendons shall NOT be included as tendons to be detensioned or have wires removed. In addition, all wires found to be broken shall be removed for tensile testing and visual examination.

e. Inspection of Filler Grease

A sample of sheathing filler grease from each of the sample tendons shall be taken and analyzed according to the following national standards:

(i) To determine water content, ASTM D95, "Standard Test Methods for Water in Petroleum Products and Bituminous Materials by Distillation."

(ii) To determine reserve alkalinity, ASTM D974, "Standard Test Method for Acid and Base Number by Color-Indicator Titration."

(iii) To determine the concentration of water soluble chlorides, ASTM D512, "Standard Test Methods for Chloride Ion in Water."

(iv) To determine the concentration of water soluble nitrates, ASTM D3867, "Standard Test Methods for Nitrite-Nitrate in Water."

(v) To determine the concentration of water soluble sulfides, APHA 4500-S^{2-} D. "Methylene Blue Method," Standard Methods for Examination of Water and Waste Water, Seventeenth Edition.

In addition to these tests, the amount of filler grease removed from and replaced into each surveillance tendon shall be recorded and compared to assess grease leakage within the containment structure.

f. Acceptance Criteria

(i) No evidence of significant structural deterioration of the concrete inspected in accordance with 3.5(~~7~~8)b.(i) and 3.5(~~7~~8)b.(iii) which may affect the structural integrity of the containment structure can be detected.

Significant structural deterioration is defined as measurable structural deterioration which, when compared with past inspections, shows strong evidence of an increase of structural deterioration which could affect the Containment's structural integrity. Evidence of cosmetic or superficial deterioration, unless determined by sound engineering judgement to be significant, is not considered to be significant structural deterioration.

No evidence of significant material degradation or corrosion of tendon anchorage hardware can be detected.

If any grease leakage is detected during visual examination of the containment exterior surface, an investigation shall be made to determine the extent of potential reduction of Containment structural integrity. An investigation shall also be made to determine which tendons could have lost the grease and whether the grease loss has adversely affected their corrosion protection.

(ii) The prestressing force measured for each tendon liftoff tested in accordance with 3.5(~~7~~8)c. shall be compared with the limits predicted by USAR Fig 5.10-3. If the measured prestressing force of a selected tendon is greater than the prescribed lower limit, the tendon is acceptable.

If the measured prestressing force of a selected tendon is less than the prescribed lower limit but greater than or equal to 95% of the prescribed lower limit, the tendon shall be tensioned to a prestress value greater than the prescribed lower limit but less than 742 kips. After increasing the tendon's prestress the tendon will be considered acceptable.

If the measured prestressing force of a selected tendon is less than 95% of the prescribed lower limit but greater than or equal to 90% of the prescribed lower limit, two additional tendons, one on each side of the first tendon, shall be liftoff tested. If the prestressing forces of each of the second and third tendons are greater than 95% of the prescribed lower limit, all three tendons shall be tensioned to greater than the prescribed lower limit, but less than 742 kips. After increasing the tendons' prestress, the tendons will be considered acceptable. If the prestressing force of either the second or third tendons is less than 95% of the prescribed lower limit, liftoff tests shall be performed on additional tendons to determine the cause and extent of such occurrence. This occurrence shall be considered reportable per 3.5(~~7~~8)g. If the measured prestressing force of a selected tendon is less than 90% of the prescribed lower limit, the defective tendon shall be fully inspected to determine the cause and extent of such occurrence. This occurrence shall be considered reportable per 3.5(~~7~~8)g.

If the average prestressing force of all measured tendons of a group (corrected for average condition) is found to be less than the prescribed lower limit, an investigation shall be performed to determine the cause and extent of such an occurrence. Such an occurrence shall be considered reportable per 3.5(~~7~~8)g.

If from consecutive surveillances the average measured prestressing force of a tendon group trends at a rate which would indicate that the loss of prestress would make the average prestress of the group of tendons less than the prescribed lower limit before the next surveillance, additional liftoff tests shall be performed to determine the cause and extent of such occurrence. Such an occurrence shall be considered reportable per 3.5(~~7~~8)g.

(iii) If during the detensioning and retensioning of tendons in accordance with 3.5(~~7~~8)c., the elongation corresponding to a specific load differs by more than 10% from that recorded during installation of the tendons, an investigation shall be made to ensure that the difference is not related to wire failures or slippage of wires in anchorages. A difference of more than 10% shall be considered reportable per 3.5(~~7~~8)g.

(iv) The minimum acceptable ultimate tensile strength of the wire samples to be tensile tested shall be 240,000 psi with a minimum elongation of 4% in accordance with ASTM A421-65 for Type BA wire. Failure in the tensile test at strength or elongation values less than those specified shall be considered reportable per 3.5(~~7~~8)g. Other conditions which indicate corrosion found by visual examination of the wire shall be considered reportable per 3.5(~~7~~8)g.

(v) Results of the laboratory tests and examinations of the filler grease will be considered acceptable if the following conditions are met:

(a)	Water content	≤ 10% by weight
(b)	Chlorides	≤ 10 ppm
(c)	Nitrates	≤ 10 ppm
(d)	Sulfides	≤ 10 ppm
(e)	Reserve alkalinity (Base numbers)	> 0

(f) The difference between the amount of grease injected into a tendon to replace the amount which was removed during inspection shall not exceed 5% of the net tendon sheath (duct) volume when injected at the original installation pressure.

(g) The lack of the presence of any free water.

The failure to meet any of the above conditions for the filler grease shall be considered reportable per 3.5(~~7~~8)g.

(g) Corrective Action and Reporting

If the above acceptance criteria are not met, an immediate investigation shall be made to determine the cause(s) and extent of the non-conformance to the criteria, and the results shall be reported to the Commission within 90 days via a special report in accordance with Technical Specification 5.9.3.

(h) Test Frequency

The tendon prestressing system surveillance shall be performed once every 5 years.

Basis

The containment is designed for an accident pressure of 60 psig.[2] While the reactor is operating, the internal environment of the containment will be air at approximately atmospheric pressure and a maximum temperature of about 120°F. With these initial conditions the temperature of the steam-air mixture at the peak accident pressure of 60 psig is 288°F.

Prior to initial operation, the containment was strength-tested at 69 psig and then was leak tested. The design objective of the pre-operational leakage rate test has been established as 0.1% by weight for 24 hours at 60 psig. This leakage rate is consistent with the construction of the containment, which is equipped with independent leak-testable penetrations and contains channels over all inaccessible containment liner welds, which were independently leak-tested during construction.

Safety analyses have been performed on the basis of a leakage rate of 0.1% of the free volume per day of the first 24 hours following the maximum hypothetical accident. With this leakage rate, a reactor power level of 1500 MWt, and with minimum containment engineered safety systems for iodine removal in operation (one air cooling and filtering unit), the public exposure would be well below 10 CFR Part 100 values in the event of the maximum hypothetical accident.[3] The performance of a periodic integrated leakage rate test during plant life provides a current assessment of potential leakage from the containment.

The reduced pressure (5 psig) test on the PAL is a conservative method of testing and provides adequate indication of any potential containment leakage path. The test is conducted by pressurizing between two resilient seals on each door. The test pressure tends to unseat the resilient seals which is opposite to the accident pressure that tends to seat the resilient seals. The six month test ensures the overall PAL integrity at 60 psig.

The frequency of the periodic integrated leakage rate test (Type A test) is keyed to the refueling schedule for the reactor, because this test can only be performed during refueling shutdowns.

The specified frequency of periodic integrated leakage rate tests is based on three major considerations. First is the low probability of leaks in the liner because of the test of the leak-tightness of the welds during erection and conformance of the complete containment to a low leak rate at 60 psig during pre-operational testing, which is consistent with 0.1% leakage at design basis accident conditions and absence of any significant stresses in the liner during reactor operation. Second is the more frequent testing, at the full accident pressure, of those portions of the containment envelope that are most likely to develop leaks during reactor operation (penetrations and isolation valves) and the low value ($0.60L_a$) of the total leakage that is specified as acceptable from penetrations and isolation valves. Third is the tendon stress surveillance program, which provides assurance that an important part of the structural integrity of the containment is maintained.

Integrity tests of the purge isolation valves are established to identify excessive degradation of the resilient seats of these valves. Simultaneous testing of redundant purge valves from a leak test connection accessible from outside containment provides adequate testing. The testing method is identical to the Type C purge isolation valve test performed in accordance with 10 CFR Part 50, Appendix J. For leakages found to be greater than 18,000 SCCM, repairs shall be initiated to ensure these valves meet the acceptance criteria.

A reduction in prestressing force and changes in physical conditions are expected for the prestressing system. Allowances have been made in the reactor building design for the reduction and changes. Through comparisons between the documented inspection results and the initial quality control records, the reductions in prestress and the physical changes are trended to verify excessive reductions or changes do not occur or are detected in a timely manner to be corrected.

The prestressing system is a necessary strength element of the plant safeguards and it is desirable to confirm that the allowances are not being exceeded. The technique chosen for surveillance is based on the rate of change of prestressing force and physical conditions so that the surveillance can either confirm that the allowances are sufficient or require maintenance before minimum levels of prestressing force or physical conditions are reached. The end anchorage concrete is needed to maintain the prestressing forces. The design investigations have concluded that the design is adequate and this has been confirmed by tests. The prestressing sequence has shown that the end anchorage concrete can withstand loads in excess of those which result when the tendons are anchored. Further, the containment building was pressure tested to 1.15 times the maximum design pressure.

References

(1) USAR, Section 5.9

(2) USAR, Section 5.1.1

(3) USAR, Section 14.15

MISCELLANEOUS DEFINITIONS

Operable - Operability

A system, subsystem, train, component or devise shall be OPERABLE or have OPERABILITY when it is capable of performing its specified functions(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support functions(s).

In Operation

A system or component is in operation if it is performing its design function.

CEA's

All full length shutdown and regulating control rods.

Non-trippable (NT) CEA's

CEA's which are non-trippable.

Containment Integrity

Containment integrity is defined to exist when all of the following are met:

(1) All nonautomatic containment isolation valves which are not required to be open during accident conditions and blind flanges are closed.

(2) The equipment hatch is properly closed and sealed.

(3) The personnel air lock is operable pursuant to Specification 2.6(1)b.

(4) All automatic containment isolation valves are operable, locked closed, or deactivated (or isolated by locked closed valves or blind flanges as permitted by limiting condition for operation).

(5) The uncontrolled containment leakage satisfies Specification 3.5.

2.6 Containment System

Applicability

Applies to the reactor containment system.

Objective

To assure the integrity of the reactor containment system.

Specifications

(1) Containment Integrity

a. Containment integrity shall not be violated unless the reactor is in a cold or refueling shutdown condition. Without containment integrity, restore containment integrity within one hour or be in at least hot shutdown within the next 6 hours, in at least subcritical and <300°F within the next 6 hours and in cold shutdown within the following 30 hours. Normally locked or sealed-closed valves (except for PCV-742A/B/C/D) may be opened intermittently under administrative control without constituting a violation of containment integrity.

b. The personnel air lock shall be operable unless the reactor is in a cold or refueling shutdown condition. Both doors shall be closed except when the air lock is being used for normal transit, then at least one air lock door shall be closed. The entire air lock assembly leakage rate shall be in accordance with Specification 3.5(4).

(i). With one personnel air lock door inoperable:

a. Maintain at least the operable air lock door closed and either restore the inoperable air lock door to operable status within 24 hours or lock the operable air lock door closed. Entry and exit is permissible to perform repairs of the affected air lock components without constituting a violation of containment integrity.

b. Operation may then continue until performance of the next required entire air lock assembly leakage test provided that the operable air lock door is verified to be locked closed at least once per 31 days.

c. Otherwise, be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours.

d. Entry into another operational mode or specified condition is allowed if the provisions stated in 2.6(1)b.(i)a. above are met.

(ii). With the personnel air lock inoperable, except as the result of an inoperable air lock door, maintain at least one air lock door closed; restore the inoperable air lock to operable status within 24 hours or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours.

c. Containment integrity shall not be violated when the reactor vessel head is removed if the boron concentration is less than refueling concentration.

d. Except for testing one CEDM at a time, positive reactivity changes shall not be made by CEA motion or boron dilution unless the containment integrity is intact.

e. The containment purge isolation valves will be locked closed unless the reactor is in a cold or refueling shutdown condition.

(2) Internal Pressure

The internal pressure shall not exceed 3 psig (except for containment leak rate tests).

(3) Hydrogen Purge System

a. Minimum Requirements

The reactor shall not be made critical unless all of the following requirements are met:

1. The containment isolation valves VA-280 and VA-289 shall be locked closed.

2. VA-80A and VA-80B with associated valves and piping to include VA-82 filters, are operable.

b. Modification of Minimum Requirements

After the reactor has been made critical, the minimum requirements may be modified to allow either or both of the following statements (i,ii) to be applicable at any one time. If the operability of the component(s) is not restored to meet the minimum requirements within the time specified below, the reactor shall be placed in a hot shutdown condition within six hours.

(i) One of the hydrogen purge fans, VA-80A or VA-80B, with associated valves and piping, may be inoperable provided the fan is restored to operable status within 30 days.

(ii) The hydrogen purge filter system, VA-82, may be inoperable provided the system is restored to operable status with 72 hours.

Basis

The reactor coolant system conditions of cold shutdown assure that no steam will be formed and, hence, there would be no pressure buildup in the containment if the reactor coolant system ruptures. The shutdown margins are selected based on the type of activities that are being carried out. The refueling boron concentration provides a shutdown margin which precludes criticality under any circumstances. Each CEDM must be tested and some have two CEA's attached.

Regarding internal pressure limitations, the containment design pressure of 60 psig would not be exceeded if the internal pressure before a major loss-of-coolant accident were as much as 3 psig.[1] The containment integrity will be protected if the visual check of all "locked closed" manual isolation valves to verify them closed is made prior to plant start-up after an extended outage where one or more valves could inadvertently be left open. Operation of the purge isolation valves is prevented during normal operations due to the size of the valves (42 inches) and a concern about their ability to close against the differential pressure that could result from a LOCA or MSLB. Specification 2.6(1)a applies when both doors of the PAL are declared inoperable, or the entire air lock assembly leakage exceeds the requirements of Specification 3.5(4). Specification 2.6(1)b(ii) applies when mechanisms other than a door, such as the inner door equalizing valve, are declared inoperable.

The Hydrogen Purge System is required to be operable in order to control the quantity of combustible gases in containment in a post-LOCA condition.[2] The containment integrity will be protected by ensuring the penetration valves VA-280 and VA-289 are "locked closed" while HCV-881 and HCV-882 are normally closed during power operation. The applicable surveillance testing requirements of Table 3-5 will ensure that the system is capable of performing its design function. The blowers (VA-80A and VA-80B), associated valves, and piping are single failure proof, have been designed as a Seismic Class I System, and are redundant to the VA-82 filter header.

VA-80A or VA-80B with the associated valves and piping may be inoperable for 30 days. The redundancy of the blowers allows one blower with associated valves and piping to be removed from operation while the other train has the capability to provide 100% hydrogen control.

References

(1) USAR, Section 14.16; Figure 14.16-2
(2) Regulatory Guide 1.7 (1971)
(3) USAR, Section 14.17
(4) Engineering Study 86-10, Calculation 53

3.0 SURVEILLANCE REQUIREMENTS

3.5 Containment Test

Applicability

Applies to containment leakage and structural integrity.

Objective

To verify that the:

(1) Locked closed manual containment isolation valves are closed and locked,

(2) potential leakage from containment is within acceptable limits, and

(3) structural performance of all important components in the containment prestressing system is acceptable.

Specifications

(1) Prior to the reactor going critical after a refueling outage, and at least once per 31 days thereafter, an administrative check will be made to confirm that all "locked closed" manual containment isolation valves are closed and locked. Valves, blind flanges, and deactivated automatic valves which are located inside the containment and are locked, sealed or otherwise secured in the closed position shall be verified closed during each cold shutdown except that such verification need not be performed more often than once per 92 days.

(2) Containment Building Leak Rate Tests

Tests shall be conducted to assure that leakage of the primary reactor containment and associated systems is maintained within allowable leakage rate limits. Periodic surveillance shall be performed to assure proper maintenance and leak repair of the containment structure and penetrations during the plant's operating life.

Definitions of terms used in the leak rate testing specifications:

Leakage Rate - for test purposes is that leakage of containment air which occurs in a unit of time. Stated as a percentage of weight of the original content of containment air at the leakage rate test pressure that escapes to the outside atmosphere during a 24 hour test period.

Maximum Allowable Leakage Rate (L_a) - the design basis leakage rate of 0.1% by weight of the containment atmosphere per 24 hours at a pressure of 60 psig.

Overall Integrated Leakage Rate - that leakage rate which is obtained from a summation of leakage through all potential leakage paths including containment welds, valves, fittings, and components which penetrate containment.

Acceptable Criteria - the standard against which test results are to be compared for establishing the functional acceptability of the containment as a leakage limiting boundary.

(3) Integrated Leak Rate Test (Type A Test)

a. Introduction

Type A tests are intended to measure the reactor containment overall integrated leakage rate at periodic intervals.

b. Pretest Requirements

A general inspection of the accessible interior and exterior surfaces of the containment structures and components shall be performed prior to any Type A test to uncover any evidence of structural deterioration which may affect either the containment structural integrity or leak-tightness. If there is evidence of structural deterioration, the Type A tests shall not be performed until corrective action is taken in accordance with repair procedures, non-destructive examinations, and tests as specified in the applicable code specified in 10 CFR Part 50.55a at the commencement of repair work. Such structural deterioration and corrective actions taken shall be reported as part of the Type A test report.

During the period between the initiation of the containment inspection and performance of the Type A test, no repairs or adjustments shall be made so that the containment can be tested in as close to the "as is" condition as practical. During the period between the completion of one Type A test and the initiation of the containment inspection for the subsequent Type A test, repairs or adjustments shall be made to components whose leakage exceeds that specified in the Technical Specifications as soon as practical after identification. This requirement is interpreted not to preclude performance of Type B and Type C testing and required repairs prior to initiation of the containment inspection and the performance of the Type A test.

If during a Type A test, potentially excessive leakage paths are identified which interfere with satisfactory completion of the test, or which result in the Type A test not meeting the acceptance criteria, the Type A test shall be temporarily suspended. Thereafter, repairs and/or adjustments to equipment shall be made and the Type A test resumed. The corrective action taken, the change in leakage rate resulting from the repairs and overall integrated leakage determined from the Type A and local leak rate tests shall be included in a report submitted to the Commission.

Closure of containment isolation valves for the Type A test shall be accomplished by normal operation and without any preliminary exercising or adjustments (e.g., no tightening of valve after closure by valve monitor). Repairs of maloperating or leaking valves shall be made necessary. Information on any valve closure malfunction or valve leakage that requires corrective action before the test, shall be included in the Type A Leak Test Report submitted to the Commission.

The containment test conditions shall stabilize for a period of approximately 4 hours prior to the start of the leakage rate test.

Those portions of the fluid systems that are part of the reactor coolant pressure boundary and are open directly to the containment atmosphere under post-accident conditions and become an extension of the boundary of the containment shall be opened or vented to the containment atmosphere prior to and during the test. Portions of closed systems inside containment that penetrate containment and rupture as a result of a loss of coolant accident shall be vented to the containment atmosphere. All vented systems shall be drained of water or other fluids to the extent necessary to assure exposure of the system containment isolation valves to containment air test pressure and to assure they will be subjected to the post-accident differential pressure. Systems that are required to maintain the plant in a safe condition during the test shall be operable in their normal mode, and need not be vented. Systems that are normally filled with water and operating under post-accident conditions, such as the containment heat removal system and the component cooling water system, need not be vented. However, the containment isolation valves in the systems defined in this section shall be tested in accordance with Section 3.5(5). The measured leakage rate from these tests shall be reported to the Commission.

c. Test Methods

All Type A tests shall be conducted in accordance with the provisions of 10 CFR Part 50, Appendix J.

The accuracy of any Test A shall be verified by a supplemental test. The supplemental test method selected shall be conducted for sufficient duration to establish accurately the change in leakage rate between the Type A test and the supplemental Type A test. Results from the supplemental test are acceptable provided the difference between the supplemental test data and the Type A test data is within 0.25 L_a. If results are not within 0.25 L_a, the reason shall be determined, corrective action taken, and a successful supplemental test performed.

Test leakage rates shall be calculated using absolute values corrected for instrument error.

d. Acceptance Criteria

The maximum allowable leakage rate shall not exceed 0.1%.

The total measured leakage rate at a pressure of 60 psig shall be less than 0.75 L_a. If local leakage measurements are taken to effect repairs in order to meet 0.75 L_a acceptance criteria, these measurements shall be taken at a pressure of 60 psig.

If two consecutive Type A tests fail to meet the acceptance criteria, notwithstanding the requirements of the testing frequency, a Type A test shall be performed at each refueling outage or approximately every 18 months, whichever occurs first, until two consecutive Type A tests meet the acceptance criteria, after which time the normal testing frequency schedule may be resumed.

e. Testing Frequency

A set of three Type A tests shall be performed, at approximately equal intervals during each 10 year service period. The third test of each set shall be conducted when the plant is shutdown for the 10-year in-service inspections.

The performance of Type A tests shall be limited to periods when the plant facility is non-operational and secured in the shutdown condition under administrative control and in accordance with the safety procedures defined in the license.

(4) Containment Penetrations Leak Rate Tests (Type B Tests)

a. Introduction

Type B tests are intended to detect local leaks and to measure leakage across each pressure-containing or leakage limiting boundary for the containment penetrations.

b. Test Methods

Type B tests shall be performed by local pneumatic pressurization of the containment penetrations, either individually or in groups, at a pressure of 60 psig.

Examination shall be performed by halide leak-detection method or by other equivalent test methods such as measurement of the rate of makeup required to maintain the test volume at 60 psig.

c. Acceptance Criteria

The combined leakage rate of all penetrations and valves subject to Type B and Type C tests shall be less than or equal to 0.6 L_a.

If at any time it is determined that a leakage rate is greater than 0.6 L_a, repairs shall be initiated immediately. If repairs are not completed and conformance to the acceptance criteria is not demonstrated within 48 hours, the reactor shall be shut down and depressurized until repairs are completed and the local leakage meets this acceptance criteria.

The results of personnel access lock door seal tests at 5 psig shall not exceed .01 L_a.

d. Testing Frequency

Type B tests shall be performed during each refueling outage, or other convenient intervals, but in no case at intervals greater than 2 years, except the personnel access lock (PAL) which will be tested as follows:

(i) Every six months the entire PAL assembly shall be leak tested at 60 psig.

(ii) If the PAL is opened during periods when containment integrity is not required, the PAL door seals shall be leak tested at 5 psig at the end of such periods and the entire PAL assembly shall then be leak tested at 60 psig within two weeks of achieving the required condition for containment integrity.

(iii) If the PAL is opened during the interval between the six-month tests when containment integrity is required, the PAL door seals shall be leak tested at a pressure not less than 5 psig within 72 hours. If the PAL is opened more frequently than once per 72 hours, the door seals shall be leak tested at a pressure of 5 psig at least once every 72 hours during the period of frequent openings.

e. Penetrations to be Tested [(1)]

(i) Equipment Hatch

(ii) Personnel Access Lock

(iii) Mechanical Penetrations M-1 through M-99

(iv) Fuel Transfer Tube (Mechanical Penetration M-100)

(v) Electrical Penetrations

A-1	B-9	D-6	F-2	E-HCV-383-3A
A-2	B-10	D-7	F-4	E-HCV-383-3B
A-4	B-11	D-8	F-5	E-HCV-383-4A
A-5	C-1	D-9	F-6	E-HCV-383-4B
A-6	C-2	D-10	F-7	
A-7	C-4	D-11	F-8	
A-8	C-5	E-1	F-9	
A-9	C-6	E-2	F-10	
A-10	C-7	E-4	F-11	
A-11	C-8	E-5	G-1	
B-1	C-9	E-6	G-2	
B-2	C-10	E-7	G-3	
B-4	C-11	E-8	G-4	
B-5	D-1	E-9	H-1	
B-6	D-2	E-10	H-2	
B-7	D-4	E-11	H-3	
B-8	D-5	F-1	H-4	

(5) Containment Isolation Valves Leak Rate Tests (Type C Tests)

a. Introduction

Type C tests are intended to measure containment isolation valve leakage rates.

b. Test Methods

Type C tests shall be performed by local pressurization with air or nitrogen at a pressure of 60 psig. The pressure shall be applied in the same direction as that when the valve would be required to perform its safety function, unless it can be determined that the results from the tests for a pressure applied in a different direction will provide equivalent or more conservative results. Each valve to be tested shall be closed by normal operation and without any preliminary exercising or adjustments (e.g., no tightening of valve after closure by valve motor).

c. Acceptance Criteria

The combined leakage rate of all penetrations and valves subject to Type B and Type C tests shall be less than or equal to 0.6 L_a. For the purge isolation valve tests, the measured purge valve leakage rate shall be substituted for the purge valve leakage rate from the last complete Type B and C test and the total leak rate recomputed.

Leakage of the containment air purge isolation valves shall not exceed 18,000 standard cubic centimeters per minute (SCCM). If the leakage rate is determined to be greater than 18,000 SCCM, repairs shall be initiated immediately in order to meet this acceptance criterion.

If at any time it is determined that a leakage rate is greater than 0.6 L_a, repairs shall be initiated immediately. If repairs are not completed and conformance to the acceptance criteria is not demonstrated within 48 hours, the reactor shall be shut down and depressurized until repairs are completed and the local leakage meets this acceptance criteria.

d. Testing Frequency

Type C tests shall be performed during each refueling outage, or other convenient intervals, but in no case at intervals greater than 2 years. The containment purge isolation valves shall also be leakage tested prior to bringing the reactor out of each cold or refueling shutdown but in no case at intervals greater than nine months. If the purge valves are opened during cold or refueling shutdown, the leak test shall be performed after the purge valves are closed for the last time.

e. Penetrations to be Tested[1]

M-2	M-31	M-52	IA-3092
M-7	M-38	M-53	IA-3093
M-8	M-39	M-57	IA-3094
M-11	M-40	M-58	
M-14	M-42	M-69	
M-15	M-43	M-73	
M-18	M-44	M-74	
M-19	M-45	M-79	
M-20	M-46	M-80	
M-22	M-47	M-87	
M-24	M-48	M-88	
M-25	M-50	M-HCV-383-3	
M-30	M-51	M-HCV-383-4	

(6) Special Testing Requirements

Any major modification or replacement of a component which is part of the containment boundary shall be followed by either Type A, Type B, or Type C tests as applicable for the area affected by the modification and shall meet the applicable acceptance criteria. Minor modifications, or replacements, performed directly prior to the conduct of a scheduled Type A test do not require a separate test.

(7) Report on Test Results

Leak rate tests shall be the subject of a summary technical report submitted to the Commission approximately 3 months after the conduct of each test. The report shall be titled "Reactor Containment Building Integrated Leak Rate Test."

The report shall contain an analysis and interpretation of the Type A test results and a summary analysis of periodic Type B and Type C tests that were performed since the last Type A test.

Leakage test results from Type A, B, and C tests that failed to meet the applicable acceptance criteria shall be reported in a separate summary report approximately 3 months after the conduct of these tests. The Type A test report shall include an analysis and interpretation of the test data, the least-squares fit analysis of the test data (Type A tests only), the instrumentation error analysis (Type A tests only). and the structural conditions of the containment or components, if any, which contributed to the failure in meeting the acceptance criteria. Results and analyses of the supplemental verification test employed to demonstrate the validity of the leakage rate test measurements shall also be included.

(8) Surveillance for Prestressing System

a. Sample Selection

The 210 dome tendons and 616 helical wall tendons shall be periodically inspected for symptoms of material deterioration or prestressing force reduction. Inspections shall be performed on four dome tendons, one from each layer and the control dome tendon, and ten helical wall tendons, five of each orientation including one control tendon in each orientation.

The tendons to be inspected shall be randomly selected from the tendons which have not been tested in previous surveillances, except for the control tendons which shall be included in each surveillance sample selection to develop a historical trend in order to correlate the observed data.

b. Visual Inspection

The following visual inspections shall be performed:

(i) The exterior surface of the containment shall be visually examined to detect areas of large spall, severe scaling, D-cracking in areas of 25 square feet or more, grease leakage, and other significant structural deterioration or disintegration.

(ii) For each surveillance tendon, selected in accordance with 3.5(8)a., the tendon anchorage assembly hardware shall be visually inspected for signs of abnormal material behavior or wear.

(iii) The concrete surrounding the visually inspected tendon anchorages shall be visually inspected for signs of significant structural deterioration.

(iv) The bottom grease caps of all helical wall tendons shall be visually inspected to detect grease leakage or grease cap deformations. Removal of the grease caps is not necessary for this inspection.

c. Prestress Monitoring Tests

Liftoff tests shall be performed on each tendon selected in accordance with 3.5(8)a. to monitor prestress. Additionally, the tests shall include the following:

(i) Two helical wall tendons, one of each orientation, and one dome tendon, each randomly selected from their respective groups of surveillance tendons, shall be detensioned and inspected for broken or damaged wires. The control tendons shall NOT be included as tendons to be detensioned.

(ii) During retensioning, simultaneous elongation and jacking force measurements shall be made at a minimum of three approximately equally spaced levels of force between zero and the lock-off force. The two intermediate stress levels shall be as near as practical to the values shown on the initial stressing records for the respective tendon.

d. Tendon Material Tests and Inspections

One wire from each of two helical wall tendons, one of each orientation, and one dome tendon, shall be removed for the following tests and examinations:

(i) Each removed wire shall be examined over its entire length for any evidence of corrosion or other deterioration.

(ii) Tensile tests shall be made on at least three samples of each wire, one cut from each end and one cut from midlength. The samples shall be the maximum length practical for testing and the guage length for elongation shall be in accordance with ASTM E8 "Standard Test Methods for Tension Testing of Metallic Materials." The following information shall be obtained from each test:

(a) Yield Strength,

(b) Ultimate tensile strength, and

(c) Elongation at ultimate tensile strength.

The tendons detensioned in accordance with 3.5(8)c.(i) may be the tendons from which the sample wires are removed. The control tendons shall NOT be included as tendons to be detensioned or have wires removed. In addition, all wires found to be broken shall be removed for tensile testing and visual examination.

e. Inspection of Filler Grease

A sample of sheathing filler grease from each of the sample tendons shall be taken and analyzed according to the following national standards:

(i) To determine water content, ASTM D95, "Standard Test Methods for Water in Petroleum Products and Bituminous Materials by Distillation."

(ii) To determine reserve alkalinity, ASTM D974, "Standard Test Method for Acid and Base Number by Color-Indicator Titration."

(iii) To determine the concentration of water soluble chlorides, ASTM D512, "Standard Test Methods for Chloride Ion in Water."

(iv) To determine the concentration of water soluble nitrates, ASTM D3867, "Standard Test Methods for Nitrite-Nitrate in Water."

(v) To determine the concentration of water soluble sulfides, APHA 4500-S^{2-} D. "Methylene Blue Method," Standard Methods for Examination of Water and Waste Water, Seventeenth Edition.

In addition to these tests, the amount of filler grease removed from and replaced into each surveillance tendon shall be recorded and compared to assess grease leakage within the containment structure.

f. Acceptance Criteria

(i) No evidence of significant structural deterioration of the concrete inspected in accordance with 3.5(8)b.(i) and 3.5(8)b.(iii) which may affect the structural integrity of the containment structure can be detected.

Significant structural deterioration is defined as measurable structural deterioration which, when compared with past inspections, shows strong evidence of an increase of structural deterioration which could affect the Containment's structural integrity. Evidence of cosmetic or superficial deterioration, unless determined by sound engineering judgement to be significant, .s not considered to be significant structural deterioration.

No evidence of significant material degradation or corrosion of tendon anchorage hardware can be detected.

If any grease leakage is detected during visual examination of the containment exterior surface, an investigation shall be made to determine the extent of potential reduction of Containment structural integrity. An investigation shall also be made to determine which tendons could have lost the grease and whether the grease loss has adversely affected their corrosion protection.

(ii) The prestressing force measured for each tendon liftoff tested in accordance with 3.5(8)c. shall be compared with the limits predicted by USAR Fig 5.10-3. If the measured prestressing force of a selected tendon is greater than the prescribed lower limit, the tendon is acceptable.

If the measured prestressing force of a selected tendon is less than the prescribed lower limit but greater than or equal to 95% of the prescribed lower limit, the tendon shall be tensioned to a prestress value greater than the prescribed lower limit but less than 742 kips. After increasing the tendon's prestress the tendon will be considered acceptable.

If the measured prestressing force of a selected tendon is less than 95% of the prescribed lower limit but greater than or equal to 90% of the prescribed lower limit, two additional tendons, one on each side of the first tendon, shall be liftoff tested. If the prestressing forces of each of the second and third tendons are greater than 95% of the prescribed lower limit, all three tendons shall be tensioned to greater than the prescribed lower limit, but less than 742 kips. After increasing the tendons' prestress, the tendons will be considered acceptable. If the prestressing force of either the second or third tendons is less than 95% of the prescribed lower limit, liftoff tests shall be performed on additional tendons to determine the cause and extent of such occurrence. This occurrence shall be considered reportable per 3.5(8)g. If the measured prestressing force of a selected tendon is less than 90% of the prescribed lower limit, the defective tendon shall be fully inspected to determine the cause and extent of such occurrence. This occurrence shall be considered reportable per 3.5(8)g.

If the average prestressing force of all measured tendons of a group (corrected for average condition) is found to be less than the prescribed lower limit, an investigation shall be performed to determine the cause and extent of such an occurrence. Such an occurrence shall be considered reportable per 3.5(8)g.

If from consecutive surveillances the average measured prestressing force of a tendon group trends at a rate which would indicate that the loss of prestress would make the average prestress of the group of tendons less than the prescribed lower limit before the next surveillance, additional liftoff tests shall be performed to determine the cause and extent of such occurrence. Such an occurrence shall be considered reportable per 3.5(8)g.

(iii) If during the detensioning and retensioning of tendons in accordance with 3.5(8)c., the elongation corresponding to a specific load differs by more than 10% from that recorded during installation of the tendons, an investigation shall be made to ensure that the difference is not related to wire failures or slippage of wires in anchorages. A difference of more than 10% shall be considered reportable per 3.5(8)g.

(iv) The minimum acceptable ultimate tensile strength of the wire samples to be tensile tested shall be 240,000 psi with a minimum elongation of 4% in accordance with ASTM A421-65 for Type BA wire. Failure in the tensile test at strength or elongation values less than those specified shall be considered reportable per 3.5(8)g. Other conditions which indicate corrosion found by visual examination of the wire shall be considered reportable per 3.5(8)g.

(v) Results of the laboratory tests and examinations of the filler grease will be considered acceptable if the following conditions are met:

(a)	Water content	≤ 10% by weight
(b)	Chlorides	≤ 10 ppm
(c)	Nitrates	≤ 10 ppm
(d)	Sulfides	≤ 10 ppm
(e)	Reserve alkalinity (Base numbers)	> 0

(f) The difference between the amount of grease injected into a tendon to replace the amount which was removed during inspection shall not exceed 5% of the net tendon sheath (duct) volume when injected at the original installation pressure.

(g) The lack of the presence of any free water.

The failure to meet any of the above conditions for the filler grease shall be considered reportable per 3.5(8)g.

g Corrective Action and Reporting

If the above acceptance criteria are not met, an immediate investigation shall be made to determine the cause(s) and extent of the non-conformance to the criteria, and the results shall be reported to the Commission within 90 days via a special report in accordance with Technical Specification 5.9.3.

h Test Frequency

The tendon prestressing system surveillance shall be performed once every 5 years.

Basis

The containment is designed for an accident pressure of 60 psig.(2) While the reactor is operating, the internal environment of the containment will be air at approximately atmospheric pressure and a maximum temperature of about 120°F. With these initial conditions the temperature of the steam-air mixture at the peak accident pressure of 60 psig is 288°F.

Prior to initial operation, the containment was strength-tested at 69 psig and then was leak tested. The design objective of the pre-operational leakage rate test has been established as 0.1% by weight for 24 hours at 60 psig. This leakage rate is consistent with the construction of the containment, which is equipped with independent leak-testable penetrations and contains channels over all inaccessible containment liner welds, which were independently leak-tested during construction.

Safety analyses have been performed on the basis of a leakage rate of 0.1% of the free volume per day of the first 24 hours following the maximum hypothetical accident. With this leakage rate, a reactor power level of 1500 MWt, and with minimum containment engineered safety systems for iodine removal in operation (one air cooling and filtering unit), the public exposure would be well below 10 CFR Part 100 values in the event of the maximum hypothetical accident.(3) The performance of a periodic integrated leakage rate test during plant life provides a current assessment of potential leakage from the containment.

The reduced pressure (5 psig) test on the PAL is a conservative method of testing and provides adequate indication of any potential containment leakage path. The test is conducted by pressurizing between two resilient seals on each door. The test pressure tends to unseat the resilient seals which is opposite to the accident pressure that tends to seat the resilient seals. The six month test ensures the overall PAL integrity at 60 psig.

The frequency of the periodic integrated leakage rate test (Type A test) is keyed to the refueling schedule for the reactor, because this test can only be performed during refueling shutdowns.

The specified frequency of periodic integrated leakage rate tests is based on three major considerations. First is the low probability of leaks in the liner because of the test of the leak-tightness of the welds during erection and conformance of the complete containment to a low leak rate at 60 psig during pre-operational testing, which is consistent with 0.1% leakage at design basis accident conditions and absence of any significant stresses in the liner during reactor operation. Second is the more frequent testing, at the full accident pressure, of those portions of the containment envelope that are most likely to develop leaks during reactor operation (penetrations and isolation valves) and the low value ($0.60L_a$) of the total leakage that is specified as acceptable from penetrations and isolation valves. Third is the tendon stress surveillance program, which provides assurance that an important part of the structural integrity of the containment is maintained.

Integrity tests of the purge isolation valves are established to identify excessive degradation of the resilient seats of these valves. Simultaneous testing of redundant purge valves from a leak test connection accessible from outside containment provides adequate testing. The testing method is identical to the Type C purge isolation valve test performed in accordance with 10 CFR Part 50, Appendix J. For leakages found to be greater than 18,000 SCCM, repairs shall be initiated to ensure these valves meet the acceptance criteria.

A reduction in prestressing force and changes in physical conditions are expected for the prestressing system. Allowances have been made in the reactor building design for the reduction and changes. Through comparisons between the documented inspection results and the initial quality control records, the reductions in prestress and the physical changes are trended to verify excessive reductions or changes do not occur or are detected in a timely manner to be corrected.

The prestressing system is a necessary strength element of the plant safeguards and it is desirable to confirm that the allowances are not being exceeded. The technique chosen for surveillance is based on the rate of change of prestressing force and physical conditions so that the surveillance can either confirm that the allowances are sufficient or require maintenance before minimum levels of prestressing force or physical conditions are reached. The end anchorage concrete is needed to maintain the prestressing forces. The design investigations have concluded that the design is adequate and this has been confirmed by tests. The prestressing sequence has shown that the end anchorage concrete can withstand loads in excess of those which result when the tendons are anchored. Further, the containment building was pressure tested to 1.15 times the maximum design pressure.

References

(1) USAR, Section 5.9

(2) USAR, Section 5.1.1

(3) USAR, Section 14.15

ATTACHMENT B

DISCUSSION, JUSTIFICATION AND NO SIGNIFICANT HAZARDS CONSIDERATION

DISCUSSION AND JUSTIFICATION

The Omaha Public Power District proposes to revise the Fort Calhoun Station Unit No. 1 Technical Specification 2.6 "Containment System," and the definition of Containment Integrity to reflect the Combustion Engineering Standard Technical Specifications (TS) 3/4.6.1.1 and 3/4.6.1.3.

Fort Calhoun does not currently have a specification separately addressing inoperability of the Personnel Air Lock (PAL). The definition of containment integrity includes the requirement that at least one door in the personnel air lock be properly closed and sealed. If the containment integrity requirements of Specification 2.6(1) cannot be met, either a Temporary Waiver of Compliance must be approved, or Specification 2.0.1 must be invoked, which requires an immediate plant shutdown and declaration of an Unusual Event. If minor seal leakage causes the inner PAL door to become inoperable, opening of the outer PAL door is required for repair and testing, which violates Specification 2.6(1). Implementation of these proposed changes will prevent unnecessary challenges to plant equipment or regulatory actions.

DEFINITION OF CONTAINMENT INTEGRITY

The definition of containment integrity is being revised to reference operability requirements of the proposed Specification 2.6(1)b. The proposed change would require that both doors of the PAL be operable to consider the PAL operable; currently only one door is required to be operable. This proposed change implements additional restrictions on the PAL and is consistent with the CE Standard TS definition.

SPECIFICATION 2.6(1) "CONTAINMENT SYSTEM"

Specification 2.6(1)a. is being revised to reflect CE Standard Technical Specification 3.6.1.1. The action statement differs from the Standard TS to take into account the differences in mode definitions and to reflect the allowed outage time provided in Fort Calhoun Specification 2.0.1(1). CE Standard TS Surveillance Requirement 4.6.1.1.a requires that all penetrations required to be closed during accident conditions which are not capable of being closed by automatic isolation valves be verified operable each month except as provided in Standard TS 3.6.4. As this proposed change will not implement Standard TS 3.6.4 with its various exceptions, it is proposed to implement an additional requirement to only verify locked closed valves once per 31 days and relocate this requirement to the surveillance section as Specification 3.5(1). A note is added which allows intermittent opening of locked or sealed containment isolation valves (except for the 42 inch purge valves) which is consistent with draft NUREG 1432 Specification 3.6.3.

Specification 2.6(1)b. is being added to address inoperability of the Personnel Air Lock. The required actions follow the actions of CE Standard Technical Specification 3.6.1.3. A note is being added to specifically address entry and exit with a PAL door inoperable. This note is consistent with that provided in draft NUREG 1432 Specification 3.6.2. The allowed air leakage rate references Specification 3.5(4) for acceptance criteria as opposed to restating the actual values as the Standard TS does. Current Specification 3.5(3)d. implements the requirements of Standard TS surveillance requirement 4.6.1.3, therefore no changes are proposed to the surveillance requirements.

SPECIFICATION 3.5 "CONTAINMENT TEST"

Specification 3.5(4) "Containment Isolation Valves Leak Rate Tests (Type C Tests)" is being revised to include valves IA-3092, IA-3093, and IA-3094 to the Type C testing program. As discussed in LER-91-031 dated January 15, 1992, these valves are permanently installed valves in the Personnel Air Lock to allow leak testing of the PAL with both of the PAL doors closed.

ADMINISTRATIVE CHANGES

Specifications 3.5(1) through 3.5(7) have been renumbered to reflect the relocation of Specification 2.6(1)d.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION:

The proposed changes do not involve significant hazards consideration because operation of Fort Calhoun Station Unit No. 1 in accordance with these changes would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed changes are based upon the definition and requirements of the Combustion Engineering Standard Technical Specifications for containment integrity and air locks. The current definition of containment integrity contained within the Fort Calhoun Technical Specifications requires that only one door of the Personnel Air Lock be operable; therefore, the proposed change to the definition is more restrictive than current requirements. Adoption of the requirements of Standard Specification 3.6.1.1 implements a one hour allowed outage time for containment integrity. As stated in draft NUREG 1432, the one hour completion time provides a period of time to correct a problem commensurate with the importance of maintaining containment integrity, while ensuring that the probability of an accident occurring during these periods is minimal. The addition of valves IA-3092, IA-3093, and IA-3094 to the Type C Leak Rate Testing ensures that these valves will be tested and meet acceptable leak rate criteria. Therefore, these proposed changes do not involve a significant increase in the probability or consequences of an accident.

(2) Create the possibility of a new or different kind of accident from any previously analyzed.

It has been determined that no new or different kind of accident will be created due to the proposed changes. The proposed changes implement the requirements of CE Standard Technical Specifications for containment integrity and the PAL doors. The proposed changes will provide for an allowed outage time to correct a problem, if encountered with containment integrity, which is commensurate with the importance of containment integrity, but is sufficient to avoid unnecessary challenges to plant equipment. The proposed changes would not modify the operation of any plant equipment other than to place additional restrictions on the operability of the PAL. The addition of valves IA-3092, IA-3093, and IA-3094 to the Type C Leak Rate Testing ensures that these valves will be tested and meet acceptable leak rate criteria. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

(3) Involve a significant reduction in a margin of safety.

The proposed changes would not modify the acceptance criteria for allowed leakage from containment or the Personnel Air Lock, nor would the proposed changes modify the operation of plant equipment, therefore the proposed changes do not involve a significant reduction in a margin of safety.

Therefore, based on the above considerations, it is OPPD's position that this proposed amendment does not involve a significant hazards consideration as defined by 10 CFR 50.92 and the proposed changes will not result in a condition which significantly alters the impact of the Station on the environment. Thus, the proposed changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(e)(9), and pursuant to 10 CFR 51.22(b) no environmental assessment need be prepared.