B 3.6 CONTAINMENT SYSTEMS

B 3.6.1 Containment

BASES

BACKGROUND

The Containment Structure consists of the concrete building, its steel liner, and the penetrations through this structure. The structure is designed to contain radioactive material that may be released from the reactor core following a Design Basis Accident (DBA). Additionally, this structure provides shielding from the fission products that may be present in the containment atmosphere following accident conditions.

The Containment Structure is a reinforced concrete structure with a cylindrical wall, a flat foundation mat, and a shallow dome roof. The Containment Structure has ungrouted tendons, therefore, the cylinder wall is prestressed with a post-tensioning system in the vertical and horizontal directions, and the dome roof is prestressed utilizing a three-way post-tensioning system. The inside surface of the Containment Structure is lined with a carbon steel liner to ensure a high degree of leak tightness during operating and accident conditions.

The concrete building is required for structural integrity of the Containment Structure under DBA conditions. The steel liner and its penetrations establish the leakage limiting boundary of the Containment Structure. Maintaining the Containment Structure OPERABLE limits the leakage of fission product radioactivity from the Containment Structure to the environment. Surveillance Requirement (SR) 3.6.1.1 leakage rate requirements comply with Reference 1, as modified by approved exemptions.

The isolation devices for the penetrations in the containment boundary are a part of the containment leak tight barrier. To maintain this leak tight barrier:

a. All penetrations required to be closed during accident conditions are either:

   1. capable of being closed by an OPERABLE automatic containment isolation system, or

2. closed by manual valves, blind flanges, or de-activated automatic valves secured in their closed positions, except as provided in Limiting Condition for Operation (LCO) 3.6.3;

b. Each air lock is OPERABLE, except as provided in LCO 3.6.2;

c. The equipment hatch is closed and sealed.

APPLICABLE SAFETY ANALYSES

The safety design basis for the Containment Structure is that the Containment Structure must withstand the pressures and temperatures of the limiting DBA without exceeding the design leakage rate.

The DBAs that result in a release of radioactive material within Containment Structure are a loss of coolant accident (LOCA), a main steam line break (SLB), and a control element assembly (CEA) ejection accident (Reference 2, Chapter 14). In the analysis of each of these accidents, it is assumed that Containment Structure is OPERABLE, such that release of fission products to the environment is controlled by the rate of Containment Structure leakage. The Containment Structure was designed with an allowable leakage rate of 0.20% of containment air weight per day (Reference 2, Chapter 5). This leakage rate is defined in Reference 1, as L_a: the maximum allowable containment leakage rate at the calculated maximum peak containment pressure (P_a) of 49.4 psig, which results from the limiting design basis LOCA (Reference 2, Chapter 14).

Satisfactory leakage rate test results are a requirement for the establishment of Containment Structure OPERABILITY.

The Containment Structure satisfies 10 CFR 50.36(c)(2)(ii), Criterion 3.

LCO

Containment OPERABILITY is maintained by limiting leakage to $\leq 1.0\ L_a$ (346,000 SCCM), except prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test. At this time the applicable leakage limits must be met.

Compliance with this LCO will ensure a containment configuration, including an equipment hatch, that is structurally sound and that will limit leakage to those leakage rates assumed in the safety analysis.

Individual leakage rates specified for the containment air lock (LCO 3.6.2) are not specifically part of the acceptance criteria of Reference 1. Therefore, leakage rates exceeding these individual limits only result in the Containment Structure being inoperable when the leakage results in exceeding the overall acceptance criteria of 1.0 L_a.

APPLICABILITY

In MODEs 1, 2, 3, and 4, a DBA could cause a release of radioactive material into the Containment Structure. In MODEs 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODEs. Therefore, the Containment Structure is not required to be OPERABLE in MODE 5 to prevent leakage of radioactive material from the Containment Structure. The requirements for the Containment Structure during MODE 6 are addressed in LCO 3.9.3.

ACTIONS

A.1

In the event the Containment Structure is inoperable, the Containment Structure must be restored to OPERABLE status within one hour. The one hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining the Containment Structure during MODEs 1, 2, 3, and 4. This time period also ensures that the probability of an accident (requiring Containment OPERABILITY) occurring during periods when the Containment Structure is inoperable is minimal.

B.1 and B.2

If the Containment Structure cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

Maintaining the Containment Structure OPERABLE requires compliance with the visual examinations and leakage rate test requirements of the Containment Leakage Rate Testing Program. Failure to meet leakage limits specified in LCO 3.6.2 and LCO 3.6.3 does not invalidate the acceptability of these overall leakage determinations unless their contribution to overall Type A, B, and C leakage causes that to exceed limits. As left leakage, prior to the first startup after performing a required Containment Leakage Rate Testing Program, is required to be $\leq 0.6\ L_a$ (207,600 SCCM) for combined Type B and C leakage and $\leq 0.75\ L_a$ (259,500 SCCM) for overall Type A leakage. At all other times between required leakage rate tests, the acceptance criteria is based on an overall Type A leakage limit of $\leq 1.0\ L_a$. At $\leq 1.0\ L_a$, the offsite dose consequences are bounded by the assumptions of the safety analysis. Surveillance Requirement Frequencies are as required by Containment Leakage Rate Testing Program. These periodic testing requirements verify that the containment leakage rate does not exceed the leakage rate assumed in the safety analysis.

SR 3.6.1.2

For ungrouted, post-tensioned tendons, this SR ensures that the structural integrity of the Containment Structure will be maintained in accordance with the provisions of the Concrete Containment Tendon Surveillance Program. Testing and Frequency are consistent with the recommendations of Reference 3.

REFERENCES

1. 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors" Option B, "Performance-Based Requirements"
2. Updated Final Safety Analysis Report (UFSAR)
3. American Society of Mechanical Engineers Boiler and Pressure Vessel Code, 1992 Edition through the 1992 Addenda, Section XI, Subsection IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants" as modified and amended by 10 CFR 50.55a

B 3.6 CONTAINMENT SYSTEMS

B 3.6.2 Containment Air Locks

BASES

BACKGROUND

Containment air locks form part of the containment pressure boundary and provide a means for personnel access during all MODEs of operation.

Each air lock is nominally a right circular cylinder, 9 feet-9 inches in diameter for the personnel air lock and 5 feet-9 inches in diameter for the emergency air lock, with a door at each end. The doors are interlocked to prevent simultaneous opening. During periods when the Containment Structure is not required to be OPERABLE, the door interlock mechanism may be disabled, allowing both doors of an air lock to remain open for extended periods when frequent Containment Structure entry is necessary. Each air lock door has been designed and tested to certify its ability to withstand a pressure in excess of the maximum expected pressure following a DBA in the Containment Structure. As such, closure of a single door supports the Containment Structure OPERABILITY. Each of the doors contains double gasketed seals and local leakage rate testing capability to ensure pressure integrity. To effect a leak tight seal, the air lock design uses pressure seated doors (i.e., an increase in containment internal pressure results in increased sealing force on each door).

Each personnel air lock is provided with an alarm in the Control Room that actuates when either door or equalizing valve for a personnel air lock is opened. The alarm senses door position from a limit switch located on each door and equalizing valve.

The containment air locks form part of the containment pressure boundary. As such, air lock integrity and leak tightness is essential for maintaining the containment leakage rate within limit in the event of a DBA. Not maintaining air lock integrity or leak tightness may result in a leakage rate in excess of that assumed in the unit safety analysis.

APPLICABLE SAFETY ANALYSES

The DBAs that result in a release of radioactive material within the Containment Structure are a LOCA, a main SLB, and a CEA ejection accident (Reference 1, Chapter 14). In the analysis of each of these accidents, it is assumed that the Containment Structure is OPERABLE such that release of fission products to the environment is controlled by the rate of containment leakage. The Containment Structure was designed with an allowable leakage rate of 0.20% of containment air weight per day (Reference 1, Chapter 5). This leakage rate is defined in 10 CFR Part 50, Appendix J, Option B, as the maximum allowable containment leakage rate at the calculated peak containment internal pressure, P_a (49.4 psig), following a design basis LOCA. This allowable leakage rate forms the basis for the acceptance criteria imposed on the SRs associated with the air lock.

The containment air locks satisfy 10 CFR 50.36(c)(2)(ii), Criterion 3.

LCO

Each containment air lock forms part of the containment pressure boundary. As part of the containment pressure boundary, the air lock safety function is related to control of the containment leakage rate resulting from a DBA. Thus, each air lock's structural integrity and leak tightness, are essential to the successful mitigation of such an event.

Each air lock is required to be OPERABLE. For the air lock to be considered OPERABLE, the air lock interlock mechanism must be OPERABLE, the air lock must be in compliance with the Type B air lock leakage test, and both air lock doors must be OPERABLE. The interlock allows only one air lock door of an air lock to be opened at one time. This provision ensures that a gross breach of the Containment Structure does not exist when the Containment Structure is required to be OPERABLE. Closure of a single door in each air lock is sufficient to provide a leak tight barrier following postulated events. Nevertheless, both doors are kept closed when the air lock is not being used for normal entry into or exit from the Containment Structure.

APPLICABILITY

In MODEs 1, 2, 3, and 4, a DBA could cause a release of radioactive material to the containment atmosphere. In MODEs 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODEs. Therefore, the containment air locks are not required in MODE 5 to prevent leakage of radioactive material from the Containment Structure. The requirements for the containment air locks during MODE 6 are addressed in LCO 3.9.3.

ACTIONS

The ACTIONS are modified by a Note that allows entry and exit to perform repairs on the affected air lock component. If the outer door is inoperable, then it may be easily accessed for most repairs. It is preferred that the air lock be accessed from inside primary containment by entering through the other OPERABLE air lock. However, if this is not practicable, or if repairs on either door must be performed from the barrel side of the door then it is permissible to enter the air lock through the OPERABLE door, which means there is a short time during which the containment boundary is not intact (during access through the OPERABLE door). The ability to open the OPERABLE door, even if it means the containment boundary is temporarily not intact, is acceptable because of the low probability of an event that could pressurize the Containment Structure during the short time in which the OPERABLE door is expected to be open. After each entry and exit, the OPERABLE door must be immediately closed. If as low as reasonably achievable (ALARA) conditions permit, entry and exit should be via an OPERABLE air lock.

A second Note has been added to provide clarification that, for this LCO, separate Condition entry is allowed for each air lock. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable air lock. Complying with the Required Actions may allow for continued operation, and a subsequent inoperable air lock is governed by subsequent Condition entry and application of associated Required Actions. A third Note has been included that requires entry into the applicable Conditions and Required Actions of LCO 3.6.1, when leakage results in exceeding the overall containment leakage limit.

A.1, A.2, and A.3

With one air lock door inoperable in one or more containment air locks, the OPERABLE door must be verified closed (Required Action A.1) in each affected containment air lock. This ensures that a leak tight containment barrier is maintained by the use of an OPERABLE air lock door. This action must be completed within one hour. This specified time period is consistent with the ACTIONS of LCO 3.6.1, which requires the Containment Structure be restored to OPERABLE status within one hour.

In addition, the affected air lock penetration must be isolated by locking closed an OPERABLE air lock door within the 24 hour Completion Time. The 24 hour Completion Time is considered reasonable for locking the OPERABLE air lock door, considering the OPERABLE door of the affected air lock is being maintained closed.

Required Action A.3 verifies that an air lock with an inoperable door has been isolated by the use of a locked and closed OPERABLE air lock door. This ensures that an acceptable containment leakage boundary is maintained. The Completion Time of once per 31 days is based on engineering judgment and is considered adequate in view of the low likelihood of a locked door being mispositioned and other administrative controls. Required Action A.3 is modified by a Note that applies to air lock doors located in high radiation areas and allows these doors to be verified locked closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of the door, once it has been verified to be in the proper position, is small.

The Required Actions have been modified by two Notes. Note 1 ensures that only the Required Actions and associated Completion Times of Condition C are required if both doors in the same air lock are inoperable. With both doors in the same air lock inoperable, an OPERABLE door is not available to be closed. Required Actions C.1 and C.2 are the appropriate remedial actions. The exception to Note 1 does not affect tracking the Completion Time from the initial entry into Condition A; only the requirement to comply with the Required Actions. Note 2 allows use of the air lock for entry and exit for seven days under administrative controls if both air locks have an inoperable door. This seven day restriction begins when the second air lock is discovered inoperable. Containment entry may be required to perform Technical Specifications Surveillances and Required Actions, as well as other activities on equipment inside the Containment Structure that are required by Technical Specifications or activities on equipment that support Technical Specifications-required equipment. This Note is not intended to preclude performing other activities (i.e., non-Technical Specifications-required activities) if the Containment Structure was entered, using the inoperable air lock, to perform an allowed activity listed above. This allowance is acceptable due to the low probability of an event that could pressurize the Containment Structure during the short time that the OPERABLE door is expected to be open.

<u>B.1, B.2, and B.3</u>

With an air lock interlock mechanism is inoperable in one or more air locks, the Required Actions and associated Completion Times are consistent with those specified in Condition A.

The Required Actions have been modified by two Notes. Note 1 ensures that only the Required Actions and associated Completion Times of Condition C are required if both doors in the same air lock are inoperable. With both doors in the same air lock inoperable, an OPERABLE door is not available to be closed. Required Actions C.1 and C.2 are the appropriate remedial actions. Note 2 allows entry into and exit from the Containment Structure under the control of a dedicated individual stationed at the air lock, to ensure that only one door is opened at a time (i.e., the individual performs the function of the interlock).

Required Action B.3 is modified by a Note that applies to air lock doors located in high radiation areas and allows these doors to be verified locked closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of the door, once it has been verified to be in the proper position, is small.

C.1, C.2, and C.3

With one or more air locks inoperable for reasons other than those described in Conditions A or B, Required Action C.1 requires action to be initiated immediately to evaluate previous combined leakage rates using current air lock test results. An evaluation is acceptable since it is overly conservative to immediately declare the Containment Structure inoperable if both doors in an air lock have failed a seal test or if the overall air lock leakage is not within limits. In many instances (e.g., only one seal per door has failed), the Containment Structure remains OPERABLE, yet only one hour (per LCO 3.6.1) would be provided to restore the air lock door to OPERABLE status prior to requiring a plant shutdown. In addition, even with both doors failing the seal test, the overall containment leakage rate can still be within limits.

Required Action C.2 requires that one door in the affected containment air lock must be verified to be closed. This action must be completed within the one hour Completion Time. This specified time period is consistent with the ACTIONS of LCO 3.6.1, which requires that the Containment Structure be restored to OPERABLE status within one hour.

Additionally, the affected air lock(s) must be restored to OPERABLE status within the 24 hour Completion Time. The specified time period is considered reasonable for restoring an inoperable air lock to OPERABLE status, assuming that at least one door is maintained closed in each affected air lock.

D.1 and D.2

If the inoperable containment air lock cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.2.1

Maintaining containment air locks OPERABLE requires compliance with the leakage rate test requirements of the Containment Leakage Rate Testing Program. This SR reflects the leakage rate testing requirements with regard to air lock leakage (Type B leakage tests). The acceptance criteria were established during initial air lock and the Containment Structure OPERABILITY testing. The periodic testing requirements verify that the air lock leakage does not exceed the allowed fraction of the overall containment leakage rate. The Frequency is required by the Containment Leakage Rate Testing Program.

The SR has been modified by two Notes. Note 1 states that an inoperable air lock door does not invalidate the previous successful performance of the overall air lock leakage test. This is considered reasonable since either air lock door is capable of providing a fission product barrier in the event of a DBA. Note 2 has been added to this SR requiring the results to be evaluated against the acceptance criteria of which is applicable to SR 3.6.1.1. This ensures that air lock leakage is properly accounted for in determining the combined Types B and C containment leakage rate.

SR 3.6.2.2

The air lock interlock is designed to prevent simultaneous opening of both doors in a single air lock. Since both the inner and outer doors of an air lock are designed to withstand the maximum expected post-accident containment pressure, closure of either door will support the Containment Structure OPERABILITY. Thus, the door interlock feature supports the Containment Support OPERABILITY while the air lock is being used for personnel transit into and out of the Containment Structure. Periodic testing of this interlock demonstrates that the interlock will function as designed and that simultaneous opening of the inner and outer doors will not inadvertently occur. Due to the purely mechanical nature of this interlock, and given that the interlock mechanism is not normally challenged when the air lock is used for entry and exit (procedures require strict adherence to single door opening), this test is only required to be performed every 24 months. The 24 month Frequency is based on the need to perform this surveillance test under the conditions that apply during a plant outage and the potential for loss of the Containment Structure OPERABILITY if the surveillance test was performed with the reactor at power. The 24 month Frequency for the interlock is justified based on generic operating experience. The 24 month Frequency is based on engineering judgment and is considered adequate given that the interlock is not challenged during use of the air lock.

REFERENCES

1. UFSAR

B 3.6 CONTAINMENT SYSTEMS

B 3.6.3 Containment Isolation Valves

BASES

BACKGROUND

The containment isolation valves form part of the containment pressure boundary. They provide a means for fluid penetrations (not serving accident consequence limiting systems) to be provided with two isolation barriers that are closed on an automatic isolation signal. These isolation devices are either passive or active (automatic). Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), blind flanges, and closed systems are considered passive devices. Check valves, or other automatic valves designed to close without operator action following an accident, are considered active devices. Two barriers in series are provided for each penetration so that no single credible failure or malfunction of an active component can result in a loss of isolation or leakage that exceeds limits assumed in the safety analysis. One of these barriers may be a closed system.

Containment isolation occurs upon receipt of a high containment pressure signal. The containment isolation signal closes automatic containment isolation valves in fluid penetrations, not required for operation of Engineered Safety Feature (ESF) systems, in order to prevent leakage of radioactive material. Upon actuation of safety injection, automatic containment isolation valves also isolate systems not required for the Containment Structure or Reactor Coolant System (RCS) heat removal. Other penetrations are isolated by the use of valves in the closed position or blind flanges. As a result, the containment isolation valves (and blind flanges) help ensure that the containment atmosphere will be isolated in the event of a release of radioactive material to containment atmosphere from the RCS following a DBA.

The OPERABILITY requirements for containment isolation valves help ensure that the Containment Structure is isolated within the time limits assumed in the safety analysis. Therefore, the OPERABILITY requirements provide assurance that the Containment Structure function assumed in the accident analysis will be maintained.

APPLICABLE SAFETY ANALYSES

The containment isolation valve LCO was derived from the assumptions related to minimizing the loss of reactor coolant inventory and establishing the containment boundary during major accidents. As part of the containment boundary, containment isolation valve OPERABILITY supports leak tightness of the Containment Structure. Therefore, the safety analysis of any event requiring isolation of the Containment Structure is applicable to this LCO.

The DBAs that result in a release of radioactive material within the Containment Structure are a LOCA, a main SLB, and a CEA ejection accident. In the analysis for each of these accidents, it is assumed that containment isolation valves are either closed or function to close within the required isolation time following event initiation. This ensures that potential paths to the environment through containment isolation valves (including containment purge valves) are minimized. The safety analysis assumes that the purge valves are closed at event initiation.

The DBA analysis assumes that, within 60 seconds after the accident, isolation of the Containment Structure is complete and leakage terminated except for the design leakage rate, L_a. The containment isolation total response time of 60 seconds includes signal delay, diesel generator startup (for loss of offsite power), and containment isolation valve stroke times.

The containment isolation valves satisfy 10 CFR 50.36(c)(2)(ii), Criterion 3.

LCO

Containment isolation valves form a part of the Containment Structure boundary. The containment isolation valve safety function is related to minimizing the loss of reactor coolant inventory and establishing the Containment Structure boundary during a DBA.

The automatic power operated isolation valves are required to have isolation times within limits and to actuate on an automatic isolation signal. The valves covered by this LCO are listed with their associated stroke times in Reference 1.

The normally closed isolation valves are considered OPERABLE when manual valves are closed, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact. These passive isolation valves or devices are those listed in Reference 1.

This LCO provides assurance that the containment isolation valves will perform their designed safety functions to minimize the loss of reactor coolant inventory and establish the Containment Structure boundary during accidents.

APPLICABILITY

In MODEs 1, 2, 3, and 4, a DBA could cause a release of radioactive material to the Containment Structure. In MODEs 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODEs. Therefore, the containment isolation valves are not required to be OPERABLE in MODE 5. The requirements for containment isolation valves during MODE 6 are addressed in LCO 3.9.3.

ACTIONS

The ACTIONS are modified by a Note allowing penetration flow paths to be unisolated intermittently under administrative controls. These administrative controls consist of stationing a dedicated operator at the valve controls who is in continuous communication with the Control Room. In this way, the penetration can be rapidly isolated when a need for containment isolation is indicated.

A second Note has been added to provide clarification that, for this LCO, separate Condition entry is allowed for each penetration flow path. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable containment isolation valve. Complying with the Required Actions may allow for continued operation, and subsequent inoperable containment isolation valves are governed by subsequent Condition entry and application of associated Required Actions.

The ACTIONS are further modified by a third Note, which ensures that appropriate remedial actions are taken, if necessary, if the affected systems are rendered inoperable by an inoperable containment isolation valve.

The fourth Note has been added that requires entry into the applicable Conditions and Required Actions of LCO 3.6.1, when leakage results in exceeding the overall containment leakage limit.

The fifth Note allows the shutdown cooling isolation valves to be opened when RCS temperature is < 300°F to establish shutdown cooling flow. This Note is required for Operation in MODE 4 to allow shutdown cooling to be established.

A.1 and A.2

In the event one containment isolation valve in one or more penetration flow paths is inoperable, the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic containment isolation valve, a closed manual valve, a blind flange, and a check valve with flow through the valve secured. For penetrations isolated in accordance with Required Action A.1, the device used to isolate the penetration should be the closest available one to the Containment Structure. Required Action A.1 must be completed within the four hour Completion Time. The four hour Completion Time is reasonable, considering the time required to isolate the penetration and the relative importance of supporting the Containment Structure OPERABILITY during MODEs 1, 2, 3, and 4.

For affected penetration flow paths that cannot be restored to OPERABLE status within the four hour Completion Time and that have been isolated in accordance with Required Action A.1, the affected penetration flow paths must be verified to be isolated on a periodic basis. This is necessary to ensure that containment penetrations required to be isolated following an accident and no longer capable of being automatically isolated, will be in the isolation position should an event occur. This Required Action does not require any testing or device manipulation. Rather, it involves verification, through a system walkdown, that those isolation devices outside the Containment Structure and capable of being mispositioned are in the correct position. The Completion Time of "once per 31 days for isolation devices outside Containment" is appropriate considering the fact that the devices are operated under administrative controls and the probability of their misalignment is low. For the isolation devices inside the Containment Structure, the time period specified as "prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days" is based on engineering judgment and is considered reasonable in view of the inaccessibility of the isolation devices and other administrative controls that will ensure that isolation device misalignment is an unlikely possibility.

Condition A has been modified by a Note indicating that this Condition is only applicable to those penetration flow paths with two containment isolation valves and not a closed system. For penetration flow paths with one or more containment isolation valves and a closed system, Condition C provides appropriate actions.

Required Action A.2 is modified by a Note that applies to isolation devices located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of these devices, once they have been verified to be in the proper position, is small.

<u>B.1</u>

With two containment isolation valves in one or more penetration flow paths inoperable, the affected penetration flow path must be isolated within one hour. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. The one hour Completion Time is consistent with the ACTIONS of LCO 3.6.1. In the event the affected penetration is isolated in accordance with Required

Action B.1, the affected penetration must be verified to be isolated on a periodic basis per Required Action A.2, which remains in effect. This periodic verification is necessary to assure leak tightness of the Containment Structure and that penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying each affected penetration flow path is isolated, is appropriate, considering the fact that the valves are operated under administrative controls and the probability of their misalignment is low.

Condition B is modified by a Note indicating this Condition is only applicable to penetration flow paths with two containment isolation valves. Condition A of this LCO addresses the condition of one containment isolation valve inoperable in this type of penetration flow path.

<u>C.1 and C.2</u>

With one or more containment isolation valves inoperable in one or more penetration flow paths, the inoperable valves must be restored to OPERABLE status or the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration. Required Action C.1 must be completed within the 72 hour Completion Time. The specified time period is reasonable, considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of supporting the Containment Structure OPERABILITY during MODEs 1, 2, 3, and 4. In the event the affected penetration is isolated in accordance with Required Action C.1, the affected penetration flow path must be verified to be isolated on a periodic basis. This is necessary to assure leak tightness of the Containment Structure and that containment penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying that each affected penetration flow path is isolated, is appropriate considering the valves are operated under administrative controls and the probability of their misalignment is low.

Condition C is modified by a Note indicating that this Condition is only applicable to those penetration flow paths with one or more containment isolation valves and a closed system. This Note is necessary since this Condition is written to specifically address those penetration flow paths in a closed system. Containment isolation valves and their associated penetration numbers are given in Reference 1, Table 5.3. The penetrations with closed systems are listed below.

Penetration No.	Function
1B	Containment Vent Header to Waste Gas
16	Component Cooling Water Inlet
18	Component Cooling Water Outlet
19A	Instrument Air
20A	Nitrogen Supply
20B	Nitrogen Supply
20C	Nitrogen Supply
23	Reactor Coolant Drain Tank Drains
24	Oxygen Sample Line
38	Demineralized Water
44	Fire Protection

Required Action C.2 is modified by a Note that applies to valves and blind flanges, located in high radiation areas, and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is small.

D.1 and D.2

If the Required Actions and associated Completion Times are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.3.1

This SR ensures that the containment vent valves are closed as required, or, if open, open for an allowable reason. If a containment vent valve is open in violation of this SR, the valve is considered inoperable. If the inoperable valve is not otherwise known to have excessive leakage when closed, it is not considered to have leakage outside of limits. The SR is not required to be met when the containment vent valves are open for pressure control, ALARA or air quality considerations for personnel entry, or for surveillance tests that require the valves to be open. The containment vent valves are capable of closing in the environment, following a LOCA. Therefore, these valves are allowed to be open for limited periods of time. The 31 day Frequency is consistent with other containment isolation valve requirements discussed in SR 3.6.3.2.

SR 3.6.3.2

This SR requires verification that each containment isolation manual valve and blind flange located outside the Containment Structure, and not locked, sealed, or otherwise secured, and required to be closed during accident conditions is closed. The SR helps to ensure that post-accident leakage of radioactive fluids or gases outside the containment boundary is within design limits. This SR does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those containment isolation valves outside the Containment Structure and capable of being mispositioned are in the correct position. Since verification of valve position for containment isolation valves outside the Containment Structure is relatively easy, the 31 day Frequency is based on engineering judgment, and was chosen to provide added assurance of the correct positions. Containment isolation valves that are open under administrative controls are not required to meet the SR during the time the valves are open. This SR does not apply to valves that are locked, sealed, or otherwise secured in the closed position, since these were verified to be in the correct position upon locking, sealing, or securing.

The Note applies to valves and blind flanges located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted during MODEs 1, 2, 3, 4 and for ALARA reasons. Therefore, the probability of misalignment of these containment isolation valves, once they have been verified to be in the proper position, is small.

SR 3.6.3.3

This SR requires verification that each containment isolation manual valve and blind flange located inside the Containment Structure, and not locked, sealed, or otherwise secured, and required to be closed during accident conditions is closed. The SR helps to ensure that post-accident leakage of radioactive fluids or gases outside the containment boundary is within design limits. For containment isolation valves inside the Containment Structure, the Frequency of "prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days" is appropriate, since these containment isolation valves are operated under administrative controls and the probability of their misalignment is low. Containment isolation valves that are open under administrative controls are not required to meet the SR during the time that they are open. This SR does not apply to valves that are locked, sealed, or otherwise secured in the closed position, since these were verified to be in the correct position upon locking, sealing, or securing.

The Note allows valves and blind flanges located in high radiation areas to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted during MODEs 1, 2, and 3 for ALARA reasons. Therefore, the probability of misalignment of these containment isolation valves, once they have been verified to be in their proper position, is small.

SR 3.6.3.4

Verifying that the isolation time of each automatic power operated containment isolation valve is within limits is required to demonstrate OPERABILITY. The isolation time test, ensures the valve will isolate in a time period less than or equal to that assumed in the safety analysis. The isolation time and Frequency of this SR are in accordance with the Inservice Testing Program.

SR 3.6.3.5

Automatic containment isolation valves close on an isolation signal [containment isolation signal Channels A or B, or safety injection actuation signal (SIAS) Channels A or B] to prevent leakage of radioactive material from the Containment Structure following a DBA. This SR ensures each automatic containment isolation valve will actuate to its isolation position on a containment isolation actuation signal. This surveillance test is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 24 month Frequency was developed considering it is prudent that this SR be performed only during a unit outage, since isolation of penetrations would eliminate cooling water flow and disrupt normal operation of many critical components. Operating experience has shown that these components usually pass this SR when performed on the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. UFSAR, Chapter 5, "Structures"

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4 Containment Pressure

BASES

BACKGROUND

The containment pressure is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a LOCA or main SLB. These limits also prevent the containment pressure from exceeding the containment design negative pressure differential, with respect to the outside atmosphere in the event of the Containment Structure being sealed during low barometric pressure and high temperature, then being exposed to a concurrent cooling of containment atmosphere and a barometric pressure rise.

Containment pressure is a process variable that is monitored and controlled. The containment pressure limits are derived from the input conditions used in the containment functional analyses and the containment structure external pressure analysis. Should operation occur above the upper limits coincident with a DBA, post-accident containment pressures could exceed calculated values. Should containment closure or integrity be set below the lower limits, the external pressure limits may be exceeded during barometric pressure changes.

APPLICABLE SAFETY ANALYSES

Containment internal pressure is an initial condition used in the DBA analyses to establish the maximum peak containment internal pressure. The limiting DBA considered for determining the maximum containment internal pressure is the LOCA. A LOCA at 102% RATED THERMAL POWER and + 1.8 psig initial containment pressure results in the highest calculated internal containment pressure (P_a) below the internal design pressure of 50.0 psig. The postulated DBAs are analyzed assuming degraded containment ESF systems (i.e., assuming the loss of one ESF bus, which is the worst case single active failure, resulting in one train of the containment spray and one train of the containment coolers being rendered inoperable). It is this maximum containment pressure that is used to ensure that the licensing basis dose limitations are met.

The initial pressure condition used in the containment analysis was 16.5 psia (1.8 psig). The LCO limit of 1.8 psig ensures that, in the event of an accident, the maximum accident design pressure for the Containment Structure, 50 psig, is not exceeded. If a LOCA occurred while the containment internal pressure was at the LCO value of 1.8 psig, a total pressure below the design value of 50 psig would result.

Containment pressure satisfies 10 CFR 50.36(c)(2)(ii), Criterion 2.

LCO

Maintaining containment pressure less than or equal to the LCO upper pressure limit ensures that, in the event of a DBA, the resultant peak containment accident pressure will remain below the containment design pressure. Maintaining containment pressure greater than or equal to the LCO lower pressure limit, ensures that the Containment Structure will not exceed the design negative pressure differential following the inadvertent actuation of containment spray.

APPLICABILITY

In MODEs 1, 2, 3, and 4, a DBA could cause a release of radioactive material to the Containment Structure. Since maintaining containment pressure within limits is essential to ensure initial conditions assumed in the accident analysis are maintained, the LCO is applicable in MODEs 1, 2, 3, and 4.

In MODEs 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODEs. Therefore, maintaining containment pressure within the limits of the LCO is not required in MODEs 5 or 6.

ACTIONS

A.1

When containment pressure is not within the limits of the LCO, containment pressure must be restored to within these limits, within one hour. The Required Action is necessary to return operation to within the bounds of the containment analysis. The one hour Completion Time is consistent with the ACTIONS of LCO 3.6.1 which requires that the Containment Structure be restored to OPERABLE status within one hour.

BASES

B.1 and B.2

If containment pressure cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner, and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.1

Verifying that containment pressure is within limits ensures that operation remains within the limits assumed in the accident analysis. The 12 hour Frequency of this SR was developed after taking into consideration operating experience related to trending of containment pressure variations during the applicable MODEs. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the Control Room, including alarms, to alert the operator to an abnormal containment pressure condition.

REFERENCES

None

B 3.6 CONTAINMENT SYSTEMS

B 3.6.5 Containment Air Temperature

BASES

BACKGROUND

The Containment Structure serves to contain radioactive material that may be released from the reactor core following a DBA. The Containment Structure average air temperature is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a LOCA or main SLB.

The containment average air temperature limit is derived from the input conditions used in the containment functional analyses and the Containment Structure external pressure analyses. This LCO ensures that initial conditions assumed in the analysis of containment response to a DBA, are not violated during unit operations. The total amount of energy to be removed from Containment Structure by the containment spray and containment cooling during post-accident conditions is dependent on the energy released to the Containment Structure due to the event, as well as the initial containment temperature and pressure. The higher the initial temperature, the more energy that must be removed, resulting in a higher peak containment pressure and temperature. Exceeding containment design pressure may result in leakage greater than that assumed in the accident analysis (Reference 1). Operation with containment temperature in excess of the LCO limit violates an initial condition assumed in the accident analysis.

APPLICABLE SAFETY ANALYSES

Containment average air temperature is an initial condition used in the DBA analyses that establishes the containment environmental qualification operating envelope for both pressure and temperature. The limit for containment average air temperature ensures that operation is maintained within the assumptions used in the DBA analysis for Containment. The accident analyses and evaluations considered both LOCAs and main SLBs for determining the maximum peak containment pressures and temperatures. The worst case LOCA generates larger mass and energy releases than the worst case main SLB. Thus, the LOCA event bounds the main SLB event from the containment peak pressure and temperature standpoint. The initial pre-accident temperature inside the Containment Structure was assumed to be 120°F (Reference 1).

The initial containment average air temperature condition of 120°F resulted in a maximum vapor temperature described in Reference 1. The consequence of exceeding the design temperature for extended periods may be the potential for degradation of the containment structure under accident loads.

Containment average air temperature satisfies 10 CFR 50.36(c)(2)(ii), Criterion 2.

LCO

During a DBA, with an initial containment average air temperature less than or equal to the LCO temperature limit, the resultant peak accident temperature is maintained below the containment design temperature. As a result, the ability of the Containment Structure to perform its function is ensured.

APPLICABILITY

In MODEs 1, 2, 3, and 4, a DBA could cause a release of radioactive material to the Containment Structure. In MODEs 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODEs. Therefore, maintaining containment average air temperature within the limit is not required in MODEs 5 or 6.

ACTIONS

A.1

When containment average air temperature is not within the limit of the LCO, it must be restored to within limit, within eight hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The eight hour Completion Time is acceptable considering the sensitivity of the analysis to variations in this parameter and provides sufficient time to correct minor problems.

B.1 and B.2

If the containment average air temperature cannot be restored to within its limit, within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.5.1

Verifying that containment average air temperature is within the LCO limit ensures that containment operation remains within the limit assumed for the containment analyses. In order to determine the containment average air temperature, an arithmetic average is calculated using measurements taken from the containment dome [1(2)-TI-5309] and the containment reactor cavity [1(2)-TI-5311] temperature indicators selected to provide a representative sample of the overall containment atmosphere. The 24 hour Frequency of this SR is considered acceptable based on the observed slow rates of temperature increase within the Containment Structure as a result of environmental heat sources (due to the large volume of the Containment Structure). Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the Control Room, including alarms, to alert the operator to an abnormal containment temperature condition.

REFERENCES

1. UFSAR, Section 14.20, "Containment Response"

B 3.6 CONTAINMENT SYSTEMS

B 3.6.6 Containment Spray and Cooling Systems

BASES

BACKGROUND

The Containment Spray and Cooling Systems provide containment atmosphere cooling to limit post-accident pressure and temperature in the Containment Structure to less than the design values. Reduction of containment pressure and the iodine removal capability of the spray, reduce the release of fission product radioactivity from the Containment Structure to the environment, in the event of a DBA, to within limits. The Containment Spray and Cooling Systems are designed to the requirements in Reference 1, Appendix 1C, Criteria, 58, 59, 60, 61, 62, 63, 64, and 65.

The Containment Spray and Cooling Systems are ESF systems. They are designed to ensure that the heat removal capability required during the post-accident period can be attained. The Containment Spray and Cooling Systems provide redundant methods to limit and maintain post-accident conditions to less than the containment design values.

Containment Spray System

The Containment Spray System consists of two separate trains of equal capacity, each of sufficient capacity to supply approximately 50% of the design cooling requirement. Each train includes a containment spray pump, spray headers, nozzles, valves, and piping. Each train is powered from a separate ESF bus. The refueling water tank (RWT) supplies borated water to the containment spray during the injection phase of operation. In the recirculation mode of operation, containment spray pump suction is transferred from the RWT to the containment sump(s). Each spray system flow path from the containment sump will be via an OPERABLE shutdown cooling heat exchanger.

The Containment Spray System provides a spray of cold borated water into the upper regions of the Containment Structure to reduce containment pressure and temperature and to reduce the concentration of fission products in the containment atmosphere during a DBA. The RWT solution temperature is an important factor in determining the heat removal capability of the Containment Spray System during the injection phase. In the recirculation mode of operation, heat is removed from the containment sump water by the shutdown cooling heat exchangers. Each train of the Containment Spray System provides adequate spray coverage to meet 50% of the system design requirements for containment heat removal and 100% of the iodine removal design bases.

The Containment Spray System is actuated either automatically by a containment spray actuation signal coincident with a SIAS or manually. An automatic actuation starts the two containment spray pumps, and begins the injection phase. The containment spray header isolation valves open upon a containment spray actuation signal. A manual actuation of the Containment Spray System is available on the main control board to begin the same sequence. The injection phase continues until an RWT low level signal is received. The low level for the RWT generates a recirculation actuation signal that aligns valves from the containment spray pump suction to the containment sump. The Containment Spray System in recirculation mode maintains an equilibrium temperature between the containment atmosphere and the recirculated sump water. Operation of the Containment Spray System in the recirculation mode is controlled by the operator in accordance with the Emergency Operating Procedures.

Containment Cooling System

Two trains of containment cooling, each of sufficient capacity to supply approximately 67% of the design cooling requirement, are provided. Two trains with two fan units each are supplied with cooling water from a separate train of service water cooling. Three of the four fans are required to furnish the design cooling capacity. Air is drawn into the coolers through the fans and discharged throughout the Containment Structure.

In post-accident operation following a SIAS, all four Containment Cooling System fans are designed to start automatically in slow speed. Cooling is supplied by the service water cooled coils. The temperature of the service water is an important factor in the heat removal capability of the fan units.

APPLICABLE SAFETY ANALYSES

The Containment Spray and Cooling Systems limit the temperature and pressure that could be experienced following a DBA. The limiting DBAs considered relative to containment temperature and pressure are LOCA and main SLB. The DBA, LOCA, and main SLB are analyzed using computer codes designed to predict the resultant containment pressure and temperature transients. No DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment ESF systems, assuming the loss of one ESF bus, which is the worst case single active failure, resulting in one train of the Containment Spray System and one train of the Containment Cooling System being rendered inoperable.

The analysis and evaluation show that under the worst case scenario, the highest peak containment pressure and temperature are within the design. (See the Bases for Specifications 3.6.4 and 3.6.5 for a detailed discussion.) The analyses and evaluations assume a power level of 102% RATED THERMAL POWER, one containment spray train and one containment cooling train operating, and initial (pre-accident) conditions of 120°F and 16.5 psia. The analyses also assumes a response time delayed initiation, in order to provide a conservative calculation of peak containment pressure and temperature responses.

The modeled Containment Spray System actuation from the containment analysis is based upon a response time associated with exceeding the Containment High-High pressure setpoint coincident with an SIAS to achieve full flow through the containment spray nozzles. The Containment Spray System total response time of 62.9 seconds for a main steam line break and 70.9 seconds for a LOCA, includes diesel generator startup (for loss of offsite power), sequencing equipment onto the emergency bus, containment spray pump startup, and spray line filling (Reference 1, Chapter 7).

The performance of the containment cooling train for post-accident conditions is given in Reference 1, Chapter 6. The results of the analysis, is that each train can provide approximately 67% of the required peak cooling capacity during the post-accident condition. The train post-accident cooling capacity under varying containment ambient conditions, required to perform the accident analyses, is also shown in Reference 1, Chapter 6.

The modeled Containment Cooling System actuation from the containment analysis, is based upon the unit specific response time associated with exceeding the SIAS to achieve full Containment Cooling System air and safety grade cooling water flow.

The Containment Spray and Cooling Systems satisfy 10 CFR 50.36(c)(2)(ii), Criterion 3.

LCO

During a DBA, a minimum of one containment cooling train and one containment spray train, is required to maintain the containment peak pressure and temperature, below the design limits (Reference 1, Chapter 6). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling trains (all four coolers) must be OPERABLE. Therefore, in the event of an accident, the minimum requirements are met, assuming that the worst case single active failure occurs.

Each Containment Spray System includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWT upon an ESF actuation signal and automatically transferring suction to the containment sump. Each spray system flow path from the containment sump will be via an OPERABLE shutdown cooling heat exchanger.

Each Containment Cooling System includes cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

APPLICABILITY

In MODEs 1, 2, and 3, a DBA could cause a release of radioactive material to the Containment Structure and an increase in containment pressure and temperature, requiring the operation of the containment spray trains and containment cooling trains.

The Containment Spray System is only required to be OPERABLE in MODE 3 with pressurizer pressure ≥ 1750 psia.

In MODE 3 with pressurizer pressure < 1750 psia, and in MODEs 4, 5, and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODEs. Thus, the Containment Spray System is not required to be OPERABLE in MODE 3 with pressurizer pressure < 1750 psia, and the Containment Spray and Cooling Systems are not required to be OPERABLE in MODEs 4, 5, and 6.

ACTIONS

A.1

With one containment spray train inoperable, the inoperable containment spray train must be restored to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE spray and cooling trains are adequate to perform the iodine removal and containment cooling functions. The 72 hour Completion Time takes into account the redundant heat removal capability afforded by the Containment Spray System, reasonable time for repairs, and the low probability of a DBA occurring during this period.

The 10 day portion of the Completion Time for Required Action A.1 is based upon engineering judgment. It takes into account the low probability of coincident entry into two Conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to Specification 1.3, for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.

B.1 and B.2

If the inoperable containment spray train cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 3 with pressurizer pressure < 1750 psia within 12 hours. The allowed Completion Time of six hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner, and without challenging plant systems. The extended interval to reach MODE 3 with pressurizer pressure < 1750 psia allows additional time for the restoration of the containment spray train and is reasonable when considering that the driving force for a release of radioactive material from the RCS is reduced in MODE 3.

C.1

With one required containment cooling train inoperable, the inoperable containment cooling train must be restored to OPERABLE status within seven days. The remaining OPERABLE containment spray and cooling components provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs after an accident. The seven day Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray and Cooling Systems, and the low probability of a DBA occurring during this period.

The 10 day portion of the Completion Time for Required Action C.1 is based upon engineering judgment. It takes into account the low probability of coincident entry into two Conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to Specification 1.3 for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.

D.1

With two required containment cooling trains inoperable, one of the required containment cooling trains must be restored to OPERABLE status within 72 hours. The remaining OPERABLE containment spray components provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray and Cooling Systems, the iodine removal function of the Containment Spray System, and the low probability of a DBA occurring during this period.

E.1 and E.2

If the Required Actions and associated Completion Times of Conditions C or D of this LCO are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1

With two containment spray trains or any combination of three or more Containment Spray and Cooling Systems trains inoperable, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.6.6.1

Verifying the correct alignment for manual, power-operated, and automatic valves in the containment spray flow path provides assurance that the proper flow paths will exist for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct position prior to being secured. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This SR does not require any testing or valve manipulation. Rather, it involves verifying, through a system walkdown, that those valves outside the Containment Structure and capable of potentially being mispositioned are in the correct position.

SR 3.6.6.2

Starting each containment cooling train fan unit from the Control Room and operating it for ≥ 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected and corrective action taken. The 31 day Frequency of this SR was developed considering the known reliability of the fan units and controls, the two train redundancy available, and the low probability of a significant degradation of the containment cooling train occurring between surveillances and has been shown to be acceptable through operating experience.

SR 3.6.6.3

Verifying a service water flow rate of ≥ 2000 gpm to each cooling unit when the full flow service water outlet valves are fully open provides assurance that the design flow rate assumed in the safety analyses will be achieved (Reference 1, Chapter 7). Also considered in selecting this Frequency were the known reliability of the Service Water System, the two train redundancy, and the low probability of a significant degradation of flow occurring between surveillance tests.

SR 3.6.6.4

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by Reference 2. Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.6.6.5 and SR 3.6.6.6

These SRs verify that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated actuation signal (i.e., the appropriate Engineered Safety Feature Actuation System signal). This SR is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The

24 month Frequency is based on the need to perform these surveillance tests under the conditions that apply during a plant outage and the potential for an unplanned transient if the surveillance tests were performed with the reactor at power. Operating experience has shown that these components usually pass the surveillance tests when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

The surveillance test of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance test may be used to satisfy both requirements.

SR 3.6.6.7

This SR verifies that each containment cooling train actuates upon receipt of an actual or simulated actuation signal (i.e., the appropriate Engineered Safety Feature Actuation System signal). The 24 month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6.5 and SR 3.6.6.6, above, for further discussion of the basis for the 24 month Frequency.

SR 3.6.6.8

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through check valve bonnets. Performance of this SR demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the Containment Structure during an accident is not degraded. Due to the passive design of the nozzle, a test after maintenance that could result in nozzle blockage is considered adequate. Maintenance that could result in nozzle blockage is generally loss of foreign material control or a flow of borated water through a nozzle. Should either of these events occur, a supervisory evaluation will be required to determine whether nozzle blockage is a possible result of the event.

BASES

REFERENCES	1.	UFSAR
	2.	American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI, “Rules for In-Service Inspection of Nuclear Power Plant Components”

B 3.6 CONTAINMENT SYSTEMS

B 3.6.8 Iodine Removal System (IRS)

BASES

BACKGROUND

The IRS is provided per Reference 1, Appendix 1C, Criteria 62, 63, and 64, to reduce the concentration of fission products released to the containment atmosphere following a postulated accident. The IRS would function together with the Containment Spray and Cooling Systems following a DBA to reduce the potential release of radioactive material, principally iodine, from the Containment Structure to the environment.

The IRS consists of three 50% capacity separate, independent (except for power), and redundant trains. Each train includes a moisture separator, a high efficiency particulate air filter, an activated charcoal adsorber section for removal of radioiodines, a fan, and instrumentation. The moisture separators function to reduce the moisture content of the air stream. The system initiates filtered recirculation of the containment atmosphere following receipt of a SIAS. The system design is described in Reference 1, Section 6.7.

The moisture separator is included for moisture (free water) removal from the gas stream. The moisture separator is important to the effectiveness of the charcoal adsorbers.

Three IRS trains are provided to meet the requirement for separation, independence (except for power), and redundancy. Two trains of the IRS are powered by separate ESF buses. The third IRS train is a swing train that can be aligned to take power from either ESFs bus.

APPLICABLE SAFETY ANALYSES

The DBAs that result in a release of radioactive iodine within the Containment Structure are a LOCA, a main SLB, or a CEA ejection accident. In the analysis for each of these accidents, it is assumed that adequate containment leak tightness exists at event initiation to limit potential leakage to the environment. Additionally, it is assumed that the amount of radioactive iodine release is limited by reducing the iodine concentration in the containment atmosphere.

The IRS design basis is established by the consequences of the limiting DBA, which is a LOCA. The accident analysis (Reference 1, Section 14.21) assumes that only two trains of the IRS are functional due to a single failure that disables the other train. The accident analysis accounts for the reduction in airborne radioactive iodine provided by the remaining two trains of this filtration system.

The IRS satisfies 10 CFR 50.36(c)(2)(ii), Criterion 3.

LCO

Three separate, independent (except for power), and redundant trains of the IRS are required to ensure that at least two are available, assuming a single failure coincident with a loss of offsite power.

APPLICABILITY

In MODEs 1, 2, 3, and 4, iodine is a fission product that can be released from the fuel to the reactor coolant as a result of a DBA. The DBAs that can cause a failure of the fuel cladding are a LOCA, main SLB, and CEA ejection accident. Because these accidents are considered credible accidents in MODEs 1, 2, 3, and 4, the IRS must be operable in these MODEs to ensure the reduction in iodine concentration assumed in the accident analysis.

In MODEs 5 and 6, the probability and consequences of a LOCA are low due to the pressure and temperature limitations of these MODEs. The IRS is not required in these MODEs to remove iodine from the containment atmosphere.

ACTIONS

A.1

With one IRS train inoperable, the inoperable train must be restored to OPERABLE status within seven days. The components in this degraded condition are capable of providing 100% of the iodine removal needs after a DBA. The seven day Completion Time is based on consideration of such factors as:

a. The availability of the OPERABLE redundant IRS train;

b. The fact that, even with no IRS train in operation, almost the same amount of iodine would be removed from the containment atmosphere through absorption by the Containment Spray System; and

c. The fact that the Completion Time is adequate to make most repairs.

B.1

If two IRS trains are inoperable, one must be restored to OPERABLE status within one hour. The one hour Completion Time allows the swing train to be aligned to the appropriate bus to ensure each of the two remaining trains are powered from separate and independent buses. The one hour, also allows time to restore one train to OPERABLE status prior to initiating a plant shutdown. This is reasonable considering that a plant shutdown is a plant transient.

C.1 and C.2

If the IRS train cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.8.1

Initiating each IRS train from the Control Room and operating it for ≥ 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly. It also ensures that motor failure can be detected for corrective action. The 31 day Frequency was developed considering the known reliability of fan motors and controls, the two train redundancy available, and the iodine removal capability of the Containment Spray System independent of the IRS.

SR 3.6.8.2

This SR verifies that the required IRS filter testing is performed in accordance with the Ventilation Filter Testing Program. The IRS filter tests are in accordance with portions of Reference 2. The Ventilation Filter Testing

Program includes testing high efficiency particulate air filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the Ventilation Filter Testing Program.

SR 3.6.8.3

The automatic startup test verifies that both trains of equipment start upon receipt of an actual or simulated test signal (Engineered Safety Feature Actuation System). The 24 month Frequency is based on the need to perform this surveillance test under the conditions that apply during a plant outage and the potential for an unplanned transient if the surveillance test were performed with the reactor at power. Operating experience has shown that these components usually pass the surveillance test when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. Furthermore, the Frequency was developed considering that the system equipment OPERABILITY is demonstrated on a 31 day Frequency by SR 3.6.8.1.

REFERENCES

1. UFSAR

2. Regulatory Guide 1.52, Revision 2, "Design, Testing, and Maintenance Criteria for Postaccident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," March 1978