ISF Facility
Technical Specification Bases

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY B-1

3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY B-3

3.1 CANISTER/ INTEGRITY..... B-6
3.1.1 Canister Integrity B-6

3.2 STORAGE TUBE INTEGRITY B-8
3.2.1 STORAGE TUBE Pressure and Interseal Leak Rate B-8
3.2.2 Storage Vault Heat Removal System B-10

3.3 CRITICALITY CONTROL SYSTEM..... B-12
3.3.1 Fuel Packaging Area Limits B-12
3.3.2 Criticality Monitoring System B-14

3.4 FUEL PACKAGING AREA CONFINEMENT BOUNDARY..... B-15
3.4.1 Heating, Ventilation, and Air Conditioning (HVAC) System..... B-15

THIS PAGE INTENTIONALLY LEFT BLANK.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1

LCO 3.0.1 establishes the Applicability statement within each individual Specification as the requirement for when the LCO is required to be met (i.e., when the facility is in the specified conditions of the Applicability statement of each specification).

LCO 3.0.2

LCO 3.0.2 establishes that upon discovery of a failure to meet an LCO, the associated ACTIONS shall be met. The Completion Time of each Required Action for an ACTIONS Condition is applicable from the point in time that an ACTIONS Condition is entered. The Required Actions establish those remedial measures that must be taken within specified Completion Times when the requirements of an LCO are not met. This Specification establishes that:

a. Completion of the Required Actions within the specified Completion Times constitutes compliance with a Specification; and

b. Completion of the Required Actions is not required when an LCO is met within the specified Completion Time, unless otherwise specified.

There are two basic types of Required Actions. The first type of Required Action specifies a time limit in which the LCO must be met. This time limit is the Completion Time to restore an inoperable system or component to operable status or to restore variables to within specified limits. If this type of Required Action is not completed within the specified Completion Time, a cessation of operations may be required to place the system or component in a condition in which the Specification is not applicable. (Whether stated as a Required Action or not, correction of the entered Condition is an action that may always be considered upon entering ACTIONS.) The second type of Required Action specifies the remedial measures that permit continued operation that is not further restricted by the Completion Time. In this case, compliance with the Required Actions provides an acceptable level of safety for continued operation.

Completing the Required Actions is not required when an LCO is met or is no longer applicable, unless otherwise stated in the individual Specifications.

The Completion Time of the Required Actions are also applicable when a system or component is removed from service intentionally. The reason for intentionally relying on the ACTIONS include, but are not limited to, performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering ACTIONS for these reasons must be done in a manner that does not compromise safety. Intentional entry into ACTIONS should not be made for operational convenience.

LCO 3.0.3

This specification is not applicable to an ISFSI. The placeholder is retained for consistency with the power reactor technical specifications.

LCO 3.0.4

LCO 3.0.4 establishes limitations on changes in specified conditions in the Applicability when an LCO is not met. It precludes placing the unit in a specified condition stated in that Applicability (e.g., Applicability desired to be entered) when the following exist:

a. Facility conditions are such that the requirements of the LCO would not be met in the Applicability desired to be entered; and

b. Continued noncompliance with the LCO requirements, if the Applicability were entered, would result in the facility being required to exit the Applicability desired to be entered to comply with the Required Actions.

Compliance with the Required Actions that permit continued operation of the facility for an unlimited period of time in a specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the facility. Therefore, in such cases, entry into a specified condition in the Applicability may be made in accordance with the provisions of the Required Actions. The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components before entering an associated specified condition in the Applicability.

The provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS. In addition, the provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are related to establishing and maintaining the spent fuel in an inert atmosphere.

Exceptions to LCO 3.0.4 are stated in the individual Specifications. These exceptions allow entry into specified conditions in the Applicability when the associated ACTIONS to be entered do not provide for continued operation for an unlimited period of time. Exceptions may apply to all the ACTIONS or to a specific Required Action of a Specification.

LCO 3.0.5

LCO 3.0.5 establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or determined to not meet the LCO to comply with ACTIONS. The sole purpose of this Specification is to provide an exception to LCO 3.0.2 (e.g., to not comply with the applicable Required Action(s)) to allow the performance of SRs to demonstrate:

a. The equipment being returned to service meets the LCO: or

b. Other equipment meets the applicable LCOs.

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements of the ACTIONS is limited to the time absolutely necessary to perform the allowed surveillance. This Specification does not provide time to perform any other preventive or corrective maintenance.

3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

SR 3.0.1

SR 3.0.1 establishes the requirement that SRs must be met during the specified conditions in the Applicability for which the requirements of the LCO apply, unless otherwise specified in the individual SRs. This Specification is to ensure that Surveillances are performed to verify systems, components, and variables are within specified limits. Failure to meet a SR within the specified Frequency, in accordance with SR 3.0.2, constitutes a failure to meet an LCO.

Systems and components are assumed to meet the LCO when the associated SRs have been met. Nothing in this Specification, however, is to be construed as implying that systems or components meet the associated LCO when:

a. The systems or components are known to not meet the LCO, although still meeting the SRs; or

b. The requirements of the Surveillance(s) are known not to be met between required Surveillance performances. Surveillances do not have to be performed when the facility is in a specified condition for which the requirements of the associated LCO are not applicable, unless otherwise specified.

Unplanned events may satisfy the requirements (including applicable acceptance criteria) for a given SR. In this case, the unplanned event may be credited as fulfilling the performance of the SR. This allowance includes those SRs whose performance is normally precluded in a specified condition.

Surveillances, including Surveillances invoked by Required Actions, do not have to be performed on equipment that has been determined to not meet the LCO because the ACTIONS define the remedial measures that apply. Surveillances have to be met and performed in accordance with SR 3.0.2, prior to returning equipment to service.

Upon completion of maintenance, appropriate post maintenance testing is required. This includes ensuring applicable Surveillances are not failed and their most recent performance is in accordance with SR 3.0.2. Post maintenance testing may not be possible in the current specified conditions in the Applicability due to the necessary facility parameters not having been established. In these situations, the equipment may be considered to meet the LCO provided testing has been satisfactorily completed to the extent possible and the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a specified condition where other necessary post maintenance tests can be completed.

SR 3.0.2

SR 3.0.2 establishes the requirements for meeting the specified Frequency for Surveillances and any Required Action with a Completion Time that requires the periodic performance of the Required Action on a “once per...” interval.

SR 3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Surveillance scheduling and considers facility conditions that may not be suitable for conducting the Surveillance (e.g., transient conditions or other ongoing Surveillance or maintenance activities).

The 25% extension does not significantly degrade the reliability that results from performing the Surveillance at its specified Frequency. This is based on the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the SRs. The exceptions to SR 3.0.2 are those Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications as a Note in the Frequency stating, “SR 3.0.2 is not applicable.”

As stated in SR 3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a “once per...” basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Action, whether it is a particular Surveillance or some other remedial action, is considered a single action with a single Completion Time. One reason for not allowing the 25% extension to this Completion Time is that such an action usually verifies that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the inoperable equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as a convenience to extend Surveillance intervals or periodic Completion Time intervals beyond those specified.

SR 3.0.3

SR 3.0.3 establishes the flexibility to defer declaring affected equipment as not meeting the LCO or an affected variable outside the specified limits when a Surveillance has not been completed within the specified Frequency. A delay period of up to 24 hours or up to the limit of the specified Frequency, whichever is less, applies from the point in time that it is discovered that the Surveillance has not been performed in accordance with SR 3.0.2, and not at the time that the specified Frequency was not met.

This delay period provides adequate time to complete Surveillances that have been missed. This delay period permits the completion of a Surveillance before complying with Required Actions or other remedial measures that might preclude completion of the Surveillance.

The basis for this delay period includes consideration of facility conditions, adequate planning, availability of personnel, the time required to perform the Surveillance, the safety significance of the delay in completing the required Surveillance, and the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the requirements. When a Surveillance with a Frequency based not on time intervals, but upon specified facility conditions or operational situations, is discovered not to have been performed when specified, SR 3.0.3 allows the full delay period of 24 hours to perform the Surveillance.

SR 3.0.3 also provides a time limit for completion of Surveillances that become applicable as a consequence of changes in the specified conditions in the Applicability imposed by Required Actions.

Failure to comply with specified Frequencies for SRs is expected to be an infrequent occurrence. Use of the delay period established by SR 3.0.3 is a flexibility which is not intended to be used as a convenience to extend Surveillance intervals.

If a Surveillance is not completed within the allowed delay period, then the

equipment is considered to not meet the LCO or the variable is considered outside the specified limits and the Completion Time of the Required Actions for the applicable LCO Conditions begin immediately upon expiration of the delay period. If a Surveillance is failed within the delay period, then the equipment does not meet the LCO, or the variable is outside the specified limits and the Completion Time of the Required Actions for the applicable LCO Conditions begin immediately upon the failure of the Surveillance.

Completion of the Surveillance within the delay period allowed by this Specification, or within the Completion Time of the ACTIONS, restores compliance with SR 3.0.1.

SR 3.0.4

SR 3.0.4 establishes the requirement that all applicable SRs must be met before entry into a specified condition in the Applicability.

This Specification ensures that system and component requirements and variable limits are met before entry into specified conditions in the Applicability for which these systems and components ensure safe operation of the facility.

The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components before entering an associated specified condition in the Applicability.

However, in certain circumstances, failing to meet an SR will not result in SR 3.0.4 restricting a change in specified condition. When a system, subsystem, component, device, or variable is outside its specified limits, the associated SR(s) are not required to be performed, per SR 3.0.1, which states that surveillances do not have to be performed on such equipment. When equipment does not meet the LCO, SR 3.0.4 does not apply to the associated SR(s) since the requirement for the SR(s) to be performed is removed. Therefore, failing to perform the Surveillances(s) within the specified Frequency does not result in an SR 3.0.4 restriction to changing specified conditions of the Applicability. However, since the LCO is not met in this instance, LCO 3.0.4 will govern any restrictions that may (or may not) apply to specified condition changes.

The provisions of SR 3.0.4 shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS.

The precise requirements for performance of SRs are specified such that exceptions to SR 3.0.4 are not necessary. The specific time frames and conditions necessary for meeting the SRs are specified in the Frequency, in the Surveillance, or both. This allows performance of Surveillances when the prerequisite condition(s) specified in a Surveillance procedure require entry into the specified condition in the Applicability of the associated LCO prior to the performance or completion of a Surveillance. A Surveillance that could not be performed until after entering the LCO Applicability, would have its Frequency specified such that it is not “due” until the specific conditions needed are met. Alternately, the Surveillance may be stated in the form of a Note as not required (to be met or performed) until a particular event, condition, or time has been reached. Further discussion of the specific formats of SRs annotation is found in Section 1.4, Frequency.

3.1 CANISTER/ INTEGRITY

3.1.1 Canister Integrity

BACKGROUND

After receiving SPENT NUCLEAR FUEL from the Fuel Packaging Area, the ISF CANISTER is moved through the Transfer Tunnel to the Canister Closure Area (CCA). The canister is enclosed by a welded lid, vacuum dried, and backfilled with helium to 19-21 psia at 80-100ºF. During storage, the inert helium gas inhibits corrosion within the canister and assists heat transfer from the spent fuel. The integrity of the canister lid welds is tested by a helium leak detector to ensure that the canister leak rate is ≤ 10^{-4} std cm^3/sec.

APPLICABLE SAFETY ANALYSIS

The ISF CANISTER is the primary confinement barrier against the migration of radiation during the storage of SPENT NUCLEAR FUEL. An inert, non-corrosive atmosphere promotes long-term integrity of the canister and the fuel. For this reason, the canister is backfilled with helium prior to final sealing in the CCA. Helium also promotes the transfer of decay heat from the fuel to the canister wall. Thermal analysis of the ISF CANISTER demonstrates that helium is not essential for safe canister handling and storage operations.

During canister closure in the CCA thermal analysis of the fuel assumes the fuel elements to be surrounded by air. The results of this analysis show that, for the off-normal condition of Transfer Tunnel temperature at 163°F, the maximum temperature attained by TRIGA elements, the most limiting fuel type, is approximately 187°F. This temperature is well below the normal temperature limit (400°F) for TRIGA fuel and produces temperatures in the surrounding fuel basket, canister, cask, and concrete that are within their design limits. Therefore, spent fuel in an air environment within the canister cask can remain in the CCA indefinitely without exceeding fuel or supporting component temperature limits.

LCO

Verifying the ISF CANISTER leak rate to be no greater than 10^{-4} std cm^3/sec satisfies ASME code requirements for acceptable leakage. The specified canister pressure of 19-21 psia ensures that the canister internal pressure will always be greater than barometric atmospheric pressure under all expected storage temperatures.

APPLICABILITY

The ISF CANISTER receives its helium backfill near the end of LOADING OPERATIONS. Therefore, the need for the canister to maintain the backfill applies only to subsequent activities, namely CANISTER HANDLING and STORAGE OPERATIONS.

ACTIONS

A Note added to the ACTIONS states that a separate Condition entry is allowed for each ISF CANISTER. Subsequent ISF CANISTERS that do not meet the LCO are governed by subsequent Condition entries and application of the associated Required Actions.

A.1

If the ISF CANISTER leak rate exceeds 10^{-4} std cm^3/sec at 19-21 psia, action must be taken to return the fill pressure and leak rate to within that limit prior to placing the canister into storage. The ACTION statement does not require a specific completion time but only that the canister leak rate be restored to within the limits prior to CANISTER HANDLING.

Typically, the helium backfill is used to promote heat transfer from the SPENT NUCLEAR FUEL to the canister wall. Thermal analysis, however, shows that all three types of fuel can remain surrounded by air or helium indefinitely in the ISF CANISTER and the canister cask without exceeding temperature limits. Therefore, temperature considerations do not impose any time limit for reestablishing backfill pressure or canister integrity.

The helium backfill also provides an inert atmosphere to impede corrosion within the ISF CANISTER. Because the stainless steel construction of the canister is highly resistant to corrosion and the ambient environment of the Idaho desert is typically dry, the formation of corrosion within the ISF CANISTER is unlikely during the short period of time needed to repair or replace it. Therefore, corrosion considerations place no time limit on the completion time of the ACTION provided that the leak rate is restored to within its limit prior to CANISTER HANDLING.

SURVEILLANCE REQUIREMENTS

SR 3.1.1.1

During LOADING OPERATIONS, the canister lid is welded to the ISF CANISTER and the canister is evacuated to remove residual moisture, purged with helium, evacuated and purged a second time. During the helium purge, the canister is pressurized to 19-21 psia while the lid weld is inspected for leaks. The vent plug is then torqued, welded, and given a final leak check. Any leak larger than 10^{-4} std cm^3/sec requires the canister to be repaired or replaced.

The correct canister pressure and leak rate is verified prior to STORAGE OPERATIONS to ensure that the ISF CANISTER contains an inert atmosphere prior to placement in a STORAGE TUBE. Once a canister is stored in a pressurized STORAGE TUBE, verifying its internal pressure is impractical.

REFERENCES

ASME Boiler and Pressure Vessel Code (1998), Section V
ISF Facility Safety Analysis Report, Chapter 8

3.2 STORAGE TUBE INTEGRITY

3.2.1 STORAGE TUBE Pressure and Interseal Leak Rate

BACKGROUND

After being pressurized with helium and sealed, the ISF CANISTER is moved by the canister trolley to the Storage Area where the Canister Handling Machine removes it from the trolley and lowers it into a STORAGE TUBE. In preparation for STORAGE OPERATIONS, the tube is evacuated, backfilled with helium, and sealed to provide a dry, inert atmosphere that prevents degradation of the canister.

APPLICABLE SAFETY ANALYSIS

The helium backfill of the STORAGE TUBE serves to:

1. provide a secondary confinement atmosphere that is consistent with the primary confinement atmosphere; and

2. provide an inert atmosphere within the tube to prevent corrosion.

The STORAGE TUBE provides the secondary confinement barrier for the SPENT NUCLEAR FUEL and the internal helium atmosphere of the tube protects the stored ISF CANISTER from unacceptable degradation. To achieve this, the helium pressure within the tube must be maintained above atmospheric pressure to prevent the incursion of air. Both the stainless steel canister and the coated carbon steel interior of the tube are resistant to corrosion. Therefore, exposure of these surfaces to air, such as during construction, loading, and backfilling operations, is permissible.

The enhanced heat transfer ability between the canister and the STORAGE TUBE wall afforded by the helium backfill is a relatively minor effect. Thermal analysis has shown that, under accident conditions, the heatup of TRIGA fuel, the most limiting fuel type, results in maximum fuel and structural temperatures that are well within design limits. This analysis conservatively took no credit for helium or air within the STORAGE TUBE as a heat removal medium. Consequently, the presence of helium is useful but not necessary in promoting heat transfer between the ISF CANISTER and the STORAGE TUBE.

Figure 3.2-1 of the Technical Specifications provides the maximum and minimum allowable helium fill pressures for a STORAGE TUBE. The minimum pressure is based upon establishing an internal tube pressure that remains above atmospheric pressure for the anticipated temperature range of outside air. Maintaining tube pressure above barometric atmospheric pressure confirms that helium is present and providing an inert atmosphere to prevent corrosion.

The maximum pressure limit of Figure 3.2-1 is based upon preventing an excessive differential pressure across the walls of the ISF CANISTER within the STORAGE TUBE. Restricting the pressure of the tube helium backfill to maximum shown on the figure ensures that the canister will not be subjected to excessive compressive forces during any anticipated storage condition.

LCO

Verifying the ISF CANISTER leak rate to be no greater than 10^{-4} std cm^3/sec satisfies ASME code requirements for acceptable leakage. Establishing STORAGE TUBE helium pressure within the limits of Figure 3.2-1 ensures that adequate helium remains to provide an inert atmosphere preventing the onset of corrosion

APPLICABILITY

The STORAGE TUBE receives its helium backfill and initial leak test at the

conclusion of CANISTER HANDLING. Therefore, the need for the tube to maintain the backfill applies only to subsequent activities, namely STORAGE OPERATIONS. Successful completion of the leak test marks the transition to STORAGE OPERATIONS and the point at which the requirements of the LCO are imposed.

ACTIONS

A Note added to the ACTIONS states that a separate Condition entry is allowed for each STORAGE TUBE containing an ISF CANISTER. Subsequent STORAGE TUBES that do not meet the LCO are governed by subsequent Condition entries and application of the associated Required Actions.

A.1

In the event that testing detects a leak in excess of 10^{-4} std cm^3/sec, the affected STORAGE TUBE is repaired or replaced to restore the leak rate to below that value within the pressure limits shown on Figure 3.2-1. Establishing these conditions ensures that leakage (and possible contaminant migration) from the tube is maintained within analyzed limits and that sufficient helium is present to maintain an inert atmosphere.

Thermal analysis shows all fuel types can be stored indefinitely in an ISF CANISTER within a STORAGE TUBE without reliance on a helium backfill for adequate heat transfer. Consequently, thermal considerations impose no time restraints on the restoration of tube leak rate.

Similarly, the material characteristics of the canister and the tube are inherently resistant to the onset of corrosion. These features, coupled with the generally dry climate of the ISF Facility, allow the interior of the STORAGE TUBE to remain in an ambient air environment for an extended period.

The helium backfill also establishes a positive pressure on the ISF CANISTER to prevent leakage from the canister to the outside atmosphere. Imposing a Completion Time of 30 days to restore the STORAGE TUBE leak rate to within limits provides a reasonable time to repair or replace the tube lid.

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

A condition for entering STORAGE OPERATIONS is that the affected STORAGE TUBE has passed its pressure and interseal leak rate test. This Surveillance Requirement establishes the need to verify that the leak rate is within limits as a prerequisite to entering STORAGE OPERATIONS.

SR 3.2.1.2

To ensure that STORAGE TUBE pressure is maintained within limits throughout the storage period, this SR requires that the leak rate and pressure of 1 tube containing an ISF CANISTER in each vault be tested annually. The verification selects a representative tube for each vault to confirm its ability to maintain confinement and an inert atmosphere.

REFERENCES

ASME Boiler and Pressure Vessel Code (1998), Section V
ISF Facility Safety Analysis Report, Chapter 8

3.2 STORAGE TUBE INTEGRITY

3.2.2 Storage Vault Heat Removal System

BACKGROUND

In addition to being a secondary confinement barrier for SPENT NUCLEAR FUEL, each STORAGE TUBE provides a heat removal path for the decay heat produced by the fuel within it. Decay heat is transferred from the fuel through helium cover gas to the inner surface of the ISF CANISTER. After transferring through the canister wall, the heat moves through the helium atmosphere of the STORAGE TUBE and through the tube wall. Outside air enters the storage vault through sixteen screened inlet vents, flowing downward through fixed ducts to the lower vault area where it rises among the STORAGE TUBES. The rising air removes decay heat from the outer surface of each tube and exits through small annular openings at the surface of the charge face to leave the Storage Area through elevated outlet vents. The storage vault heat removal system is passive and depends upon natural circulation to function. An unrestricted flowpath is necessary for proper operation.

APPLICABLE SAFETY ANALYSIS

The surface temperature of the concrete vault structure is the limiting parameter for this specification. The maximum off-normal temperature of the vault concrete is limited to 200°F. With an assumed maximum normal operating fuel temperature of 118°F, a total blockage of vault airflow, and adiabatic boundary conditions, the calculated rise in the temperature of the fuel, canister, and STORAGE TUBE is 0.35°F/hr. The increase is conservatively applied to the vault's concrete surface because of its close proximity to the tube. This analysis indicates that concrete temperature reaches its limit in approximately 9½ days after airflow blockage.

LCO

Ensuring that the Storage Vault Heat Removal System is OPERABLE establishes that the stored SPENT NUCLEAR FUEL is adequately cooled to preserve its physical integrity as well as that of the ISF CANISTERS and the STORAGE TUBES that contain it.

APPLICABILITY

The Storage Vault Heat Removal System is required to operate only when SPENT NUCLEAR FUEL is placed within a STORAGE TUBE. Consequently, This LCO is applicable only during STORAGE OPERATIONS.

ACTIONS

A note added to the ACTIONS states that a separate Condition entry is allowed for each STORAGE TUBE containing an ISF CANISTER. Subsequent STORAGE TUBES that do not meet the LCO are governed by subsequent Condition entry and application of the associated Required Actions.

A.1

If the heat removal system for each STORAGE TUBE containing an ISF CANISTER is not functioning properly, action must be taken to restore cooling to maintain the integrity of the fuel and its confinement structures. Heat removal within the storage vault is driven by natural circulation, requiring a flowpath between the heat source (nuclear fuel) and the heat sink (ambient atmosphere). Blockage of this flowpath is the most likely cause for interruption of spent fuel cooling. Since calculations for a conservative adiabatic heatup show that the concrete temperature limit would not be reached for approximately 9½ days, allowing operators 48 hours to find and remedy the cause of the flow blockage is permissible.

B.1

The inlet and outlet air vents of the Storage Area can be readily cleared of obstructions if necessary. If this is insufficient to satisfy Required Action of A.1, the airflow obstruction is most likely located in the annulus between a STORAGE TUBE and the vault structure. In this case, the ISF CANISTER in the affected STORAGE TUBE must be moved to another tube with adequate cooling. Calculations for a conservative adiabatic heatup show that the concrete temperature limit would not be reached for approximately 9½ days after airflow blockage. Given this and assuming the operators used the full 48 hours allowed by Required Action A.1, an additional 96 hours is a reasonable time to relocate an ISF CANISTER into an unaffected STORAGE TUBE.

SURVEILLANCE REQUIREMENTS

SR 3.2.2.1

The passive nature of natural circulation cooling within the storage vault depends upon an unobstructed air path connecting the heat source (spent fuel) to the heat sink (ambient atmosphere). The purpose of this surveillance is to require a periodic inspection of locations where obstructions are most likely to occur. Given a total airflow blockage, no fuel or structural temperature limit would be approached for approximately 9½ days. With a nominal time of 48 hours between inspections, as much as 60 hours could elapse before a lack of heat removal condition is discovered if the 1.25 extension allowance of SR 3.0.2 is applied. When this is combined to the completion times of Required Actions A.1 and B.1, a total of 204 hours (8½ days) could elapse from the time of airflow obstruction until the affected ISF CANISTER is relocated into a STORAGE CANISTER with adequate cooling.

REFERENCES

ISF Facility Safety Analysis Report, Chapter 8

3.3 CRITICALITY CONTROL SYSTEM

3.3.1 Fuel Packaging Area Limits

BACKGROUND

The Fuel Packaging Area (FPA) is designed to accommodate the dry transfer of SPENT NUCLEAR FUEL from DOE-provided transport casks to ISF CANISTERS suitable for storage at the ISF Facility. Since the facility deals with three (Peach Bottom, Shippingport, and TRIGA) fuel types of differing physical and nuclear characteristics, controls are necessary to segregate these types during operations in the FPA.

APPLICABLE SAFETY ANALYSIS

Criticality analyses show that all fuel handling operations within the FPA will not result in a k_{eff} greater than 0.95. These analyses, however, assume that a single fuel type is present in the FPA at any one time. Only limited analyses have been performed to assess the criticality effects of FPA operations with a combination of fuel types. Since such operations could constitute an unanalyzed condition, administrative constraints are imposed to prevent it from occurring.

LCO

To preclude the possibility of entering an unanalyzed operating condition, the LCO restricts activities within the FPA to only one fuel type at a time.

APPLICABILITY

This LCO is applicable during LOADING OPERATIONS because this is the phase during which SPENT NUCLEAR FUEL is present in the FPA. It is also applicable during RECEIPT OPERATIONS because a Surveillance Requirement specifies the verification of the type of SPENT NUCLEAR FUEL contained in each transfer cask prior to placement in the Transfer Tunnel.

ACTIONS

The overall goal of the Required Actions is to halt fuel handling activities upon discovery of the presence of more than one fuel type within the FPA and to effect a recovery plan that restores the FPA to an analyzed condition.

A.1

When the presence of mixed fuel types is discovered in the FPA, action must be taken immediately to halt any fuel handling that could result in unanalyzed interaction between them. Immediately stopping fuel handling prevents any interaction from occurring.

A.2

With LOADING OPERATIONS suspended, no evolutions are in progress in the FPA that constitute a criticality hazard. Therefore, the facility staff can, in a deliberate manner, develop a recovery plan to restore the FPA to an analyzed condition containing only one fuel type. 72 hours is adequate to formulate this plan.

A.3

After its development, the recovery plan implements the actions needed to return the FPA to a single-fuel condition. In addition to physical activities within the FPA, the plan may require engineering evaluations, changes to procedural guidance, or other administrative details. Restoration activities could involve the return of SPENT NUCLEAR FUEL to INTEC and require several weeks to reconfigure receiving equipment. Accordingly, the Completion Time of 90 days is reasonable.

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1

This SR requires verification of the type of SPENT NUCLEAR FUEL contained in the DOE transfer cask before the cask is allowed to be moved into the Transfer Tunnel. Since physical inspection of the fuel is not possible in the Receipt Area, this verification is performed by reviewing the DOE-supplied documentation accompanying the transfer cask.

SR 3.3.1.2

This SR provides visual verification that all fuel packages handled in the FPA at one time are of the same type.

REFERENCES

ISF Facility Safety Analysis Report, Section 3.3

3.3 CRITICALITY CONTROL SYSTEM

3.3.2 Criticality Monitoring System

BACKGROUND

The criticality monitoring system is a subsystem of the radiation monitoring system that employs dedicated gamma radiation detectors in the Operating Gallery and Canister Closure Area (CCA) to detect rapidly rising radiation levels that are consistent with the onset of criticality during the movement of SPENT NUCLEAR FUEL.

APPLICABLE SAFETY ANALYSIS

The criticality monitoring system alarm setpoints are high enough to minimize alarms from sources other than criticality and low enough to detect the minimum criticality event of concern. Setpoints for monitors are based upon modeled radiation fluxes, the position of monitors, the distance between monitors and potential sources, and the shielding effects of nearby equipment.

LCO

The criticality monitoring system must be OPERABLE as specified by the Surveillance Requirements to ensure that a critical condition does not go undetected during fuel movement in the Fuel Packaging Area.

APPLICABILITY

Because all fuel handling operations outside of the Fuel Packaging Area involve containers that prevent critical geometries, the requirement for criticality monitoring system availability is limited only to LOADING OPERATIONS when SPENT NUCLEAR FUEL is actually in the FPA.

ACTIONS

A.1

If the criticality monitoring system is not OPERABLE, LOADING OPERATIONS are immediately halted to prevent further unmonitored fuel movement.

A.2

Once LOADING OPERATIONS are suspended, no additional SPENT NUCLEAR FUEL movement is permitted until the criticality monitoring system is again OPERABLE.

SURVEILLANCE REQUIREMENTS

SR 3.3.2.1

This Surveillance Requirement ensures that the criticality monitoring system is qualitatively checked to provide reasonable assurance that is functioning properly prior to the start of fuel movement in the FPA and every 24 hours thereafter. These checks continue while SPENT NUCLEAR FUEL is present in the FPA.

SR 3.3.2.2

To provide greater assurance of proper criticality monitoring system operation beyond that afforded by the CHANNEL CHECK required by SR 3.3.2.1, this SR provides for an annual CHANNEL FUNCTIONAL TEST, the first of which to be performed within 7 days before the initial commencement of LOADING OPERATIONS.

REFERENCES

ISF Facility Safety Analysis Report, Chapter 5

3.4 FUEL PACKAGING AREA CONFINEMENT BOUNDARY

3.4.1 Heating, Ventilation, and Air Conditioning (HVAC) System

BACKGROUND

Proper operation of the HVAC system is necessary to establish airflows that prevent the spread of contamination throughout the ISF Facility as well ensure that all ventilation air leaving the facility is filtered and monitored.

APPLICABLE SAFETY ANALYSIS

In addition to establishing habitable conditions within the ISF Facility, the HVAC system limits the likelihood for contamination migration by establishing ventilation zones of different air pressures. The highest pressures are in areas least likely to become contaminated while areas with a greater potential for contamination have lower pressures. This arrangement causes air to flow from the least contaminated areas to the more contaminated ones, thereby limiting the spread of radioactive particles. The area of lowest pressure is the Fuel Packaging Area (FPA) where the potential for contamination is highest. All airflow from the FPA passes through a series of HEPA filters and is monitored for radioactivity before its release to the outside atmosphere.

LCO

Establishing that the HVAC system is OPERABLE (as defined by the accompanying Surveillance Requirements) ensures that confinement boundaries are in place and that necessary contamination filtering equipment is available.

APPLICABILITY

The generation of airborne contamination is most likely in the FPA during fuel packaging because it involves a variety of manipulations with bare nuclear fuel. Consequently, this LCO is applicable during LOADING OPERATIONS.

ACTIONS

A.1

LOADING OPERATIONS involve the movement of unshielded fuel elements within the FPA and present the most likely source of contamination. Halting these operations when the HVAC system is not available minimizes the potential for contamination production and migration.

A.2

As a further preventive measure against the spread of contamination from more heavily contaminated areas, this Required Action directs the closing of all confinement boundaries. The Completion Time of 1 hour allows this to be done in a prompt and controlled manner.

A.3

This Required Action requires local air monitoring at various points within the ISF Facility. This ensures that facility personnel are aware of areas having airborne contamination levels in excess of permissible limits.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR requires verification that 1 FPA exhaust fan is running prior to and during LOADING OPERATIONS. This ensures that the FPA is maintained at a negative pressure to prevent the spread of contamination. It also ensures that airflow from the FPA passes through HEPA filters to remove particulates and is monitored prior to release to the environment. The requirement to verify fan operation every 24

hours ensures that operators are aware of HVAC system status and serves as a backup to installed instrumentation and alarms.

SR 3.4.1.2

A critical function of the HVAC system is the ability to filter radioactive particulates before they enter the environment. An excessively low differential pressure across the HEPA filter bank indicates the presence of a punctured filter. An excessively high differential pressure indicates a blocked filter. This SR requires verification that the filter bank differential pressure is within a range that shows all filters are functioning effectively.

SR 3.4.1.3

This SR establishes requirements for the condition of major penetrations into the FPA to ensure that confinement is established whenever SPENT NUCLEAR FUEL is present.

When fuel enters the FPA for packaging, it moves through the normally closed cask port separating the FPA from the Transfer Tunnel. With the port plug removed, an inflatable seal closes the gap between the cask and the port and serves as a confinement boundary to prevent the spread of contamination. The seal also maintains proper ventilation flow by preventing direct airflow from the Transfer Tunnel to the FPA, thereby bypassing the FPA inlet HEPA filter.

Packaged fuel exits the FPA through the normally closed canister port and into the canister trolley for transfer to the Canister Closure Area. An inflatable seal, similar to the one at the cask port, closes the gap between the canister and the canister port, providing the same confinement and ventilation control as the cask port seal.

Neither waste port has an inflatable seal comparable to those associated with the cask and canister ports. Consequently, the SR prohibits opening either of ports while LOADING OPERATIONS are in progress unless SPENT NUCLEAR FUEL in the FPA is in designated storage locations. Opening a waste port provides direct communication between the FPA and the Solid Waste Processing Area that is not within the confinement boundary. The risk of contamination migration is minimal, however, because the HVAC continues to maintain the FPA under a negative pressure and no fuel handling is in progress.

REFERENCES ISF Facility Safety Analysis Report, Section 4.3.1