72-1027 TN-68 AMENDMENT 1
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B 2.0 FUNCTIONAL AND OPERATIONAL LIMITS

B 2.1.1 Fuel to be Stored in the TN-68 Cask

BASES

BACKGROUND

The cask design requires certain limits on spent fuel parameters, including fuel type, assembly weight, initial enrichment, maximum burnup, minimum cooling time prior to storage in the cask, and physical condition of the spent fuel to safely store the spent fuel in the cask. These limitations are included in the thermal, structural, radiological and criticality evaluations performed for the cask.

APPLICABLE SAFETY ANALYSIS

Various analyses have been performed that use these spent fuel parameters as assumptions. These assumptions are included in the thermal, criticality, structural, shielding and confinement analyses. The fuel geometry is determined by the fuel type designation (i.e. GE4, GE5, etc). The maximum uranium content is not generally specified for each fuel type. However, the fuel manufacturer is required to provide the uranium content for each assembly. The shielding analysis is conservatively based on a uranium content either greater than or equal to the TS value for uranium content. The user verification of fuel parameters may be done by administrative review. It is recognized that rod pitch, rod outside diameter and channel thickness values are design nominal values.

The limitations for the storage of damaged fuel are based on structural analysis demonstrating that damaged fuel will be retrievable under normal and off-normal conditions.

Technical Specification Table 2.1.1-1 provides for minimum cooling times based on a fuel minimum initial enrichment and maximum burnup *for 7x7 fuel.* To use the table, the minimum enrichments are rounded down and the burnups are rounded up. For example, fuel with a 2.68% enrichment and a burnup of 34.2 GWd/MTU would use the 2.6% enrichment row and the 35 GWd/MTU column.

For 8x8, 9x9, and 10x10 fuel, the same function is fulfilled by a fuel qualification flowchart and decay heat formula.

FUNCTIONAL AND OPERATIONAL LIMITS

The Functional and Operational Limits are established to protect the integrity of the fuel clad barrier and the public from radioactive materials in effluents and direct radiation levels associated with cask operation.

(continued)

BASES

FUNCTIONAL AND OPERATING LIMITS VIOLATIONS

2.2.1 If Functional and Operating Limit 2.1 is violated, the limitations on the fuel assemblies in the cask have not been met. Actions must be taken to place the affected fuel assemblies in a safe condition. This safe condition may be established by returning the affected fuel assemblies to the spent fuel pool. However, it is acceptable for the affected fuel assemblies to remain in the cask if that is determined to be a safe condition.

2.2.2 and 2.2.3

Notification of the violation of a Functional and Operating Limit to the NRC is required within 24 hours. Written reporting of the violation must be accomplished within 30 days. This notification and written report are independent of any reports and notification that may be required by 10 CFR 72.75.

B 3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

BASES

LCOs	LCO 3.0.1, 3.0.2, 3.0.4, and 3.0.5 establish the general requirements applicable to all Specifications in Sections 3.1 and 3.2 and apply at all times, unless otherwise stated.
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 cask 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 equipment or variables to within specified limits. 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. (continued)

BASES

LCO 3.0.2 (continued)

The Completion Times of the Required Actions are also applicable when a system or component is removed from service intentionally. The reasons 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. Individual Specifications may specify a time limit for performing an SR when equipment is removed from service or bypassed for testing. In this case, the Completion Times of the Required Actions are applicable when this time limit expires, if the equipment remains removed from service or bypassed.

When a change in specified condition is required to comply with Required Actions, the cask may enter a specified condition in which another Specification becomes applicable. In this case, the Completion Times of the associated Required Actions would apply from the point in time that the new Specification becomes applicable and the ACTIONS Condition(s) are entered.

LCO 3.0.3

This specification is not applicable to a cask. 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 cask in a specified condition stated in that Applicability (e.g., Applicability desired to be entered) when the following exist:

a. 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 cask being required to exit the Applicability desired to be entered to comply with the Required Actions.

Compliance with Required Actions that permit continued operation of the cask for an unlimited period of time in a specified condition provides an acceptable level of safety for continued operation. 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 equipment or variables to within specified limits before entering an associated specified condition in the Applicability.

BASES

LCO 3.0.4 (continued)	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 the unloading of a cask. Exceptions to LCO 3.0.4 are stated in the individual Specifications. Exceptions may apply to all the ACTIONS or to a specific Required Action of a Specification. Surveillances do not have to be performed on the associated equipment out of service (or on variables outside the specified limits), as permitted by SR 3.0.1. Therefore, changing specified conditions while in an ACTIONS Condition, either in compliance with LCO 3.0.4 or where an exception to LCO 3.0.4 is stated, is not a violation of SR 3.0.1 or 3.0.4 for those Surveillances that do not have to be performed due to the associated out of service equipment.
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. 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 SRs. This Specification does not provide time to perform any other preventive or corrective maintenance.
LCO 3.0.6	This specification is not applicable to a cask. The placeholder is retained for consistency with the power reactor technical specifications.
LCO 3.0.7	This specification is not applicable to a cask. The placeholder is retained for consistency with the power reactor technical specifications.

B 3.0 SURVEILLANCE REQUIREMENTS (SR) APPLICABILITY

BASES

SRs	SR 3.0.1 through SR 3.0.4 establish the general requirements applicable to all Specifications in Sections 3.1 and 3.2 and apply at all times, unless otherwise stated.
SR 3.0.1	SR 3.0.1 establishes the requirements 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 that equipment and variables are within specified limits. Failure to meet a Surveillance 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 to be not met between required Surveillance performances. Surveillances do not have to be performed when the cask is in a specified condition for which the requirements of the associated LCO are not applicable, unless otherwise specified. 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 to declare equipment within its LCO. 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 cask 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.

(continued)

BASES

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 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. The requirements of regulations take precedence over the TS. Therefore, when a test interval is specified in the regulations, the test interval cannot be extended by the TS, and the SR includes 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 equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as an operational 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.

(continued)

BASES

SR 3.0.3 (continued)

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 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 interval, but upon specified 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 an operational convenience to extend Surveillance intervals

If a Surveillance is not completed within the allowed delay period, then the equipment is considered inoperable or the variable is considered outside the specified limits and the Completion Times 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 its LCO Conditions, or the variable is outside the specified limits and the Completion Times 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.

(continued)

BASES

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 equipment requirements and variable limits are met before entry into specified conditions in the Applicability for which this equipment ensures safe operation of the cask.

The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring equipment to an appropriate status 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, division, 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 equipment outside of specified limits. When equipment is outside specified limits, 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 Surveillance(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 restriction 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. In addition, the provisions of SR 3.0.4 shall not prevent changes in specified conditions in the Applicability that are related to the unloading of a cask.

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.

B 3.1 CASK INTEGRITY

B 3.1.1 Cask Cavity Vacuum Drying

BASES

BACKGROUND	A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operational Limits. A lid is then placed on the cask. Subsequent operations involve moving the cask to the decontamination area and removing water from the cask fuel cavity. After the cask lid is secured, vacuum drying of the cask cavity is performed and the cavity is backfilled with helium. During normal storage conditions, the cask is backfilled with helium, which is a better conductor than air or vacuum, which results in lower temperatures for stored fuel and the basket. Cavity vacuum drying is utilized to remove residual moisture from the fuel cavity after the cask has been drained of water. Any water which was not drained from the cask cavity evaporates from fuel or basket surfaces due to the vacuum. This is aided by the temperature increase due to the heat generation of the fuel.
APPLICABLE SAFETY ANALYSIS	The confinement of radioactivity during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are uranium dioxide fuel pellet matrix, metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This protective environment is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in the accident analysis (Reference 1).
LCO	A vacuum pressure of less than 4 mbar held for 30 minutes indicates that all liquid water has evaporated and has been removed from the cask cavity. Removing water from the cask cavity helps to ensure the long term minimization of fuel clad corrosion.
APPLICABILITY	Cavity vacuum drying is performed during LOADING OPERATIONS before the cask is transported to the ISFSI storage pad. Therefore, the vacuum requirements do not apply after the cask is backfilled with helium prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS.

(continued)

BASES (continued)

ACTIONS A.1

The thermal analyses of the cask are performed assuming that helium is in the cask. *But during the period from draining of the cask until evacuation of the air and its replacement by helium, heat conduction out of the fuel occurs through air, which has lower conductivity than helium. For the design basis load of 30 kW under air, the maximum fuel cladding temperature will reach the limit of 400°C at 37 hours.* If the cavity vacuum drying pressure limit cannot be achieved within *24* hours of completion of cask draining, the cask must be backfilled with helium (a pressure greater than 0.1 atm abs is sufficient to provide required thermal conductivity) within *6* hours. This results in the cask being backfilled with helium within *30* hours of draining the cask. ACTION A.1 requires backfilling with helium to maintain the cask in an analyzed condition, thus allowing additional time to determine the source of the vacuum drying problem.

After the *introduction of helium at 30 hours, in the steady state the fuel cladding does not reach the temperature limit and basket thermal expansion is within acceptable limits for a design basis load of 30 kW* (Reference 2).

Establishment of even a low pressure helium environment satisfies the helium properties described in design basis thermal analyses because thermal conductivity of gases is not pressure dependent until a high vacuum is attained. Thereby, design basis heat removal requirements will be satisfied over the period of time that it may take to remedy a leaking cask. The near-term effects of not providing a completely dried and pressurized helium atmosphere during this period are negligible. Insignificant corrosion of materials would occur during this period.

Required Action A.1 is modified by a note which allows exiting the LCO in the event that the nominal helium cask environment must be vented during subsequent actions that may be necessary to remedy the condition. For example, the helium may be vented and the LCO exited if it is discovered that residual water must be drained from the cask prior to re-commencing the vacuum drying process.

ACTIONS A.2

If the cask cavity vacuum drying pressure limit cannot be achieved, actions must be taken to meet the LCO. Failure to successfully complete cavity vacuum drying could have many causes, such as failure of the vacuum drying system, inadequate draining, ice clogging of the drain lines, or leaking of the cask seals. *Once the helium atmosphere is established by Action A.1, there is enough conduction to maintain the loaded fuel and the basket within their temperature limits. Therefore, no time limit is required for this action, other than completion prior to final helium backfill.*

(continued)

BASES

ACTIONS (continued)

B.1

If a nominal helium environment cannot be achieved or maintained in the cask within *37* hours of draining the cask, *the fuel cladding could exceed its temperature limit.* Therefore the cask will be placed back into the spent fuel pool within 7 days. *Seven* days is sufficient time to reflood the cask. Once placed in the spent fuel pool with the lid removed, the fuel is provided with adequate decay heat removal facilities to maintain the loaded fuel within limits.

C.1

If the cask cavity drying pressure limits cannot be achieved within the Completion Time of *7 days*, actions must be taken to return the cask to the spent fuel pool within the ensuing 30 days. Evaluation and repair to cask drying equipment may continue. Once placed in the spent fuel pool with the lid removed, the fuel is provided with adequate decay heat removal facilities to maintain the loaded fuel within limits.

SURVEILLANCE REQUIREMENTS

SR 3.1.1.1

Cavity dryness is demonstrated by evacuating the cavity to a very low pressure and verifying that the pressure is held over a specified period of time. A high vacuum is an indication that the cavity is dry.

This dryness test must be performed successfully on each cask before placing in storage. The test must be performed within *24* hours of draining the cask and removing it from the spent fuel pool. This period allows sufficient time to prepare the cask and perform the test while minimizing the time the fuel is in the cask without a helium atmosphere.

At steady state for a thermal load below 22 kW, the fuel cladding and basket do not reach their temperature limits, so there is no time limit for completion of vacuum drying (Reference 2). At or above 22 kW, the same applies once the air is evacuated and replaced by helium at any time during vacuum drying.

REFERENCES

1. SAR Section 11.1.2, Cask Seal Leakage

2. SAR Section *4.5.1, Vacuum Drying*

B 3.1 CASK INTEGRITY

B 3.1.2 Cask Helium Backfill Pressure

BASES

BACKGROUND	A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operational Limits. A lid is then placed on the cask. Subsequent operations involve moving the cask to the decontamination area and removing water from the cask fuel cavity. After the cask lid is secured, vacuum drying of the cask cavity is performed, and the cavity is backfilled with helium. During normal storage conditions, the cask is backfilled with helium, which is a better conductor than air or vacuum, which results in lower temperatures for stored fuel and the basket. Backfilling the cask cavity with helium promotes heat transfer from the fuel and the inert atmosphere protects the fuel cladding. Providing a helium pressure greater than atmospheric pressure ensures that there will be no in-leakage of air over the life of the cask.
APPLICABLE SAFETY ANALYSIS	The confinement of radioactivity during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are uranium dioxide fuel pellet matrix, metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in the accident analysis (Reference 1). In addition, the thermal analyses of the cask STORAGE OPERATIONS assume that the cask cavity is filled with helium.
LCO	Backfilling the cask cavity with helium at a pressure exceeding atmospheric pressure will ensure that there will be no air in-leakage into the cavity which could damage the fuel cladding over the licensed storage period. The helium pressure of 2.0 atm abs (+0/-10%) was selected to ensure that the pressure within the cask remains within the design pressure limits over the life of the cask. The helium pressure is the as left value *immediately* after helium fill is completed in preparation for long term storage.
APPLICABILITY	Helium backfill is performed during LOADING OPERATIONS prior to transporting the cask to the ISFSI storage pad. The helium leak rate is then measured prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS.

(continued)

BASES (continued)

ACTIONS

A.1

The thermal analyses of the cask are performed assuming that helium is in the cask. If the cask cavity helium pressure limit cannot be achieved within *30* hours of completion of cask draining, the cask must be backfilled with helium (a pressure greater than 0.1 atm abs is sufficient to provide required thermal conductivity) *immediately, i.e., within 30 hours of draining the cask. This time limit is achievable because a helium environment is generally maintained in the cask after vacuum drying. For the design basis load of 30 kW under air, the maximum fuel cladding temperature will reach the limit of 400°C at 37 hours.* ACTION A.1 requires backfilling the helium with helium to maintain the cask in an analyzed condition, thus allowing additional time to determine the source of the helium backfill problem.

Establishment of even a low pressure helium environment satisfies the helium properties described in design basis thermal analyses because thermal conductivity of gases is not pressure dependent until a high vacuum is attained. Thereby, design basis heat removal requirements will be satisfied over the period of time that it may take to remedy a leaking cask. The near-term effects of not providing a completely dried and pressurized helium atmosphere during this period are negligible. Insignificant corrosion of materials would occur during this period.

Required Action A.1 is modified by a note which allows exiting the LCO in the event that the nominal helium cask environment must be vented during subsequent actions that may be necessary to remedy the condition.

A.2

If the initial helium backfill pressure cannot be obtained, actions must be taken to meet the LCO. *Once the helium atmosphere is established by Action A.1, there is enough conduction to maintain the loaded fuel within its temperature limit. Therefore, no time limit is required for this action, other than completion prior to helium leak testing.*

(continued)

BASES

ACTIONS (continued)

B.1

If a nominal helium environment cannot be achieved or maintained in the cask within *37* hours of draining the cask, the *fuel cladding could exceed its temperature limit.* Therefore the cask will be placed back into the spent fuel pool within 7 days. *Seven* days is sufficient time to reflood the cask. Once placed in the spent fuel pool with the lid removed, the fuel is provided with adequate decay heat removal facilities to maintain the loaded fuel within limits.

C.1

If the helium backfill limits cannot be achieved, actions must be taken to return the cask to the spent fuel pool within the ensuing 30 days. Evaluation and repair to helium backfill equipment may continue. Once placed in the spent fuel pool with the lid removed, the fuel is provided with adequate decay heat removal facilities to maintain the loaded fuel within limits.

SURVEILLANCE REQUIREMENTS

SR 3.1.2.1

The long-term integrity of the stored fuel is dependent on storage in a dry, inert environment and maintenance of adequate heat transfer mechanisms. Filling the cask cavity with helium at the initial pressure specified will ensure that there will be no air in-leakage, which could potentially damage the fuel and that the cask cavity internal pressure will remain within limits for the life of the cask.

Backfilling with helium must be performed successfully on each cask before placing in storage. The SR must be performed within *30* hours after draining the cask. This time is limited to ensure that the *fuel cladding and basket* do not exceed *their* temperature *limits*. This *30* hour period is sufficient time to backfill the cask cavity with helium while minimizing the time the fuel is in the cask without the assumed thermally-conductive atmosphere.

Below 22 kW, the fuel cladding and basket will not reach their temperature limits, so there is no time limit for completion of helium backfill (Reference 2). At or above 22kW, the same applies once the air is evacuated and replaced by helium at any time prior to 30 hours from draining.

REFERENCES

1. SAR Section 11.1.2, Cask Seal Leakage
2. SAR Section *4.5.1, Vacuum Drying*

B 3.1 CASK INTEGRITY

B 3.1.3 Cask Helium Leak Rate

BASES

BACKGROUND	A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operational Limits. A lid is then placed on the cask. Subsequent operations involve removing water from the cask fuel cavity and moving the cask to the decontamination area. After the cask lid is secured, vacuum drying of the cask cavity is performed, and the cavity is backfilled with helium. During normal storage conditions, the cask is backfilled with helium, which is a better conductor than air or vacuum, which results in lower temperatures for stored fuel and the basket. Backfilling the cask cavity with helium promotes heat transfer from the fuel and the inert atmosphere protects the fuel cladding. Prior to moving the cask to the storage pad, the helium leak rate is determined to ensure that the fuel is confined.
APPLICABLE SAFETY ANALYSIS	The confinement of radioactivity during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of one of the confinement barriers is considered as an off-normal condition (Reference 1). In addition, the thermal analyses of the cask STORAGE OPERATIONS assume that the cask cavity is filled with helium.
LCO	Verifying that the cask cavity is sealed by measuring the helium leak rate will ensure that the assumptions in the normal, off-normal, and accident analyses and radiological evaluations are maintained. The helium leak rate value not to exceed 1×10^{-5} ref cc/sec is used in the confinement analyses (Reference 3). This limit is based on air leakage (ref-cc/sec) which requires conversion from helium leakage as appropriate.
APPLICABILITY	During LOADING OPERATIONS, the helium leak rate is required to be met when all lid bolts have had their final tensioning (torqued). Cask seal integrity is monitored during STORAGE OPERATIONS by LCO 3.1.5, Cask Interseal Pressure.

(continued)

BASES

ACTIONS

A.1

If the helium leak rate limit is not met or is unknown due to unsatisfactory results from SR 3.1.3.1, actions must be taken to meet the LCO. The *7 day* Completion Time provides ample time to investigate the source of the leak and reestablish the cask helium leak rate within limit.

B.1

The 30-day Completion Time is based on engineering judgment and operating experience that any credible seal leak within the total 37 day period would not result in significant loss of helium inventory that would affect the heat removal capability of the cask. Even in the event of a significant leak, the cask environment would not be reduced to less than one atmosphere of helium because there is no mechanism to exchange the helium in the cask with external air. Based on operational experience with transport casks, this 30 day Completion Time is sufficient to disconnect the test equipment, vent the cask, return the cask to the spent fuel pool *so that examination, repairs, seal exchange, or cask unloading can be performed as appropriate.*

Once placed in the spent fuel pool with the lid removed, the fuel is provided with adequate decay heat removal facilities to maintain the loaded fuel within limits.

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1

A primary design consideration of the cask is that it adequately can contain radioactive material. Measuring the helium leak rate with an appropriate detector demonstrates that the confinement barrier is established and within design assumptions (Reference 2).

Measuring the helium leak rate must be performed successfully on each cask prior to placing it in storage. *Once the helium atmosphere is established by SR 3.1.2, there is enough conduction to maintain the loaded fuel within its temperature limits, and to prevent thermal expansion from damaging the basket. Therefore, no time limit is required for this surveillance, other than completion prior to Transport Operations..*

REFERENCES

1. SAR Section 11.1.2, Cask Seal Leakage
2. SAR Section 9.1.3, Leak Tests
3. SAR Section 7.3, Confinement Requirements for Hypothetical Accident Conditions

B 3.1 CASK INTEGRITY

B 3.1.4 Combined Helium Leak Rate

BASES

BACKGROUND

A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operational Limits. A lid is then placed on the cask. Subsequent operations involve removing water from the cask fuel cavity and moving the cask to the decontamination area. After the cask lid is secured, vacuum drying of the cask cavity is performed, and the cavity is backfilled with helium.

During normal storage conditions, the cask is backfilled with helium, which is a better conductor than air or vacuum, which results in lower temperatures for stored fuel and the basket. Backfilling the cask cavity with helium promotes heat transfer from the fuel and the inert atmosphere protects the fuel cladding. Prior to moving the cask to the storage pad, the helium leak rate is determined to ensure that the fuel is confined. The overpressure system *provides redundant sealing and a means of monitoring the cask confinement system.* The overpressure system may be leak tested prior to moving the cask to the storage pad or within 48 hours of moving the cask to the storage pad.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactivity during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of one of the *cask seals* is considered as an off-normal condition (Reference 1). In addition, the thermal analyses of the cask STORAGE OPERATIONS assume that the cask cavity is filled with helium.

LCO

Verifying that the *overpressure system* is sealed by measuring the helium leak rate will ensure that the assumptions in the normal, off-normal, and accident analyses and radiological evaluations are maintained. The helium leak rate value not to exceed 1×10^{-5} ref cc/sec is used in the confinement analyses (Reference 3). This limit is based on air leakage (ref-cc/sec) which requires conversion from helium leakage as appropriate.

APPLICABILITY

During STORAGE OPERATIONS, the helium leak rate is required to be met within 48 hours of moving the cask to the storage pad. Cask seal integrity is monitored during STORAGE OPERATIONS by LCO 3.1.5, Cask Interseal Pressure.

(continued)

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a note indicating that a separate Condition entry is allowed for each cask. This note is acceptable because the internal environment of one cask is independent of the internal environment of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the helium leak rate limit is not met or is unknown due to unsatisfactory results from SR 3.1.4.1, actions must be taken to meet the LCO. The 48 hour Completion Time of Required Action A.1 provides ample time to investigate the source of the leak and reestablish the cask helium leak rate within limit.

B.1

The 30-day Completion Time is based on engineering judgment and operating experience that any credible seal leak within the total 32-day period would not result in significant loss of helium inventory that would affect the heat removal capability of the cask. Even in the event of a significant leak, the cask environment would not be reduced to less than one atmosphere of helium because there is no mechanism to exchange the helium in the cask with external air. *Because the cask has previously passed SR 3.1.3, failure of SR 3.1.4 would be due to an overpressure system leak rather than a confinement boundary leak.* Based on operational experience with transport casks, this 30 day Completion Time is sufficient to disconnect the test equipment *and* return the cask *to the a fuel unloading facility where repairs can be made, the cask can be flooded, and the fuel can be removed as appropriate*.

Because the cask will retain its helium, the fuel is provided with adequate decay heat removal facilities to maintain the loaded fuel within limits.

SURVEILLANCE REQUIREMENTS

SR 3.1.4.1

A primary design consideration of the cask is that it adequately can contain radioactive material. Measuring the helium leak rate with an appropriate detector demonstrates that the confinement barrier is established and within design assumptions (Reference 2).

Measuring the helium leak rate must be performed successfully on each cask prior to placing it in storage. The surveillance must be performed within 48 hours of moving the cask to the storage pad. This 48 hour period allows sufficient time to perform the SR while minimizing the time the fuel is in the cask without verifying that the cask is sealed

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)		A note has been added to the surveillance to state that SR 3.1.4.1 may be combined with SR 3.1.3.1. This surveillance allows the leak testing of the overpressure system while on the storage pad. However, the surveillance may be performed with the leak testing of the cask seals while in the spent fuel building.
REFERENCES	1. 2. 3.	SAR Section 11.1.2, Cask Seal Leakage SAR Section 9.1.3, Leak Tests SAR Section 7.3, Confinement Requirements for Hypothetical Accident Conditions

B 3.1 CASK INTEGRITY

B 3.1.5 Cask Interseal Pressure

BASES

BACKGROUND

A cask is loaded, dried, and sealed prior to being transported to the ISFSI and placed on a storage pad. The cask is designed with redundant seals to contain the radioactive material. In addition, 10CFR72.122(h)(4) and 10CFR72.128(a)(1) state that the casks must have the capability to be continuously monitored such that the licensee will be able to determine when corrective action needs to be taken to maintain safe storage conditions. The monitoring systems provide the following features:

a. The capability to monitor interseal pressure that will indicate if cask seal integrity is compromised; and

b. Local alarms to notify the licensee that potential seal degradation has occurred.

It is necessary to verify cask seal integrity at a regular interval.

Backfilling the cask cavity with helium promotes heat transfer from the fuel and the inert atmosphere protects the fuel cladding.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactivity during the storage of spent fuel in the cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in the accident analysis and the off-normal analysis (References 1, 2, and 3). In addition, the thermal analyses of the cask STORAGE OPERATIONS assume that the cask cavity is filled with helium.

LCO

Verifying cask interseal pressure ensures that the assumptions relating to radioactive releases in the accident analyses and radiological evaluations are maintained. Seal integrity is verified by monitoring interseal pressure indication and alarms.

(continued)

APPLICABILITY

Cask interseal pressure verification is performed regularly during STORAGE OPERATIONS to confirm that the cask confinement barriers have not been compromised. During LOADING OPERATIONS the seal integrity is verified prior to moving the cask to the ISFSI storage pads. Verification during TRANSPORT OPERATIONS is not possible as the cask is being moved. However, TRANSPORT OPERATIONS are brief and follow the verification performed during LOADING OPERATIONS and, therefore, does not represent a significant lapse in seal integrity monitoring.

ACTIONS

The ACTIONS Table is modified by a note indicating that a separate Condition entry is allowed for each cask. This note is acceptable because the internal environment of one cask is independent of the internal environment of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of Required Actions.

A.1

If a condition is entered due to failure to meet SR 3.1.5.1, an appropriate evaluation shall be performed to investigate the cause of the low pressure condition. The 7 day period is sufficient time to perform an assessment of the condition and make repairs to the overpressure system, change out the pressure switch, if necessary, and reestablish a pressure above 3.0 atmospheres. Reestablishing the pressure above 3.0 atmospheres prevents leakage of radioactive material from the cask cavity. However, if the source of the low pressure is due to a leak greater than analyzed in any cask seal or the overpressure system, the leak should be repaired.

B.1

If it is determined that there is a leakage path in the cask or overpressure system, the repair should be performed in a timely manner. If the interseal pressure has been reestablished to 3.0 atmospheres or above, no leakage of radioactive material from the cask cavity can occur.

The 30 day COMPLETION TIME of REQUIRED ACTION B.1 provides ample time to *return the cask to the a fuel unloading facility where repairs can be made, the cask can be flooded, and the fuel can be removed as appropriate*.

Even if there is a leak to an inner seal, the cask retains at least one atmosphere of helium, so the fuel is provided with adequate decay heat removal to maintain the loaded fuel within temperature limits.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.1.5.1

After the initial leak testing is successfully performed, the cask overpressure tank pressure is routinely monitored every 7 days. This ensures that no leaks have occurred after initial testing is done. Verification of the pressure exceeding 3.0 atmospheres may be performed using alarms, pressure transducers, or other similar verification methods. Seven days is appropriate, based on the low probability of developing a leak during TRANSFER and STORAGE OPERATIONS.

Cask seal integrity must be verified in accordance with 10CFR72.112(h)(4) and 10CFR72.128(a)(1). The method for verifying seal integrity is to monitor the interseal pressure. Normally, the cask seal integrity is verified using installed instrumentation that alarms or indicates. If this system is not operating on one or more casks, monitoring of seal integrity at each affected cask may be performed by alternative means.

SR 3.1.5.2

Cask seal integrity must be verified in accordance with 10CFR72.122(h)(4) and 10CFR72.128(a)(1). To ensure operability of the interseal pressure monitoring system as a remote indicator during STORAGE OPERATIONS, SR 3.1.5.2 verifies the proper functioning and setpoint of the pressure switch and transducer within 7 days of commencing STORAGE OPERATIONS. This verification is a CHANNEL OPERATIONAL TEST (COT) which exercises the pressure switch by reducing the sensed pressure below the setpoint, and which verifies the accuracy of the trip setpoint within the required range. Full channel calibration over the range of the instrument is not required because the instrument provides no analog indication. Subsequent operability in-service is verified by a COT every 36 months, a reasonable period which addresses the expected drift of the instrument and the reliability of the pressure switch testing.

REFERENCES

1. SAR Section 7.3, Confinement Requirements for Hypothetical Accident Conditions
2. SAR Section 11.1.2, Cask Seal Leakage
3. SAR Section 11.2.9, Loss of Confinement Barrier

BASES

BACKGROUND	Minimum temperature limits for cask lifting/movement operations must be observed to avoid the potential for brittle fracture of the cask.
APPLICABLE SAFETY ANALYSIS	The containment vessel and the gamma shielding are fabricated from materials selected for their fracture toughness properties at low temperatures. The fracture toughness evaluation is based on a minimum temperature of -20°F. The cask will generally be at a temperature higher than the ambient temperature due to the heat load of the fuel. However, for conservatism and simplicity, it is recommended that the ambient be selected as the minimum cask movement temperature. It is highly unlikely that any cask movement activity would take place at temperatures below -20°F. Nevertheless, if movement at a temperature below that specified is necessary, calculations (similar to those presented in Chapter 4 of the SAR) or direct measurement may be used to estimate the minimum cask surface temperature for any particular ambient condition.
LCO	The LCO requires that the cask not be lifted or moved if the cask outer surface temperature is below that specified.
APPLICABILITY	This technical specification is applicable during TRANSPORT OPERATIONS.
ACTIONS	A.1 If the Surveillance Requirements are satisfied prior to the operation, the ambient temperature limits will be met. If, however, the temperature should decrease below the limit during the operation, the cask must be placed on a stable, qualified surface and the lifting/movement operation must be suspended. If the temperature limit is violated during TRANSPORT OPERATIONS, the cask must first be returned to a safe and secure location. Based on the significant margin provided in the calculation of fracture toughness, it is safe to continue TRANSPORTATION OPERATIONS for a short period if the ambient temperatures decrease a few degrees below the limit. For radiological and security reasons, it would be safer to transport the cask to a safe and secure area, as opposed to immediately suspending the operation and establishing temporary security and radiological controls at some temporary location until the time that ambient temperature increased above the specified value.

(continued)

BASES

SURVEILLANCE REQUIREMENTS	SR 3.1.6.1 Prior to TRANSPORT OPERATIONS, the cask outer surface temperature should be verified. This temperature requirement can be met by measuring the ambient temperature prior to transport. Weather forecasts should be considered for the planned period of the TRANSPORT OPERATION.

B 3.2 CASK RADIATION PROTECTION

B 3.2.1 Cask Surface Contamination

BASES

BACKGROUND	A cask is immersed in the spent fuel pool in order to load the spent fuel assemblies. As a result, the surface of the cask may become contaminated with the radioactive material in the spent fuel pool water. This contamination is removed prior to moving the cask to the ISFSI in order to minimize radioactive contamination to personnel or the environment. This allows the ISFSI to be entered without additional radiological controls to prevent the spread of contamination and reduce personnel dose due to the spread of loose contamination or airborne contamination. This is consistent with ALARA practices (Reference 1).
APPLICABLE SAFETY ANALYSIS	The radiation protection measures implemented at the ISFSI are based on the assumption that the exterior surfaces of the cask have been decontaminated. Failure to decontaminate the surfaces of the casks could lead to higher than projected occupational doses.
LCO	Removable surface contamination on the cask exterior surfaces is limited to 1000 dpm/100 cm^2 from beta and gamma sources and 20 dpm/100 cm^2 from alpha sources. These limits are taken from Ref. 1 and are based on the minimum level of activity that can be routinely detected under a surface contamination control program using direct survey methods. Experience has shown that these limits are low enough to prevent the spread of contamination to clean areas and are significantly less than the levels which would cause significant personnel skin dose.
APPLICABILITY	Verification that the cask surface contamination is less than the LCO limit is performed during LOADING OPERATIONS. This occurs prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS, and CONDITION A is not applicable until the SURVEILLANCE REQUIREMENT (SR3.2.1.1) has been performed. Measurement of the cask surface contamination is unnecessary during TRANSPORT OPERATIONS in preparation for UNLOADING OPERATIONS as surface contamination would have been measured prior to moving the cask to the ISFSI.
ACTIONS	A.1 If the removable surface contamination of a cask that has been loaded with spent fuel is not within the LCO limits, action must be initiated to decontaminate the cask and bring the removable surface contamination within limits. The Completion Time requires that the decontamination be completed prior to TRANSPORT OPERATIONS, which will prevent the release of contamination to the environment and the ISFSI.

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SURVEILLANCE REQUIREMENTS	SR 3.2.1.1 This SR verifies that the removable surface contamination on the cask is less than the limits in the LCO. The Surveillance is performed using smear surveys to detect removable surface contamination. The Frequency requires performing the verification once; following cask loading and prior to initiating TRANSPORT OPERATIONS. This Frequency is adequate to confirm that the cask can be moved to the ISFSI without spreading loose contamination, and assumes that the cask will not develop surface contamination during TRANSPORT or STORAGE OPERATIONS. Storage of the fuel in the dry, redundantly-sealed cask eliminates the possibility for leakage of contaminated liquids.	
REFERENCES	1.	USNRC IE Circular 81-07 dated May 14, 1981, "Control of Radioactively Contaminated Materials."