APPENDIX A TO CERTIFICATE OF COMPLIANCE NO. 1029

TECHNICAL SPECIFICATIONS FOR THE ADVANCED NUHOMS® SYSTEM

OPERATING CONTROLS AND LIMITS

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OPERATING CONTROLS AND LIMITS

1.0 Use and Application

1.1 Definitions

-- NOTE --
The defined terms of this section appear in capitalized type and are applicable throughout these Technical Specifications and Bases.
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Term	Definition
ACTIONS	ACTIONS shall be that part of a Specification that prescribes Required Actions to be taken under designated Conditions within specified Completion Times.
ADVANCED HORIZONTAL STORAGE MODULE (AHSM)	The AHSM is a reinforced concrete structure for storage of a loaded 24PT1-DSC at a spent fuel storage cask.
DAMAGED FUEL ASSEMBLY	A DAMAGED FUEL ASSEMBLY is a fuel assembly with known or suspected cladding defects greater than pinhole leaks or hairline cracks.
DRY SHIELDED CANISTER (24PT1-DSC)	A 24PT1-DSC is a welded pressure vessel that provides confinement of INTACT or DAMAGED FUEL ASSEMBLIES in an inert atmosphere.
INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)	The facility within a perimeter fence licensed for storage of spent fuel within AHSMs.
INTACT FUEL ASSEMBLY	Spent Nuclear Fuel Assemblies without known or suspected cladding defects greater than pinhole leaks or hairline cracks and which can be handled by normal means.
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on a 24PT1-DSC while it is being loaded with INTACT or DAMAGED FUEL ASSEMBLIES, and on a TRANSFER CASK while it is being loaded with a 24PT1-DSC containing INTACT or DAMAGED FUEL ASSEMBLIES. LOADING OPERATIONS begin when the first INTACT or DAMAGED FUEL ASSEMBLY is placed in the 24PT1-DSC and end when the TRANSFER CASK is ready for TRANSFER OPERATIONS.

STORAGE OPERATIONS	STORAGE OPERATIONS include all licensed activities that are performed at the ISFSI while a 24PT1-DSC containing INTACT or DAMAGED FUEL ASSEMBLIES is located in an AHSM on the storage pad within the ISFSI perimeter.
TRANSFER CASK (TC)	The TRANSFER CASK will consist of a licensed NUHOMS® OS197 onsite transfer cask. The TRANSFER CASK will be placed on a transfer trailer for movement of a 24PT1-DSC to the AHSM.
TRANSFER OPERATIONS	TRANSFER OPERATIONS include all licensed activities involving the movement of a TRANSFER CASK loaded with a 24PT1-DSC containing INTACT or DAMAGED FUEL ASSEMBLIES. TRANSFER OPERATIONS begin when the TRANSFER CASK is placed on the transfer trailer following LOADING OPERATIONS and end when the 24PT1-DSC is located in an AHSM on the storage pad within the ISFSI perimeter.
UNLOADING OPERATIONS	UNLOADING OPERATIONS include all licensed activities on a 24PT1-DSC to unload INTACT or DAMAGED FUEL ASSEMBLIES. UNLOADING OPERATIONS begin when the 24PT1-DSC is removed from the AHSM and end when the last INTACT or DAMAGED FUEL ASSEMBLY has been removed from the 24PT1-DSC.

1.2 Logical Connectors

PURPOSE

The purpose of this section is to explain the meaning of logical connectors.

Logical connectors are used in Technical Specifications (TS) to discriminate between, and yet connect, discrete Conditions, Required Actions, Completion Times, Surveillances, and Frequencies. The only logical connectors that appear in TS are AND and OR. The physical arrangement of these connectors constitutes logical conventions with specific meanings.

BACKGROUND

Several levels of logic may be used to state Required Actions. These levels are identified by the placement (or nesting) of the logical connectors and by the number assigned to each Required Action. The first level of logic is identified by the first digit of the number assigned to a Required Action and the placement of the logical connector in the first level of nesting (i.e., left justified with the number of the Required Action). The successive levels of logic are identified by additional digits of the Required Action number and by successive indentions of the logical connectors.

When logical connectors are used to state a Condition, Completion Time, Surveillance, or Frequency, only the first level of logic is used, and the logical connector is left justified with the statement of the Condition, Completion Time, Surveillance, or Frequency.

EXAMPLES

The following examples illustrate the use of logical connectors:

EXAMPLE 1.2-1:

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Verify . . . AND A.2 Restore . . .	

In this example the logical connector AND is used to indicate that when in Condition A, both Required Actions A.1 and A.2 must be completed.

EXAMPLES (continued)

EXAMPLE 1.2-2:

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Stop . . . OR A.2.1 Verify . . . AND A.2.2.1 Reduce . . . OR A.2.2.2 Perform . . . OR A.3 Remove . . .	

This example represents a more complicated use of logical connectors. Required Actions A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Actions may be chosen. If A.2 is chosen, then both A.2.1 and A.2.2 must be performed as indicated by the logical connector AND. Required Action A.2.2 is met by performing A.2.2.1 or A.2.2.2. The indented position of the logical connector OR indicates that A.2.2.1 and A.2.2.2 are alternative choices, only one of which must be performed.

1.3 Completion Times

PURPOSE	The purpose of this section is to establish the Completion Time convention and to provide guidance for its use.
BACKGROUND	Limiting Conditions for Operation (LCOs) specify the lowest functional capability or performance levels of equipment required for safe operation of the facility. The ACTIONS associated with an LCO state Conditions that typically describe the ways in which the requirements of the LCO are not met. Specified with each stated Condition are Required Action(s) and Completion Times(s).
DESCRIPTION	The Completion Time is the amount of time allowed for completing a Required Action. It is referenced to the time of discovery of a situation (e.g., equipment or variable not within limits) that requires entering an ACTIONS Condition unless otherwise specified, providing the facility is in a specified condition stated in the Applicability of the LCO. Required Actions must be completed prior to the expiration of the specified Completion Time. An ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the facility is not within the LCO Applicability. Once a Condition has been entered, subsequent subsystems, components, or variables expressed in the Condition, discovered to be not within limits, will not result in separate entry into the Condition unless specifically stated. The Required Actions of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

EXAMPLES

The following examples illustrate the use of Completion Times with different types of Conditions and changing Conditions:

EXAMPLE 1.3-1:

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2	12 hours 36 hours

Condition B has two Required Actions. Each Required Action has its own separate Completion Time. Each Completion Time is referenced to the time that Condition B is entered.

The Required Actions of Condition B are to complete action B.1 within 12 hours AND complete action B.2 within 36 hours. A total of 12 hours is allowed for completing action B.1 and a total of 36 hours (not 48 hours) is allowed for completing action B.2 from the time that Condition B was entered. If action B.1 is completed within 6 hours, the time allowed for completing action B.2 is the next 30 hours because the total time allowed for completing action B.2 is 36 hours.

EXAMPLES (continued)

EXAMPLE 1.3-2:

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One system not within limit	A.1 Restore system to within limit.	7 days
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2.	12 hours 36 hours

When a system is determined to not meet the LCO, Condition A is entered. If the system is not restored within 7 days, Condition B is also entered and the Completion Time clocks for Required Actions B.1 and B.2 start. If the system is restored after Condition B is entered, Condition A and B are exited, and therefore, the Required Actions of Condition B may be terminated.

EXAMPLES (continued)

EXAMPLE 1.3-3:

ACTIONS

-------------------------NOTE---

Separate Condition entry is allowed for each component.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Restore compliance with LCO.	4 hours
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2.	6 hours 12 hours

The Note above the ACTIONS Table is a method of modifying how the Completion Time is tracked. If this method of modifying how the Completion Time is tracked was applicable only to a specific Condition, the Note would appear in that Condition rather than at the top of the ACTIONS Table.

The Note allows Condition A to be entered separately for each component, and Completion Times tracked on a per component basis. When a component is determined to not meet the LCO, Condition A is entered and its Completion Time starts. If subsequent components are determined to not meet the LCO, Condition A is entered for each component and separate Completion Times start and are tracked for each component.

IMMEDIATE COMPLETION TIME

When "Immediately" is used as a Completion Time, the Required Action should be pursued without delay and in a controlled manner.

1.4 Frequency

PURPOSE	The purpose of this section is to define the proper use and application of Frequency requirements.
DESCRIPTION	Each Surveillance Requirement (SR) has a specified Frequency in which the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO). An understanding of the correct application of the specified Frequency is necessary for compliance with the SR. The "Specified Frequency" is referred to throughout this section and each of the Specifications of Section 3, Surveillance Requirement (SR) Applicability. The "Specified Frequency" consists of the requirements of the Frequency column of each SR, as well as certain Notes in the Surveillance column that modify performance requirements. Situations where a Surveillance could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated LCO is within its Applicability, represent potential SR 3.0.4 conflicts. To avoid these conflicts, the SR (i.e., the Surveillance or the Frequency) is stated such that it is only "required" when it can be and should be performed. With a SR satisfied, SR 3.0.4 imposes no restriction.

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified:

EXAMPLE 1.4-1:

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Verify Pressure within limit.	12 hours

Example 1.4-1 contains the type of SR most often encountered in the Technical Specifications (TS). The Frequency specifies an interval (12 hours) during which the associated Surveillance must be performed at least one time. Performance of the Surveillance initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the stated Frequency is allowed by SR 3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the SR is not required to be met per SR 3.0.1 (such as when the equipment is determined to not meet the LCO, a variable is outside specified limits, or the unit is outside the Applicability of the LCO). If the interval specified by SR 3.0.2 is exceeded while the facility is in a condition specified in the Applicability of the LCO, the LCO is not met in accordance with SR 3.0.1.

If the interval as specified by SR 3.0.2 is exceeded while the facility is not in a condition specified in the Applicability of the LCO for which performance of the SR is required, the Surveillance must be performed within the Frequency requirements of SR 3.0.2 prior to entry into the specified condition. Failure to do so would result in a violation of SR 3.0.4.

EXAMPLES (continued)

EXAMPLE 1.4-2:

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Verify flow is within limits.	Once within 12 hours prior to starting activity AND 24 hours thereafter

Example 1.4-2 has two Frequencies. The first is a one-time performance Frequency, and the second is of the type shown in Example 1.4-1. The logical connector "AND" indicates that both Frequency requirements must be met. Each time the example activity is to be performed, the Surveillance must be performed prior to starting the activity.

The use of "once" indicates a single performance will satisfy the specified Frequency (assuming no other Frequencies are connected by "AND"). This type of Frequency does not qualify for the 25% extension allowed by SR 3.0.2.

"Thereafter" indicates future performances must be established per SR 3.0.2, but only after a specified condition is first met (i.e., the "once" performance in this example). If the specified activity is canceled or not performed, the measurement of both intervals stops. New intervals start upon preparing to restart the specified activity.

EXAMPLES
(continued)

EXAMPLE 1.4-3:

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
------NOTE------- Not required to be met until 96 hours after verifying the helium leak rate is within limit. Verify 24PT1-DSC vacuum drying pressure is within limit.	Once after verifying the helium leak rate is within limit.

As the Note modifies the required performance of the Surveillance, it is construed to be part of the "specified Frequency." Should the vacuum drying pressure not be met immediately following verification of the helium leak rate while in LOADING OPERATIONS, this Note allows 96 hours to perform the Surveillance. The Surveillance is still considered to be performed within the "specified Frequency."

Once the helium leak rate has been verified to be acceptable, 96 hours, plus the extension allowed by SR 3.0.2, would be allowed for completing the Surveillance for the vacuum drying pressure. If the Surveillance was not performed within this 96 hour interval, there would then be a failure to perform the Surveillance within the specified Frequency, and the provisions of SR 3.0.3 would apply.

2.0 Functional and Operating Limits

2.1 Fuel To Be Stored In The 24PT1-DSC

The spent nuclear fuel to be stored in each 24PT1-DSC/AHSM at the ISFSI shall meet the following requirements:

a. Fuel shall be INTACT FUEL ASSEMBLIES or DAMAGED FUEL ASSEMBLIES. DAMAGED FUEL ASSEMBLIES shall be placed in screened confinement cans (failed fuel cans) inside the 24PT1-DSC guidesleeves. Damaged fuel assemblies shall be stored in outermost guidesleeves located at the 45, 135, 225 and 315 degree azimuth locations.

b. Fuel types shall be limited to the following:

   UO_2 Westinghouse 14x14 (WE 14x14) Assemblies (with or without IFBA fuel rods), as specified in Table 2-1.

   WE 14x14 Mixed Oxide (MOX) Assemblies, as specified in Table 2-1

   Fuel burnup and cooling time is to be consistent with the limitations specified in Table 2-4 for UO2 fuel.

   Control Components stored integral to WE 14x14 Assemblies in a 24PT1-DSC, shall be limited to Rod Cluster Control Assemblies (RCCAs), Thimble Plug Assemblies (TPAs), and Neutron Source Assemblies (NSAs). Location of control components within a 24PT1-DSC shall be selected based on criteria which does not change the radial center of gravity by more than 0.1 inches.

c. The maximum heat load for a single fuel assembly, including control components, is 0.583 kW for SC fuel assemblies and 0.294 kW for MOX fuel assemblies. The maximum heat load per 24PT1-DSC, including any integral Control Components, shall not exceed 14 kW when loaded with all SC fuel assemblies and 13.706 kW when loaded with any MOX fuel assemblies.

d. Fuel can be stored in the 24PT1-DSC in any of the following configurations:

   1) A maximum of 24 INTACT WE 14x14 MOX or SC fuel assemblies; or

   2) Up to four WE 14x14 SC DAMAGED FUEL ASSEMBLIES, with the balance INTACT WE 14x14 SC FUEL ASSEMBLIES; or

   3) One MOX DAMAGED FUEL ASSEMBLY with the balance INTACT WE 14x14 SC FUEL ASSEMBLIES.

   A 24PT1-DSC containing less than 24 fuel assemblies may contain dummy fuel assemblies in fuel assembly slots. The dummy fuel assemblies are unirradiated, stainless steel encased structures that approximate the weight and center of gravity of a fuel assembly. The effect of dummy assemblies or empty fuel assembly slots on the radial center of gravity of the DSC must meet the requirements of Section 2.1.b.

No more than two empty fuel assembly slots are allowed in each DSC. They must be located at symmetrical locations about the 0-180° and 90-270° axes.

No more than 14 fuel pins in each assembly may exhibit damage. A visual inspection of assemblies will be performed prior to placement of the fuel in the 24PT1-DSC, which may then be placed in storage or transported anytime thereafter without further fuel inspection.

e. Fuel dimensions and weights are provided in Table 2-2.

f. The maximum neutron and gamma source terms are provided in Table 2-3.

2.2 Functional and Operating Limits Violations

If any Functional and Operating Limit of 2.1 is violated, the following actions shall be completed:

a. The affected fuel assemblies shall be placed in a safe condition.

b. Within 24 hours, notify the NRC Operations Center.

c. Within 30 days, submit a special report which describes the cause of the violation and the actions taken to restore compliance and prevent recurrence.

Table 2-1 Fuel Specifications

Fuel Type	Maximum Initial Enrichment	Cladding Material	Minimum Cooling Time	Minimum Initial Enrichment	Maximum Burnup
UO_2 WE 14x14 (with or without IFBA fuel rods)	4.05 weight % U-235	Type 304 Stainless Steel	10 years	See Table 2-4 for Enrichment, Burnup, and Cooling Time Limits.	
WE 14x14 MOX	2.84 weight % Fissile Pu - 64 rods 3.10 weight % Fissile Pu - 92 rods 3.31 weight % Fissile Pu - 24 rods	Zircalloy-4	20 years	2.78 weight % Fissile Pu –64 rods 3.05 weight % Fissile Pu –92 rods 3.25 weight % Fissile Pu – 24 rods	25,000 MWd/MTU
Integral Control Components	N/A	N/A	10 years	N/A	N/A

Table 2-2 Fuel Dimension and Weights

Parameter	WE 14x14 SC[1]	WE 14x14 MOX[1]
Number of Rods	180	180
Number of Guide Tubes/Instrument Tubes	16	16
Cross Section (in)	7.763	7.763
Unirradiated Length (in)	138.5	138.5
Fuel Rod Pitch (in)	0.556	0.556
Fuel Rod O.D. (in)	0.422	0.422
Clad Material	Type 304 SS	Zircaloy-4
Clad Thickness (in)	0.0165	0.0243
Pellet O.D. (in)	0.3835	0.3659
Max. initial ^{235}U Enrichment (weight %)	4.05	Note 2
Theoretical Density (%)	93-95	91
Active Fuel Length (in)	120	119.4
Max. U Content (kg)	375	Note 3
Assembly Weight (lbs)	1210	1150
Max. Assembly Weight incl. NFAH[4] (lbs)	1320	1320

(1) Nominal values shown unless stated otherwise
(2) Mixed-Oxide assemblies with 0.71 weight % U-235 and maximum fissile Pu weight of 2.84 weight % (64 rods), 3.10 weight % (92 rods), and 3.31 weight % (24 rods)
(3) Total weight of Pu is 11.24 kg and the total weight of U is 311.225 kg
(4) Weights of TPAs and NSAs are enveloped by RCCAs

Table 2-3 Maximum Neutron and Gamma Source Terms

Parameter	WE 14x14 SC	WE 14x14 MOX
Gamma Source (γ/sec/assy)	3.43E+15	9.57E+14
Neutron Source (n/sec/assy)	2.84E+08	4.90E+07

Parameter	RCCAs	TPAs	NSAs
Gamma Source (γ/sec/assy)	7.60E+12	5.04E+12	1.20E+13
Decay heat (Watts)	1.90	1.2	1.66

Table 2-4 Fuel Qualification Table

(Minimum required years of cooling time after reactor core discharge)

Burnup GWd/MTU	Initial Enrichment (weight % U-235)			
	3.12	**3.36**	**3.76**	**3.96**
45.0	Not Analyzed		15.2	15.2*
43.3			15.2	11.5
40.0		10.9	10.9**	10.9**
36.8		10.9	10.0***	10.0***
35.0 or less	10.0***	10.0***	10.0***	10.0***

Notes

* Cooling time based on 3.76 weight % enrichment is conservatively used.

** Cooling time based on 3.36 weight % enrichment is conservatively used.

*** Cooling time based on shielding analysis source term.

General Notes:

- Use burnup and enrichment to look up minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Example: An assembly with an initial enrichment of 3.90 weight % U-235 and a burnup of 37 GWd/MTU is acceptable for storage after a 10.9 year cooling time as defined at the intersection of 3.76 weight % U-235 (rounding down) and 40 GWd/MTU (rounding up) on the qualification table.

3.0 Limiting Condition for Operation (LCO) and Surveillance Requirement (SR) Applicability

LCO 3.0.1	LCOs shall be met during specified conditions in the Applicability, except as provided in LCO 3.0.2.
LCO 3.0.2	Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5. If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required, unless otherwise stated.
LCO 3.0.3	Not applicable to a spent fuel storage cask.
LCO 3.0.4	When an LCO is not met, entry into a specified condition in the Applicability shall not be made except when the associated ACTIONS to be entered permit continued operation in the specified condition in the Applicability for an unlimited period of time. This Specification shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS, or that are related to the unloading of a 24PT1-DSC. Exceptions to this Specification are stated in the individual Specifications. These exceptions allow entry into specified conditions in the Applicability when the associated ACTIONS to be entered allow operation in the specified condition in the Applicability only for a limited period of time.
LCO 3.0.5	Equipment removed from service or not in service in compliance with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate it meets the LCO or that other equipment meets the LCO. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate that the LCO is met.
LCO 3.0.6	Not applicable to a spent fuel storage cask.
LCO 3.0.7	Not applicable to a spent fuel storage cask.

SR 3.0.1	SRs shall be met during the specified conditions in the Applicability for individual LCOs, unless otherwise stated in the SR. Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO. Failure to perform a Surveillance within the specified Frequency shall be failure to meet the LCO except as provided in SR 3.0.3. Surveillances do not have to be performed on equipment or variables outside specified limits.
SR 3.0.2	The specified Frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met. For Frequencies specified as "once," the above interval extension does not apply. If a Completion Time requires periodic performance on a "once per . . ." basis, the above Frequency extension applies to each performance after the initial performance. Exceptions to this Specification are stated in the individual Specifications.
SR 3.0.3	If it is discovered that a Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is less. This delay period is permitted to allow performance of the Surveillance. If the Surveillance is not performed within the delay period, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered. When the Surveillance is performed within the delay period and the Surveillance is not met, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered.
SR 3.0.4	Entry into a specified condition in the Applicability of an LCO shall not be made unless the LCO's Surveillances have been met within their specified Frequency. This provision shall not prevent entry into specified conditions in the Applicability that are required to comply with ACTIONS or that are related to the unloading of a 24PT1-DSC.

3.1 24PT1-DSC and Fuel Cladding Integrity

3.1.1 24PT1-DSC Vacuum Drying Time (Duration) and Pressure

LCO 3.1.1 Duration: Vacuum Drying of the 24PT1-DSC shall be achieved within the following time durations after the start of bulk water removal (blowdown):

Heat Load (kW)	Time Limit
kW ≤ 12	No limit
12< kW ≤ 13	71 Hours
13< kW ≤ 14	54 Hours

Pressure: The 24PT1-DSC vacuum drying pressure shall be sustained at or below 3 Torr (3 mm Hg) absolute for a period of at least 30 minutes following stepped evacuation.

APPLICABILITY: During LOADING OPERATIONS.

ACTIONS

--------------------------------- NOTE ----------------------------------

This specification is applicable to all 24PT1-DSCs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. 24PT1-DSC vacuum drying pressure limit not met within 47 hours for a DSC with heat load greater than 12 kW and ≤ 13 kW or within 30 hours for a DSC with heat load greater than 13 kW and ≤ 14 kW.	A.1 Establish helium pressure of at least 1 atm and no greater than 20 psig in the 24PT1-DSC.	24 hours
	OR	
	A.2 Flood the DSC with water submerging all fuel assemblies.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	Verify that the 24PT1-DSC vacuum pressure is less than, or equal to, 3 Torr (3 mm Hg) absolute for at least 30 minutes, within the specified total time duration based on heat load.	Once per 24PT1-DSC, after an acceptable NDE of the inner top cover plate weld.

3.1.2 24PT1-DSC Helium Backfill Pressure

LCO 3.1.2 24PT1-DSC helium backfill pressure shall be 1.5 ± 1.5 psig (stable for 30 minutes after filling).

APPLICABILITY: During LOADING OPERATIONS.

ACTIONS

------------------------------------ NOTE ----------------------------------

This specification is applicable to all 24PT1-DSCs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
Note: Not applicable until SR 3.1.2.1 is performed. A. The required backfill pressure cannot be obtained or stabilized.	A.1 Establish the 24PT1-DSC helium backfill pressure to within the limit. OR A.2 Flood the DSC with water submerging all fuel assemblies.	24 hours 24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.2.1	Verify that the 24PT1-DSC helium backfill pressure is 1.5 ± 1.5 psig.	Once per 24PT1-DSC, after the completion of TS 3.1.1 actions.

3.1.3 24PT1-DSC Helium Leak Rate of Inner Top Cover Plate Weld and Vent/Siphon Port Cover Welds

LCO 3.1.3 The 24PT1-DSC helium leak rate of the inner top cover plate and vent/siphon port cover welds shall be less than or equal to 10^{-7} std-cc/sec.

This leak test shall be performed using helium gas ≥99% purity.

APPLICABILITY: During LOADING OPERATIONS.

ACTIONS

------------------------------------ NOTE ------------------------------------
This specification is applicable to the inner top cover plate weld and vent/siphon port cover welds of all 24PT1-DSCs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
Note: Not applicable until SR 3.1.3.1 is performed. A. Helium leak rate not met.	A.1 Establish the 24PT1-DSC leak rate to within the limit.	7 days
B. Required Action A.1 and associated Completion Time not met.	B.1 Determine and complete corrective actions necessary to return the 24PT1-DSC to an analyzed condition. OR B.2 Unload the 24PT1-DSC.	30 days 30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.3.1 Verify that the helium leak rate is within limit.	Once per 24PT1-DSC, after the welding of the root pass(es) for the outer top cover plate.

4.0 Design Features

The specifications in this section include the design characteristics of special importance to each of the physical barriers and to maintenance of safety margins in the Advanced NUHOMS® System design. The principal objective of this section is to describe the design envelope that may constrain any physical changes to essential equipment. Included in this section are the site environmental parameters that provide the bases for design, but are not inherently suited for description as LCOs.

4.1 Site

4.1.1 Site Location

Because this SAR is prepared for a general license, a discussion of a site-specific ISFSI location is not applicable.

4.2 Storage System Features

4.2.1 Storage Capacity

The total storage capacity of the ISFSI is governed by the plant-specific license conditions.

4.2.2 Storage Pad

For sites for which soil-structure interaction is considered important, the licensee is to perform site-specific analysis considering the effects of soil-structure interaction. Amplified seismic spectra at the location of the AHSM center of gravity (CG) is to be developed based on the SSI responses. The AHSM center of gravity is shown in Table 3.2-1. The site-specific spectra at the AHSM CG must be bounded by the spectra presented in Chapter 2.

The storage pad location shall have no potential for liquefaction at the site-specific SSE level earthquake.

Additional requirements for the pad configuration are provided in Section 4.4.2.

4.2.3 Canister Neutron Absorber

Neutron absorber with a minimum ^{10}B loading of 0.025 grams/square centimeter is provided for criticality control.

4.2.4 Canister Flux Trap Configuration

The canister flux trap configuration is defined by the spacer disc ligament width dimensions. Figure 4-1 shows the location and dimensions of the ligaments (the dimensions shown in the one quadrant are applicable to all four quadrants).

4.2.5 Fuel Spacers

Bottom fuel spacers are required to be located at the bottom of the DSC below each fuel assembly stored in the 24PT1-DSC. Top fuel spacers are required to be located above each intact fuel assembly stored in the 24PT1-DSC (the failed fuel can design includes an integral top fuel spacer and therefore does not require a top fuel spacer).

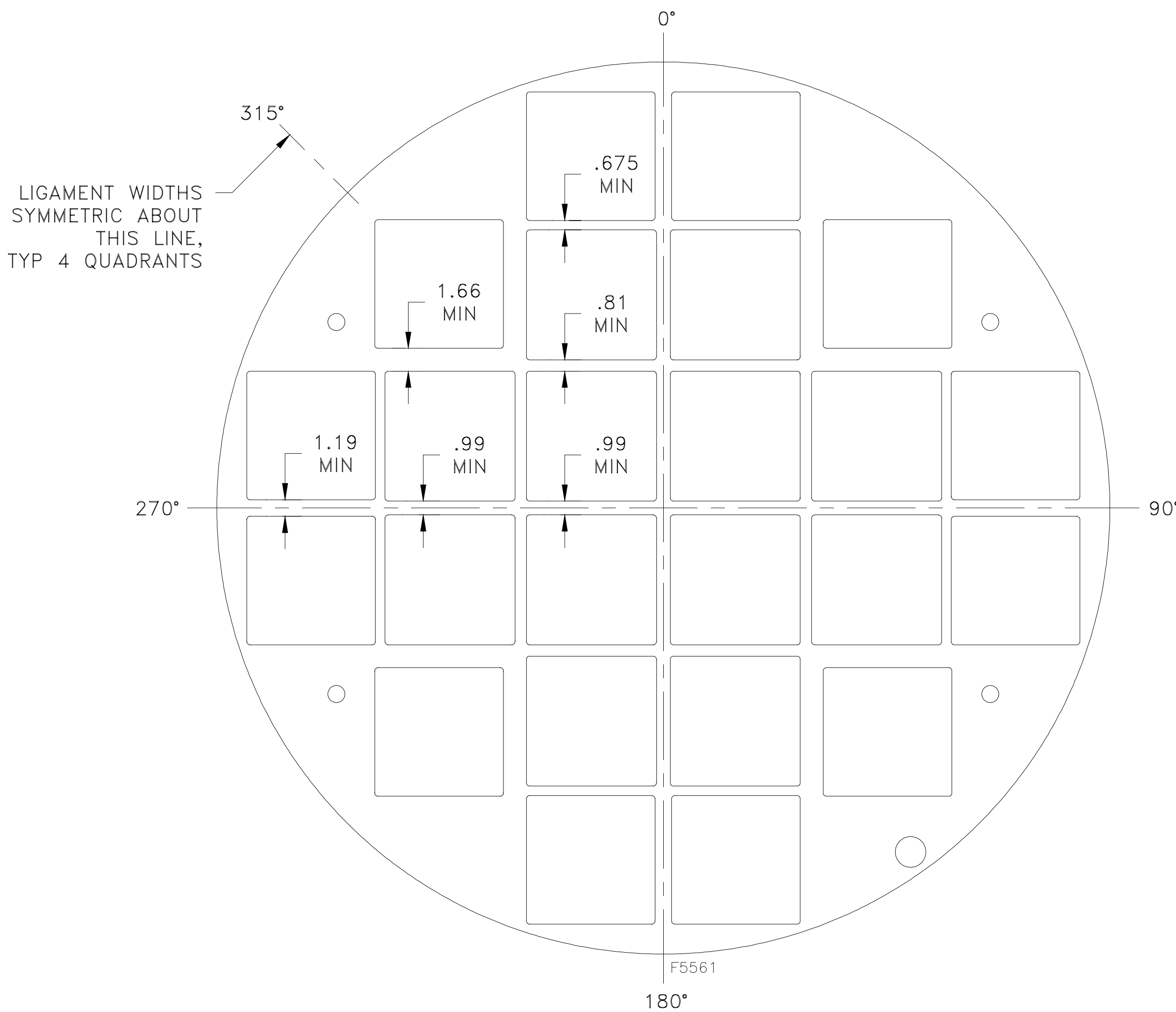

Figure 4-1
Minimum Spacer Disc Ligament Widths
(All dimensions are in inches)

4.3 Codes and Standards

4.3.1 Advanced Horizontal Storage Module (AHSM)

The reinforced concrete AHSM is designed to meet the requirements of ACI 349-97. Load combinations specified in ANSI 57.9-1984, Section 6.17.3.1 are used for combining normal operating, off-normal, and accident loads for the AHSM.

4.3.2 Dry Shielded Canister (24PT1-DSC)

The 24PT1-DSC is designed fabricated and inspected to the maximum practical extent in accordance with ASME Boiler and Pressure Vessel Code Section III, Division 1, 1992 Edition with Addenda through 1994, including exceptions allowed by Code Case N-595-1, Subsections NB, NF, and NG for Class 1 components and supports. Code exceptions are discussed in 4.3.4.

4.3.3 Transfer Cask

The Transfer Cask shall meet the codes and standards that are applicable to its design under Certificate of Compliance C of C 72-1004, OS-197 Transfer Cask.

A solar shield is required for cask transfer operations at temperatures exceeding 100ºF.

4.3.4 Exceptions to Codes and Standards

ASME Code exceptions for the 24PT1-DSC are listed below:

DSC Shell Assembly ASME Code Exceptions, Subsection NB

Reference ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NCA	All	Not compliant with NCA
NB-1100	Requirements for Code Stamping of Components	The 24PT1-DSC shell is designed & fabricated in accordance with the ASME Code, Section III, Subsection NB to the maximum extent practical. However, Code Stamping is not required. As Code Stamping is not required, the fabricator is not required to hold an ASME "N" or "NPT" stamp, or to be ASME Certified.
NB-2130 NB-4121	Material must be supplied by ASME approved material suppliers Material Certification by Certificate Holder	All materials designated as ASME on the SAR drawings are obtained from ASME approved MM or MS supplier(s) with ASME CMTR's. Material is certified to meet all ASME Code criteria but is not eligible for certification or Code Stamping if a non-ASME fabricator is used. As the fabricator is not required to be ASME certified, material certification to NB-2130 is not possible. Material traceability & certification are maintained in accordance with TNW's NRC approved QA program

Reference ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NB-6111	All completed pressure retaining systems shall be pressure tested	The shield plug support ring and vent and siphon block are not pressure tested due to the manufacturing sequence. The support ring is not a pressure-retaining item and the siphon block weld is helium leak tested after fuel is loaded and the inner top closure plate installed.
NB-7000	Overpressure Protection	No overpressure protection is provided for the 24PT1-DSC. The function of the 24PT1-DSC is to contain radioactive materials under normal, off-normal and hypothetical accident conditions postulated to occur during transportation and storage. The 24PT1-DSC is designed to withstand the maximum internal pressure considering 100% fuel rod failure at maximum accident temperature. The 24PT1-DSC is pressure tested to 120% of normal operating design pressure. An overpressure protection report is not prepared for the DSC.
NB-8000	Requirements for nameplates, stamping & reports per NCA-8000	The 24PT1-DSC nameplate provides the information required by 10CFR71, 49CFR173 and 10CFR72 as appropriate. Code stamping is not required for the 24PT1-DSC. In lieu of code stamping, QA Data packages are prepared in accordance with the requirements of 10CFR71, 10CFR72 and TNW's approved QA program.

Basket ASME Code Exceptions, Subsection NG/NF

Reference ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NCA	All	Not compliant with NCA
NG/NF-1100	Requirements for Code Stamping of Components	The 24PT1-DSC baskets are designed & fabricated in accordance with the ASME Code, Section III, Subsection NG/NF to the maximum extent practical as described in the SAR, but Code Stamping is not required. As Code Stamping is not required, the fabricator is not required to hold an ASME N or NPT stamp or be ASME Certified.
NG/NF-2130 NG/NF-4121	Material must be supplied by ASME approved material suppliers Material Certification by Certificate Holder	All materials designated as ASME on the SAR drawings are obtained from ASME approved MM or MS supplier with ASME CMTR's. Material is certified to meet all ASME Code criteria but is not eligible for certification or Code Stamping if a non-ASME fabricator is used. As the fabricator is not required to be ASME certified, material certification to NG/NF-2130 is not possible. Material traceability & certification are maintained in accordance with TNW's NRC approved QA program.
Table NG-3352-1	Permissible Joint Efficiency Factors	Joint efficiency (quality) factor of 1 is assumed for the guidesleeve longitudinal weld. Table NG-3352-1 permits a quality factor of 0.5 for full penetration weld with visual inspection. Inspection of both faces provides n= (2*0.5)=1. This is justified by this gauge of material (0.12 inch) with visual examination of both surfaces which ensures that any significant deficiencies would be observed and corrected.

Reference ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NG/NF-8000	Requirements for nameplates, stamping & reports per NCA-8000	The 24PT1-DSC nameplate provides the information required by 10CFR71, 49CFR173 and 10CFR72 as appropriate. Code stamping is not required for the 24PT1-DSC. In lieu of code stamping, QA Data packages are prepared in accordance with the requirements of 10CFR71, 10CFR72 and TNW's approved QA program.

Proposed alternatives to the ASME code, other than the aforementioned ASME Code exceptions may be used when authorized by the Director of the Office of Nuclear Material Safety and Safeguards, or designee. The applicant should demonstrate that:

1. The proposed alternatives would provide an acceptable level of quality and safety, or

2. Compliance with the specified requirements of ASME Code, Section III, 1992 Edition with Addenda through 1994 would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Requests for exceptions in accordance with this section should be submitted in accordance with 10CFR 72.4.

4.4 Storage Location Design Features

The following storage location design features and parameters shall be verified by the system user to assure technical agreement with this SAR.

4.4.1 Storage Configuration

AHSMs are to be tied together in single rows or back to back arrays with not less than 3 modules tied together (side by side). Any 2 of the 3 modules may be empty (not contain a loaded DCS) Each group of modules not tied together must be separated from other groups by a minimum of 20 feet to accommodate possible sliding during a seismic event. The distance between any module and the edge of the ISFSI pad shall be no less than 10 feet.

4.4.2 Concrete Storage Pad Properties to Limit 24PT1-DSC Gravitational Loadings Due to Postulated Drops

The TC/24PT1-DSC has been evaluated for drops of up to 80 inches onto a reinforced concrete storage pad. The evaluations are based on the concrete parameters specified in EPRI Report NP-4830, "The Effects of Target Hardness on the Structural Design of Concrete Storage Pads for Spent Fuel Casks," October 1986.

4.4.3 Site Specific Parameters and Analyses

The following parameters and analyses shall be verified by the system user for applicability at their specific site. Other natural phenomena events, such as lightning, tsunamis, hurricanes, and seiches, are site specific and their effects are generally bounded by other events, but they should be evaluated by the user.

1. Tornado maximum wind speeds: 290 mph rotational
   70 mph translational

2. Flood levels up to 50 ft. and water velocity of 15 fps.

3. One-hundred year roof snow load of 110 psf.

4. Normal ambient temperatures of 0°F to 104°F.

5. Off-normal ambient temperature range of –40°F without solar insolation to 117°F with full solar insolation.

6. The potential for fires and explosions shall be addressed, based on site-specific considerations.

7. Supplemental Shielding: In cases where engineered features (i.e., berms, shield walls) are used to ensure that the requirements of 10CFR 72.104(a) are met, such features are to be considered important to safety and must be evaluated to determine the applicable Quality Assurance Category.

8. Seismic restraints shall be provided to prevent overturning of a loaded TC during a seismic event if a certificate holder determines that the horizontal acceleration is 0.40 g or greater. The determination of horizontal acceleration acting at the center of gravity (CG) of the loaded TC must be based on a peak horizontal ground acceleration at the site.

5.0 Administrative Controls

5.1 Procedures

Each user of the Advanced NUHOMS® System will prepare, review, and approve written procedures for all normal operations, maintenance, and testing at the ISFSI prior to its operation. Written procedures shall be established, implemented, and maintained covering the following activities that are important to safety:

- Organization and management
- Routine ISFSI operations
- Alarms and annunciators
- Emergency operations
- Design control and facility change/modification
- Control of surveillances and tests
- Control of special processes
- Maintenance
- Health physics, including ALARA practices
- Special nuclear material accountability
- Quality assurance, inspection, and audits
- Physical security and safeguards
- Records management
- Reporting
- All programs specified in Section 5.2

5.2 Programs

Each user of the Advanced NUHOMS® System will implement the following programs to ensure the safe operation and maintenance of the ISFSI:

- Safety Review Program
- Training Program
- Radiological Environmental Monitoring Program
- Radiation Protection Program
- AHSM Thermal Monitoring Program

5.2.1 Safety Review Program

Users shall conduct safety reviews in accordance with 10CFR 72.48 to determine whether proposed changes, tests, and experiments require NRC approval before implementation. Changes to the Technical Specification Bases and other licensing basis documents will be conducted in accordance with approved administrative procedures. Changes may be made to

Technical Specification Bases and other licensing basis documents without prior NRC approval, provided the changes meet the criteria of 10CFR 72.48.

The safety review process will contain provisions to ensure that the Technical Specification Bases and other licensing basis documents are maintained consistent with the SAR.

Proposed changes that do not meet the criteria above will be reviewed and approved by the NRC before implementation. Changes to the Technical Specification Bases implemented without prior NRC approval will be provided to the NRC in accordance with 10CFR 72.48.

5.2.2 Training Program

Training modules shall be developed as required by 10CFR 72. Training modules shall require a comprehensive program for the operation and maintenance of the Advanced NUHOMS® System and the independent spent fuel storage installation (ISFSI). The training modules shall include the following elements, at a minimum:

- Advanced NUHOMS® System design (overview)
- ISFSI Facility design (overview)
- Systems, Structures, and Components Important to Safety (overview)
- Advanced NUHOMS® System Safety Analysis Report (overview)
- NRC Safety Evaluation Report (overview)
- Certificate of Compliance conditions
- Advanced NUHOMS® System Technical Specifications
- Applicable Regulatory Requirements (e.g.,10CFR 72, Subpart K, 10CFR 20, 10 CFR Part 73)
- Required Instrumentation and Use
- Operating Experience Reviews
- Advanced NUHOMS® System and Maintenance procedures, including:
  - Fuel qualification and loading,
  - Rigging and handling,
  - Loading Operations as described in Chapter 8 and Section 9.2 of the SAR,
  - Unloading Operations including reflooding,
  - Auxiliary equipment operations and maintenance (i.e., welding operations, vacuum drying, helium backfilling and leak testing, reflooding),
  - Transfer operations including loading and unloading of the Transfer Vehicle,
  - ISFSI Surveillance operations,
  - Radiation Protection,
  - Maintenance,
  - Security,
  - Off-normal and accident conditions, responses and corrective actions.

5.2.3 Radiological Environmental Monitoring Program

a) A radiological environmental monitoring program will be implemented to ensure that the annual dose equivalent to an individual located outside the ISFSI controlled area does not exceed the annual dose limits specified in 10CFR 72.104(a).

b) Operation of the ISFSI will not create any radioactive materials or result in any credible liquid or gaseous effluent release.

c) In accordance with 10CFR 72.44(d)(3), a periodic report will be submitted by the licensee that specifies the quantity of each of the principal radionuclides released to the environment in liquid and gaseous effluents during the previous calendar year of operation.

5.2.4 Radiation Protection Program

The Radiation Protection Program will establish administrative controls to limit personnel exposure to As Low As Reasonably Achievable (ALARA) levels in accordance with 10CFR Part 20 and Part 72.

a. As part of its evaluation pursuant to 10CFR 72.212, the licensee shall perform an analysis to confirm that the limits of 10CFR 20 and 10CFR 72.104 will be satisfied under the actual site conditions and configurations considering the planned number of 24PT1-DSCs to be used and the planned fuel loading conditions.

b. A monitoring program to ensure the annual dose equivalent to any real individual located outside the ISFSI controlled area does not exceed regulatory limits is incorporated as part of the environmental monitoring program in the Radiological Environmental Monitoring Program of Section 5.2.3.

c. Following placement of each loaded Transfer Cask into the cask decontamination area and prior to transfer to the ISFSI, the 24PT1-DSC smearable surface contamination levels on the outer surface of the 24PT1-DSC shall be less than 2,200 dpm/100 cm^2 from beta and gamma emitting sources, and less than 220 dpm/100 cm^2 from alpha emitting sources.

   The contamination limits specified above are based on the allowed removable external radioactive contamination specified in 49 CFR 173.443 (as referenced in 10 CFR 71.87(i)) the system provides significant additional protection for the 24PT1-DSC surface than the transportation configuration. The AHSM will protect the 24PT1-DSC from direct exposure to the elements and will therefore limit potential releases of removable contamination. The probability of any removable contamination being entrapped in the AHSM air flow path released outside the AHSM is considered extremely small.

5.2.5 AHSM Thermal Monitoring Program

This program provides guidance for temperature measurements that are used to monitor the thermal performance of each AHSM. The intent of the program is to prevent conditions that could lead to exceeding the concrete and fuel clad temperature criteria.

a) AHSM Concrete Temperature

The temperature measurement will be a direct measurement of the AHSM concrete temperature, or other means that would identify and allow for the correction of off-normal thermal conditions that could lead to exceeding the concrete and fuel clad temperature criteria. A temperature measurement of the thermal performance for each AHSM will be taken on a daily basis.

If the temperature of the AHSM at the monitored location rises by more than 80°F, based on a daily surveillance, then it is possible that some type of an inlet and or outlet vent blockage has occurred and appropriate corrective actions will be taken to avoid exceeding the concrete and cladding temperature limits. The 80°F value is obtained from a review of a transient thermal analysis of the AHSM with a 24 kW heat load to ensure that the rapid heatup is detected in time to initiate corrective action prior to exceeding concrete temperature limits.

In addition, if the temperature of the AHSM at the monitored location is greater than 225°F, then it is possible that some type of an inlet and or outlet vent blockage has occurred and appropriate corrective actions need to be taken to avoid exceeding the concrete and cladding temperature limits. The 225°F temperature limit is chosen based on the expected concrete temperature for the 14 kW blocked vent scenario to ensure that the associated fuel clad temperature is not exceeded.

The AHSM Thermal Monitoring Program provides a positive means to identify conditions that could approach the temperature criteria for proper AHSM operation and allow for the correction of off-normal thermal conditions that could lead to exceeding the concrete and fuel clad temperature criteria.

b) AHSM Air Temperature Difference

Following initial 24PT1-DSC transfer to the AHSM, the air temperature difference between ambient temperature and the roof vent temperature will be measured 24 hours after DSC insertion into the HSM and again 7 days after insertion into the AHSM. If the air temperature differential is greater than 100°F, the air inlets and exits should be checked for blockage. If after removing any blockage found, the temperature differential is still greater than that ≤100ºF, corrective actions and analysis of existing conditions will be performed in accordance with the site corrective action program to confirm that conditions adversely affecting the concrete or fuel cladding do not exist.

The specified air temperature rise ensures the fuel clad and concrete temperatures are maintained at or below acceptable long-term storage limits. If the temperature rise is within the ≤100ºF, then the AHSM and 24PT1-DSC are performing as designed and no further temperature measurements are required.

c) AHSM Air Vents

Since the AHSMs are located outdoors, there is a possibility that the AHSM air inlet and outlet openings could become blocked by debris. Although the ISFSI security fence and AHSM bird screens reduce the probability of AHSM air vent blockage, the ISFSI SAR postulates and analyzes the effects of air vent blockage.

The AHSM design and accident analyses demonstrate the ability of the ISFSI to function safely if obstructions in the air inlets or outlets impair airflow through the AHSM for extended periods. This specification ensures that blockage will not exist for periods longer than assumed in the analyses.

Site personnel will conduct a daily visual inspection of the air vents to ensure that AHSM air vents are not blocked for more than 40 hours and that blockage will not exist for periods longer than assumed in the safety analysis.

5.3 Lifting Controls

5.3.1 Cask Lifting Heights

The lifting height of a loaded cask/24PT1-DSC, is limited as a function of location and temperature, as follows:

a) The maximum lift height of the cask/24PT1-DSC inside the Fuel Handling Building shall be 80 inches if the ambient temperature is below 0°F but higher than -80°F.

b) No lift height restriction (no lift height restriction as a function of temperature, other 10 CFR 50 administrative lift height restrictions may apply) is imposed on the cask/24PT1-DSC during LOADING OPERATIONS, if the ambient temperature is higher than 0°F.

c) The maximum lift height and handling height for all TRANSFER OPERATIONS shall be 80 inches and the ambient temperature must be greater than 0°F.

These restrictions ensure that any 24PT1-DSC drop as a function of location or low temperature is within the bounds of the accident analysis. If the ambient temperature is outside of the specification limits, LOADING and TRANSFER OPERATIONS will be terminated.

5.3.2 Cask Drop

Inspection Requirement

The 24PT1-DSC will be inspected for damage after any transfer cask drop of fifteen inches or greater.

Background

TC/24PT1-DSC handling and loading activities are controlled under the 10CFR 50 license until a loaded TC/24PT1-DSC is placed on the transporter, at which time fuel handling activities are controlled under the 10CFR 72 license. Although the probability of dropping a loaded TC/24PT1-DSC while en route from the Fuel Handling Building to the ISFSI is small, the potential exists to drop the cask 15 inches or more.

Safety Analysis

The analysis of bounding drop scenarios shows that the transfer cask will maintain the structural integrity of the 24PT1-DSC confinement boundary from an analyzed drop height of 80 inches. The 80-inch drop height envelopes the maximum vertical height of the transfer cask when secured to the transfer trailer while en route to the ISFSI.

Although analyses performed for cask drop accidents at various orientations indicate much greater resistance to damage, requiring the inspection of the DSC after a drop of 15 inches or greater ensures that:

1. The DSC will continue to provide confinement

2. The transfer cask can continue to perform its design function regarding DSC transfer and shielding.