APPENDIX A TO CERTIFICATE OF COMPLIANCE NO. 1030

NUHOMS® HD SYSTEM GENERIC TECHNICAL SPECIFICATIONS

Amendment *2*

Table of Contents **Page**

Table of Contents **Page**

List of Tables

List of Figures

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.

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.
HORIZONTAL STORAGE MODULE (HSM-H)	The HSM-H is a reinforced concrete structure for storage of a loaded 32PTH DSC at a spent fuel storage installation.
DRY SHIELDED CANISTER (32PTH DSC)	A 32PTH DSC is a welded pressure vessel that provides confinement of INTACT or DAMAGED FUEL ASSEMBLIES in an inert atmosphere.
FUEL CLASS	A FUEL CLASS includes fuel assemblies of a particular type of fuel design. For example, WEV 17x17, WEO 17x17, and ANP Advanced MK BW 17x17 fuel assemblies of a 17x17 type fuel assembly design are part of a 17x17 fuel class.
INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)	The facility within a perimeter fence licensed for storage of spent fuel within HSM-Hs.
INTACT FUEL ASSEMBLY, *DAMAGED FUEL ASSEMBLY*	*The definition for intact or damaged assemblies is located in the fuel specification tables for each DSC referred to in Section 2.1*.
BLEU FUEL MATERIAL	*Blended Low Enriched Uranium (BLEU) fuel material is identical to UO_2 fuel material except for the presence of higher cobalt impurity.*
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on a 32PTH DSC while it is being loaded with INTACT or DAMAGED FUEL ASSEMBLIES, and in a TRANSFER CASK while it is being loaded with a 32PTH DSC containing INTACT or DAMAGED FUEL ASSEMBLIES. LOADING OPERATIONS begin when the first INTACT or DAMAGED FUEL ASSEMBLY is placed in the 32PTH DSC and end when the TRANSFER CASK is ready for TRANSFER OPERATIONS.

1.1 Definitions (continued)

RECONSTITUTED FUEL ASSEMBLY	A RECONSTITUTED FUEL ASSEMBLY is an INTACT FUEL ASSEMBLY where one or more fueled rods are replaced by hollow rods of stainless steel or zirconium alloy containing low enriched uranium or natural uranium or zirconium alloy pellets. In addition, the replacement rods can be solid stainless steel or zirconium alloy rods. The nominal volume of the replacement rods is equivalent to the replaced fueled rods in the active fuel region of the fuel assembly.
STORAGE OPERATIONS	STORAGE OPERATIONS include all licensed activities that are performed at the ISFSI while a 32PTH DSC containing INTACT or DAMAGED FUEL ASSEMBLIES is located in an HSM-H on the storage pad within the ISFSI perimeter.
TRANSFER CASK (TC)	The TRANSFER CASK consists of a licensed NUHOMS® OS187H onsite transfer cask. The TRANSFER CASK will be placed on a transfer trailer for movement of a 32PTH DSC to the HSM-H.
TRANSFER OPERATIONS	TRANSFER OPERATIONS include all licensed activities involving the movement of a TRANSFER CASK loaded with a 32PTH DSC containing INTACT or DAMAGED FUEL ASSEMBLIES. TRANSFER OPERATIONS begin when the TRANSFER CASK is placed horizontal on the transfer trailer ready for TRANSFER OPERATIONS and end when the 32PTH DSC is located in an HSM-H on the storage pad within the ISFSI perimeter.
UNLOADING OPERATIONS	UNLOADING OPERATIONS include all licensed activities on a 32PTH DSC to unload INTACT or DAMAGED FUEL ASSEMBLIES. UNLOADING OPERATIONS begin when the 32PTH DSC is removed from the HSM-H and end when the last INTACT or DAMAGED FUEL ASSEMBLY has been removed from the 32PTH 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 (Limiting Condition for Operation) 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.

(continued)

1.2 Logical Connectors (continued)

EXAMPLES (continued)

EXAMPLE 1.2-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Stop… OR A.2 A.2.1 Verify… AND A.2.2 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 <u>not</u> 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.

(continued)

1.3 Completion Times (continued)

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

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.

(continued)

1.3 Completion Times (continued)

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 3.0, Limiting Condition for Operation (LCO) and 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.

(continued)

1.4 Frequency (continued)

EXAMPLES (continued)

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.

(continued)

1.4 Frequency (continued)

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.

(continued)

1.4 Frequency (continued)

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.*	Once after verifying the helium leak rate is within limit.
Verify 32PTH DSC vacuum drying pressure 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 32PTH DSC

PHYSICAL PARAMETERS:	
FUEL CLASS	*INTACT or DAMAGED unconsolidated* Westinghouse 17x17 (WE 17x17), Westinghouse 15x15 (WE 15x15), Combustion Engineering 16x16 (CE 16x16) and Combustion Engineering 14x14 (CE 14x14) class PWR assemblies (with or without control components) that are enveloped by the fuel assembly design characteristics listed in Table 2. Reload fuel manufactured by the same or other vendors but bounded by the design characteristics listed in Table 2 is also acceptable. *DAMAGED fuel assemblies beyond the definition contained below are not authorized for storage.*
DAMAGED FUEL	*Damaged PWR fuel assemblies are assemblies having missing or partial fuel rods or fuel rods with known or suspected cladding defects greater than hairline cracks or pinhole leaks. The extent of cladding damage in the fuel rods is to be limited such that a fuel assembly needs to be handled by normal means. Damaged assemblies shall also contain top and bottom end fittings or nozzles or tie plates depending on the fuel type.*
RECONSTITUTED FUEL ASSEMBLIES:	
• Maximum No. of Reconstituted Assemblies per DSC With Irradiated Stainless Steel Rods	4
• Maximum No. of Irradiated Stainless Steel Rods per Reconstituted Fuel Assembly	10
• Maximum No. of Reconstituted Assemblies per DSC with unlimited number of low enriched UO_2 rods, or Zr Rods or Zr Pellets or Unirradiated Stainless Steel Rods	32

Control Components (CCs)	• Up to 32 CCs are authorized for storage in 32PTH DSC. • Authorized CCs include Burnable Poison Rod Assemblies (BPRAs), Thimble Plug Assemblies (TPAs), Control Rod Assemblies (CRAs), Control Element Assemblies (CEAs), Rod Cluster Control Assemblies (RCCAs), Axial Power Shaping Rod Assemblies (APSRAs), Orifice Rod Assemblies (ORAs), Vibration Suppression Inserts (VSIs), Neutron Source Assemblies (NSAs) and Neutron Sources. *Non-fuel hardware that are positioned within the fuel assembly after the fuel assembly is discharged from the core such as Guide Tubes or Instrument Tube Tie Rods or Anchors, Guide Tube Inserts, BPRA Spacer Plates or devices that are positioned and operated within the fuel assembly during reactor operation such as those listed above are also considered to be authorized CCs.* • Design basis thermal and radiological characteristics for the CCs are listed in Table 3.
Number of Intact Assemblies	≤ 32
Number and Location of Damaged Assemblies	Up to 16 damaged fuel assemblies with balance intact fuel assemblies, or dummy assemblies are authorized for storage in 32PTH DSC. Damaged fuel assemblies are to be placed in the center 16 locations as shown in Figure 1. The DSC basket cells which store damaged fuel assemblies are provided with top and bottom end caps to assure retrievability.
Maximum Assembly plus CC Weight	*1610* lb
THERMAL/RADIOLOGICAL PARAMETERS:	
Burnup, Enrichment, and Minimum Cooling Time for the 32PTH DSC	Per Table 4A, Table 4B, and Table 4C The licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.

Maximum *Planar* Average Initial Fuel Enrichment	*Per Table 7*
Maximum Decay Heat Limits for Heat Load Zones 1a, 1b, 2 and 3 fuel.	Per Figure 2
Decay Heat per DSC	≤ 34.8 kW for WE 15x15, WE 17x17 and CE 16x16 class fuel assemblies
	≤ 33.8 kW for CE 14x14 class fuel assemblies
Minimum Boron Loading	*Per Table 7*

2.2 Functional and Operating Limits Violations

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

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

2.2.2 Within 24 hours, notify the NRC Operations Center.

2.2.3 Within 60 days, submit a special report which describes the cause of the violation and the actions taken to restore compliance and prevent recurrence.

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 32PTH 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.

(continued)

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

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 32PTH DSC.

3.1 DSC Fuel Integrity

3.1.1 DSC Bulkwater Removal Medium and Vacuum Drying Pressure

LCO 3.1.1	Medium: Helium shall be used for cover gas during drainage of bulk water (blowdown or draindown) from the DSC. Pressure: The 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 evacuation.
APPLICABILITY:	During LOADING OPERATIONS but before TRANSFER OPERATIONS.

3.1 DSC Fuel Integrity (continued)

ACTIONS

--------------------------------NOTE--------------------------------------
This specification is applicable to all 32PTH DSCs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. If the required vacuum pressure cannot be obtained.	A.1 A.1.1 Confirm that the vacuum drying system is properly installed. Check and repair the vacuum drying system as necessary. <u>OR</u> A.1.2 Establish helium pressure of at least 0.5 atm and no greater than 15 psig in the DSC. <u>OR</u>	30 days
	A.2 Flood the DSC with spent fuel pool water or water meeting the requirements of LCO 3.2.1 if applicable submerging all fuel assemblies.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1	Verify that the 32PTH DSC vacuum pressure is less than, or equal to, 3 Torr (3 mm Hg) absolute for at least 30 minutes following evacuation.	Once per 32PTH DSC, after an acceptable NDE of the inner top cover/shield plug assembly to DSC shell weld.

3.1 DSC Fuel Integrity (continued)

3.1.2 32PTH DSC Helium Backfill Pressure

LCO 3.1.2 32PTH DSC helium backfill pressure shall be 2.5 ± 1 psig (stable for 30 minutes after filling) after completion of vacuum drying.

APPLICABILITY: During LOADING OPERATIONS but before TRANSFER OPERATIONS.

ACTIONS

--NOTE--

This specification is applicable to all 32PTH DSCs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
------------------NOTE------------------ *Not applicable until SR 3.1.2 is performed.* A. The required backfill pressure cannot be obtained or stabilized.	A.1 A.1.1 Maintain helium atmosphere in the DSC cavity. <u>AND</u> A.1.2 Confirm, check and repair or replace as necessary the vacuum drying system, helium source and pressure gauge.	14 days
	<u>OR</u> A.2 Establish the DSC helium backfill pressure to within the limit. If pressure exceeds the criterion, release a sufficient quantity of helium to lower the DSC cavity pressure within the limit.	14 days

(continued)

	<u>OR</u> A.3 Flood the DSC with spent fuel pool water or water meeting the requirements of LCO 3.2.1 if applicable submerging all fuel assemblies.	14 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		**FREQUENCY**
SR 3.1.2	Verify that the 32PTH DSC helium backfill pressure is 2.5 ± 1 psig stable for 30 minutes after filling.	Once per 32PTH DSC, after the completion of SR 3.1.1 requirement.

3.1 DSC Fuel Integrity (continued)

3.1.3 Transfer Cask Cavity Helium Backfill Pressure

LCO 3.1.3 Duration: OS187H transfer cask cavity / annulus helium backfill shall be initiated within 28 hours after drainage of TC cavity / annulus water during LOADING OPERATIONS OR after retracting the DSC into TC during UNLOADING OPERATIONS.

APPLICABILITY: During LOADING, TRANSFER and UNLOADING OPERATIONS.

ACTIONS

---NOTE---

This specification is applicable to all 32PTH DSCs/OS187H TC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. The transfer cask cavity/ annulus helium backfill cannot be initiated within 26 hours after drainage of TC cavity / annulus water during LOADING OPERATIONS OR within 26 hrs of retracting the DSC into the TC during UNLOADING OPERATIONS. ---NOTE--- *Not applicable until SR 3.1.3.1 or 3.1.3.2 is performed.*	A.1 Flood the TC cavity/annulus with water	2 hours
B. The required backfill pressure cannot be obtained or stabilized.	B.1 Establish the TC cavity/annulus helium backfill pressure to within the limit. OR B.2 Flood the TC cavity/annulus with water.	18 hours 18 hours

3.1 DSC Fuel Integrity (concluded)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1 SR 3.1.3.2	Verify that the OS187H cavity/annulus helium backfill pressure is 2.0 ± 1 psig, stable for 30 minutes after filling. OR Monitor the OS187H cavity/annulus pressure during transfer operation to verify it does not drop below 1.0 psig.	If SR 3.1.3.1 is used, then once per 32PTH DSC, after the completion of SR 3.1.2 requirements and after the installation of the TC lid. If SR 3.1.3.2 is used then every 4 hours during TRANSFER and UNLOADING OPERATIONS.

3.2 Cask Criticality Control

LCO 3.2.1 The dissolved boron concentration of the spent fuel pool water and the water added to the cavity of a loaded DSC shall be at least the boron concentration shown in Table 7 for the basket type and fuel enrichment selected.

APPLICABILITY: During LOADING and UNLOADING OPERATIONS with fuel and liquid water in the DSC cavity.

ACTIONS

--NOTE--

This specification is applicable to all 32PTH DSCs/OS187H TC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Dissolved boron concentration limit not met.	A.1 Suspend loading of fuel assemblies into DSC AND A.2 A.2.1 Add boron and re-sample, and test the concentration until the boron concentration is shown to be greater than that required OR A.2.2 Remove all fuel assemblies from DSC	Immediately Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.1	Verify dissolved boron concentration limit in spent fuel pool water and water to be added to the DSC cavity is met using two independent measurements.	Within 4 hours prior to commencing LOADING OPERATIONS AND 48 hours thereafter while the DSC is in the spent fuel pool or while water is in the DSC.

SR 3.2.2	Verify dissolved boron concentration limit in spent fuel pool water and water to be added to the DSC cavity is met using two independent measurements.	Once within 4 hours prior to flooding DSC during UNLOADING OPERATIONS AND 48 hours thereafter while the DSC is in the spent fuel pool or while water is in the DSC.

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 NUHOMS® HD 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 *U*FSAR 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 HSM-H center of gravity (CG) is to be developed based on the SSI responses. HSM-H seismic analysis information is provided in *U*FSAR Appendix 3.9.9.10.2.

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 4.6.2.

(continued)

4.0 Design Features (continued)

4.3 Canister Criticality Control

The NUHOMS®-32PTH is designed for unirradiated fuel with an assembly average initial enrichment of less than or equal to 5.0 wt. % U-235 taking credit for soluble boron in the DSC cavity water during loading operations and the boron content in the poison plates of the DSC basket. The 32PTH DSC has multiple basket configurations, based on the material type and boron content in the poison plates, as listed in Table 6. Table 7 defines the requirements for boron concentration in the DSC cavity water as a function of the DSC basket type for the various intact and damaged fuel classes (most reactive) authorized for storage in the 32PTH DSC.

A Type I basket contains poison plates that are either borated aluminum or MMC while a Type II basket contains Boral® poison plates. The basket types are further defined by the B-10 areal density in the plates, ranging from the lowest, Type A to the highest, Type E.

4.3.1 Neutron Absorber Tests

Borated Aluminum, MMCs, or Boral® shall be supplied in accordance with *U*FSAR Sections 9.1.7.1 through 9.1.7.4, 9.5.2.a, portions of 9.5.2.b, *portions of* 9.5.3.4, *all of* 9.5.3.5, 9.5.4.1 and 9.5.4.2, with the minimum B10 areal density specified in Table 6. These sections of the *U*FSAR are hereby incorporated into the NUHOMS® HD CoC.

The sections of the UFSAR incorporated by reference contain specification, qualification and acceptance testing requirements for the neutron absorber materials. Proposed alternatives to these requirements listed in these UFSAR sections other than those aforementioned requirements 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 exceptions involve an acceptable level of quality and safety, or*
2. *Compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.*

The applicant should also submit information regarding the environmental impact of such a request to support the NRC's NEPA regulations in 10 CFR Part 51. Any proposed alternatives must be submitted and approved prior to implementation.

However, any changes to the minimum B10 areal density requirements listed in these technical specifications shall not be the subject of these exceptions. Requests for exceptions in accordance with this section should be submitted in accordance with 10 CFR 72.4.

4.4 Codes and Standards

4.4.1 Horizontal Storage Module (HSM-H)

The reinforced concrete HSM-H 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 HSM-H.

4.4.2 Dry Shielded Canister (32PTH DSC)

The 32PTH DSC is designed, fabricated and inspected to the maximum practical extent in accordance with ASME Boiler and Pressure Vessel Code Section III, Division 1, 1998 Edition with Addenda through 2000, Subsections NB, NF, and NG for Class 1 components and supports. Code alternatives are discussed in 4.4.4.

4.4.3 Transfer Cask (OS187H)

The OS187H Transfer Cask is designed, fabricated and inspected to the maximum practical extent in accordance with ASME Boiler and Pressure Vessel Code Section III, 1998 Edition with Addenda through 2000, Subsection NC for Class 2 vessels.

4.4.4 Alternatives to Codes and Standards

ASME Code alternatives for the 32PTH DSC are listed below:

DSC ASME Code Alternatives, Subsection NB

Reference ASME Code Section/Article	Code Requirement	Justification & Compensatory Measures
NCA	All	Not compliant with NCA
NB-1100	Requirements for Code Stamping of Components	The canister shell, the inner top cover/shield plug, the inner bottom cover, and the siphon/vent port cover are 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	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 TN's NRC approved QA program.
NB-4243 and NB-5230	Category C weld joints in vessels and similar weld joints in other components shall be full penetration joints. These welds shall be examined by UT or RT and either PT or MT.	The shell to the outer top cover weld, the shell to the inner top cover/shield plug weld (including option 2 or option 3 inner top cover as described in the *U*FSAR), and the siphon/vent cover welds, are all partial penetration welds. As an alternative to the NDE requirements of NB-5230, for Category C welds, all of these closure welds will be multi-layer welds and receive a root and final PT examination, except for the shell to the outer top cover weld. The shell to the outer top cover weld will be a multi-layer weld and receive multi-level PT examination in accordance with the guidance provided in ISG-15 for NDE. The multi-level PT examination provides reasonable assurance that flaws of interest will be identified. The PT examination is done by qualified personnel, in accordance with Section V and the acceptance standards of Section III, Subsection NB-5000. All of these welds will be designed to meet the guidance provided in ISG-15 for stress reduction factor.
NB-2531	Vent & siphon Port Cover; straight beam UT per SA-578 for all plates for vessel	SA-578 applies to 3/8" and thicker plate only; allow alternate UT techniques to achieve meaningful UT results.
NB-5520	*NDE Personnel must be qualified to a specific edition of SNT-TC-1A*	*Permit use of the Recommended Practice SNT-TC-1A to include up to the most recent 2011 edition.*

DSC ASME Code Alternatives, Subsection NB (concluded)

Reference ASME Code Section/Article	Code Requirement	Justification & Compensatory Measures
NB-6000	All completed pressure retaining systems shall be pressure tested	The 32PTH is not a complete or "installed" pressure vessel until the top closure is welded following placement of Fuel Assemblies within the DSC. Due to the inaccessibility of the shell and lower end closure welds following fuel loading and top closure welding, as an alternative, the pressure testing of the DSC is performed in two parts. The DSC shell, shell bottom, including all longitudinal and circumferential welds, is pneumatically tested and examined at the fabrication facility. The shell to the inner top cover/shield plug closure weld (including option 2 or option 3 inner top cover as described in the *U*FSAR) are pressure tested and examined for leakage in accordance with NB-6300 in the field. The siphon/vent cover welds will not be pressure tested; these welds and the shell to the inner top cover/shield plug closure weld (including option 2 or option 3 inner top cover as described in the *U*FSAR) are helium leak tested after the pressure test. Per NB-6324 the examination for leakage shall be done at a pressure equal to the greater of the Design pressure or three-fourths of the test pressure. As an alternative, if the examination for leakage of these field welds, following the pressure test, is performed using helium leak detection techniques, the examination pressure may be reduced to 1.5 psig. This is acceptable given the significantly greater sensitivity of the helium leak detection method.
NB-7000	Overpressure Protection	No overpressure protection is provided for the 32PTH DSC. The function of the 32PTH DSC is to contain radioactive materials under normal, off-normal, and hypothetical accident conditions postulated to occur during transportation. The 32PTH DSC is designed to withstand the maximum internal pressure considering 100% fuel rod failure at maximum accident temperature. The 32PTH DSC is pressure tested in accordance with the requirements of 10 CFR *Part* 71 and TN's approved QA program.
NB-8000	Requirements for nameplates, stamping & reports per NCA-8000	The 32PTH DSC nameplates provide the information required by 10 CFR *Part* 71, 49 CFR *Part* 173, and 10 CFR *Part* 72 as appropriate. Code stamping is not required for the 32PTH DSC. QA Data packages are prepared in accordance with the requirements of 10 CFR *Part* 71, 10 CFR *Part* 72, and TN's approved QA program.
NB-1132	Attachments with a pressure retaining function, including stiffeners, shall be considered part of the component.	Outer bottom cover, bottom plate, bottom casing plate, side casing plate, top shield plug casing plate, lifting posts, grapple ring and grapple ring support are outside code jurisdiction; these components together are much larger than required to provide stiffening for the confinement boundary cover. These component welds are subject to root and final PT examinations.

Basket ASME Code Alternatives, Subsection NG/NF

Reference ASME Code Section/Article	Code Requirement	Justification & Compensatory Measures
NCA	All	Not compliant with NCA
NG/NF-1100	Requirements for Code Stamping of Components	The 32PTH DSC baskets are designed & fabricated in accordance with the ASME Code, Section III, Subsection NG to the maximum extent practical as described in the *U*FSAR, 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	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 TN's NRC approved QA program. The poison material and aluminum plates are not used for structural analysis, but to provide criticality control and heat transfer. They are not ASME Code Class I materials. See note 1.
NG/NF-8000	Requirements for nameplates, stamping & reports per NCA-8000	The 32PTH DSC nameplates provide the information required by 10 CFR *Part* 71, 49 CFR *Part* 173, and 10 CFR *Part* 72 as appropriate. Code stamping is not required for the 32PTH DSC. QA Data packages are prepared in accordance with the requirements of 10 CFR *Part* 71, 10 CFR *Part* 72, and TN's approved QA program.

Note:

1. Because Subsection NCA does not apply, the NCA-3820 requirements for accreditation or qualification of material organizations do not apply. CMTRs shall be provided using NCA- 3862 for guidance.

Proposed alternatives to the ASME code, other than the aforementioned ASME Code alternatives 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, 1998 Edition with Addenda through 2000 would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The applicant should also submit information regarding the environmental impact of such a request to support the NRC's NEPA regulations in 10 CFR Part 51. Any proposed alternatives must be submitted and approved prior to implementation.

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

4.0 Design Features (continued)

4.5 HSM-H Side Heat Shields

The HSM-H utilizes side heat shields to protect the HSM-H concrete surfaces and provide for enhanced heat transfer within the HSM-H. Three side heat shield configurations have been evaluated in the *U*FSAR: finned anodized aluminum, flat (unfinned) anodized aluminum, and flat (unfinned) galvanized steel. Heat load limits for these three heat shield configurations and material types are established at 34.8 kW, 32.0 kW, and 26.1 kW per DSC, respectively. Alternate heat shield material types and configurations may be evaluated using the HSM-H thermal performance methodology described in the *U*FSAR.

4.6 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 *U*FSAR.

4.6.1 Storage Configuration

HSM-Hs are placed together in single rows or back to back arrays. An end shield wall is placed on the outside end of any loaded outside HSM-H. A rear shield wall is placed on the rear of any single row loaded HSM-H.

4.6.2 Concrete Storage Pad Properties to Limit 32PTH DSC Gravitational Loadings Due to Postulated Drops

The TC/32PTH 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-7551, “Structural Design of Concrete Storage Pads for Spent Fuel Casks,” August 1991.

(continued)

4.0 Design Features (concluded)

4.6.3 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 100 °F.

5. Off-normal ambient temperature range of –21 °F without solar insolation to 115 °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 10 CFR 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. *Reactor site design response spectra seismic zero period acceleration (ZPA) levels of 0.30g horizontal and 0.20g vertical for the systems using the HSM-H modules.*

9. *If an independent spent fuel storage installation site is located in a coastal salt water marine atmosphere, then any load-bearing carbon steel DSC support structure rail components of any associated HSM-H shall be procured with a minimum 0.20% copper content or stainless steel shall be used for corrosion resistance. For weld filler material used with carbon steel, 1% or more nickel bearing weld material would also be acceptable in lieu of 0.20% copper content.*

5.0 ADMINISTRATIVE CONTROLS

5.1 Procedures

Each user of the NUHOMS® HD 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 NUHOMS® HD 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
- HSM-H Thermal Monitoring Program

5.2.1 Safety Review Program

Users shall conduct safety reviews in accordance with 10 CFR 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 10 CFR 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 *U*FSAR.

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 10 CFR 72.48.

(continued)

5.2 Programs (continued)

5.2.2 Training Program

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

- NUHOMS® HD System design (overview)
- ISFSI Facility design (overview)
- Systems, Structures, and Components Important to Safety (overview)
- NUHOMS® HD System Final Safety Analysis Report (overview)
- NRC Safety Evaluation Report (overview)
- Certificate of Compliance conditions
- NUHOMS® HD System Technical Specifications
- Applicable Regulatory Requirements (e.g.,10 CFR 72, Subpart K, 10 CFR *Part* 20, 10 CFR Part 73)
- Required Instrumentation and Use
- Operating Experience Reviews
- NUHOMS® HD System and Maintenance procedures, including:
  - Fuel qualification and loading,
  - Rigging and handling,
  - Loading Operations as described in Chapter 8 of the *U*FSAR,
  - 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, as described in Section 9.2 of the *U*FSAR,
  - Security, and
  - 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 10 CFR 72.104(a).

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

(continued)

5.2 Programs (continued)

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 10 CFR Part 20 and Part 72.

a) As part of its evaluation pursuant to 10 CFR 72.212, the licensee shall perform an analysis to confirm that the limits of 10 CFR *Part* 20 and 10 CFR 72.104 will be satisfied under the actual site conditions and configurations considering the planned number of 32PTH 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) *When using a TC with a liquid neutron shield (NS), if draining the NS is required to meet the plant lifting crane capacity limits, the NS shall be verified to be filled after completion of the lift. If DSC cavity draining or TC/DSC annulus draining operations, as applicable, are initiated after the lift, the NS shall be verified to be filled before these draining operations are initiated and continually monitored during the first five minutes of the draining evolution to ensure the NS remains filled. Observation of water level in the expansion tank or some other means can be used to verify compliance with this requirement.*

d) *Following completion of the 32PTH DSC shell assembly at the fabricator facility, the inner bottom cover plate, canister shell and all associated welds are leak-tested to demonstrate that these welds and components meet the "leak-tight" criterion (≤ 1.0 x 10^{-7} reference cm^3/sec) as defined in "American National Standard for Radioactive Materials – Leakage Tests on Packages for Shipment", ANSI N14.5-1997. If the leakage rate exceeds 1.0 x 10^{-7} reference cm^3/sec, check and repair these welds or components.*

Following completion of the welding of *the* 32PTH DSC inner top cover/shield plug *and* siphon and vent cover plates, these welds *and components* are leak-tested to demonstrate that *they* meet the "leak-tight" criterion (≤ 1.0 x 10^{-7} reference cm^3/sec) as defined in "American National Standard for *Radioactive Materials* - Leakage Tests on Packages for Shipment", ANSI N14.5-1997. If the leakage rate exceeds 1.0 x 10^{-7} reference cm^3/sec, check and repair these welds *or components*.

These specifications ensure that an inert helium atmosphere will be maintained around the fuel and radiological consequences will be negligible.

(continued)

e) Following placement of each loaded Transfer Cask into the cask decontamination area and prior to transfer to the ISFSI, the 32PTH DSC smearable surface contamination levels on the outer top 1 foot surface of the 32PTH 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 32PTH DSC surface than the transportation configuration. The HSM-H will protect the 32PTH 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 HSM-H airflow path released outside the HSM-H is considered extremely small.

5.2 Programs (continued)

5.2.5 HSM-H Thermal Monitoring Program

This program provides guidance for temperature measurements that are used to monitor the thermal performance of each HSM-H. The intent of the program is to prevent conditions that could lead to exceeding the concrete and fuel clad temperature criteria. Each user is required to implement 5.2.5a, and each user must implement 5.2.5b OR 5.2.5c.

a) HSM-H Air Temperature Difference

The user shall develop and implement procedures to measure HSM-H air temperature differences. Following initial 32PTH DSC transfer to the HSM-H, the air temperature difference between ambient temperature and the roof vent temperature will be measured 24 hours after DSC insertion into the HSM-*H* and again 7 days after insertion into the HSM-H. If the air temperature differential is greater than 77 °F, the air inlets and exits should be checked for blockage. If after removing any blockage found, the temperature difference is greater than or equal to 100 °F, corrective actions and evaluation 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 less than 100 °F, then the HSM-H and 32PTH DSC are performing as designed and no further temperature measurements are required.

b) Daily Visual Inspection of HSM-H Inlets and Outlets (Front Wall and Roof Birdscreens)

The user shall develop and implement procedures to perform visual inspection of HSM-H inlets and outlets on a daily basis. There is a possibility that the HSM-H air inlet and outlet openings could become blocked by debris, as postulated and analyzed in the *U*FSAR accident analyses for air vent blockage. The procedures shall ensure that blockage will not exist for periods longer than assumed in the *U*FSAR analyses.

Perform a daily visual inspection of the air vents to ensure that HSM-H air vents are not blocked for more than 34 hours. If visual inspection indicates blockage, clear air vents and replace or repair birdscreens if damaged. If the air vents are blocked or could have been blocked for more than 34 hours, evaluate existing conditions in accordance with the site corrective action program to confirm that conditions adversely affecting the concrete or fuel cladding do not exist.

(continued)

c) Daily Temperature Measurement Program

i. The user shall develop a daily temperature measurement program to verify the thermal performance of each NUHOMS® HD system. The user shall establish administrative temperature limits to (1) detect off-normal and accident blockage conditions before the HSM-H components and fuel cladding temperatures would exceed temperature design limits and (2) ensure the HSM-H air vents are not blocked for more than 34 hours. The daily temperature measurements shall include at least one of the following three options:

1) direct measurement of the HSM-H concrete temperature
2) direct measurement of the DSC temperature
3) direct measurement of inlet and outlet air temperatures.

If the direct measurement of the inlet and outlet air temperatures (option 3) is performed, the measured temperature differences of the inlet and outlet vents of each individual HSM-H must be compared to the predicted temperature differences for each individual HSM-H during normal operations.

ii. The user shall establish in the program, measurement locations in the HSM-H that are representative of the HSM-H thermal performance and directly correlated to the predicted fuel cladding temperatures, air mass flow rates, and NUHOMS® HD temperature distributions that would occur with the off-normal and accident blockage conditions, as analyzed in the *U*FSAR. The administrative temperature limits shall employ appropriate safety margins that ensure temperatures would not exceed design basis temperature limits in the *U*FSAR, and be based on the *U*FSAR methodologies used to predict thermal performance of the NUHOMS® HD system. If the direct measurement of the inlet and outlet air temperatures (option 3) is performed, the user must develop procedures to measure air temperatures that are representative of inlet and outlet air temperatures, as analyzed in the *U*FSAR. The user must also consider site-specific environmental conditions, loaded decay heat patterns, and the proximity of adjacent HSM-H modules in the daily air temperature measurement program. The user must ensure that measured air temperatures reflect only the thermal performance of each individual module, and not the combined performance of adjacent modules.

iii. The user shall establish in the program the appropriate actions to be taken if administrative temperature criteria are exceeded. If an administrative temperature limit is exceeded during a daily measurement, the user shall inspect the vents and implement Technical Specification 5.2.5(b) for the affected system, until the cause of the excursion is determined and necessary corrective actions are completed under the site corrective action program.

iv. If measurements or other evidence indicates that the HSM-H

(continued)

concrete temperatures have exceeded the concrete accident criteria of 350 °F for more than 24 hours, the user shall implement Technical Specification 5.5 and perform an analysis and/or tests of the concrete in accordance with ACI-349, appendix A.4.3. The user shall demonstrate that the structural strength of the HSM-H has an adequate margin of safety and take appropriate actions to return the HSM-H to normal operating conditions.

v. If measurements or other evidence indicates that off-normal or accident temperature limits for fuel cladding has been exceeded, verify that canister confinement is maintained and assess analytically the condition of the fuel. Within 30 days, take appropriate actions to return the spent fuel to a safe configuration.

5.3 Lifting Controls

5.3.1 Transfer Cask Lifting Heights

The lifting height of a loaded transfer cask/32PTH DSC, is limited as a function of location, as follows:

a) The maximum lift height and handling height for all TRANSFER OPERATIONS where the TC/32PTH is in the horizontal position on the trailer shall be 80 inches.

b) The maximum lift height of the transfer cask/32PTH DSC shall be restricted by site (10 CFR *Part* 50) limits for all handling operations except those listed in 5.3.1a above. An evaluation of the fuel cladding structural integrity shall be performed for all credible drops under the user's 10 CFR *Part* 50 heavy loads program.

These restrictions ensure that any 32PTH DSC drop as a function of location is within the bounds of the accident analysis.

5.3.2 Cask Drop

Inspection Requirement

The 32PTH DSC will be inspected for damage after any transfer cask side drop of fifteen inches or greater.

Background

TC/32PTH DSC handling and loading activities are controlled under the 10 CFR *Part* 50 license until a loaded TC/32PTH DSC is placed on the transporter, at which time fuel handling activities are controlled under the 10 CFR *Part* 72 license.

(continued)

5.3 Lifting Controls (concluded)

5.3.2 Cask Drop (concluded)

Safety Analysis

The analysis of bounding drop scenarios shows that the transfer cask will maintain the structural integrity of the 32PTH DSC confinement boundary from an analyzed side drop height of 80 inches. The 80-inch drop height envelopes the maximum height from the bottom 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 side 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.

5.4 HSM-H Dose Rate Evaluation Program

This program provides a means to help ensure that the cask (DSC) is loaded properly and that the facility will meet the off-site dose requirements of 72.104(a).

1. As part of its evaluation pursuant to 10 CFR 72.212, the licensee shall perform an analysis to confirm that the limits of 10 CFR Part 20 and 10 CFR 72.104 will be satisfied under the actual site conditions and configurations considering the planned number of HSM-*H*s to be used and the planned fuel loading conditions.

2. On the basis of the analysis in TS 5.4.1, the licensee shall establish a set of HSM-H dose rate limits which are to be applied to 32PTH DSCs used at the site. Limits shall establish peak dose rates for:

   a. HSM-H front surface,
   b. HSM-H door centerline, and
   c. End shield wall exterior.

3. Notwithstanding the limits established in TS 5.4.2, the dose rate limits may not exceed the following values as calculated for a content of design basis fuel as follows:

   a. 800 mrem/hr at the front birdscreen,
   b. *5* mrem/hr at the door centerline, and
   c. *5* mrem/hr at the end shield wall exterior.

   The number and locations of the dose rate measurements on the surface of the front birdscreen of the HSM-H are indicated below:

   - *Two dose rate measurements are taken for each front birdscreen for the HSM-H. These dose rate measurements are approximately within 24 inches measured from the surface of the ISFSI pad and are approximately 6 inches from the centerline of each front birdscreen.*
   - *None of these measurements shall exceed the specified dose rate limits.*

   The number and locations of the dose rate measurements on the centerline (outside surface) of the HSM-H door are indicated below:

   - *Five locations within a radius of approximately 25 inches (diameter of approximately 50 inches) around the door centerline.*
   - *None of these measurements shall exceed the specified dose limits.*

   The number and locations of the dose rate measurements on the exterior surface of the HSM-H end shield wall are indicated below:

   - *Five dose rate measurements are taken for every end shield wall. The central dose location shall be approximately 10 feet from the HSM-H front surface and at an elevation corresponding to the approximate door centerline. The remaining four dose locations shall be within a radius of*

approximately 25 inches (diameter of approximately 50 inches) around the central dose location.
- *None of these measurements shall exceed the specified dose rate limits.*

4. If the measured dose rates do not meet the limits of TS 5.4.2 or TS 5.4.3, whichever are lower, the licensee shall take the following actions:

   a. Notify the U.S. Nuclear Regulatory Commission (Director of the Office of Nuclear Material Safety and Safeguards) within 30 days,
   b. Administratively verify that the correct fuel was loaded,
   c. Ensure proper installation of the HSM-H door,
   d. Ensure that the DSC is properly positioned on the support rails, and
   e. Perform an analysis to determine that placement of the as-loaded DSC at the ISFSI will not cause the ISFSI to exceed the radiation exposure limits of 10 CFR Part 20 and *Part* 72 and/or provide additional shielding to assure exposure limits are not exceeded.

5.5 Concrete Testing

HSM-H concrete shall be tested *during the fabrication process* for elevated temperatures to verify that there are no significant signs of spalling or cracking and that the concrete compressive strength is greater than that assumed in the structural analysis. Tests shall be performed at or above the calculated peak temperature and for a period no less than the 40 hour duration of HSM-H blocked vent transient for components exceeding 350 °F.

HSM-H concrete temperature testing shall be performed whenever:

- *There is a change in the supplier of the cement, or*
- *There is a change in the source of the aggregate, or*
- *The water-cement ratio changes by more than 0.04.*

5.6 Hydrogen Gas Monitoring

For DSCs, while welding the inner top cover/shield plug during loading operations, and while cutting the outer or inner top cover/shield plug during unloading operations, hydrogen monitoring of the space under the inner top cover/shield plug in the DSC cavity is required, to ensure that the combustible mixture concentration remains below the flammability limit of 4%. If this limit is exceeded, all welding operations shall be stopped and the DSC cavity purged with helium to reduce hydrogen concentration safely below the limit before welding or cutting operations can be resumed.

Table 1
Fuel Specifications

This table has been deleted and replaced by revised Technical Specification 2.1 “Fuel to be Stored in the 32PTH DSC.”

Table 2
Fuel Assembly Design Characteristics for the NUHOMS®-32PTH DSC

Assembly Class	WE 17x17	WE 15x15	CE 14x14	CE 16x16
Max*imum* Unirradiated Length (in) (1)	170.0	170.0	170.0	170.0
Fissile Material	UO_2	UO_2	UO_2	UO_2
Cladding Material *(3)*	*Zircaloy* / Zirlo / M5	*Zircaloy* / Zirlo / M5	*Zircaloy* / Zirlo / M5	*Zircaloy* / Zirlo / M5
Maximum MTU/Assembly (2)	0.476	0.476	0.476	0.476
Maximum Number of Fuel Rods	264	204	176	236
Maximum Number of Guide/ Instrument Tubes	25	21	5	5

Notes:
1. Maximum Assembly + Control Component Length (unirradiated).
2. The maximum MTU/assembly is based on the shielding analysis. The listed value is higher than the actual.
3. *All zirconium based alloys are acceptable.*

Table 3
Maximum Control Component Source Terms

Parameter	*Limit*
Maximum Gamma Source *Term* (γ/sec/DSC)	7.36 E+15
Maximum Decay *H*eat (Watts/*Control Component*)	9

Note:

NSAs and Neutron Sources shall only be stored in the interior compartments of the basket. Interior compartments are those that are completely surrounded by other compartments, including the corners. There are 12 interior compartments in the 32PTH DSC.

Table 4A

Maximum Allowable Assembly *Average* Burnup as a Function of Assembly Average Initial Enrichment

Assembly Average Initial Enrichment (X2) wt. % U-235)	Maximum Assembly *Average* Burnup (X1) (GW*d*/MTU)
$0.2 \leq X2 < 0.3$	20
$0.3 \leq X2 < 0.7$	25
$0.7 \leq X2 < 1.5$	32
$1.5 \leq X2 < 2.5$	55
$2.5 \leq X2 < 5.00$	60

Table 4B

For Assembly Average Initial Enrichment Greater Than or Equal to 1.50 wt. % U-235

For an assembly average initial enrichment greater than or equal to 1.50 *wt. % U-235*, the equation shown below to calculate the decay heat shall be employed. UFSAR Table 2-2D provides example tables, which may be used at the discretion of the user, to verify the proper use of the equation.

The Decay Heat (DH) in watts is expressed as:

$$F1 = A + B*X1 + C*X2 + D*X1^2 + E*X1*X2 + F*X2^2$$
$$DH = F1*Exp(\{[1-(5/X3)]*G\}*[(X3/X1)^H]*[(X2/X1)^I])$$

where,

F1 Intermediate Function
X1 Assembly *Average* Burnup in GW*d*/MTU
X2 Assembly Average Initial Enrichment in wt. % U-235 (*1.5 ≤ X2 ≤ 5.0*)
X3 Cooling Time in Years (min*imum* 5 yrs)

A = 13.69479	B = 25.79539	C = -3.547739	D = 0.307917	E = -3.809025
F = 14.00256	G = -0.831522	H = 0.078607	I = -0.095900	

- *When irradiated stainless steel rods are present in the reconstituted fuel assembly, the decay heat is calculated with using an X3 value, which corresponds to the actual cooling time minus one year. This restriction is applicable only when the cooling time of the reconstituted fuel assembly is less than 10 years. This fuel assembly is qualified if X3 is greater than 5 years. Further, this calculated decay heat shall be employed to determine the applicable Heat Load Zone shown in Figure 2.*
- *For a fuel assembly containing BLEU fuel material, the decay heat is calculated using an X3 value, which corresponds to the actual cooling time of BLEU fuel minus 2.5 years.*

This fuel assembly is qualified if X3 is greater than 5 years. Further, this calculated decay heat shall be employed to determine the applicable Heat Load Zone shown in Figure 2.

- *The calculated decay heat with actual cooling time shall be employed to determine the total heat load of the DSC as shown in Figure 2.*
- *Any fuel assembly that is qualified from a thermal standpoint is also qualified from a radiological standpoint.*
- *Any fuel assembly with a burnup and enrichment combination that is encompassed by that specified in Table 4A is qualified from a radiological standpoint.*
- *The qualification of fuel assemblies with assembly average initial enrichment between 0.2 wt. % U-235 and 1.5 wt. % U-235 as a function of burnup and cooling time is specified in Table 4C.*

Table 4C

<u>For Assembly Average Initial Enrichment Less Than 1.50 wt. % U-235</u>

For an assembly average initial enrichment less than 1.5 wt. % U-235, the following qualification shall be employed.

Assembly Average Initial Enrichment Range (wt. % U-235)	Max*imum Assembly Average Burnup* (GW*d*/MTU)	Cooling Time (Years)	Decay Heat (Watts)
0.7 ≤ X2 < 1.5	32	5	1100
	32	6	900
	32	7	780
	32	10	540
0.3 ≤ X2 < 0.7	25	5	970
	25	6	800
	25	10	620
0.2 ≤ X2 < 0.3	20	5	652

Notes:

1. For an assembly average enrichment between 0.2 and 0.3 wt. % U-235, fuel assemblies with a*n assembly average* burnup below 20 GW*d*/MTU and a cooling time greater than *5* years are qualified for storage anywhere in the basket.
2. For an assembly average enrichment between 0.3 and 0.7 wt. % U-235, fuel assemblies with a*n assembly average* burnup below 25 GW*d*/MTU and a cooling time greater than 6 years are qualified for storage anywhere in the basket.
3. For an assembly average enrichment between 0.7 and 1.5 wt. % U-235, fuel assemblies with a*n assembly average* burnup below 32 GW*d*/MTU and a cooling time greater than 7 years are qualified for storage anywhere in the basket.
4. *For fuel assemblies containing BLEU fuel material, the cooling time used in the table corresponds to the actual cooling time of BLEU fuel minus 2.5 years. For example, an assembly average enrichment between 0.7 and 1.5 wt. % U-235 containing BLEU fuel material, fuel assemblies with an assembly average burnup below 32 GWd/MTU and a cooling time greater than 7.5 years, the maximum decay heat is less than or equal to 1100 Watts.*

Table 5
NFAH Thermal Qualification

This table has been deleted and replaced by revised Technical Specification 2.1 "Fuel to be Stored in the 32PTH DSC" and Table 3.

Table 6
B10 Specification for the NUHOMS®-32PTH Poison Plates

NUHOMS®-32PTH DSC Basket Type	Minimum B10 Areal Density, gm/cm^2	
	Natural or Enriched Boron Aluminum Alloy / Metal Matrix Composite (MMC) (Type I)	Boral® (Type II)
A	0.007	0.009
B	0.015	0.019
C	0.020	0.025
D	0.032	N/A
E	0.050	N/A

Table 7
Maximum *Planar* Average Initial Enrichment for Intact and Damaged Fuel Loading

Assembly Class	Maximum *Planar* Average Initial Enrichment [(2)] of U-235 as a Function of Soluble Boron Concentration and Fixed Poison Loading (Basket Type)					
	Basket Type [(1)]	Minimum Soluble Boron Concentration				
		2000 ppm	2300 ppm	2400 ppm	2500 ppm	*2800 ppm*
CE 14x14 Intact Fuel Assembly (without CCs)	A	4.05	4.40	4.45	4.55	*4.60*
	B	4.55	4.90	5.00	*5.00*	*5.00*
	C	4.70	5.00	*5.00*	*5.00*	*5.00*
	D	5.00	*5.00*	*5.00*	*5.00*	*5.00*
	E	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
CE 14x14 Intact Fuel Assembly (with [(3)] CCs)	A	3.95	4.25	4.35	4.45	*4.55*
	B	4.35	4.70	4.80	4.90	*5.00*
	C	4.50	4.85	5.00	*5.00*	*5.00*
	D	4.75	5.00	*5.00*	*5.00*	*5.00*
	E	5.00	*5.00*	*5.00*	*5.00*	*5.00*
CE 16x16 Intact Fuel Assembly (without CCs)	A	3.90	4.10	4.20	4.30	*4.60*
	B	4.30	4.60	4.70	4.80	*5.00*
	C	4.50	4.80	4.90	5.00	*5.00*
	D	4.80	5.00	5.00	5.00	*5.00*
	E	5.00	5.00	5.00	5.00	*5.00*
CE 16x16 Intact Fuel Assembly (with [(3)] CCs)	A	3.80	4.00	4.10	4.20	*4.50*
	B	4.20	4.50	4.60	4.70	*5.00*
	C	4.40	4.70	4.80	4.90	*5.00*
	D	4.70	4.90	5.00	5.00	*5.00*
	E	4.90	5.00	5.00	5.00	*5.00*
WE 15x15 Intact Fuel Assembly (with and without CCs)	A	3.50	3.70	3.80	3.90	*4.05*
	B	3.80	4.10	4.20	4.30	*4.50*
	C	3.95	4.25	4.35	4.45	*4.70*
	D	4.20	4.50	4.70	4.80	*5.00*
	E	4.50	4.80	4.90	5.00	*5.00*
WE 17x17 Intact Fuel Assembly (with and without CCs)	A	3.50	3.70	3.80	3.90	*4.00*
	B	3.80	4.10	4.20	4.30	*4.45*
	C	3.95	4.25	4.35	4.45	*4.65*
	D	4.20	4.50	4.60	4.70	*4.95*
	E	4.45	4.70	4.90	5.00	*5.00*

Table 7
Maximum *Planar* Average Initial Enrichment for Intact and Damaged Fuel Loading (concluded)

Assembly Class	Maximum *Planar* Average Initial Enrichment (2) of U-235 as a Function of Soluble Boron Concentration and Fixed Poison Loading (Basket Type)					
	Basket Type (1)	Minimum Soluble Boron Concentration				
		2000 ppm	2300 ppm	2400 ppm	2500 ppm	*2800 ppm*
CE 14x14 Damaged Fuel Assembly (without CCs)	A	3.90	4.20	4.25	4.35	*4.40*
	B	4.35	4.70	4.80	4.90	*4.90*
	C	4.50	4.85	4.95	5.00	*5.00*
	D	4.85	5.00	*5.00*	*5.00*	*5.00*
	E	5.00	*5.00*	*5.00*	*5.00*	*5.00*
CE 14x14 Damaged Fuel Assembly (with (3) CCs)	A	3.70	3.95	4.05	4.10	*4.20*
	B	4.10	4.40	4.50	4.60	*4.65*
	C	4.20	4.55	4.65	4.75	*4.90*
	D	4.50	4.85	5.00	*5.00*	*5.00*
	E	4.75	5.00	*5.00*	*5.00*	*5.00*
CE 16x16 Damaged Fuel Assembly (without CCs)	A	3.65	3.90	4.00	4.05	*4.30*
	B	4.05	4.30	4.40	4.50	*4.80*
	C	4.20	4.50	4.60	4.70	*5.00*
	D	4.50	4.80	4.90	5.00	*5.00*
	E	4.75	5.00	5.00	5.00	*5.00*
CE 16x16 Damaged Fuel Assembly (with (3) CCs)	A	3.60	3.80	3.90	4.00	*4.20*
	B	3.95	4.20	4.30	4.40	*4.70*
	C	4.10	4.40	4.50	4.60	*4.90*
	D	4.40	4.70	4.80	4.90	*5.00*
	E	4.65	4.90	5.00	5.00	*5.00*
WE 15x15 Damaged Fuel Assembly (with and without CCs)	A	3.40	3.60	3.70	3.80	*3.95*
	B	3.75	4.00	4.10	4.20	*4.35*
	C	3.85	4.15	4.25	4.35	*4.50*
	D	4.10	4.40	4.50	4.60	*4.80*
	E	4.35	4.70	4.80	4.90	*5.00*
WE 17x17 Damaged Fuel Assembly (with and without CCs)	A	3.40	3.60	3.70	3.80	*3.95*
	B	3.75	4.00	4.10	4.20	*4.35*
	C	3.85	4.15	4.25	4.35	*4.55*
	D	4.10	4.40	4.50	4.60	*4.80*
	E	4.30	4.65	4.80	4.90	*5.00*

Notes:

1. *The fixed poison loading requirements as a function of Basket Type are specified in Table 6.*
2. *Linear interpolation is allowed between adjacent maximum planar average initial enrichments and soluble boron concentration levels.*
3. *Applicable for fuel assemblies with CCs that extend into the active fuel region.*

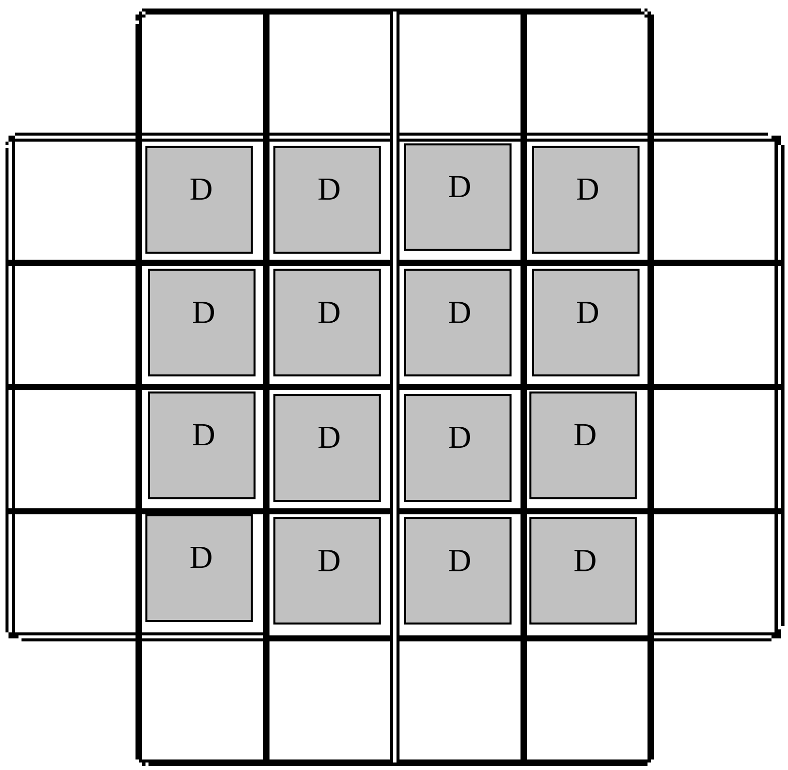
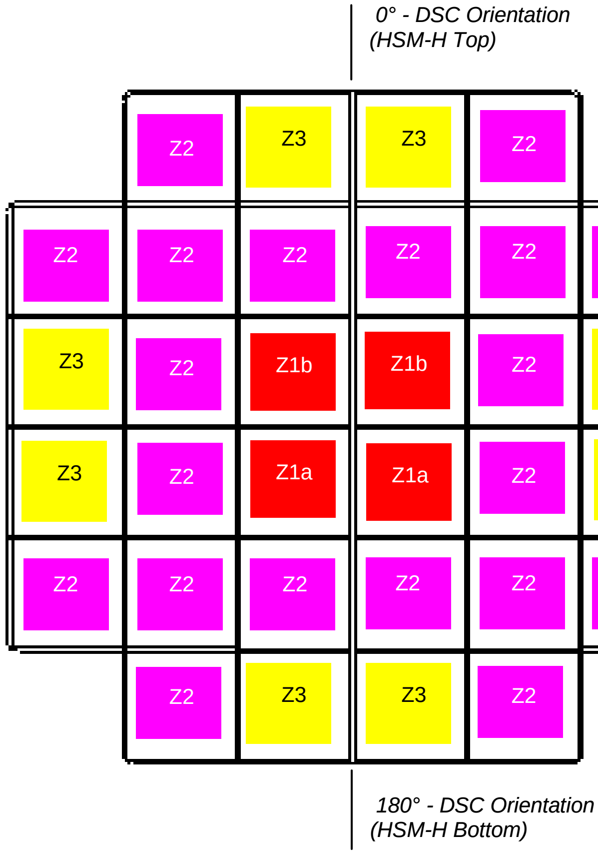


Figure 1
Damaged Fuel Assembly Locations



For CE 14x14 *Class Fuel* Assemblies

- Q_{zi} is the maximum decay heat per assembly in zone i
- Total Decay Heat $\leq$ 33.8 kW
- 4 fuel assemblies in zone 1 with $Q_{z1} \leq$0.775 kW
- 20 fuel assemblies in zone 2 with $Q_{z2} \leq$ 1.068 kW
- 8 fuel assemblies in zone 3 with $Q_{z3} \leq$ 1.5 kW

For other *Class Fuel* Assemblies

- Q_{zi} is the maximum decay heat per assembly in zone i
- Total Decay Heat $\leq$ 34.8 kW
- 4 fuel assemblies in zone 1 with
  - total decay heat $\leq$ 3.2 kW
  - $Q_{z1a} \leq$ 1.05 kW in the lower compartments
  - $Q_{z1b} \leq$ 0.8 kW in the upper compartments
- 20 fuel assemblies in zone 2 with $Q_{z2} \leq$ 1.1 kW
- 8 fuel assemblies in zone 3 with $Q_{z3} \leq$ 1.5 kW

Figure 2
<u>Heat Load Zones</u>