PROPOSED CERTIFICATE OF COMPLIANCE NO. 1014

APPENDIX D

TECHNICAL SPECIFICATIONS

FOR THE HI-STORM 100S VERSION E CASK

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FIGURES

TABLES

1 DEFINITIONS, USE, AND APPLICATION

1.1 Definitions

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.
CASK TRANSFER FACILITY (CTF)	A CASK TRANSFER FACILITY is an optional aboveground or underground system used during the transfer of a loaded MPC between a transfer cask and a storage OVERPACK external to 10 CFR Part 50 controlled structures. The CASK TRANSFER FACILITY includes the following components and equipment: (1) a Cask Transfer Structure used to stabilize the OVERPACK, TRANSFER CASK and/or MPC during lifts involving spent fuel not bounded by the regulations of 10 CFR Part 50, and (2) Either a stationary lifting device or a mobile lifting device used in concert with the stationary structure to lift the OVERPACK, TRANSFER CASK, and/or MPC.
DAMAGED FUEL ASSEMBLY	DAMAGED FUEL ASSEMBLIES are fuel assemblies with known or suspected cladding defects, as determined by a review of records, greater than pinhole leaks or hairline cracks, empty fuel rod locations that are not filled with dummy fuel rods, missing structural components such as grid spacers, whose structural integrity has been impaired such that geometric rearrangement of fuel or gross failure of the cladding is expected based on engineering evaluations, or that cannot be handled by normal means. Fuel assemblies that cannot be handled by normal means due to fuel cladding damage are considered FUEL DEBRIS.

Term	Definition
DAMAGED FUEL CONTAINER (DFC)	DFCs are specially designed enclosures for DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS which permit gaseous and liquid media to escape while minimizing dispersal of gross particulates. DFCs authorized for use in the HI-STORM 100 System are as follows: 1. Holtec Dresden Unit 1/Humboldt Bay design 2. Transnuclear Dresden Unit 1 design 3. Holtec Generic BWR design 4. Holtec Generic PWR design
DAMAGED FUEL ISOLATOR (DFI)	DFIs are specially designed barriers installed at the top and bottom of the storage cell space which permit flow of gaseous and liquid media while preventing the potential migration of fissile material from fuel assemblies with cladding damage. DFIs are used ONLY with damaged fuel assemblies which can be handled by normal means and whose structural integrity is such that geometric rearrangement of fuel is not expected. Damaged fuel stored in DFIs may contain missing or partial fuel rods and/or fuel rods with known or suspected cladding defects greater than hairline cracks or pinhole leaks.
FUEL DEBRIS	FUEL DEBRIS is ruptured fuel rods, severed rods, loose fuel pellets, containers or structures that are supporting these loose fuel assembly parts, or fuel assemblies with known or suspected defects which cannot be handled by normal means due to fuel cladding damage.
FUEL BUILDING	The FUEL BUILDING is the site-specific power plant facility, governed by the regulations of 10 CFR Part 50, where the loaded OVERPACK or TRANSFER CASK is transferred to or from the transporter.

Term	Definition
GROSSLY BREACHED SPENT FUEL ROD	Spent nuclear fuel rod with a cladding defect that could lead to the release of fuel particulate greater than the average size fuel fragment for that particular assembly. A gross cladding breach may be confirmed by visual examination, through a review of reactor operating records indicating the presence of heavy metal isotopes, or other acceptable inspection means.
INTACT FUEL ASSEMBLY	INTACT FUEL ASSEMBLIES are fuel assemblies without known or suspected cladding defects greater than pinhole leaks or hairline cracks and which can be handled by normal means. Fuel assemblies without fuel rods in fuel rod locations shall not be classified as INTACT FUEL ASSEMBLIES unless dummy fuel rods are used to displace an amount of water greater than or equal to that displaced by the fuel rod(s) in the active region. INTACT FUEL ASSEMBLIES may contain integral fuel absorber rods (IFBA) in PWR fuel, or burnable poison rods in BWR fuel.
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on an OVERPACK or TRANSFER CASK while it is being loaded with fuel assemblies. LOADING OPERATIONS begin when the first fuel assembly is placed in the MPC and end when the OVERPACK or TRANSFER CASK is suspended from or secured on the transporter. LOADING OPERATIONS does not include MPC TRANSFER.
MINIMUM ENRICHMENT	MINIMUM ENRICHMENT is the minimum assembly average enrichment. Natural uranium and low enrichment blankets are not considered in determining minimum enrichment.
MULTI-PURPOSE CANISTER (MPC)	MPCs are the sealed spent nuclear fuel canisters which consist of a honeycombed fuel basket contained in a cylindrical canister shell which is welded to a baseplate, lid with welded port cover plates, and closure ring. The MPC provides the confinement boundary for the contained radioactive materials.

Term	Definition
MPC TRANSFER	MPC TRANSFER begins when the MPC is lifted off the TRANSFER CASK bottom lid and ends when the MPC is supported from beneath by the OVERPACK or VVM (or the reverse).
NON-FUEL HARDWARE	NON-FUEL HARDWARE is defined as Burnable Poison Rod Assemblies (BPRAs), Thimble Plug Devices (TPDs), Control Rod Assemblies (CRAs), Axial Power Shaping Rods (APSRs), Wet Annular Burnable Absorbers (WABAs), Rod Cluster Control Assemblies (RCCAs), Control Element Assemblies (CEAs), Neutron Source Assemblies (NSAs), water displacement guide tube plugs, orifice rod assemblies, instrument tube tie rods (ITTRs), vibration suppressor inserts, and components of these devices such as individual rods.
OVERPACK	OVERPACKs are the casks which receive and contain the sealed MPCs for interim storage on the ISFSI. They provide gamma and neutron shielding, and in some versions, may provide for ventilated air flow to promote heat transfer from the MPC to the environs. The term OVERPACK does not include the TRANSFER CASK.
PLANAR-AVERAGE INITIAL ENRICHMENT	PLANAR AVERAGE INITIAL ENRICHMENT is the average of the distributed fuel rod initial enrichments within a given axial plane of the assembly lattice.
REDUNDANT PORT COVER DESIGN	REDUNDANT PORT COVER DESIGN refers to two independent port cover plates per port opening, where each port cover plate contains multiple pass closure welds.

Term	Definition
REPAIRED/RECONSTITUTED FUEL ASSEMBLY	Spent nuclear fuel assembly which contains dummy fuel rod(s) that displaces an amount of water greater than or equal to the original fuel rod(s) and/or which contains structural repairs so it can be handled by normal means. If irradiated dummy stainless steel rods are present in the fuel assembly, the dummy/replacement rods will be considered in the site specific dose calculations.
SPENT FUEL STORAGE CASKS (SFSCs)	SFSCs are containers approved for the storage of spent fuel assemblies at the ISFSI. The HI-STORM 100 SFSC System consists of the OVERPACK/VVM and its integral MPC.
STORAGE OPERATIONS	STORAGE OPERATIONS include all licensed activities that are performed at the ISFSI while an SFSC containing spent fuel is situated within the ISFSI perimeter. STORAGE OPERATIONS does not include MPC TRANSFER.
TRANSFER CASK	TRANSFER CASKs are containers designed to contain the MPC during and after loading of spent fuel assemblies and to transfer the MPC to or from the OVERPACK/VVM. The HI-STORM 100 System employs either the 125-Ton, the 100-Ton HI-TRAC TRANSFER CASK or the HI-TRAC MS.
TRANSPORT OPERATIONS	TRANSPORT OPERATIONS include all licensed activities performed on an OVERPACK or TRANSFER CASK loaded with one or more fuel assemblies when it is being moved after LOADING OPERATIONS or before UNLOADING OPERATIONS. TRANSPORT OPERATIONS begin when the OVERPACK or TRANSFER CASK is first suspended from or secured on the transporter and end when the OVERPACK or TRANSFER CASK is at its destination and no longer secured on or suspended from the transporter. TRANSPORT OPERATIONS includes MPC TRANSFER.

Term	Definition
UNDAMAGED FUEL ASSEMBLY	UNDAMAGED FUEL ASSEMBLY is: a) a fuel assembly without known or suspected cladding defects greater than pinhole leaks or hairline cracks and which can be handled by normal means; or b) a BWR fuel assembly with an intact channel, a maximum planar average initial enrichment of 3.3 wt% U-235, without known or suspected GROSSLY BREACHED SPENT FUEL RODS, and which can be handled by normal means. An UNDAMAGED FUEL ASSEMBLY may be a REPAIRED/ RECONSTITUTED FUEL ASSEMBLY.
UNLOADING OPERATIONS	UNLOADING OPERATIONS include all licensed activities on an SFSC to be unloaded of the contained fuel assemblies. UNLOADING OPERATIONS begin when the OVERPACK or TRANSFER CASK is no longer suspended from or secured on the transporter and end when the last fuel assembly is removed from the SFSC. UNLOADING OPERATIONS does not include MPC TRANSFER.
UNVENTILATED OVERPACK	The UNVENTILATED OVERPACK is an aboveground OVERPACK which receives and contains the sealed MPC for interim storage at the ISFSI. The UNVENTILATED OVERPACK design is characterized by its absence of inlet and outlet ventilation passages.
VENTILATED OVERPACK	The VENTILATED OVERPACK is an aboveground OVERPACK which receives and contains the sealed MPC for interim storage at the ISFSI. The VENTILATED OVERPACK provides passages for airflow to promote heat transfer from the MPC.
ZR	ZR means any zirconium-based fuel cladding or fuel channel material authorized for use in a commercial nuclear power plant reactor.

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.

(continued)

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.

(continued)

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 can fail to be 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 HI-STORM 100 System 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 HI-STORM 100 System 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.

(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	12 hours
	AND	
	B.2 Perform Action B.2	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.

(continued)

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 Complete action B.1. AND B.2 Complete action B.2.	12 hours 36 hours

When a system is determined not to 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, Conditions A and B are exited, and therefore, the Required Actions of Condition B may be terminated.

(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 Complete action B.1. AND B.2 Complete 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.

(continued)

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, Surveillance Requirement (SR) Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each SR. 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 an SR satisfied, SR 3.0.4 imposes no restriction.

(continued)

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 interval specified in the 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 or variables are outside specified limits, or the facility 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)

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 within 12 hours 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.

2 APPROVED CONTENTS

2.1 Fuel Specifications and Loading Conditions

2.1.1 Fuel To Be Stored In MPC-32M

a. UNDAMAGED FUEL ASSEMBLIES, DAMAGED FUEL ASSEMBLIES, FUEL DEBRIS, and NON-FUEL HARDWARE meeting the limits specified in Table 2-1 and other referenced tables may be stored in MPC- 32M.

b. For MPCs partially loaded with stainless steel clad fuel assemblies, all remaining fuel assemblies in the MPC shall meet the decay heat generation limit for the stainless steel clad fuel assemblies.

c. INTACT FUEL ASSEMBLIES, UNDAMAGED FUEL ASSEMBLIES, DAMAGED FUEL ASEMBLIES, FUEL DEBRIS and NON-FUEL HARDWARE meeting the limits specified in Appendix B Table 2-1 and other referenced Appendix B tables for MPC-24/24E/24EF/32/32F/68/68F/68FF/68M may be stored in the applicable MPC in the HI-STORM 100S Version E.

d. INTACT FUEL ASSEMBLIES, UNDAMAGED FUEL ASSEMBLIES, FUEL DEBRIS, DAMAGED FUEL ASSEMBLIES and NON-FUEL HARDWARE meeting the limits specified in Appendix B Table 2-1 and other referenced Appendix B tables for the MPC-68 may be stored in the MPC-68 version 1 in the HI-STORM 100S Version E.

e. INTACT FUEL ASSEMBLIES, UNDAMAGED FUEL ASSEMBLIES, FUEL DEBRIS, DAMAGED FUEL ASSEMBLIES and NON-FUEL HARDWARE meeting the limits specified in Appendix B Table 2-1 and other referenced Appendix B tables for the MPC-32 may be stored in the MPC-32 version 1 in the HI-STORM 100 Version E.

2.1.2 Fuel Loading

Fuel assembly decay heat limits and other restrictions related to DAMAGED FUEL, FUEL DEBRIS, and NON-FUEL HARDWARE are specified in Section 2.2. Cell identification for MPC-32M is in Figure 2-1.

Table 2-1 (page 1 of 4)

Fuel Assembly Limits

I. MPC MODEL: MPC-32M

A. Allowable Contents

1. Uranium oxide, PWR UNDAMAGED FUEL ASSEMBLIES listed in Table 2-2, with or without NON-FUEL HARDWARE and meeting the following specifications (Note 1):

a. Cladding Type:	ZR for all fuel assembly array/class except, Stainless Steel (SS) for 14x14D and 15x15G fuel assembly array/class
b. Maximum Initial Enrichment:	5.0 wt. % U-235
c. Post-irradiation Cooling Time and Average Burnup Per Assembly:	
i. All Array/Classes	Zr clad: Cooling time ≥ 1 year and average burnup ≤ 68,200 MWD/MTU. SS clad: Cooling time ≥ 9 years and ≤ 30,000 MWD/MTU or ≥ 20 years and ≤ 40,000MWD/MTU
ii. NON-FUEL HARDWARE	As specified in Table 2-3.

Table 2-1 (page 2 of 4)

Fuel Assembly Limits

I. MPC MODEL: MPC-32M stored in HI-STORM 100S Version E SFSC (cont'd)

A. Allowable Contents (cont'd)

d. Decay Heat Per Fuel Storage Location:	
i. Array/Classes 14x14D and 15x15G	≤ 500 Watts.
ii. All Other Array/Classes	As specified in Section 2.2.
e. Fuel Assembly Length	≤ 176.8 inches (nominal design)
f. Fuel Assembly Width	≤ 8.54 inches (nominal design)
g. Fuel Assembly Weight	≤ 2,050 lbs (including NON-FUEL HARDWARE)

Table 2-1 (page 3 of 4)

Fuel Assembly Limits

I. MPC MODEL: MPC-32M (cont'd)

A. Allowable Contents (cont'd)

2. Uranium oxide, PWR DAMAGED FUEL ASSEMBLIES and FUEL DEBRIS, with or without NON-FUEL HARDWARE, placed in DAMAGED FUEL CONTAINERS. Uranium oxide PWR DAMAGED FUEL ASSEMBLIES whose damage is limited such that the fuel assembly is able to be handled by normal means and whose structural integrity remains intact to the extent that geometric rearrangement of fuel is not expected, may be placed in basket cell locations containing top and bottom DAMAGED FUEL ISOLATORS. Uranium oxide PWR DAMAGED FUEL ASSEMBLIES and FUEL DEBRIS shall meet the criteria specified in Table 2-2 and meet the following specifications (Note 1):

a. Cladding Type:	ZR for all fuel assembly array/class except, Stainless Steel (SS) for 14x14D and 15x15G fuel assembly array/class
b. Maximum Initial Enrichment:	5.0 wt. % U-235
c. Post-irradiation Cooling Time and Average Burnup Per Assembly:	
i. All Array/Classes	Zr clad: Cooling time ≥ 1 year and average burnup ≤ 68,200 MWD/MTU. SS clad: Cooling time ≥ 9 years and ≤ 30,000 MWD/MTU or ≥ 20 years and ≤ 40,000MWD/MTU
ii. NON-FUEL HARDWARE	As specified in Table 2-3.

Table 2-1 (page 4 of 4) Fuel
Assembly Limits

I. MPC MODEL: MPC-32M stored in HI-STORM 100S Version E SFSC (cont'd)

A. Allowable Contents (cont'd)

d. Decay Heat Per Fuel Storage Location:	
i. Array/Classes 14x14D and 15x15G	≤ 500 Watts.
ii. All Other Array/Classes	As specified in Section 2.2.
e. Fuel Assembly Length	≤ 176.8 inches (nominal design)
f. Fuel Assembly Width	≤ 8.54 inches (nominal design)
g. Fuel Assembly Weight	≤ 2,050 lbs (including NON-FUEL HARDWARE and DFC)

B. Quantity per MPC: Up to sixteen (16) DAMAGED FUEL ASSEMBLIES stored using DAMAGED FUEL ISOLATORS or DAMAGED FUEL CONTAINERS and/or FUEL DEBRIS in DAMAGED FUEL CONTAINERS, stored in fuel storage locations in Table 2-5. The remaining fuel storage locations may be filled with PWR UNDAMAGED FUEL ASSEMBLIES meeting the applicable specifications.

C. One NSA is permitted for loading.

Note 1: Fuel assemblies containing BPRAs, TPDs, WABAs, water displacement guide tube plugs, orifice rod assemblies, or vibration suppressor inserts, with or without ITTRs, may be stored in any fuel storage location.

Table 2-2 (page 1 of 4)

PWR FUEL ASSEMBLY CHARACTERISTICS FOR MPC-32M (Note 1)

Fuel Assembly Array/Class	**14x14A**	**14x14B**	**14x14C**	**14x14D**
No. of Fuel Rod Locations	179	179	176	180
Fuel Rod Clad O.D. (in.)	≥ 0.400	≥ 0.417	≥ 0.440	≥ 0.422
Fuel Rod Clad I.D. (in.)	≤ 0.3514	≤ 0.3734	≤ 0.3880	≤ 0.3890
Fuel Pellet Dia. (in.)(Note 3)	≤ 0.3444	≤ 0.3659	≤ 0.3805	≤ 0.3835
Fuel Rod Pitch (in.)	≤ 0.556	≤ 0.556	≤ 0.580	≤ 0.556
Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤ 144
No. of Guide and/or Instrument Tubes	17	17	5 (Note 2)	16
Guide/Instrument Tube Thickness (in.)	≥ 0.017	≥ 0.017	≥ 0.038	≥ 0.0145

Table 2-2 (page 2 of 4)

PWR FUEL ASSEMBLY CHARACTERISTICS FOR MPC-32M (Note 1)

Fuel Assembly Array/Class	**15x15A**	**15x15B**	**15x15C**	**15x15D**	**15x15E**	**15x15F**
No. of Fuel Rod Locations	204	204	204	208	208	208
Fuel Rod Clad O.D. (in.)	≥ 0.418	≥ 0.420	≥ 0.417	≥ 0.430	≥ 0.428	≥ 0.428
Fuel Rod Clad I.D. (in.)	≤ 0.3660	≤ 0.3736	≤ 0.3640	≤ 0.3800	≤ 0.3790	≤ 0.3820
Fuel Pellet Dia. (in.) (Note 3)	≤ 0.3580	≤ 0.3671	≤ 0.3570	≤ 0.3735	≤ 0.3707	≤ 0.3742
Fuel Rod Pitch (in.)	≤ 0.550	≤ 0.563	≤ 0.563	≤ 0.568	≤ 0.568	≤ 0.568
Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤150	≤ 150	≤ 150
No. of Guide and/or Instrument Tubes	21	21	21	17	17	17
Guide/Instrument Tube Thickness (in.)	≥ 0.0165	≥ 0.015	≥ 0.0165	≥ 0.0150	≥ 0.0140	≥ 0.0140

Table 2-2 (page 3 of 4)

PWR FUEL ASSEMBLY CHARACTERISTICS FOR MPC-32M (Note 1)

Fuel Assembly Array/ Class	**15x15G**	**15x15H**	**15x15I**	**16x16A**	**16x16B**	**16x16C**
No. of Fuel Rod Locations	204	208	216	236	236	235
Fuel Rod Clad O.D. (in.)	≥ 0.422	≥ 0.414	≥ 0.413	≥ 0.382	≥ 0.374	≥ 0.374
Fuel Rod Clad I.D. (in.)	≤ 0.3890	≤ 0.3700	≤ 0.367	≤ 0.3350	≤ 0.3290	≤ 0.3290
Fuel Pellet Dia. (in.) (Note 3)	≤ 0.3825	≤ 0.3622	≤ 0.360	≤ 0.3255	≤ 0.3225	≤ 0.3225
Fuel Rod Pitch (in.)	≤ 0.563	≤ 0.568	≤ 0.550	≤ 0.506	≤ 0.506	≤ 0.485
Active Fuel Length (in.)	≤ 144	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150
No. of Guide and/or Instrument Tubes	21	17	9 (Note 4)	5 (Note 2)	5 (Note 2)	21
Guide/Instrument Tube Thickness (in.)	≥ 0.0145	≥ 0.0140	≥ 0.0140	≥ 0.0350	≥ 0.0400	≥ 0.0157

Table 2-2 (page 4 of 5)

PWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/ Class	**17x17A**	**17x17B**	**17x17C**
No. of Fuel Rod Locations	264	264	264
Fuel Rod Clad O.D. (in.)	≥ 0.360	≥ 0.372	≥ 0.377
Fuel Rod Clad I.D. (in.)	≤ 0.3150	≤ 0.3310	≤ 0.3330
Fuel Pellet Dia. (in.) (Note 3)	≤ 0.3088	≤ 0.3232	≤ 0.3252
Fuel Rod Pitch (in.)	≤ 0.496	≤ 0.496	≤ 0.502
Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150
No. of Guide and/or Instrument Tubes	25	25	25
Guide/Instrument Tube Thickness (in.)	≥ 0.016	≥ 0.014	≥ 0.020

Notes:

1. All dimensions are design nominal values. Maximum and minimum dimensions are specified to bound variations in design nominal values among fuel assemblies within a given array/class.
2. Each guide tube replaces four fuel rods.
3. Annular fuel pellets are allowed in the top and bottom 12" of the active fuel length.
4. One Instrument Tube and eight Guide Bars (Solid ZR)

Table 2-3
MPC-32M NON-FUEL HARDWARE COOLING AND AVERAGE BURNUP
(Notes 1 and 2)

Post-irradiation Cooling Time (years)	**Inserts** (Note 3) **Burnup (MWD/MTU)**	**TPD Burnup** (Note 4) **(MWD/MTU)**	**Control Component** (Note 5)**, NSA Burnup (MWD/MTU)**
≥ 1	≤ 60,000	≤ 225,000	NA (Note 6)
≥ 2	-	-	≤ 630,000

Notes:
1. Burnups for NON-FUEL HARDWARE are to be determined based on the burnup and uranium mass of the fuel assemblies in which the component was inserted during reactor operation.
2. Non-fuel hardware burnup and cooling times are not applicable to ITTRs since they are installed post irradiation.
3. Includes Burnable Poison Rod Assemblies (BPRAs), Wet Annular Burnable Absorbers (WABAs), and vibration suppressor inserts.
4. Includes Thimble Plug Devices (TPDs), water displacement guide tube plugs and orifice rod assemblies.
5. Includes Axial Power Shaping Rods (APSRs), Control Rod Assemblies (CRAs), Control Element Assemblies (CEAs) and Rod Cluster Control Assemblies (RCCAs).
6. NA means not authorized for loading at this cooling time.

Table 2-4
BURNUP AND COOLING TIME FUEL QUALIFICATION FOR MPC-32M

Cell Decay Heat Load Limit (kW) (Notes 1, 2, 3)	Polynomial Coefficients, see Paragraph 2.II.1.5.2			
	A	B	C	D
≤ 0.83	6.57083E-14	-4.02593E-09	1.47107E-04	8.01647E-01
0.83 < decay heat ≤ 1.25	4.11020E-14	-4.62813E-09	2.17444E-04	-5.55545E-01
1.25 < decay heat ≤ 1.46	1.21147E-14	-1.08013E-09	8.66361E-05	4.04455E-01
1.46 < decay heat ≤ 1.81	3.82652E-15	-2.38729E-10	4.75134E-05	6.36443E-01
1.81 < decay heat ≤ 3.26	3.76103E-16	4.83486E-11	1.74805E-05	6.53455E-01

The burnup and cooling time for every fuel loaded into the MPC-32M must satisfy the following equation:

$$Ct = A \cdot Bu^3 + B \cdot Bu^2 + C \cdot Bu + D$$

where,

Ct = Minimum cooling time (years),

Bu = Assembly-average burnup (MWd/mtU),

A, B, C, D = Polynomial coefficients listed in Table 2-4

Notes:

1. Decay heat per fuel assembly is presented
2. A decay heat value that is equal to or greater than the appropriate decay heatload limit
3. The polynomial coefficients associated for decay heat load “1.81 < decay heat ≤ 3.26” are applied to the UNVENTILATED OVERPACK MPC-32M decay heat load range of “0.83 < decay heat ≤ 3.26”

Figure 2-1: Cell Identification for MPC-32M

2.2 Decay Heat Limits for ZR-Clad Fuel

For MPC-24/24E/24EF/32/32F/68/68F/68FF/68M decay heat, burnup, and cooling time limits from Appendix B Section 2.2 apply for ZR clad fuel. Decay heat limits from Appendix B Table 2-1 apply for SS clad fuel.

For MPC-32 Version 1 decay heat, burnup and cooling time limits for MPC-32 from Appendix B Section 2.2 apply for ZR clad fuel. Decay heat limits for MPC-32 from Appendix B Table 2-1 apply for SS clad fuel.

For MPC-68 Version 1 decay heat, burnup and cooling time limits for MPC-68 from Appendix B Section 2.2 apply for ZR clad fuel. Decay heat limits for MPC-68 from Appendix B Table 2-1 apply for SS clad fuel.

Decay heat limits for ZR clad for storage in MPC-32M in HI-STORM 100S Version E are provided in the following subsections. Burnup and cooling time limits for the MPC-32M are provided in Table 2-4.

2.2.1 Regionalized Fuel Loading Decay Heat Limits for ZR-Clad Fuel for MPC-32M for a VENTILATED OVERPACK

The maximum allowable decay heat per fuel storage location for intact or undamaged fuel assemblies in regionalized loading is determined using the following equations:

$Q(X) = 2 \times Q_0 / (1 + X^y)$

$y = 0.23 / X^{0.1}$

$q_2 = Q(X) / (n_1 \times X + n_2)$

$q_1 = q_2 \times X$

Where:

Q_0 = Maximum uniform storage MPC decay heat (38 kW)

X = Inner region to outer region assembly decay heat ratio

$(0.5 \leq X \leq 3)$

n_1 = Number of storage locations in inner region from Table 2-7.

n_2 = Number of storage locations in outer region from Table 2-7.

Allowable heat loads for Damaged Fuel and Fuel Debris are shown in Table 2-5. Allowable storage locations for Damaged Fuel in DFIs and Damaged Fuel or Fuel Debris in DFCs are shown in Table 2-5. Cell heat load limits and total heat load limits may need to be adjusted in accordance with Section 2.2.4.

2.2.2 Discrete Loading Pattern Decay Heat Limits for ZR-Clad Fuel in MPC-32M for a VENTILATED OVERPACK

Discrete decay heat loading patterns (Patterns A and B) for MPC-32M are shown in Figures 2-2 and 2-3. Figures 2-2 and 2-3 provide the maximum allowable decay heat loads per fuel storage location. Table 2-2 provides the maximum total allowable decay heat load and maximum allowable quadrant decay heat load for Figures 2-2 and 2-3. Cell heat load limits, quadrant heat load limits and total heat load limit may need to be adjusted in accordance with Section 2.2.4.

2.2.3 Compliance with Maximum Fuel Storage Location Decay Heat Limits

When complying with the maximum fuel storage location decay heat limits, users must account for the decay heat from both the fuel assembly and any NON-FUEL HARDWARE, as applicable for the particular fuel storage location, to ensure the decay heat emitted by all contents in a storage location does not exceed the limit.

2.2.4 Variable Fuel Height for MPC-32M

2.2.4.1 For fuel with a longer active fuel length than the reference fuel (144 in), the total heat load, quadrant heat load limits and specific heat load limits in each cell, may be increased by the ratio SQRT(L/144), where L is the active length of the fuel in inches.

2.2.4.2 For fuel with a shorter active fuel length than the reference fuel (144 in), the total heat load, quadrant heat load limits and specific heat load limits in each cell, shall be reduced linearly by the ratio L/144, where L is the active fuel length of the fuel in inches.

2.2.5 Decay Heat Limits for MPC-32M for the UNVENTILATED OVERPACK

Tables 2-9 and 2-10 provide the maximum allowable decay heat per fuel storage location for MPC-32M for UNVENTILATED OVERPACK.

A minor deviation from the prescribed loading pattern in an MPC's permissible contents to allow one slightly thermally-discrepant fuel assembly per quadrant to be loaded as long as the peak cladding temperature for the MPC remains below the ISG-11 Rev 3 requirements is permitted for essential dry storage campaigns to support decommissioning.

Table 2-5: Allowable Heat Loads and Soluble Boron Requirements for MPC-32M

Row No.	DFC/DFI (Note 1)	Number of DFC/DFI Locations	Locations/Storage Cell Numbers (Note 2)	Penalty on per storage cell heat load limit (Note 3)	Min. Soluble Boron Content
1	DFC	4	2, 11, 22, 31 (NOTE 4)	0%	Table 3-8
2		8	1, 4, 5, 10, 23, 28, 29, 32	5%	Table 3-7
3		12	1, 2, 4, 5, 10, 16, 17, 23, 28, 29, 31, 32	5%	Table 3-7
4		16	1, 2, 3, 4, 5, 10, 11, 16, 17, 22, 23, 28, 29, 30, 31, 32 (NOTE 4)	0%	Table 3-8
5		16	1, 2, 3, 4, 5, 10, 11, 16, 17, 22, 23, 28, 29, 30, 31, 32	5%	Table 3-8
6	DFI	4	2, 11, 22, 31	10%	Table 3-6
7		12	1, 2, 4, 5, 10, 16, 17, 23, 28, 29, 31, 32	40%	Table 3-6
8		16	1, 2, 3, 4, 5, 10, 11, 16, 17, 22, 23, 28, 29, 30, 31, 32	40%	Table 3-6
9	DFI or DFC	16	1, 2, 3, 4, 5, 10, 11, 16, 17, 22, 23, 28, 29, 30, 31, 32	DFCs – 5% DFIs – 40%	Table 3-8

Note 1: Damaged fuel assemblies or fuel debris can be loaded in DFCs while only damaged fuel assemblies that can be handles by normal means can be loaded in DFIs.

Note 2: DFCs/DFIs are allowed for storage in certain basket peripheral locations as defined herein. Basket storage cell numbers are identified in Figure 2-1.

Note 3: Heat load penalties are applicable to ONLY those cells where DFCs/DFIs are located and are applied to the allowable undamaged fuel assembly decay heat limit in that storage cell location. The penalties remain the same for all regionalized patterns and discrete loading patterns.

Note 4: Storage cell locations 6, 9, 24, 27 all must remain empty.

Table 2-6: Maximum Allowable Decay Heat Loads for MPC-32M (Note 2)

Heat Load Pattern	Maximum Total Decay Heat Load (kW)	Maximum Quadrant (Note 1) Decay heat Load (kW)
Figure 2-2 (Discrete Loading Pattern A)	40.0	10.0
Figure 2-3 (Discrete Loading Pattern B)	39.0	9.75
Regionalized Loading per Section 2.2.1	41.2	N/A

Notes:

1. Figure 2-1 identifies cell locations. Table 2-8 lists cell locations in each quadrant.
2. Quadrant heat load limits and total heat load limits may need to be adjusted in accordance with Section 2.2.4.

Table 2-7: MPC-32M Fuel Storage Regions

MPC	Number of Storage Cells		Storage Cell IDs (Note1)	
	Inner Region (n1)	Outer Region (n2)	Inner Region	Outer Region
MPC-32M	12	20	7, 8, 12 through 15, 18 through 21, 25 and 26	All other locations

Note:

1. See Figure 2-1 for storage cell numbering for MPC-32M.

Table 2-8: MPC-32M Fuel Storage Quadrants

Quadrant	Storage Cell IDs (Note 1)
1	3, 4, 8, 9, 10, 14, 15, 16
2	20, 21, 22, 26, 27, 28, 31, 32
3	17, 18, 19, 23, 24, 25, 29, 30
4	1, 2, 5, 6, 7, 11, 12, 13

Note:

1. See Figure 2-1 for storage cell numbering for MPC-32M.

Table 2-9: MPC-32 Heat Load Data for UNVENTILATED OVERPACK (Note 3)

Number of Regions: 2			
Number of Storage Cells: 32			
Maximum Total Heat Load (kW): 25			
Maximum Section Heat Load (kW): 3.125			
Region No. (Note 1)	Decay Heat Limit per Cell, kW (Note 2)	Number of Cells per Region	Decay Heat Limit per Region, kW
1 (Inner)	0.781	12	9.375
2 (Outer)	0.781	20	15.625
Note 1: Figure 2-1 identifies the cell locations. The inner region consists of cells 7, 8,12 through 15,18 through 21, 25 and 26. The outer region is maintained by all other cell locations. Note 2: Heat load limits provided in this table are for reference length fuel assemblies (144 in. active length). Maximum total heat load, maximum quadrant heat load and specific cell heat load limits may need to be adjusted in accordance with Section 2.2.4.			

Table 2-10: MPC-32M Requirements on Developing Regionalized Heat Load Patterns for UNVENTILATED OVERPACK (see Figure 2-1)

1. Total MPC aggregate Heat Load must be equal to 25 kW
2. Maximum Section Heat Load must be equal to 3.125 kW, calculated as defined in Table 2-11, and pattern must be 1/8th symmetric
3. Maximum Heat Load per Cell in Region 1 is 0.781 kW
4. Maximum Heat Load per Cell in Region 2 is 1.562 kW
5. Pattern-specific Heat Loads in a storage cell may need to be adjusted to meet items 1 and 2
6. Pattern-specific Heat Load for storage cells may be determined by reducing the allowable heat load in any Region 1 cell in Table 2-9 by a certain amount (Δ) and adding the same Δ to a single cell or distributed amongst multiple cells in Region 2. i.e. Any reduction of total allowable heat load in Region 1 must be compensated by an equivalent addition in Region 2.

General Notes –

1. Any assembly with a Heat Load less than the limits defined above can be loaded in the applicable cell, provided it meets all other CoC requirements.
2. DFCs/DFIs are permitted in locations denoted in Table 2-12 with the applicable heat load penalties identified therein.

Table 2-11: Section Heat Load Calculations for MPC-32M for UNVENTILATED OVERPACK

Section	Equation for Section Heat Load (Note 1)
Section 1	$Q_3 + Q_4 + Q_8 + ½Q_9 + ½Q_{14}$
Section 2	$Q_{10} + Q_{15} + Q_{16} + ½Q_9 + ½Q_{14}$
Section 3	$Q_{21} + Q_{22} + Q_{28} + ½Q_{20} + ½Q_{27}$
Section 4	$Q_{31} + Q_{32} + Q_{26} + ½Q_{20} + ½Q_{27}$
Section 5	$Q_{29} + Q_{30} + Q_{25} + ½Q_{19} + ½Q_{24}$
Section 6	$Q_{17} + Q_{18} + Q_{23} + ½Q_{19} + ½Q_{24}$
Section 7	$Q_{11} + Q_{12} + Q_5 + ½Q_6 + ½Q_{13}$
Section 8	$Q_1 + Q_2 + Q_7 + ½Q_6 + ½Q_{13}$

Notes

1.) $Q_{X\text{-}Y}$ is the heat load in kW in cell ID (X-Y), identified in Figure 2-1

Table 2-12: DFC and DFI Storage Locations with Heat Load Penalties for MPC-32M for UNVENTILATED OVERPACK

MPC Type	DFC/DFI (Note 1)	Locations/Storage Cell Numbers (Note 2)	Heat Load Penalty (Note 3)	Min. Soluble Boron Content
MPC-32M	DFI	1, 2, 3, 4, 5, 10, 11, 16, 17, 22, 23, 28, 29, 30, 31, 32	40%	Table 3-6
	DFC		5%	Table 3-8
	DFC or DFI		DFCs – 5% DFIs – 40%	

Note 1: Damaged fuel assemblies or fuel debris can be loaded in DFCs while only damaged fuel assemblies that can be handled by normal means can be loaded in DFIs.

Note 2: DFCs/DFIs are allowed for storage in certain basket peripheral locations as defined herein. Basket storage cell numbers are identified in Figure 2-1 for the MPC-32M.

Note 3: Heat load penalties are applicable to ONLY those cells where DFCs/DFIs are located and are applied to the allowable undamaged fuel assembly decay heat limit in that storage cell location. The penalties remain the same for all regionalized patterns and discrete loading patterns.

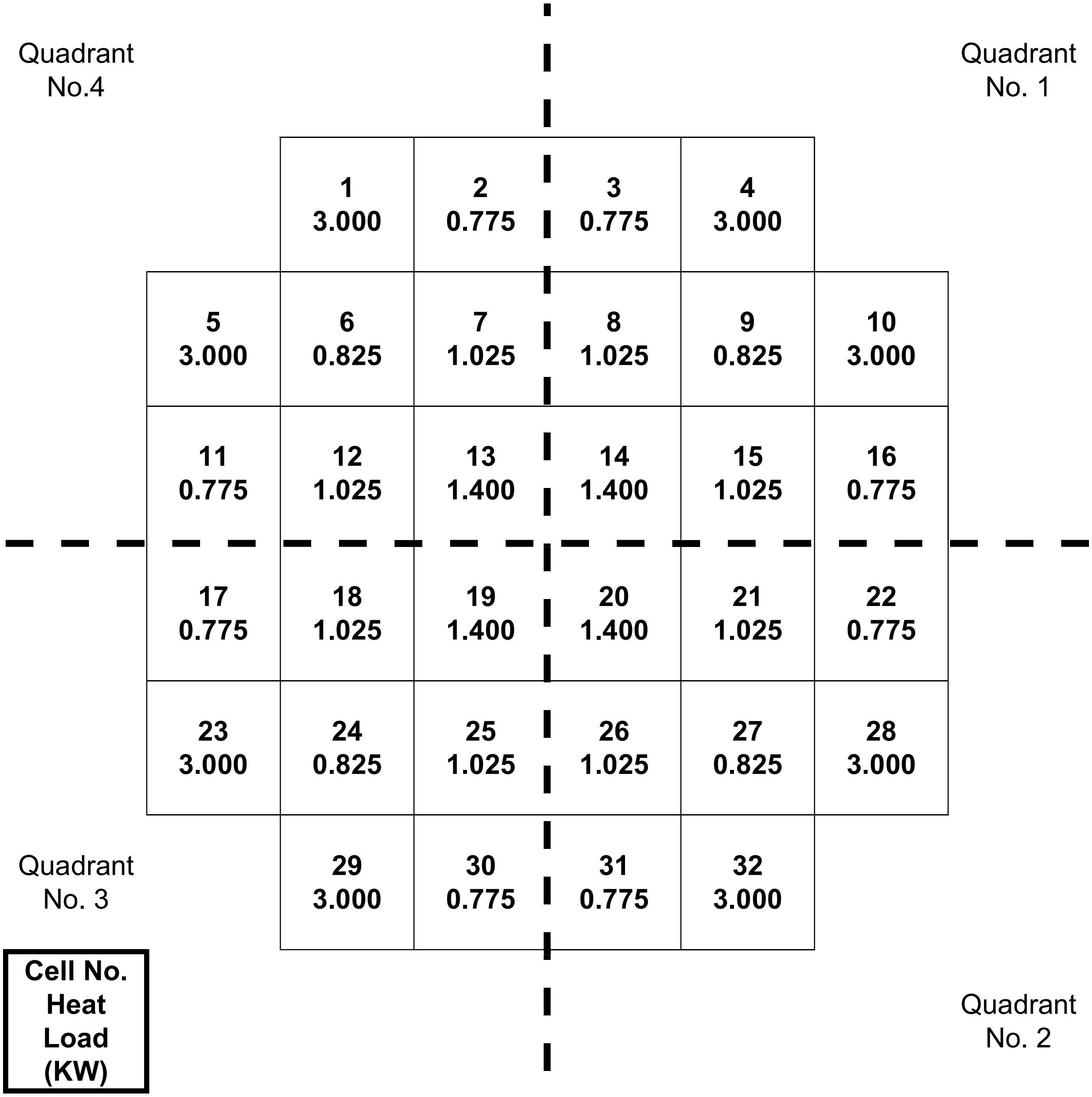

Figure 2-2: Discrete Pattern A Per Cell Allowable Heat Loads (kW) – MPC-32M

*Notes:

1. This figure provides per cell allowable heat loads for MPC-32M with all UNDAMAGED FUEL assemblies.

2. Location of DFCs/ DFIs, applicable cell heat load penalties, and the soluble boron requirements are provided in Table 2-5.

Quadrant No.4

Quadrant No. 1

	1 **3.255**	**2** **0.745**	**3** **0.745**	**4** **3.255**	
5 **3.255**	**6** **0.375**	**7** **0.990**	**8** **0.990**	**9** **0.375**	**10** **3.255**
11 **0.745**	**12** **0.990**	**13** **1.275**	**14** **1.275**	**15** **0.990**	**16** **0.745**
17 **0.745**	**18** **0.990**	**19** **1.275**	**20** **1.275**	**21** **0.990**	**22** **0.745**
23 **3.255**	**24** **0.375**	**25** **0.990**	**26** **0.990**	**27** **0.375**	**28** **3.255**
	29 **3.255**	**30** **0.745**	**31** **0.745**	**32** **3.255**	

Quadrant No. 3

Quadrant No. 2

Cell No.
Heat Load (KW)

Figure 2-3: Discrete Pattern B Per Cell Allowable Heat Loads (kW) – MPC-32M

*Notes:

1. This figure provides per cell allowable heat loads for MPC-32M with all UNDAMAGED FUEL assemblies.

2. Location of DFCs/ DFIs, applicable cell heat load penalties, and the soluble boron requirements are provided in Table 2-5.

3 LIMITING CONDITIONS FOR OPERATION (LCOS) AND SURVEILLANCE REQUIREMENTS (SRS)

3.0 Applicability

Limiting Conditions for Operation (LCO) 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.
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 an SFSC.
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.

Surveillance Requirement (SR) Applicability

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 an SFSC.

3.1 SFSC INTEGRITY

3.1.1 Multi-Purpose Canister (MPC)

LCO 3.1.1 The MPC shall be dry and helium filled.

Tables 3-1 and 3-2 provide decay heat and burnup limits for forced helium dehydration (FHD) and vacuum drying. FHD is not subject to time limits. Vacuum drying of MPCs may be subject to time limits, from the end of bulk water removal until the start of helium backfill, as shown in Tables 3-1 and 3-2.

APPLICABILITY: During TRANSPORT OPERATIONS and STORAGE OPERATIONS.

ACTIONS

---NOTES--

Separate Condition entry is allowed for each MPC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. MPC cavity vacuum drying pressure or demoisturizer exit gas temperature limit not met.	A.1 Perform an engineering evaluation to determine the quantity of moisture left in the MPC.	7 days
	AND	
	A.2 Develop and initiate corrective actions necessary to return the MPC to compliance with Tables 3-1 and 3-2.	30 days

ACTIONS (continued)

B. MPC cavity vacuum drying acceptance criteria not met during allowable time.	B.1 Backfill the MPC cavity with helium to a pressure of at least 0.5 atm.	6 hours
C. MPC helium backfill limit not met.	C.1 Perform an engineering evaluation to determine the impact of helium differential.	72 hours
	AND	
	C.2.1 Develop and initiate corrective actions necessary to return the MPC to an analyzed condition by adding helium to or removing helium from the MPC. OR C.2.2 Develop and initiate corrective actions necessary to demonstrate through analysis, using the models and methods from the HI-STORM FSAR, that all limits for cask components and contents will be met.	14 days
D. MPC helium leak rate limit for vent and drain port cover plate welds or cover plate base metal not met.	D.1 Perform an engineering evaluation to determine the impact of increased helium leak rate on heat removal capability and offsite dose.	24 hours
	AND	
	D.2 Develop and initiate corrective actions necessary to return the MPC to compliance with SR 3.1.1.3.	7 days

E. Required Actions and associated Completion Times not met.	E.1 Remove all fuel assemblies from the SFSC.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	Verify that the MPC cavity has been dried in accordance with the applicable limits in Tables 3-1 and 3-2, within the specified vacuum drying time limits as applicable.	Once, prior to TRANSPORT OPERATIONS
SR 3.1.1.2	Verify MPC helium backfill quantity is within the limit specified in Tables 3-3 and 3-4 for the applicable MPC model. Re-performance of this surveillance is not required upon successful completion of Action C.2.2.	Once, prior to TRANSPORT OPERATIONS
SR 3.1.1.3	Verify that the helium leak rate through the MPC vent and drain port cover plates (confinement welds and the base metal) meets the leaktight criteria of ANSI N14.5-1997. This surveillance does not need to be performed in the MPC utilizing the REDUNDANT PORT COVER DESIGN.	Once, prior to TRANSPORT OPERATIONS

3.1.2 HI-STORM 100S VERSION E SFSC Heat Removal System

LCO 3.1.2 The HI-STORM 100S VERSION E SFSC Heat Removal System shall be operable

---NOTE---

The SFSC Heat Removal System is operable when 50% or more of the inlet and outlet vent areas are unblocked and available for flow or when air temperature requirements are met. This LCO only applies to the VENTILATED OVERPACKs.

APPLICABILITY: During STORAGE OPERATIONS.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each SFSC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SFSC Heat Removal operable but partially (< 50%) blocked	A.1 Remove blockage	N/A
B. SFSC Heat Removal System inoperable.	B.1 Restore SFSC Heat Removal System to operable status.	Table 3-5

C. Required Action B.1 and associated Completion Time not met.	C.1 Measure SFSC dose rates in accordance with the Radiation Protection Program. AND C.2.1 Restore SFSC Heat Removal System to operable status. OR C.2.2 Transfer the MPC into a TRANSFER CASK.	Immediately and once per 12 hours thereafter Table 3-5 Table 3-5

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.2	Verify all OVERPACK inlets and outlet area are free of blockage from solid debris or floodwater.	Table 3-5
	OR	
	For OVERPACKS with installed temperature monitoring equipment, verify that the difference between the average OVERPACK air outlet temperature and ISFSI ambient temperature is $\leq$ 142^{o}F (MPC-32M), or $\leq$ 163^{o}F (MPC-32 Version 1/MPC-68 Version 1), or $\leq$ 155^{o}F (MPC-24/24E/24EF/32/32F), or $\leq$ 137^{o}F (MPC-68/68F/68FF) or $\leq$ 164^{o}F (MPC-68M)	Table 3-5

3.1.3 MPC Cavity Reflooding

LCO 3.1.3 The MPC cavity pressure shall be:
< 110 psig (MPC-32M/32 Version 1/68 Version 1), or
< 100 psig for (MPC-24/24E/24EF/32/32F/68/68F/68FF/68M)

--NOTE--

The LCO is only applicable to wet UNLOADING OPERATIONS.

APPLICABILITY: UNLOADING OPERATIONS prior to and during re-flooding.

ACTIONS

--NOTE--

Separate Condition entry is allowed for each MPC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. MPC cavity pressure not within limit.	A.1 Stop re-flooding operations until MPC cavity pressure is within limit.	Immediately
	<u>AND</u>	
	A.2 Ensure MPC vent port is not closed or blocked.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	Ensure via analysis or direct measurement that MPC cavity pressure is within limit.	Once, prior to MPC re-flooding operations. AND Once every 1 hour thereafter when using direct measurement.

3.1.4 Supplemental Cooling System

LCO 3.1.4 A supplemental cooling system (SCS) shall be operable

--NOTE--

Upon reaching steady state operation, the SCS may be temporarily disabled for a short duration (≤ 7 hours) to facilitate necessary operational evolutions, such as movement of the TRANSFER CASK through a door way, or other similar operation.

APPLICABILITY: This LCO is not applicable to the MPC-68M. This LCO is not applicable to the HI-TRAC MS TRANSFER CASK. For all other MPCs and TRANSFER CASKs, this LCO is applicable when the loaded MPC is in the TRANSFER CASK and:

a. Within 4 hours of the completion of MPC drying operations in accordance with LCO 3.1.1 or within 4 hours of transferring the MPC into the TRANSFER CASK if the MPC is to be unloaded

AND

b. The MPC contains one or more fuel assemblies with an average burnup > 45,000 MWD/MTU

AND

c1. MPC backfilled to higher helium backfill limits in Appendix B Tables 3-3 and 3-4 AND any storage cell decay heat load exceeds 90% of maximum allowable storage cell heat load defined in Appendix B, Section 2.2.1 or 2.2.2 and FSAR Section 2.1.9.1 procedures.

OR

c2. MPC backfilled to lower helium backfill limits in Appendix B Tables 3-3 and 3-4 AND any storage cell heat load exceeds 90% of storage cell heat load limits defined in Appendix B Table 2-16 or 2-17.

OR

c3. MPC-32 Version 1/MPC-68 Version 1 where any storage cell heat load exceeds 90% of storage cell heat load limits defined in Section 2.2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SFSC Supplemental Cooling System inoperable.	A.1 Restore SFSC Supplemental Cooling System to operable status.	7 days
B. Required Action A.1 and associated Completion Time not met.	B.1 Remove all fuel assemblies from the SFSC.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Verify SCS is operable.	2 hours

3.2 SFSC RADIATION PROTECTION.

3.2.1 TRANSFER CASK Surface Contamination.

LCO 3.2.2 Removable contamination on the exterior surfaces of the TRANSFER CASK and accessible portions of the MPC shall each not exceed:

a. 1000 dpm/100 cm^2 from beta and gamma sources

b. 20 dpm/100 cm^2 from alpha sources.

--NOTE--

This LCO is not applicable to the TRANSFER CASK if MPC TRANSFER operations occur inside the FUEL BUILDING.

APPLICABILITY: During TRANSPORT OPERATIONS.

ACTIONS

--NOTE--

Separate Condition entry is allowed for each TRANSFER CASK.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. TRANSFER CASK or MPC removable surface contamination limits not met.	A.1 Restore removable surface contamination to within limits.	7 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.2.1	Verify that the removable contamination on the exterior surfaces of the TRANSFER CASK and accessible portions of the MPC containing fuel is within limits.	Once, prior to TRANSPORT OPERATIONS

3.3 SFSC CRITICALITY CONTROL

3.3.1 Boron Concentration

LCO 3.3.1

The concentration of boron in the water in the MPC shall meet the following limits for the applicable MPC model and the most limiting fuel assembly array/class and classification to be stored in the MPC:

a. MPC-32M: Minimum soluble boron concentration as required by the Tables 3-6 through 3-8, per configurations in Table 2-5.

b. MPC-32/32F and MPC-32 Version 1: Minimum soluble boron concentration as required by Table 3-9

c. MPC-24 with one or more fuel assemblies having an initial enrichment greater than the value in Appendix B Table 2-2 for no soluble boron credit and $\leq$ 5.0 wt% ^{235}U: $\geq$ 400 ppmb

d. MPC-24E or MPC-24EF (all INTACT FUEL ASSEMBLIES) with one or more fuel assemblies having an initial enrichment greater than the value in Appendix B Table 2-2 for no soluble boron credit and $\leq$ 5.0 wt% ^{235}U: $\geq$ 300 ppmb

e. MPC-24E or MPC-24EF (one or more DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS) with one or more fuel assemblies having an initial enrichment > 4.0 wt% ^{235}U and $\leq$ 5.0 wt% ^{235}U: $\geq$ 600 ppmb

APPLICABILITY:

During PWR fuel LOADING OPERATIONS with fuel and water in the MPC

AND

During PWR fuel UNLOADING OPERATIONS with fuel and water in the MPC.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each MPC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Boron concentration not within limit.	A.1 Suspend LOADING OPERATIONS or UNLOADING OPERATIONS.	Immediately
	AND	
	A.2 Suspend positive reactivity additions.	Immediately
	AND	
	A.3 Initiate action to restore boron concentration to within limit.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
NOTE This surveillance is only required to be performed if the MPC is submerged in water or if water is to be added to, or recirculated through the MPC. SR 3.3.1.1 Verify boron concentration is within the applicable limit using two independent measurements.	Once, within 4 hours prior to entering the Applicability of this LCO. AND Once per 48 hours thereafter.

Table 3-1: MPC Cavity Drying Limits for VENTILATED OVERPACK (Note 7)

Fuel Burnup (MWD/MTU)	MPC Heat Load (kW) (Note 12)	Method of Moisture Removal (Notes 1, 2, and 3)
All Assemblies ≤ 45,000	≤ 26 (MPC-32 Version 1, MPC-68 Version 1)	VDS[Note 5] or FHD[Note 6]
	≤ 36.9 (MPC-32 Version 1, MPC-68 Version 1)[Note 6]	VDS[Note 8] or FHD
	≤ 41.2 (MPC-32M)[Note 9]	VDS or FHD
	≤ 40 (MPC-32M)[Note 10]	
One or more assemblies > 45,000	≤ 27 (MPC-32M)	VDS[Note 4]
	≤ 36.9 (MPC-32 Version 1, MPC-68 Version 1)[Note 6]	VDS[Note 8] or FHD
	≤ 41.2 (MPC-32M)[Note 9]	VDS[Note 8,11] or FHD
	≤ 40 (MPC-32M)[Note 10]	

Notes:

1. VDS means a vacuum drying system. The acceptance criterion when using a VDS is MPC cavity pressure shall be ≤ 3 torr for ≥ 30 minutes.

2. FHD means a forced helium dehydration system. The acceptance criterion when using an FHD system is the gas temperature exiting the demoisturizer shall be ≤ 21°F for ≥ 30 minutes or the gas dew point exiting the MPC shall be ≤ 22.9°F for ≥ 30 minutes.

3. Vacuum drying of the system must be performed with the annular gap between the MPC and the TRANSFER CASK filled with water.

4. The maximum allowable decay heat per fuel storage location is 0.843 kW for MPC-32M.

5. Maximum allowable storage cell heat load is 0.812 kW (MPC-32 Version 1) and 0.382 kW (MPC-68 Version 1).

6. Maximum per assembly allowable heat loads under uniform or regionalized storage defined in Appendix B, Section 2.2.1 or 2.2.2.

7. For limits applicable to MPC-24/24E/24EF/32/32F/68/68F/68FF/68M see Appendix B Tables 3-1 and

3-2.

8. Vacuum drying of the MPC must be performed using cycles of the drying system, according to the guidance contained in ISG-11 Revision 3. The time limit for these cycles shall be determined based on site-specific conditions.

9. Maximum per assembly allowable heat loads defined in Section 2.2.1.

10. Maximum per assembly allowable heat loads defined in Figures 2-2 and 2-3.

11. Applies when any one storage cell heat load is greater than 0.843kW.

12. For MPC-32M, these heat load limits may need to be modified based on fuel height, in accordance with Section 2.2.4.

Table 3-2: MPC-32M Cavity Drying Limits for UNVENTILATED OVERPACK

Fuel Burnup (MWD/MTU)	**MPC Heat Load (kW)**	**Method of Moisture Removal (Notes 1 and 2)**
All burnups	≤ 25 (MPC-32M)[Note 4]	VDS or FHD

Notes:

1. VDS means a vacuum drying system. The acceptance criterion when using a VDS is MPC cavity pressure shall be $\leq$ 3 torr for $\geq$ 30 minutes.

2. FHD means a forced helium dehydration system. The acceptance criterion when using an FHD system is the gas temperature exiting the demoisturizer shall be $\leq$ 21°F for $\geq$ 30 minutes or the gas dew point exiting the MPC shall be $\leq$ 22.9°F for $\geq$ 30 minutes.

3. Vacuum drying of the system must be performed with the annular gap between the MPC and the TRANSFER CASK filled with water.

4. Maximum per assembly allowable heat loads under uniform or regionalized storage defined in Section 2.2.5.

Table 3-3: MPC Helium Backfill Limits for VENTILATED OVERPACK (Notes 1 and 3)

MPC MODEL	LIMIT
MPC-32M (Note 4)	
i. Cask Heat Load ≤ 41.2 kW Regionalized Loading per Section 2.2.1	≥ 43.0 psig and ≤ 46.0 psig
ii. Cask Heat Load ≤ 40.0 kW Discrete Loading Patterns per Section 2.2.2	≥ Note 2 and ≤ 46.8 psig
MPC-32 Version 1/ MPC-68 Version 1	
i. All allowable heat loads per Section 2.2	≥ 49.5 psig and ≤ 52.5 psig

Notes:

1. Helium used for backfill of MPC shall have a purity of ≥ 99.995%. Pressure range is at a reference temperature of 70^{o}F.

2. Minimum permitted helium backfill is equal to: 43.8√(Q/Q')

   Where:

   Q = aggregate heat load for MPC at time of fuel loading (kW)

   Q' = allowable maximum heat load for the canister Table 2-7 For any scenario where Q/Q' ≤ 0.9, 0.9 shall be used.

3. For limits applicable to MPC-24/24E/24EF/32/32F/68/68F/68FF/68M see Appendix B Table 3-3.

4. These heat load limits may need to be modified based on fuel height, in accordance with Section 2.2.4.

Table 3-4: MPC Helium Backfill Limits for UNVENTILATED OVERPACK (Note 1)

MPC MODEL	LIMIT
MPC-32M[Note 2] i. Cask Heat Load ≤ 25 kW - uniformly distributed per Section 2.2.5 or regionalized loading per Section 2.2.5	0.1218 +/-10% g-moles/l OR ≥ 40.0 psig and ≤ 43.0 psig

Notes:

1. Helium used for backfill of MPC shall have a purity of ≥ 99.995%. Pressure range is at a reference temperature of 70°F.
2. These heat load limits may need to be modified based on fuel height, in accordance with Section 2.2.4.

Table 3-5: Completion Time for Actions to Restore SFSC Heat Removal System Operable (Note 1)

MPC Material	MPC Type	Decay Heat Limits per Storage Location	Condition A Completion Time	Condition B Completion Time	Surveillance Frequency
Alloy X Except Duplex [Note3]	MPC-32 Version 1/ MPC-68 Version 1	Section 2.2	8 hrs	24 hrs	24 hrs
Alloy X	MPC-32 Version 1/ MPC-68 Version 1	Section 2.2	8 hrs	16 hrs	16 hrs
Alloy X	MPC-32 Version 1	0.5 kW	24 hrs	64 hrs	30 days
	MPC-68 Version 1	0.264 kW			
	MPC-32M	0.75 kW [Note 2]			
Alloy X Except Duplex [Note 3]	MPC-32M	Section [Note 2] 2.2.1 OR Section [Note 2] 2.2.2	8 hrs	24 hrs	24 hrs
Alloy X	MPC-32M	Section [Note 2] 2.2.1 OR Section [Note 2] 2.2.2	8 hrs	24 hrs	24 hrs

Notes:

1. For limits applicable to MPC-24/24E/24EF/32/32F/68/68F/68FF/68M see Appendix B Table 3-5.
2. For MPC-32M, heat load limits may need to be modified based on fuel height, in accordance with Section 2.2.4.
3. If any component of the MPC is made of duplex, these completion times are not applicable.

Table 3-6: MPC-32M with up to Sixteen DFIs Soluble Boron Requirements (Note 1)

Array/Class	All UNDAMAGED FUEL ASSEMBLIES OR Up to Twelve DAMAGED FUEL ASSEMBLIES using DFI		Thirteen to Sixteen DAMAGED FUEL ASSEMBLIES using DFIs	
	Maximum Initial Enrichment ≤ 4.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment ≤ 4.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)
14x14A/B/C/D, 16x16A/B/C	1000	1500	1100	1600
15x15A/B/C/D/E/ F/G/H/I, 17x17A/B/C	1500	2100	1600	2200

Notes: 1. For maximum initial enrichments between 4.0 wt% and 5.0 wt% ^{235}U, the minimum soluble boron concentration may be determined by linear interpolation between the minimum soluble boron concentrations at 4.0 wt% and 5.0 wt%.

Table 3-7: MPC-32M with up to Twelve DFCs Soluble Boron Requirements (Note 1)

	All UNDAMAGED FUEL ASSEMBLIES OR Up to Eight DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS		Nine to Twelve DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS	
	Maximum Initial Enrichment ≤ 4.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment ≤ 4.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)
14x14A/B/C/D, 16x16A/B/C	1000	1500	1100	1600
15x15A/B/C/D/E/ F/G/H/I, 17x17A/B/C	1500	2100	1500	2200

Notes: 1. For maximum initial enrichments between 4.0 wt% and 5.0 wt% ^{235}U, the minimum soluble boron concentration may be determined by linear interpolation between the minimum soluble boron concentrations at 4.0 wt% and 5.0 wt%.

Table 3-8: MPC-32M with Thirteen to Sixteen DFCs/DFIs Soluble Boron Requirements (Note 1)

	Thirteen to Sixteen DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS		Up to Sixteen DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS and Empty Cell Locations Note 2	
	Maximum Initial Enrichment ≤ 4.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment ≤ 4.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)
14x14A/B/C/D, 16x16A/B/C	1300	1700	1000	1500
15x15A/B/C/D/E/F/G/H/I, 17x17A/B/C	1700	2300	1500	2100

Notes: 1. For maximum initial enrichments between 4.0 wt% and 5.0 wt% ^{235}U, the minimum soluble boron concentration may be determined by linear interpolation between the minimum soluble boron concentrations at 4.0 wt% and 5.0 wt%.
2. Cell locations 6, 9, 24 and 27 in Figure 2-1 MUST ALL remain empty.

Table 3-9: MPC-32/32F and Version 1 Soluble Boron Requirements (Notes 1 and 2)

Array/Class	All UNDAMAGED FUEL ASSEMBLIES		One or more DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS[Note2]	
	Maximum Initial Enrichment ≤ 4.1 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)	Maximum Initial Enrichment ≤ 4.1 wt% ^{235}U (ppmb)	Maximum Initial Enrichment 5.0 wt% ^{235}U (ppmb)
14x14A/B/C/D/E	1,300	1,900	1,500	2,300
15x15A/B/C/G/I	1,800	2,500	1,900	2,700
15x15D/E/F/H	1,900	2,600	2,100	2,900
16x16A/B/C	1,400	2,000	1,500	2,300
17x17A	1,600	2,200	1,800	2,600
17x17B/C	1,900	2,600	2,100	2,900

Notes: 1. For maximum initial enrichments between 4.1 wt% and 5.0 wt% ^{235}U, the minimum soluble boron concentration may be determined by linear interpolation between the minimum soluble boron concentrations at 4.1 wt% and 5.0 wt%.
2. In locations allowed in Appendix B Table 2-1.

4 ADMINISTRATIVE CONTROLS

4.1 Radioactive Effluent Control Program for HI-STORM 100S Version E

a. The HI-STORM 100 Version E Cask System does not create any radioactive materials or have any radioactive waste treatment systems. Therefore, specific operating procedures for the control of radioactive effluents are not required. Specification 3.1.1, Multi-Purpose Canister (MPC), provides assurance that there are not radioactive effluents from the SFSC.

b. This program includes an environmental monitoring program. Each general license user may incorporate SFSC operations into their environmental monitoring programs for 10 CFR Part 50 operations.

c. An annual report shall be submitted pursuant to 10 CFR 72.44(d)(3).

4.2 Cask Transport Evaluation Program

For lifting of the loaded MPC, TRANSFER CASK, or OVERPACK using equipment which is integral to a structure governed by 10 CFR Part 50 regulations, 10 CFR 50 requirements apply. This program is not applicable when the TRANSFER CASK or OVERPACK is in the FUEL BUILDING or is being handled by equipment providing support from underneath (i.e., on a rail car, heavy haul trailer, air pads, etc...).

The TRANSFER CASK or OVERPACK, when loaded with spent fuel, may be lifted to and carried at any height necessary during TRANSPORT OPERATIONS and MPC TRANSFER, provided the lifting equipment is designed in accordance with items a, b, and c below.

a. The metal body and any vertical columns of the lifting equipment shall be designed to comply with stress limits of ASME Section III, Subsection NF, Class 3 for linear structures. All vertical compression loaded primary members shall satisfy the buckling criteria of ASME Section III, Subsection NF.

b. The horizontal cross beam and any lifting attachments used to connect the load to the lifting equipment shall be designed, fabricated, operated, tested, inspected, and maintained in accordance with applicable sections and guidance of NUREG-0612, Section 5.1. This includes applicable stress limits from ANSI N14.6.

c. The lifting equipment shall have redundant drop protection features which prevent uncontrolled lowering of the load.

d. For existing handling equipment which does not meet the above criteria, a cask drop analysis may be performed utilizing the site conditions and will be addressed as part of the 10 CFR72.212 report.

4.3 Radiation Protection Program

4.3.1.1 Each cask user shall ensure that the Part 50 radiation protection program appropriately addresses dry storage cask loading and unloading, as well as ISFSI operations, including transport of the loaded OVERPACK or TRANSFER CASK outside of facilities governed by 10 CFR Part 50. The radiation protection program shall include appropriate controls for direct radiation and contamination, ensuring compliance with applicable regulations, and implementing actions to maintain personnel occupational exposures As Low As Reasonably Achievable (ALARA). The actions and criteria to be included in the program are provided below.

4.3.1.2 Based on the analysis performed pursuant to 10 CFR 72.212(b)(5)(iii), the licensee shall establish individual cask surface dose rate limits for the HI-TRAC TRANSFER CASK and the HI-STORM OVERPACK to be used at the site. Total (neutron plus gamma) dose rate limits shall be established at the following locations:

a. The top of the OVERPACK.

b. The side of the TRANSFER CASK and OVERPACK

c. The inlet and outlet ducts on the OVERPACK (applicable only for VENTILATED OVERPACKs)

4.3.1.3 Notwithstanding the limits established in Section 4.3.1.2, the measured dose rates on a loaded OVERPACK shall not exceed the following values:

a. 20 mrem/hr (gamma + neutron) on the top of the OVERPACK

b. 200 mrem/hr (gamma + neutron) on the side of the OVERPACK, excluding inlet and outlet ducts

c. 4000 mrem/hr (gamma + neutron) on the side of the TRANSFER CASK

4.3.1.4 The licensee shall measure the TRANSFER CASK and OVERPACK surface neutron and gamma dose rates as described in Section 4.3.1.7 for comparison against the limits established in Section 4.3.1.2 or Section 4.3.1.3, whichever are lower.

4.3.1.5 If the measured surface dose rates exceed the lower of the two limits established in Section 4.3.1.2 or Section 4.3.1.3, the licensee shall:

a. Administratively verify that the correct contents were loaded in the correct fuel storage cell locations.

b. Perform a written evaluation to verify whether an OVERPACK at the ISFSI containing the as-loaded MPC will cause the dose limits of 10 CFR 72.104 to be exceeded.

c. Perform a written evaluation within 30 days to determine why the surface dose rate limits were exceeded.

4.3.1.6 If the evaluation performed pursuant to Section 4.3.1.5 shows that the dose limits of 10 CFR 72.104 will be exceeded, the MPC shall not be placed into storage or, in the case of the OVERPACK loaded at the ISFSI, the MPC shall be removed from storage until appropriate corrective action is taken to ensure the dose limits are not exceeded.

4.3.1.7 TRANSFER CASK and OVERPACK surface dose rates shall be measured at approximately the following locations:

a. A minimum of four (4) dose rate measurements shall be taken on the side of the TRANSFER CASK approximately at the cask mid-height plane. The measurement locations shall be approximately 90 degrees apart around the circumference of the cask. Dose rates shall be measured between the radial ribs.

b. A minimum of twelve (12) dose rate measurements shall be taken on the side of the OVERPACK in three sets of four measurements. One measurement set shall be taken approximately at the cask mid-height plane, 90 degrees apart around the circumference of the cask. The second and third measurement sets shall be taken approximately 60 inches above and below the mid-height plane, respectively, also 90 degrees apart around the circumference of the cask.

c. A minimum of five (5) dose rate measurements shall be taken on the top of the OVERPACK. One dose rate measurement shall be taken at approximately the center of the lid and four measurements shall be taken at locations on the top concrete shield, approximately half way between the center and the edge of the top concrete shield, approximately 90 degrees apart around the circumference of the lid.

d. A dose rate measurement shall be taken on contact at the surface of each inlet and four (4) locations approximately 90 degrees apart around the circumference of the outlet vent of the OVERPACK (applicable only for VENTILATED OVERPACKs).

4.4 Fabrication Helium Leak Test

At completion of welding the MPC shell to baseplate, an MPC confinement weld helium leak test shall be performed using a helium mass spectrometer. This test shall include the base metals of the MPC shell and baseplate. A helium leak test shall also be performed on the base metal of the fabricated MPC lid. The confinement boundary leakage rate tests shall be performed in accordance with ANSI N14.5 to “leaktight” criteria. If a leakage rate exceeding the acceptance criteria is detected, then the area of leakage shall be determined and the area repaired per ASME Code Section III, Subsection NB requirements. Re-testing shall be performed until the leakage rate acceptance criterion is met.

4.5 Violations of Fuel Specifications or Loading Conditions

If any Fuel Specifications or Loading Conditions of 2.1 are 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 actions taken to restore compliance and prevent recurrence.

4.6 Heavy Loads Requirements

Each lift of an MPC, a HI-TRAC transfer cask, or any HI-STORM overpack must be made in accordance to the existing heavy loads requirements and procedures of the licensed facility at which the lift is made. A plant specific review (under 10 CFR 50.59 or 10 CFR 72.48, if applicable) is required to show operational compliance with existing plant specific heavy loads requirements. Lifting operations outside of structures governed by 10 CFR Part 50 must be in accordance with Section 4.2 and Sections 2.1.6 and 2.3 (if applicable) of Appendix C.

4.7 Aging Management Program

Each general licensee shall have a program to establish, implement, and maintain written procedures for each AMP described in the FSAR. The program shall include provisions for changing AMP elements, as necessary, and within the limitations of the approved licensing bases to address new information on aging effects based on inspection findings and/or industry operating experience provided to the general licensee during the renewal period.

The general licensee shall establish and implement these written procedures within 365 days after the effective date of the renewal of the CoC or 365 days of the 20th anniversary of the loading of the first dry storage system at its site, whichever is later.

Each general licensee shall perform tollgate assessments as described in Chapter 9 of the FSAR.