72-1015

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September 1, 2000

U.S. Nuclear Regulatory Commission
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Attn: Document Control Desk

Subject: Docket No. 72-1015

Submittal of Supplemental Information for the NAC-UMS® Universal Storage System Amendment for Maine Yankee Atomic Power Company Site Specific Spent Fuel (TAC No. L22979)

References: 1. Conference Call - Discussion of Consistency of UMS-MY SAR Pages With Respect to the NAC-UMS® SAR, August 30, 2000

In accordance with Reference 1, NAC International (NAC) herewith submits 10 copies of supplemental information for the NAC-UMS® Universal Storage System Amendment for Maine Yankee Atomic Power Company Site Specific Spent Fuel (UMS-MY). Included in this submittal are the changed pages for the UMS-MY Safety Analysis Report (SAR), which incorporate the supplemental information as discussed.

NAC has prepared this submittal to be fully responsive to, and in complete accordance with, all NRC/NAC discussions during the conference discussion. This submittal includes SAR Revision UMSS-00H changed pages for Chapters 9, 10, and 12. The List of Effective Pages and the Master Table of Contents for the SAR are updated to incorporate the text and page changes made in the body of the SAR.

As the NAC-UMS® Storage System is a critical path item for successful completion of the decommissioning of the Maine Yankee site, NAC has expedited this submittal to support the ongoing NRC review of the UMS-MY Amendment.

If you have any comments or questions, please contact me at (770) 447-1144, x-321, or you may call me on my direct line at (678) 328-1321.

Sincerely,

T C Thompson

Thomas C. Thompson
Director, Licensing
Engineering & Design Services

Enclosure

cc (w/o enclosure): G. Zinke (MY)
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NMSS01 Public

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DOCKET NO. 72-1015

UMS®

UNIVERSAL MPC SYSTEM®

SAFETY ANALYSIS REPORT

for the

UMS® UNIVERSAL STORAGE CASK

Amendment for

MAINE YANKEE ATOMIC POWER COMPANY

Site Specific Spent Fuel

August 2000 UMSS-00H

NAC INTERNATIONAL

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9.2 Maintenance Program

The Universal Storage System is a passive system. No active components or systems are incorporated in the design. Consequently, only a minimal amount of maintenance is required over its lifetime, as described in Section 9.2.3.

9.2.1 Subsystems Maintenance

The Universal Storage System has no active or passive subsystems that require scheduled maintenance. As described in Section 9.2.3, the air inlets and outlets are subject to daily inspection to identify blockage of the vents, which could result in a reduction in cooling airflow.

9.2.2 Valves, Rupture Discs, and Gaskets on the Containment Vessel

The Universal Storage System has no valves, gaskets, rupture discs, seals, or accessible penetrations. Consequently, there is no maintenance associated with these types of features.

9.2.3 Continuing Maintenance Requirements

Recommended maintenance for the vertical concrete cask in normal conditions is specified below. The surveillance requirements are described in Technical Specification LCO 3.1.6 in Appendix 12A of Chapter 12. It is not necessary to inspect the canister during the storage period as long as the thermal performance is normal, based on daily temperature verification.

1. Daily surveillance of the vertical concrete casks:

    - Visual inspection of air inlet and outlets for detection of blockage.
    - Verify that the inlet and outlet screens are in place, and are whole and secure.
    - Record the ambient temperature and air outlet temperature for each vertical concrete cask upon placement in service. Thereafter, the temperatures shall be recorded on a daily basis to verify the continuing thermal performance of the system.
    - Visual inspection of the ISFSI site for security and safeguards.

2. Annual inspection of the vertical concrete cask exterior:

- Visual inspection of surface for chipping, spalling or other surface defects. Any defects larger than one inch in diameter (or width) and deeper than one inch shall be regrouted, according to the grout manufacturer's recommendations.

- Reapplication of corrosion-inhibiting (external) coatings on accessible surfaces, including concrete cask lifting lugs, if present.

9.2.4 Required Maintenance of First Storage System Placed in Service

For the first Universal Storage System placed in service, the canister is loaded with spent fuel assemblies and the decay heat load calculated for that canister. The canister is then loaded into the vertical concrete cask, and the cask's thermal performance is evaluated by measuring the ambient and air outlet temperatures for normal air flow. The purpose of the test is to measure the heat removal performance of the Universal Storage System and to establish baseline data. A letter report summarizing the results of the test and evaluation is submitted to the NRC within 30 days of placing the cask in service in accordance with 10 CFR 72.4.

Should the first canister not be loaded with spent fuel that has the design basis heat load, the user may use a lesser heat load for the test. However, a calculation of the temperature difference between the inlet and outlet temperatures must be performed using the same methodology and inputs documented in this Safety Evaluation Report. The calculation and the measured temperature data must be reported to the NRC in accordance with 10 CFR 72.4.

9.2.5 Transfer Cask Maintenance

The transfer cask trunnions and shield door assemblies shall be visually inspected for gross damage and proper function prior to each use. Annually, the lifting trunnions, shield doors and shield door rails shall be either dye penetrant or magnetic particle examined, using the examination method appropriate to the material. The examination method shall be in accordance with Section V of the ASME Code. The acceptance criteria shall be in accordance with Section III, Subsection NF, Article NF-5350 or NF-5340 as appropriate to the examination method, as required by ANSI N14.6.

The annual examination may be omitted in periods of nonuse of the transfer cask, provided that the transfer cask examination is performed prior to the next use of the transfer cask.

Annually, the coating applied to the carbon steel surfaces of the transfer cask shall be inspected and any chips, cracks or other defects in the coating shall be repaired.

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10.3 Estimated On-Site Collective Dose Assessment

Occupational radiation exposures (person-mrem) resulting from the use of the Universal Storage System are calculated using the estimated exposure rates presented in Sections 5.1.3, 5.4.3 and 10.2.1. Exposure is evaluated by identifying the tasks and estimating the duration and number of personnel performing those tasks based on industry experience. The tasks identified are based on the design basis operating procedures, as presented in Chapter 8.0.

Dose rates are calculated using the shielding analysis design basis fuel assemblies. The shielding design basis PWR assembly is the Westinghouse 17X17 Standard fuel assembly, with an initial enrichment of 3.7 wt % ^{235}U. The design basis BWR assembly is the GE 9X9, with 79 fuel rods and an initial enrichment of 3.25 wt % ^{235}U. Both design basis fuel assemblies have an assumed burnup of 40,000 MWD/MTU, and a cool time of 5 years. The selection of these assemblies for the shielding design basis is described in Section 5.1. The principal parameters of these assemblies are presented in Table 2.1-1.

10.3.1 Estimated Collective Dose for Loading a Single Universal Storage System

This section estimates the collective dose due to the loading, sealing, transfer and placement on the ISFSI pad, of the Universal Storage System. The analysis assumes that the exposure incurred by the operators is independent of background radiation, as background radiation varies from site to site. The number of persons allocated to task completion is generally the minimum number required for the task. Working area exposure rates are assigned based on the orientation of the worker with respect to the source and take into account the use of temporary shielding.

Table 10.3-1 summarizes the estimated total exposure by task, attributable to the loading, transfer, sealing and placement of a design basis Universal Storage System. Exposures associated with shield lid operations are based on the presence of a 5-inch thick steel temporary shield.

This estimated dose is considered to be conservative as it assumes the loading of a cask with design basis fuel, and does not account for efficiencies in the loading process that occur with experience.

10.3.2 Estimated Annual Dose Due to Routine Operations

Once in place, the ISFSI requires limited ongoing inspection and surveillance throughout its service life. The annual dose evaluation considers the combination of inspection and surveillance requirements specified in Appendix 12A of Chapter 12, and those tasks that are anticipated to be representative of an operational facility. Other than an inspection of the Vertical Concrete Cask surface, no annual maintenance of the storage system is required. Collective dose due to design basis off-normal conditions and accident events, such as clearing the blockage of air vents, is accounted for in Chapter 11.0, and is not included in this evaluation.

Routine operations are expected to include:

- Daily visual inspection of the cask array. This inspection consists of the inspection for blockage of the inlets and outlets. Inspection of the inlets and outlets is assumed to take one operator 1 minute per cask.

- Daily electronic measurement of air outlet temperatures. Outlet temperature indicators are located away from the cask array. Remote temperature measurement is not assumed to contribute to operator dose.

- A daily security inspection of the fence and equipment surrounding the storage area. This surveillance is assumed to be performed by the operator concurrently with the inlet and outlet vent inspection. The security inspection is assumed to make no additional contribution to operator dose.

- Grounds maintenance performed every other week by 1 maintenance technician. Grounds maintenance is assumed to require 0.5 hour.

- Quarterly radiological surveillance. The surveillance consists of a radiological survey comprised of a surface radiation measurement on each cask, the determination and/or verification of general area exposure rates and radiological postings. This surveillance is assumed to require 1 hour and 1 person.

- Annual inspection of the general condition of the casks. This inspection is estimated to require 15 minutes per cask and require 2 technicians.

Calculation of the dose due to annual operation and surveillance requirements is estimated based on a single cask containing design basis fuel, and on an ISFSI array of 20 casks that are assumed to be loaded at the rate of 2 casks per year over a ten year period. Consequently, the casks in the array are assumed to have the cool times as shown in Table 10.3-2. To account for the reduction in source term with cool time, weighting factors are applied to the neutron and gamma radiation spectra as shown in Table 10.3-3.

The annual operation and surveillance requirements result in an estimated annual collective exposure of 71.4 person-mrem for a single PWR cask containing design basis fuel and 46.8 person-mrem for a single design basis BWR cask. The annual operation and surveillance requirements for the assumed single cask and total estimated dose is shown in Table 10.3-4 for the single PWR cask, and in Table 10.3-6 for the BWR cask. The annual operation and surveillance requirements for the assumed 20 cask ISFSI are shown in Tables 10.3-5, and 10.3-7 for PWR and BWR configurations, respectively. These tables show an estimated annual collective exposure of 1086 person-mrem for the PWR cask configuration, and 733 person-mrem for the BWR cask configuration for operation and maintenance of a 20-cask array.

Figure 10.3-1 Typical ISFSI 20 Cask Array Layout

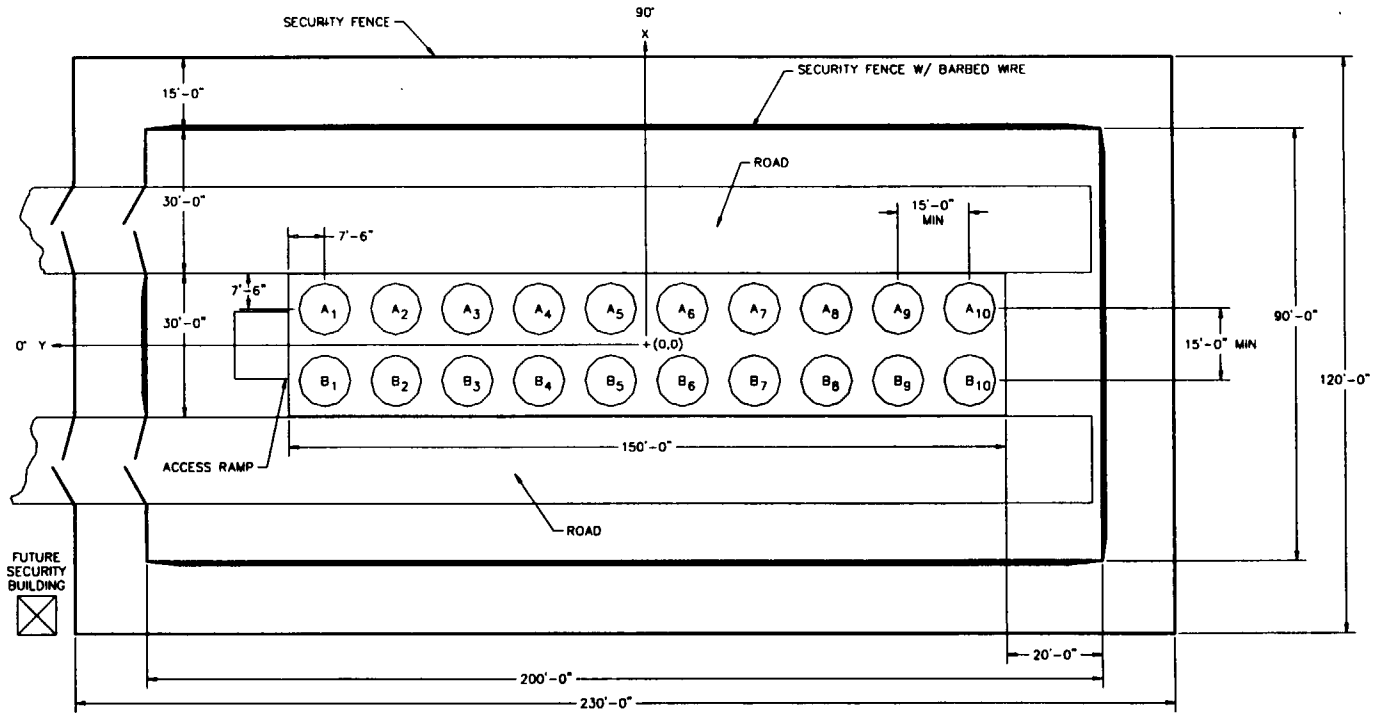

Table 10.3-3 Vertical Concrete Cask Radiation Spectra Weighting Factors

Cask Numbers	Axial Neutron Weighting Factor		Axial Gamma Weighting Factor		Radial Neutron Weighting Factor		Radial Gamma Weighting Factor	
	PWR	BWR	PWR	BWR	PWR	BWR	PWR	BWR
A-1, B-1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
A-2, B-2	0.96	0.96	0.83	0.84	0.96	0.96	0.83	0.83
A-3, B-3	0.93	0.93	0.72	0.74	0.93	0.93	0.72	0.74
A-4, B-4	0.89	0.89	0.65	0.67	0.89	0.89	0.65	0.67
A-5, B-5	0.86	0.86	0.59	0.62	0.86	0.86	0.59	0.62
A-6, B-6	0.83	0.83	0.55	0.58	0.83	0.83	0.55	0.58
A-7, B-7	0.80	0.80	0.52	0.55	0.80	0.80	0.52	0.55
A-8, B-8	0.77	0.77	0.50	0.52	0.77	0.77	0.50	0.52
A-9, B-9	0.74	0.74	0.47	0.50	0.74	0.74	0.48	0.50
A-10, B-10	0.72	0.72	0.45	0.48	0.72	0.72	0.46	0.48

Table 10.3-4 Estimate of Annual Exposure for Operation and Surveillance of a Single PWR Cask

Activity	Dose Rate Distance (meters)	Frequency (days)	Time (min)	Dose Rate (mrem/hr)	Personnel Required	Total Exposure (Pers-mrem)
Visual Inspection	4	365	1	7.40	1	45.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Radiological surveillance	4	4	15	7.40	1	7.4
Annual inspection						
Operations	1	1	15	25.30	1	6.3
Radiological Support	1	1	3	25.30	1	1.3
Grounds maintenance	10	26	15	1.76	1	11.4
Total Person-mrem						71.4

Table 10.3-5 Estimate of Annual Exposure for Operation and Surveillance of a 20 Cask Array of PWR Casks

Activity	Dose Rate Distance (meters)	Frequency (days)	Time (min)	Dose Rate (mrem/hr)	Personnel Required	Total Exposure (Pers-mrem)
Visual Inspection	4	365	1(1)	5.83	1	709.3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Radiological surveillance	4	4	60	5.83	1	23.3
Annual inspection						
Operations	1	1	15(1)	47.91	1	239.6
Radiological Support	1	1	3(1)	47.91	1	47.9
Grounds maintenance	10	26	60	2.55	1	66.3
Total Person-mrem for the 20 Cask Array						1086.4
Total Person-mrem for a Single Cask in the Array						54.3

(1) Time listed is per cask; it is multiplied by 20 for the cask array.

Table 10.3-6 Estimate of Annual Exposure for the Operation and Surveillance of a Single BWR Cask

Activity	Dose Rate Distance (meters)	Frequency (days)	Time (min)	Dose Rate (mrem/hr)	Personnel Required	Total Exposure (mrem)
Visual Inspection	4	365	1	4.9	1	29.8
Radiological surveillance	4	4	15	4.9	1	4.9
Annual inspection						
Operations	1	1	15	15.2	1	3.8
Radiological Support	1	1	3	15.2	1	0.8
Grounds maintenance	10	26	15	1.16	1	7.5
Total Person - mrem						46.8

Table 10.3-7 Estimate of Annual Exposure for the Operation and Surveillance of a 20 Cask Array of BWR Casks

Activity	Dose Rate Distance (meters)	Frequency (days)	Time (min)	Dose Rate (mrem/hr)	Personnel Required	Total Exposure (mrem)
Visual Inspection	4	365	1(1)	4.04	1	491.5
Radiological surveillance	4	4	60	4.04	1	16.2
Annual inspection						
Operations	1	1	15(1)	29.85	1	149.3
Radiological Support	1	1	3(1)	29.85	1	29.9
Grounds maintenance	10	26	60	1.79	1	46.5
Total Person - mrem for the 20 Cask Array						733.4
Total Person - mrem for a Single Cask in the Array						37.0

(1) Time listed is per cask; it is multiplied by 20 for the cask array.

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TECHNICAL SPECIFICATIONS FOR THE NAC-UMS® SYSTEM

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A 5.0 ADMINISTRATIVE CONTROLS AND PROGRAMS

A 5.1 Training Program

A training program for the NAC-UMS® Universal Storage System shall be developed under the general licensee's systematic approach to training (SAT). Training modules shall include comprehensive instructions for the operation and maintenance of the NAC-UMS® Universal Storage System and the independent spent fuel storage installation (ISFSI).

A 5.2 Pre-Operational Testing and Training Exercises

A dry run training exercise on loading, closure, handling, unloading, and transfer of the NAC-UMS® Storage System shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies. The training exercise shall not be conducted with spent fuel in the CANISTER. The dry run may be performed in an alternate step sequence from the actual procedures, but all steps must be performed. The dry run shall include, but is not limited to the following:

a. Moving the CONCRETE CASK into its designated loading area
b. Moving the TRANSFER CASK containing the empty CANISTER into the spent fuel pool
c. Loading one or more dummy fuel assemblies into the CANISTER, including independent verification
d. Selection and verification of fuel assemblies requiring preferential loading
e. Installing the shield lid
f. Removal of the TRANSFER CASK from the spent fuel pool
g. Closing and sealing of the CANISTER to demonstrate pressure testing, vacuum drying, helium backfilling, welding, weld inspection and documentation, and leak testing
h. TRANSFER CASK movement through the designated load path
i. TRANSFER CASK installation on the CONCRETE CASK
j. Transfer of the CANISTER to the CONCRETE CASK
k. CONCRETE CASK shield plug and lid installation
l. Transport of the CONCRETE CASK to the ISFSI

(continued)

A 5.2 Pre-Operational Testing and Training Exercises (continued)

m. CANISTER unloading, including reflooding and weld removal or cutting

n. CANISTER removal from the CONCRETE CASK

Appropriate mockup fixtures may be used to demonstrate and/or to qualify procedures, processes or personnel in welding, weld inspection, vacuum drying, helium backfilling, leak testing and weld removal or cutting.

A 5.3 Special Requirements for the First System Placed in Service

The heat transfer characteristics and performance of the NAC-UMS® SYSTEM will be recorded by temperature measurements on the first NAC-UMS® SYSTEM placed in service with a heat load equal to or greater than 10 kW. A letter report summarizing the results of the measurements shall be submitted to the NRC. A separate report will also be submitted for each NAC-UMS® SYSTEM subsequently loaded with a higher heat load, up to the 23.0 kW maximum heat load. The calculated and measured temperature data shall be reported to the NRC in accordance with 10 CFR 72.4. A report is not required to be submitted to the NRC for NAC-UMS® SYSTEMs that are subsequently loaded with lesser loads than the latest reported case.

A 5.4 Surveillance After an Off-Normal, Accident, or Natural Phenomena Event

A Response Surveillance is required following off-normal, accident or natural phenomena events. The air outlet temperature of the NAC-UMS® SYSTEMs in use at an ISFSI shall be monitored within 4 hours after the occurrence of an off-normal, accident or natural phenomena event in the area of the ISFSI. Following a natural phenomena event, the ISFSI site shall be inspected to verify that the CONCRETE CASKS have not been repositioned so as to result in higher dose rates at the ISFSI boundary. CONCRETE CASKS with an air outlet temperature that does not register, or that exceeds the limits of SR 3.1.6.1, shall be inspected for continued serviceability. At least one-half of the inlets and outlets on each CONCRETE CASK must be cleared of blockage or debris within 24 hours to restore air circulation.

The CONCRETE CASK and CANISTER shall be inspected if they experience a drop or a tipover.

(continued)

A 5.5 Radioactive Effluent Control Program

The program implements the requirements of 10 CFR 72.44(d).

a. The NAC-UMS® 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. LCO 3.1.5, CANISTER Helium Leak Rate, provides assurance that there are no radioactive effluents from the NAC-UMS® SYSTEM.

b. This program includes an environmental monitoring program. Each general license user may incorporate NAC-UMS® SYSTEM operations into their environmental monitoring program for 10 CFR Part 50 operations.

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

A 5.6 NAC-UMS® SYSTEM Transport Evaluation Program

This program provides a means for evaluating various transport configurations and transport route conditions to ensure that the design basis drop limits are met. For lifting of the loaded TRANSFER CASK or CONCRETE CASK using devices, which are 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 CONCRETE CASK is in the fuel building or is being handled by a device providing support from underneath (i.e., on a rail car, heavy haul trailer, air pads, etc.).

Pursuant to 10 CFR 72.212, this program shall evaluate the site specific transport route conditions.

a. The lift height above the ISFSI pad surface prescribed in Section B3.4.6 of Appendix B to Certificate of Compliance (CoC) No. 1015 shall not exceed the limits in Table 12A5-1. Also, the program shall ensure that the transport route conditions (i.e., surface hardness and pad thickness) are equivalent to or less limiting than those prescribed for the reference pad surface which forms the basis for the values cited in Section B3.4.6 of Appendix B to CoC No. 1015.

(continued)

b. For site specific transport conditions which are not bounded by the surface characteristics in Section B3.4.6 of Appendix B to CoC No. 1015, the program may evaluate the site specific conditions to ensure that the impact loading due to design basis drop events does not exceed 60g. This alternative analysis shall be commensurate with the drop analyses described in the Safety Analysis Report for the NAC-UMS® SYSTEM. The program shall ensure that these alternative analyses are documented and controlled.

c. The TRANSFER CASK and CONCRETE CASK may be lifted to those heights necessary to perform cask handling operations including CANISTER transfer provided the lifts are made with structures and components designed in accordance with the criteria specified in Section B3.5 of Appendix B to CoC No. 1015, as applicable.

A 5.7 Verification of Oxide Layer Thickness on High Burnup Fuel

A verification program is required to determine the oxide layer thickness on high burnup fuel by measurement or by statistical analysis. A fuel assembly having a burnup between 45,000 MWD/MTU and 50,000 MWD/MTU is classified as high burnup. The verification program shall be capable of classifying high burnup fuel as INTACT FUEL or DAMAGED FUEL based on the following criteria:

1. A HIGH BURNUP FUEL assembly may be stored as INTACT FUEL provided that no more than 1% of the fuel rods in the assembly have a peak cladding oxide thickness greater than 80 microns, and that no more than 3% of the fuel rods in the assembly have a peak oxide layer thickness greater than 70 microns, and that the fuel assembly is otherwise INTACT FUEL.

2. A HIGH BURNUP FUEL assembly not meeting the cladding oxide thickness criteria for INTACT FUEL or that has an oxide layer that is detached or spalled from the cladding is stored as DAMAGED FUEL.

A fuel assembly, having a burnup between 45,000 and 50,000 MWD/MTU, must be preferentially loaded in periphery positions of the basket.

Table 12A5-1 TRANSFER CASK and CONCRETE CASK Lifting Requirements

Item	Orientation	Lifting Height Limit
TRANSFER CASK	Horizontal	None Established
TRANSFER CASK	Vertical	None Established[1]
CONCRETE CASK	Horizontal	Not Permitted
CONCRETE CASK	Vertical	≤ 24 inches

Note:

1. See Technical Specification A 5.6 (c).

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