CERTIFICATE OF COMPLIANCE FOR SPENT FUEL STORAGE CASKS

The U.S. Nuclear Regulatory Commission is issuing this Certificate of Compliance pursuant to Title 10 of the Code of Federal Regulations, Part 72, "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste" (10 CFR Part 72). This certificate is issued in accordance with 10 CFR 72.238, certifying that the storage design and contents described below meet the applicable safety standards set forth in 10 CFR Part 72, Subpart L, and on the basis of the Final Safety Analysis Report (FSAR) of the cask design. This certificate is conditional upon fulfilling the requirements of 10 CFR Part 72, as applicable, and the conditions specified below.

Certificate No.	Effective Date	Expiration Date	Docket Number	Amendment No.	Amendment Date	Package Identification No.
1025	04/10/00	04/10/20	72-1025	-	-	USA/72-1025

Issued To: (Name/Address)

NAC International Inc.
655 Engineering Drive
Norcross, GA 30092

Safety Analysis Report Title

NAC International Inc.
Final Safety Analysis Report for the NAC Multi-Purpose Canister (NAC-MPC) System
Docket No. 72-1025

CONDITIONS

This certificate is conditioned upon fulfilling the requirements of 10 CFR Part 72, as applicable, the attached Appendix A (Technical Specifications), and the conditions specified below:

1. CASK

   a. Model No.: NAC-MPC

   The principal components of the NAC-MPC system are the transportable storage canister (TSC), the vertical concrete cask (VCC), and the transfer cask. The NAC-MPC system is a transport compatible dry storage system that uses a stainless steel TSC stored within the central cavity of a VCC. The transfer cask is used to move the loaded TSC to and from the VCC.

   The TSC is designed to contain up to 36 intact Yankee Class pressurized water reactor spent fuel assemblies, which consists of fuel assemblies manufactured by Westinghouse, United Nuclear, Exxon, and Combustion Engineering. A TSC may also contain one or more Reconfigured Fuel Assemblies (RFAs), which are designed and approved to confine intact or damaged Yankee Class spent fuel rods or fuel debris. An RFA can accept up to 64 full length spent fuel rods (rod segments or whole rods), held in individual stainless steel tubes in an 8 by 8 array.

   b. Description

   The NAC-MPC system which is being certified is described in the SAR and in NRC's Safety Evaluation Report accompanying the Certificate of Compliance. The NAC-MPC system is a transport compatible dry storage system that uses a stainless steel TSC stored within the central cavity of a VCC.

1. b. Description (continued)

The TSC is designed to be compatible with the NAC-STC transport cask to allow future shipment. The VCC provides radiation shielding and contains internal air flow paths that allow decay heat from the TSC spent fuel contents to be removed by natural air circulation around the canister wall. The transfer cask is used to move the loaded TSC to and from the VCC and provides radiation shielding while the TSC is being closed and sealed. The TSC is placed in the VCC by positioning the transfer cask on top of the VCC and subsequently lowering the TSC.

The TSC assembly consists of a right circular cylindrical shell with a welded bottom plate, a fuel basket, a shield lid, two penetration port covers, and a structural lid. The cylindrical shell, plus the bottom plate and lids, constitutes the confinement boundary. The stainless steel fuel basket is a right circular cylinder configuration with 36 fuel tubes laterally supported by a series of stainless steel support disks, which are retained by spacers on eight radially located tie rods. The spent fuel assemblies are contained in stainless steel fuel tubes. The square fuel tubes are encased with Boral sheets on all four sides for criticality control. Aluminum heat transfer disks are spaced midway between the support disks and are the primary path for conducting heat from the spent fuel assemblies to the TSC wall.

The VCC is the storage overpack for the TSC and provides structural support, shielding, protection from environmental conditions, and natural convection cooling of the TSC during long-term storage. The VCC is a reinforced concrete (Type II Portland cement) structure with a carbon steel inner liner. The VCC has an annular air passage to allow the natural circulation of air around the TSC. The air inlet and outlet vents take non-planar paths to the VCC cavity to minimize radiation streaming. The spent fuel decay heat is transferred from the fuel assemblies to the tubes in the fuel basket and through the heat transfer disks to the TSC wall. Heat flows by convection from the TSC wall to the circulating air, as well as by radiation from the TSC wall to the VCC inner liner. The heat flow to the circulating air from the TSC wall and the VCC liner is exhausted through the air outlet vents. The top of the VCC is closed by a shield plug, consisting of carbon steel plate (gamma shielding) and NS-4-FR (neutron shielding), and a carbon steel lid. The lid is bolted in place and has tamper indicating seals on two of the bolts.

The transfer cask provides shielding during TSC movements between work stations, the VCC, or the transport cask. It is a multi-wall (steel/lead/NS-4-FR/steel) design and has a bolted top retaining ring to prevent a loaded canister from being inadvertently removed through the top of the transfer cask. Retractable (hydraulically operated) bottom shield doors on the transfer cask are used during unloading operations. To minimize contamination of the transfer cask, clean water is circulated in the gap between the transfer cask and the TSC during spent fuel pool loading operations.

The fuel transfer and auxiliary equipment necessary for Independent Spent Fuel Storage Installation (ISFSI) operation are not included as part of the NAC-MPC system reviewed for a Certificate of Compliance under 10 CFR Part 72, Subpart L. Such equipment may include, but is not limited to, special lifting devices, transfer trailers or equipment, and vacuum drying/helium leak test equipment.

2. OPERATING PROCEDURES

Written operating procedures shall be prepared for cask handling, loading, movement, surveillance, and maintenance. The user's site-specific written operating procedures shall be consistent with the technical basis described in Chapter 8 of the SAR.

3. ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

Written cask acceptance tests and a maintenance program shall be prepared consistent with the technical basis described in Chapter 9 of the SAR.

4. QUALITY ASSURANCE

Activities in the areas of design, purchase, fabrication, assembly, inspection, testing, operation, maintenance, repair, modification of structures, systems and components, and decommissioning that are important to safety shall be conducted in accordance with a Commission-approved quality assurance program which satisfies the applicable requirements of 10 CFR Part 72, Subpart G, and which is established, maintained, and executed with regard to the cask system.

5. HEAVY LOADS REQUIREMENTS

Each lift of an NAC-MPC TSC, transfer cask, or VCC must be made in accordance with the existing heavy loads requirements and procedures of the licensed facility at which the lift is made. A plant-specific safety review (under 10 CFR 50.59 or 10 CFR 72.48 requirements, if applicable) is required to show operational compliance with existing plant-specific heavy loads requirements.

6. APPROVED CONTENTS

Contents of the NAC-MPC system must meet the fuel specifications given in Appendix A to this certificate.

7. DESIGN FEATURES

Features or characteristics for the site, cask, or ancillary equipment must be in accordance with Appendix A to this certificate.

8. CHANGES TO THE CERTIFICATE OF COMPLIANCE

The holder of this certificate who desires to make changes to the certificate, which includes Appendix A (Technical Specifications), shall submit an application for amendment of the certificate.

NRC FORM 651A
(3-1999)
10 CFR 72

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR SPENT FUEL STORAGE CASKS
Supplemental Sheet

Certificate No. 1025

9. AUTHORIZATION

The NAC-MPC system, which is authorized by this certificate, is hereby approved for general use by holders of 10 CFR Part 50 licenses for nuclear reactors at reactor sites under the general license issued pursuant to 10 CFR 72.210, subject to the conditions specified by 10 CFR 72.212, and the attached Appendix A.

FOR THE NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Attachment:
NAC-MPC System
Technical Specifications

APPENDIX A

NAC-MPC SYSTEM
TECHNICAL SPECIFICATIONS

Appendix A
Table of Contents

Appendix A
Table of Contents (Continued)

1.0 USE AND APPLICATION

1.1 Definitions

---------------------------------NOTE---------------------------------
The defined terms of this section appear in capitalized type and are applicable throughout these Technical Specifications.

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.
CANISTER	See TRANSPORTABLE STORAGE CANISTER
CONCRETE CASK	See VERTICAL CONCRETE CASK
DAMAGED FUEL ASSEMBLY	DAMAGED FUEL ASSEMBLY is a fuel assembly having individual fuel rods with known or suspected cladding defects greater than a hairline crack or a pinhole leak.
DAMAGED FUEL ROD	DAMAGED FUEL ROD is a fuel rod with known or suspected cladding defects greater than a hairline crack or a pinhole leak.
FUEL DEBRIS	FUEL DEBRIS is fuel in the form of particles, loose pellets, and fragmented rods or assemblies.
INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)	The facility within the perimeter fence licensed for storage of spent fuel within NAC-MPC SYSTEMs (see also 10 CFR 72.3).

1.1 Definitions (Continued)

INTACT FUEL ASSEMBLY	INTACT FUEL ASSEMBLY is a fuel assembly without known or suspected cladding defects greater than a pinhole leak or a hairline crack and which can be handled by normal means. A fuel assembly shall not be classified as an INTACT FUEL ASSEMBLY unless solid Zircaloy or stainless steel rods are used to replace missing fuel rods and which displaces an amount of water equal to that displaced by the original fuel rod(s).
INTACT FUEL ROD	INTACT FUEL ROD is a fuel rod without known or suspected cladding defects greater than a pinhole leak or a hairline crack.
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on an NAC-MPC SYSTEM while it is being loaded with fuel assemblies. LOADING OPERATIONS begin when the first fuel assembly is placed in the CANISTER and end when the NAC-MPC SYSTEM is secured on the transporter.
RECONFIGURED FUEL ASSEMBLY (RFA)	A stainless steel canister having the same external dimensions as a standard Yankee Class spent fuel assembly that ensures criticality control geometry and which permits gaseous and liquid media to escape while minimizing dispersal of gross particulates. The RECONFIGURED FUEL ASSEMBLY may contain a maximum of 64 INTACT FUEL RODS, DAMAGED FUEL RODS or FUEL DEBRIS from any type of Yankee Class spent fuel assembly.

1.1 Definitions (Continued)

NAC-MPC SYSTEM	NAC-MPC SYSTEM includes the components approved for loading and storage of spent fuel assemblies at the ISFSI. The NAC-MPC SYSTEM consists of a CONCRETE CASK, a TRANSFER CASK and a CANISTER.
STORAGE OPERATIONS	STORAGE OPERATIONS include all licensed activities that are performed at the ISFSI, while an NAC-MPC SYSTEM containing spent fuel is located on the storage pad within the ISFSI perimeter.
TRANSPORT OPERATIONS	TRANSPORT OPERATIONS include all licensed activities involved in moving a loaded NAC-MPC CONCRETE CASK AND CANISTER to and from the ISFSI. TRANSPORT OPERATIONS begin when the NAC-MPC SYSTEM is first secured on the transporter and end when the NAC-MPC SYSTEM is at its destination and no longer secured on the transporter.
TRANSPORTABLE STORAGE CANISTER (CANISTER)	TRANSPORTABLE STORAGE CANISTER is the sealed container that consists of a tube and disk fuel basket in a cylindrical canister shell that is welded to a baseplate, shield lid with welded port covers, and structural lid. The CANISTER provides the confinement boundary for the confined spent fuel.
TRANSFER CASK	TRANSFER CASK is a shielded lifting device that holds the CANISTER during LOADING and UNLOADING OPERATIONS and during closure welding, vacuum drying, leak testing, and non-destructive examination of the CANISTER closure welds. The TRANSFER CASK is also used to transfer the CANISTER into and from the CONCRETE CASK, and into the transport cask.

1.1 Definitions (Continued)

TRANSFER OPERATIONS	TRANSFER OPERATIONS include all licensed activities involved in transferring a loaded CANISTER from a CONCRETE CASK to another CONCRETE CASK or to a TRANSPORT CASK.
UNLOADING OPERATIONS	UNLOADING OPERATIONS include all licensed activities on an NAC-MPC SYSTEM to be unloaded of the contained fuel assemblies. UNLOADING OPERATIONS begin when the NAC-MPC SYSTEM is no longer secured on the transporter and end when the last fuel assembly is removed from the NAC-MPC SYSTEM. UNLOADING OPERATIONS may include transfer of a loaded CANISTER from the CONCRETE CASK to the transport cask.
VERTICAL CONCRETE CASK (CONCRETE CASK)	CONCRETE CASK is the cask that receives and holds the sealed CANISTER. It provides the gamma and neutron shielding and convective cooling of the spent fuel confined in the CANISTER.

1.0 USE AND APPLICATION

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 Technical Specifications 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 indentations 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; the logical connector is left justified with the statement of the Condition, Completion Time, Surveillance, or Frequency.

1.2 Logical Connectors (Continued)

EXAMPLES The following examples illustrate the use of logical connectors.

EXAMPLES 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.

1.2 Logical Connectors (Continued)

EXAMPLES (continued)

EXAMPLE 1.2-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met	A.1 Stop. . .	
	OR	
	A.2.1 Verify. . .	
	AND	
	A.2.2	
	A.2.2.1 Reduce. . .	
	OR	
	A.2.2.2 Perform. . .	
	OR	
	A.3 Remove. . .	

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

1.0 USE AND APPLICATION

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 Operations (LCOs) specify the lowest functional capability or performance levels of equipment required for safe operation of the NAC-MPC SYSTEM. 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 Time(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, provided that the NAC-MPC SYSTEM is in a specified condition stated in the Applicability of the LCO. Prior to the expiration of the specified Completion Time, Required Actions must be completed. An ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the NAC-MPC 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 <u>not</u> result in separate entry into the Condition, unless specifically stated. The Required Actions of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

1.3 Completion Times (Continued)

EXAMPLES

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

EXAMPLE 1.3-1

ACTIONS

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

Condition B has two Required Actions. Each Required Action has its own 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 six 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.

1.3 Completion Times (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	12 hours
	<u>AND</u>	
	B.2 Complete action B.2	36 hours

When a System is determined not to meet the LCO, Condition A is entered. If the System is not restored within seven 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; therefore, the Required Actions of Condition B may be terminated.

1.3 Completion Times (Continued)

EXAMPLES (continued)

EXAMPLE 1.3-3

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each component.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. LCO not met	A.1	Restore compliance with LCO	4 hours
B. Required Action and associated Completion Time not met.	B.1	Complete action B.1	6 hours
	AND		
	B.2	Complete action B.2	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 to be 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 are tracked for each component.

1.3 Completion Times (Continued)

EXAMPLES	EXAMPLE 1.3-3 (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.

1.0 USE AND APPLICATION

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 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 a SR satisfied, SR 3.0.4 imposes no restriction.

The use of "met" or "performed" in these instances conveys specific meanings. A Surveillance is "met" only after the acceptance criteria are satisfied. Known failure of the requirements of a Surveillance, even without a Surveillance specifically being "performed", constitutes a Surveillance not "met."

1.4 Frequency

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, SR 3.0.2 allows an extension of the time interval to 1.25 times the interval specified in the Frequency 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.

1.4 Frequency (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.

2.0 FUNCTIONAL AND OPERATING LIMITS

2.1 Functional and Operating Limits

2.1.1 Fuel to be Stored in the NAC-MPC SYSTEM

INTACT FUEL ASSEMBLIES, INTACT FUEL RODS, DAMAGED FUEL RODS and FUEL DEBRIS placed in a RECONFIGURED FUEL ASSEMBLY meeting the limits specified in Table A2-1 may be stored in the NAC-MPC SYSTEM.

The values shown in Tables A2-1 and A2-2 are design nominal record values.

2.2 Functional and Operating Limit Violations

If any Functional and Operating Limits of Table A2-1 are violated, the following actions shall be completed:

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

2.2.2 Within 24 hours, notify the NRC Operations Center.

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

Table A2-1
Fuel Assembly Limits

I. NAC-MPC CANISTER

A. Allowable Contents

1. Uranium oxide Yankee Class INTACT FUEL ASSEMBLIES listed in Table A2-2 and meet the following specifications:

a. Cladding Type:	Zircaloy or Stainless Steel as specified in Table A2-2 for the applicable fuel assembly class (Note: Type A and Type B configurations in Table A2-2 identify variations in the arrangement of the outer row of fuel rods that accommodate the insertion of control blades in the reactor.)
b. Enrichment:	As specified in Table A2-2 for the applicable fuel assembly type.
c. Decay Heat Per Assembly:	
i. Zircaloy-Clad Fuel:	≤ 347 Watts
ii. Stainless Steel-Clad Fuel:	≤ 264 Watts
d. Post-irradiation Cooling Time and Average Burnup Per Assembly:	
i. Zircaloy-Clad Fuel:	As specified in Table A2-2 for the applicable fuel assembly type.
ii. Stainless Steel-Clad Fuel:	As specified in Table A2-2 for the applicable fuel assembly type.

Table A2-1
Fuel Assembly Limits (Continued)

f. Nominal Fuel Assembly Length:	Maximum = 111.8 inches Minimum = 109.0 inches
g. Nominal Fuel Assembly Width:	≤ 7.64 inches
h. Fuel Assembly Weight:	
i. Zircaloy-Clad Fuel:	≤ 850 lbs
ii. Stainless Steel-Clad Fuel:	≤ 900 lbs
i. Minimum Length of Bottom Fuel Nozzle:	6.7 inches (17.0 cm)

2. Uranium oxide Yankee Class INTACT FUEL RODS, DAMAGED FUEL RODS or FUEL DEBRIS placed in RECONFIGURED FUEL ASSEMBLIES (RFA). The original fuel assemblies for the INTACT FUEL RODS, DAMAGED FUEL RODS and FUEL DEBRIS shall meet the criteria specified in Table A2-2 for the fuel assembly class, and meet the following additional specifications:

a. Cladding Type:	Zircaloy or Stainless Steel as specified in Table A2-2 for the applicable fuel assembly type.
b. Enrichment:	As specified in Table A2-2 for the applicable fuel assembly type.
c. Decay Heat Per RFA:	≤ 102 Watts
d. Post-irradiation Cooling Time and Average Burnup Per Original Assembly:	
i. Zircaloy-Clad Fuel:	As specified in Table A2-2 for the applicable fuel assembly type.

Table A2-1
Fuel Assembly Limits (Continued)

ii. Stainless Steel-Clad Fuel:	As specified in Table A2-2 for the applicable fuel assembly type.
e. Nominal Original Fuel Assembly Length:	≤ 111.8 inches
f. Nominal Original Fuel Assembly Width:	≤ 7.64 inches
g. Maximum Weight:	≤ 850 lbs, including RFA
h. Maximum mass U per RFA:	66.33 kg

B. Quantity per CANISTER:
Up to 36 INTACT FUEL ASSEMBLIES and RFAs to the maximum content weight limit of 30,600 pounds.

C. INTACT FUEL ASSEMBLIES and RFAs shall not contain control components.

D. INTACT FUEL ASSEMBLIES shall not contain empty fuel rod positions. A solid Zircaloy or stainless steel rod that would displace an equivalent amount of water as an intact fuel rod shall replace any missing fuel rods.

Table A2-2 INTACT FUEL ASSEMBLY Characteristics

Fuel Assembly Type	Combustion Engineering Type A	Combustion Engineering Type B	Exxon Type A	Exxon Type B	Exxon Type A	Exxon Type B	Westinghouse Type A	Westinghouse Type B	United Nuclear Type A	United Nuclear Type B
ASSEMBLY CONFIGURATION[2]										
Assembly Length (cm)	283.9	283.9	283.3	283.3	283.9	283.9	282.6	282.6	282.4	282.4
Assembly Width (cm)	19.2	19.2	19.3	19.3	19.3	19.3	19.3	19.3	19.4	19.4
Assembly Weight (kg)	352	350.6	372	372	372	372	408.2	408.2	385.5	385.5
Enrichment-wt. % ^{235}U Maximum	3.90	3.90	4.00	4.00	4.00	4.00	4.94	4.94	4.00	4.00
Minimum	3.70	3.70	3.50	3.50	3.50	3.50	4.94	4.94	4.00	4.00
Max. Burnup (MWD/MTU)	36,000[1]	36,000[1]	36,000	36,000	36,000	36,000	32,000	32,000	32,000	32,000
Max. Initial Heavy Metal KgU/assembly	239.4	238.4	239.4	238.4	239.4	238.4	286.9	286.0	245.6	244.6
Min. Cool Time (yr)	8.1[1]	8.1[1]	16.0	16.0	9.0	9.0	21.0	21.0	13.0	13.0
Max. Decay Heat (kW)	0.347[1]	0.347[1]	0.269	0.269	0.331	0.331	0.264	0.264	0.257	0.257
FUEL ROD CONFIGURATION										
Fuel Rod Pitch (cm)	1.20	1.20	1.20	1.20	1.20	1.20	1.07	1.07	1.19	1.19
Active Fuel Length (cm)	231.1	231.1	231.1	231.1	231.1	231.1	234.0	234.0	231.1	231.1
Rod OD (cm)	0.93	0.93	0.93	0.93	0.93	0.93	0.86	0.86	0.93	0.93
Clad ID (cm)	0.81	0.81	0.81	0.81	0.81	0.81	0.76	0.76	0.81	0.81
Clad Material	Zircaloy	Zircaloy	Zircaloy	Zircaloy	Zircaloy	Zircaloy	SS	SS	Zircaloy	Zircaloy
Pellet OD (cm)	0.79	0.79	0.79	0.79	0.79	0.79	0.75	0.75	0.79	0.79
Rods per Assembly	231	230	231	230	231	230	305	304	237	236

1. Combustion Engineering fuel may be loaded at a maximum burnup of 32,000 MWD/MTU, a minimum enrichment of 3.5 wt% ^{235}U and cool time of 8.0 years. The maximum decay heat for this assembly is 0.304 kW.

2. Type A and Type B configurations identify variations in the arrangement of the outer row of fuel rods that accommodate the insertion of control blades in the reactor.

3.0 LIMITING CONDITION 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 to an NAC-MPC SYSTEM.

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 NAC-MPC SYSTEM.

Exceptions to this Specification are stated in the individual Specifications. These exceptions allow entry into specified conditions in the Applicability where the associated ACTIONS to be entered allow operation in the specified conditions in the Applicability only for a limited period of time.

LCO 3.0.5 Equipment removed from service or not in service in compliance with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate it meets the LCO or that other equipment meets the LCO. This is an exception to LCO 3.0.2 for the System to return to service under administrative control to perform the testing.

LCO 3.0.6	Not applicable to an NAC-MPC SYSTEM.
LCO 3.0.7	Not applicable to an NAC-MPC SYSTEM.

3.0 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 a 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.

3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

SR 3.0.3 (continued)	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 NAC-MPC SYSTEM.

3.1 NAC-MPC SYSTEM Integrity

3.1.1 [Reserved]

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3.1 NAC-MPC SYSTEM Integrity

3.1.2 CANISTER Vacuum Drying Pressure

LCO 3.1.2 The CANISTER vacuum drying pressure shall meet the limit specified in Table A3-1.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. CANISTER vacuum drying pressure limit not met.	A.1 Establish CANISTER cavity vacuum drying pressure within limit.	25 days
B. Required Action and Associated Completion Time not met.	B.1 Remove all fuel assemblies from the NAC-MPC SYSTEM.	5 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.2.1	Verify CANISTER cavity vacuum drying pressure is within limit	Within 24 hours after completion of CANISTER draining.

3.1 NAC-MPC SYSTEM Integrity
3.1.3 CANISTER Helium Backfill Pressure

LCO 3.1.3 The CANISTER helium backfill pressure shall meet the limit specified in Table A3-1.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. CANISTER helium backfill pressure limit not met.	A.1 Establish CANISTER helium backfill pressure within limit.	25 days
B. Required Action and Associated Completion Time not met.	B.1 Remove all fuel assemblies from the NAC-MPC SYSTEM.	5 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	Verify CANISTER helium backfill pressure is within limit	Within 24 hours after completion of CANISTER draining.

3.1 NAC-MPC SYSTEM Integrity

3.1.4 CANISTER Helium Leak Rate

LCO 3.1.4 There shall be no indication of a helium leak at a test sensitivity of 4×10^{-8} cm^3/sec (helium) through the CANISTER shield lid to CANISTER shell confinement weld to demonstrate a helium leak rate less than 8×10^{-8} cm^3/sec (helium) as specified in Table A3-1.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

-----NOTE-----

Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. CANISTER helium leak rate limit not met.	A.1 Establish CANISTER helium leak rate within limit.	25 days
B. Required Action and Associated Completion Time not met.	B.1 Remove all fuel assemblies from the NAC-MPC SYSTEM.	5 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Verify CANISTER helium leak rate is within limit	Prior to TRANSPORT OPERATIONS.

3.1 NAC-MPC SYSTEM Integrity
3.1.5 CANISTER Maximum Time in Vacuum Drying

LCO 3.1.5 The following limits for vacuum drying time shall be met, as appropriate:

1. The time duration from completion of draining the CANISTER through completion of vacuum dryness testing and the introduction of helium backfill shall not exceed 16 hours.
2. The time duration from end of external forced air cooling or in-pool cooling of the CANISTER through completion of vacuum dryness testing and the introduction of helium backfill shall not exceed 10 hours.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO time limits not met	A.1 Commence filling CANISTER with helium AND	2 hours
	A.1.1 Place TRANSFER CASK with helium filled loaded CANISTER in spent fuel pool. AND	2 hours
	A.1.2 Maintain TRANSFER CASK and CANISTER in spent fuel pool for a minimum of 24 hours. OR	Prior to restart of LOADING OPERATIONS

3.1 NAC-MPC SYSTEM Integrity

3.1.5 CANISTER Maximum Time in Vacuum Drying (Continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	A.2	Commence filling CANISTER with helium	2 hours
	AND		
	A.2.1	Commence supplying air to the TRANSFER CASK bottom eight fill/drain lines at a rate of 250 CFM and a maximum temperature of 75°F	2 hours
	AND		
	A.2.2	Maintain airflow for a minimum of 24 hours	Prior to restart of LOADING OPERATIONS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.5.1	Monitor elapsed time from completion of canister draining until start of helium backfill.	Once at completion of canister draining AND 3 hours thereafter.
SR 3.1.5.2	Monitor elapsed time from completion of canister draining following in-pool or forced air cooling until start of helium backfill.	Once at completion of canister draining AND 2 hours thereafter.

3.1 NAC-MPC SYSTEM Integrity

3.1.6 CANISTER Maximum Time in TRANSFER CASK

LCO 3.1.6 The following limits for CANISTER time in TRANSFER CASK shall be met, as appropriate:

1. The time duration from the introduction of helium backfill of the CANISTER with helium through completion of the CANISTER transfer operation from the TRANSFER CASK tc the CONCRETE CASK shall not exceed 26 hours.
2. The time duration from completion of in-pool or external forced air cooling of the CANISTER through completion of the CANISTER transfer operation from the TRANSFER CASK to the CONCRETE CASK shall not exceed 25 hours. This LCO time limit is also applicable if LCO 3.1.5.1 was not met during vacuum drying operations.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

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

Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO time limits not met	A.1 A1.1. Place TRANSFER CASK with helium filled loaded CANISTER in spent fuel pool	2 hours
	AND A.1.2 Maintain TRANSFER CASK and CANISTER in spent fuel pool for a minimum of 24 hours	Prior to restart of LOADING OPERATIONS
	OR	

3.1 NAC-MPC SYSTEM Integrity

3.1.6 CANISTER Maximum Time in TRANSFER CASK (Continued)

	A.2 A.2.1 Commence supplying air to the TRANSFER CASK bottom eight fill/drain lines at a rate of 250 CFM and a maximum temperature of 75°F	2 hours
	AND A.2.2 Maintain airflow for a minimum of 24 hours	Prior to restart of LOADING OPERATIONS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	Monitor elapsed time from the introduction of helium backfill until completion of transfer of loaded CANISTER into CONCRETE CASK.	Once at completion of vacuum dryness verification test AND 3 hours thereafter.
SR 3.1.6.2	Monitor elapsed time from completion of in-pool or forced air cooling until completion of transfer of loaded CANISTER into CONCRETE CASK	Once at completion of cooling operations AND 3 hours thereafter.

3.1 NAC-MPC SYSTEM Integrity

3.1.7 Fuel Cooldown Requirements

LCO 3.1.7 A loaded CANISTER and its fuel contents shall be cooled down in accordance with the following specifications:

a. Nitrogen gas flush for a minimum of 10 minutes

b. Minimum cooling water temperature of 70°F

c. Cooling water flow rate of 5 (+3, -0) gallons per minute at inlet pressure of 25 (+10, -0) psig

d. Maintain cooling water flow through CANISTER until outlet water temperature ≤ 200°F

e. Maximum canister pressure ≤ 50 psig

APPLICABILITY: During UNLOADING OPERATIONS

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

The LCO is only applicable to wet UNLOADING OPERATIONS.

ACTIONS

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

Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. CANISTER cooldown requirements not met.	A.1 Initiate actions to meet CANISTER cooldown requirements.	Immediately

3.1 NAC-MPC SYSTEM Integrity

3.1.7 Fuel Cooldown Requirements (Continued)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.7.1	Initiate CANISTER cooldown flow to loaded CANISTER.	Within 30 hours after removal of CANISTER from CONCRETE CASK and placement in Transfer Cask.
SR 3.1.7.2	Verify that the cooldown water temperature and flow rate are within limits.	Once within 1 hour prior to initiating cooldown AND 1 hour thereafter.

3.1 NAC-MPC SYSTEM Integrity

3.1.8 CONCRETE CASK Maximum Lifting Height

LCO 3.1.8 A CONCRETE CASK containing a CANISTER loaded with INTACT FUEL ASSEMBLYs or RECONFIGURED FUEL ASSEMBLYs shall be lifted in accordance with the following requirement

a. A lift height $\leq$ 6 inches

APPLICABILITY: During TRANSPORT OPERATIONS

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. NAC-MPC SYSTEM lifting requirements not met.	A.1 Initiate actions to meet CONCRETE CASK maximum lifting height.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.8.1	Verify CONCRETE CASK lifting requirements are met.	After the CONCRETE CASK is raised to install or remove air pad and prior to TRANSPORT OPERATIONS

3.1 NAC-MPC SYSTEM Integrity

3.1.9 TRANSFER CASK Minimum Operating Temperature

LCO 3.1.9 The TRANSFER CASK shall not be used for loaded CANISTER transfer operations outside of the fuel handling facility when the external ambient temperature is ≤ 0°F.

APPLICABILITY: During LOADING or UNLOADING OPERATIONS

ACTIONS

-----------------------------------NOTE-----------------------------------
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. External ambient temperature below LCO limit	A.1 Do not perform TRANSFER CASK operations external to the facility.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.9.1	Measure external ambient temperature.	Prior to start of LOADING or UNLOADING OPERATIONS AND 1 hour thereafter.

3.1 NAC-MPC SYSTEM Integrity

3.1.10 CANISTER Removal from the CONCRETE CASK

LCO 3.1.10 The following limits for TRANSFER OPERATIONS shall be met, as appropriate:

1. The time duration for holding the CANISTER in the TRANSFER CASK shall not exceed 16 hours, without forced air cooling.
2. The time duration for holding the CANISTER in the TRANSFER CASK using external forced air cooling of the CANISTER is not limited.

APPLICABILITY: During TRANSFER OPERATIONS

ACTIONS

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

Separate Condition entry is allowed for each NAC-MPC SYSTEM.

Separate Condition entry to this LCO is allowed following each 24-hour period of continuous forced air cooling.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Loaded CANISTER held in TRANSFER CASK	A.1.1 Load CANISTER into operable CONCRETE CASK	16 hours
	<u>OR</u> A.2.1 Load CANISTER into TRANSPORT CASK	16 hours
	<u>OR</u> A.3.1 Perform A.1.1 or A.2.1 following a minimum of 24-hours of forced air cooling	16 hours
B. Required Actions in A and associated Completion Time not met	B.1.1 Commence supplying air to the TRANSFER CASK annulus fill/drain lines at a rate of 250 CFM and a maximum temperature of 75°F	4 hours
	<u>AND</u> B.2.1 Maintain forced air cooling. Condition A of this LCO may be re-entered after 24 hours of forced air cooling	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.10.1	Monitor elapsed time from closing of the TRANSFER CASK bottom shield doors until unloading of the CANISTER from the TRANSFER CASK	Once at closing of the TRANSFER CASK bottom shield doors AND 4 hours thereafter
SR 3.1.10.2	Monitor continuous forced air cooling operation until unloading of the CANISTER from the TRANSFER CASK	Once at start of cooling operations AND 6 hours thereafter

Table A3-1
CANISTER Limits

CANISTER	LIMITS
NAC-MPC CANISTER	
a. CANISTER Vacuum Drying Pressure	$\leq$ 3 mm of Mercury for $\geq$ 30 min
b. CANISTER Helium Leak Rate	$\leq 8 \times 10^{-8}$ std cc/sec (helium)
c. CANISTER Helium Backfill Pressure	0 (+1, -0) psig

3.2 NAC-MPC SYSTEM Radiation Protection

3.2.1 NAC-MPC SYSTEM Average Surface Dose Rates

LCO 3.2.1 CONCRETE CASK dose rates shall be measured at the locations shown in Figure A3-1. The average surface dose rates of each CONCRETE CASK shall not exceed:

a. 50 mrem/hour (neutron + gamma) on the side (on the concrete surfaces)

b. 35 mrem/hour (neutron + gamma) on the top;

c. 100 mrem/hour (neutron + gamma) at air inlet and outlet vents.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. CONCRETE CASK average surface dose rate limits not met.	A.1 Administratively verify correct fuel loading. AND	24 hours

3.2 NAC-MPC SYSTEM Radiation Protection

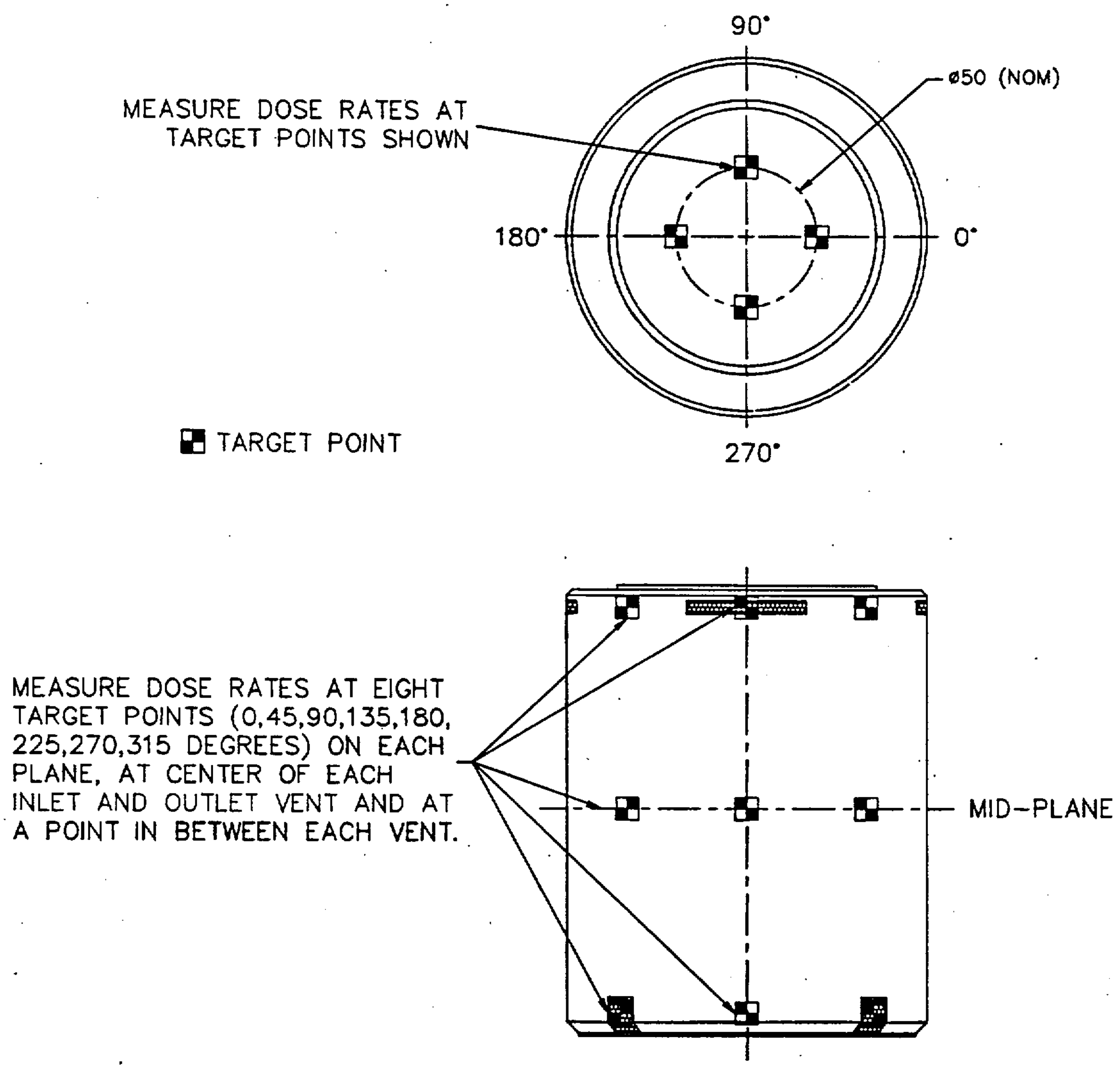
3.2.1 CONCRETE CASK Average Surface Dose Rates (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2 Verify that the dose rate from the cask will not cause the ISFSI to exceed the offsite radiation protection requirements of 10 CFR 20 and 10 CFR 72.	Prior to TRANSPORT OPERATIONS
B. Required Action and Associated Completion Time not met.	B.1 Remove all fuel assemblies from the NAC-MPC SYSTEM.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.1.1	Verify average surface dose rates of CONCRETE CASK containing fuel assemblies are within limits.	Prior to TRANSPORT OPERATIONS

Figure A3-1
CONCRETE CASK Surface Dose Rate Measurement



3.2 NAC-MPC SYSTEM Radiation Protection

3.2.2 CANISTER Surface Contamination

LCO 3.2.2 Removable contamination on the accessible exterior surfaces of the CANISTER or accessible interior surfaces of the TRANSFER CASK shall each not exceed:

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

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

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

--NOTE--
Separate Condition entry is allowed for each NAC-MPC SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. CANISTER or TRANSFER CASK removable surface contamination limits not met.	A.1 Restore CANISTER and TRANSFER CASK removable surface contamination to within limits.	Prior to TRANSPORT OPERATIONS

3.2 NAC-MPC SYSTEM Radiation Protection

3.2.2 CANISTER Surface Contamination (Continued)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.2.1	Verify that the removable contamination on the accessible exterior surfaces of the CANISTER containing fuel is within limits.	Prior to TRANSPORT OPERATIONS
SR 3.2.2.2	Verify that the removable contamination on the accessible interior surfaces of the TRANSFER CASK do not exceed limits.	Prior to TRANSPORT OPERATIONS

4.0 DESIGN FEATURES

4.1 Site

4.1.1 Site Location

Not applicable

4.2 Storage Features

4.2.1 Storage Cask

The NAC-MPC SYSTEM consists of the VERTICAL CONCRETE CASK (CONCRETE CASK) and its integral TRANSPORTABLE STORAGE CANISTER (CANISTER).

4.2.2 Storage Capacity

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

4.2.3 Storage Pad(s)

Not applicable

4.3 Codes and Standards

The American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), 1995 Edition with Addenda, is the governing Code for the NAC-MPC CANISTER.

The American Concrete Institute Specifications ACI-349 and ACI-318 govern the NAC-MPC Vertical Concrete Cask design and construction, respectively.

The American National Standards Institute ANSI N14.6 and NUREG-0612 govern the NAC-MPC Transfer Cask design and construction.

4.1 Site (Continued)

4.3.1 Exceptions to the ASME Code

Codes and Standards

The NAC-MPC CANISTER and fuel basket structure are designed and fabricated in accordance with the ASME Code, Section III, Division 1, Subsections NB and NG, respectively. Exceptions to the applicable ASME Code requirements are listed in Table A4-1.

Proposed alternatives to ASME Code Section III, 1995 Edition with Addenda, including exceptions allowed by Table A4-1 may be used as authorized by the Director of the Office of Nuclear Material Safety and Safeguards or Designee. The justification in Table A4-1 demonstrates that:

1. The proposed alternatives will provide an acceptable level of quality and safety, or
2. Compliance with the specified requirements of ASME Code, Section III, 1995 Edition with Addenda would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Table A4-1

List of ASME Code Exceptions for the NAC-MPC CANISTER

Component	Reference ASME Code Section/Article	Code Requirement	Exception, Justification and Compensatory Measures
CANISTER	NB-1100	Statement of requirements for Code stamping of components.	CANISTER is designed and will be fabricated in accordance with ASME Code, Section III, Subsection NB to the maximum practical extent, but Code stamping is not required.
CANISTER Shield Lid and Structural Lid Welds	NB-4243	Full penetration welds required for Category C joints (flat head to main shell per NB-3352.3).	Shield lid and structural lid to canister shell welds are not full penetration welds. These field welds are performed independently to provide a redundant closure. Leaktightness of the canister is verified by testing.
CANISTER Structural Lid Weld	NB-4421	Requires removal of backing ring.	Structural lid to canister shell weld uses a backing ring that is not removed. The backing ring permits completion of the groove weld; it is not considered in any analyses; it has no detrimental effect on the canister's function.
CANISTER Vent Port Cover and Drain Port Cover to Shield Lid Welds; Shield Lid to Canister Shell Weld	NB-5230	Radiographic (RT) or ultrasonic (UT) examination required.	Root and final surface liquid penetrant examination to be performed per ASME Code Section V, Article 6, with acceptance in accordance with NB-5350.

Table A4-1
List of ASME Code Exceptions for the NAC-MPC CANISTER (Continued)

Component	Reference ASME Code Section/Article	Code Requirement	Exception, Justification and Compensatory Measures
CANISTER Structural Lid to Shell Weld	NB-5230	Radiographic (RT) or ultrasonic (UT) examination required.	The CANISTER structural lid to canister shell closure weld is performed in the field following fuel assembly loading. The structural lid-to-shell weld will be verified by either ultrasonic (UT) or progressive liquid penetrant (PT) examination. If progressive PT examination is used, at a minimum, it will include the root and final surfaces and sufficient intermediate layers to detect critical flaws. If UT examination is used, it will be followed by a final surface PT examination. For either UT or PT examination, the maximum, undetectable flaw size is demonstrated to be smaller than the critical flaw size. The critical flaw size is determined in accordance with ASME Section XI methods. The examination of the weld will be performed by qualified personnel per ASME Code Section V, Articles 5 (UT) and 6 (PT) with acceptance per ASME Code Section III, NB-5330 (UT) and NB-5350 for (PT).

Table A4-1
List of ASME Code Exceptions for the NAC-MPC CANISTER (Continued)

Component	Reference ASME Code Section/Article	Code Requirement	Exception, Justification and Compensatory Measures
CANISTER Vessel and Shield Lid	NB-6111	All completed pressure retaining systems shall be pressure tested.	The CANISTER shield lid to shell weld is performed in the field following fuel assembly loading. The CANISTER, including the shield lid weld, is then pneumatically (air-over-water) pressure tested as defined in Chapter 9 and described in Chapter 8. Accessibility for leakage inspections precludes a Code compliant hydrostatic test. The shield lid-to-shell weld is re-examined by liquid penetrant (PT) examination following the pneumatic pressure test. The shield lid weld is also leak tested to leak-tight criteria of ANSI N14.5. The vent port and drain port cover welds are examined by root and final PT examination. The structural lid secondary enclosure weld is not pressure tested, but is examined by UT and final surface PT or progressive PT.
CANISTER Vessel	NB-7000	Vessels are required to have overpressure protection.	No overpressure protection is provided. The function of the CANISTER is to confine radioactive contents under normal, off-normal, and accident conditions of storage. The CANISTER vessel is designed to withstand a maximum internal pressure considering 100% fuel rod failure and maximum accident temperatures.

Table A4-1
List of ASME Code Exceptions for the NAC-MPC CANISTER (Continued)

Component	Reference ASME Code Section/Article	Code Requirement	Exception, Justification and Compensatory Measures
CANISTER Vessel	NB-8000	States requirements for nameplates, stamping and reports per NCA-8000.	The NAC-MPC SYSTEM is marked and identified in accordance with 10 CFR 72 requirements. Code stamping is not required. The QA data package will be in accordance with NAC's approved QA program.
CANISTER Basket Assembly	NG-8000	States requirements for nameplates, stamping and reports per NCA-8000.	The NAC-MPC SYSTEM will be marked and identified in accordance with 10 CFR 72 requirements. No Code stamping is required. The CANISTER basket data package will be in conformance with NAC's approved QA program.
CANISTER Vessel and Basket Assembly Material	NB-2130/ NG-2130	States requirements for certification of material to NCA-3861 and NCA-3862	The NAC-MPC CANISTER Vessel and Basket Assembly component materials are procured in accordance with the specifications for materials in ASME Code Section II. The component materials will be obtained from NAC approved Suppliers in accordance with NAC's approved QA program.

4.4 Site Specific Parameters and Analyses

Site-specific parameters and analyses that will need verification by the NAC-MPC SYSTEM user, are as a minimum, as follows:

1. The temperature of 75°F is the maximum average yearly temperature. The average daily ambient temperature shall be 100°F or less.

2. The temperature extremes of 125°F with incident solar radiation and -40°F for storage of the CANISTER inside the CONCRETE CASK.

3. The design basis earthquake horizontal and vertical seismic acceleration levels are bounded by the values shown below:

   Design-Basis Earthquake Input on the Top Surface of an ISFSI Pad

Horizontal g-level in each of Two Orthogonal Directions	Corresponding Vertical g-level (upward)
0.25g	0.25 x 0.667 = 0.167g

4. The analyzed flood condition of 15 fps water velocity and a height of 50 feet of water (full submergence of the loaded cask) are not exceeded.

5. The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the fuel tank of the cask handling equipment used to move the loaded CONCRETE CASK onto the ISFSI site contains no more than 50 gallons of fuel.

4.4 Site Specific Parameters and Analyses (Continued)

6. In addition to the requirement of 10 CFR 72.212(b)(2)(ii), the ISFSI pad and foundation shall include the following characteristics as applicable to the end drop and tip-over analyses:

a.	Concrete thickness	36 inch maximum
b.	Pad Subsoil thickness	72 inch minimum
c.	Concrete compressive strength	≤ 4,000 psi at 28 days
d.	Concrete density (ρ)	$125 \leq \rho \leq 150$ lbs/ft^3
e.	Soil density (ρ)	$85 \leq \rho \leq 130$ lbs/ft^3
f.	Soil Stiffness (k)	k ≤ 300 psi/in.

The concrete pad maximum thickness excludes the ISFSI pad footer. The compressive strength of concrete should be determined according to the test method given in Section 5.6 of ACI 318. Steel reinforcement is used in the pad. The placement of the reinforcement, including its area and spacing, are determined by analysis and installed in accordance with ACI 318. The soil stiffness should be determined according to the test method described in Chapter 9 of the Civil Engineering Reference Manual, 6th Edition..

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

4.5 Design Specifications

4.5.1 Specification Important for Thermal Performance

1. The spacing of the NAC-MPC SYSTEM shall be a minimum of 15 feet (center-to-center).
2. Helium shall have a minimum purity of 99.9%.

4.5.2 Specification Important to CANISTER Lifting

The minimum distance from the master link of the CANISTER lifting slings to the top of the CANISTER shall be 67 inches.

5.0 ADMINISTRATIVE CONTROLS

5.1 NAC-MPC SYSTEM Training

Training modules shall be developed under the general licensee's training program as required by 10 CFR 72.212(b)(6). Training modules shall require a comprehensive, program for the operation and maintenance of the NAC-MPC SYSTEM and the Independent Spent Fuel Storage Installation (ISFSI). The training modules shall include the following elements, at a minimum:

- Regulatory Requirements Overview
- NAC-MPC SYSTEM Design and Operational Features
- ISFSI Facility Design (overview)
- Certificate of Compliance Conditions
- Technical Specifications, Controls, Limits and Conditions of Use
- Identification of Components and Equipment Important to Safety
- Surveillance Requirements
- NAC-MPC SYSTEM and ISFSI procedures, including:
  - Documentation, Inspection and Compliance Requirements
  - Handling the CONCRETE CASK and Empty CANISTER
  - Handling the Transfer Cask
  - Loading and Closing the CANISTER
  - Loading the CONCRETE CASK
  - Moving the CONCRETE CASK and CANISTER and Placement on the ISFSI
- Special Processes and Equipment, including Leak Testing, Welding and Weld Examination
- Auxiliary Equipment, including Lifting Yokes and Slings
- Off-Normal and Accident Conditions, Response and Corrective Actions
- Radiological Safety and ALARA
- Operating Experience

Training session participation should be documented as required to establish qualification to performed the designated tasks.

5.2 Dry Run Training

A dry run training exercise of the loading, closure, handling, unloading, and transfer of the NAC-MPC Storage System shall be conducted by the licensee before the system is initially loaded. This demonstrates equipment fitup and interfacing, provides the opportunity to illustrate key features, operations, inspections and test conditions. It also allows comparison of procedural steps to component handling requirements. 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:

- Moving the Concrete Cask into its Designated Loading Area
- Moving the Transfer Cask Holding the Empty Canister into the Spent Fuel Pool
- Loading One or More Dummy Fuel Assemblies into the Canister, Including Independent Verification
- Installing the Shield Lid
- Removal of the Transfer Cask from the Spent Fuel Pool
- Closing and Sealing of the Canister to Demonstrate Pressure Testing, Vacuum Drying, Helium Backfilling, Welding, Weld Inspection and Documentation, and Leak Testing
- Transfer Cask Movement Through the Designated Load Path
- Transfer Cask Installation on the Concrete Cask
- Placement of the Canister in the Concrete Cask
- Transport of the Concrete Cask to the ISFSI
- Canister Unloading, Including Reflooding and Weld Removal or Cutting

Demonstration of closing and sealing the canister may be performed using a mockup of the canister. The mockup should closely approximate the actual canister to allow qualification of personnel in the welding and testing tasks as required. The closed mockup is also used to demonstrate the activities necessary to open and unload the canister.

Participation in dry run training should be documented as required to establish qualification to perform designated tasks.

5.3 Special Requirements for First NAC-MPC SYSTEM Placed in Service

The heat transfer characteristics of the NAC-MPC SYSTEM will be recorded by temperature measurements of the first NAC-MPC SYSTEM placed in service with a heat load equal to or greater than 7.5 kW.

5.4 Programs

5.4.1 CONCRETE CASK Thermal Monitoring Program

The following programs shall be established, implemented and maintained.

This program provides guidance for the temperature measurement and visual inspection activities that are used to monitor the thermal performance of each CONCRETE CASK.

a. The ambient air temperature and the air outlet temperatures are measured and compared every 24 hours. The temperature difference between the air outlet temperatures and the ambient air temperature is calculated and recorded.

b. If any air outlet temperature, or temperature difference between air outlet and ambient temperature shows an unexplained reading, appropriate actions are taken to determine the cause and to return the outlet temperatures to acceptable values. One of the immediate actions will be to increase the frequency of temperature monitoring until normal conditions are returned.

c. If an air outlet temperature exceeds the ambient air temperature by 92°F, the NRC will be notified and actions will be taken to evaluate the effects and impact of the elevated temperature on the CONCRETE CASK and CANISTER. A temperature differential of 92°F corresponds to a concrete temperature of 165°F. The long-term normal concrete temperature limit for the CONCRETE CASK is 200°F and the short-term bulk concrete temperature limit is 350°F.