Certificate of Compliance
FOR DRY SPENT FUEL STORAGE CASKS

10 CFR 72

AUG 17 1990

1. a. CERTIFICATE NUMBER: 1003
   b. REVISION NUMBER: 0
   c. PACKAGE IDENTIFICATION NUMBER: USA/72-1003
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2. **Preamble** This certificate is issued to certify that the cask and contents, described in item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 72; "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."

3. ***THIS CERTIFICATE*** is issued on the basis of a safety analysis report of the cask design.

a. PREPARED BY (Name and Address)

Nuclear Assurance Corporation
6251 Crooked Creek Road
Suite 200
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Topical Safety Analysis Report for the NAC Storage/Transport Cask Containing Consolidated Fuel for use at an Independent Spent Fuel Storage Installation

c. DOCKET NUMBER 72-1003

4. **CONDITIONS** This certificate is conditional upon fulfilling the requirements of 10 CFR 72, as applicable, and the conditions specified below.

5. **Cask**
   a. **Model No:** NAC-C28 S/T
   b. **Description**
   The Nuclear Assurance Corporation Storage/Transport cask for consolidated fuel (NAC-C28 S/T) is designed for the storage and shipment of irradiated fuel rods placed in canisters. This certificate addresses spent fuel handling, transfer, and storage on an NRC-licensed nuclear reactor site but does not address any use of this cask for offsite transport of spent fuel.

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The NAC-C28 S/T is a multi-wall cylinder with a 38.86 mm (1.53 in) thick inner shell and a 66.07 mm (2.68 in) thick outer shell, both made of stainless steel, separated by 81.3 mm (3.2 in) of lead. There is a 177.8 mm (7.0 in) thick solid neutron shield around the outer shell which is encased in 6.35 mm (.25 in) thick stainless steel. The cask body is 4605 mm (181.3 in) long and 2419 mm (95.24 in) in diameter. The loaded cask including fuel, water, and lifting yoke weighs less than 113 tonne (125 tons), empty it weighs approximately 75 tonne (83 tons). The fuel basket has 28 cavities which are 223 mm (8.78 in) square for storage of PWR fuel assemblies. Six trunnions can be attached to the cask, four around the top and two opposite each other near the bottom.

Gamma and neutron radiation is shielded by the lead, stainless steel, and Bisco (solid neutron shield) in the wall. The bottom and lid are also made of lead encased in a stainless steel shell. A 96.5 mm (3.8 in) thick stainless steel and Bisco neutron shield cap is placed on top of the cask after fuel loading to further reduce radiation.

The cask is sealed, to maintain an inert helium atmosphere, using a 215.9 mm (8.5 in) thick lid with two metallic O-rings. The lid is secured by 24 bolts. The lid has four penetrations: (1) cask cavity drain, (2) cask cavity vent, (3) interseal test port, (4) interseal pressure transducer. Each is sealed using two metal O-rings.

The 28 fuel cavities are square aluminum tubes tubes which are held by aluminum castings at its periphery. Sheets of boral are attached to the outside of the tubes to absorb neutrons.

Impact limiters are attached to the top and bottom of the cask during transport and storage. They are made of Aluminum honeycomb inside a stainless shell. The cask may never be lifted higher than 59 inches and must be moved in a vertical position.

c. Drawing

The NAC-C28 S/T cask is described by drawings in Chapter 4 of the TSAR.

d. Basic Components

The Basic Components of the NAC-C28 S/T cask, that are important to safety, are listed in Section 3.4 of the TSAR.

6. Cask fabrication activities shall be conducted in accordance with the reviewed and approved quality assurance program submitted with the TSAR.

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7. Notification of cask fabrication schedules shall be made in accordance with the requirements of §72.232(c), 10 CFR Part 72.

8. Casks of the Model No. NAC-C28 S/T authorized by this certificate are 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 §72.210, 10 CFR Part 72, subject to the conditions specified by §72.212 and the attached Conditions for Cask Use.

9. **Expiration Date:**
August 31, 2010

FOR THE NUCLEAR REGULATORY COMMISSION

Charles J. Haughney
SIGNATURE

Chief, Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety
Office of Nuclear Material Safety
and Safeguards

CONDITIONS FOR CASK USE

CERTIFICATE OF COMPLIANCE

72-1003

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1.0 INTRODUCTION

These Conditions for Cask Use govern the safety of the receipt possession and storage of irradiated nuclear fuel at an Independent Spent fuel Storage Installation (ISFSI) and the transfer of such fuel to and from a Nuclear Power Station and its ISFSI.

1.1 GENERAL CONDITIONS

1.1.1 Operating Procedures

Written operating procedures shall be prepared for cask handling, movement, placement, surveillance, and maintenance.

1.1.2 Quality Assurance

Activities at the ISFSI shall be conducted in accordance with the requirements of Appendix B, 10 CFR Part 50.

1.2 PREOPERATIONAL CONDITIONS

The user shall not allow the initial loading of spent nuclear fuel in the Model Number NAC-C2B S/T cask until such time as the following preoperational license conditions are satisfied:

(1) A training module shall be developed for the Station Training Program establishing an ISFSI Training and Certification Program which will cover the following:

a. Cask Design (overview)

b. ISFSI Facility Design (overview)

c. ISFSI Safety Analysis (overview)

d. Fuel loading and cask handling procedures and abnormal procedures

e. Certificate of Compliance (overview).

(2) A training exercise (Dry Run) of cask loading and handling activities shall be held which shall include but not be limited to:

a. Moving cask in and out of spent fuel pool area.

b. Loading a consolidated fuel canister (using a dummy canister).

c. Cask sealing and cover gas backfilling operations.

d. Moving cask to and placing it on the storage pad.

e. Returning the cask to the reactor.

f. Unloading the cask assuming fuel cladding failure.

g. Cask decontamination.

2.0 FUNCTIONAL AND OPERATING LIMITS

2.1 FUEL TO BE STORED AT ISFSI

2.1.1 Specification

The spent nuclear fuel to be received and stored at the ISFSI in NAC-C28 S/T casks shall meet the following requirements:

(1) Consolidated Zircaloy clad PWR fuel rods in canisters that have the characteristics listed in Table 10.1-1 of the TSAR may be stored in the NAC-C28 S/T cask. The maximum number of canisters that may be stored is 28.

(2) Maximum initial enrichment shall not exceed 3.5 weight percent U-235.

(3) Maximum assembly average burnup shall not exceed 35,000 megawatt days per metric ton uranium.

(4) Maximum heat generation rate shall not exceed .714 kilowatt per fuel canister.

(5) Fuel canisters shall contain no fewer than 361 fuel rods and no more than 408 fuel rods.

(6) Fuel canisters known or suspected to have structural defects sufficiently severe to adversely affect fuel handling and transfer capability shall not be loaded into the cask for storage.

(7) A procedure shall be developed for the documentation of the characterizations performed to select spent fuel to be stored in the casks. Such procedure shall include independent verification of fuel and canister selection by an individual other than the original individual making the selection.

(8) Immediately prior to insertion of a spent fuel canister into a cask, the identity of the canister shall be independently verified by two individuals.

2.1.2 Basis

The design criteria and subsequent safety analysis assumed certain characteristics and limitations for the fuels that are to be received and stored. Specification 2.1.1 assures that these bases remain valid by defining the type of spent fuel, maximum initial enrichment, irradiation history, and maximum thermal heat generation.

2.2 NAC-C28 S/T DRY STORAGE CASK

2.2.1 Specification

NAC-C28 S/T Dry Storage Casks used to store spent nuclear fuel at an ISFSI shall have the operating limits shown in Table 2-1.

2.2.2 Basis

The design criteria and subsequent safety analysis of the NAC-C28 S/T assumed certain characteristics and operating limits for the use of the casks. This specification assures that those design criteria are not exceeded.

Table 2-1 NAC-C28 S/T OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Nonredundant Lifting Device	
With Impact Limiters	≦ 4 feet, 11 inches
Without Impact Limiters	≦ 15 inches
Dose Rate	
. 2 m Distance	≦ 10 mrem/hr
. Surface	≦ 200 mrem/hr
Cask Tightness (Standard He-Leak Rate)	
. Primary Lid Seal	≦ 10^{-6} atm cm^3/sec
. Secondary Lid Seal	≦ 10^{-6} atm cm^3/sec
Max. Specific Power of one Fuel Canister	.714 kW
Initial Helium Pressure Limit (Cask Cavity)	32.4 psia

2.3 LIMITING CONDITION - HANDLING HEIGHT

2.3.1. Specification

This specification applies to the handling of a loaded cask outside of the Fuel Building and Crane Enclosure Building.

(1) The NAC-C28 S/T cask shall not be lifted higher than 59 inches.

(2) The NAC-C28 S/T must always be handled in a vertical orientation.

(3) The bottom impact limiter must be used when handling a loaded cask above a height of 15 inches.

2.3.2 Basis

The drop analyses performed for the NAC-C28 S/T dry storage cask requires these conditions to avoid sustaining unacceptable damage to the storage cask and fuel basket in the event of a cask drop. This limiting condition ensures that the handling height limits will not be exceeded at the storage pad or in transit to and from the reactor.

2.4 DRY STORAGE CASK SURFACE CONTAMINATION

2 4.1 Specification

Initial removable surface contamination shall not exceed 2200 dis/min/100 cm^2 from beta-gamma sources, and 220 dis/min/100 cm^2 from alpha sources.

2.4.2 Basis

Compliance with this limit ensures that the decontamination requirements of 49 CFR 173.443 will be met.

2.5 DRY STORAGE CASK INTERNAL COVER GAS

2.5.1 Specification

The dry storage casks shall be backfilled with helium.

2.5.2 Basis

The thermal analysis performed for the dry storage casks assumes the use of helium as a cover gas. In addition, the use of an inert gas (helium) is to ensure long-term fuel clad integrity.

3.0 SURVEILLANCE REQUIREMENTS

Requirements for surveillance of various radiation levels cask internal pressure, contamination levels, cask seal leak rates, and fuel related parameters are contained in this section. These requirements are summarized in Table 3-1 from details contained in Section 3.1 through 3.6. Specified time intervals may be adjusted plus or minus 25 percent to accommodate normal test schedules.

Table 3-1 SURVEILLANCE REQUIREMENTS SUMMARY

Section	Quantity or Item	Period
3.1.1	Cask Loading Measurements	P
3.2.1	Cask Seal Testing	L
3.3.1	Cask Contamination	L
3.4.1	Dose Rates (Cask surface or up to 2 meters from cask surface)	L
	Dose Rates (Fence)	Q
3.5.1	Safety Status Surveillance	Q
3.6.1	Pressure Transducer System Parameters	P & L
3.7.1	Alarm System	A

P - Prior to cask loading
L - During loading operations
Q - Quarterly
A - Annually

3.1 CASK LOADING MEASUREMENTS

3.1.1 Specification

For the first loading of a cask model, cask side-wall surface dose rate shall be measured upon cask draining. Prior to moving the cask to the storage pad, cask surface temperature shall be measured after the cask has been sealed for an appropriate period, which should not be less than that expected for the cask surface temperature to come into approximate equilibrium. These dose rate and temperature measurements shall be made at the cask side-wall mid-line at three locations 120° apart around the cask circumference and shall be recorded to establish a baseline of comparison for all subsequent loadings of this model of cask.

For all subsequent loadings of casks of this model, measure and record cask side-wall surface dose rates and temperatures at the cask side-wall mid-line at three locations 120° apart and compare these to the baseline established during first cask use. Do not transfer the cask to the storage pad if unexplained variations (which can not be resolved through known differences in spent fuel assemblies loaded) are found.

3.1.2 Basis

These measurements are to assure that casks have been properly loaded.

3.2 CASK SEAL TESTING

3.2.1 Specification

Prior to storage, the cask seals must be tested as specified in Section 3.3.2.2 of the TSAR.

3.2.2 Basis

The safety analysis of leak tightness of the cask as discussed in the topical report is based on the seals being leak tight to 10^{-6} atm cm^3/s. This check is done to ensure compliance with this design criteria.

3.3 CASK CONTAMINATION

3.3.1 Specification

After cask loading and prior to moving the cask to the storage pad, the cask shall be swiped to ensure that removable surface contamination levels are less than 2200 dis/min/100 cm^2 from beta-emitting sources, and 220 dis/min/100 cm^2 from alpha emitting sources.

3.3.2 Basis

This surveillance requirement will ensure compliance with the decontamination requirements of 49 CFR 173.443 prior to storage in the ISFSI.

3.4 DOSE RATES

3.4.1 Specification

The following dose rate measurements shall be made for the ISFSI:

(1) Cask Surface Gamma and Neutron Dose Rates: After completion of cask loading, gamma and neutron measurements shall be taken on the outside surface (or within 2 meters of the cask surface). The combined gamma and neutron dose rates shall be less than the surface dose rate stated in Table 2-1 (or the specified rate a distance of up to 2 meters from the cask surface).

(2) Dry Cask ISFSI Boundary: Doses shall be determined by measurement at the Dry Cask ISFSI site fence and shall be evaluated on a quarterly basis to demonstrate compliance with §20.105, 10 CFR Part 20.

3.4.2 Basis

These measurements are necessary to assure compliance with the cask specifications and that the dose rates at the security fence meet Part 20 limits as additional casks are placed in storage.

3.5 SAFETY STATUS SURVEILLANCE

3.5.1 Specification

A visual surveillance shall be performed on a quarterly basis of the ISFSI to determine that no significant damage or deterioration of the exterior of the emplaced casks has occurred. Surveillance shall also include observation to determine that no significant accumulation of debris on cask surfaces has occurred.

3.5.2 Basis

This surveillance requirement shall ensure cask maintenance.

3.6 CASK INTERSEAL PRESSURE

3.6.1 Specification

The cask interseal pressure shall be monitored by use of a pressure transducer system as described in section 3.3.3.2 of the TSAR.

3.6.2 Basis

This specification requires the interseal space to be monitored to detect any leakage of either cask seal.

3.7 ALARM SYSTEM

3.7.1 Specification

An alarm system to which all of the pressure transducer systems are connected shall be installed at the storage site and functionally tested annually to ensure proper operation of the system.

3.7.2 Basis

The alarm system must be capable of alerting surveillance personnel of possible cask seal failure and must permit identification of the specific cask indicating a seal failure.