NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1.a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9235	0	USA/9235/B(U)F	1	5

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

a. ISSUED TO *(Name and Address)*

NAC Services Inc.
655 Engineering Drive
Norcross, Georgia 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation application dated August 20, 1992, as supplemented

c. DOCKET NUMBER 71-9235

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: NAC-STC

(2) Description

A steel, lead and polymer (NS4FR) shielded shipping cask for irradiated PWR fuel assemblies. The cask body is a right circular cylinder with an impact limiter at each end. The package has approximate dimensions as follows:

Cavity diameter	71 inches
Cavity length	165 inches
Cask body outer diameter	87 inches
Neutron shield outer diameter	99 inches
Lead shield thickness	3.7 inches
Neutron shield thickness	5.5 inches
Impact limiter diameter	124 inches
Package length:	
without impact limiters	193 inches
with impact limiters	257 inches

The maximum weight of the contents is 39,650 pounds and the maximum gross weight of the package is 250,000 pounds.

The cask body is made of two concentric stainless steel shells. The inner shell is 1.5 inches thick and has an inside diameter of 71 inches. The outer shell is 2.65 inches thick and has an outside diameter of 86.7 inches. The annulus between the inner and outer shells is filled with lead.

The inner and outer shells are welded to steel forgings at the top and bottom ends of the cask. The bottom end of the cask consists of two stainless steel circular plates which are welded to the bottom end

5.(a)(2) Description (Continued)

forging. The inner bottom plate is 6.2 inches thick and the outer bottom plate is 5.45 inches thick. The space between the two bottom plates is filled with a 2-inch thick disk of a synthetic polymer (NS4FR) neutron shielding material.

The cask is closed by two steel lids which are bolted to the upper end forging. The inner lid (containment boundary) is 9 inches thick and is made of Type 304 stainless steel. The outer lid is 5.25 inches thick and is made of SA-705 Type 630 stainless steel. The inner lid is fastened by 42, 1-1/2-inch diameter bolts and the outer lid is fastened by 36, 1-inch diameter bolts. The inner lid is sealed by two metallic O-rings. The outer lid is equipped with a single metallic O-ring. The inner lid is fitted with a vent and drain port which are sealed by metallic O-rings and cover plates.

The cask body is surrounded by a 1/4-inch thick jacket shell constructed of 24 stainless steel plates. The jacket shell is approximately 99 inches in diameter and is supported by 24 longitudinal stainless steel fins which are connected to the outer shell of the cask body. Copper plates are bonded to the fins. The space between the fins is filled with NS4FR shielding material. The package is equipped at each end with an impact limiter made of redwood and balsa.

The fuel basket within the cask cavity can accommodate up to 26 PWR fuel assemblies. The fuel assemblies are positioned within square sleeves made of stainless steel. BORAL sheets are encased within the walls of the sleeves. The sleeves are laterally supported by 31, 1/2-inch thick, 70.86 inch diameter stainless steel disks. The basket also has 20 fins made of Type 6061-T6 aluminum alloy. The support disks and fins are connected by six, 1-5/8-inch diameter by 161-inch long threaded rods made of Type 17-4 PH stainless steel.

Four lifting trunnions are welded to the top end forging. The package is shipped in a horizontal orientation and is supported by a cradle under the top forging and by two trunnion sockets located near the bottom end of the cask.

(3) Drawings

The package is constructed and assembled in accordance with the following Nuclear Assurance Corporation Drawing Nos.:

423-800, sheets 1-2, Rev. 3	423-811, sheets 1-2, Rev. 4
423-802, sheets 1-6, Rev. 6	423-812, Rev. 0
423-803, Rev. 1	423-870, Rev. 2
423-804, sheets 1-3, Rev. 2	423-871, Rev. 1
423-805, Rev. 1	423-872, Rev. 3
423-806, Rev. 1	423-873, Rev. 1
423-807, sheets 1-2, Rev. 0	423-874, Rev. 1
423-809, sheets 1-2, Rev. 1	423-875, Rev. 1
423-810, sheets 1-2, Rev. 1	423-900, Rev. 2

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(b) Contents

(1) Type and form of material

Irradiated PWR fuel assemblies with solid UO_2 pellets. Each fuel assembly may have a maximum burnup of 40,000 MWD/MTU when cooled for at least 6.5 years, or 45,000 MWD/MTU when cooled for at least 10 years. The maximum heat load per package is 22.1 kilowatts. The maximum heat load per assembly is 850 watts. Prior to irradiation, the fuel assemblies must be within the following dimensions and specifications:

Assembly Type	14x14	15x15	16x16	17x17	17x17 (OFA)
Cladding Material	Zirc-4	Zirc-4	Zirc-4	Zirc-4	Zirc-4
Maximum Initial Uranium Content (kg/assembly)	407	469	426	464	426
Maximum Initial Enrichment (wt% ^{235}U)	4.2	4.2	4.2	4.2	4.1
Assembly Cross-Section (in)	7.76 to 8.11	8.20 to 8.54	8.10 to 8.14	8.43 to 8.54	8.43
Number of Fuel Rods per Assembly	176 to 179	204 to 216	236	264	264
Fuel Rod OD (in)	0.422 to 0.440	0.418 to 0.430	0.382	0.374 to 0.379	0.360
Minimum Cladding Thickness (in)	0.023	0.024	0.025	0.023	0.023
Pellet Diameter	0.344 to 0.377	0.358 to 0.390	0.325	0.3225 to 0.3232	0.3088
Maximum Active Fuel Length (in)	145.20	144	150	144	144

(2) Maximum quantity of material per package

Twenty six (26) PWR fuel assemblies

(3) Fissile Class I

6. The maximum heat load within the packaging at any time (transport, storage or testing) shall not exceed the decay heat limits in 5(b)(1).

7. Known or suspected failed fuel and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.

8. Water and residual moisture shall be removed from the containment vessel in accordance with the procedures in Section 7.1 of the application.

9. Containment vessel seals must be tested to a sensitivity of at least 2.9×10^{-5} std-cm^3/sec, and shown to have a leak rate no greater than 5.79×10^{-5} std-cm^3/sec:

   (a) Before first use of each packaging;

   (b) Within the 12-month period prior to each shipment; and

   (c) After seal replacement.

10. All containment vessel O-rings shall be replaced with new O-rings after each use.

11. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) Each packaging must be fabricated in accordance with the fabrication specifications in Chapter 8 of the application;

   (b) Each package shall be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application; and

   (c) Each package must meet the acceptance tests and be maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 of the application.

12. Prior to transport by rail, the Association of American Railroads must have evaluated and approved the railcar and the system used to support and secure the package during transport.

13. Prior to marine or barge transport, the National Cargo Bureau, Inc., must have evaluated and approved the system used to support and secure the package to the barge or vessel, and must have certified that package stowage is in accordance with the regulations of the Commandant, United States Coast Guard.

14. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

15. Expiration date: September 30, 1999.

REFERENCES

Nuclear Assurance Corporation application dated September 27, 1990.

Nuclear Assurance Corporation supplements dated December 23, 1991; August 20, 1992; and August 19, 1993.

NAC Services Inc. supplements dated February 1 and 15, May 18, June 24, July 19, August 10, and September 30, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Section Leader
Cask Certification Section
Storage and Transport Systems Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date SEP 30 1994